REPORT

El Aouj Ore Mining Project

Environmental and Social Impact Assessment (ESIA)

Submitted to:

El Aouj Mining Company (EMC)

Submitted by:

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24715462_EMC_ESIA 2026_VOL1_Full report_V2

06-11-2026

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Non Technical summary

1: GENERAL BACKGROUND TO THE PROJECT

What is the El Aouj Project?

The El Aouj Project is a large-scale iron ore mining development in northern Mauritania. It is planned as an owner-operated, conventional open-pit mine using drilling and blasting. Ore will be processed through crushing, screening, high-pressure grinding and dry magnetic separation to produce an iron concentrate containing approximately 66.5% Fe.

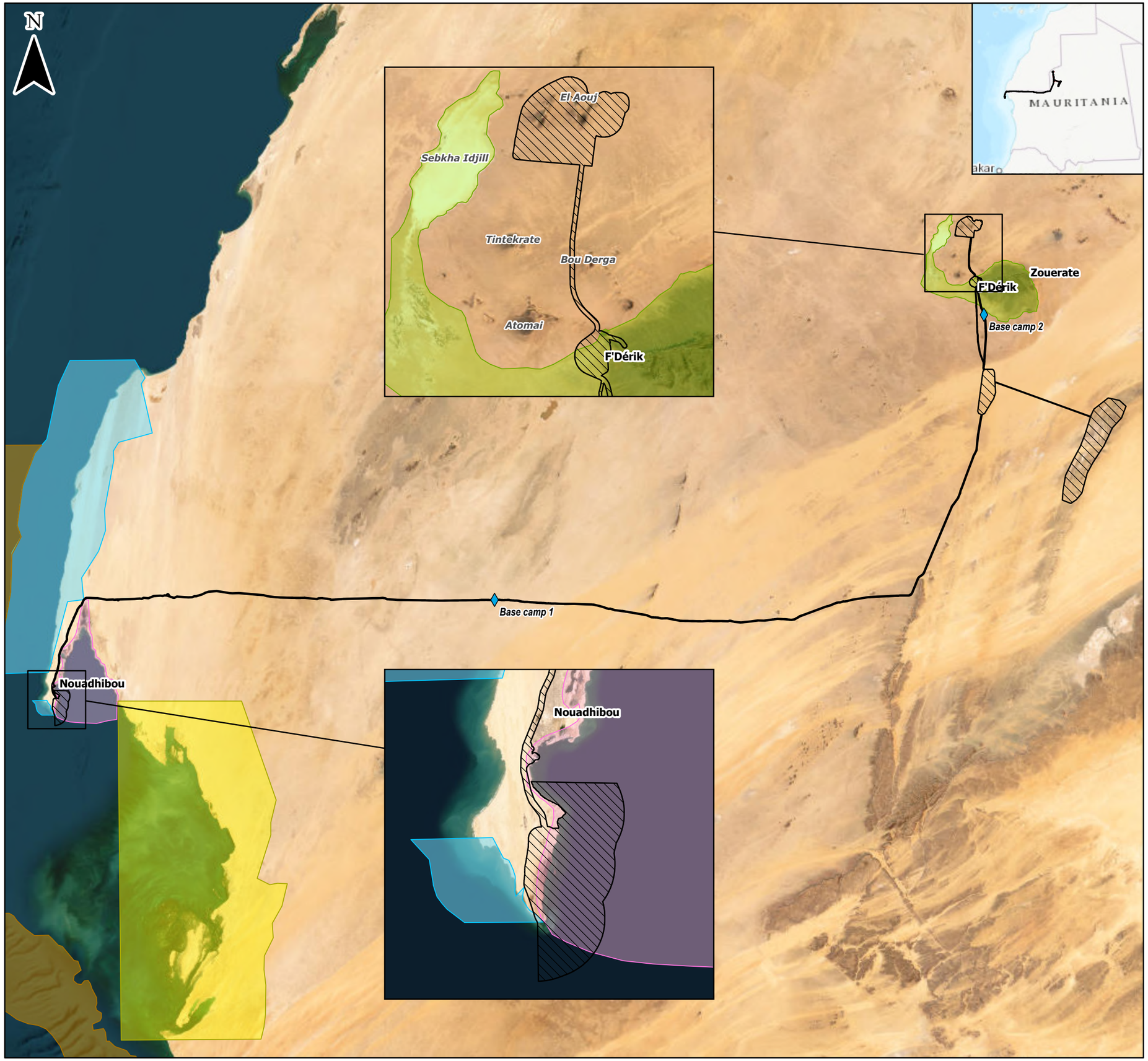
The concentrate will be dispatched through a new approximately 35 km rail spur connecting the mine to the existing railway operated by Société Nationale Industrielle et Minière (SNIM). It will then be carried over approximately 618 km to the existing mineral port at Nouadhibou for export. The mine will also require dedicated water-supply infrastructure, power generation, access roads, accommodations and supporting facilities.

Project classification

The Project is classified as Category A under Mauritanian requirements and the International Finance Corporation (IFC)/U.S. International Development Finance Corporation (DFC) approach, and as Category 1 under the African Development Bank framework. These classifications reflect the potential for significant and diverse environmental and social impacts.

Where is the Project located?

The mine and processing site are located in the Tiris Zemmour Region, approximately 650 km north-east of Nouadhibou, about 50 km south-east of Zouérate and about 30 km north of F'Dérik. The wider Project system extends from the mine area to the existing railway corridor and the mineral port at Nouadhibou.



Project Area of Influence

Base camp

Key Biodiversity Area

- Cap Blanc
- Dakhla area
- Kediet ej Jill
- Banc d'Arguin National Park
- Canary current shelf-break north and south

0 50 100

1:1 850 000 KM

NOTES

REFERENCE

1. BASEMAP : ESRI WORLD IMAGERY, WORLD TOPOGRAPHIC MAP

CLIENT

EL AOUJ MINING COMPANY (EMC)

PROJET

EMC IRON ORE MINING PROJECT ESIA

TITLE

PROJECT AREA OF influence (PORT, RAIL AND MINE)

CONSULTANT

wsp

DATE - JJ/MM/AAAA	21/08/2026
DESIGNED	LBA
REVIEWED	LBI
APPROUVED	RMO

PROJECT N° 500054.02.01

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Why is the Project being developed?

The Project will develop the El Aouj East iron ore deposit and produce a high-grade concentrate for international markets. It will contribute to national revenues, employment, training, local procurement and infrastructure development. The Environmental and Social Impact Assessment (ESIA) also recognises that these benefits must be balanced against long-term demands on groundwater, land use, biodiversity, community services and existing livelihoods.

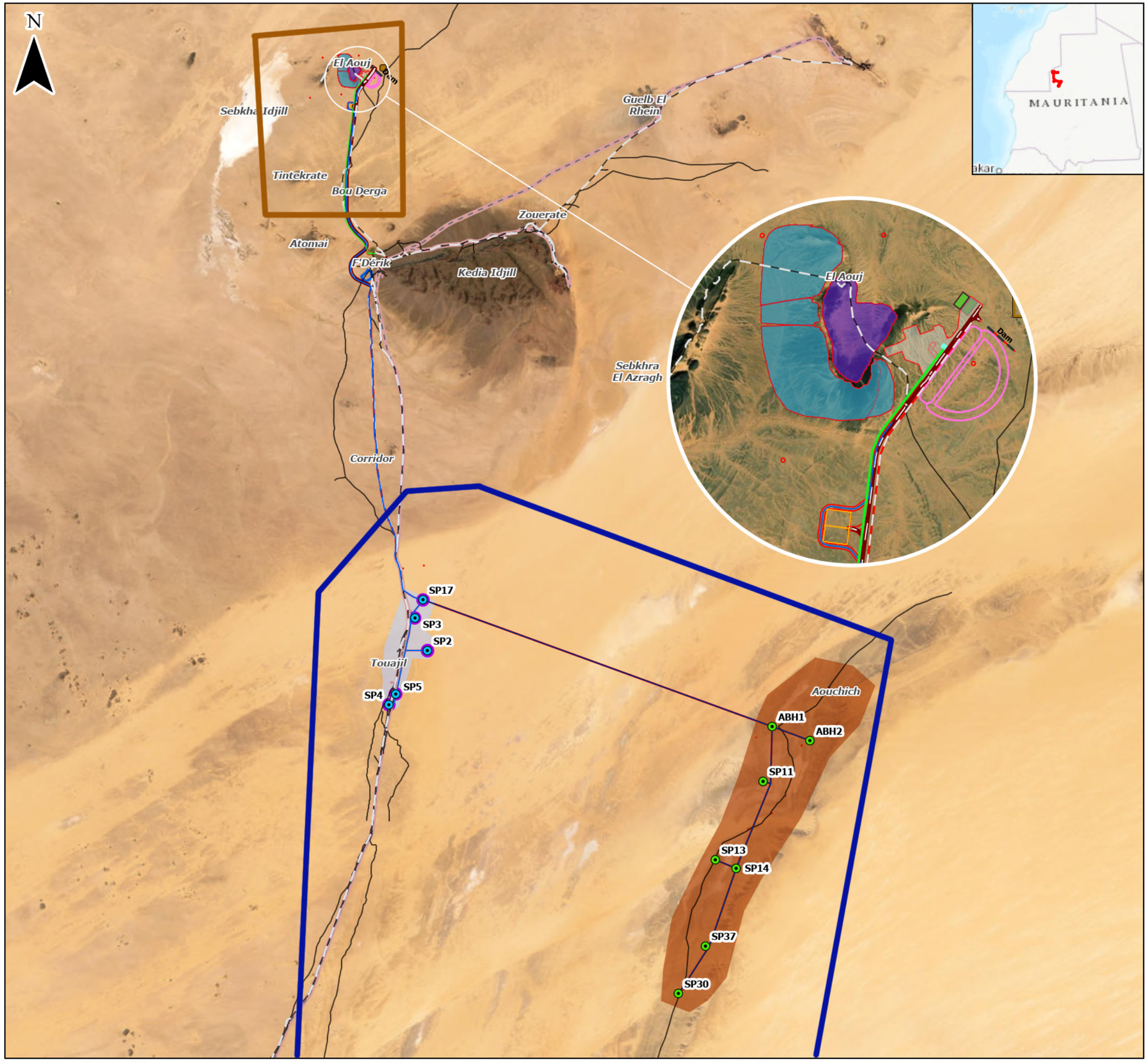
Who is responsible for the Project?

Organisation	Main role
El Aouj Mining Company (EMC)	Project proponent; responsible for the mine and its environmental and social management.
Société Nationale Industrielle et Minière (SNIM)	Owner/operator of existing rail and port infrastructure; responsible for the rail spur implementation and for management of rail and port operational interfaces within its responsibilities.
Mauritanian authorities	Permitting, review, authorisation and regulatory oversight.

2: PROJECT COMPONENTS AND LIFECYCLE

What are the main Project components?

Component	Summary
Mine and process plant	Open pit; waste-rock facilities; crushing, screening, grinding and dry magnetic separation; ROM stockpile; concentrate handling.
Tailings and water-control structures	Dry tailings disposal area, with a capacity of 567 Mt and an expected stored quantity of about 497 Mt; upstream surface water runoff-control dam.
Water supply	Touajil and Aouchich wellfields, approximately 90 km and 140 km from the mine, connected by underground pipelines.
Power	Diesel generation and a solar power plant, with supporting electrical distribution infrastructure.
Transport	New mine access road; approximately 35 km rail spur; use of the existing approximately 618 km SNIM railway; existing Nouadhibou mineral port.
Workforce facilities	Temporary construction camp, permanent mine accommodation and residential development at F'Dérik.
Ancillary facilities	Explosives storage, fuel storage and distribution, wastewater and raw-water treatment, workshops, hardstanding and non-mineral waste facilities.



Project footprint
New El Aouj City at F'Dérick

Mine plant
El Ajou mine plant

El Aouj mine infrastructures
Explosive deposit
Dam
Tailing area
Solar plant
Power plant
Waste dump
Surface water
Open pit

Workers camp
Permanent workers camp
Temporary workers camp

Network
Main Water pipe from well fields to El Aouj Mine
Water pipe from Touajil to Aouchich
Power transmission line

Roads
Existing main roads
Access roads

Railway
Existing railroad
Rail spur

Permits
Mine permit
Water permit

Well fields
Aouchich well field
Touajil well field

Boreholes from well fields
Aouchich
Touajil

0 20 40
1:550 000 KM

NOTES

REFERENCE
1. BASEMAP: ESRI WORLD IMAGERY

CLIENT
EL AOUJ MINING COMPANY (EMC)

PROJET
EMC IRON ORE MINING PROJECT ESIA

TITLE
OVERALL EL AOUJ PROJECT SITE LAYOUT

CONSULTANT

DATE - JJ/MM/AAAA	19/08/2026
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REVIEWED	LBI
APPROUVED	RMO

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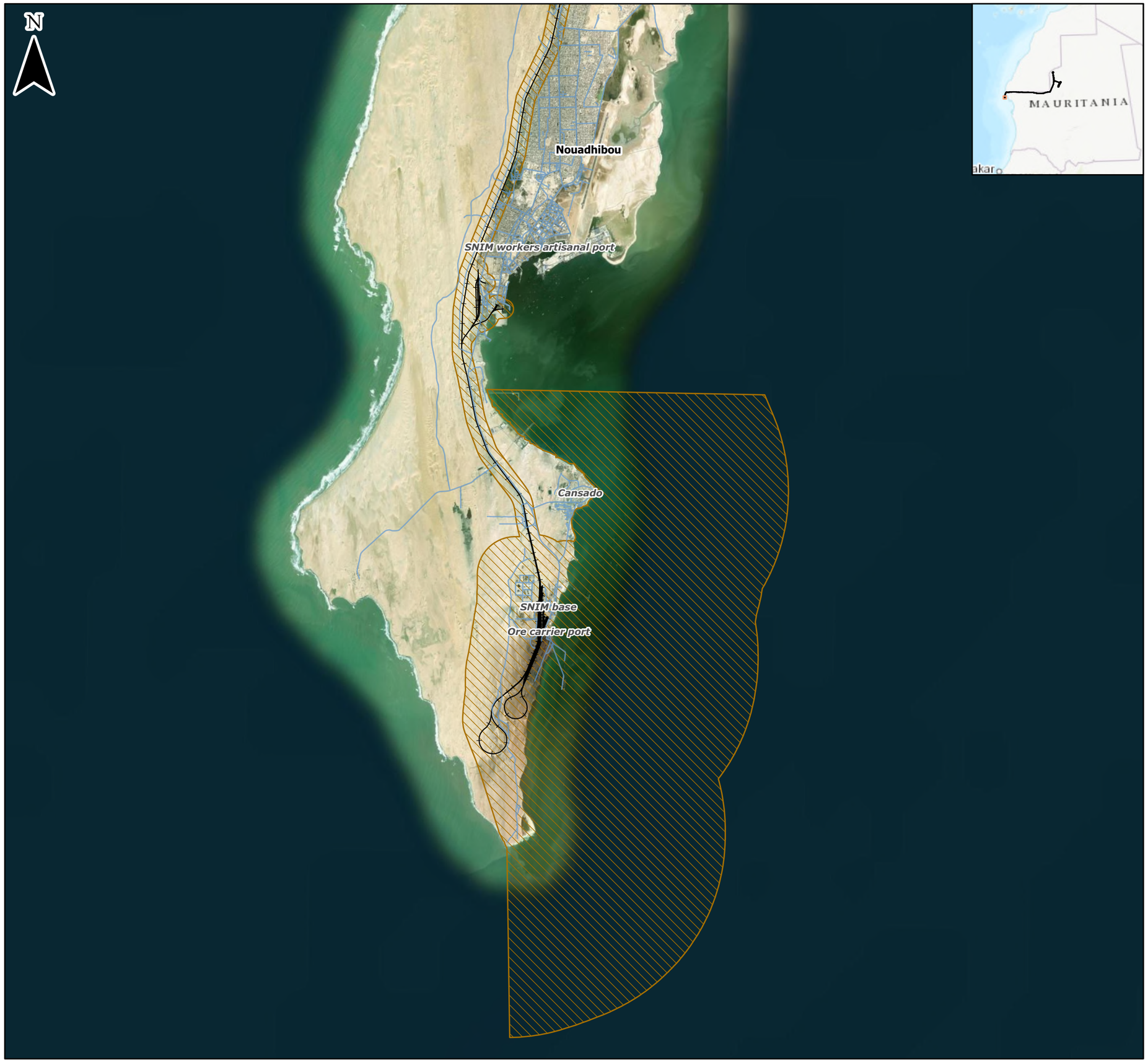

- Project footprint
- Project Area of Influence
- Existing main roads
- Existing railroad

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NOTES

REFERENCE
1. BASEMAP : ESRI WORLD IMAGERY, WORLD TOPOGRAPHIC MAP

CLIENT
EL AOUJ MINING COMPANY (EMC)

PROJET
EMC IRON ORE MINING PROJECT ESIA

TITLE
PROJECT AREA OF INFLUENCE IN THE PORT AREA

CONSULTANT
wsp

DATE - JJ/MM/AAAA	28/08/2026
DESIGNED	LBA
REVIEWED	LBI
APPROUVED	RMO

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What is the proposed schedule?

Phase	Indicative timing
Early works	12 months from January 2027
Construction Phase 1	January 2027 to December 2029
Construction Phase 2	January 2030 to December 2031
Total construction period	Approximately 5 years
Operations Phase 1	From January 2030
Operations Phase 2	From January 2032
Life of mine	Approximately 41 years from January 2030
Closure and rehabilitation	Approximately 4 years

What is the scale of production, investment and employment?

Indicator	ESIA estimate
Run-of-mine ore over mine life	Approximately 931 Mt
Final product over mine life	Approximately 421 Mt
Construction capital expenditure	USD 1.885 billion
Operating expenditure over 41 years	USD 15.479 billion
Conceptual closure cost	USD 13.2 million
Construction workforce	Approximately 2,000 workers
Operational workforce	Approximately 1,214 workers
Expatriate share	Expected to remain below 10%

3: APPLICABLE ENVIRONMENTAL AND SOCIAL REQUIREMENTS

What requirements apply to the Project?

The ESIA has been prepared against Mauritanian environmental and social legislation, including the national impact-assessment process, and against international lender standards. The framework considered includes the IFC Performance Standards, the African Development Bank Integrated Safeguards System, DFC environmental and social requirements, the Equator Principles, and relevant World Bank Group and IFC Environmental, Health and Safety Guidelines.

- IFC Performance Standards addressing risk management, labour, resource efficiency, community health and safety, land and livelihood impacts, biodiversity, Indigenous Peoples where relevant, and cultural heritage.
- African Development Bank operational safeguards applicable to Category 1 projects.
- Good International Industry Practice for mining, occupational health and safety, hazardous materials, transport, emergency preparedness and closure.

- EMC and SNIM corporate environmental and social policies and commitments.

Which permits are already identified?

EMC holds a water exploitation licence covering the Touajil and Aouchich wellfields. The licence was granted in October 2012 for a 30-year term. Other authorisations and approvals remain subject to the applicable Mauritanian permitting process and the final Project design.

4: AREAS OF INFLUENCE AND ALTERNATIVES

Which geographical areas were assessed?

The assessment considers three connected areas: the mine area, including the open pit, process facilities, wellfields, pipelines, access road, accommodation and F'Dérik interface; the rail area, including the new spur and increased use of the existing railway; and the port area at Nouadhibou. Topic-specific areas of influence were defined for physical, biological, social, cultural-heritage and ecosystem-service receptors.

What alternatives were considered?

The ESIA reviews the "no Project" option and main alternatives relating to water demand and supply, ore treatment, and measures to reduce water use for dust control and energy supply. The selected configuration seeks to meet production needs while reducing water and energy demand and avoiding or limiting environmental and social effects where practicable.

How were cumulative impacts considered?

The cumulative assessment considers the Project together with existing and planned mining, railway, urban and infrastructure developments in the Tiris Zemmour Region and at Nouadhibou. The valued environmental and social components include groundwater quantity and quality, the Sebkha Idjill system (used for artisanal salt mining), air quality, greenhouse-gas emissions, pastoral livelihoods, community services, health and safety, cultural heritage, natural habitats, avifauna and marine critical habitats. Particular attention is given to regional groundwater abstraction, increasing pressure on housing and public services, habitat fragmentation, additional rail traffic and the growth of port and shipping activities. Although the Project can mitigate its own contribution through the Environmental and Social Management Program (ESMP) and associated management plans, several cumulative effects cannot be effectively managed by EMC alone. The ESIA therefore recommends coordinated regional monitoring, information sharing and joint management arrangements involving EMC, SNIM, public authorities and other relevant operators, particularly for groundwater resources, biodiversity, railway safety and community services.

5: EXISTING ENVIRONMENTAL AND SOCIAL CONDITIONS

What are the main physical-environment characteristics?

The mine area is situated in an arid Saharan setting characterised by very low and irregular rainfall, high evaporation, sparse surface-water features and strong dependence on groundwater. The assessment therefore treats groundwater availability and quality as key sensitivities. Dust, noise, soil disturbance, flood pathways and pollution prevention are also important because Project activities will occupy a large and long-lived industrial footprint.

The rail corridor crosses extensive desert and pastoral landscapes, while the port is located in a sensitive coastal and marine environment. Increased rail and shipping activity therefore requires management of dust, noise, collision risks, sediments, seawater quality and marine fauna.

What are the main biodiversity sensitivities?

The assessment covers natural habitats, flora, reptiles, mammals, birds, bats, arthropods and marine biodiversity. The mine area includes habitats and legally protected flora of conservation interest and lies close to the Kedia d'Idjil Key Biodiversity Area (KBA)/Important Bird Area (IBA). The port area is associated with internationally recognised and protected coastal and marine areas, including Cap Blanc KBA/IBA, Cap Blanc Satellite Reserve, and the wider Dakhla area KBA/IBA, all of which support sensitive bird and marine-fauna receptors.

The ESIA's critical-habitat screening identifies receptors requiring the application of the mitigation hierarchy and additional conservation actions, additional targeted surveys, implementation of a Biodiversity Action Plan, and long-term monitoring. Particular attention is given to habitat loss and fragmentation, protected trees, birds of conservation concern, marine mammals and the consequences of additional vessel traffic and power transmission infrastructure.

What are the main social and livelihood characteristics?

The social area of influence includes F'Dérik, Zouérate, communities and users around the mine and wellfields, settlements and pastoral users along the transport corridors, and communities connected to the port economy. Livelihoods include formal employment, trade, pastoralism, salt extraction at Sebkha Idjill, artisanal activities and fishing in the Nouadhibou area.

Water access, grazing resources, mobility, community services, inflation, employment expectations, vulnerable groups, labour influx, health and safety, and the distribution of Project benefits are central social issues. The Project may create substantial employment and procurement opportunities, but may also increase pressure on services and natural resources and alter established access patterns.

What cultural heritage and ecosystem services are relevant?

Archaeological and cultural-heritage surveys identify tangible and intangible heritage values in the mine area and along the Project's interfaces. Ecosystem services identified and assessed in the ESIA include water supply, forage and livestock resources, salt extraction, wild products, traditional-use resources, climate and water regulation, and cultural or spiritual values.

6: STAKEHOLDER ENGAGEMENT

How were stakeholders consulted?

The ESIA builds on consultation undertaken during the earlier 2013–2016 assessment process, recent engagement in 2023, an EMC Project-information meeting in October 2024 and further ESIA consultation activities in June 2025. Engagement was used to present the Project, document concerns and requests, validate baseline information and inform the impact assessment and management measures.

What were the main themes raised?

- Access to water and possible effects of wellfield abstraction on existing users.
- Local employment, training, procurement and fair access to Project opportunities.
- Land access, pastoral mobility, grazing resources and natural-resource-based livelihoods.
- Pressure on housing, services and prices associated with workforce and in-migration.
- Community health, traffic safety, security and worker conduct.

- Protection of biodiversity, cultural heritage and the Sebkha Idjill salt works.
- Continued information-sharing, participation and an accessible grievance mechanism.

How will future engagement be managed?

The ESIA requires a Stakeholder Engagement Plan and a grievance mechanism covering communities and workers. Engagement is to continue through construction, operation and closure, with tailored measures for women, vulnerable groups, groundwater users, pastoralists, fishers and other affected stakeholders.

7: IMPACT ASSESSMENT METHOD

How was impact significance determined?

The assessment considers the Project phase, whether an impact is positive or negative, and whether it is direct, indirect or cumulative. For adverse impacts, magnitude is determined from intensity, geographic extent and duration. This is combined with receptor sensitivity to determine impact significance. Mitigation is then applied and the residual impact is rated.

Step	Question
1. Identify interaction	Which Project activity could affect which receptor?
2. Characterise magnitude	What are the intensity, extent and duration of the change?
3. Evaluate sensitivity	How vulnerable, valuable or replaceable is the receptor?
4. Determine significance	What is the significance before mitigation?
5. Apply mitigation hierarchy	Can the impact be avoided, reduced, restored or offset?
6. Rate residual impact	What remains after the measures are implemented?

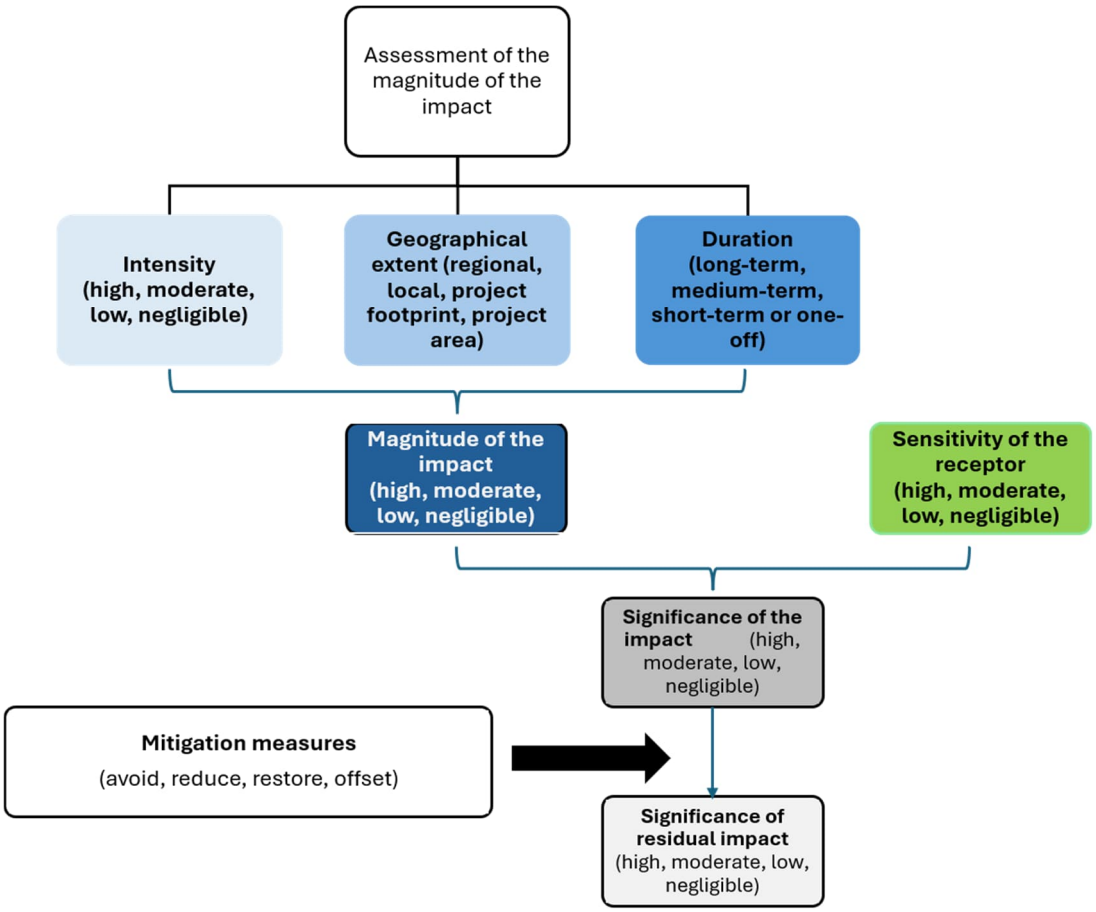

Figure D: Determining the significance of adverse impacts

8: MAIN POSITIVE AND NEGATIVE IMPACTS

What are the main positive outcomes?

- Increased government revenues and export earnings from iron ore production.
- Approximately 2,000 construction jobs and 1,214 operational jobs, with training and a stated preference for Mauritanian and regional recruitment.
- Local procurement and business opportunities in construction, transport, accommodation, catering, maintenance and services.
- Infrastructure and community-development opportunities associated with F'Dérik, water, roads, energy and workforce services.
- Potential long-term use of selected assets after closure, subject to detailed closure planning and agreement with relevant authorities or community organisations.

What are the main negative impacts in the mine area?

Theme	Main potential effect
Groundwater	Long-term drawdown in the P2 and P4 aquifers; effects on groundwater users; possible quality changes.
Surface water and land	Changes to runoff and flood pathways; sediment and pollution risks; effects on wadis and Sebkha Idjill; soil disturbance and land-use change.
Air, climate, noise and vibration	Dust and combustion emissions; greenhouse-gas emissions from power generation and mobile equipment; noise and vibration from mining and blasting.
Biodiversity	Loss, degradation and fragmentation of natural habitat; loss of protected flora; disturbance of and increased mortality risk for birds and other fauna.
Livelihoods and community	Effects on pastoral resources, water-dependent activities and salt extraction; in-migration; inflation; pressure on services; health, safety and security risks.
Workers	Occupational risks associated with blasting, heavy mobile equipment, processing, electricity, hazardous materials, heat and remote work.
Cultural heritage	Damage or disturbance to archaeological and intangible cultural-heritage values and changes to their setting.
Closure	Retrenchment and economic transition; long-term stability, rehabilitation and post-closure monitoring obligations.

What are the main impacts associated with the railway?

The rail component may increase dust, noise, vibration and pollution risks along the corridor. It may also disturb fauna, and incrementally increase collision risks, constrain pastoral movement, affect community safety and interact with tangible and intangible cultural heritage. These effects are linked mainly to the new spur and the increased frequency of ore trains on the existing railway.

What are the main impacts at the port?

Additional ore handling and shipping may increase dust and noise, affect sediment and seawater quality, disturb birds and marine fauna, increase vessel-collision risk for marine mammals and affect fishing activities through increased traffic or accidental pollution. These risks are particularly important because of the protected and internationally recognised coastal and marine areas near Nouadhibou.

9: MITIGATION AND MANAGEMENT MEASURES

What measures will be implemented?

The ESIA applies the mitigation hierarchy. Design and operational controls are to be used first to avoid impacts, followed by measures to reduce impacts, restore disturbed areas and, where necessary, compensate or offset impacts that cannot otherwise be addressed.

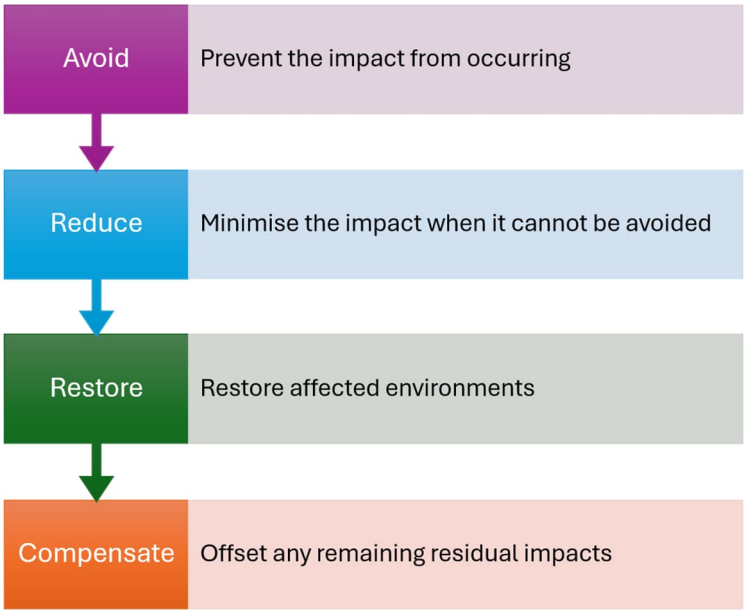

Figure E: Order of priority for measures to mitigate negative impacts

Management area	Examples of required measures
Groundwater and surface water	Abstraction controls; monitoring network; user surveys; water-balance updates; trigger levels and adaptive management; pollution prevention; runoff and flood management.
Air and climate	Dust suppression; covered or controlled transfer points; speed management; equipment maintenance; emissions monitoring; energy-efficiency and renewable-energy measures.
Land and waste	Defined footprints; topsoil and erosion management; hazardous-material controls; waste segregation; spill-prevention and response; progressive rehabilitation.
Biodiversity	Pre-clearance surveys; avoidance of sensitive features; limits on clearance; fauna protection; lighting and traffic controls; habitat restoration; bird friendly power line design; Biodiversity Action Plan with additional conservation actions targeting KBAs/IBAs, and monitoring.
Communities and livelihoods	Local recruitment and procurement procedures; influx management; livelihood measures; community health and safety controls; security management; grievance mechanism.
Workers	Occupational health and safety system; competency and permit-to-work requirements; heat-stress controls; emergency response; contractor management.
Cultural heritage	Avoidance, demarcation and monitoring; chance-find procedure; consultation with relevant custodians and authorities.
Rail and port interfaces	Coordination with SNIM; traffic and rail safety; dust/noise controls; marine pollution prevention; vessel and fauna risk management.

Which specific management plans are required?

- Groundwater and Surface Water Management Plan.
- Hazardous Materials Management Plan.
- Traffic Management Plan.
- Emergency Preparedness and Response Plan.
- Energy Management Plan.
- Non-mineral Waste Management Plan.
- Biodiversity Action Plan.
- Cultural Heritage Management Plan.
- Stakeholder Engagement Plan.
- Occupational Health and Safety Management Plan.
- Community Health, Safety and Security Management Plan.
- Community Development Plan.
- Mine Closure Plan.

10: RESIDUAL IMPACTS, RISKS AND CLOSURE

What impacts remain after mitigation?

For the mine area, the ESIA reports 72 residual-impact ratings: one High, 26 Moderate, 35 Low, two Negligible and 11 Positive. The only residual impact rated High is the decline of groundwater levels in the P2 Touajil and P4 Aouchich aquifers due to the volume and duration of pumping.

Principal residual impact

Long-term groundwater drawdown is the defining environmental and social management issue for the Project. It requires monitored abstraction, protection of existing users, transparent triggers, adaptive management and contingency measures throughout operation and after closure.

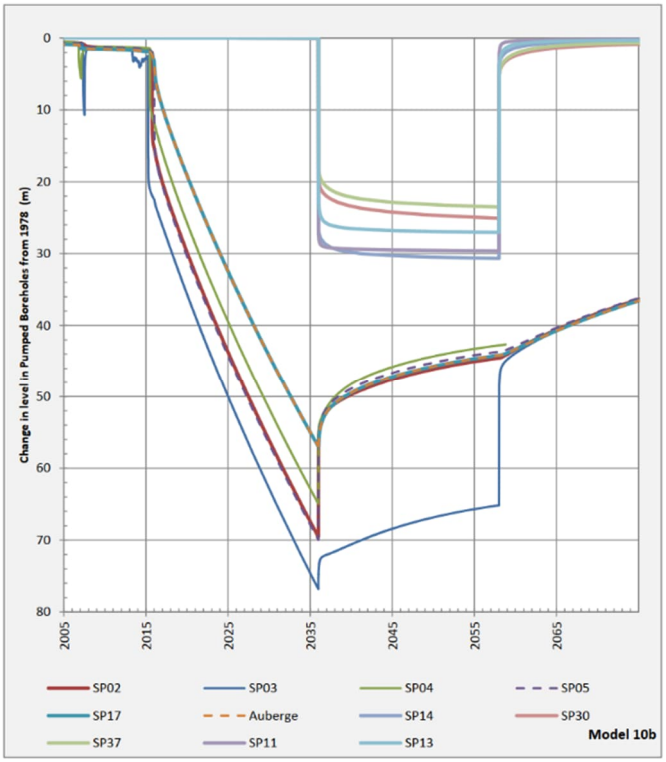

Figure F. Predicted groundwater drawdown in the Touajil and Aouchich wellfields over the Project life.

Moderate residual impacts include groundwater effects on users, greenhouse-gas emissions, natural habitat loss and fragmentation, impacts on protected flora and birds, in-migration, inflation, livelihood effects, community health and safety, impacts on women and vulnerable groups, pressure on forage and water resources, heritage effects and closure-related employment transition.

What accidental risks were identified?

The ESIA considers emergencies at the mine, along the railway and at the port. Scenarios include heavy-equipment incidents, traffic and rail accidents, fires and explosions, hazardous-material spills, worker rescue, failure of water or tailings-control structures, marine pollution, vessel incidents and evacuation emergencies. Responsibilities are divided according to operational control, with EMC responsible for the mine and SNIM responsible for rail and port facilities.

How is climate risk addressed?

The climate-risk assessment extends to 2070 and considers physical risks that may intensify over the Project life. Relevant hazards include extreme heat, intense rainfall and flooding, drought and water scarcity, wind and dust, and effects on infrastructure, water supply, workers and operational continuity. The ESIA requires climate resilience to be integrated into design, operating procedures, emergency planning and periodic risk review.

Figure G. Main risk results predicted by the CCRA

How will closure be managed?

Closure is expected to include decommissioning, demolition where required, stabilisation, rehabilitation, revegetation, management of residual contamination and waste, long-term water and geotechnical monitoring, workforce transition and engagement with affected communities.

The current closure estimate is conceptual : major demolition, rehabilitation, geotechnical stabilisation and financial-assurance costs must be quantified in a detailed Mine Closure Plan.

What assets could remain after closure?

Subject to technical assessment, legal agreements and acceptance by the relevant authorities or community organisations, the ESIA envisages that selected assets may be retained or transferred. These may include the mine access road, the rail spur, water pipelines and wellfield infrastructure, power facilities, accommodation or housing at F'Dérik. Assets that are not retained would be decommissioned, removed or made safe, and disturbed ground would be stabilised and rehabilitated.

11: IMPLEMENTATION, COSTS AND MONITORING

Who will manage environmental and social performance?

EMC will be responsible for implementation of the mine ESMP and associated management plans, including contractor control, monitoring, reporting, stakeholder engagement and corrective action. SNIM will retain responsibility for the rail and port components under its operational control. Regulatory authorities and lenders may undertake oversight, review and independent monitoring.

What resources are identified for the ESMP?

Phase	Specific Management Plan Initial implementation (€)	Additional initial implementation (€)	TOTAL cost initial implementation
Construction	€932,000	€330,000	€1,262,000
Operation	€12,000	€280,000/year	€292,000
Closure	€65,000		€65,000

Cost synthesis by phase and component (initial implementation)

Phase	Component	Periodic Implementation of Specific Management Plans (€/year)	Additional maintenance / monitoring (€/year)	EHS management (per year)	E&S external monitoring (per year)	TOTAL cost annual implementation
Construction TOTAL		1 463 000 €	120 000 €	600 000 €	190 000 €	**2 373 000 €**
Operation TOTAL		2 597 000 €	75 000 €	1 000 000 €	95 000 €	**3 767 000 €**
Closure TOTAL		135 000 €		1 000 000 €		**1 135 000€**

Cost synthesis by phase and component (annual implementation)

These ESMP-level figures do not replace the broader capital, operating and closure budgets required to deliver all engineering, compensation, rehabilitation, financial-assurance and long-term liability obligations.

How will performance be verified?

- Baseline confirmation before disturbance and updated surveys where the design changes.
- Routine monitoring of groundwater levels, abstraction, quality and impacts on users.
- Air, dust, noise, vibration, soil, surface-water and marine monitoring as applicable.
- Biodiversity, habitat-restoration and critical-habitat monitoring.
- Worker and community health and safety indicators, incident reporting and emergency exercises.
- Local employment, procurement, in-migration, vulnerable-group and livelihood indicators.
- Grievance tracking, stakeholder feedback and disclosure of relevant monitoring results.
- Internal and independent audits, corrective-action tracking and periodic management review.

12: OVERALL CONCLUSION

The El Aouj Project is a strategic, long-life mining development with the potential to generate substantial economic benefits for Mauritania. It also presents significant environmental and social risks because of its scale, duration, dependence on groundwater and reliance on connected rail and port infrastructure.

The 2026 ESIA concludes that most impacts can be reduced to Low or Moderate levels through the proposed mitigation and management framework. One residual impact remains High: long-term groundwater drawdown in the Touajil and Aouchich aquifers. The Project's acceptability therefore depends on rigorous implementation of the ESMP, transparent monitoring, adaptive water management, protection of affected users and livelihoods, coordination between EMC and SNIM, and progressive planning for closure and post-closure conditions.

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APPENDICES

Refer to volume 2 : Appendixes

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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
AfDB	African Development Bank
ANARPAM	National Agency for Geological Research and Mining Heritage
ANSADE	Agence Nationale de la Statistique, de l'Analyse et de la Démographie Économique
AoI / SAoI	Area of Influence / Social Area of Influence
AQ	Air Quality
ARD	Acid Rock Drainage
BAP	Biodiversity Action Plan
BBA	BBA Inc. (Engineering consultancy)
BIF	Banded iron formation
BS	British Standard
CBD	Convention on Biological Diversity
CBDR	Common But Differentiated Responsibilities
CCRA	Climate Change Risk Assessment
CDM	Clean Development Mechanism
CDP	Community Development Plan
CESMP	Construction Environmental and Social Management Plan
CH	Cultural Heritage
CHMP	Cultural Heritage Management Plan
CHSSMP	Community Health, Safety and Security Management Plan
CIA	Cumulative Impact Assessment
CITES	Convention on International Trade in Endangered Species
Co	Construction phase
COP	Conference of the Parties
CSR	Corporate Social Responsibility
D	Decommissioning phase
DFC	U.S. International Development Finance Corporation
DFIs / DFI	Development Finance Institutions
DEM	Dust Extinction Moisture
DM	Dense Media
DMS	Dense Media Separation
EAAA	Ecologically Appropriate Area of Assessment
EB	Ecology and Biodiversity
ECA	Export Credit Agencies
EH	Environmental, Health, and Safety
EHR	Employee Health Record
EHS	Environment, Health and Safety
EHS Guidelines	Environmental, Health and Safety Guidelines
EMC	El Aouj Mining Company
EnMP	Energy Management Plan
EPC	Engineering, Procurement and Construction Contractor
EPCV	Enquête Permanente pour les Conditions de Vie
EP	Equator Principles
EP4	Equator Principles – 4th Edition
EPFI	Equator Principles Financial Institution

Acronym	Definition
EPRP	Emergency Preparedness and Response Plan
ERP	Emergency Response Plan
ES	Ecosystem Services
ESAP	Environmental and Social Action Plan
ESA	Ecosystem Services Assessment
ESE	Environmental and Social Evaluation
ESHS	Environmental, Social, Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMR	Environmental and Social Monitoring Report
ESMS	Environmental and Social Management System
FCCC	Framework Convention on Climate Change
FEED	Front-End Engineering Design
FGD	Focus Group Discussion
GAC	Guelb El Aouj Centre
GAE	Guelb El Aouj East
GAW	Guelb El Aouj West
GCPH	General Census of Population and Housing
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GN	Guidance Note
GN6	Guidance Note 6
GSE	Green Sahel Expertise
GW	Groundwater
GWSWMP	Groundwater and Surface Water Management Plan
H&S / HS	Health and Safety
HAZMAT	Hazardous Materials
HPGR	High-Pressure Grinding Rolls
HSE/EHS	Health, Safety and Environment
IAQM	Institute of Air Quality Management
IEM	Iowa Environmental Mesonet
IFC	International Finance Corporation
IGA	Income Generating Activities
ILO	International Labour Organization
IMROP	Institut Mauritanien de Recherches Océanographiques et des Pêches
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
ISO	International Organization for Standardization
ISS	Integrated Safeguards System
IUCN	International Union for Conservation of Nature
JV	Joint Venture
KBA	Key Biodiversity Area
KII / KIIs	Key Informant Interview(s)
LC	Least Concern (IUCN Red List)
LCA	Landscape Character Area
LIMS	Low-Intensity Magnetic Separation

Acronym	Definition
LQU / LQ	Land Quality and Land Use
LRP	Livelihood Restoration Plan
LV	Landscape and Visual
MCP	Mine Closure Plan
MEA	Millennium Ecosystem Assessment
MEP	Ministry of Energy and Petroleum
MESD	Ministry of Environment and Sustainable Development
MHA	Ministry of Hydraulics and Sanitation
MHUAT	Ministry of Housing, Urban Development and Territorial Planning
MIMS	Magnetite Intermediate Magnetic Separation
ML/d / ML/day	Megalitres per day
MP	Management Plan
MQ	Magnetite quartzite
Mt	Million tonnes
NE	North-East
NGO / NGOs	Non-Governmental Organization(s)
NMWMP	Non-mineral Management Plan
NNE	North-North-East
No	Numéro
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NV	Noise and Vibration
OHS	Occupational Health and Safety
OHSMP	Occupational Health and Safety Management Plan
ONS	Office National de la Statistique (Mauritanie)
Op	Operation phase
OS	Operational Safeguard
OS6	Operational Safeguard 6
P2 / P4	Hydrogeological Units (Taoudeni Basin)
PAoI	Project Area of Influence
PAP	Project Affected People
PDC	Plan de développement communal
PES	Priority Ecosystem Services
PM	Particulate Matter
PM10 / PM2.5	Particulate Matter fractions
PNBA	Parc National du Banc d'Arguin
PNDSE	Programme national de développement du secteur de l'éducation
PNIDDLE	Programme National Intégré d'Appui à la Décentralisation, au Développement Local et à l'Emploi des jeunes
PRAPS-2	Regional Sahel Pastoralism Support Project – Phase II
PS	Performance Standards
RO	Reverse Osmosis
ROM	Run-of-mine
SAoI	Social Area of Influence
SCAPP	Stratégie de Croissance Accélérée et de Prospérité Partagée
SDC	Specific Diesel Consumption
SEC	Specific Energy Consumption

Acronym	Definition
SEP	Stakeholder Engagement Plan
SFB	Sinter fines blend
SG	Société Générale
SNADEA	National Strategy for Sustainable Access to Water and Sanitation
SNDE	Société Nationale de l'Eau
SNDEL	National Strategy for Decentralization and Local Development
SNDSR	National Strategy for the Development of the Rural Sector
SNEDD	National Environment and Sustainable Development Strategy
SNIM	Société Nationale Industrielle et Minière
SOC	Social
SOMELEC	Société Mauritanienne d'Électricité
SO_2	Sulphur Dioxide
SOP	Standard Operating Procedure
SP	Specific Production Well
SW	Surface Water
TCFD	Task Force on Climate-Related Disclosures
TDS	Total Dissolved Solids
TMP	Traffic Management Plan
TSF	Tailings Storage Facility
TT	Traffic & Transportation
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNGP	United Nations Guiding Principles
UST	Unités de Santé au Travail
VEC	Valued Environmental and Social Component
WA	Wadi Area
WB	World Bank Group
WHO	World Health Organization
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

1.1.1 Overall context

The El Aouj Project (hereafter designed as the “Project”) is a conventional iron ore mining, owner operated, open-pit drill and blast operations and process plant. Located 750 km northeast of the capital, the Project is more precisely located in the Tiris-Zemmour Region, approximately 30 km north of the village of F’Dérik.

An Environmental and Social Impact Assessment (ESIA) for the Project was undertaken by URS Infrastructure and Environment UK Limited (URS, now AECOM) with the assistance of Mauritanian consultant Innovant Bureau Consult (URS, 2015). The final report by URS was issued in December 2015 based on the feasibility study designs for the Project. That ESIA was developed in accordance with the Mauritanian requirements as well as EMC’s corporate standards, international standards (International Finance Corporation (IFC) Performance Standards and the World Bank Group Environmental Health and Safety (EHS) Guidelines), and guidance applicable to the mining industry. The Project ESIA was approved by the Mauritanian authorities in 2016.

In 2023, WSP France (WSP) was engaged to undertake a gap analysis of the ESIA in early 2023 based on the Front-End Engineering Design (FEED) and execution plans (WSP, 2023). The review identified areas of the 2015 ESIA to be updated to reflect the updated project design and modern guidance under international standards (IFC, AfDB, Equator Principles). In addition, a specific chapter on the impact assessment of the Aouchich area and the pipeline was prepared as it was not covered in the URS ESIA (2015). WSP subsequently updated the ESIA, including supplementary baseline surveys (physical, biodiversity, social and cultural heritage); updated impact assessments; and the development of management plans to support implementation of the ESIA outcomes. The ESIA updates were published in December 2023. To ensure compliance with the Equator Principles, a climate change impact assessment (for physical and transition risks) and a human rights risk assessment were also carried out.

A new version of the ESIA was required in 2024 by the lenders to account for:

- updates in project description,
- inclusion of the port and rail in the area of influence of the Project,
- additional biodiversity studies to include multi-season data,
- new round of stakeholder consultations,
- inclusion of cumulative impact assessment, including the increased rail and port (shipping) traffic.

This ESIA compiles data from existing chapters from previous ESIA (URS, 2015), (WSP, 2023) and new data collected in 2024 and 2025 and reassesses the impacts and mitigation measures based on the latest information. It also includes updates in some of the specific management plans previously developed by WSP. This report presents the legal framework, project categorization, project description and alternative analysis. This chapter is part of the El Aouj project ESIA and cannot be separated from it.

1.1.2 Objectives

The objective of this report is to deliver a comprehensive Environmental and Social Impact Assessment (ESIA) based on newly collected data, while integrating relevant findings from previous assessments conducted by URS (2015) and WSP (2023). The ESIA covers the full project scope, including not only the mine but also the port and railway areas, and ensures compliance with Mauritanian regulatory requirements as well as applicable international standards, including the Equator Principles; the International Finance Corporation (IFC) Performance Standards and Guidance Notes; the African Development Bank (AfDB) Operational Safeguards and Guidance Notes; the Environmental and Social Policies and Procedures of the U.S. International

Development Finance Corporation (DFC); and the World Bank Group Environmental, Health, and Safety (EHS) Guidelines.

The objective of the study is to present a full ESIA using new data and also incorporating part of the assessments carried out by URS in 2015 and by WSP in 2023 by including the port and railway areas and assuring compliance with Mauritanian regulations as well as with international standards: Equator Principles, Standards and Guidance Notes of the International Finance Corporation Performance, Operational Safeguards of the African Development Bank and Environmental and Social Policies, Procedures of the US International Development Finance Corporation (DFC) and World Bank Guidelines on Environmental Health and Safety.

1.1.3 Project Proponent

El Aouj Mining Company

The El Aouj Project is owned by the El Aouj Mining Company (EMC). EMC's main shareholders are SNIM (92%) and Glencore (8%). EMC owns the iron ore mine project in Mauritania (the "Project").

Permits and approvals for all Project activities will be the responsibility of EMC. EMC already holds the mining exploitation permit for the Project (No. 609), granted in 2008, as well as a water exploitation permit (No. 2058 M.H.A), granted in 2012 to supply water to the Project. It is to be reminded that the environmental feasibility study was validated in 2016 by the environmental authorities.

SNIM

The SNIM, the "Société Nationale Industrielle et Minière" of Mauritania (National Industrial and Mining Society) is a Mauritanian company, operating in the research, exploitation, processing, transport and export of iron ore with headquarters in Nouadhibou. SNIM is the first industrial group and the second biggest employer in Mauritania and the second largest African iron ore producer.

SNIM essentially operates two types of deposits in the region of Tiris Zemmour in northern Mauritania: hematite and magnetite. SNIM also owns and operates other existing iron ore mines in the area, an existing heavy haul rail system between the M'Haoudat mine and the iron ore port at Nouadhibou (704km long).

SNIM will be responsible for the funding, design, procurement and construction of the rail spur and rollingstock as well as any other required upgrades to facilitate the transport and export of iron ore and management of rail transported goods for construction and operations.

Glencore

Glencore plc is a Swiss multinational commodity trading and mining company. Glencore has a number of production facilities all around the world and supplies metals, minerals, crude oil, oil products, coal, natural gas and agricultural products to international customers in the automotive, power generation, steel production and food processing industries.

1.1.4 ESIA team

WSP

WSP is one of the one of the world's top professional services firms. We design lasting solutions in the Transportation & Infrastructure, Property & Buildings, Environment, Industry, Resources (including Mining and Oil & Gas) and Power & Energy sectors as well as project delivery and strategic consulting services. With approximately 75,000 talented people in 500 offices across 50 countries in the Americas, Europe, the Middle East, Africa, and Asia-Pacific, we engineer projects that will help societies grow for lifetimes to come.

Our Environmental and Social Impact Assessment (ESIA) and Planning teams specialize in the process of securing approvals, permitting, licensing, and planning support. We work with organizations focused on investing, developing, or expanding existing assets, seeking on-going maintenance for their operations and

infrastructure, or the closure of their facilities. We are involved in the full lifecycle delivery of projects, including the strategic advisory, investment, procurement, due diligence, planning, construction, and monitoring phases. In each case, we work to deliver positive outcomes for all stakeholders.

With our multidisciplinary team of planners, scientists and engineers, we are well positioned to analyse the environments in which projects are undertaken. We combine our experience with global standards such the Equator Principles, and International Finance Corporation's Performance Standards, with a thorough understanding of the local regulatory systems and cultural sensitivities.

GSE

Green Sahel Expertise (GSE) is a consulting firm specializing in the environment and was created by a group of environmentalists trained in major schools and universities and benefits from both the expertise and the effective support of national experts from various disciplines and from an excellent knowledge of the Sahel and the sub-region countries issues. GSE responds to the environmental issues in public and private sectors of the Sahelian and sub-region countries. Their main areas of expertise are the extractive industries, projects for the exploration and exploitation of oil and gas products, fisheries and industrial projects and road development projects, and water/agriculture. GSE also collaborates with international researchers and research centres, allowing them to anticipate environmental issues and direct their skills towards strategic needs.

The key members of the team who worked on the ESIA 2025 are presented in APPENDIX A.

1.1.5 ESIA deliverables

1) Environmental And Social Impact Assessment
2) Stakeholder Engagement Plan
3) Specific Management Plans
    a. Cultural Heritage Management Plan
    b. Community Development Plan
    c. Community Health, Safety & Security Management Plan
    d. Emergency Response Plan
    e. Groundwater and Surface Water Management Plan
    f. Non-Mineral Waste
    g. Traffic Management Plan
    h. Hazardous Materials
    i. Biodiversity Management Plan
    j. Energy Management Plan
    k. Occupational Health & Safety Management Plan
    l. Mine Closure Plan

2.0 LEGAL AND INSTITUTIONAL FRAMEWORK

For the preparation of the present document, international conventions and agreements, International Standards have been analysed and considered together with national standards.

2.1 Mauritanian E&S legal and institutional framework

2.1.1 National political framework

Mauritania's environmental policy is mainly defined by the National Strategy for the Environment and Sustainable Development (Stratégie Nationale pour l'Environnement et le Développement Durable) and the National Action Plan for the Environment (Plan National d'Action pour l'Environnement). These two tools aim, in line with the Strategic Framework for Poverty Reduction, to define a strategy and measures to integrate the environment into all sectors of economic and social development, on the one hand, and to take socio-economic factors into account in environmental protection and management programs, on the other. These two instruments are complemented by the National Climate Change Adaptation Plan with regard to climate, and the National Biodiversity Strategy (Table 2-2).

2.1.2 Applicable E&S laws and regulations and national strategies

The national legislative system of Mauritania includes the laws, decrees and orders, as well as by-laws and circular. Mauritania has developed several legislative texts on environmental protection. The main national laws that cover environmental issues, including pollution and nuisances, as well as social issues, hygiene, health, and safety at work, are taken into account in the study, in relation to the project activities. Therefore, relevant provisions of the environmental, hygiene, sanitation, labour, forestry, and urban planning codes, etc., are listed in the next chapters. International treats and agreements have signed and ratified by Mauritania that are relevant to the project summarized in Table 2-3.

The Project is subject to tenure and permitting requirements in relation to exploitation and mining, environment and water. Mining activities in Mauritania are subject in particular to Law No. 2025-019 on Environmental and Social Assessment, the Water Code (Law No. 2005-030), Law No. 2018-002 on air pollution control, Ordinance No. 84-136 on classified installations, and the Mining Code and its implementing regulations.

The Islamic Republic of Mauritania has published the Environmental & Social Evaluation Law (Loi n°2025-019) which was adopted by the Mauritanian National Assembly on 9 May 2025 and published in the Journal Official on 15 July 2025[1], formerly replacing Law 2000-045 (Environmental Framework Law). The law defines the circumstances in which an Environmental and Social Impact Assessment (ESIA) must be carried out, namely for projects that are likely to have a significant physical, biological, economic or social impact due to their nature, size or location (Table 2-1). Any developer whose activity causes the involuntary physical or economic displacement of people or their property, whether permanent or temporary, is required to draw up a resettlement plan. This plan must be attached to the ESIA report.

The law requires that environmental and social considerations be integrated prior to project approval, throughout the project lifecycle, including construction, operation, closure, and rehabilitation[2]. Mining projects are subject to mandatory public participation procedures, including disclosure of ESIA information, consultation with affected communities and stakeholders and consideration of stakeholder concerns in project design and mitigation measures. These requirements are legally binding and form part of the ESIA approval process.

Law No. 2025-019 explicitly addresses dismantling and closure, requiring mining projects to plan for end-of-life closure and site rehabilitation, manage wastes and contaminated materials, restore sites to environmentally and socially acceptable conditions. These obligations apply before cessation of activities and are subject to regulatory oversight.

[1] mau237685.pdf

[2] https://www.fao.org/faolex/results/details/es/c/LEX-FAOC237685/

Table 2-1:Law No. 2025-019 on Environmental and Social Assessment

Legal reference	Mining obligation	Practical compliance evidence
Art. 1–3 (Purpose & scope)	Any mining project, extension, or closure must undergo Environmental and Social Assessment proportionate to its risks	ESA screening decision; approval letter
Art. 6–9 (Screening & classification)	Project must be classified (ESIA / impact notice / audit) before any permit or works	Screening certificate
Art. 10–18 (ESIA content)	ESIA must assess direct, indirect, cumulative, temporary and permanent impacts, including social impacts	ESIA report approved by authority
Art. 19–23 (Public participation)	Public consultation and disclosure are mandatory	Consultation minutes, disclosure proof
Art. 24–28 (Environmental authorisation)	Environmental authorisation is a precondition to mining permits	Environmental permit
Art. 35–40 (Compliance & audit)	Environmental and social compliance audits may be required during operation	Audit reports, corrective action plans
Art. 44–48 (Sanctions)	Non-compliance exposes operator to administrative and financial sanctions	Compliance tracking

Table 2-2: National legislation applicable to the Project

Category	National legislation	Relevance for mining projects
Legislative context		
Laws	Law No. 2025-019 of 15 July 2025 on Environmental & Social Evaluation.	It establishes the legal framework governing environmental and social evaluation (ESE) in Mauritania. It applies to projects, plans, and programs likely to have environmental and/or social impacts and introduces a strengthened, integrated assessment system aligned with international good practice. Mining activities are explicitly covered due to their potential impacts on land, water resources, biodiversity, communities, health and safety, and cultural heritage.
	Law No. 2021-008 of 22 February 2021 on the creation of the Environmental Police.	Establishes an Environmental Police to enforce environmental laws and decrees on the ground (relevant inspections/sanctions for mining operations).
	Constitutional Law of August 2017 (Creation of the Economic, Social and Environmental Council "EESC").	Provides consultative opinions on major economic/social/environmental matters; large mining projects may be considered.
	Law No. 2018-041 of 5 December 2018 on Hunting and Wildlife Management.	Sets biodiversity constraints for mining and obligations during construction/exploitation.

Category	National legislation	Relevance for mining projects
	Law No. 2019-003 of 22 January 2019 on CITES (Convention on International Trade in Endangered Species).	Transposes the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) into Mauritanian law. Its primary objective is the protection and conservation of threatened wild fauna and flora species through control of their use, capture, possession, transport, and trade. The law applies to all persons and activities, including mining companies, when their operations interact with protected species.
	Law No. 2010-042 of July 21, 2010 relating to the Hygiene Code.	It establishes national hygiene and public-health rules covering potable water supply, wastewater and sanitation, solid waste management, hygiene of buildings and premises, collective catering, and enforcement by the Hygiene Police. Directly applicable to mining camps, worker accommodation, canteens, wastewater systems, and camp sanitation.
	Law No. 2008-07 of March 17, 2008, relating to the Urban Planning Code. *Note: it has been modified by Law 2025-012 but still in Force.*	Defines the legal framework governing land use, urban development, construction, and spatial planning. It is Applicable to mine infrastructure permitting (roads, buildings, camps).
	Law No. 2018-024 on the General Code of Child Protection.	Constitutes the primary legal framework governing the rights, protection, and welfare of children in the country. Child-protection and labour safeguards should be included in social management plans developed for mining projects.
	Law No. 2022-027 of December 12, 2022, on the Electricity Code.	Governs all activities in the electricity sector within the territory of Mauritania, with limited exceptions for national security installations and research equipment in the energy sector. Relevant to mine power generation, grid connection and (Independent Power Producer /captive models.
	Law No. 2023-031 of 14 December 2023 on solid waste management.	Establishes a legal framework governing the management of solid waste. It is relevant to non-hazardous solid waste management at mine sites.
	Law No. 2018-002 of 12 January 2018 relating to the fight against air pollution.	Establishes the legal regime for preventing, controlling, and reducing air pollution It is relevant to air emissions/dust control obligations at mine sites.
	Law No. 2005-030 of February 2, 2005, relating to the Water Code.	Defines legal regime governing inland water resources (surface water, ground water and continental waters). applies to mining activities in Mauritania, governing water abstraction, dewatering, pollution prevention, and water-resource protection throughout the mine lifecycle.
	Law No. 2005-046 of July 25, 2005, relating to the protection of tangible cultural heritage.	Is the framework law governing the protection of tangible cultural heritage. It applies fully to mining activities in Mauritania and imposes binding

Category	National legislation	Relevance for mining projects
		obligations throughout the mining lifecycle, from exploration to closure, particularly regarding excavation, chance finds, and protection of archaeological and cultural heritage.
	Law No. 2004-017 relating to the Labor Code.	Governs all individual and collective employment relationships between employers and workers bound by an employment contract, in both the public and private sectors, including the mining sector. It is the primary legal instrument governing workers' health and safety in Mauritania. It establishes employer obligations to ensure safe and healthy working conditions and covers accident prevention, occupational diseases, medical surveillance, employer liability and applies to all sectors, including mining, construction, and industry. Recent amendments (including Loi n°2022-025 and Loi n°2024-048) reinforced worker protections and updated labour provisions, without removing the employer's occupational health and safety duties.
Orders	Ordinance No. 2002-05 of 28 March 2002 relating to the downstream hydrocarbons sector.	Sets the licensing/regulatory framework for downstream hydrocarbons (import, storage, distribution, transport). It applies to mining activities whenever mining operations involve downstream hydrocarbons activities, particularly fuel importation, storage, transport, and distribution.
	Ordinance No. 84-136 of June 6, 1984, regulating classified establishments.	Establishes the legal regime for classified establishments, i.e., establishment that may be dangerous, unhealthy, or inconvenient. It applies to mining activities because mining involves industrial installations that may pose environmental and safety risks (processing plants, fuel depots, and hazardous-materials storage, etc) and are subject to prior authorisation or declaration.
	Order No. 83-127 of June 5, 1983, on land reorganization and domain.	Defines land tenure and public domain (state lands, concessions). It governs access to land, State concessions, private ownership, and development rights, and is relevant to all mining and infrastructure projects through land acquisition, permitting, and resettlement processes.
	Order No. 85-156 of July 23, 1985, regulating explosive substances in Mauritania and Decree No. 2013-142 of August 7, 2013, organizing the land transport of explosive products and substances on the national territory. (*Decree n°2014-171 modifies some dispositions of the decree n°2013-142*)	Legal basis for explosives manufacture, import, storage, transport, and use. Compliance is mandatory and independent of mining licenses and environmental approvals.

Category	National legislation	Relevance for mining projects
Decrees	Decree No. 2004-054 of July 06, 2004, relating to environmental protection in the mining sector.	Is the implementing decree of the Mauritanian Mining Code providing procedural and administrative rules for mining activities and forming a key link between mining authorisations and environmental regulation
	Decree No. 2020-064 of 28 May 2020 creating the National Agency for Geological Research and Mining Heritage (ANARPAM) and setting its organizational and operating rules.	Provides geological data, sector promotion and manages State participations — interfaces needed by mining projects.
	Decree No. 2018-025 of February 8, 2018, repealing and replacing Decree No. 2009-224 of October 29 setting the conditions of employment of foreign workers and instituting work permits for foreigners.	Mining projects employing expatriates must obtain work permits and comply with localisation/priority rules via official platforms.
	Decree No. 2019-056 of April 2, 2019, amending the Decree of March 2005 setting the conditions for the exercise of import, export, storage, refining, distribution, marketing and transport of refined hydrocarbons. The decree was amended notably by the decree adopted by the Council of Ministers on 6 April 2022.	Implements Ordinance No. 2002-05 governing downstream hydrocarbons and modernises the regulatory framework by repealing the 2005 decree. Covers import, storage, barreling, transport, distribution and marketing of refined products used by mines.
	Decree No. 2007-036 of 25 January 2007, relating to water police.	Establish Water Police powers to investigate/sanction breaches of the Water Code affecting mine abstraction, discharge and water infrastructure.
	Decree No. 2019-057 repealing and replacing Decree No. 85-193 of October 2, 1985, determining the conditions for the application of certain provisions of Ordinance No. 84-136 of June 6, 1984, regulating classified establishments.	Operational decree for the classified establishments regime applicable to industrial installations, including mining (authorisations, safety stocks, sanctions).
	Decree No. 2010-048 of 1 March 2010 on the Environmental Intervention Fund.	Creates a fund to finance the prevention and remediation of environmental damage — relevant to mining liabilities and enforcement.
	Decree No. 2009-231 of November 24, 2009, repealing and replacing Decree No. 2006-001 of January 13,2006,6 amended by	Frames national Extractive Industries Transparency Initiative (EITI) governance; mining companies cooperate with revenue/payment disclosures.
	Decree No. 2006-029 of March 1, 2006, establishing the creation, organization and operation of the National Committee for the Extractive	Mining companies are part of the extractive industries covered by EITI. Mining projects must therefore comply with transparency, reporting and participation requirements overseen by the National EITI Committee.

Category	National legislation	Relevance for mining projects
	Industries Transparency Initiative (EITI) and of which SNIM is a part.	
	Decree No. 2013-142 of 7 Aug 2013 (land transport of explosives) – as amended	Sets safety/authorisation conditions for road transport of explosives relevant to mining supply chains.
By-law	Order No. 0530 of 22 July 2020 relating to the composition and functioning of company health and safety committees pursuant to the 2004 Labour Code.	Applicable to mines because sites employing ≥50 workers must establish an internal Health & Safety Committee with duties covering incident investigations, periodic inspections, equipment conformity checks and formal advisory opinions on safety requirements that directly apply to large-scale mining operations and contractors.
	Order No. 690/Minister of Energy of 28 March 2012 setting the specifications for refined petroleum products intended for consumption in the territory of Mauritania	Mining projects consume and store fuels (diesel/gasoil, gasoline, etc.) for power generation and heavy equipment; the order mandates national fuel specifications (e.g., sulfur content, density, octane, distillation, corrosion) that operators and their suppliers must meet for procurement, storage, and on-site use.
Circulars	Circular of the General Directorate of Mines (EITI Standard-Disclosure of data and real ownership of mining titles) n°0133 of 16 July 2020.	Mining operators must disclose beneficial ownership information for mining titles, contracts and operators, in line with EITI requirements. Compliance is checked during title granting, renewal, cadaster management and reporting, making this circular directly applicable to mining projects.
National Strategies		
National strategies	National Strategy for Biodiversity (2022-2030). Towards sustainable, inclusive and innovative management of natural heritage and capital of Mauritania, which represents Mauritania's renewed commitment to the protection of its natural heritage and its obligations under international agreements, notably the Kunming-Montreal Global Biodiversity Framework of the Convention on Biological Diversity.	Mining projects are subject to environmental impact assessments that must consider biodiversity conservation, ecosystem restoration, and avoidance of sensitive habitats. The strategy guides permit conditions, mitigation measures, offsets, and rehabilitation plans for mining operations.
	National Strategy for Economic Growth and Shared Prosperity (SCAPP) to 2030, succeeding the Strategic Framework for Poverty Reduction (CSLP III), translating the government's strategic options for achieving the Sustainable Development Goals (SDGs) and the realization of the African Union's Agenda 2063.	Mining is a priority productive sector under SCAPP. Projects are expected to contribute to economic growth, employment, local content, infrastructure and fiscal revenues, and to align with SDGs and Agenda 2063. Public authorities assess mining projects against SCAPP objectives.

Category	National legislation	Relevance for mining projects
	Regional Strategy for Accelerated Growth and Shared Prosperity of the Wilaya of Tiris Zemmour 2021-2025, which is a declination of the national SCAPP at the regional level.	Tiris Zemmour is Mauritania's main mining region. Mining projects are expected to align with regional priorities (employment, infrastructure, services, environmental management), and this strategy is used in local consultations, land-use planning and social acceptability assessments.
	National Strategy for Decentralization and Local Development (SNDEL) 2020.	Mining projects must engage with regional councils and municipalities, support local development, and integrate territorial governance mechanisms. SNDEL underpins requirements for local stakeholder engagement, benefit-sharing and coordination with decentralized authorities.
	National Environment and Sustainable Development Strategy (SNEDD) 2017-2030.	Mining activities are environmentally sensitive and must comply with SNEDD principles: pollution prevention, sustainable resource use, climate resilience, and rehabilitation. SNEDD directly informs ESIA approvals, environmental permits and monitoring obligations.
	National Strategy for the Development of the Rural Sector (SNDSR) to 2025.	Mining projects operating in rural areas must consider land use, pastoralism, agriculture and water access. The SNDSR frames expectations for impact avoidance, compensation, and coexistence with rural livelihoods.
	National Strategy for Sustainable Access to Water and Sanitation (SNADEA) for 2030.	Mining projects are major water users. SNADEA is applicable through water abstraction permits, impact assessments, and resource protection measures, especially in arid regions. Projects must ensure sustainable and non-competitive water use.
	National Determined Contribution to the fight against climate change (revised NDC 2021) 2021-2030.	Mining projects must align with climate mitigation and adaptation objectives: energy efficiency, emissions management, climate-resilient infrastructure. NDC commitments increasingly shape ESIA conditions, financing eligibility and government expectations.

2.1.3 International and regional treaties and agreements

Mauritania has signed and ratified several international conventions, agreements and treaties relating to the preservation of the environment. The main international conventions ratified by Mauritania are presented in the Table 2-1.

Table 2-3: International conventions ratified by Mauritania

Designation	Location Date	Ratified by Mauritania Date	Description	Relevance to the Project
Biodiversity and Natural resources				
Convention on Biological Diversity (CBD)	Rio Signed 5 June 1992	1996	The goals are 1) the conservation of biological diversity 2) the sustainable use of its components 3) the fair and equitable sharing of benefits arising from genetic resources.	Protection and enhancement of biological diversity that might be impacted by the Project
Convention on International Trade in Endangered Species (CITES).	Switzerland 3 March 1994	13 March 1998	The Convention concerns the sustainable use, fair and equitable sharing of benefits arising from the utilization of genetic resources.	The relevance of this agreement lies in the rarity of the fauna in the project study area, which must be preserved in every way possible.
Bonn Convention	Bonn, Adopted 23 June 1979	23 June 1979	Aims to ensure the conservation of migratory species and natural environment by intergovernmental co-operation.	-
African Convention for Nature Conservation and the Conservation of Natural Resources	Alger Adopted 15 September 1968	11 July 2003	Focuses on the conservation and rational use of soil, water, flora, and fauna.	Biodiversity protection in the project area of interest.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Washington Adopted 3 March 1973	13 March 1998	Aims to ensure international trade in specimens of wild animals and plants does not threaten their survival.	-
Ramsar Convention on Wetlands of International Importance	Ramsar Adopted 12 February 1991	-	Provides a framework for national action and international cooperation for the conservation of wetlands and their resources.	-
Convention to Combat Desertification	Paris Adopted 17 June 1994	07 August 1996	Aims to combat drought and desertification	Protection of lands occupied by the schools and fight against water erosion

Designation	Location Date	Ratified by Mauritania Date	Description	Relevance to the Project
International for plant protection convention	Rome, Adopted 6 December 1951	-	Aims to protect cultivated and wild plants by preventing the introduction and spread of pests.	-
Conservation of fauna and flora at a natural status (wildlife)	London Adopted 8 November 1933	-	Aims to conserve fauna and flora in their natural state	Biodiversity protection at the Project scale
Protocol on Cooperation in Combating Pollution in Cases of Emergency	Bâle, Adopted 22 March 1989	-	Aims to protect the marine environment, the coastal zones and the related internal waters falling within the jurisdiction of the States of the West and Central African region against pollution in cases of emergency	Management of accidentel pollution (fire, river pollution)
Climate change				
Kyoto Protocol on the GHG emission reduction	Kyoto Adopted 21 March 1992	1994	Operationalises FCCC by committing industrialised countries and economies in transition to limit and reduce GHG emissions in accordance with agreed individual targets.	Atmospheric pollution that might result from the Project (COV / NOX emissions or fire emissions)
Paris Climate Agreement (COP 21)	Paris Adopted 12 December 2015	-	Commits countries to limit the rise in global temperature to well below 2°C relative to the pre-industrial era.	Reduction of GHG emissions
Framework Convention on Climate Change (FCCC)	New-York Adopted 9 May 1992	-	Sets general goals and rules for addressing climate change.	Fight against atmospheric pollution
Vienna convention	Vienna Adopted 22 March 1985	26 May 1994	The convention concerns the control and elimination of substances that deplete the ozone layer protection	Management of atmospheric pollution that might result from the Project (COV / NOX emissions or fire emissions), and management of people health

Designation	Location Date	Ratified by Mauritania Date	Description	Relevance to the Project
Montreal Protocol	Montreal Adopted 16 September 1987	26 May 1994	Substances that deplete the ozone layer	Air pollution that might result from the Project (COV / NOX emissions or fire emissions)
Stockholm Convention on Persistent Organic Pollutants	Stockholm Adopted 22 May 2001	2005	Aims to ban certain highly polluting chemicals to protect human health and the environment.	Reduction of impact from the use of organic products in schools' construction activities
Rotterdam convention	Rotterdam 10 September 1998	-	Exportation of chemical products and hazardous pesticides	Purchase of chemical products
Bamako convention	Bamako Adopted 30 January 1991		Prohibition of hazardous waste import in Africa and control of transborder transport, and management of hazardous wastes produced in Africa	Protection of human health and environment, and adoption of protection measures regarding proper disposal of hazardous wastes
Bale convention	Bale Adopted 22 March 1989	16 Auguste 1989	Control of transboundary transport of hazardous wastes and their disposal	Responsible management of hazardous wastes, of their disposal, and remove their production
Cultural Heritage				
Convention for the Safeguarding of the Intangible Cultural Heritage (UNESCO)	Paris 17 October 2003	15 November 2006	To safeguard and ensure respect for the world's Intangible Cultural Heritage, including raising awareness of the importance of intangible heritage and encouraging international cooperation and assistance	Cultural heritage in the Project area
Convention on the Protection and Promotion of the Diversity of Cultural Expressions (UNESCO)	Paris 20 October 2005	24 March 2006	Recognises the rights of states to protect and promote the diversity of cultural expressions, encompassing cultural and natural heritage,	Cultural heritage in the Project area

Designation	Location Date	Ratified by Mauritania Date	Description	Relevance to the Project
			movable cultural property, intangible cultural heritage and contemporary creativity	
Convention on the Protection of the World Cultural and Natural Heritage	Paris Adopted 16 November 1972	02 March 1981	Aims to protect the world's cultural and natural heritage of outstanding universal value and establishes an intergovernmental committee for protection of this heritage and a fund for its protection.	Cultural heritage in the Project area
Social				
International Covenant on Economic, Social and Cultural Rights,	16 November 1966	1976	It requires States parties to take action to ensure economic, social and cultural rights.	Human rights
International Covenant on Civil and Political Rights	16 December 1966 and 15 December 1989	17 November 2004	It requires States parties to take action to ensure civil and political right	Human rights
International Labour Organisation (ILO)	1961	-	International labour law represents legal standards that regulate the rights and responsibilities of employers and employees.	-

2.1.4 Institutional framework

The institutional authorities and organisations related to the Project are presented in the Table 2-4.

Ministry of Environment and Sustainable Development (MESD) overall mission is to prepare, coordinate, implement and/or enforce, monitor and evaluate the government's environmental policy, taking into account the sustainable development objectives contained in various public policies and in the management of natural spaces and resources. Within the MEDD, the department involved in the proposed project is the Environmental Assessment and Control Department (DECE). It oversees the environmental and social management and validation of the project. It is responsible for supervising and reviewing ESIA, in addition to ensuring the effective implementation of environmental and social management plans.

The role of the Ministry of Energy and Petroleum is to formulate and implement government policies, laws and regulations concerning petroleum and the energy sector in general.

The role of the Ministry of Mines and Industry is to formulate and implement government policies, laws and regulations concerning Mining and the Industry sector in general. In terms of mining, it is responsible for the definition and application of mining policies related to environmental protection.

The Ministry of Hydraulics and Sanitation (MHA) is responsible for the management of surface and groundwater resources and issues water abstraction and discharge permits.

Ministry of Trade, Industry, Handicrafts and Tourism is responsible for industrial policy, trade regulation, and private-sector development in Mauritania.

Ministry of Equipment and Transport is responsible for transport infrastructure and logistics regulation in Mauritania. For mining projects, it oversees road, rail, port and airport infrastructure, regulates transport of goods and hazardous materials, issues relevant transport permits, and coordinates on access roads, heavy haulage, and export logistics (including ports and corridors), ensuring that mining operations comply with national transport, safety, and infrastructure standards.

The National Agency for Geological Research and Mining Heritage (ANARPAM) are the Mauritania’s public agency in charge of geological research, mining promotion, and management of the State’s mining heritage and equity interests.

Ministry of Health is responsible for public health protection and regulation in Mauritania. In relation to mining projects, it oversees health impact considerations, including community and occupational health, monitors exposure to pollutants and nuisances, and contributes to the review and enforcement of health-related mitigation measures within ESIA processes, in coordination with environmental and labor authorities.

MHUAT (Ministry of Housing, Urban Development and Territorial Planning) is responsible for land use, urban planning, and territorial development in Mauritania. For mining projects, it oversees land tenure and site allocation, ensures consistency with spatial and urban plans, and coordinates on resettlement, housing, and infrastructure planning where mining activities affect settlements or require land acquisition.

Table 2-4: National institutional framework applicable to the Project

Authorities	Organization
National Authorities	▪ Ministry of Energy and Petroleum (MPE). ▪ Ministry of Mines and Industry ▪ Ministry of Environment and Sustainable Development (MESD). ▪ Ministry of Hydraulics and Sanitation (MHA) ▪ Ministry of Trade and Tourism. ▪ Ministry of Equipment and Transport. ▪ Ministry of Health. ▪ Ministry of Housing, Urbanism and territorial Reclamation ▪ National Agency for Geological Research and Mining Heritage (ANARPAM).
Regional Authorities	▪ Wali (Regional Governor). ▪ Hakem (District Administrator).

2.1.5 National ESIA Process

According to Mauritanian regulations (refer to chapter 2.1.2) and due to the nature of the Project, it is classified as **Category A**. As such the projects are subject to a mandatory full Environmental and Social Impact Assessment under Law No. 2025-019, including approved terms of reference, public consultation, technical review by the Ministry of Environment, and issuance of environmental and social authorisation prior to any project implementation.

Therefore, it is subject to an environmental evaluation which requires the following elements:

Terms of Reference (ToR)

For Category A projects, the proponent must prepare draft ESIA Terms of Reference (ToR). The ToR define:

- Scope of environmental and social studies
- Baseline data requirements
- Impact assessment methodology
- Stakeholder engagement plan
- Alternatives analysis (including the “no-project” option)

The ToR are reviewed and approved by MEDD / DECE (Directorate of Environmental Assessment and Control).

Public consultations

Once the terms of reference have been submitted, the Proponent must inform by all appropriate means the Hakem (Prefect of the Department), the mayor, and the population in the area of the proposed Project of the forthcoming environmental impact assessment.

In order to allow interested parties to react as soon as possible to the mining project, a public consultation is organised during the completion of the impact study. One or more meetings are held to present the mining project to the local authorities, the population, the administrations involved, Non-Governmental Organization (NGOs) and other relevant organisations.

The ESIA must document issues raised by stakeholders and responses and mitigation commitments

Environmental and Social Impact Assessment

The Law No. 2025-019 defines the content of the ESIA, which should include:

- Introduction & Project Context, including detailed description of the different phases of the project (from construction to closure and rehabilitation of sites)
- Legal, Institutional & Regulatory Framework
- Environmental & Social Baseline
- Identification & Classification of Impacts
- Analysis of Alternatives
- Environmental & Social Management Plan
- Public Consultation & Stakeholder Engagement
- Cumulative Impact Assessment
- Risk Assessment and Hazard Management (including environmental and social risks and major accident risks)
- Monitoring & Follow-Up Plan
- Mine Closure or Decommissioning Plan (for mining/industrial projects)

MEDD, through the DECE, carries out a technical and regulatory review of the ESIA. Copies are sent to the Minister in charge of the environment, the territorially competent Hakem and the mayor of the municipality where the project is located.

Public enquiry

After receiving the report, MEDD informs the territorially competent Hakem of the opening of a public enquiry, who in turn informs the public by posting notices in daily newspapers, by radio and possibly by any other appropriate means. The enquiry is conducted by one or more investigators designated by the ministry in charge of the environment according to their qualifications and experience. The public enquiry lasts 30 days from the publication of its opening in the newspapers. An additional 7 days are given to the investigators to gather additional information on the Project. The result of the enquiry is then transmitted to the MEDD and the MPEM. After this transmission, the MEDD issues an opinion on the environmental feasibility of the mining project which is communicated to MPEM.

Environmental and Social authorisation

For Category A projects, environmental and social authorisation is a legal prerequisite to: Mining licences, Construction permits and any physical works. The authorisation includes binding conditions, including ESMP implementation and monitoring obligations.

Environmental and social monitoring and compliance

The environmental assessment does not end with the decision to authorise the project. In fact, projects subject to an impact study are accompanied by an environmental and social management plan (ESMP) as well as a site rehabilitation plan in certain cases. Finally, the environmental acceptability opinion for the project may be subject to conditions. On the basis of these elements, the MEDD, in collaboration with the Minister(s) concerned, monitors the implementation of the measures thus provided for during project implementation. The project owner, i.e. the mining

promoter, sends the Minister in charge of the environment, via the Minister in charge of mines, a six-monthly declaration containing all the elements necessary for this purpose.

Inspections, sampling, measurements and analyses by agents of the administration in charge of the environment may take place to ensure compliance with the implementation of measures. Non-compliance with ESIA obligations may result in administrative sanctions, financial penalties and suspension or withdrawal of authorization.

2.1.6 Permitting already granted to the Project

EMC was granted an Exploitation Licence over the Project area by government decree dated 27 March 2008 which has a term of 30 years with extensions of 10-year periods. The licence is governed by the terms of a Mining Convention signed 29 March 2007. Completion of an environmental impact study was a requirement for grant of the Exploitation Licence for the Project.

EMC holds a Water Exploitation Licence over the defined Touajil and Aouchich wellfields. The licence was granted in October 2012 for a term of 30 years.

2.2 International standards

The ESIA is carried out in accordance with the Performance Standards (PS) of the International Finance Corporation (IFC), the operational safeguards of the African Development Bank (AfDB), the Environmental and Social Policies and Procedures of the America's Development Finance Institution (DFC), the IFC and World Bank EHS guidelines as well as the Equator Principles (EP), presented below.

2.2.1 IFC Performance Standards

The IFC PSs considered material for this Project are summarised in Table 2-5.

Table 2-5: IFC Performance Standards applicable to the Project

#	Title	Applicable to Project	Date of issue
PS1	Assessment and Management of Environmental Risks and Impacts and Associated Guidance Note	✓	2012 **(updated 2021)**
PS2	Labour and Working Conditions and Associated Guidance Note	✓	2012
PS3	Resource Efficiency and Pollution Prevention and Associated Guidance Note	✓	2012
PS4	Community Health, Safety and Security and Associated Guidance Note	✓	2012
PS5	Land Acquisition and Involuntary Resettlement and Associated Guidance Note	✓	2012
PS6	Biodiversity Conservation and Sustainable Management of Natural Living Resources	✓	2012
GN	Associated Guidance Note updated	✓	2012 **(updated 2019)**
PS7	Indigenous People and Associated Guidance Note	×	2012
PS8	Cultural Heritage and Associated Guidance Note	✓	2012

In line with the IFC's E&S Framework for the categorisation of E&S risk associated with direct investments (IFC, In line with the IFC's E&S Framework for the categorisation of E&S risk associated with direct investments, the investment is classified as Category In line with the IFC's E&S Framework for the categorisation of E&S risk associated with direct investments, 2012), the project is classified as Category A project: "Business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented."

The assessment of whether Indigenous Peoples are present within the El Aouj project's area of influence draws on a factual, cumulative review of the characteristics of the communities concerned. . It considers information from the social baseline, pastoralist assessments, cultural heritage investigations and stakeholder consultations undertaken for the Project. The table below summarises the assessment against the relevant identification criteria.

Table 2-6: Indigenous people identification criteria and rationale

Criterion	Questions to assess	Rationale for concluding that the criterion is not met
Self-identification	Does the community identify as a culturally distinct group? Is that identity recognized by others?	The potentially affected communities do not self-identify as a distinct people or cultural group within the meaning of IFC PS7, and no collective identity of this nature is recognised by other communities or institutions.
Collective attachment	Are livelihoods, identity, culture, spirituality or customary practices collectively linked to ancestral lands, habitats or natural resources?	The use of grazing lands, water points, mobility/transhumance routes or other natural resources does not constitute an ancestral collective attachment integral to the identity, culture or customary practices of a group meeting the other relevant characteristics. Pastoral mobility is practiced across different socio-ethnic groups in Mauritania and does not identify the pastoralists as a distinct Indigenous cultural group
Distinct institutions	Are there customary governance, decision-making, social, cultural or economic institutions distinct from mainstream society?	The communities concerned have no customary institutions of their own that function separately from those of mainstream society.
Language	Is there a distinct language or dialect?	No distinct language or dialect specific to the potentially affected communities has been identified.

Based on the assessment above, no communities meeting the identification criteria for Indigenous Peoples under IFC PS7 have been identified within the Project's area of influence. IFC PS7 is therefore not considered applicable to the Project.

2.2.2 AfDB Integrated Safeguards

The African Development Bank Group (AfDB, 2023) developed an Integrated Safeguards System which is composed of Operational Safeguards (OS) which are "a set of ten safeguard requirements that Bank clients are expected to meet when addressing social and environmental impacts and risks". Bank staff use due diligence, review and supervision to ensure that clients comply with these requirements during project preparation and implementation". The AfDB's Integrated System is supported by detailed guidance notes (GN1 to GN10), which integrate environmental and social considerations into the Bank's operations (AfBD, 2024). In addition, it has also

developed a specific guidance note on gender, designed to ensure that different gender perspectives are taken into account and to strengthen knowledge and understanding of issues related to the inclusion of women and gender discrimination. The AfDB's OSs are summarized in the Table 2-7.

Table 2-7: AfDB Operational Safeguards applicable to the Project

#	Title	Date of issue	Applicable to Project
OS 1	Assessment and management of environmental and social risk and impact	2023	✓
OS 2	Labour and working conditions	2023	✓
OS 3	Resources efficiency and pollution prevention and management	2023	✓
OS 4	Community health, safety and security	2023	✓
OS 5	Land acquisition, restrictions on access to land and land use, and involuntary resettlement	2023	✓
OS 6	Habitat and biodiversity conservation, and sustainable management of living natural resources	2023	✓
OS 7	Vulnerable groups	2023	✓
OS 8	Cultural heritage	2023	✓
OS 9	Financial intermediaries	2023	×
OS 10	Stakeholder engagement and information disclosure	2023	✓

The OS9 is not applicable to the ESIA.

As per the AfDB **Category 1** (High-risk operations likely to cause significant and/or irreversible adverse environmental and/or social impacts on a large scale, or to significantly affect environmental or social components that the Bank or the borrowing country considers sensitive. This includes projects classified as high risk under national legislation or moderate-risk projects financed by the Bank in a low E&S implementation capacity or fragile context)."

2.2.3 DFC E&S Standards

The US International Development Finance Corporation (DFC) Environmental and Social Policies and Procedures (2024) adopts, as a standard for assessment, review, and management of environmental and social risks and impacts, the IFC Performance Standards (2.2.1) and the World Bank Group's Environmental, Health, and Safety (EHS) Guidelines (2.2.5) (IDFC, 2024). When co-financing Projects in which a multilateral development bank such as AfDB is involved, DFC may adopt a common approach with co-financiers for Project assessment.

The Project is considered of high risk and classified as Category A "Projects that may have significant adverse environmental and/or social impacts that are irreversible, sensitive, diverse, or unprecedented in the absence of adequate mitigation measures".

2.2.4 Equator Principles

The Equator Principles (Equator Principles, 2020) are intended to serve as a common baseline and risk management framework for financial institutions to identify, assess and manage environmental and social risks when financing Projects. The Project constitutes a transaction over $10 million USD and therefore the Equator Principles are applicable to this Project.

There are 10 EPs and their applicability to the elaboration of the ESIA for Project are summarized in the Table 2-8.

Table 2-8: Equator Principles applicable to the elaboration of the ESIA for the Project

#	Title	Date of issue	Applicable to Project
EP1	Review and Categorisation	2020	✓
EP2	Environmental and Social Assessment	2020	✓
EP3	Applicable Environmental and Social Standards	2020	✓
EP4	E&S Management System and EP Action Plan	2020	✓
EP5	Stakeholder Engagement	2020	✓
EP6	Grievance Mechanism	2020	✓
EP7	Independent Review	2020	×
EP8	Covenants	2020	×
EP9	Independent Monitoring and Reporting	2020	×
EP10	Reporting Transparency	2020	×

EP1 - Review and Categorisation

The EP make a distinction between Designated and Non-Designated Countries in the application of the EP. Designated Countries are those countries deemed to have robust environmental and social governance, legislation systems and institutional capacity designed to protect their people and the natural environment. Mauritania is not referred to as a Designated country in the Equator Principles referencing. EP4 requires that for projects located in non-designated Countries (as is the case of Mauritania), the assessment process evaluates compliance with the applicable IFC PSs on ES sustainability and with the IFC EHS Guidelines (see section 2.2.1 and 2.2.5).

EP 2 - Environmental and Social Assessment

For projects Category A (classification according to IFC, see section 2.2.1, the following is required:

- Environmental and Social Impact Assessment.
- Potential human rights impacts, according to the United Nations Guiding Principles on Business and Human Rights (UNGP 2011). The main risks associated with the Project are linked to the potential impacts to the livelihood of pastoralists (see PS5), discrimination in a context of a hierarchized society (see PS1, PS2), impacts on the health and safety of workers and communities (see PS2 and PS4), impact on gender-based violence (see PS1 and PS4).
- Climate change risks assessment, aligned with the Climate Physical Risk and Climate Transition Risk categories of the TCFD (Task Force on Climate-Related Disclosures, 2017, 2021), but the depth and nature of the climate change risks assessment depends on the type of project and nature of risk. an estimation of an estimation of GHG emissions during the construction and operation phases should be conducted indicating the annual GHG emissions for each phase because the exceedance of 100 kT CO_2e/year triggers the requirement to produce a GHG report annually.

As Mauritania is not a designated country and El Aouj Project follows into the is a Category A, the above list applies.

EP3 - Applicable Environmental and Social Standards

The ESIA should comply to national (Chapter 2.1) and international standards (chapters 2.2.1, 2.2.2, 2.2.3).

EP 4 - E&S Management System and EP Action Plan

An Environmental and Management Plan should be developed for all phases of the Project.

EP 5 - Stakeholder Engagement

Stakeholder consultation and disclosure need to be conducted, and a Stakeholder Engagement Plan (SEP) is to be developed.

EP6 - Grievance Mechanism

A grievance mechanism is to be developed for both workers and communities.

The following Guidance Notes were since 2020 and are relevant to the Project:

- Guidance Note on Implementation of Human Rights Assessments Under the EPs (September 2020).
- Guidance Note on Climate Change Risk Assessment (CCRA) (September 2023).
- Guidance Note on Biodiversity Data Sharing for Equator Principles Financial Institution (EPFI) Clients (September 2020).

2.2.5 IFC and World Bank Group environmental and social (EHS) guidelines

The IFC and World Bank Group (WB) Environmental Health and Safety (EHS) guidelines are technical reference documents that complement performance standards and provide general and industry-specific examples of Good International Industry Practice (IFC, 2007)

The General EHS Guidelines (2007) contain information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors and contain guidance on environment air emissions and air quality, waste water and ambient water quality, hazard material , waste management, noise etc), community health and safety (water quality and availability, traffic safety, disease prevention etc), occupational health and safety (personal protective equipment, training, etc) and construction and decommissioning.

The following IFC and WB environmental and social (E&S) industry sector guidelines are also relevant for the Project:

- Guidelines for Mining (2007).
- Guidelines for Railways (2007).
- Guidelines for Electric Power Transmission and Distribution (2007).
- Guidelines for Water and Sanitation (2007).
- Guidelines for Waste Management Facilities (2007).
- Guidelines for Construction Materials Extraction (2007).

In addition, IFC documents relevant for this Project are:

- IFC and EBRD (European Bank for Reconstruction and Development) Guidance note on Workers' accommodation: processes and standards (2009).

- IFC Good Practice Handbook Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (2013).
- IFC Good Practice Handbook: Land Acquisition and Involuntary Resettlement (2023)
- IFC Good Practice Note: Addressing Gender-Based Violence and Harassment – Emerging Good Practice for the Private Sector (2020)
- IFC Good Practice Note: Addressing Child Labor in the Workplace and Supply Chain (2002)
- IFC Good Practice Note: Managing Retrenchment (2005)
- IFC Introduction to Health Impact Assessment (2009)
- IFC Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets (2007)

2.3 Corporate Policies of Project Proponents

EMC has developed its Human Resources Policies (EMC, 2013) which includes the following policies which are relevant to the ESIA and environmental and social management of the Project:

1) HR Fundamentals
2) Performance Promotion Policy
3) Compensation, Bonuses and Benefits
4) Mauritanisation of Employment
5) Housing and Citizenship
6) Health Policy
7) Tendering, Partnerships and Subcontracting
8) Sustainable Social Development Policy
9) Religion in the Workplace Policy
10) Promotion of Hygiene and Safety
11) Human Resources and the Environment
12) Career Management Policy
13) Language in the Workplace Policy
14) Promotion of a Leadership Culture
15) Training and Skills Acquisition
16) Recruitment Policy
17) Internal Communication Policy

EMC is also committed to complying with SNIM's good citizen and sustainable development practices. In particular, SNIM has focused on reducing poverty where its projects are located (SNIM, 2023). SNIM's E&S policy focuses on:

- Continuous improvement of environmental performance, taking into account economically viable technological developments.
- Implementation of best practices and strategies to prevent pollution, reduce waste, and respond to emergencies.
- Compliance with national laws and regulations relating to environmental protection and the environmental requirements of development partners.
- Climate change through: (i) its Energy Policy; (ii) its Water Management Policy,
- Community management through its Corporate Social Responsibility

The above-mentioned SNIM E&S policy incorporates environmental and social policies applicable to the Group and its various sites.

By application of national regulatory requirements and international good practice, EMC corporate policies are achieved by the Project.

3.0 PROJECT E&S CATEGORIZATION

In line with the IFC's and DFC E&S Framework for the categorisation, the Project is considered as high risk (Category A), which is equivalent to the project Category 1 as per the AfDB.

Finally, according to Mauritanian regulations, it is classified as Category A due to its potential significant physical, biological, economic or social impact, as already mentioned in Chapter 2.1.5.

4.0 PROJECT DESCRIPTION

4.1 The Project at a glance

The El Aouj Project is a conventional mining, owner operated, open-pit drill and blast operation. The processing flowsheet is based on standard crushing, screening, high pressure grinding and dry magnetic separation to produce a concentrate with 66.5% Fe content with some silica.

The concentrate will be transported via the existing 618 km railway to the port of Nouadhibou where it will be shipped internationally. The railway will require the construction of a 35km railway spur to connect the existing line to the mine site, which will be financed, owned and implemented by SNIM. A road extension from F'Dérik area to the mine will be financed, owned and constructed by EMC .

A 30 km long 33 kV overhead power line will be constructed within the infrastructures corridor to connect the existing sub-station at F'Derick to the proposed El Aouj power plant to supply the reserve power for the mine in case of breakdown of an operating unit. Step-down transformers will convert the voltage to 11 kV at the El Aouj mine site. A 30 km, 33 kV overhead power line will be constructed within the infrastructure corridor to connect the existing substation at F'Derick to the proposed El Aouj power plant, in order to supply reserve power to the mine in the event of a breakdown of an operating unit. Step-down transformers will reduce the voltage to 11 kV at the El Aouj mine site. The infrastructure corridor is assumed to be 250 m wide and will accommodate the access road,

power transmission line, the 35 km rail spur and the water pipeline. Of the 35 km infrastructure corridor, 14.7 km are located outside the EMC mine permit, starting from the junction with the existing SNIM railway.
The mine site is not serviced by utilities, and the Project will require construction of a 48 MW diesel power plant and a 12 MW solar power plant. The Project will also require the development of two wellfields, located 90 km and 140 km from the mine site, to abstract water from groundwater aquifers; both will be connected to the mine facilities by a pipeline conveying the water.

Accommodation facilities will be constructed at the mine site, together with a residential development in the existing town of F'Dérik, to provide family homes and single accommodation for the operational phase of the Project.

4.1.1 Location

The El Aouj Project is located in Northern Mauritania, in the iron ore producing region of Tiris Zemmour, 650 km northeast of the port of Nouadhibou and 50 km south-east from the "iron ore capital" of Zouérate. The future mine and process plant site will be located 30 km north from the village of F'Dérik (Figure 4-1).

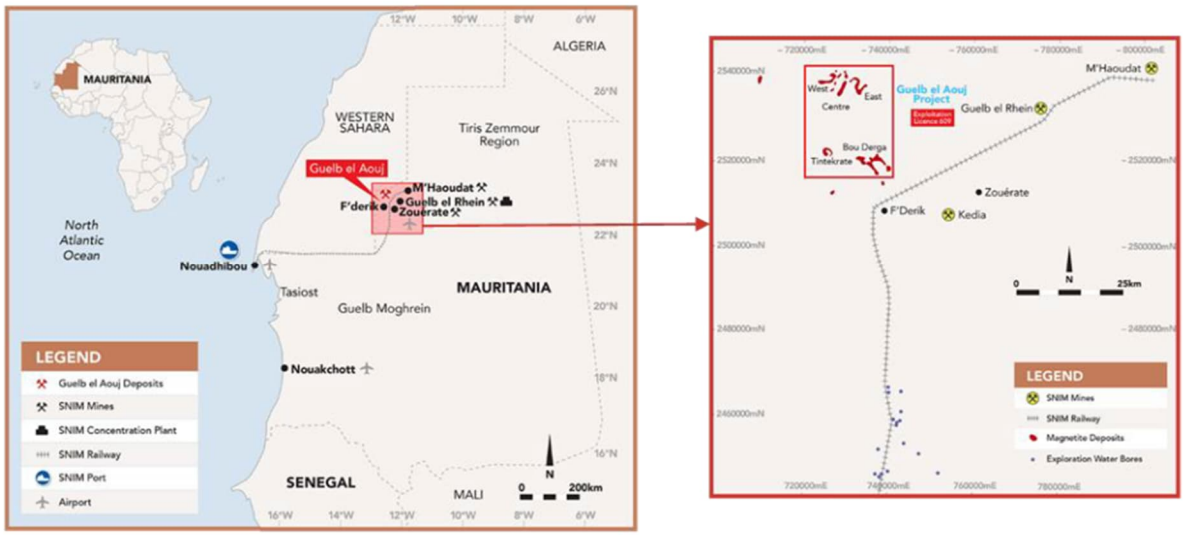


Figure 4-1: El Aouj Project location and existing SNIM port, railway and other existing mines in the region.

4.1.2 Geology and mineral resources and ore reserves

The El Aouj East deposit is located within the Reguibat Shield, which dominates northern Mauritania and extends into the southern part of Western Sahara and part of Algeria. The Reguibat Shield is one of the five major geological provinces in Mauritania. As shown in Figure 4-2, (Golder Associates, 2014), the El Aouj East deposit is a north-plunging synform with true thicknesses of 150 m to 200 m. Each limb of the synform outcrops over a strike length of approximately 2.5 km and the deposit remains present towards the north, at depths of 850 m below surface.

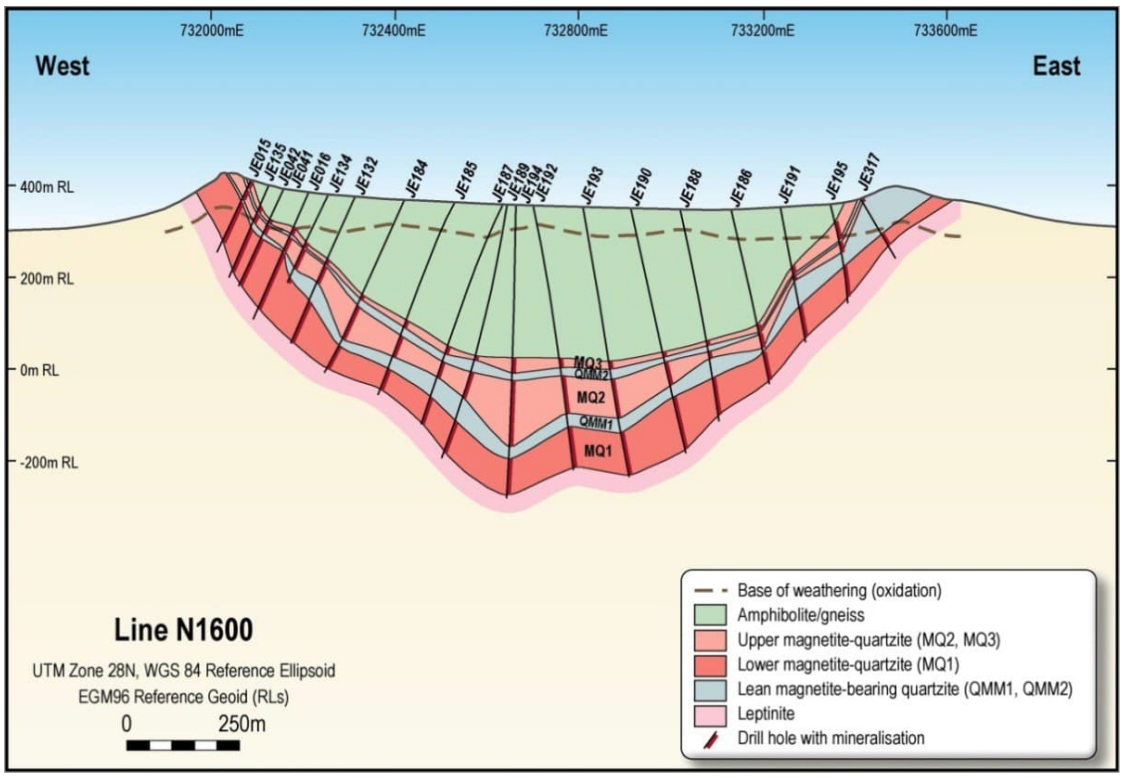


Figure 4-2 Typical Geological Cross-Section of the El Aouj deposit (Golder Associates, 2014)

The magnetite quartzite (MQ) mineralisation is subdivided into three domains, numbered from the base as MQ1, MQ2 and MQ3 (Figure 4-2). MQ1 and MQ2 are separated by an internal waste band of relatively barren quartzite (QMM1). MQ2 and MQ3 are also separated by a similar internal waste band (QMM2). MQ1 is the thickest unit, also known as Lower Magnetite-Quartzite (MQL). The combined MQ2 and MQ3 units together are also known as Upper Magnetite-Quartzite (MQU). Processing of this ore is described in Section 4.2.1.2.5.

The MQ unit represents a metamorphosed banded iron formation (BIF). Re-crystallisation and aggregation of the magnetite grains in the BIF units have resulted in partial to total destruction of the original banded (bedding) texture to produce the El Aouj magnetite-quartzite deposit. Outcrop expression of the deposit is strong with the limbs of the synform represented by the two prominent erosion resistant magnetite-quartzite ridges of the El Aouj East guelb.

Figure 4-3 shows a 3D perspective view of El Aouj East deposit illustrating the synformal geometry defined by the fresh mineralised domains: MQ1 in red, MQ2 in blue and MQ3 in magenta (Golder Associates, 2014) .

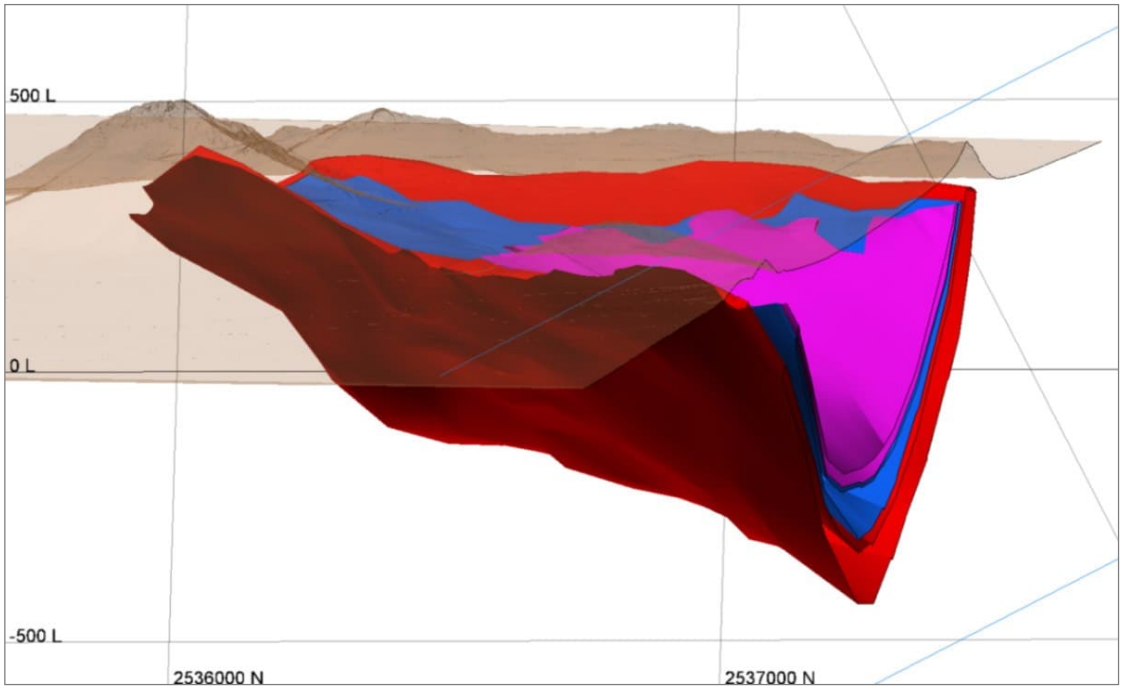


Figure 4-3 Perspective View of El Aouj East Deposit and Fresh Mineralised Domains (Golder Associates, 2014)

The mineral resources of the El Aouj East deposit currently defined are as shown in Table 4-1 and Table 4-2. The mineral resources for 'fresh' ore, above a cut-off grade of 20% DT80 DTR are shown in the table below. The fresh ore resources (i.e. ore that is not weathered) will be processed in the proposed plant.

Table 4-1: El Aouj East Fresh Mineral Resource (Golder Associates, 2014)

Resource Classification	Mt (dry)	Fe %	SiO2 %	Al2O3 %	CaO %	MgO %	S %	Na2O %	K2O %	LOI %
Measured	400	36	44	1.1	0.9	0.069	0.033	0.075	0.55	-0.6
Indicated	1170	36	44	1.1	1.2	0.069	0.042	0.086	0.52	-0.7
Inferred	300	36	44	1.1	1.2	0.060	0.042	0.108	0.50	-0.9
Total	1870	36	44	1.1	1.1	0.068	0.040	0.087	0.52	-0.7

In addition to fresh ore, there are further resources near the surface that are weathered and contain hematite as well as magnetite ore (oxide ore). This oxide ore does not upgrade well in the dry processing plant proposed for this Project (Section 3.5), therefore it will be stockpiled alongside the waste rock dumps in the waste dump area (Section 3.6.1) for possible future use if a different type of processing plant is constructed at a later date. The mineral resources for weathered mineralization, above a cut-off grade of 20% Fe grade, are shown in Table 4-2.

Table 4-2: El Aouj East Weathered Mineral Resources (Golder Associates, 2014)

Resource Classification	Mt (dry)	Fe %	SiO2 %	Al2O3 %	CaO %	MgO %	S %	Na2O %	K2O %	LOI %
Measured	70	34	46	1.6	0.5	0.7	0.008	0.060	0.71	1.2
Indicated	80	35	45	1.2	0.8	1.2	0.011	0.060	0.52	0.8
Inferred	30	35	45	1.8	0.4	0.9	0.011	0.060	0.70	0.9
Total	180	36	45	1.5	0.6	1.0	0.010	0.060	0.63	1.0

4.1.3 Project schedule

The ore reserves have served as the foundation for designing the open-pit mining operation. This operation is expected to produce approximately 931 million tonnes (Mt) of run-of-mine (ROM) ore throughout the projected mine life. From this ROM ore, a total of about 421 Mt of final product will be generated. The mining activities are planned to span an estimated 41 years, ensuring the efficient extraction and processing of the ore reserves.

Table 4-3: Project schedule

Project phase	Indicative duration
Early works Construction (pipeline, OHL, road, camp)	12 months – starting from *January 2027*
EPC Contracts signing	Early 2027
Construction Phase 1	Jan 2027 to Dec 2029 (3 years)
Construction Phase 2	Jan 2030 to Dec 2031 (2 years)
Total Construction period	5 years – starting from *Jan 2027*
Operations Phase 1	Starting on Jan 2030
Operations Phase 2	Starting on Jan 2032
Total Operations (Life of Mine)	41 years starting from Jan 2030
Closure (including rehabilitation)	4 years

4.1.4 Project costs

The estimated costs of the project are:

- Construction CAPEX: 1 885 million USD
- Operation: 15 479 million USD for 41 years LOM (41 USD/t)
- Closure Cost: 13.2 million USD

4.1.5 Work force

The workforce is expected to comprise approximately 2,000 workers during the construction phase and around 1,214 workers during the operational phase. Expatriate personnel are expected to represent less than 10% of the total workforce. A higher proportion of expatriate workers is anticipated during the construction phase and the early stages of operation, reflecting initial technical and supervisory requirements.

The Project will prioritise recruitment of experienced workers from the surrounding region and Mauritania. However, due to limited local availability, a training program will be implemented, and a limited number of positions will be filled through international recruitment.

Senior and managerial positions will be filled by fully qualified personnel recruited locally or internationally. For standard positions, experienced candidates will be prioritised; where unavailable, suitably qualified candidates will be recruited and trained.

Local recruitment will be supported through a dedicated recruitment office in F'Dérik, providing information and assistance to applicants. Selection will include competency testing, psychological assessment, and pre-employment medical screening.

Training needs will be identified through a competency gap analysis conducted by supervisors and human resources. International "bridging" personnel will be employed on a temporary basis to support training and succession planning.

The operation will be conducted on a continuous 24-hour basis, seven days per week, using 12-hour shifts. Work will be organized under a structured rotational roster system. Mauritanian employees will follow a seven-days-on/seven-days-off rotation. Expatriate employees will be engaged under rotational arrangements depending on their base location, with roster patterns of either six weeks on followed by three weeks off, or three weeks on followed by one and a half weeks off.

4.1.6 Organisational chart of EMC E&S team

The following organisation chart shows the team that will be responsible for the environmental, social, health and safety aspects.

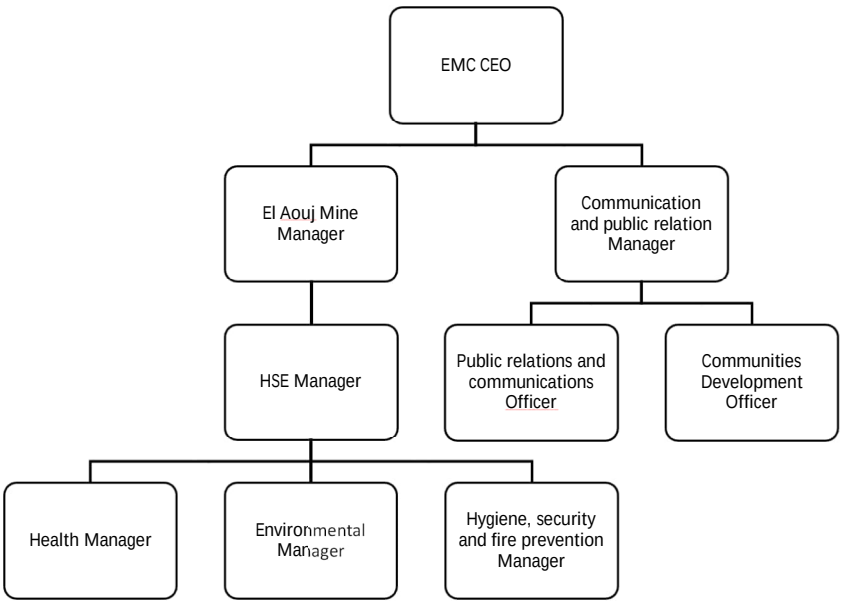


Figure 4-4: Planned organisation chart for the team environmental and social aspects during El Aouj Operation.

4.2 Project components and footprint

The mine location is not presently serviced by utilities, roads or railway, although there is an existing heavy haul rail system owned and operated by SNIM between the port of Nouadhibou and its current mining facilities which includes an existing siding approximately 35km to the south of El Aouj.

Project's main components are described in the next chapters and in 4.2.1

4.2.1 Mine facilities and operations

4.2.1.1 Mine facilities

The overall mine site layout is shown in Figure 4-5

- **Open pit:** the open pit will be mined using conventional drill, blast, load and haul techniques and its final dimensions will be approximately 2.7 km length, 1.6 km width and 600 m depth (see section 4.2.1.2.1).
- **Waste dump area**: will accommodate 2 waste rock dumps (1,187 Mt of waste rock in total) and two oxide ore dumps (153 Mt of oxide ore in total) and is expected to reach a height of approximately 105 m above the valley floor (see section 4.2.1.3.1);
- **Process plant:** a predominantly "dry" processing technique will be used to minimise water consumption. The processing circuit involves three main steps to change the raw iron ore into a saleable sinter fines blend (SFB) concentrate product: (1) crushing and screening; (2) high pressure grinding; and (3) dry magnetic separation (DMS) (see section 4.2.1.2.5).
- **Tailing's disposal area**: Represents dry tailings from the DMS process (11-14 Mt/a), which will contain mostly quartz and silica and no chemicals or acid generating minerals, will be wetted to supress dust and conveyed to the tailings disposal area with a capacity of 567 Mt. Only 497 Mt are expected to be stored in this area. The tailings will be stacked to approximately 105 m above the valley floor (see section 4.2.1.3.2).
- **SFB stockpile and rail load out facilities**: the SFB concentrate will be conveyed to either the concentrate stockpile or the load-out bin before being loading onto rail wagons for export via a proposed rail spur (in the ESIA scope) to the existing SNIM railway for transportation to the existing SNIM port at Nouadhibou for export.
- **Water treatment, Storage and Distribution:** Raw groundwater from Touajil and Aouchich wells will be pumped to the main tank at El Aouj and treated for industrial and potable use. A reverse osmosis plant will supply potable water to mine accommodations and F'Dérik city, while demineralized water will serve the power plant and crushing cooling. Untreated water will be used for dust suppression and firefighting at the plant and mine.
- **Dam:** The dam will be constructed upstream the tailings disposal area to collect runoff flows from the upper part of the watershed flowing toward the future tailing area.

Figure 4-5: Overall El Aouj Project site layout

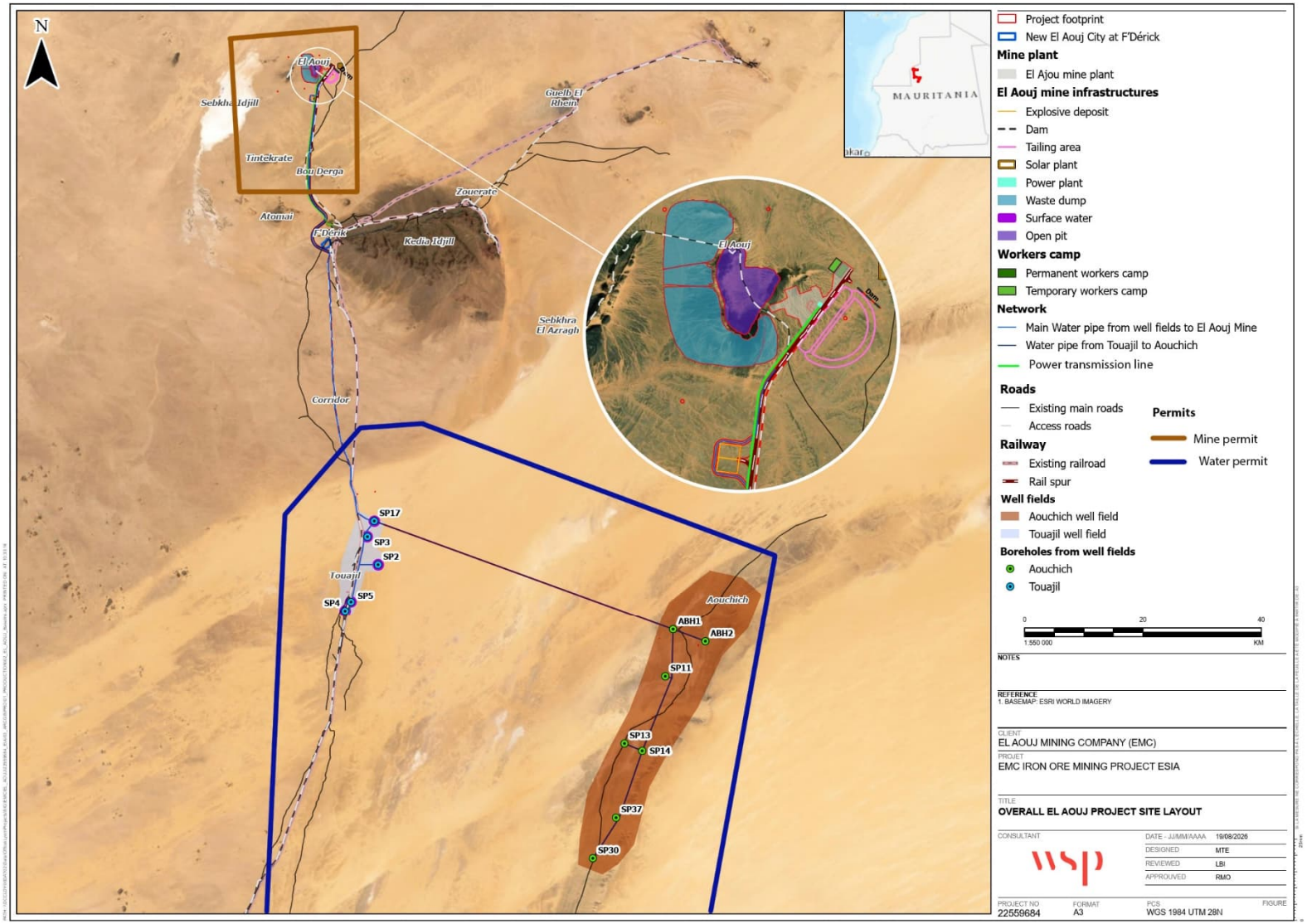
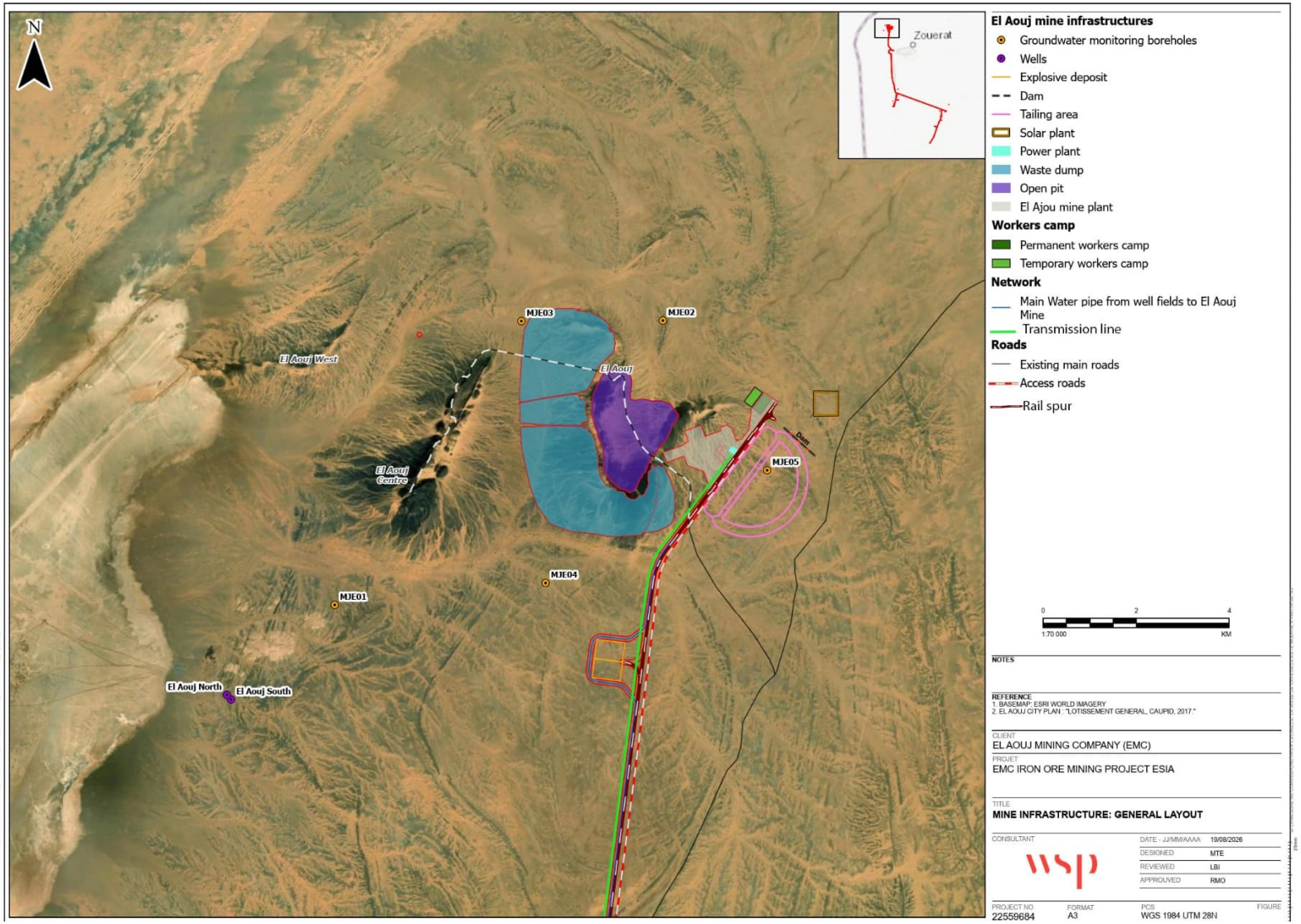


Figure 4-6: Mine infrastructure: General Layout



4.2.1.2 Mining operations

4.2.1.2.1 Open pit

Open-Pit Design and Dimensions

The open-pit will be developed starting with two smaller open-pits in early years of mining which will later merge into a single larger pit, to accommodate the structure of the deposit, as shown in the indicative mine development for the operation phase in Figure 4-7.

The open pit will be constructed with bench heights of 14 metres, utilising a triple benching system between berms. This design approach will be maintained regardless of whether ore or waste is being mined. Upon completion, the pit is expected to measure approximately 1.6 kilometres in width and 2.7 kilometres in length, covering a total area of around 287 hectares. The final depth of the open pit will extend to nearly 600 metres below the current surface level.

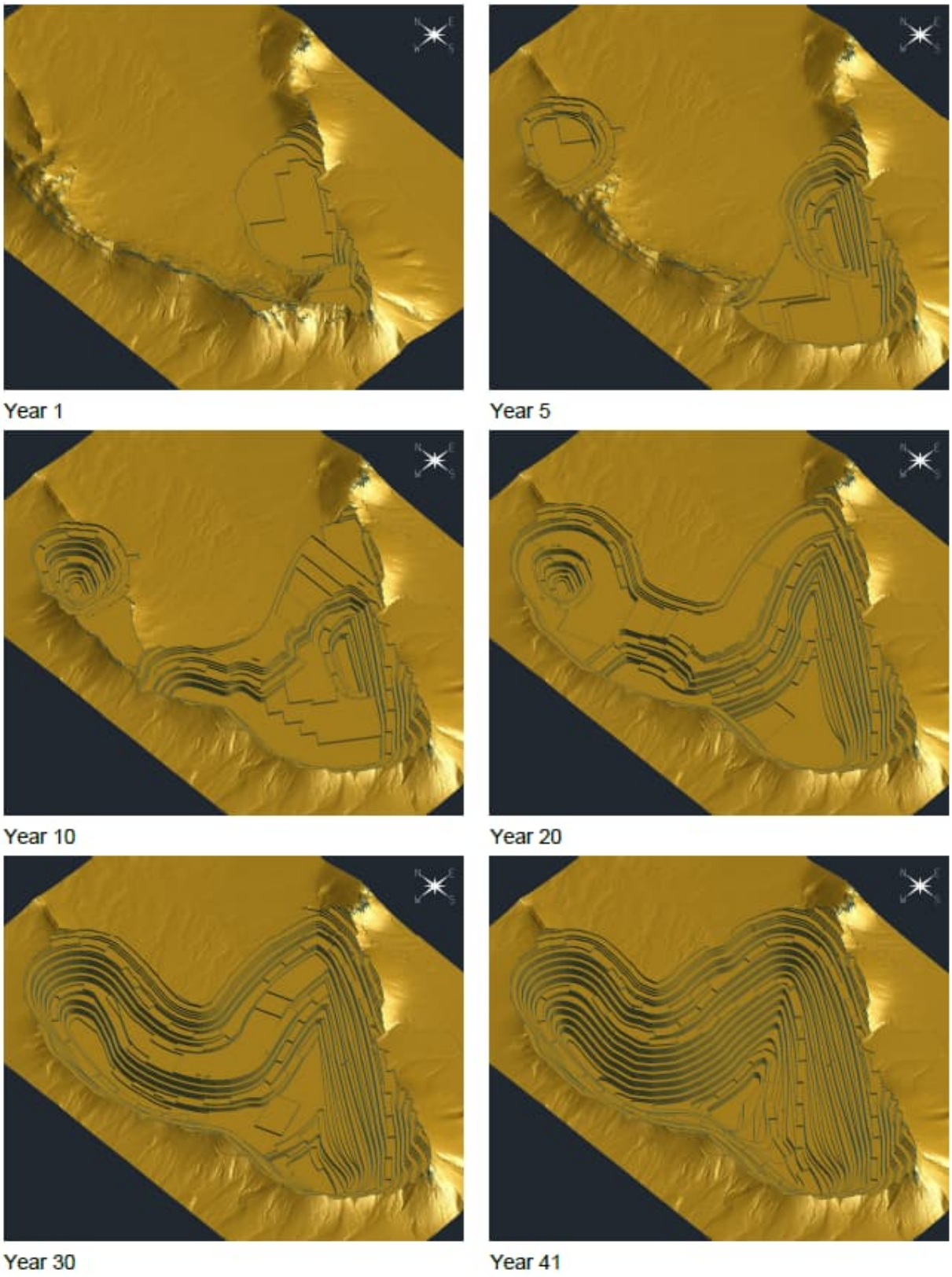


Figure 4-7: Indicative mine development

Water Management and Geotechnical Considerations

Mining activities will commence above the water table and subsequently proceed to excavate below it. Drilling and testing have revealed low permeability rates (ranging from 10^{E-9} to 10^{E-10} metres per second), with some

water-bearing fractures present. However, no significant water inflows have been detected, and as such, the pit is anticipated to remain essentially dry (URS, 2015). Minor groundwater inflows will be managed through the use of local sumps, which will also serve to collect rainfall. The collected water will be stored and utilised for dust control on site.

Pore water pressures behind the pit face may require active management to maintain slope stability within acceptable limits. Nevertheless, geotechnical analysis suggests that depressurisation measures will not be necessary (URS, 2015). During operations, pore water pressures in the pit walls below the water table will be monitored, and adjustments to the pit wall slope angle may be considered to optimise stability.

Open-Pit Design Parameters

The pit incorporates the following design parameters, as outlined in (URS, 2015):

- Haul road width (double lane): 34 metres
- Haul road width (single lane): 22 metres
- Maximum ramp grade: 10%
- Minimum working width: 40 metres
- Minimum pushback width: 60 metres

Mining Method and Equipment

The open pit will be mined using conventional truck and shovel methods. Excavators with an operating weight of 562 tonnes will load haul trucks with a nominal capacity of 220-240 tonnes. Large front-end loaders will be deployed to support the excavators during mining operations.

Blasting Operations

All material extracted from the pit will require blasting. Blast holes with a diameter of 311 millimetres will be drilled, and blasting will utilise ammonium nitrate-based explosives. The annual quantity of explosives required will depend on both the volume and characteristics of the material being mined. Blasting requirements will be lowest during the pre-production phase and when mining weathered material. At maximum production capacity, explosive consumption is expected to reach approximately 57 tonnes per day.

Ore Handling

Run-of-mine (ROM) ore will be transported either to a storage area (ROM pad) or directly to the primary crusher for initial processing. The ROM pad will be situated immediately north of the primary crusher and should be, capable of storing up to 10 Mt of ore.

4.2.1.2.2 Mine equipment for ore extraction and transportation

The following table provides a detailed list of mine equipment planned for the extraction and transportation on the mine site.

Table 4-4: Mine equipment planned for the ore extraction and transportation on the mine site

	Mining Equipment	Description	Qty
Loading	FS Hydraulic shovel	Komatsu PC7000-6	3
	Backhoe Hydraulic	Hitachi EX2600-6	1
	Large Wheel loader	L-1850	1
Hauling	Primary Haul Truck	CAT 793D	17

	Mining Equipment	Description	Qty
	Auxiliary Haul truck	Komatsu HD785-7	5
Drilling and Blasting	Rotary Production Drill	Sandvik D90KS	4
	pre-split DTH	Sandvik DR560	2
	Explosive Truck	Ground force worldwide capacities 20 tonnes	3
Mine Support Equipment	Motor grader	Komatsu GD825A-2	3
	Stemming loader	Hitachi ZW220 Stemming Loader	1
	Water truck	Komatsu HD 785-5 Mega MTT20 Water Tank 75700 L	2
	Wheel dozer	CAT844K	1
	Track Dozer	Komatsu D375A-6	9
	Wheel loader	Komatsu WA900-3E0	2
	Wheel loader	Komatsu WA600-6R	2

A fleet of ancillary equipment will be deployed to facilitate support services such as road construction and maintenance, dust suppression, lighting upkeep, refuelling and lubrication, personnel transportation, vehicle servicing and repair, pit dewatering, and general construction activities (BBA, 2015).

Table 4-5: indicative ancillary fleet (BBA, 2015)

Item	Example	Indicative Quantity
Excavator	CAT374 (352 kW)	1
Excavator	Cat 390 (391 kW)	1
Aggregate Production Plant	Metso	1
Crane	150 t hydraulic crane	2
Crane	75 t hydraulic crane	2
Boom Truck	Boom truck	2
Service Truck	Maintenance service truck	2
Low Bed	Cat 785F	1
Forklift	Hyster	2
Tire changer	DMT	1
Passenger bus	Blue bird	3
Toyota Land Cruiser 90	Pickup truck	20
Toyota Land Cruiser 70	Pickup truck	20
Light Plant	1000 W Diesel generator	2
Dewatering pump	Electric submersible	2

4.2.1.2.3 Dust Suppression and Management During Mining Operations

Dust generation is a significant concern during mining activities. The primary sources include blasting, vehicular movements, and strong winds acting upon areas of disturbed ground.

The main approach to dust suppression involves the use of raw water associated with brine sourced from the water treatment plant or polymers / inorganic salts (see section 5.2.4). Water trucks will distribute water across roads, while stockpiles will be managed using water monitors supplied by local tanks. This method aims to minimise airborne dust and maintain a safe working environment.

Blasting operations are also expected to generate significant amounts of dust. If surface wetting alone does not achieve adequate dust control, alternative dust suppression methods will be evaluated and implemented as necessary. One effective method involves the use of portable fogging equipment. This method generates a fog in the area upwind of the blast site. As the blast occurs, dust released into the air mixes with the fog produced by the equipment. The interaction between the fog and the dust is crucial. Individual particles of water and dust come together, causing them to coalesce and subsequently settle on the ground. This process significantly reduces the formation and spread of dust clouds during blasting.

Importantly, the fogging system does not require prolonged operation or excessive water consumption to achieve effective dust suppression. A brief application is usually sufficient to manage airborne dust generated from blasting activities.

Comprehensive calculations have been conducted by EMC to determine the appropriate quantity of water required for dust suppression. The planned allocations, together with brine from the water treatment plant, are deemed sufficient for managing dust within the mining operation (see section 4.4.1).

4.2.1.2.4 Mine Development and Production Schedule

A pre-stripping period of approximately 2 years before the end of the construction of phase 1 will be necessary to construct the first mine benches within the open pit and be ready for day 1 of operation. During this time, the overlying waste material will be removed in order to access and expose fresh ore, preparing it for subsequent mining operations.

Ore production (ROM) will progressively increase starting with the necessary quantity to feed phase 1 only and increasing to reach full capacity by feeding both phase 1 and phase 2. This phased approach allows for the gradual expansion of mining activities as more ore becomes accessible and as the Plants are being commissioned.

The anticipated operational mine life is 41 years, as summarised in Table 3.7. Throughout this period, mining of run-of-mine (ROM) ore is expected to remain relatively stable, with production averaging around 24 million tonnes per annum (Mt/a).

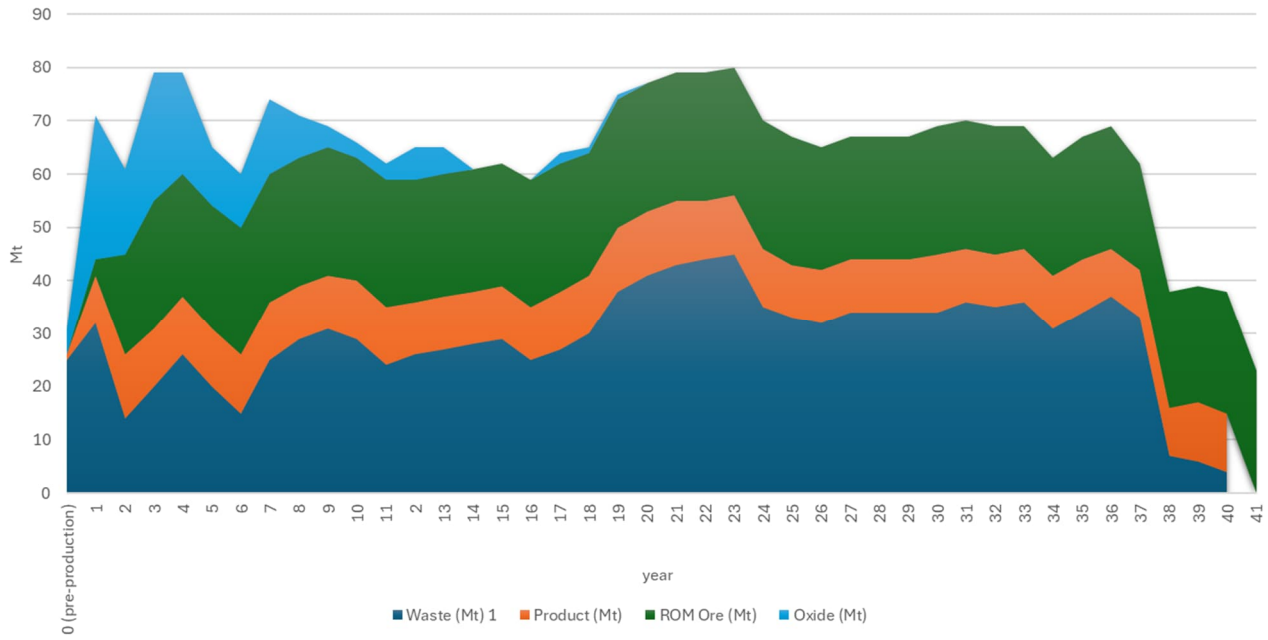


Figure 4-8: Annual Operational Mine Production (BBA, 2015), modified

4.2.1.2.5 Ore treatment process

The El Aouj Project will treat run-of-mine (ROM) ore using a fully dry beneficiation flowsheet comprising primary and secondary crushing, screening, crushed-ore stockpiling and reclaim, high-pressure grinding rolls (HPGR), dry magnetic separation (Medium-Intensity Magnetic Separation, MIMS, followed by two-stage Low-Intensity Magnetic Separation, LIMS), product stockpiling and train load-out, with dry tailings handling via overland conveyors and stackers. The design targets a magnetite concentrate at 66.5% Fe, with a design ore throughput of 24.2 Mtpa (dry) to produce around 11.3 Mtpa (dry) of concentrate from around 23–29 Mtpa ROM feed. The process plant flowsheet is presented in Figure 4-9 and summarized as follows:

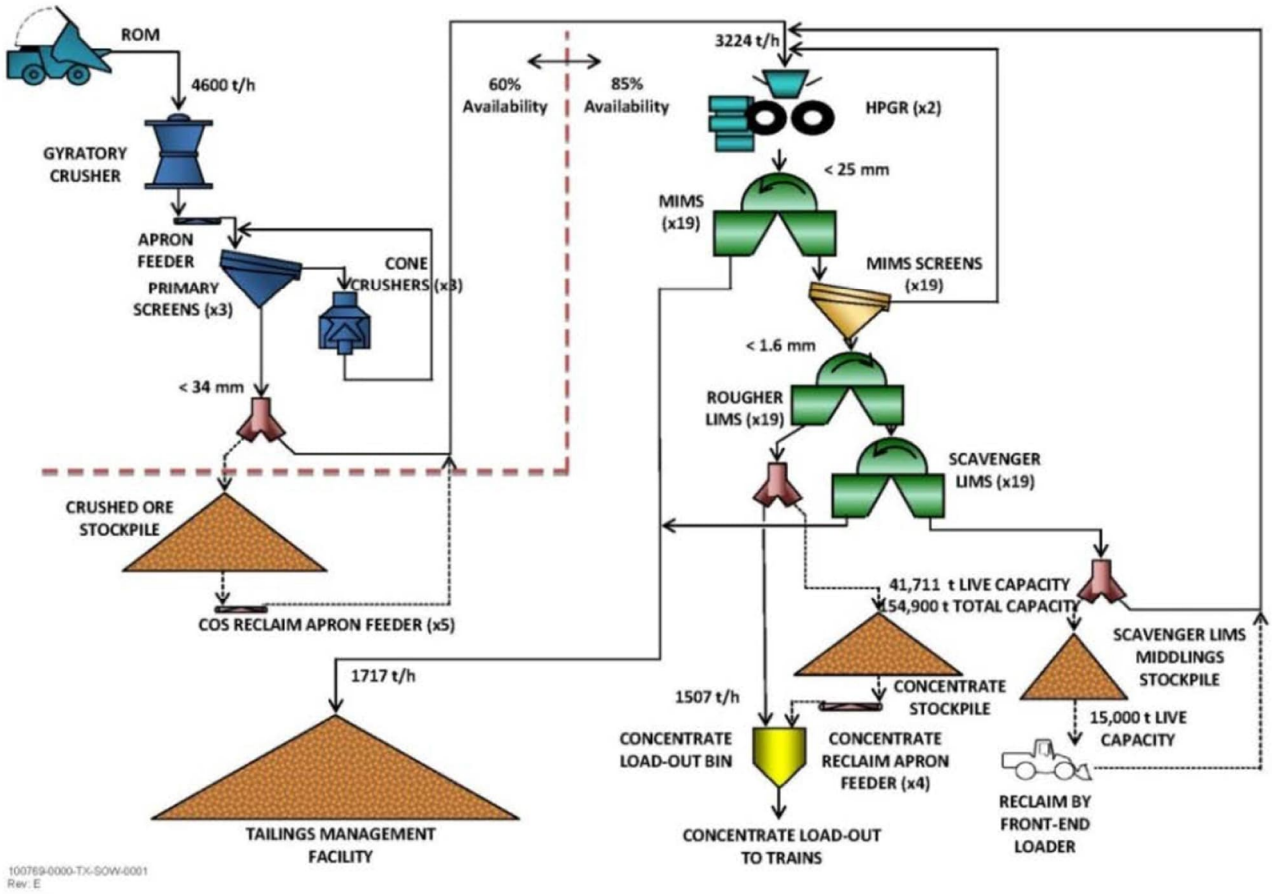


Figure 4-9: Ore treatment process flow sheet

ROM Receiving, Primary Size Reduction and Screening

ROM reception and primary crushing: Haul trucks (maximum lump size up to 1,200 mm) tip into a ROM bin fitted with a pedestal rock breaker; ore is reduced in a primary gyratory crusher and discharged via an apron feeder to the primary crusher conveyor, with dust controlled by a water-based suppression system and a baghouse. The primary crushing system is sized for around 4,600 tph (dry) to the primary screening station.

Secondary crushing and screening: Combined crushed ore is screened in a building housing three double-deck vibrating screens. Screen undersize (P100 = 31.54 mm) proceeds to the HPGR feed/stockpile system; screen oversize is routed to a secondary crushing building with a single feed bin, three apron feeders and three cone crushers, before being returned to screening. Dust is managed via baghouse collectors and dry-fog suppression at critical transfer points.

The Crushing area will be common for both phases and will be built during phase 1.

Crushed Ore Stockpiling and Reclaim

Crushed ore stockpile: A diverter gate splits screened undersize between the HPGR feed conveyor, and a crushed-ore stockpile stacked by a stacker / reclaimer. The stockpile provides 7 days capacity. Water cannons and atomizing sprays suppress dust during stacking. The crushed ore stockpile will be phased by building half of the stockpile for Phase 1 and the other half for Phase 2.

Middling management: Middlings from scavenger LIMS are normally recycled to the crushed-ore reclaim conveyor; if circulating loads rise, material can be diverted to a middling surge stockpile for later loader-assisted

reclaim through a grizzlied hopper back to the reclaim conveyor. The middling stockpile will be common for both phases and will be built during phase 1.

Phased Beneficiation Plant

Both Phase 1 and Phase 2 will be composed of an HPGR building (2 units) followed by a MIMS building (10 units) and a LIMS building (10 units) :

High-Pressure Grinding (HPGR) building

The reclaim conveyor feeds the HPGR bin via a distribution gate; feed also includes MIMS screen oversize and LIMS middling. Metal detectors and belt magnets remove tramp. Choke-fed HPGRs grind the ore and discharge to the Beneficiation Plant (dry magnetic separation) feed conveyor. Dust collection is handled by multiple baghouses ducted to transfer points, returning collected dust to the process stream.

- ***MIMS building***

A travelling tripper car distributes HPGR product to the feed bins at the top of the MIMS building. Vibratory feeders meter material to MIMS machine, which removes non-magnetic tailings to a dedicated tails conveyor. Plant control adjusts MIMS drum speed based on tailings F_e grade; water sprays at discharge minimize dust liberation.

MIMS magnetic product is screened; >1.6 mm oversize recycles to HPGR via the MIMS screen-oversize conveyor, while undersize is conveyed to rougher LIMS building.

- ***LIMS building***

A travelling tripper car distributes Screen undersize product to the feed bins at the top of the LIMS building. Vibratory feeders meter material to Rougher LIMS (r-LIMS) machine. R-LIMS produces the final magnetite concentrate, with non-magnetic fraction proceeding to scavenger LIMS. The concentrate is conveyed to stockpile of direct shipping. Discharge chutes utilize water sprays for dust suppression.

Scavenger LIMS (s-LIMS) treats r-LIMS tails to yield magnetic middling (recycled to HPGR or routed to the middling stockpile) and non-magnetic final tails to the combined tails conveyor. Drum speeds are adjusted based on measured tailings grade; discharge points are water-sprayed to limit dust.

Product Handling and Train Load-Out

Concentrate stockpile: Concentrate is conveyed to a linear stockpile with stockers and reclaimers similar to the crushed ore stockpile system. It will have a 7 days stockpile capacity. The crushed ore stockpile will be phased by building half of the stockpile for Phase 1 and the other half for Phase 2.

Train load-out: The load-out station comprises two gravimetric silos (4,530 t each) feeding chutes over the rail track. An automatic slotted-vessel sampler above the silos collects multiple representative samples. Insertable dust collectors and a dedicated compressor provide local dust control. Trains pass at constant speed for uniform wagon loading.

Tailings Handling and Disposal

Combined non-magnetic tailings are conveyed from the benefication plant to a disposal area. The system includes a radial stacker (for contingency stockpiles) and two shiftable dump covered conveyors (each ~1,200 m; 90° slew), plus tripper cars, link bridges, crawlers and spreaders to progressively build the dry stack. The initial conveyor configuration supports approximately 8.7 years of tailings placement before relocation; subsequent phases provide capacity for the 41.5-year life-of-mine.

Process Control, Monitoring and Sampling

Instrumentation and control. The plant uses a centralized PCS/PLC architecture with Ethernet TCP/IP integration to package systems. Key conveyors and product streams incorporate belt scales, online magnetic susceptibility analysers (MAGNASAT), and primary/secondary sampling to support real-time mass balance and quality control. Dust collection networks, dust suppression sprays, and local insertable collectors are interlocked to process equipment.

4.2.1.2.6 Dust Suppression and Management During Mineral processing

Dust generation is a significant concern in mineral processing operations. Effective dust control is crucial to protect personnel, maintain equipment performance, and limit environmental impact. The following strategy outlines specific targets and methods for dust management within mineral processing facilities.

Dust Control Targets

- Enclosed Workspaces: The goal is to maintain a mean average concentration of PM_{10} dust at or below 45 µg/m^3/h in areas with continuous human presence, such as control rooms, electrical substations, and offices.
- Controlled Source Emissions: At emission points (such as stacks or vents) from dust abatement plants, the maximum emission rate should not exceed 45 mg/m^3/h.
- Diffuse Emissions: For locations within 50 meters of diffuse emission sources—including product or tailings stockpiles, material handling areas, roads, and conveyors—the mean value for total dust should be limited to 1 mg/m^3.

Dust Control Strategies

- Materials Handling Design: To minimize dust generation, materials handling systems are designed to reduce the number of transfer points, lower the height from which materials fall, avoid double handling, and limit the exposure of ore to the environment.
- Ore Wetting Procedures: Dust generation is further minimized by wetting the ore, ensuring that the moisture content exceeds the Dust Extinction Moisture (DEM) limit.
- Equipment Enclosure and Airflow Management: Where dust is generated, equipment is enclosed to contain and capture airborne particles. Air ingress into the enclosure is minimized, and the velocity of incoming air is controlled to prevent dust from escaping, ensuring efficient dust capture within the system.
- Dust Settling and Separation Techniques: To reduce the amount of dust reaching dust collectors, captured dust is allowed to settle by gravity, with or without supplemental dust suppression. Alternatively, cyclonic separators are used to separate dust particles before they enter the collection system, further limiting the load on dust collectors.
- Dust Conveyance and Collection: Collected dust is conveyed to multiple fabric filter dust collectors via a modified low velocity duct design. This system enhances the efficiency of dust transport and collection throughout the facility.
- Dust Reintroduction to Process: Where feasible, collected dust is moistened and then returned to the process. This practice helps manage dust waste and reintegrates valuable material into operations.
- Maintenance and Equipment Performance: A focused maintenance program is implemented, including scheduled bag replacements, to maintain optimal performance of all dust collection and separation equipment. Regular maintenance ensures ongoing effectiveness in dust control.

- Housekeeping and Personnel Protection: Good housekeeping procedures are established to minimize personnel exposure to dust, both within enclosed workspaces and across the site. These procedures include the provision of vacuum ports specifically designed for cleaning and dust removal, supporting a safer working environment.

Dust Management in Processing Equipment

Dust will inevitably be generated inside dry processing equipment. Areas with significant dust generation within a 10-meter radius will be enclosed and equipped with dust capture systems. Equipment enclosures will operate under slight negative pressure, promoting air ingress and preventing dust escape. By tightly specifying equipment to minimize air ingress, the overall airflow and required capacity of the dust extraction system can be reduced.

Advanced Dust Suppression Techniques

High-pressure dust suppression systems will be deployed where enclosures are impractical or when large air volumes require control. Instead of conveying substantial dust quantities to collectors, the bulk will be dropped out at the source using knock-out chambers or cyclonic devices with low pressure drops. Removing coarse dust enables the use of modified low velocity ducts, making dust capture and conveyance more efficient.

Dust Collection Systems

Reverse pulse fabric filters will be used to collect dust from each area. A single fabric filter, compartmentalized for efficiency, is easier to maintain than several discrete units. The filtered clean air will be discharged to the atmosphere, and recovered dust will be returned to the process, either dry or moistened above the DEM value.

Dust Collector Locations

- Primary crushing
- Primary screening
- Secondary crushing HPGR
- Beneficiation Plant (multiple units)
- Train loading

Vacuum Ports and Emissions Thresholds

Vacuum ports are required wherever dust emissions exceed 1kg per hour within a 10-meter radius, facilitating periodic area clean-up. For emissions between 1 and 12 kg/h, dust enclosures and extraction equipment are not required.

4.2.1.3 Mining waste management

4.2.1.3.1 Waste Rock

Overview of Waste Rock and Ore Production

During the 41-year operational life of the mine, it is estimated that a total of approximately 1,187 million tonnes (Mt) of waste rock will be generated. The strip ratio, defined as the amount of waste rock removed per unit of ore extracted, is projected to be 1.4:1. In addition to waste rock, 153 Mt of oxide ore will be stockpiled for potential future processing. This oxide ore will be considered as a mine waste and managed accordingly during the closre phase until its eventual future processing. Production levels of waste and ore will fluctuate throughout the mine's lifespan, with peak annual production reaching as high as 67 Mt per year. Detailed figures for annual waste rock production are provided in Figure 4-8.

Design and Layout of Waste Dump Area

The life-of-mine (LOM) waste dump area will be organized into two distinct waste rock dumps, referred to as the north and south dumps. Additionally, there will be two dedicated oxide ore dumps, where material will be stockpiled for possible future use. Each waste rock dump is designed to accommodate approximately 594 Mt of material, while the combined capacity of the oxide ore dumps is limited to a maximum of 153 Mt. The waste dump area will reach a maximum height of about 105 meters, encompassing a footprint of up to 972 hectares.

Location and Operational Procedures

For safety and geotechnical stability, the waste dump area will be situated at least 100 meters beyond the ultimate pit boundary. Waste rock will be transported directly from the open pit to the active sections of the dumps using trucks. The material will be end-tipped and subsequently spread by dozer. To enhance pile stability and facilitate safer trucking activities, the dump will feature wider benches, each measuring 15 meters.

4.2.1.3.2 Tailings

Process Plant Feed and Tailings Generation

The process plant is designed to receive a Run-of-Mine (ROM) feed of approximately 24Mt/y, as presented in Figure 4-8. This feed rate is intended to yield an average of around 11 Mt/y of final product. As a result of this operation, the plant is expected to generate between 11 to 14 Mt/y of process tailings, equivalent to 8Mm^3/y.

Characteristics of Tailings

The combined tailings stream, consisting of Magnetite Intermediate Magnetic Separation (MIMS) and Scavenger Low Intensity Magnetic Separation (LIMS) tailings, is classified as silty sand under the Unified Soil Classification System (USCS, 2020). Specifically, MIMS tailings have a P80 particle size of approximately 0.6 mm, while Scavenger LIMS tailings have a P80 size of about 0.8 mm. The average moisture content of these tailings is 2%.

Tailings are composed of a mixture of gangue minerals and residual ore minerals. Quartz is the dominant gangue mineral, with minor quantities of feldspar, pyroxene, and amphibole present. Notably, no chemicals or hazardous substances are introduced to the tailings during the mineral processing stage.

Tailings Disposal Area Design

The tailings disposal area is situated southeast of the process plant, as illustrated in Figure 4-6. This area is designed to expand in a semi-circular pattern towards the southeast over the years of operation. Tailings are transported from the plant via an uncovered conveyor to a central point on the northwest side of the disposal area, where they are transferred to a dump conveyor system. To mitigate dust, water is applied to the tailing's conveyor.

Tailings are distributed using two uncovered, shiftable dump conveyors that are mounted on skids. Each conveyor is equipped with a tripper and a spreader car to facilitate even spreading of tailings. The disposal area itself will not be lined.

Tailings Deposition and Storage Capacity

Deposition of tailings will occur in layers. Over the planned 41 years of operation, 3 plateaus will be constructed at elevations of 35 meters, 70 meters, and 105 meters above ground level. Each plateau will consist of a 20-meter-deep cast layer and a 15-meter-high cast layer. The first plateau, at 35 meters elevation, is scheduled for completion by the end of year ten; the second plateau, at 70 meters elevation, by the end of year twenty; and the third plateau, at 105 meters elevation, will receive tailings until the end of mine life.

Upon completion, the tailings disposal area will measure 2,150 meters in length, 2,700 meters in width, and reach a height of 105 meters above ground level, with a calculated maximum storage capacity of 567 Mt of tailings, equivalent to 328 Mm^3.

The tailings management process aims to minimize water usage and adheres to recognized international best practices.

Surface Water Dam and Runoff Management

A surface water dam will be established on the north (upstream) side of the tailings disposal area. Its purpose is to capture runoff from infrequent rainfall events within the upstream wadi catchment basin. Constructed from backfill material and protected with sand, HDPE geomembrane, and rock, the dam will span approximately 800 meters in width and offer a total retention capacity of 300,000 m^3.

The dam's sizing is based on a catchment area of about 7.75 mm^2, which represents 6% of the total catchment and a conservative water retention requirement of 200,000 m^3. Water collected by the dam will be used for dust suppression at the mine site.

Additional runoff will be managed via a drainage channel located between the tailings disposal area and the rail spur. This channel will divert water to the main wadi channel to the south, facilitating natural drainage (see Figure 4-6).

4.2.2 Wellfields (Touajil and Aouchich)

The project plans to utilise only the Touajil wellfield for the first 20 years of operations. From this period onwards, the Aouchich wellfield will be brought into service. The planned wellfields in the Touajil and Aouchich areas have not been modified since the studies conducted in 2015 (URS, 2015). The boreholes initially planned for the development of the wellfields throughout the operating period are as follows:

- Touajil: SP02 - SP03 - SP04 - SP05 - SP17.
- Aouchich: SP30, SP37, SP13, SP11 and ABH1 & ABH2 (to be drilled).

A recent survey revealed that some pumping and groundwater observation structures are no longer operational and will need to be re-drilled (SP02-SP05). During the operation phase, the concerned boreholes will be re-drilled.

The route of the water pipeline from the wellfield will be constructed with Ø450 mm HDPE main buried pipe. The pipeline will extend for a total length of 99 km between the mine and the Touajil wellfield, with an additional 110 km section connecting the Aouchich wellfield to the pipeline linking the mine to Touajil. Out of those 99km, 46km of this pipeline will be built outside the mine or water permit perimeter, between the north of the Touajil wellfield and the southern limit of the mine permit perimeter. The entire pipeline will be buried at a depth of approximately 1 metre. Pressure-regulating valves will run through the pipe to prevent water hammering when the wellfield pumps are restarted. These valves will be located every 5 km between the mine and the wellfield.

Figure 4-10: Touajil well field

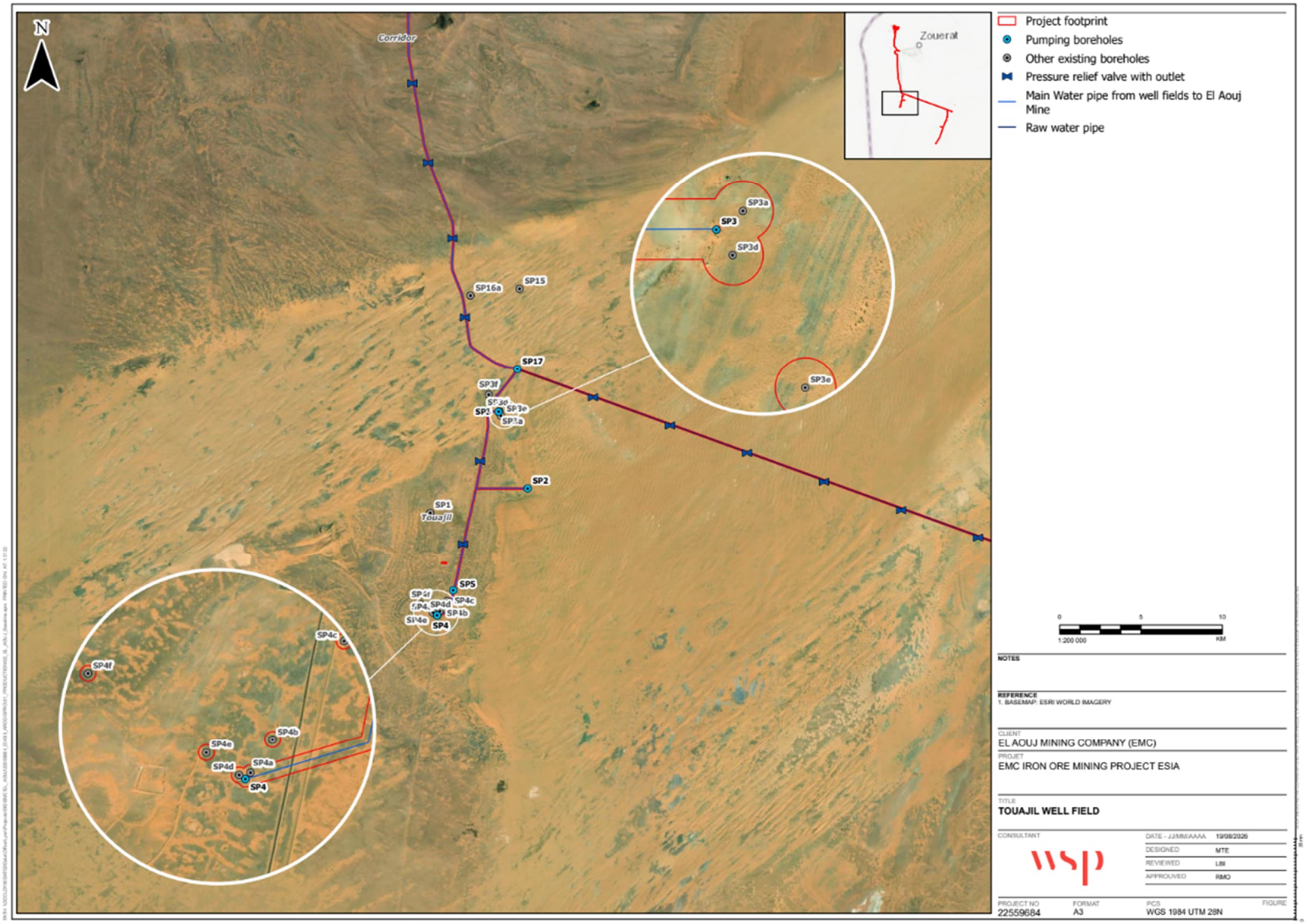
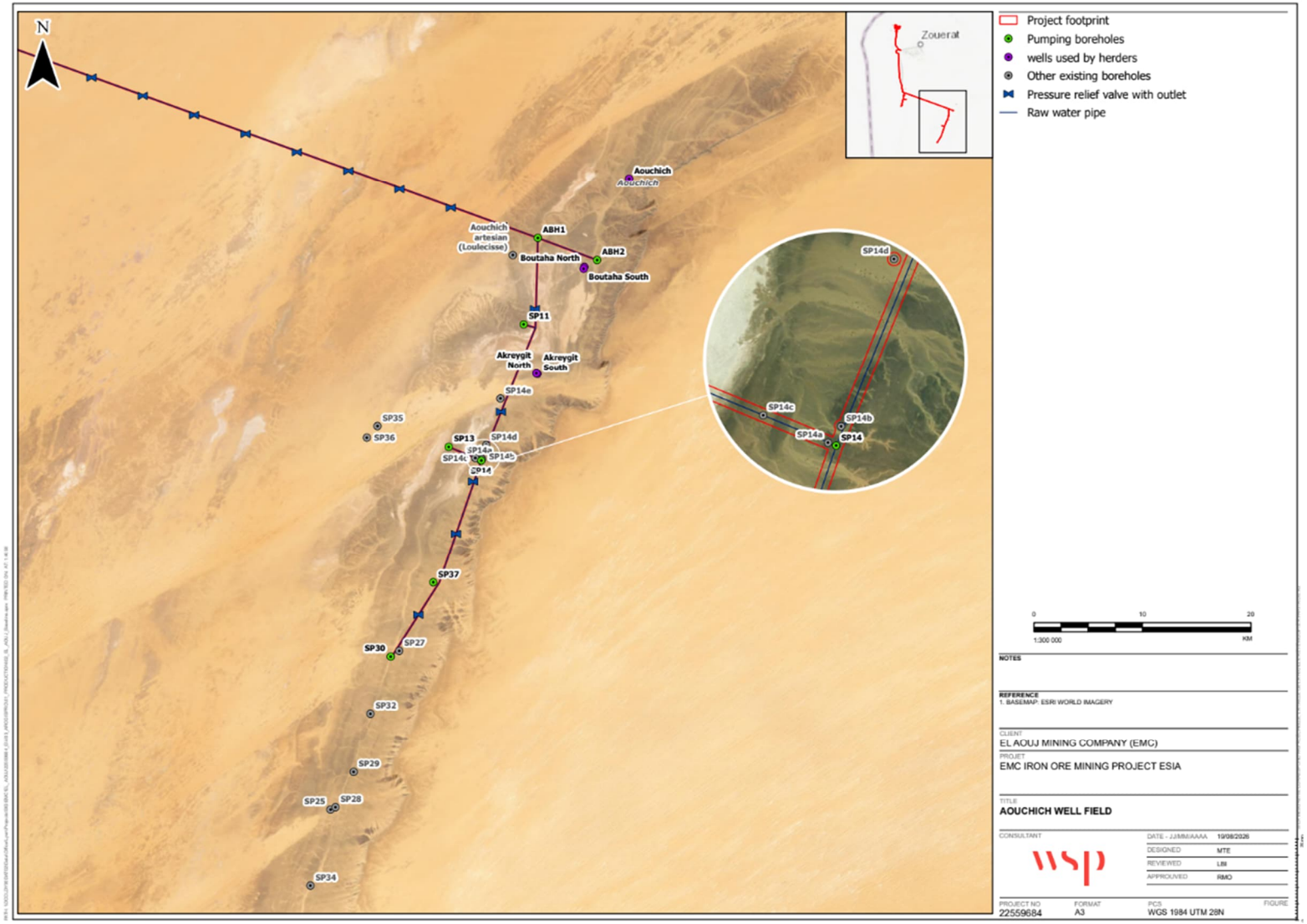


Figure 4-11: Aouchich well field



4.2.3 New access road

A new 30km access road will be built to link the mine to the existing paved road north of F'Dérik. For most of its length, the access road will be built along the rail spur and will be paved after construction.

4.2.4 Ancillary infrastructures and utilities

4.2.4.1 Explosive Storage Facility

The explosives storage facility is planned to be situated 4km south of the process plant. It will be positioned adjacent to the service corridor, as illustrated in Figure 4-6. This strategic location provides convenient access while maintaining a safe distance from other core operations. The facility comprises several key components:

- Explosive Storage Area: This area includes two secure magazines designed specifically for the storage of detonators, cords, and boosters, ensuring that sensitive materials are kept safe and properly managed.
- Ammonium Nitrate-Based Explosives Mixing Facility: A dedicated facility for mixing explosives based on ammonium nitrate, supporting the operational needs of the site.
- Ammonium Nitrate Storage Shelters: The facility features two separate shelters for storing ammonium nitrate, providing additional safety and segregation for this material.

The explosives storage area will be secured with a double fence to prevent unauthorized access. Additionally, a guard house will be established to control the entry and exit of mine site personnel, ammonium nitrate-based explosives loading trucks, and delivery trucks carrying explosive components. These measures are designed to ensure the safety and security of all materials and personnel involved in the operation.

4.2.4.2 Non-mineral Waste disposal

A dedicated Waste Management Facility (WMF) will be installed in the mine site and will be sized to receive all types of industrial waste, allowing to recycle them or temporary store them for further disposal to accredited treatment / disposal facilities.

Non-mining waste will be collected on site and segregated at source as follows (Table 4-6, Table 4-7):

- **Inert Waste** – refers to material that does not experience notable physical, chemical, or biological changes and possesses minimal potential for environmental impact. Typical examples include excavated soil, aggregates, bricks, blocks, and excess concrete.
- **Non-hazardous** – refers to all wastes that are classified as neither inert nor hazardous. Typical examples encompass metals, wood, plastics, paper and cardboard, as well as other packaging materials.
- **Hazardous** – wastes from operations or maintenance that have dangerous properties (such as ignitability, corrosiveness, reactivity, or toxicity) or characteristics posing risks to health or the environment if not managed properly. Examples include waste oil, chemicals, paints, solvents, and healthcare waste.

Waste will be generated during all phases of the Project.

Table 4-6: Management of inert materials (construction/demolition materials) and non-hazardous waste

Waste	Disposal Management
Food waste	Use as compost for gardening and agricultural purpose at the palm grove.
Plastic waste	Plastic waste such as empty water bottles, pipes, plastic bags, cans and barrels are collected and transported to the WMF. Water bottles are either compacted or bulk loaded into shipping containers and sent to a local recycler in Nouakchott. Where possible, plastic containers such as drums and intermediate bulk container totes (1000 litters) are reused on or off site after going

Waste	Disposal Management
	through a stringent cleaning process. Other plastics are stored with the option of shredded for recycling.
Scrap steel	Ferrous waste is generated on site from several sources. Temporary storage at the WMF. Disposal to accredited scrap metal recycling center in Mauritania once a considerable quantity of scrap is available
Used tires	Stored in the WMF pending possible temporary use on site (roundabouts/roadsides) or disposed to accredited tires recycling center in Mauritania
Wood waste	Wood wastes, including pallets, wood packaging and other wood wastes are reused where practicable either on-site or with authorized recyclers. The non-reusable wood (very small pieces or saw dust) is stockpiled and either used as part of fire training exercises or shredded as a moisture absorbent additive for the composters or the directly applied to the ground as mulch in tree planting.
Office and domestic waste	This waste is generally paper, magazines, books, clothing, shoes, hats, cardboard boxes, rags, sawdust, pieces of packaging material, and cardboard boxes. This waste will be sorted in the WMF and sent for recycling to recyclers and local NGO's (with agreement)
White goods and equipment	White goods and equipment will be stored pending the conclusion of a recovery/recycling contract with a local service
Liner (conveyor)	Stored in the WMF, for later recycling
Furniture	All used furniture is collected, dismantled and sorted. The metallic pieces are stored with the metal scrap yard. Furniture that could be reused will be recycled locally (local NGO's)

Table 4-7: Non-Mineral hazardous waste management

Waste	Disposal Management
Used Oils	Used oils are collected at their source (mobile maintenance shops, power plants, etc.) in storage tanks or IBC totes. Waste oil in totes is collected and brought to the WMF and stored in a waste oil tank which is offloaded by a competent, authorized and certified companies / recyclers and shipped off-site for recycling
Used batteries	Batteries from vehicles, mobile equipment, universal power supplies, and other sources are collected separately, transported to the WMF, and stored in concrete containment. When enough batteries is available for recycling, they are carefully packaged, transported and recycled off-site by a competent, authorized and certified companies/ recyclers
Used air Filters	Air filters from mobile equipment are crushed at source and stored in dedicated containers at the WMF, for later recycling.
Fluorescent Light Bulbs	Light bulbs are gathered at the WMF and stored until they can be disposed of at a certified recycling center in Mauritania. If no external option exists, they are crushed onsite, then drummed and sent off-site as hazardous waste.
Electronic Waste	Electronic waste includes printers, computers, photocopiers, universal power supplies, monitors, televisions, and any other electronic related equipment. They are sent to the WMF for later recycling. Electrics cables can easily find interested recyclers
Paint Cans	Empty paint cans are collected and sent to the WMF scrap yard for later recycling.
Aerosol Cans	Empty aerosol cans are collected separately at the source, punctured and sent to the WMF scrap yard for later recycling

Waste	Disposal Management
Drums	Empty drums, in particular oil and grease drums, are collected at the source and sent to the used oil storage area of the WMF for later recycling
Used oil Filters	Oil filters are drained and crushed at the source maintenance shops and stored in dedicated containers at the WMF for later recycling, with the remaining steel placed into the scrap steel area.
Medical waste	All biohazardous waste will be incinerated in a decicated incinerator on site.
Lab waste	Sent to the WMF and stored in dedicated containers for later disposal to accredited disposal or recycling facilities

During the construction, the contractors will be required to manage and dispose of their own waste. In addition to the types of waste generated during the operational phase, there will also be a significant amount of general construction/ demolition waste generated, such as inert soil, rocks and rubble. A landfill will be constructed for disposal of this inert waste (under strict conditions). During the operational phase, inert waste will be disposed of in the waste dumps. All other waste during all project phases will be managed as described in Table 3.15 above.

Waste Management During Construction Phases

Throughout the construction phase, all contractors will be responsible for the management and disposal of their own waste. This obligation includes not only the types of waste typically generated during the operational phase, but also a considerable quantity of general construction and demolition waste. Such waste comprises inert materials including soil, rocks and rubble.

To facilitate the proper disposal of this inert construction and demolition waste, a dedicated landfill will be established. The operation of this landfill will be governed by strict conditions to ensure compliance with environmental standards. Once the project moves into the operational phase, all inert waste will produce during the construction phase will be directed to the rock waste dumps within the site.

All other types of waste, regardless of the project phase, will be managed according to the procedures detailed in Table 4-6 and Table 4-7 above. This approach ensures that waste management practices remain consistent and compliant throughout both construction and operational activities.

4.2.4.3 Raw water treatment

The raw water treatment system at the El Aouj mine is designed to supply potable water, process water, demineralized water for the power plant, and water for dust suppression. Groundwater abstracted from the Touajil wellfield is conveyed to the site through a dedicated pipeline and stored in the main Raw Water Tank, from which it is distributed to the reverse osmosis (RO) plant, firewater system, process water network and dust suppression facilities (see section 4.4.1).

The RO plant forms the core of the treatment process. Raw water is first treated through sand and cartridge filtration, followed by a two-pass reverse osmosis system with antiscalant dosing to protect membrane performance. The resulting permeate is disinfected by ultraviolet treatment before being used for potable supply, mining operations, and demineralized water needs, including the power plant and HPGR chillers.

The RO concentrate stream is recovered rather than discharged, blended with raw water, and reused for dust suppression across the mine and plant areas. This integrated approach improves water efficiency and helps reduce freshwater demand.

4.2.4.4 Waste water treatment

Wastewater will be generated at the mine site will mainly be generated at the operator camp and in a lesser proportion at the mine site. The wastewater will be collected through a dedicated sewage network within the camp and mine site and treated on site using Activated Sludge Bioreactors, chlorine treatment and sludge drying beds. The effluent water (estimated as 100 L/person/day) will be treated. The dried sludge will be disposed of in a waste disposal area on the south side of the railway line while the treated water will be used for developing the palm grove garden and undergo routine quality monitoring to ensure adherence to prevailing effluent standards.

Overhead power line

A 30 km long 33 kV overhead power line will be constructed to connect F'Dérik sub-station to the proposed El Aouj power plant to supply the reserve power for the mine. Step-down transformers will convert the voltage to 11 kV at the El Aouj mine site.

4.2.4.5 Solar power plant

The solar power plant planned for the mine site will comprise a 12 MWp photovoltaic installation coupled with a battery energy storage system, contributing approximately 27% renewable energy to the site's power supply (see Figure 4-12). The plant will use N-type monocrystalline photovoltaic modules, with a total of 18,462 modules rated at 650 Wp each, arranged over an area of approximately 25 ha. It will be connected to the site's electrical network at 33 kV. Given the site's high solar resource, with an expected average irradiation of around 2,100 to 2,200 kWh/m²/year, the facility is designed to support low-carbon power generation under arid conditions. Dry cleaning equipment is also planned to limit water use for module maintenance .

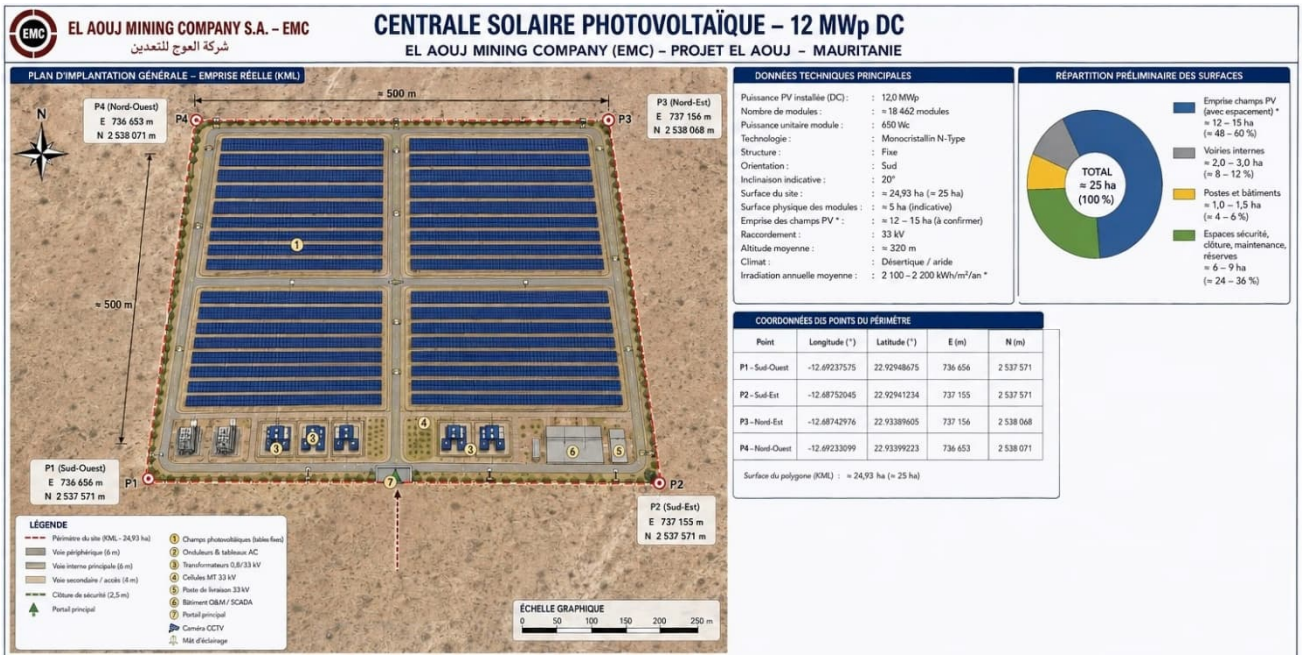


Figure 4-12: Photovoltaic plant at the mine site

4.2.4.6 Hard standing areas

In addition to the construction of buildings, hard standing areas will be developed to support various operational requirements. These areas will collectively cover approximately 80,000 m² and are designated for specific purposes to ensure efficient facility management and workflow:

- Storage and Laydown Areas: dedicated spaces will be provided for storage and laydown, supporting the central warehouse, lubricant storage compound, and tyre storage. These zones are essential for organizing materials and equipment used throughout the facility.
- Parking Facilities: parking areas are planned to accommodate different types of vehicles and high-pressure grinding rolls (HPGR) workshops. Additional parking spaces will be available near the gatehouse as well as operations and mining offices.
- Refuelling Stations: refuelling facilities will be constructed, particularly catering to the needs of the HV workshop. These stations are designed to streamline vehicle maintenance and operational readiness.
- Vehicle Wash-Down Areas: designated wash-down zones will be established for both HV and LV workshops. These areas will enable thorough cleaning and maintenance of vehicles, supporting safety and operational efficiency.

4.2.4.7 Fuel storage and distribution facilities

The El Aouj mine includes dedicated fuel storage, unloading and distribution facilities designed to support both power generation and mining operations. Fuel is delivered to the site by rail every two days and unloaded at a dedicated HFO/LFO handling facility comprising separate unloading, storage and distribution systems. Heavy Fuel Oil (HFO) is used primarily for the mine power plant, while Light Fuel Oil (LFO, diesel) supplies mobile mining equipment, heavy vehicles and light vehicles. The unloading facility is equipped with eight rotary pumps (four for HFO and four for LFO) and includes dedicated storage tanks with capacities of approximately 1,750 m^3 for HFO and 1,300 m^3 for LFO. From these storage tanks, fuel is distributed through a network of pumps to the power plant day tanks and to site refuelling stations. Two dedicated refuelling stations serve heavy mining equipment and mine service vehicles, while additional diesel storage is provided at the explosive storage area through a 50 m^3 ANFO diesel tank used for blasting operations.

4.2.4.8 Other facilities

Other facilities will include general administration, laboratory facility, compressor building, security systems, plant control systems, water treatment, buried services, prayer room, change rooms, medical center.

4.2.5 Workforce facilities

4.2.5.1 Construction camp (temporary camp)

The construction camp will be set up on site, near the planned permanent camp, approximately 1 km from the center of the process plant. It is expected to operate for a period of 10 years. Facilities include general office, first aid, security & administration, dining, medical center, laundry, guard house, guest house with 96 units, mosque, recreation center, football and basketball fields. It will be sized and designed, to suit both options; 2000 people camp and 3000 people camp and will have power generator, water treatment plant and wastewater treatment plant.

The temporary construction camp will be independent of the permanent accommodation camp, and the accommodations will be constructed with demountable housings. The temporary construction camp layout plan is shown in Figure 4-13.

The construction, maintenance and servicing of the temporary living quarters during the construction phase will be entrusted entirely to a principal contractor (civil contractor).

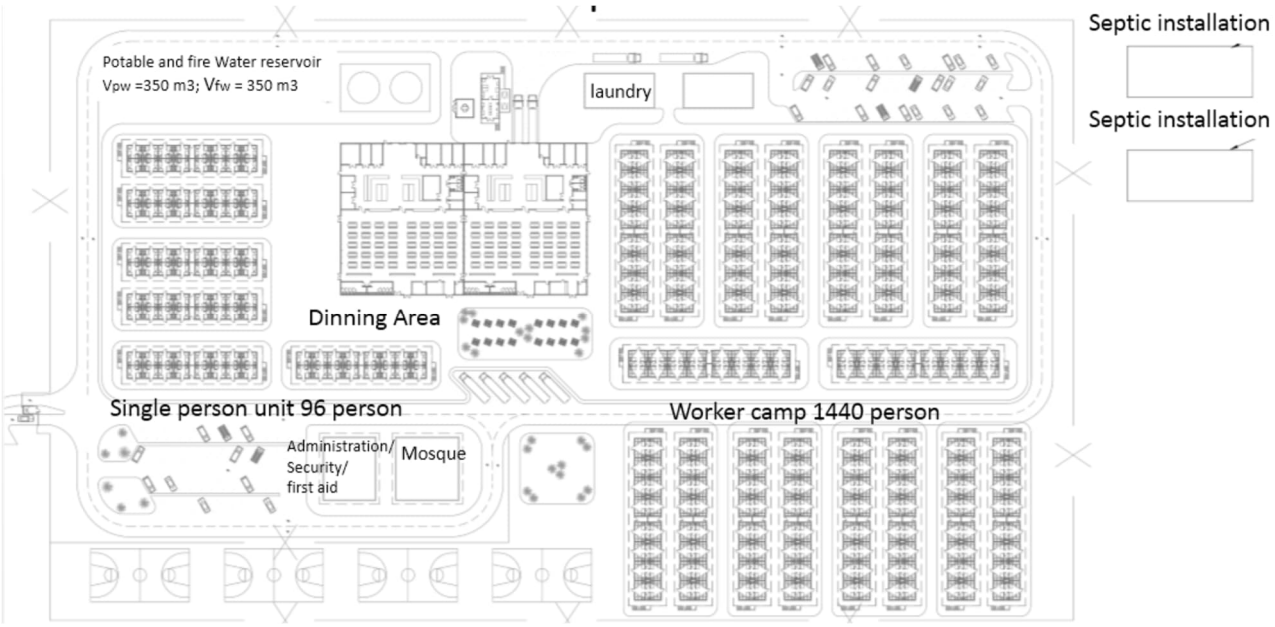


Figure 4-13: Temporary construction camp layout

4.2.5.2 Permanent camp in the mine area

The permanent camp will be built 900 m from the process plant and will cover around 77,000 m^2(cf.Figure 4-6. Workers' housing will be permanent during the operating phase, and the accommodation will be constructed in concrete brick dwellings.

The permanent accommodation camp is designed to accommodate 960 occupants and operate as a fully self-sufficient residential facility supporting long-term mine operations. The camp includes capacity for 644 rotating shift workers, 256 short-term personnel, and an additional contingency allowance of 60 occupants. Accommodation is distributed across 640 rooms, comprising 322 rooms for shift workers on a fly-in/fly-out rotation basis, 28 rooms for international employees, 30 rooms for visitors and VIPs, 120 rooms for temporary contractors during maintenance shutdowns, 30 rooms for OEM representatives and trainers, 50 rooms for maintenance personnel on rotation, and 60 additional rooms reserved for future operational requirements.

The construction of the permanent camp will be entrusted entirely by a contractor (camp supplier), which will deliver all the facilities, including :

- Foundations,
- Roads and driveways,
- Electrical network,
- Water network,
- Sewers,
- Security fence and janitor's quarters,
- Fire-fighting system.

Facilities and utilities to be integrated into the camp will include:

- General office, first aid, security and administration,
- Kitchen and dining room (seating for 322 employees, serving 3 courses per meal),

- Food storage,
- Guard house (for two guards),
- Laundry room for management and workers,
- Guest center with 28 studios sized to accommodate foreign employees,
- Maintenance workshop and warehouse,
- Prayer room/mosque,
- Telecommunications facilities,
- Leisure center for management and workers, and gymnasium.

The facilities will be equipped with air conditioning and easy-to-clean surfaces.

Energy and water supply are supplied by the mine infrastructures (see section 4.5.1 and 4.4.1). Waste management is described in section 4.2.4.2 and wastewater management in section 4.2.4.4).

During the operation phase, the permanent camp will be entirely managed by EMC.

4.2.5.3 El Aouj City at F'Dérik

To complement the accommodation provided for the operational workforce at the mine, a residential development will be established in the existing town of F'Dérik. This initiative aims to offer both family homes and singles accommodation for the Project. EMC will collaborate with local Authorities to secure land adjacent to F'Dérik, ensuring that the new residences are seamlessly integrated into the town.

4.2.5.3.1 Location and development schedule

The location of the future city is presented in Figure 4-15.

The land, encompassing 140 hectares, has been fully delineated and the acquisition process has been conducted in coordination with local authorities. The authorities have confirmed that the land is unencumbered and have issued a formal letter to be submitted to the Ministry of Finance. Final allocation of the land will be determined by the Council of Ministers. It remains unoccupied (see Figure 4-15).

An architectural study has been conducted by a local Mauritanian Architectural Office to ensure taking into account the Mauritanian specificities in terms of housing design. The plan includes constructing residences for the operational workforce, totalling around 880 homes. The development will proceed in 3 phases:

- Phase 1: The initial stage will encompass the development of the first 220 residences alongside the establishment of mining infrastructure.
- Phase 2: The second phase is scheduled for implementation in the third year of operations and will involve the construction of an additional 220 residential units.
- Phase 3: this last phase involves the development of an additional 440 residences across both the southern and northern sections of the site, encompassing housing units and public facilities. Implementation of this phase is scheduled to commence four years following the initiation of mining operations. Figure 4-14 below shows the suggested phases.

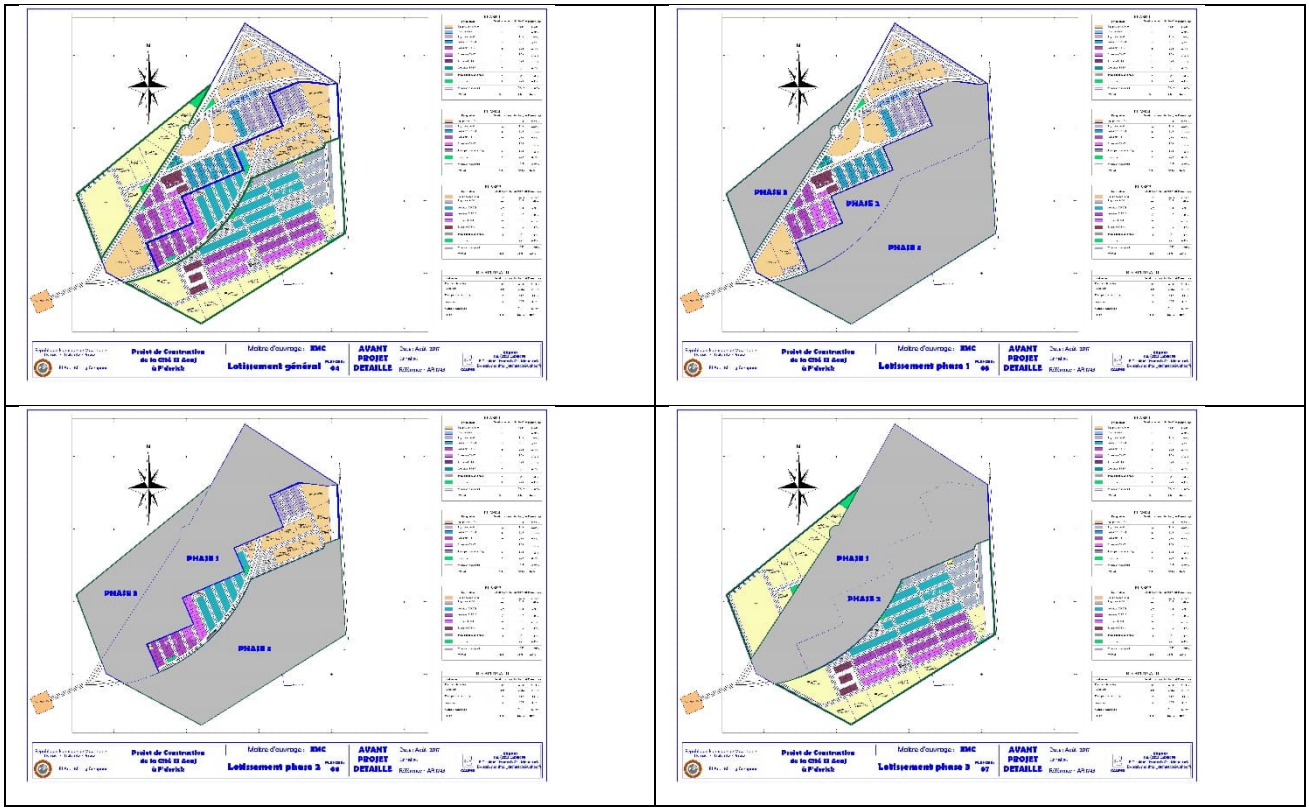
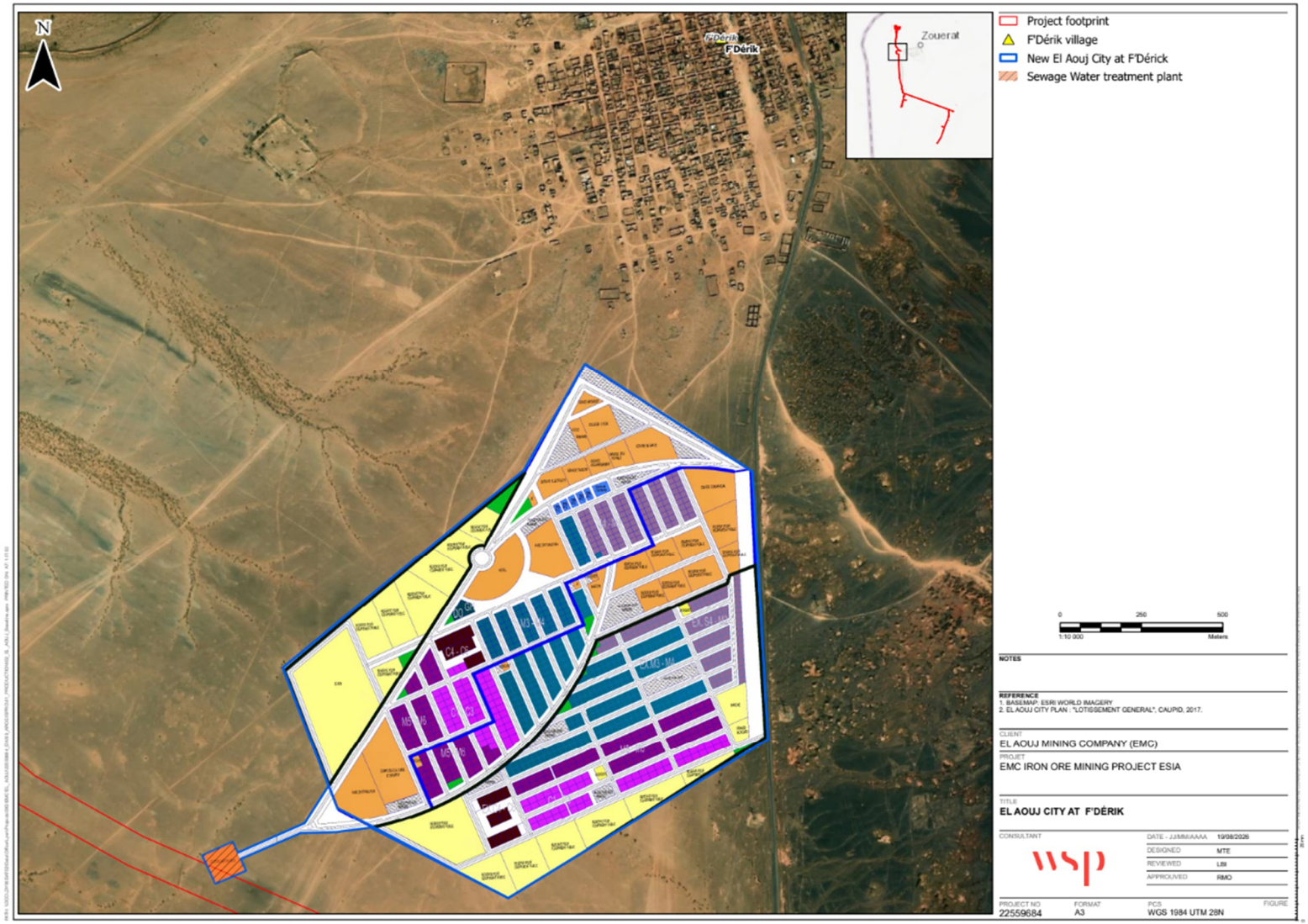


Figure 4-14: Suggested phasing for the El Aouj City construction at F'Dérik

Figure 4-15: El Aouj city at F'Dérick



4.2.5.3.2 Community Support and El Aouj city Infrastructure Development

To successfully implement the El Aouj Project and accommodate its workforce, it is essential to expand and develop key services and infrastructure in F'Dérik. These enhancements will ensure that the needs of both the project and its employees are met efficiently and sustainably.

EMC will operate within the existing regulatory framework to facilitate the supply of essential utilities—including power, water, and wastewater systems—in F'Dérik for El Aouj employees. Employees will be responsible for paying utility providers directly for the services they use, as required.

EMC's approach to supporting the community is grounded in 3 core principles:

- Maximizing Contribution Through Business Processes: EMC will seek to enhance its contribution to the community by integrating support into its standard business activities, such as procurement, employee housing, medical services for employees, and utility provision.
- Indirect Community Benefits: EMC will support initiatives that offer indirect benefits to the community, including literacy training and medical services for the families of employees.
- Sustainable and Collaborative Programs: EMC will contribute to the community by participating in self-help and sustainable programs, working in partnership with local authorities and leveraging existing community resources.

Potable water supply

EMC is committed to supplying potable water to the F'Dérik community throughout the duration of the Project. The daily provision will amount to 0.84 ML and will be distributed 'at cost.' This allocation will also cover the needs of EMC workers and their families.

The potable water will be sourced from the Touajil wellfield. At the mine site, the water will undergo treatment using a reverse osmosis plant to ensure its safety and quality before distribution.

Once treated, the water will be pumped to a holding tank located in F'Dérik. From there, distribution will be managed by a 'local utilities authority,' whose capacity will be developed by relevant Authorities. The utility will be responsible for delivering water to the residences of El Aouj workers as well as other residents within F'Dérik.

The local utilities authority will also oversee the collection of tariffs from the residents and other users. The tariff system will operate on a user pays basis, ensuring fair and equitable access to the supplied potable water.

Wastewater and sludge management

Wastewater from the El Aouj City will be treated at a wastewater treatment plant to be built outside the new town, more than 300 m southwest of its periphery (see Figure 4-15). This plant is already described in detail in Facilities Description (2018)[3]. The wastewater treatment plant will be sized to treat water from El Aouj City at F'Dérik along with the whole wastewater discharged by the city of F'Dérik.

The town of F'Dérik is not currently equipped with a wastewater collection and treatment network. Once the El Aouj City wastewater treatment plant will be running, the town will install a collection and discharge network to connect to the El Aouj City sewage system.

The water treated by the wastewater treatment plant will be reused to irrigate palm groves planned for development near in the city of F'Dérik.

[3] El Aouj Project – FEED –**Facilities description**

The plant will generate residual sludge, which will be removed from the clarifier and sent to waterproofed concrete drying beds. The treatment plant Residual sludge of the El Aouj City is expected to represent 1.8% of the total discharge mass, i.e., a total of 226,300 m^3 over the entire mine operation (41 years).

It is considered that the recycled water and mud from this facility will be made available for local agricultural use.

As described in Facilities Description, the 'local utilities authority' will be responsible for the ongoing operation of the facility in F'Dérik once it is built. EMC will continue to be responsible for monitoring the quality of the effluents leaving the treatment plant and will participate in the training of F'Dérik council staff responsible for maintaining the plant.

Waste

On-site, the wastes will be separated to distinguish the reusable/recyclable wastes than the wastes that will be incinerated. An incinerator will be constructed on-site. No landfill will be planned on-site.

In F'Dérik city, the municipal landfill will be used with support from EMC for the town hall.

4.2.6 Associated facilities

4.2.6.1 Rail Spur for Ore Transportation

The railway element of the project includes the construction of a 35 km railway spur, which will link the existing rail line to the mine site and associated sidings. The first 14,7km of the rail spur starting from the junction with the existing SNIM railroad is located out of the perimeter of the EMC mine permit. The construction will be carried out by SNIM, ensuring integration with the current infrastructure. All rail spur components, as well as rolling stock and locomotives, are to be financed by SNIM and are therefore considered as associated facilities.

Construction Phase

The extension between the future El Aouj mine and the existing railway network is scheduled to be constructed by SNIM during the initial phase of mine development. This construction will coincide with the establishment of the asphalt access road, enabling the rail spur to facilitate supply deliveries during mine construction. This operation will require significant quantities of railway sleepers and ballast.

Sleepers

The monoblock concrete sleepers required for the rail spur will be manufactured locally at the SNIM facility, using the factory's existing production capacity located in Nouadhibou. A total of 73,348 sleepers will be produced, each measuring 260 cm in length, 24 cm in width and 14 cm in height. The sleepers will be transported by train (SNIM).The sleeper factory is not considered an associated facility, as it was originally established to meet SNIM's own requirements for the progressive replacement of wooden sleepers with concrete sleepers along the main railway line between Nouadhibou and Zouerate (50 km/year).

Ballast

Ballast for the rail spur will be sourced from gabbro material extracted from 5 existing SNIM-operated quarries located between Nouadhibou and Zouérate. These quarries are conveniently positioned near the existing railroad line. Each quarry holds an operational permit issued by the Ministry of Mines and Industry since July 2010 and has undergone Environmental Impact Assessment and received environmental approval from the Mauritanian Ministry of the Environment. The permits are currently in the process of renewal. Approximately 45,000 m^3 of ballast will be extracted and transported to the construction site using the existing train network.

Theses quarries are not considered associated facilities as they have been originally established to meet SNIM's own requirements for the progressive replacement of ballast along the main railway line between Nouadhibou and Zouerate.

Ore Routing Operations

Upon completion of construction, SNIM will oversee the operation of the rail spur connecting the mine to the existing railway network. SNIM and EMC will collaborate to manage transport logistics and maintenance. EMC will be responsible for loading the ore wagons at the mine site, after which SNIM will take charge of transporting the ore from the mine to the port in Nouadhibou.

4.2.7 Project Footprint

The estimated Project land footprint being assessed in the ESIA is given in Table 4-8. A theoretical boundary has been assumed around the perimeters of the Project infrastructure and that the entire areas within these boundaries will be required for Project purposes.

Table 4-8: Project Footprint

Project Area	Estimated Project footprint (km²)
Mine site area[1]	17,411 km²
Infrastructures corridor between the mine site and F'Dérick[2]	0,437 km²
El Aouj City	1,511 km²
Water pipelines[3]	0,416 km²
Wellfields	160 km² (Touajil) – 800 km² (Aouchich)
Total	**980 km²**

Notes:

1) Overall area encompassing all mine site components including open-pit, waste/tailings dump area, process plant, mine accommodation.
2) Considers a corridor of 250m width including the access road, the30km power transmission line, the 35km rail spur and the water pipeline. 14,7km out of 35km are located outside the EMC mine permit, starting from the junction with the existing SNIM railroad.
3) Assumes length of 200 km, built within corridor of 150m width, excluding the pipeline within the infrastructures's corridor.

4.3 Existing supporting infrastructures

4.3.1 Rail infrastructures for ore and goods transportation from El Aouj Mine to Nouadhibou Port

Ore extracted from the El Aouj mine will be transported via rail to the Nouadhibou ore port. The existing railway comprises a single track stretching approximately 730 kilometres from M'Haoudat station (PK704) to Nouadhibou (Point Central station PK0) and features 15 sidings to facilitate train crossings Figure 4-16).

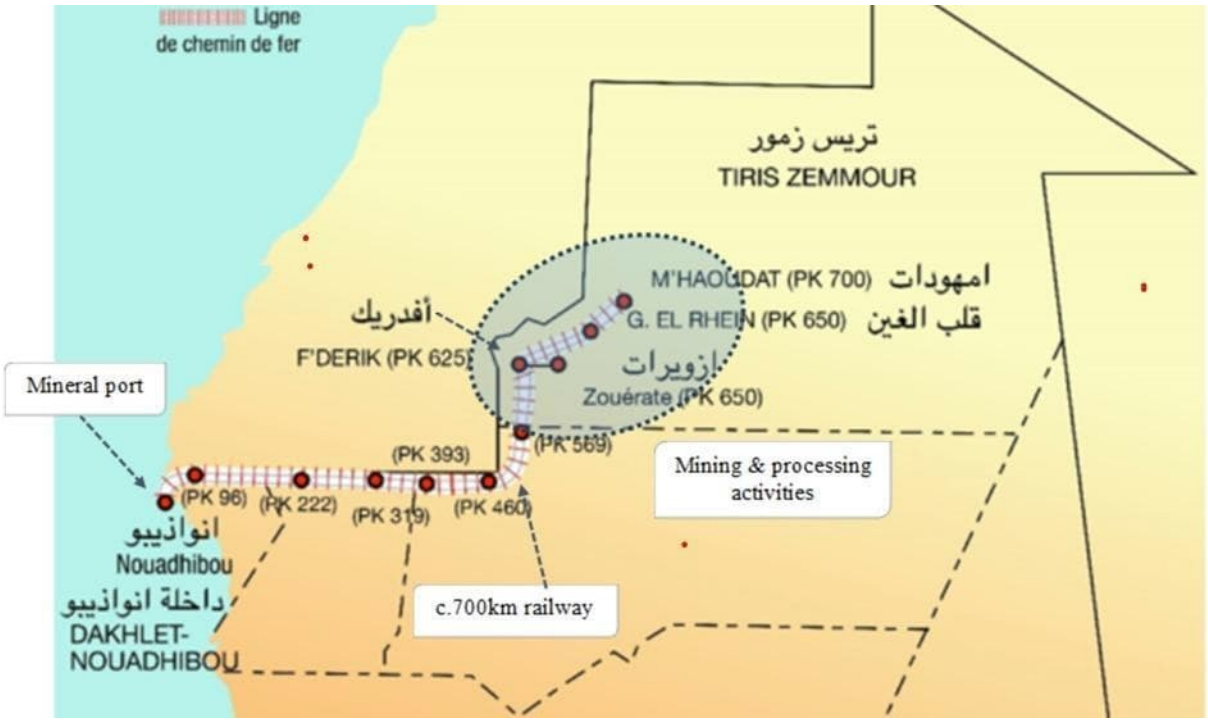


Figure 4-16: SNIM Railway location (SNIM, 2024)

According to SNIM's Annual Report (SNIM, 2023), recent upgrades—including track renewal and modernisation of rail infrastructure—have directly contributed to increased tumbled tonnage. In 2024, the railway transported and unloaded 14.3 million tonnes of iron ore, representing a 2% increase on 2023 and a 12% rise compared to 2022 (Figure 4-17).

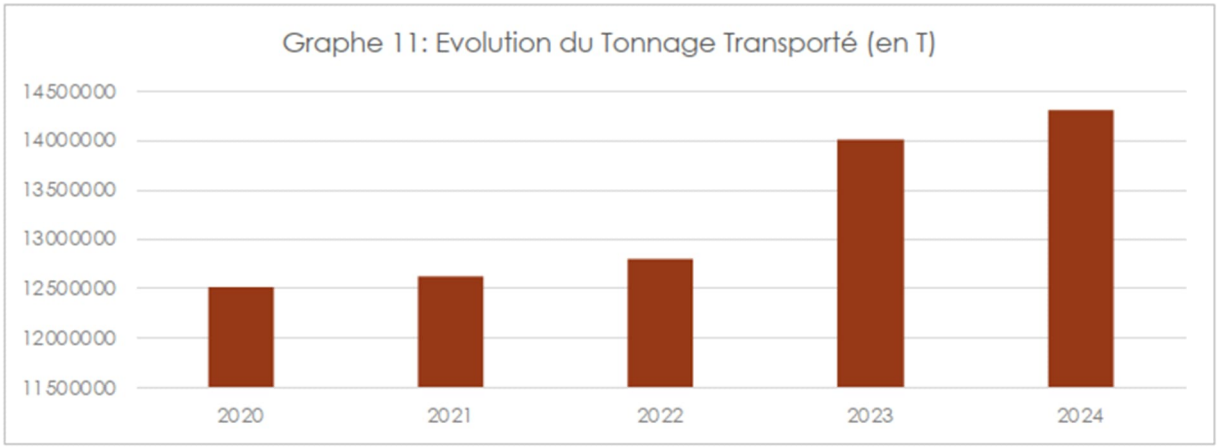


Figure 4-17: Growth in Rail-Transported Ore (in T) Year Or transported by train via SNIM railway (in tons) (SNIM, 2024)

4.3.1.1 Transport of goods to site during construction and operation

Bulk materials required for construction and operation will be delivered to Mauritania predominantly by sea, mainly through the port of Nouadhibou, with limited shipments arriving via Nouakchott. Goods will then be transported to the project site primarily by rail using the SNIM railway, including hazardous substances such as fuel and raw materials for explosives.

During an initial construction period of approximately seven months, while the rail spur to the mine site is being built, goods will be offloaded at the F'Dérik side and transported by road to the mine site, generating around seven truck movements per day (return trips).

Road transport from Nouakchott will be limited, with about four truck trips per week during construction and two per week during operations. The construction phase will require an average of 47 rail wagon journeys per week. During operations, consumables, including fuel, will continue to be delivered to the mine by rail.

4.3.1.2 Transport of ore during operation

SNIM currently transports iron ore from the Tiris Zemmour mines to the mineral port of Nouadhibou using 4 pairs of trains daily (one outbound and one return trip make up a pair), allowing a transport capacity of 14 Mt/y. Moving 11 Mt/y of ore from the El Aouj mine will require 2 more pairs of trains each day, increasing the overall train traffic by 50%. To support this increase, the project includes acquiring 18 locomotives and 870 wagons—each able to carry 120 tonnes—to enhance the efficiency of ore transport from the mining site. Table 4-9

Table 4-9 shows the additional locomotives and wagons to be purchased by EMC for the project. This fleet will then be operated by SNIM.

Table 4-9: Railway rolling stock for the Project

Type	Units
Locomotives: SD70ACs type GPL38S type	 10 8
Mineral ore cars of 120 tons, "Gondola"	870
Flat Cars	19
Tanks Wagons	15
Ballast Wagons	13
Special Flat Car (Six Axles)	1

The entire railway network is owned by SNIM, which is solely responsible for ore transport from the mine's loading area to the mineral port at Nouadhibou. SNIM will coordinate train movements as part of the comprehensive mine-to-port scheduling. Trains for the project are typically scheduled at intervals of 8 to 12 hours, allowing direct loading from the processing plant between departures. One day per week may be set aside for track maintenance, during which no trains will operate to El Aouj.

Product transport on the SNIM railway and through the port facilities at Nouadhibou will be managed and overseen by SNIM.

4.3.2 Nouadhibou Mineral Port for ore handling and shipping

The Nouadhibou mineral port operates exclusively for the export of concentrated iron ore sourced from SNIM mines situated in the Tiris Zemmour region. Port facilities comprise two stockyards with stackers and reclaimers, crushing & screening circuit (for ore from two other mines operated by SNIM), two loading berths and ship loaders.

The 5.7% growth in ship loadings in 2023 resulted of the investments and infrastructure improvements implemented by SNIM in previous years (SNIM, 2025) (Figure 4-18). In 2022, the dredging project for the mineral port's access channel was inaugurated, designed to accommodate ships of up to 250,000 tons

(compared to 150,000 tons previously). This was achieved by extending the channel length from 15 to 25 km and increasing its width from 400 to 582 meters. Additionally, the creation of an 800-meter diameter turning circle has made it easier for ships to manoeuvre. The project also included work to deepen the channel, allowing ships with drafts of up to 18.3 meters to pass through, compared to 16.15 meters previously. An ESIA has been prepared for the dredging project (Antea Group, 2017).

Additionally, a new loading line project to further increase the capacity of the mineral port will double the ship loading capacity to 10,000 tons per hour.

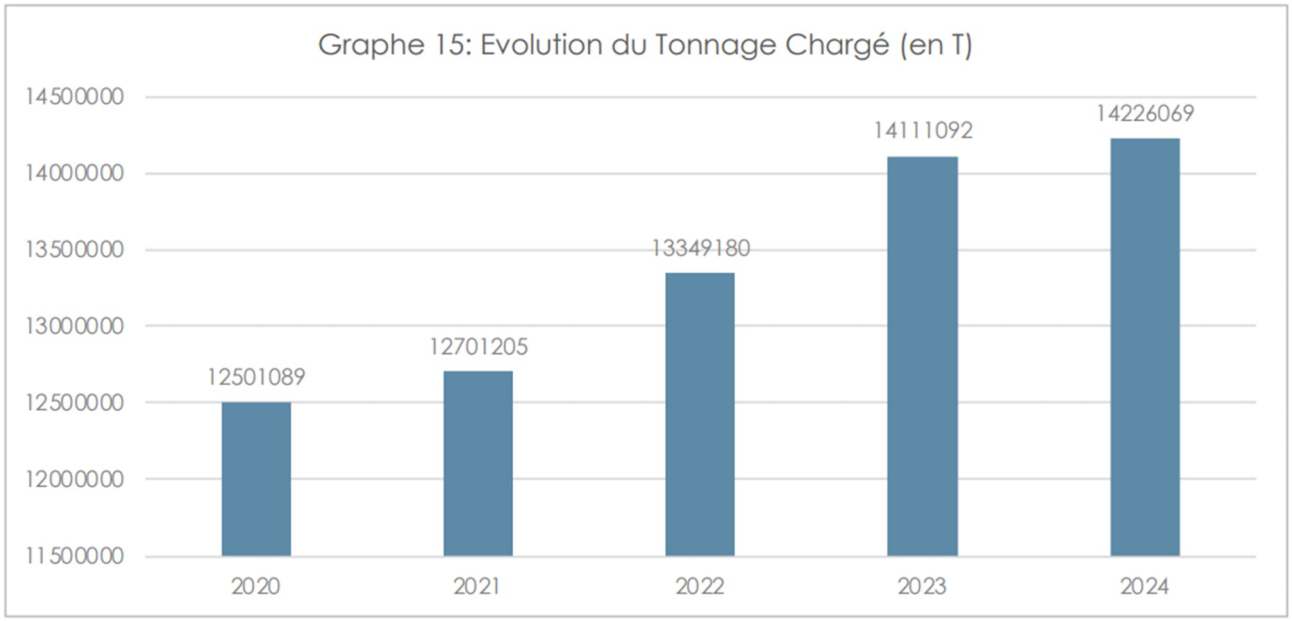


Figure 4-18: SNIM Port of Nouadhibou in loaded tonnage 2018 - 2024 (in Tons) (SNIM, 2025)

Figure 4-19 : New ship loading at SNIM Port at Nouadhibou (SNIM, 2025)

In 2024, the port successfully loaded 14.2 Mt of iron ore onto bulk carriers, underscoring its importance to SNIM's mining activities. With the commencement of operations at the El Aouj mine, an additional 11 Mt of iron ore are expected to be produced annually. This entire output will be channelled through the Nouadhibou mineral port, resulting in a significant increase in port activity. Specifically, this influx will contribute to an approximate 78% rise in overall port operations compared to current levels, affecting processes such as unloading, temporary storage, and ship loading.

The anticipated increase in iron ore volume will also have a pronounced impact on maritime traffic. In 2025, the port received 99 vessels, each with a capacity of 150,000 tonnes. The El Aouj Project will introduce an additional 55 vessels per year, each capable of carrying between 205,000 and 208,000 tonnes. This change equates to an estimated 55% increase in shipping movements through the port.

El Aouj's concentrate will be transported directly from the car tippler by conveyor belts firstly to the stockyards, and then to the ship loaders. The Nouadhibou mineral port being exclusively owned and operated by SNIM, all iron ore originating from the El Aouj mine will be handled and managed by SNIM, ensuring streamlined operations and consistent oversight throughout the export process.

4.3.3 Existing capacity to meet Project needs

Assessments of the existing rail infrastructure have confirmed that the required capacity is available and can be unlocked through the addition of rolling stock, specifically locomotives and wagons (HATCH, 2017). Figure 4-20 demonstrates that, with targeted investment solely in equipment, the railway is capable of supporting up to 32 Mt/y without necessitating track upgrades. Notably, the new tippler referenced in the study has been operational since 2016.

Similarly, assessments of the infrastructure at the Nouadhibou mineral port indicate that the existing facilities can accommodate the increased volumes associated with the El Aouj mine. Ore concentrate storage at the SNIM mineral port currently amounts to 2 Mt, equivalent to 40% of the total allowable storage capacity. The El Aouj Project would require an additional 465 kt of ore storage, representing a 23.25% increase over the current storage volume. Total storage following the addition of the Project's requirements would remain below 65% of the port's existing allowable capacity. Accordingly, no additional construction or expansion is anticipated to be required to accommodate the projected increase in activity. (HATCH, 2017). Throughout the operational phase of the El Aouj Project, the port's principal functions will remain the unloading, temporary storage, and loading of iron ore onto bulk carriers. With SNIM's current production averaging approximately 14 Mt per year, these existing infrastructures are therefore deemed adequate to support the demands of the El Aouj project, negating the need for additional development works.

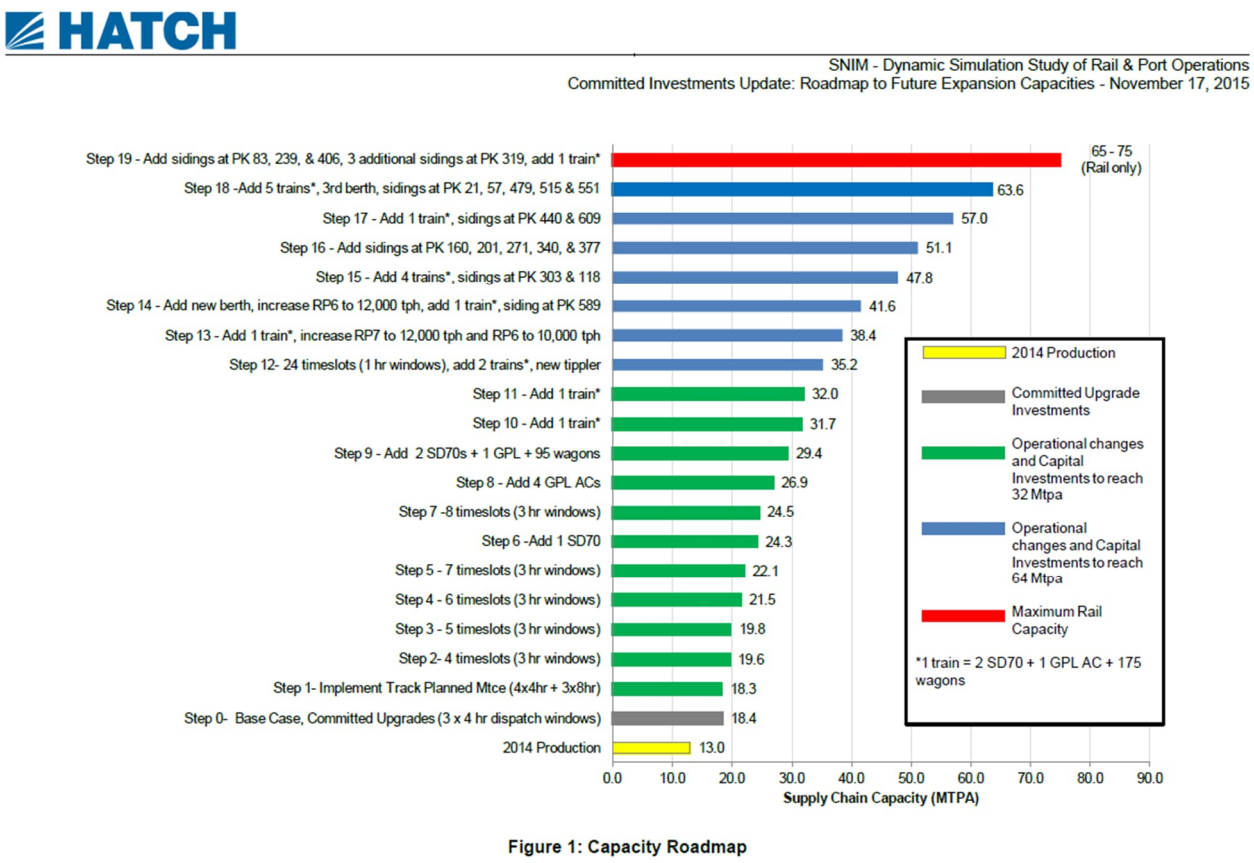


Figure 1: Capacity Roadmap

Figure 4-20: Dynamic simulation of Rail and Port operations (HATCH, 2017)

4.4 Water demand and supply

4.4.1 Water demand

The daily volume of water required to operate the mine is estimated at 5,570 m^3/day (initially 5,100 m^3 /day) i.e., an average flow rate of around 232 m^3/h. The pumping system will be sized for a maximum flowrate of 268 m^3/h.

Of the 232 m^3/h of raw water pumped from the wellfields, water use will be distributed as follows:

- 32% (1,782 m^3/d - 74.5 m^3/h) will be treated and used as drinking or distilled water.
- 67% (3,710 m^3/d – 155 m^3/h) will be used untreated (raw water) for dust abatement:
  - On the mine (2,990 m^3/d - 54%: 125 m^3/h).
  - On the tailings dam (720 m^3/d - 13%: 30 m^3/h).
- The remaining 1% represents pumped water that cannot be recovered during the various phases of treatment or use (losses through pressure regulation valves on the main pipeline or during handling / treatment...).

The detailed breakdown of consumption is shown in Figure 4-21, and is described below:

54% (2,990 m^3/d – 125 m^3/h) of the raw water will treated. The treated water will then be desalinated by a reverse osmosis process, eliminating enough mineral salts to make it potable. Treated water will be used for the following applications:

- The mine's drinking water consumption (60 m^3/d - 2.5 m^3/h).
- Additional drinking water needs for F'Dérik town (840 m^3/d – 35 m^3/h) (potable water supplied to the F'Dérik network via a pipeline from the mine). The F'Dérik tank (1200 m^3 of capacity) will store potable water treated for both the local population and EMC's employees and families.
- 2%-humidification of concentrated ore before loading onto railcars and cooling of high-pressure rollers (840 m^3/d – 35 m^3/h).
- 3% of the treated water (53 m^3/d - 2.2 m^3/h) will undergo a second reverse osmosis treatment to obtain demineralized water for cooling the thermal power plant.

A significant quantity of residual water will be released after each treatment phase. The main quantity of residual water will be released by the first reverse osmosis treatment, which will transform up to 32% (960 m^3/d – 40 m^3/h) of the initial raw water volume into brine-concentrated water. Residual water from other treatments (sand filtration and CA) is estimated at a total of 4% (240 m^3/d – 10 m^3/h) of the initial raw water volume.

All residual water from the various treatments will be used for dust abatement. However, this quantity (1,140 m^3/d - 47.5 m^3/h) is currently deemed insufficient to ensure sufficient dust abatement throughout the mine. For this reason, this residual water will be mixed with raw water at a 62% rate (1,872 m^3/d – 78 m^3/h).

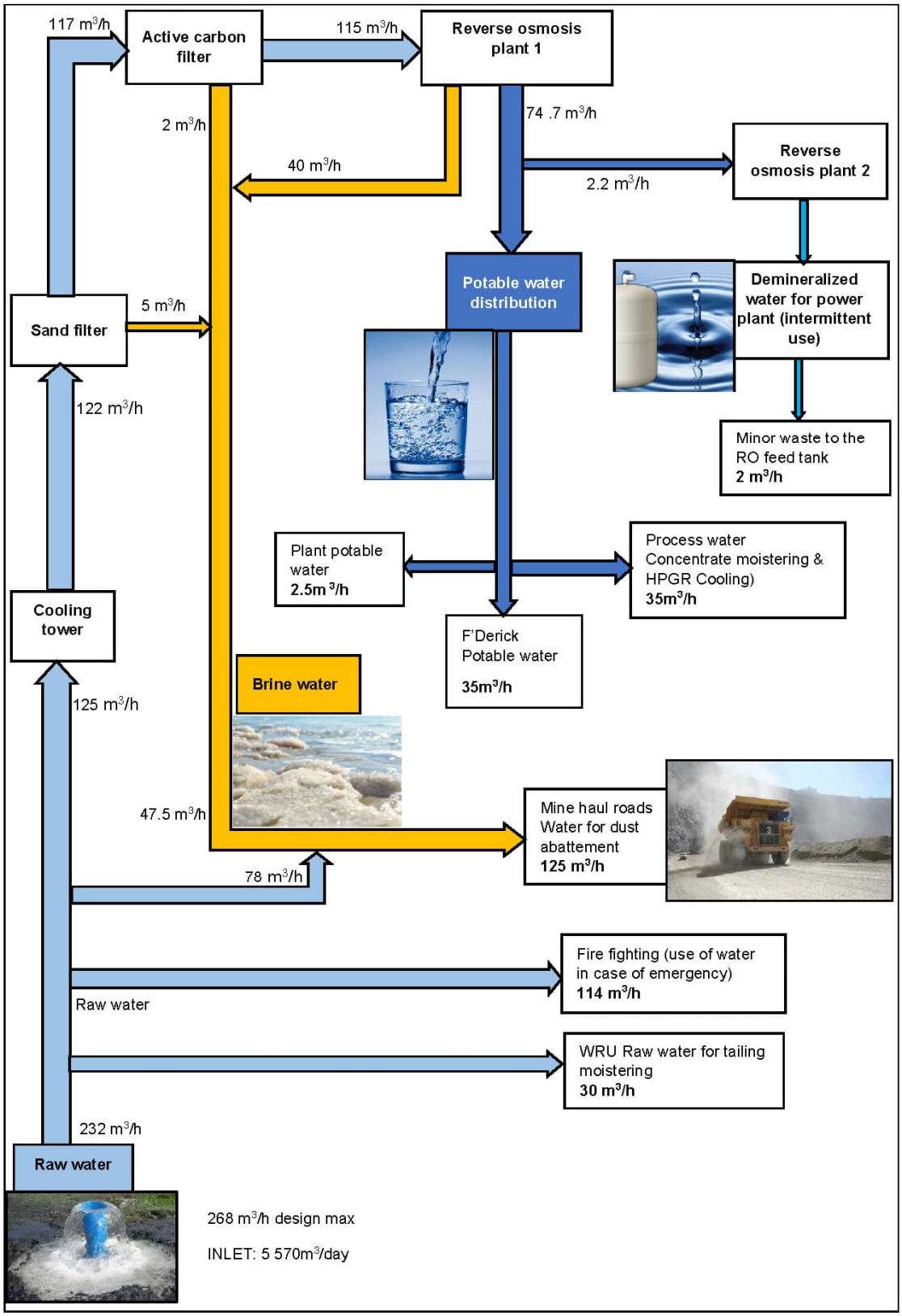


Figure 4-21: Diagram showing the distribution of water consumption

Should the need arise, the mine's fire-fighting system will be supplied by a system capable of delivering 114 m^3/h.

The following diagram on Figure shows the distribution of water consumption over the entire operation of the mine.

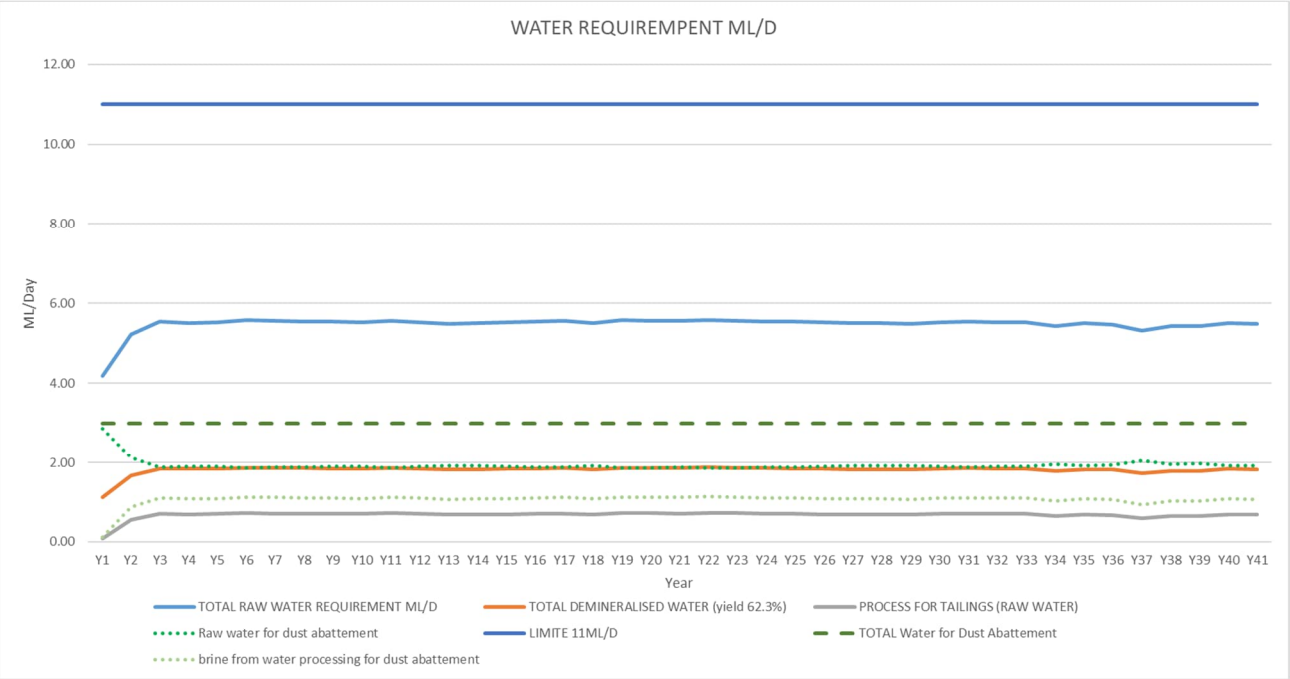


Figure 4-22: Distribution of water consumption over the entire life of the mine

4.4.2 Water supply from Touajil and Aouchich well fields

Multiple hydrogeological studies have confirmed that, once Aouchich takes over from Touajil after the initial 20 years of mining activities, there will be sufficient water resources to support operations through to the end of the Project's life, covering the subsequent 20 years (URS, 2015) (Golder, 2008) (Golder, 2008) (Golder, 2014).

EMC has confirmed that Touajil wellfield will be used for the first 20 years of the Project, and Aouchich wellfield will be used for the following 20 years of the Project.

The Pressure-regulating valves will create a permanent water point for users and herds. These water points will also enable the local development of palm groves and vegetable gardens, such as those currently being developed along the water supply line to the Guelb El Rein mine (Figure 4-23). A water point will also be created at F'Dérik.

Figure 4-23: Palm groves and vegetable gardens developed along the water supply line to the Guelb El Rein mine

4.5 Power demand and supply

4.5.1 Power supply for the Mine

A power plant will be constructed at the mine site to meet the Project's maximum power demand of 48 MW. The plant's normal operating load is anticipated to be 38 MW. This facility will provide electricity to all mine site infrastructure, facilities, and the operational site accommodation.

In the early stages of construction, temporary generators will be deployed to facilitate initial on-site activities until the connection to F'Dérik sub-station is established.

The power plant is designed to operate on Heavy Fuel Oil (HFO) and will be converted to natural gas once available. The power plant will consist of six generator sets of 10.6 MW running with HFO. The units are in an N+2 configuration: two machines on stand-by and only used when an operating unit is taken off-line for maintenance. The thermal power plant will be supplemented by future development of a solar array as part of the project decarbonisation strategy. The solar power plant will be installed on the El Aouj site (12MW) and will be combined with the power supply from the HFO power plant before being used and then sent to F'Dérik.

A 30 km long 33 kV overhead power line will be constructed within the infrastructures corridor to connect the existing sub-station at F'Derick to the proposed El Aouj power plant to supply the reserve power for the mine in case of breakdown of an operating unit. Step-down transformers will convert the voltage to 11 kV at the El Aouj mine site. The power line will not impose any restrictions on the movement of people or animals.A Renewable Energy Integration Study was carried on in 2023 (SRL, 2023). The outcome of this study is detailed in section 5.3.1.

4.5.2 Power supply for the Well fields

The Project considers an electrical supply of the bore fields solely by photovoltaic energy using 55 kW for each of the 5 bore fields. Photovoltaic panels will be associated with batteries and voltage regulation systems to count for the night shift.

A backup LFO mobile engine will nevertheless be installed in the event of temporary malfunction of the photovoltaic system.

4.5.3 Power supply for the new El Aouj city

The new El Aouj city in F'Dérik will be supplied by the same network currently maintained by SNIM subsidiary power company (M2E SA).

Power for El Aouj Project homes and accommodation, owned or built by EMC, will come from MEE SA, a SNIM subsidiary that plans to upgrade F'Dérik's power supply. The system will shift to user-pays. EMC will supply electricity to the town of F'Dérick through its Electrical Line.

4.6 Borrow areas

The construction of the mine's infrastructures will require the use of borrow materials, mainly for the production of concrete and ballast for the future extension of the rail network.

4.6.1 Borrowed materials for concrete production

The Table 4-10 details the concrete needs for the construction of the mining infrastructure. A total of 38,410 m^3 of concrete will need to be produced during the construction phase.

Table 4-10: Volume of concrete to produce for the construction of the mines' infrastructures

Designation	Quantity (m^3)
Concrete for rafts and walls	3.820,00
Concrete for footing, incl. formwork	93,70
Concrete for basement, incl. formwork	174,30
Concrete for slab on grade	195,70
Concrete for steps	3,80
Concrete for tunnel	81,10
Concrete	309,20
concrete for pylons	40,00
Concrete for slab on grade, incl. Formwork	178,00
Concrete for basement, incl. formwork	2,40
Concrete for base plates/beams/foundations, incl. formwork	451,00
Concrete for rafts, incl. formwork	556,10
Concrete for walls, incl. formwork	568,00
Concrete for full slabs and beams, incl. formwork	148,90
Concrete for rafts, incl. formwork	504,00
Concrete for rafts, incl. formwork	562,00
Concrete for rafts, incl. formwork	69,90
Concrete for Walls	335,00
Concrete for slab	222,10
Concrete for base plates/beams/foundations, incl. formwork	531,00
Concrete, incl. formwork	5.270,50

Designation	Quantity (m^3)
Concrete for base plates/beams/foundations, incl. formwork	671,10
Concrete for poles, incl. formwork	169,80
Concrete for beams, incl. formwork	341,30
Concrete for full slabs, incl. formwork	239,20
Concrete for columns	514,40
Concrete for beams	476,60
Concrete for wall	205,80
Concrete for slab	194,40
Concrete for base plates/beams/foundations, incl. formwork	3.445,80
Concrete for poles, incl. formwork	76,50
Concrete for columns	2.331,00
Concrete for beams	4.254,00
Concrete for base plates/beams/foundations, incl. formwork	152,80
Concrete for base plates/beams/foundations, incl. formwork	174,70
Concrete for full slabs, incl. formwork	143,80
Concrete Train unloading platform: Value of with and length is unknown	1.085,00
Concrete, incl. formwork	7.258,00
Concrete for base plates/beams/foundations, incl. formwork	2.559,00
TOTAL	**38.409,90**

Geotechnical investigations were carried out in 5 borrow areas to verify the quality of the materials (Figure 4-24). In the end, only one zone was selected as having the rock materials optimum characteristics. This zone lies partly within the footprint of the future tailing area. The extraction surface will cover a maximum of 20 ha in total. Excavation depth will not exceed 1 m. The area is currently totally devoid of vegetation and is located on a slight rocky promontory (Figure 4-25).

Figure 4-24: Borrow area near the future mine for rock extraction

The extracted material will be used to produce sand and aggregates for concrete production. The total volume of material to be extracted will be around 26,000 m^3 (2/3 of concrete composition).

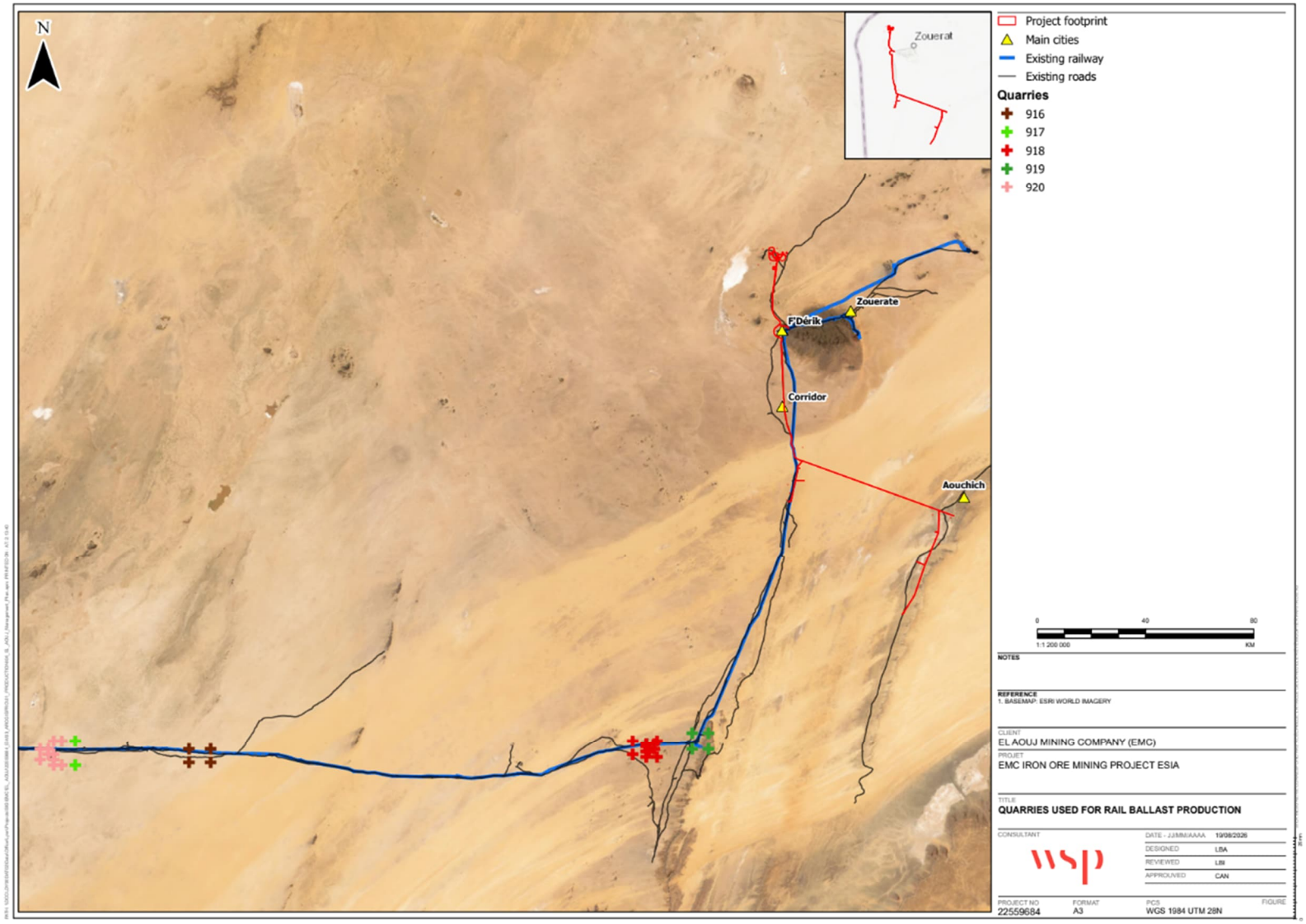
The material will be extracted to a maximum thickness of 1 meter. It will be carried out using a loader, a mobile crusher and trucks to transport the aggregate and sand to the construction site.

4.6.2 Borrowed materials for ballast

The total volume of ballast required for the rail spur construction is estimated to 45 000 m^3. The ballast will be produced from extracted rock directly crushed and screen in existing quarries operated by SNIM. All the quarries being located near the railway, the ballast supply will carry out by train from the quarries to the rail spur construction site.

The quarries used for rail ballast production are presented in Figure 4-25.

Figure 4-25: Quarries used for rail ballast production



4.7 Mine closure

The general principles and overarching objectives for rehabilitation and closure of the Project components are outlined within the Conceptual Mine Closure Plan and summarized in **Table 4-11**.

Table 4-11: Summary of Closure Principles

Project Component		Closure Principle
Mine site	Open pit	Open pit to be retained, with restricted access with a 3 m high rock safety berm placed around perimeter with appropriate safety signage.
	Waste dump area	Will be designed and developed to be stable; therefore, not requiring works/ profiling at closure (unless required for geotechnical reasons) and will allow for natural revegetation. Run-off will be routed to perimeter areas.
	Tailings disposal area	Will be designed and developed to be stable; therefore, not requiring works/ profiling at closure (unless required for geotechnical reasons) and will allow for natural revegetation. Run-off will be routed to perimeter areas.
	Plant and ancillary facilities	Will be dismantled and removed for re-use or sale. Foundation will be broken up and covered to a depth of at least 500 mm. Contaminated areas will be excavated and soil treated. Excavated areas will be backfilled with clean material to reinstate to original topographical level or profiled to <10% slope gradient.
	RO plant	Will be retained on-site or dismantled/ removed and set up elsewhere by a community organisation, to supply potable water on an ongoing basis.
	Power plant	Will be retained with ownership transferred to SNIM or MEE SA.
	Haul roads	All site roads, including plant roads, service roads and haul roads, not required for post closure activities, will be ripped and regraded to local topography and covered with a layer of site sourced sand.
	Mine accommodation	Accommodation at the mine site will be decommissioned unless a local community organisation wants to take over the facility.
Mine access road		To be retained for use by local communities.
Water pipelines		Handed over to a community organisation for long term usage and supply of water. If this is not feasible, the pipelines will be left in-situ.
Worker residences in F'Dérik		Any housing at F'Dérik still owned by EMC will be sold or passed onto community organisations for long-term usage.
wellfields and associated infrastructure		This will be retained with ownership being agreed during mine life.
Rail spur		Will be retained with ownership transferred to SNIM or MEE SA.

Project Component	Closure Principle
Source: EMC and Ausenco (2015) 1 To be confirmed in the detailed Mine Closure Plan, developed two years before the end of the mine life	

5.0 ALTERNATIVE ANALYSIS

5.1 Option “no Project”

In accordance with international good practices, the assessment of the environmental and social impacts of the alternative Project options includes consideration of the “No-Project” alternative (zero project), i.e. the potential impacts that would be associated with the decision not to develop the Project.

With the “No-Project” scenario, the El Aouj Project would not be developed. The “No-Project” alternative would be associated with the absence of a number of residual adverse environmental and social impacts and risks that are associated with the selected Project design.

This “No-Project” option would also mean that the open-pit mine would not be developed and the infrastructure and utilities to support the mining operation would not be required. Therefore, the significant opportunity to improve the infrastructure, economy and livelihoods of the local area, associated with the development and operation of the Project, would not be created.

Regarding the physical and biological components, the absence of the project will make it possible to preserve the environment as it currently exists. The main benefit of the absence of the project will be the preservation of water resources in the Touajil and Aouchich deep aquifers. Those aquifers are confined and not accessible by the nomadic herders and remote communities who use shallow wells targeting superficial aquifers mainly fed by local rainfall. A no project will however imply absence of creation of local water supply points through the water pressure release valves planned to be developed every 5 km along the main raw water pipeline (approximately 25 release points spread out along the pipeline). These pressure release points can offer a regular access to raw water to the local community and develop locally agriculture such as observed along the main raw water pipeline feeding the existing Guelb El Rhein mine.

The landscape of El Aouj will not be altered and the rocky massifs characteristic of this region will not be affected.

It is on the social aspects that the project is likely to have the greatest negative impact if the project fails, insofar as the failure to commission the mine will precipitate F'Derik into an irremediable decline that is already perceptible. The local economy will rely solely on SNIM's mining activities and will not be able to develop with a new activity and the jobs generated.

5.2 Water demand alternatives

5.2.1 Entry data for alternative analysis

The analysis of alternatives considered the possible exploitation of the three types of ore present:

- Oxidised ore: superficial levels of the mineralised complex represents 180 Mt, or 8.78% of the resource.
- Freshed ore: MQU (Magnetic quartzit upper) + MQL (Magnetic quartzite lower) upper and lower levels of the ore represents 1,870 Mt, or 91.22% of the resource.

Similarly, four possible types of treatment have been evaluated:

- For non-oxidised ore:
  - Process campaign treats one type of ore at a time.
  - Combined process: treats both types of ore at the same time.
- For oxidised ore:
  - Oxide plant treatment (wet processing)
  - Dry magnetic separation followed by wet density separation:
    - Stand-alone processing.
    - Integrated with Magnetite options (options 1, 3 and 4).

5.2.2 Alternatives analysis

The alternatives evaluated are as follows:

Dry processing

- **Option 1**: designed to process both types of ore at the same time. Requires larger machines and higher water/energy consumption.
- **Option 4 (upper)**: For processing MQL ore only. This sizing does not allow dry MQU processing, which requires finer grinding and therefore more powerful machines and more energy/water.

Wet processing

All the wet processing solutions presented below and considered in the analysis of alternatives include prior dry processing.

- **Option 2**: only part of the ore is wet processed. This produces ore with an Fe concentration of 68%. However, water consumption remains high, at around 109.3 L/t, and energy consumption at 31.2 kWh/t. This option was not selected.
- **Option 3:** A 66% pre-concentrate is produced, and the wet process is used to raise it to 68%. The entire quantity of dry concentrate is wet processed. On the other hand, water consumption is high, around 155 L/t, and energy consumption 45.3 kWh/t. This option was not selected.
- **Option 4 (lower)**: Starting with dry grinding, wet treatment enables a higher Fe concentration to be obtained, i.e. up to 66% if combined with prior dry treatment, and up to 68% if only wet treatment is used. This option was not selected due to its excessive water consumption.
- **Option 5:** concerns only the treatment of oxidized ore: water consumption was estimated at 569L/t, i.e. consumption of 13 ML/day; and 26.1 kWh/t. This option was not selected due to its excessive water consumption.
- **Option 6:** concerns only the treatment of oxidized ore: water consumption was estimated at 292 L/t, i.e. consumption of 6.7 ML/day; and 31.6 kWh/t. This option was not selected due to its excessive water consumption.

A summary of the water consumption evaluated for each option considered is presented in Figure 5-1.

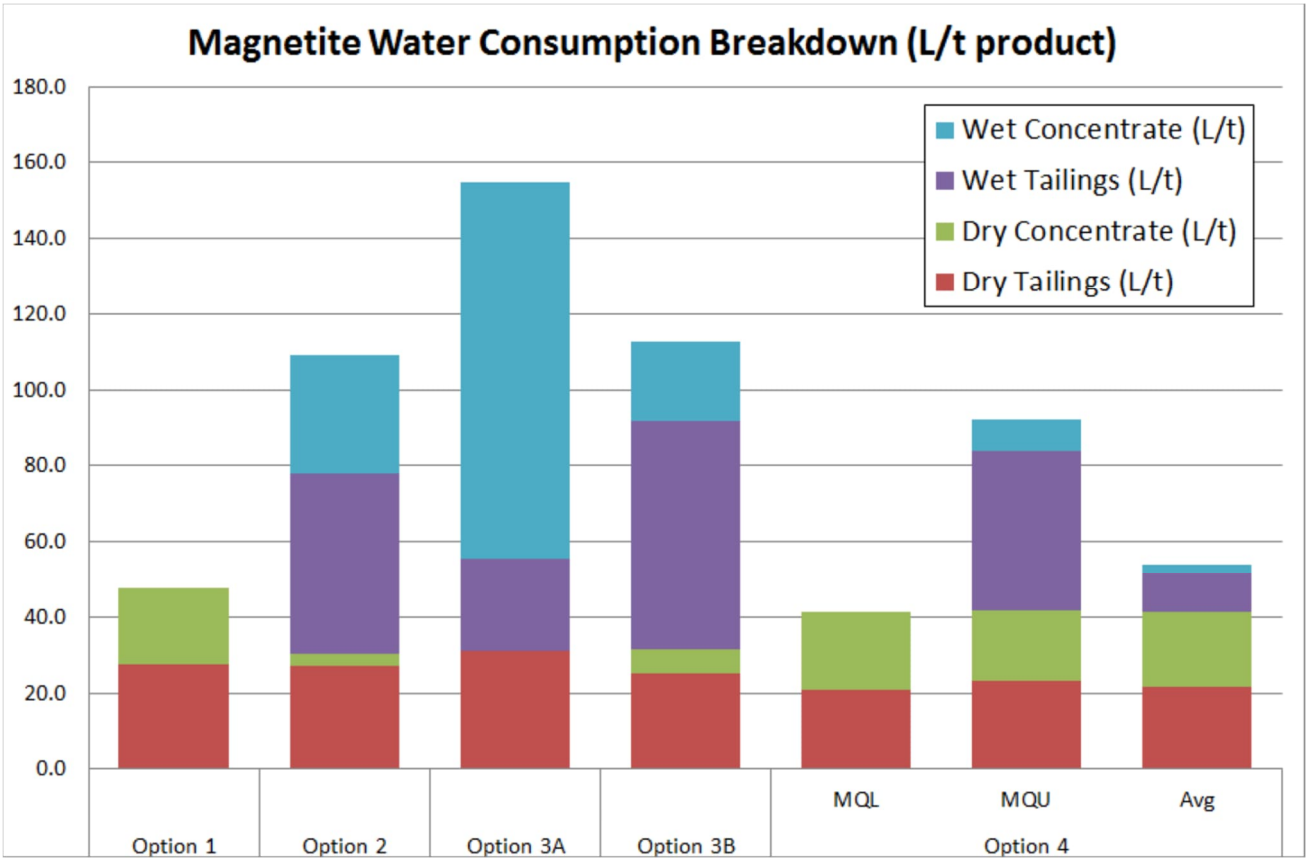


Figure 5-1: El Aouj Iron ore treatment Water Consumption breakdown

5.2.3 Choice of the ore treatment method

Wet treatment solutions were not selected as they require excessive water consumption. EMC therefore opted for a dry-only treatment solution.

Of the two dry processing options considered, extracting only MQL dry (option 4 upper) is not sufficiently profitable for the mine as it does not allow the exploitation of MQU, which alone represents 32% of the ore resource. It was therefore not selected.

Option 1 (both types of ore processed dry together) is therefore selected as the optimized option and one of the solutions that consumes the least water resources.

Figure 5-2 below shows the block flow diagram that will be used to implement option 1.

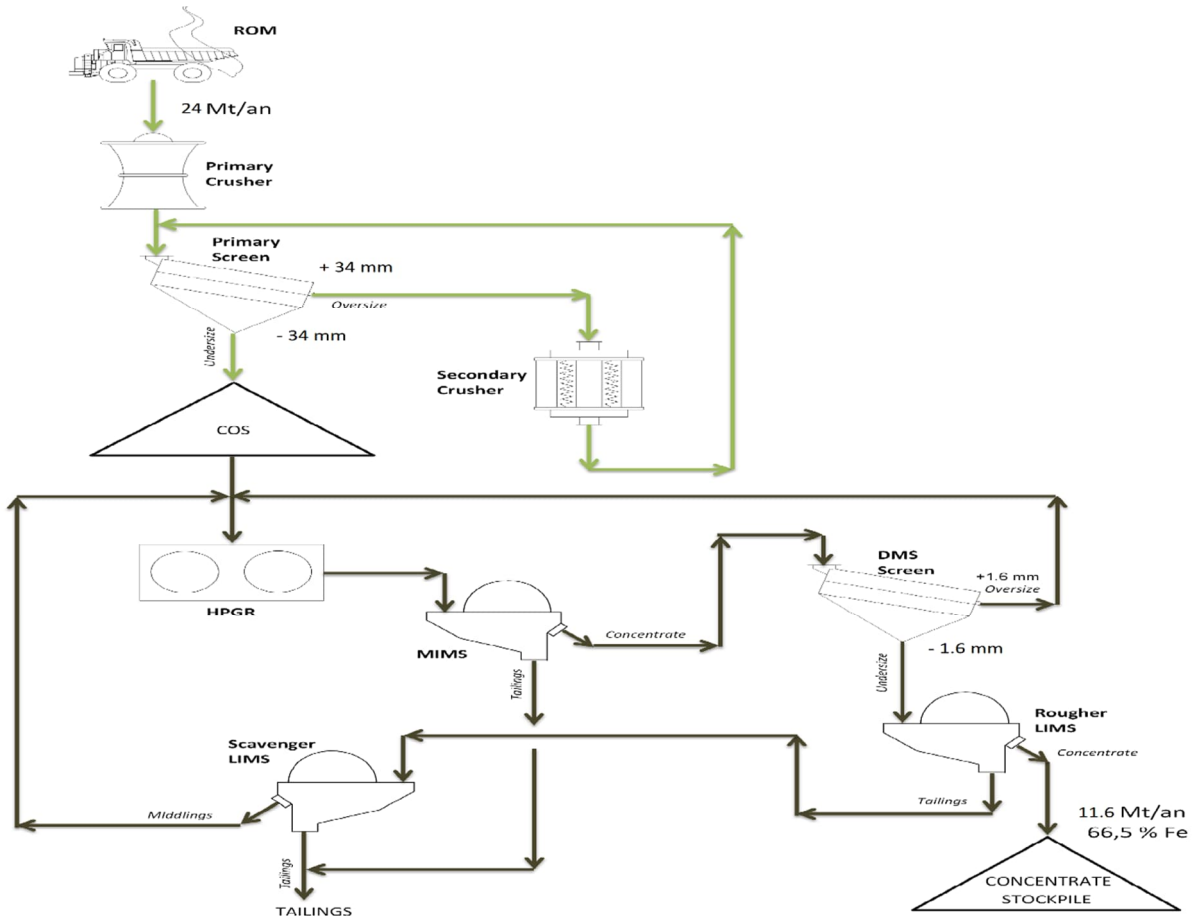


Figure 5-2: Block flow diagram of retained dry extraction treatment method

5.2.4 Use of polymer to reduce water consumption for dust control

As described in the above section on water demand, 62% of the water supplied to the mine will be used for dust control and sprayed on hauling road, tracks, and stockpile to reduce the amount of dust emission and potential health effects on workers and neighbouring communities.

Airborne dust is a by-product of natural and artificial occurrences, including high winds in arid regions and human activities, and it affects most of the world's population. Watering is the most general practice for reducing airborne dust by wetting the surface of the dust source to agglomerate dust particles *via* the capillary effect, increasing the aerodynamic diameter of (ultra)fine particles and reducing dust emission. However, the short-term effectiveness due to fast water evaporation, requiring frequent watering, is a major disadvantage.

One option is under review by EMC and consist of using polymer solution to control dust emission. After the water evaporated, the liquid polymers maintains moisture on the dust sources, resulting in a significant reduction of (ultra)fine particle emissions and extended effectiveness compared to conventional water treatment.

Polymer-based dust suppressants have emerged as a promising solution, offering a wide range of benefits over conventional techniques such as water spraying and mechanical sweeping. These innovative polymer solutions possess unique properties that effectively binds and stabilizes soil particles, reducing dust emissions in various industries including mining, agriculture, and construction.

Sustainable polymers and eco-friendly alternatives play an essential role in mitigating the negative impacts of dust generation on air quality, soil erosion, and water resources. These innovative dust suppression technologies not only help in reducing particulate matter emissions but also decrease the consumption of natural

resources such as water, which is conventionally used for dust management. Furthermore, synthetic polymer-based products possess low toxicity levels and biodegradability properties that minimize potential harm to ecosystems and human health. The use of environmentally friendly polymer solutions contributes to preserving biodiversity by decreasing habitat destruction caused by excessive dust particles. Additionally, these advanced materials enhance worker safety by reducing the risk of respiratory illnesses associated with prolonged exposure to airborne pollutants.

The application of polymer solutions in the mining industry has proven beneficial in various aspects such as haul road stabilization, tailings management, material handling, and slope protection. Haul roads treated with these products exhibit enhanced load-bearing capacity and reduced maintenance requirements due to their increased resistance against wear and tear caused by heavy machinery traffic. Tailings management becomes more efficient through consolidation of fine materials into larger agglomerates that can be easily contained or disposed of without causing environmental contamination. Material handling processes can benefit from improved flow properties of bulk solids when coated with polymers, leading to less spillage during transportation or storage. They contribute to water reduction in conserving water resources by reducing the need for frequent watering of haul roads and stockpiles, thus minimizing overall water usage within mining operations.

The typical lifespan of a polymer-based dust suppressant can vary depending on several factors, such as environmental conditions, traffic patterns, and the specific formulation used. Generally, these suppressants exhibit a longer-lasting performance compared to traditional methods like water spraying or chemical suppressants, with some lasting several months up to a year before requiring reapplication. The ideal reapplication frequency depends on site-specific requirements and the desired level of dust control; however, it is essential to monitor performance indicators such as visual observation of fugitive dust emissions and air quality measurements regularly.

As there is no feedback to date on the use of eco-friendly polymer in Mauritania, EMC will do pilot tests at the early stage of the project to evaluate the efficiency and the water consumption reduction.

5.3 Energy alternatives

5.3.1 Alternative analysis for energy production

EMC contracted a consulting firm to conduct a study for assessing the potential integration of a renewable energy into the Project (SLR, 2023), and therefore examining the potential to further decarbonize the proposed hybrid power generation system of the Project. The power generation system will mainly operate as an islanded (also known as “off grid”) system, predominantly fired on heavy fuel oil (HFO) generation.

A “Base Case” was first established that reflects the system included in the current plans for Project development, i.e., 6 x 10.6 MW low-speed HFO generator sets in an “n+2” configuration, to meet an average electricity demand of 38 MW (maximum = 43 MW). This Base Case was then used for comparative analysis against three other power generation and energy storage configurations that include various capacities of smaller high-speed fast-start HFO generator sets (nom. 4 000 kW), wind and PV solar generation with battery storage. The high-speed HFO units were included in the modelling due to their ability to better manage system balancing requirements with variable renewable energy and energy storage resources, i.e., wind and solar with battery storage (compared to low-speed HFO units running on nominal).

As evidence to support the development of more renewable energy in Mauritania, the International Renewable Energy Agency (IRENA) estimated that Mauritania has a maximum development potential of around 457.9 GW for PV solar projects and 47 GW for wind projects, making it one of the main future hubs for green hydrogen in Africa.

In addition to PV solar, wind and BESS, several different renewable (or low GHG emissions) energy generation options were considered but not included in the evaluation model based on their limited viability for deployment at the Project site:

- Hydropower – no natural water courses available within the transmission-connected local electricity network with year-round generation potential.
- Green Hydrogen Electrolysis – cost is prohibitive for the next ~5 years and it also requires a significant supply of demineralized water (i.e., 9 tons of water is required to produce ~1 ton of hydrogen) which would be challenging to secure and develop. However, in-country studies are currently being undertaken by oil majors such as Total Eren and BP that may yield domestic supply chain possibilities for the Project. These developments should be monitored closely over the next few years, as they may have a significant impact on how the iron ore mining operations may be fully decarbonised in the coming decades.
- Biogas – requires the availability of a stable organic waste feedstock within a ~100 km radius for the anaerobic digestion process, which is not feasible in this region of Mauritania.
- Modular Nuclear – early stages of technology development, i.e., at least 10-15 years before commercialization is reached. Also, deployment of this technology requires strong governmental and social support, and a long payback period.

The 4 options presented in the report are the following:

- Option 1 includes 65.7% renewable energy contribution – from wind and PV solar coupled with battery storage and high-speed HFO generation (multiple units, in addition to the existing low-speed HFO units).
- Option 2 includes 37.8% renewable energy contribution – from PV solar coupled with battery storage and high-speed HFO generation (single unit, in addition to the existing low-speed HFO units).
- Option 3 includes 27.0% renewable energy contribution – from PV solar coupled with battery storage and high-speed HFO generation (multiple units, in addition to the existing low-speed HFO units).
- Option 4 is the same as Option 3, except two of the six 10.2 MW HFO generators are removed from the system, thereby reducing capital cost while still maintaining acceptable system reliability.

The capacity of each option is summarized in Figure 5-3 below:

	PROPOSED OPTION 1			PROPOSED OPTION 2			PROPOSED OPTIONS 3 &4		
Component	Installed Capacity (MWh/yr)	Actual Production (MWh/yr)	Capacity Factor	Installed Capacity (MWh/yr)	Actual Production (MWh/yr)	Capacity Factor	Installed Capacity (MWh/yr)	Actual Production (MWh/yr)	Capacity Factor
PV Solar Panels [1]	402,084	79,496	20%	831,937	164,740	20%	651,744	129,006	20%
Wind Turbines	525,600	187,499	36%	0	0	0%	0	0	0%

Figure 5-3: Predicted PV Solar Panel & Wind Turbine Capacity Factors

The calculated GHG emissions for each option are described in the Figure 5-4:

GHG EMISSIONS (t CO_2e / yr)	System Configuration				
	BASE CASE	OPTION 1	OPTION 2	OPTION 3	OPTION 4
Annual HFO-based Power Production (MWh)	323,210	114,178	206,936	243,101	243,101
Annual HFO Consumption (Litres)	62,173,379	22,302,914	39,448,869	48,827,050	48,827,050
Annual GHG Emissions (t CO2e)	186,705	67,074	118,483	147,059	147,059

Figure 5-4: GHG Emissions Summary for Base Camp vs Options 1 to

Option 1 suffers the lack of available wind at low height and the lack of required logistics in Mauritania on wind energy, which could be seen as an issue for the project. Option 2 relies only on PV energy coupled with high speed HFO generation, with a renewable energy contribution of 37.8%, but presents a significant high CAPEX. Options 3 and 4 also rely on PV energy coupled with battery storage and high-speed HFO generation but with 27% of renewable energy contribution. Option 4 reduces the low speed HFO generator capacity to 40.8MW (61.2MW for option 3) for a total of 56.8MW produced by HFO generator (77.2MW for option 3). This fourth option has been selected: For Phase 1, the project will install 40 MW of HFO-fired generation capacity through four generator units, complemented by 12 MW of solar PV capacity. For Phase 2, EMC plans to connect to the power line from Nouakchott, which is expected to supply gas-based electricity, provided that this option is available. If the grid connection is not available, EMC will instead install an additional 20 MW of HFO-fired capacity through two generator units, together with 6 MW of solar PV capacity.

5.3.2 Expected energy consumption

The Table 5-1 presents the global fuel consumption expected at each main mine sectors.

Table 5-1: Global fuel consumption for base case

Activities	Expected Fuel consumption (liters)
HFO power plant	48 827 050 litres / year
Ore extraction /transportation equipment	46 511 000 litres / year
train	2.4 litres / ton

5.3.3 Ore processing

In the same way as for water consumption, an analysis of alternatives was carried out to assess energy consumption for each of the treatment options identified (see chapter 5.2.2).

The following Figure 5-5 compares energy consumption according to the scenarios considered and by sector of activity. Option 1, selected as the most optimal treatment solution in terms of water consumption, is the third-lowest energy-consuming alternative after option 4, which was found to be not profitable because it does not allow all the ore to be mined or requires excessive water consumption.

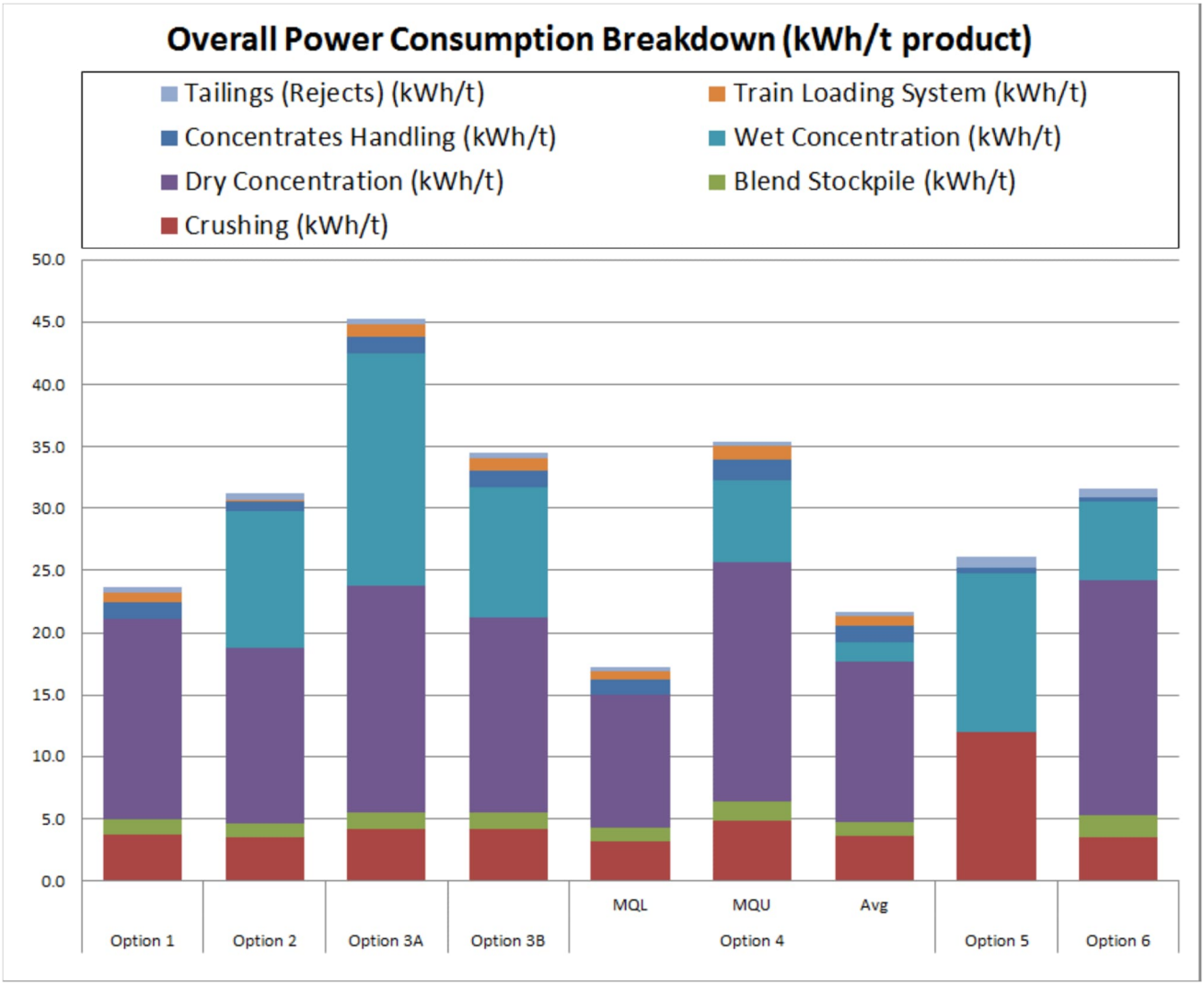


Figure 5-5: Overall Power consumption breakdown (kWh/t product)

The following Figure 5-6 provides a summary of the ore processing alternatives considered, with a comparison of the associated energy and water consumption and expected ore yield. The processing option selected (option 1) represents one of the options with the highest ore recovery yields, combined with some of the lowest energy and water consumption.

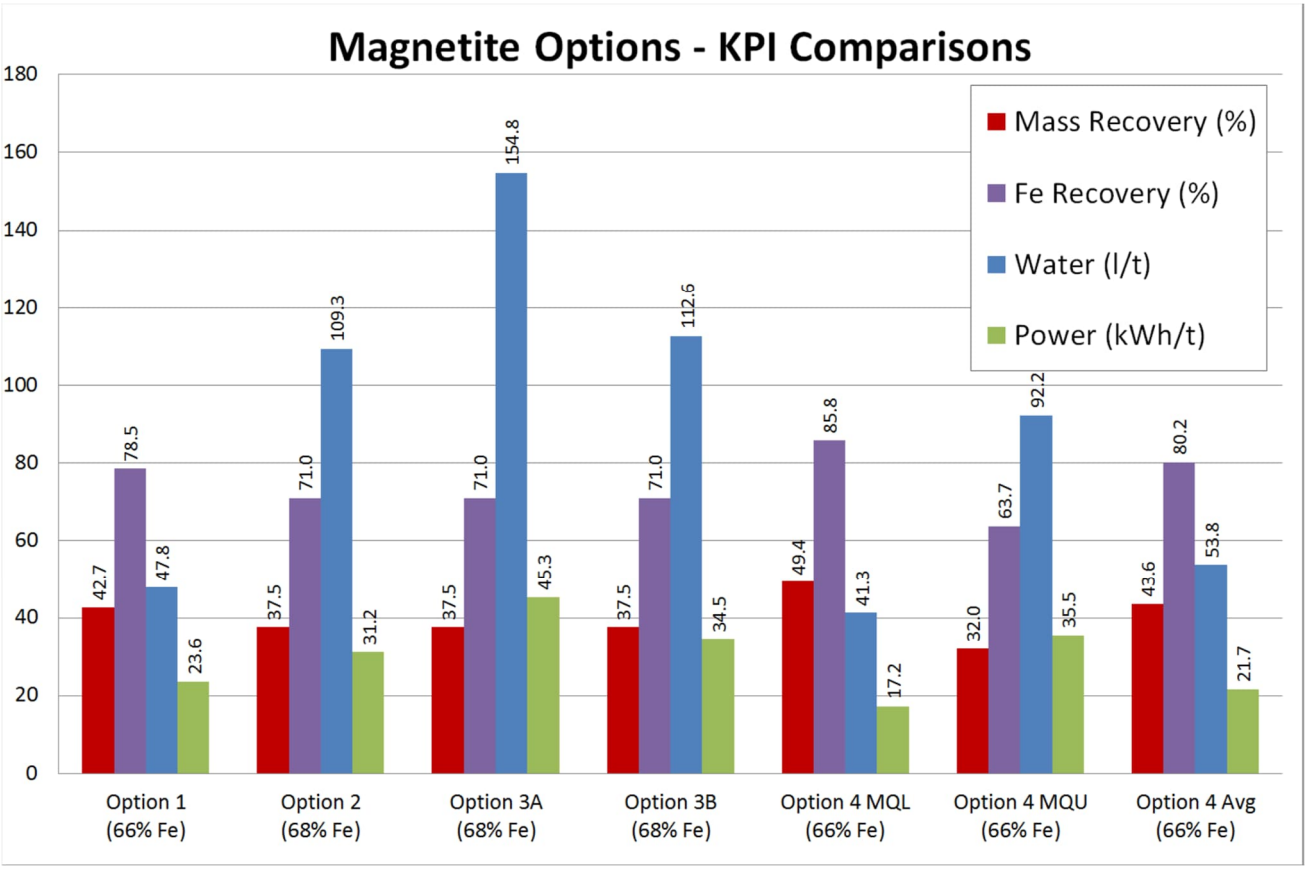


Figure 5-6: Magnetite options - KPI Comparisons

5.3.4 Energy supply for wellfields

Initially, the electrical system was designed to comprise three separate sections, each supplied by either a diesel generator or photovoltaic (PV) panels. Two of these sections were designated to receive power from diesel generators, while the third section was intended to be powered by solar panels.

As the project progressed, the design was revised to focus exclusively on supplying power to the wellfields through photovoltaic energy. This new approach utilises 55 kW PV panels (on each wellfield), supplemented by batteries and voltage regulation systems, ensuring stable and reliable energy supply. In the event of a temporary malfunction of the photovoltaic system, a back-up system powered by fuel oil will be installed to maintain operational continuity.

This revised strategy is expected to significantly reduce fossil fuel consumption, with an estimated decrease of approximately 352 m^3 of fuel oil per year.

5.4 Power line location

The original plan was to install an overhead powerline connecting El Aouj to the Guelb El Rhein mine to allow for an additional level of redundancy for the power station and to compensate SNIM for providing power to the F'Dérik town. This option has been replaced by an overhead powerline connection directly to the town of F'Dérik and a N+2 strategy on generating capacity (two machines on stand-by and only used when an operating unit is taken off-line for maintenance).

5.5 Origin of railway sleepers

The supply of railroad sleepers was assessed through different options:

- **Wooden sleepers:** The option of importing wooden sleepers from Gabon via SOMIVAB SA was initially considered but not selected. The sleepers would have come from Gabon and would have been supplied by SOMIVAB SA, a company specialising in the production of hydraulic timber and railway sleepers, based in Essassa, Gabon. Deliveries would have been organised in batches of 20,000 sleepers, with production of each batch taking four months. The timber would have been Azobé or Okan, and the batches would have been shipped from Gabon to Nouadhibou, then transported by SNIM train to F'Dérik.
- **Concrete sleepers**
  - Importation of Concrete Sleepers: the option of importing concrete sleepers from international suppliers was carefully evaluated. However, this approach was ultimately deemed unfeasible due to the significant transportation costs associated with the considerable weight of the sleepers. Shipping concrete sleepers by sea proved prohibitively expensive, making it an impractical solution for the Project's requirements.
  - Local Production of Concrete Sleepers: SNIM operates a facility dedicated to the local manufacture of monoblock concrete sleepers. After evaluating various alternatives, the decision was made to utilise this factory for producing the sleepers needed to construct the railway connection. This approach leverages local resources and infrastructure, ensuring a reliable and efficient supply of sleepers for the project.

6.0 PHYSICAL COMPONENT BASELINE

This chapter describes the main characteristics of the physical environment within the El Aouj project study area and provides a comprehensive understanding of the existing environmental conditions.

6.1 Methodological Approach

6.1.1 Definition of the Project Area of Influence (AoI) for the Physical Environment

The Project's Area of Influence (AoI) corresponds to the perimeter allowing for assessing all potentially significant impacts that could affect environmental and social receptors during the construction, operation and closure phases of the project. It therefore delimits the area within which the direct, indirect, cumulative or induced effects of the various activities of the El Aouj project are analysed.

According to IFC Performance Standard 1, where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts will be identified in the context of the project's AoI. This area of influence encompasses the infrastructure and activities described in **Table 6-1.**

Table 6-1: Areas of influence according to PS1 and their corresponding areas likely to be affected by the Project

PS1 Area of influence	Areas likely to be affected by:
The area is likely to be affected by: ▪ The project, including activities and facilities that are directly owned, operated, or managed (including by contractors) by the proponent and that are a component of the project;	Project infrastructure: ▪ Mine and process plant infrastructures ▪ Bore wells (Touajil and Aouchich areas) ▪ Water pipeline ▪ Extended road

PS1 Area of influence	Areas likely to be affected by:
▪ The area covered by the drawdown of the aquifers that will be exploited for the mine's water needs ▪ Impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or ▪ Indirect project impacts on physical environment or on ecosystem services upon which biodiversity and Affected Communities' livelihoods are dependent.	▪ Thermal and solar power plants ▪ Temporary workers' accommodation ▪ Permanent workers' accommodation (El Aouj City and workers camp) ▪ Transmission line Project activities and their potential direct and indirect impacts: ▪ Infrastructure construction ▪ Use of borrow materials ▪ Ore extraction and processing ▪ Mine waste and tailings deposition ▪ Industrial waste production ▪ Access roads use ▪ Thermal and solar power plant operation ▪ Water abstraction, treatment, transport and use from Touajil and Aouchich wellfields ▪ Operation of workers' accommodation (El Aouj City and on-site permanent camp) ▪ Ore transportation (by train from the mine site to Nouadhibou and vessels from Nouadhibou port) ▪ Mine closure and rehabilitation. A detailed description of the project is included in Section 4.0
Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reason.	Mine, port, and rail corridor receptors are potentially subject to cumulative impacts from other mining operations, increased port activities, other rail users, or broader regional development and population movement.

As part of the definition of the Project's AoI, clarification is required regarding the status of existing infrastructures used for Project logistics.

The railway network and the mineral port are existing infrastructures currently used to meet the needs of SNIM. Therefore, these infrastructures are not considered as "associated facilities" for the El Aouj Project. However, the Project will benefit from these infrastructures:

(i) to transport its ore from the El Aouj mine to the mineral port; and

(ii) to temporarily store and load the ore onto cargo ships for delivery to the final client destination.

A comprehensive assessment of the impacts generated by the use of these infrastructures within the framework of the El Aouj Project (e.g. increased rail and maritime traffic, risk of contamination, risk of collision) will therefore be carried out as part of the ESIA.

The AoI for the physical environment was defined by taking into consideration the spatial extent of potential direct and indirect impacts of the project. Direct impacts of the project are located within project footprint and may extend to a smaller area around the project activities (i.e., in the direct area of influence) while indirect

impacts typically extend across a wider area and often relate to the socioeconomic sphere of influence of the project. The Project AoI was defined by the environmental features surrounding the project and the anticipated spatial extent of impacts around the different components of the project footprint. The AoI for the physical environment encompasses the following elements:

- Groundwater:
  - **Around the Mine site:** an area of 5 km around the mine site area, based on knowledge of the geology, hydrogeology and groundwater systems in the Project Area and in the vicinity from previous assessments undertaken in 2007 – 2008 at El Aouj (Scott Wilson, 2007b) and 2012 at Askaf (URS, Askaf Iron Ore Project, Environmental and Socio-Economic Impact Assessment Report, 2013). The Mine Site Area is underlain by geological formations that yield low quantities of water, with low hydraulic conductivity. Although groundwater is present in pores and fractures, the volume is very small and difficult to extract. These conditions are expected to limit the radius of influence around the dewatered open-pit;
  - **Area of Touajil:** based on the groundwater modelling performed by Golder (Golder-Associates-Pty, 2008), the area that will be impacted by the Touajil wellfield groundwater abstraction (drawdown). This area is limited to the west by the boundary of the Taoudeni sedimentary basin in contact with the non-aquifer Reguibat Shield granite basement. The eastern boundary was considered until Aouchich, however without considering the second wellfield to be developed at Aouchich after the first 20 years of water abstraction at the Touajil wellfield. The northern limit of the pumping influence was established from hydrogeological modelling initially carried out by Golder (Golder Associates, 2014) and then taken up by URS (URS, 2015). This limit is located at the level of a fault constituting a low-conductivity barrier to the lateral flow of water which has the potential to isolate zones of the aquifer and consequently leads to a lower groundwater level in the neighbouring compartment.
  - **Aouchich area:** The Groundwater Project AoI includes the area of influence of the Aouchich wellfield. Its boundaries are defined by the maximum area of influence of the drawdown of the P5 aquifer induced by the water abstraction at the Aouchich wellfield (URS, 2015).

  It is to be noted that the groundwater modelling (URS, 2015) shows clearly a cumulative impact of the groundwater drawdown by the other ongoing mining activities developed in the north of the Kedja Idjil and drawing their water resources from the same aquifer (P2) between 40 and 60 km northward from the Touajil area (El Gah,Tarf Srey and M'Haoudat Wellfields): the simulated drawdowns reach the northern recharge barrier of the Touajil compartment. The Project AoI cannot therefore be clearly defined, and assumption is made that the lateral drawdown extent toward the north encompasses at minimum up to the northern recharge barrier.

  As a consequence, an AoI is defined for all groundwater infrastructures above ground (wells, underground water pipeline, tanks, generators, access areas). A specific AoI presenting the extension of the expected drawdown of the aquifers is also presented.

- Air quality, noise & vibrations, soil quality: the other AoI include:
  - A 1 km buffer around the mine's infrastructure, with a wider area (almost 7 km) in the dominant wind direction to incorporate estimated dust dispersion and deposition,
  - A 250 m buffer of the rail spur between F'Derik and El Aouj, and between F'Derik and Touajil
  - A 250 m buffer around F'Derik town, the future worker City (El Aouj City) and the new permanent camp,
  - A 150 m buffer of the underground pipeline between F'Derik and Touajil,

  - A 150 m buffer of the underground pipeline between Touajil and Aouchich,
  - A smoothed polygon around the Touajil wellfield, accounting for a minimum buffer of 50 m around individual wells and off-road access requirements; and
  - A smoothed polygon around the Aouchich wellfield, accounting for a minimum buffer of 50m around individual wells and potential off-road access requirements.
- The **Port AoI**, which was defined as:
  - A 1 km buffer encompassing terrestrial habitats around the mineral port and Nouadhibou's mining infrastructure; and
  - A 5 km buffer encompassing marine and coastal habitats around the mineral port.
- The **Rail AoI**, which includes:
  - a 250 m buffer of the railway between F'Derik and Nouadhibou; including emplacement of base camp 1 and 2.

The project infrastructure as well as the Area of Influence defined for the physical environment are illustrated in Figure 6-1 and Figure 6-2.

Figure 6-1: Location of general infrastructure of the Project in the mine area.

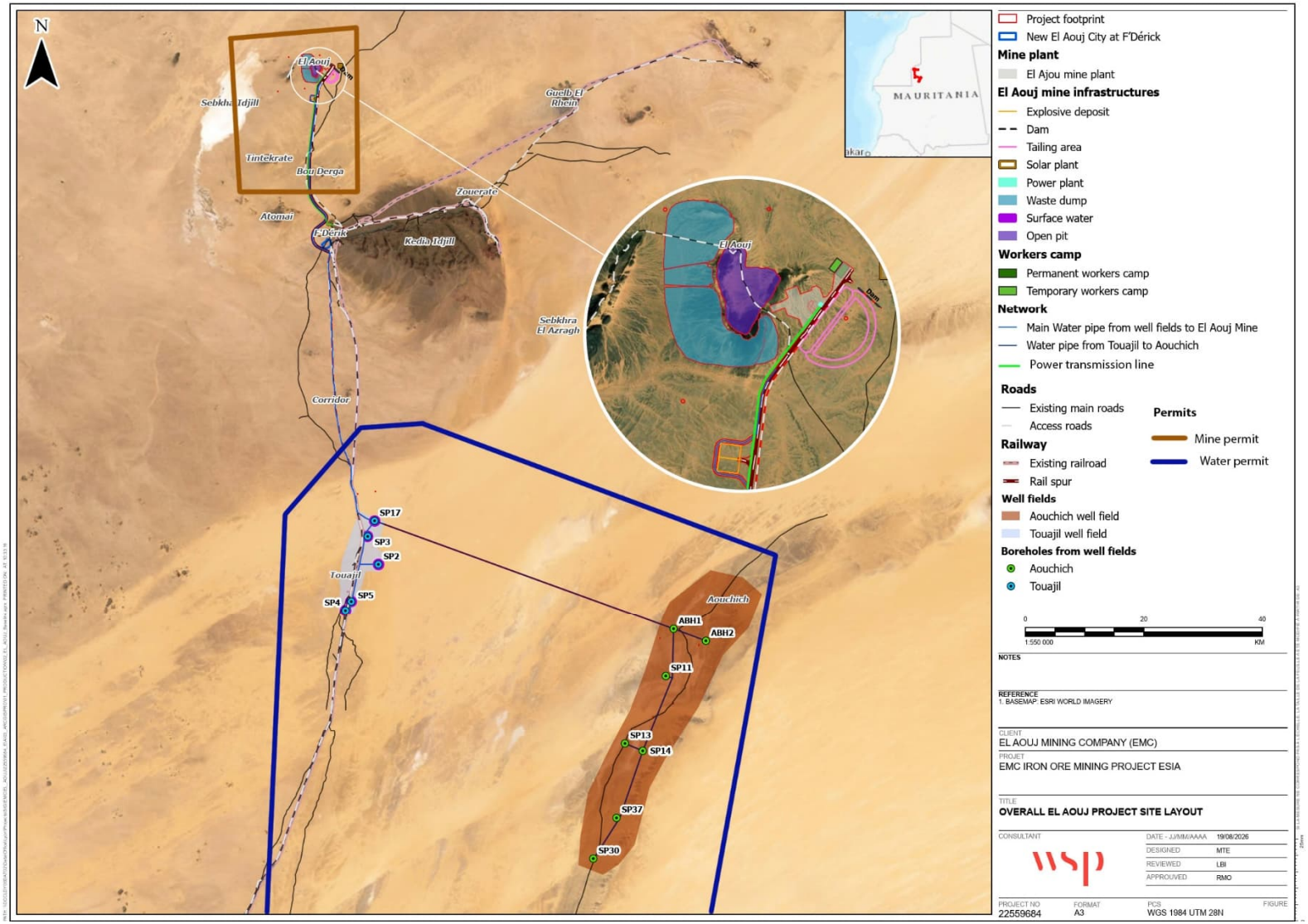
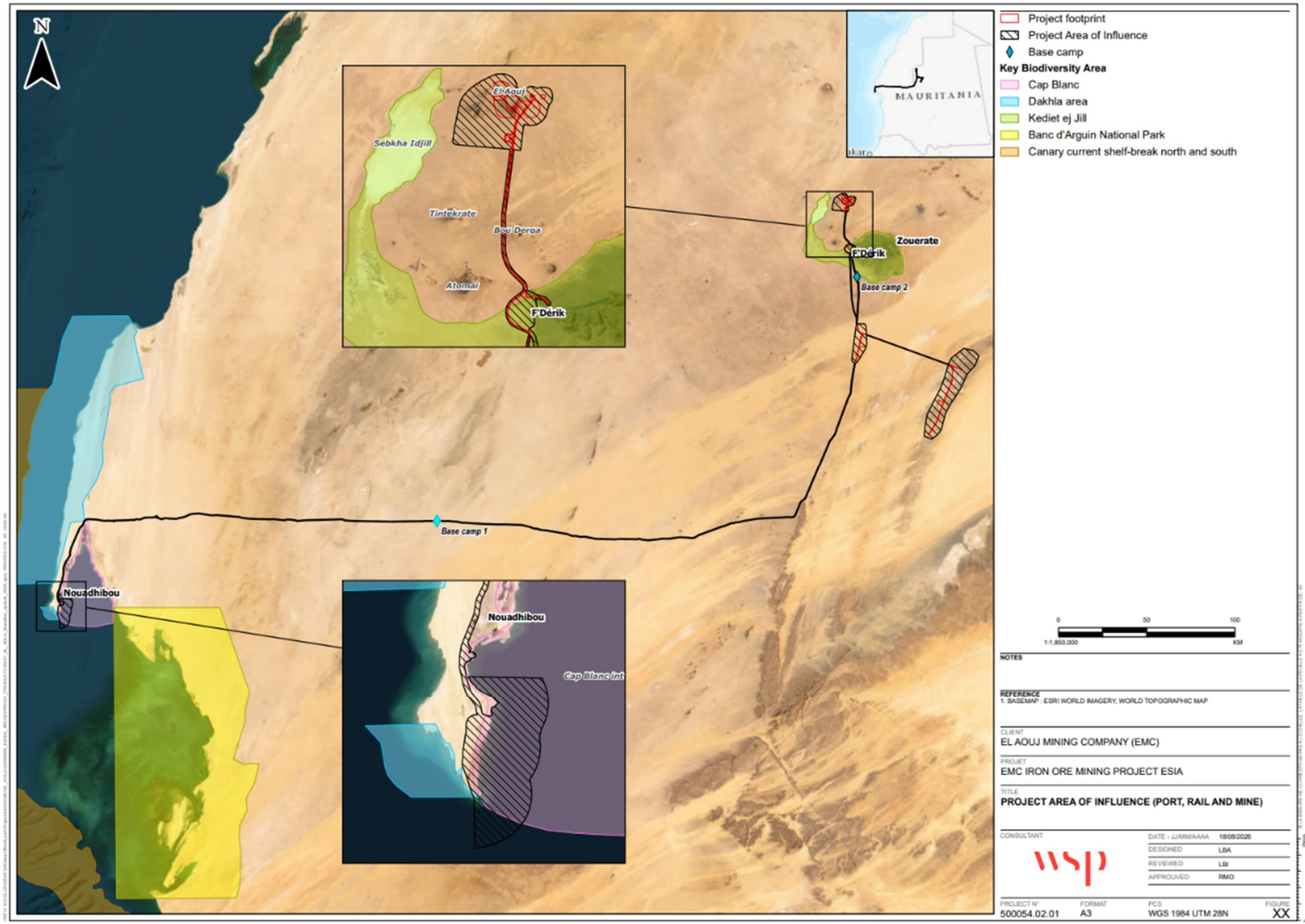


Figure 6-2: Physical Project Area of Influence



6.1.2 Desktop review

The project site has been the subject of several studies, including the ESIA conducted by URS in 2015, as well as a partial update of the ESIA conducted by WSP in 2023.

As part of the 2025 update of the physical baseline study, WSP conducted a desktop review based on previous studies carried out within the project study area, as well as the most recent data available. This phase consisted of collect and analysis, all data relevant information obtained from the following sources:

- El Aouj Project, Environmental and Social Impact Assessment (ESIA) in 2015 (URS, 2015).
- El Aouj Project, Partial update Environmental and Social Impact Assessment (ESIA) in 2023, (WSP, 2023).
- Project for the Modernisation of SNIM's Infrastructure and rolling stock, Environmental and Social Impact Assessment (ESIA) in 2024, (SNIM, 2024).
- Dredging project for the channel of the mineral port of Nouadhibou, Environmental and Social Impact Assessment (ESIA) in 2017, (Antea Group, 2017).
- Construction of a new loading quay at the mineral port of Nouadhibou, Environmental and Social Impact Assessment (ESIA) in 2009, (TECSULT, 2009).
- Cartographic data provided by EMC.
- Technical reports and earlier studies conducted in the study area.
- Climatic and hydrological information sourced from official databases (meteorological and hydrological agencies in Mauritania, etc.).
- Relevant scientific publications in the study area.

All data collected in the study area are listed in Section 15.0.

6.1.3 Field study

Field campaigns were undertaken within the project's area of interest to assess baseline conditions, encompassing water, air, soil, and noise. These investigations complemented and validated the data gathered during the desktop review. The activities undertaken included:

- Sampling of soil and water for chemical analysis;
- Groundwater surveys: identification of water points, piezometric measurements, and in situ parameter;
- Air quality monitoring;
- Noise measurements.

The fieldworks were carried out in accordance with the methodological requirements of the ESIA and international standards for environmental assessment. The sampling methodology and the results obtained are summarized in the following chapters, under Sections 6.6.5.2, 6.6.6.2 below.

6.2 Overview of Mauritania's Climatic Conditions

Mauritania is characterized by a predominantly hot and arid climate. Climatic conditions range from the Saharan climate in the north, which is marked by extreme temperatures and almost no rainfall, to the Sahelian climate in the south, which features a short yet significant rainy season. The country's Atlantic coastline also benefits from a temperate climate due to oceanic influences, particularly in coastal areas.

Mauritania is influenced by two major climatic phenomena: the Harmattan and the monsoon:

- The Harmattan blows during the dry season and is characterized by dry, cool, dusty winds, contributing to wide temperature fluctuations during the day and night. The Harmattan wind blows from the north-east to the south-west, from the Sahara between late November and mid-March. This wind brings substantial quantities of dust to Mauritania, often resulting in dust storms. In the most extreme cases, Harmattan haze can occur, corresponding to a significant amount of dust in the atmosphere, creating a haze effect that can last for several days, limiting visibility and blocking out the sun.
- Although the monsoon is less marked in Mauritania than in other parts of West Africa, it plays a crucial role in annual rainfall. It occurs mainly between June and September, bringing the rains needed for agriculture and water resources.

More specific descriptions of climate conditions are provided in sections 6.4.1.1 for the port area and 6.6.1 for the mine area.

6.3 Climate change

6.3.1 Country's GHG emissions

In 2018, the country's net GHG emissions were estimated at 9,944.618 CO_2 Eq, which corresponds to approximately 2.5 tons of CO_2 Eq per capita. The main sources of emissions identified are the energy and livestock sectors (MEDD, 2021).

The renewable energies, which currently account for around 40% of the national energy mix, and the AFAT (Agriculture, Forestry and Land Use) sector are the main drivers of GHG emissions mitigation at the national level (MEDD, 2021). Since 2015, Mauritania has been committed to actively contributing to global efforts to reduce greenhouse gas (GHG) emissions. This commitment translates into a targeted reduction of 22.3% in GHG emissions by 2030, representing an estimated reduction of 33.56 million tons of CO_2 equivalent (Mt CO_2 eq), according to the Ministry of Environment and Sustainable Development (MEDD, 2015).

6.3.2 Climate projections for the region

Mauritania is one of the country's most vulnerable to climate change, due to its arid climate and its population's heavy dependence on natural resources. Based on existing literature, the main issues identified in the country are as follows (Tomalka, 2020):

- Rising temperatures: Climate projections indicate a temperature increase of between +2°C and +4.5°C by 2080, compared to pre-industrial levels. This trend is accompanied by an increase in extreme heat events, increasing health risks and placing greater strain on agricultural and energy systems.
- Irregular rainfall: Changes in rainfall patterns result in more frequent droughts and episodes of intense rainfall. These phenomena contribute to soil degradation through erosion, the advance of desertification, and increased pressure on available water resources.
- Sea level rise: An estimated rise of +36 cm by 2080 threatens coastal areas, with increased risks of flooding, coastal erosion, and saltwater intrusion into coastal aquifers, compromising drinking water quality and the viability of local ecosystems.

Faced with rising atmospheric GHG concentrations, climate projections indicate a significant increase in temperatures in Mauritania. According to various scenarios, the average air temperature is expected to rise by 2.0°C to 4.5°C by 2080 compared to pre-industrial levels, with higher and more frequent heat peaks in the

southern and western regions of the country (Tomalka, 2020). Figure 6-3 illustrates projections of the gradual increase in the average annual temperature in Mauritania over a period of 60 years.

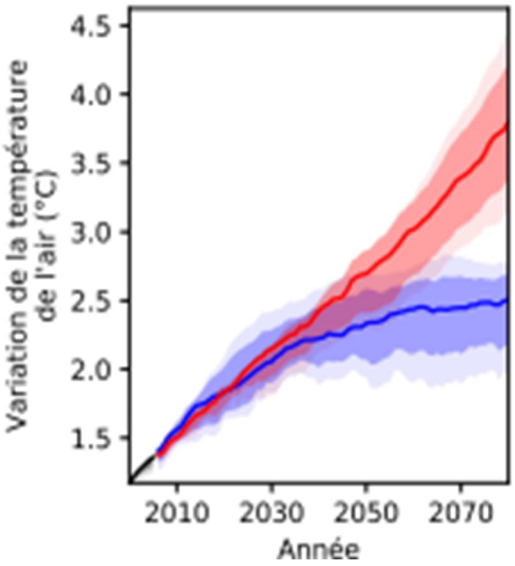


Figure 6-3: Scenario for the evolution of average air temperature between 2020 and 2070 (Tomalka, 2020).

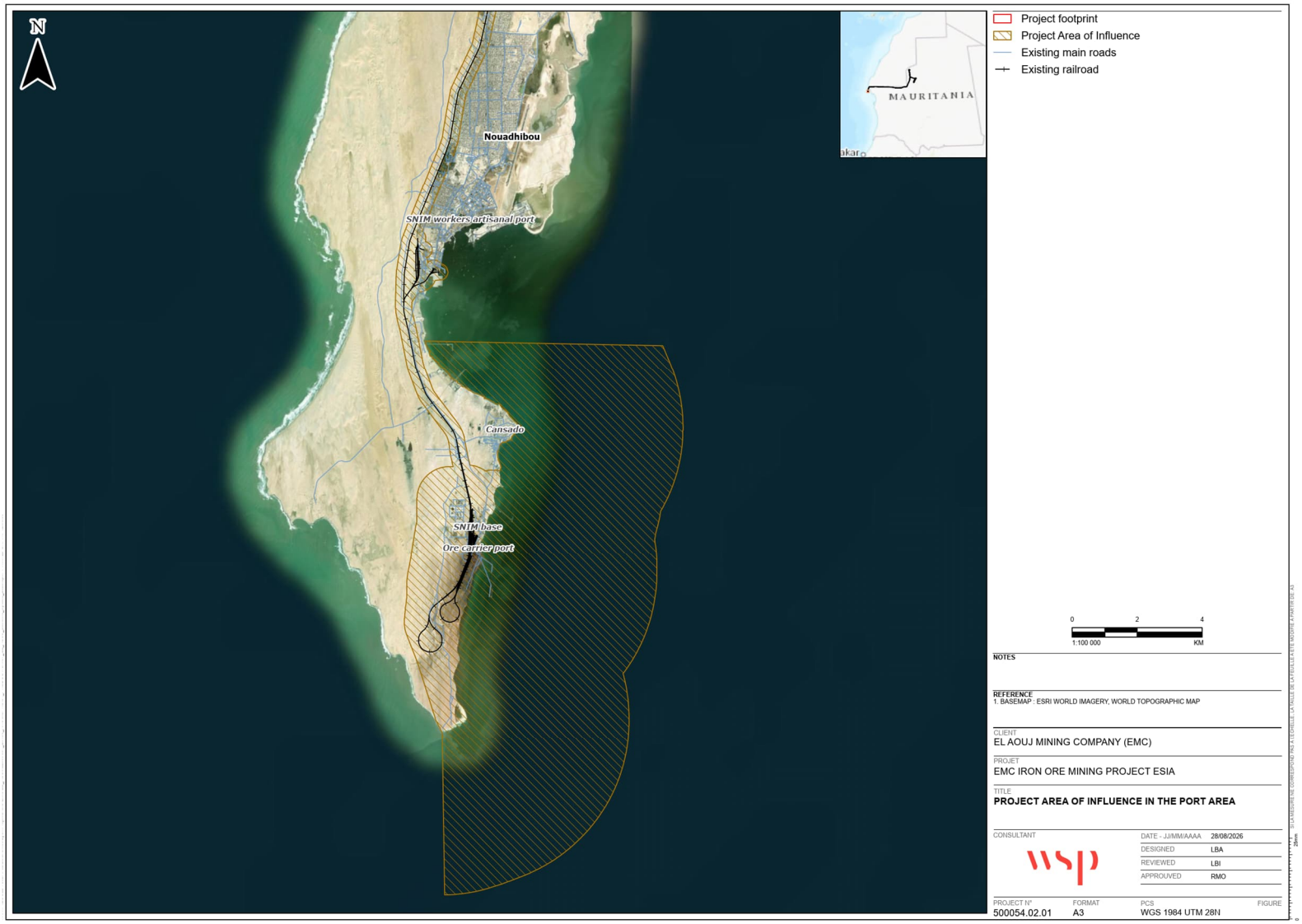
Climate projections based on the Climate Change Risk Assessment performed by WSP (WSP, 2023) indicate a continuous increase in temperatures in all scenarios evaluated, between 27° for the most optimistic scenario (SSP1-2.6) and 34° for the most pessimistic scenario (SSP5-8.5).

In contrast, cumulative annual precipitation is expected to remain stable at around 100 mm/year, with no significant trend, although interannual variability remains high.

6.4 Port Area

As part of the El Aouj iron ore mining project, maritime transport of the ore will be carried out via the existing port operated by the National Industrial and Mining Company (SNIM), located approximately seven (07) kilometres south of the city of Nouadhibou, on Mauritania's Atlantic coast. This section presents the physical baseline in the port area. Figure 6-4 shows the port area of Nouadhibou, which is used for loading iron ore destined for international markets**.**

Figure 6-4: Project area of influence in the port area



6.4.1 Meteorology and Climate

6.4.1.1 Climate

The city of Nouadhibou, located on the north-western coast of Mauritania, falls under the BWh category of the Köppen climate classification system, which denotes a hot desert climate. This climate is characterized by mild and sunny winters, hot summers and low annual rainfall. However, temperatures in Nouadhibou are relatively moderate compared to other Saharan regions, owing to the combined effects of the cold Canary Current, which flows along the Mauritanian coast, and the maritime trade winds, which bring a degree of coolness and help to mitigate the intensity of the heat (World Bank-ZFN, 2019).

The Dakhlet Nouadhibou region is also exposed to climate hazards, exacerbated by temperature anomalies and irregular rainfall. These factors increase the risk of drought and flooding. The main issues related to climate hazards in the region are as follows (Tomalka, 2020):

- Sea Level Rise: The rising sea level disrupts coastal dynamics and littoral ecosystems, affecting natural habitats, port infrastructure, and residential areas located along the shoreline. This phenomenon also promotes saline intrusion into coastal aquifers.
- Marine Ecosystem Alteration: Climate change impacts the breeding grounds of fish species and the habitats of migratory birds. These disturbances jeopardise the sustainability of both artisanal and industrial fishing activities, which represent a key economic pillar of the region.
- Urban Growth: The city of Nouadhibou is experiencing rapid expansion, which heightens vulnerability to flood risks, coastal erosion, and environmental pollution. This urbanisation places increasing pressure on infrastructure and essential public services.
- Environmental Degradation: The intensification of anthropogenic pressures, combined with inadequate management of natural resources, exacerbates the risks of soil degradation, biodiversity loss, and contamination of natural environments.
- Economic Activity Vulnerability: The fisheries sector, the region's primary economic driver, is particularly sensitive to climatic variations, both in terms of productivity and long-term viability.

6.4.1.2 Meteorology

- **Temperature**

According to the climate data available for the port area, the average annual temperature in Nouadhibou in 2025 ranges from a minimum of 15°C in January to a maximum of 31.4°C in September. This moderate temperature range reflects a generally stable climate profile throughout the year, characteristic of the coastal desert climate influenced by the proximity of the Atlantic Ocean. The graph (Figure 6-5) shows the monthly average temperature trends recorded in Nouadhibou in 2025 (IOWA ENVIRONMENT MESONET, 2025).

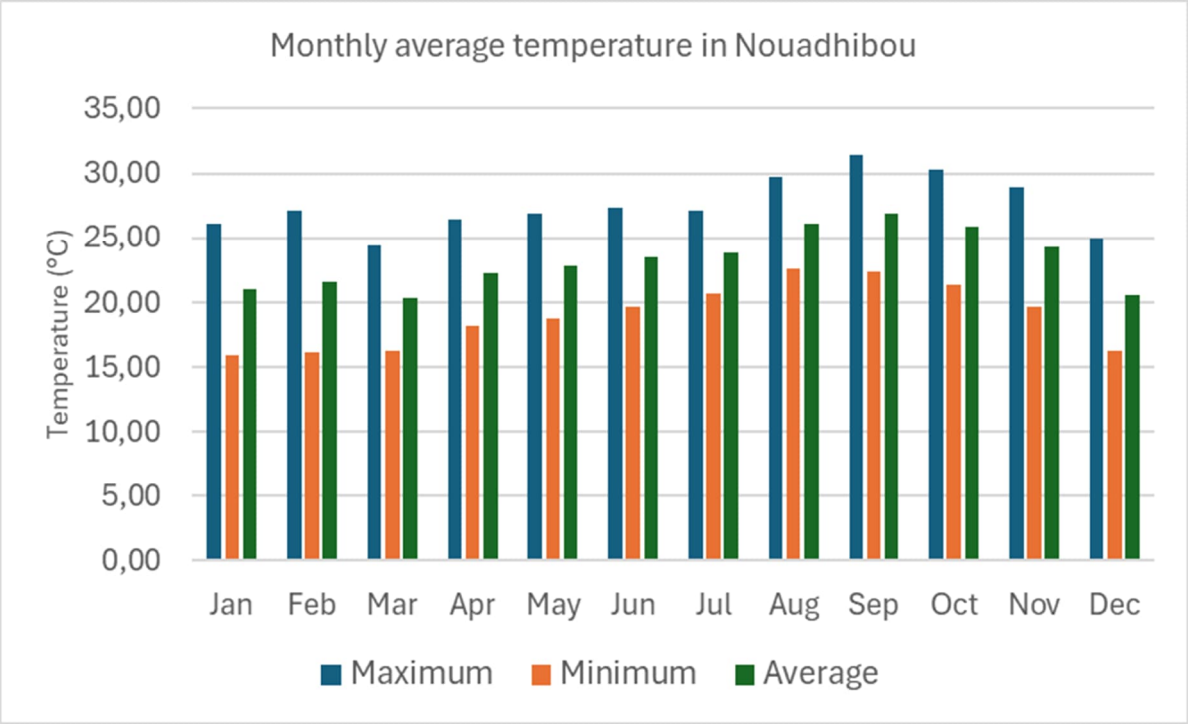


Figure 6-5: Monthly average temperature in Nouadhibou in 2025 (IOWA ENVIRONMENT MESONET, 2025).

- **Pluviometry**

The data used for rainfall analysis comes from the Nouadhibou Airport weather station, which is the main source of climate observation in the region. In the absence of complete series for the year 2024, only the data available for the year 2023 was taken into account for updating the rainfall indicators.

According to this data, the average annual rainfall recorded in Nouadhibou in 2023 was 84.2 mm, which is relatively high compared to the historical average for the region. Table 6-2 shows the average monthly distribution of rainfall in Nouadhibou for the year 2023. Due to the subtropical desert climate prevailing in this area, rainfall is generally very low and irregular.

Table 6-2: Average monthly rainfall in Nouadhibou in 2023 (source: Weather station Nouadhibou airport (GQPP).

Average monthly rainfall	Month											
	January	February	March	April	May	June	July	August	September	October	November	December
Quantity (mm)	0	45.6	0	8,6	30	0	0	0	0	0	0	0
Total (mm)	84.2											

- **Wind**

The city of Nouadhibou is subject to prevailing wind conditions throughout the year, with winds blowing mainly from the north-north-west (NNW) to the north-north-east (NNE). Observed wind speeds generally vary between

6 m/s and 10 m/s, reflecting moderate to strong winds (F.Domain-ORSTOM, 1985). This dynamic is particularly pronounced between December and May, when the region is exposed to north and north-east trade winds associated with the Azores high-pressure system. The diagram (Figure 6-6) below shows the wind rose in Nouadhibou, based on data recorded between 01 January 2020 and 31 December 2025, a five-year observation period.

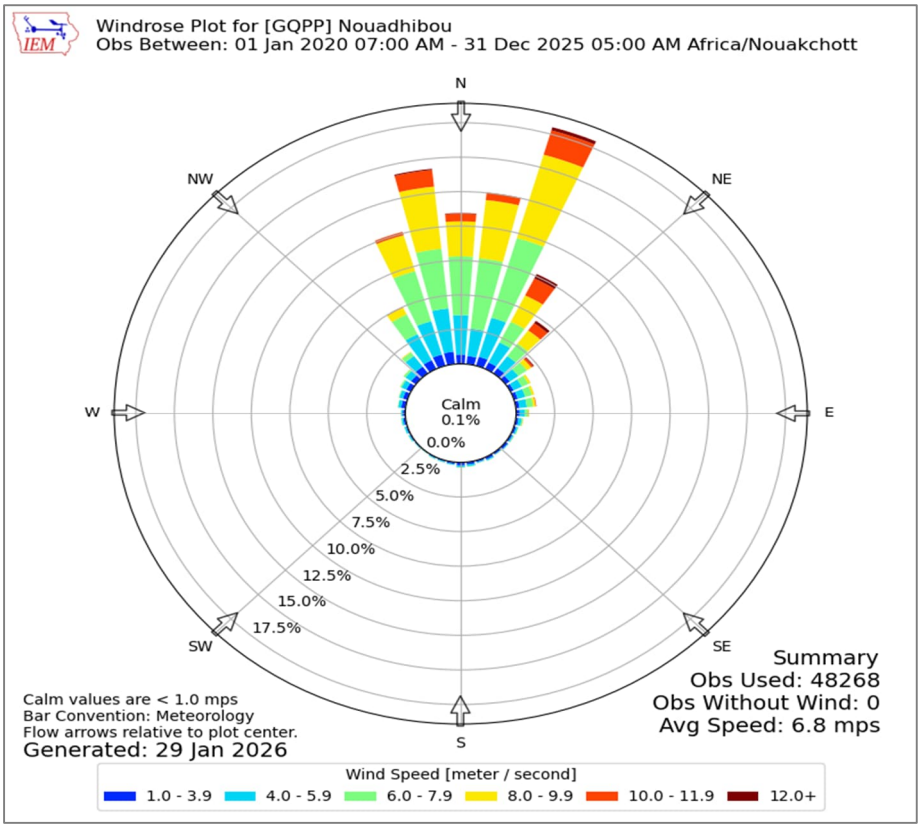


Figure 6-6: Wind rose from Nouadhibou weather station (IOWA ENVIRONMENT MESONET, 2025).

From 2020 to 2025, Nouadhibou saw winds primarily coming from the north and north-east, typical of the coastal climate found in Mauritania. The observed wind speeds were mostly between 06 and 10 m/s, with frequent occurrences of speeds exceeding 10 m/s. The average wind speed recorded over this period is 24,48 km/h (6,8 m/s). This configuration, marked by persistent winds coming from the North and North-East, is typical of Mauritania's coastal desert climate.

6.4.2 Marine environment

6.4.2.1 Bathymetry and topography

Mauritania has a coastline stretching 720 km from Cape Timiris to Cape Blanc, including the Gulf of Arguin. This coastline is characterized by alternating sandy beaches, rocky coves and caves, bordered by the Sahara Desert. The city of Nouadhibou is located on the narrow Cape Blanc peninsula, which forms a natural barrier delimiting Greyhound Bay, which also encompasses Cansado Bay and Étoile Bay.

The bathymetric characteristics of the continental shelf of Nouadhibou are as follows:

- The water depth reaches 30 meters about 20 km from the coast.
- It descends 200 meters, about 50 km from the coast.
- It reaches 2,000 meters, about 110 km from the coast.

These bathymetric gradients indicate a relatively steep continental slope, influencing ocean dynamics, marine currents and the biological productivity of the area. This geomorphological configuration is particularly favourable for the concentration of fishery resources, but also vulnerable to the effects of climate change, particularly sea level rise and ocean acidification (Julien Michel, 2011).

6.4.2.2 Tides and Currents

Mauritanian coast is characterized by semidiurnal tides, with an average range of 1 meter (1.6 meters at high tide and 0.5 to 1.0 meters at low tide). Tidal currents can be strong on the Banc d'Arguin and in the surrounding area (F.Domain-ORSTOM, 1985). During the trade wind period, the surface current is stable and flows southwards. It is stronger off the continental shelf than along the coast and its speed does not exceed 0.8 knots. During the warm season, the surface current is poorly defined and occasionally reverses with persistent southwesterly winds.

The coastal waters are the scene, among others, of two major phenomena. The first one is the occurrence of the thermal front resulting of the meeting of the two main currents of the zone namely the Canary current and the northern equatorial counter-current commonly called the Guinea current. The second one is the coastal upwelling that is one of the most important oceanographic factors in shaping the hydrological regime and structures of water bodies in northwestern Africa. It is at the origin of a high abundance of phytoplankton in the system which is the basis of the complex food web of the marine environment. This coastal Upwelling explains in part the very great wealth species of the Mauritanian waters which have a reputation as being one of the richest waters in fish in the world (Moulaye Mohamed Wagne, 2011). Figure 6-7 shows the direction of the main winds and currents in the Gulf of Arguin.

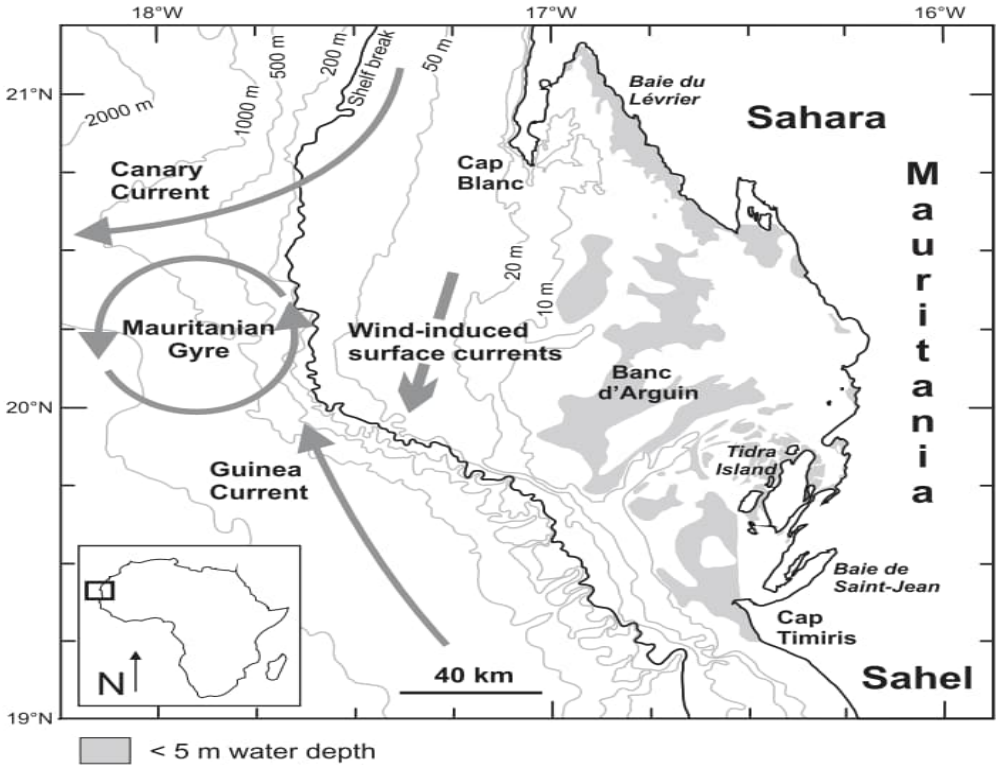


Figure 6-7: Main winds and currents in the Gulf of Arguin (Julien Michel, 2011).

6.4.2.3 Sedimentology

The sedimentary dynamics along the coastline of Nouadhibou are primarily influenced by both exogenous and endogenous inputs of fine and sandy materials. The main sources of sedimentation in this region include (IMROP, 2012):

- Erosion of the sandstone cliffs of Cape Blanc, which generates mineral particles transported towards coastal areas.
- Aeolian transport from the Sahara Desert, contributing to the accumulation of sand and fine dust along the shoreline.
- Marine deposits, resulting from the dynamics of coastal currents and wave action, which redistribute sediments along the continental shelf.

The granulometric composition of the sediments is predominantly fine to medium sand, with the localised presence of sandy mud zones, particularly in sheltered or low-energy hydrodynamic areas, as well as silt and medium to coarse sands (F.Domain-ORSTOM, 1985).

6.4.2.4 Sediment quality

The available data on sediment quality in the Nouadhibou port area comes mainly from the environmental monitoring reports of the IMROP (Mauritanian Institute for Oceanographic Research and Fisheries) covering the period 2010–2024 (IMROP-ONISPA, 2024), as well as from the 2016 report of the ANTEA group (Antea Group, 2017).

According to historical data, physicochemical analyses of sediments have revealed the presence of chromium (Cr) and traces of hydrocarbons at certain sampling stations. These contaminants are generally associated with port and industrial activities, although their concentration remains limited to specific areas (Antea Group, 2017).

6.4.2.5 Water quality

The available data on sediment quality in the Nouadhibou port area comes mainly from the environmental monitoring reports of the IMROP (Mauritanian Institute for Oceanographic Research and Fisheries) covering the period 2010–2024 (IMROP-ONISPA, 2024), as well as from the 2016 report of the ANTEA group (Antea Group, 2017).

According to historical data, physicochemical analyses have revealed the presence of heavy metals such as iron (Fe), mercury (Hg), lead (Pb), zinc (Zn), copper (Cu), and cadmium (Cd), as well as traces of hydrocarbons in certain samples. These elements are generally associated with port activities, maritime traffic, and atmospheric deposition (IMROP-ONISPA, 2024).

6.4.3 Terrestrial environment

6.4.3.1 Geology and geomorphology

6.4.3.1.1 Regional Geology of Mauritania

Mauritania is located on the West African Craton and comprises five geological provinces: the Reguibat Dorsal, the Taoudeni Basin, the Tindouf Basin, the Mauritanian Belt and the Coastal Sedimentary Basin. The Reguibat Ridge is composed of Archean and Paleoproterozoic groups and granites. The Taoudeni Basin and the Tindouf Basin are made up of Neoproterozoic and Palaeozoic sedimentary rocks.

- The **Reguibat Ridge** extends mainly into Mauritania and Western Sahara (central and western part) as well as Algeria (eastern part). A comprehensive description of this domain is provided in section 6.6.2.
- The **Taoudeni Basin** represents the most extensive intracratonic sedimentary basin in West Africa, spanning the territories of Mauritania, Mali, Guinea, Burkina Faso, Senegal, and Sierra Leone. A comprehensive description of this domain is provided in section 6.6.2.

- The **Tindouf Basin** extends marginally on the northwestern edge of Mauritania, near the borders with Algeria and Morocco. It is formed of dolomites, sandstones, schists and limestones dating from the Upper Proterozoic to the Ordovician-Devonian.
- The **Mauritanides chain**, stretching over 1,500 km along West Africa's coast, is an orogenic zone shaped by Pan-African and Hercynian tectonic events. Composed of sedimentary, metamorphic, and volcanic rocks, it spans Mauritania, parts of Morocco, and eastern Senegal. The belt primarily features Neoproterozoic to Lower Paleozoic rocks, with sections exposing older Archean to Paleoproterozoic basement material (Chiron, 1974).
- The **Atlantic Coastal Sedimentary Basin**, or Senegalo-Mauritanian Basin, was formed during the Permo-Triassic during the opening of the Atlantic Ocean. It is filled with Mesozoic to Cenozoic sediments, reaching up to 9 km thick west of Nouakchott.

Figure 6-8 below shows the distribution of regional geological formations in Mauritania.

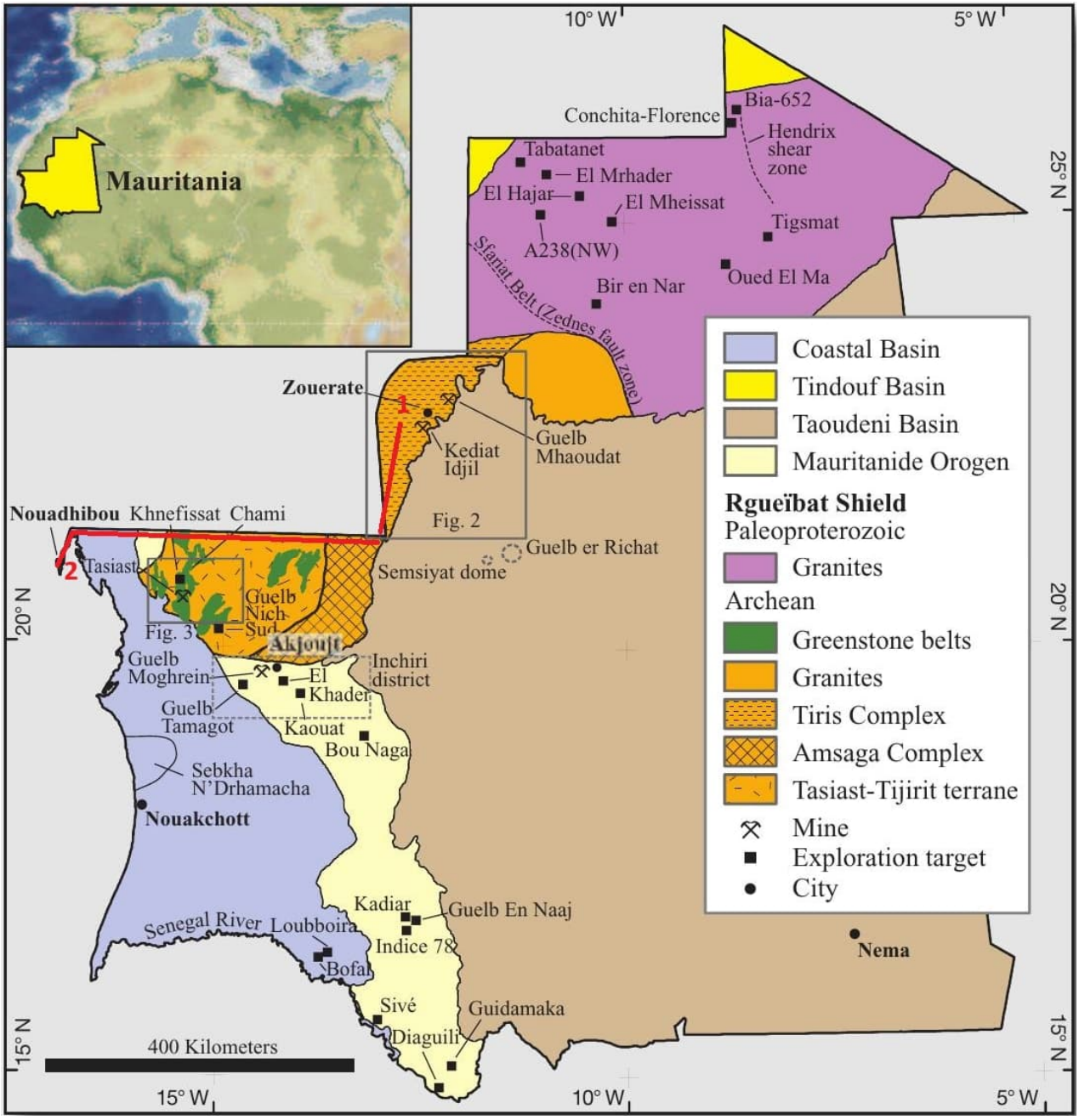


Figure 6-8: Geological formations of Mauritania (in red: 1: El Aouj mine area; red line: SNIM railway.; 2: SNIM mineral Port) (Anderson, 2012).

6.4.3.1.2 Local context

Nouadhibou lies on the Atlantic coastal basin, which consists of sedimentary rocks and sediments dating from the Lower Cretaceous to the Quaternary. The Senegalese Mauritanian coastal basin is up to 300 km wide and covers an area of more than 160,000 km², of which 100,000 km² are offshore.

This basin formed during the Permian-Triassic on the passive western continental margin as the proto-Atlantic Ocean opened. It contains Mesozoic to Cenozoic sediments that thicken seaward due to subsidence along rift-related normal faults. The majority of the basin's surface is comprised of terminal continental deposits, referred to as the M'Bidane formation. This formation includes Miocene marine deposits that have experienced significant laterization, as well as terrigenous detrital deposits in other areas (BA Oumar, 2017).

The geomorphology of the Nouadhibou region is characterized by a diversity of natural formations, including coastal cliffs, rocky outcrops, dune systems, coastal lagoons and sandy beaches. These elements reflect complex geomorphological dynamics, influenced by wind, marine and tectonic processes, which shape the coastal landscape and the interior of the region. Rock outcrops and fractured geological structures indicate the effects of tectonic activity, including uplifts and faults that have played a role in shaping the landscape.

6.4.3.2 Topography and landscape

The Nouadhibou region is located on the Cap Blanc peninsula and is characterized by a long, narrow geomorphological formation stretching from north to south along the Atlantic coast. This linear configuration has a strong influence on coastal dynamics and land use. The coastline is dominated by rock formations, including steep sandstone cliffs ranging in height from 10 to 20 meters and coastal caves formed by marine erosion. The arid climate and prevailing winds promote erosion, transport and deposition of fine particles, contributing to the formation and migration of sand dunes. These dunes can be mobile or fixed depending on vegetation cover and soil moisture.

The local topography is generally flat, with minor altitude variations due to the presence of sand dunes and mounds of sand. The coastline of Nouadhibou is affected by waves, tides, and coastal currents, which influence the formation of coastal cliffs, sandy beaches, and lagoons. The southern tip of the coastline contains an arrow-shaped beach, which is a distinctive geomorphological feature in the region. Sebkhas and isolated sandy zones are also present at the base of certain bays, including Lévrier Bay, Casando Bay, and Étoile Bay. (Antea Group, 2017).

Human activities in the region include industrial operations by SNIM, primarily involving the export of iron ore via the mineral terminal; residential presence in the Casando district; and artisanal port and mining activities.

6.4.3.3 Hydrogeology

The Boulenouar well field is the main source of groundwater in the region (Figure 6-9). It is located in the aquifers of the recent western basin, in clayey sands and sandstones, about 90 km from the city of Nouadhibou (World Bank-ZFN, 2019). Nouadhibou's region is distinguished by its saline groundwater, which forms part of the Atlantic Coast Basin. The saltwater table is located at a depth of less than one metre and is subject to tidal influences. During the cold season, upwelling originates from deeper ocean layers and results from trade winds moving surface waters eastward. In the study area, the tidal level is +2.5 m and the main water levels to be considered are as follows:

- Highest spring tides: + 2.40 m / + 2.50 m;
- Lowest spring tides: + 0.20 m / + 0.25 m.

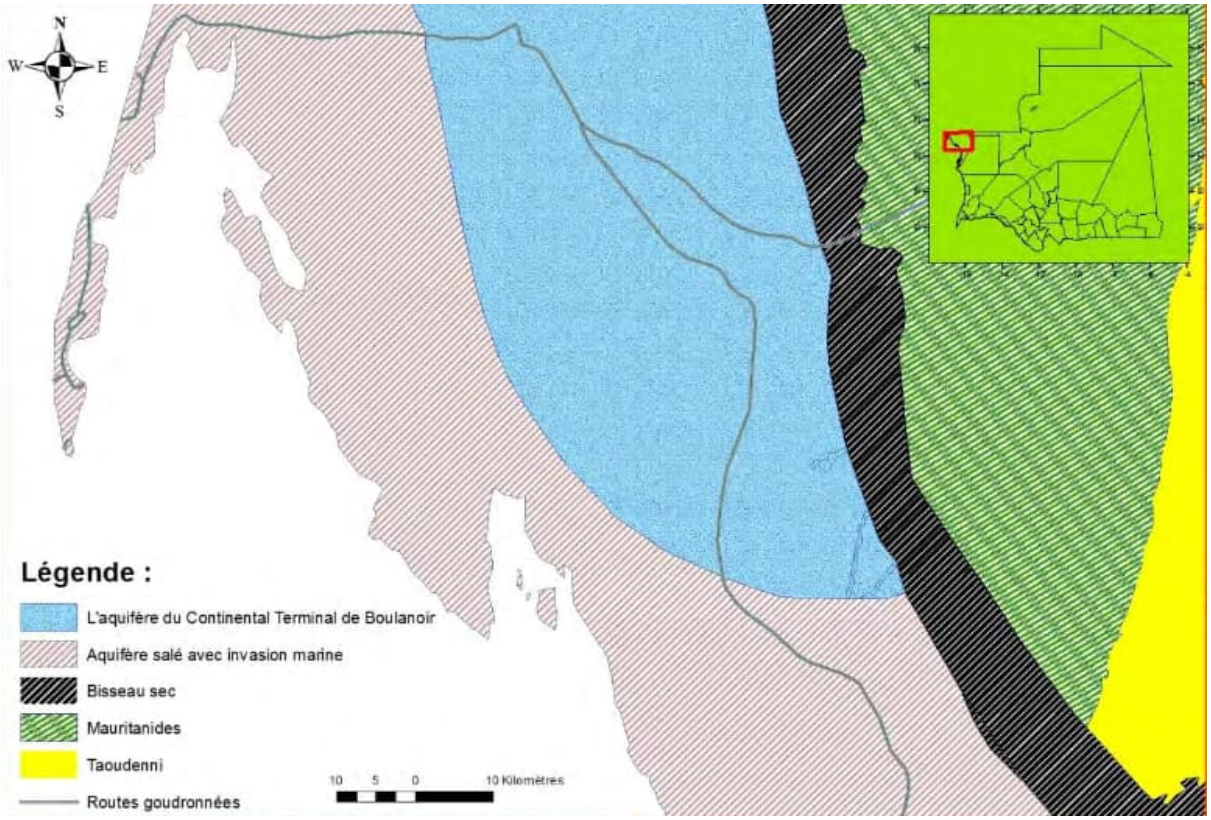


Figure 6-9: Hydrogeological map of Dakhlet-Nouadhbou-Boulenouar wellfield (Mahmoud, Caractérisation hydrogéologique de l'aquifère du continental terminal dans le secteur Boulanoir en Mauritanie, 2018).

6.4.3.4 Air quality

Air quality in Nouadhibou is primarily influenced by natural and industrial dust emissions. The region's natural dust comes from desert sand carried by winds. Elevated dust levels are noted during periods of strong wind, when sandstorms, referred to as "hamada". These events can decrease visibility and raise the concentration of fine particles in the air.

Industrial dust mainly comes from nearby factories, especially those in mineral port operations, as well as local traffic. Fish odours from artisanal and industrial ports and processing plants also impact Nouadhibou's air quality during the day (World Bank-ZFN, 2019). Project activities at the mineral port will be limited to increasing the loading of iron ore onto ships at the current facilities. As there is no identified receptor downwind of the mineral port, additional air quality assessment is not considered necessary within the current scope of the Project.

6.4.3.5 Noise levels

The main sources of noise in Nouadhibou come from both strong winds and human activities. The natural conditions, characterized by persistent and often sustained winds, generate significant natural background noise. Added to this is noise pollution from industrial operations, port activities, and road, rail and maritime transport. At the mineral port, the El Aouj project's activities will be limited exclusively to loading iron ore onto ships. In addition, all activities related to the handling and management of the ore will be carried out in existing facilities, without any extension of infrastructure or significant increase in the operational perimeter. In this context, a supplementary assessment of noise levels is not considered necessary.

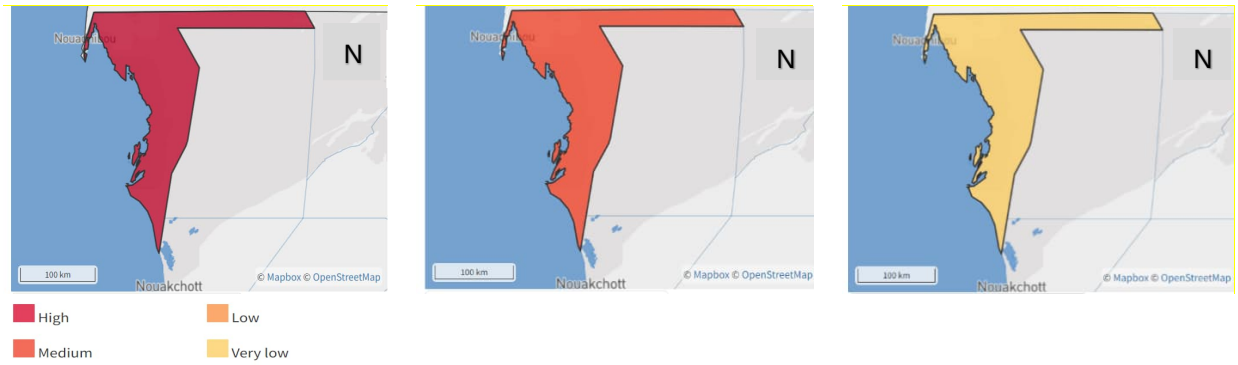
6.4.3.6 Soil quality

Historical data on the chemical characterization of the soil in the region is not available. The surface soils in Nouadhibou consist of recent sandy sedimentary formations, including wind-blown sand dunes and coastal deposits of varying thickness. These soils are typical of arid and desert areas. All activities related to El Aouj ore management will be carried out within the existing facilities (no extension), chemical soil characterisation is not considered necessary within the current scope of the project.

6.4.4 Natural hazards

Mauritania is one of the sub-Saharan African countries most vulnerable to the effects of climate change on populations and socio-economic systems. In recent years, the country has experienced a series of extreme weather events, including prolonged droughts and flash floods, causing significant disruption in certain regions (Tomalka, 2020). The vulnerability to flooding stems from the interplay of natural factors, such as rainfall patterns, topography and hydrological dynamics, and human-driven factors, including unplanned urbanization, soil sealing and urban expansion.

According to the September 2020 Think-Hazard report, the Dakhlet-Nouadhibou region has a high-risk level for coastal flooding, extreme heat, and water scarcity (Figure 6-10). The area has a moderate risk level for Tsunami and a very low risk level for earthquake and landslide, wildfire, urban flooding, and flood (ThinkHazard, 2020).



1: High hazard level (coastal flood, extreme heat and water scarcity)

2: Medium hazard level (Tsunami)

3: Very low hazard level (river flood, urban flood, earthquake, landslide and wildfire)

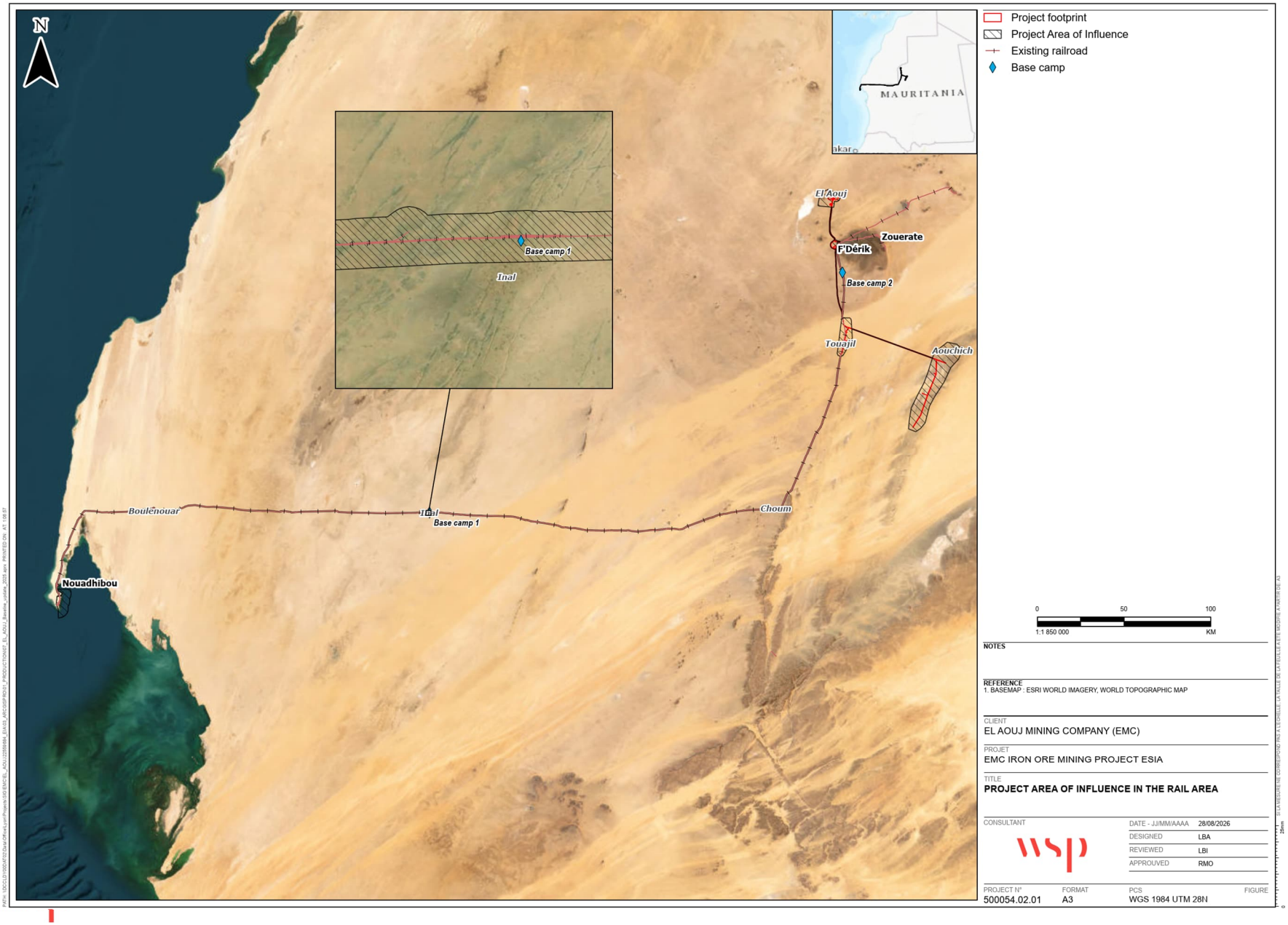
Figure 6-10: Natural hazard in the Dakhlet-Nouadhibou region (source: Think Hazard-Mapbox Open Street).

6.5 Rail Area

As part of the El Aouj iron ore mining project, the existing SNIM railway connecting Zouerate to Nouadhibou will be used to transport the iron ore extracted from the El Aouj mine to the existing SNIM port of Nouadhibou. Although no major upgrade will be necessary to integrate the El Aouj ore transportation on the existing rail infrastructures, this railway line is a critical component of the Project's logistics chain, enabling the efficient delivery of ore to the port for export to the international market. This section presents the physical baseline in the railway area.

Figure 6-11 shows the railway between Zouerate and Nouadhibou, used for transporting iron ore.

Figure 6-11: Project Area of Influence along the rail way between Zouerate and Nouadhibou


N
MAURITANIA
Project footprint
Project Area of Influence
Existing railroad
Base camp
El Aouj
Zouerate
F'Dérik
Base camp 2
Touajil
Aouchich
Base camp 1
Inal
Boulenouar
Choum
Nouadhibou
0
50
100
1:1 850 000
KM
NOTES
REFERENCE
1. BASEMAP : ESRI WORLD IMAGERY, WORLD TOPOGRAPHIC MAP
CLIENT
EL AOUJ MINING COMPANY (EMC)
PROJET
EMC IRON ORE MINING PROJECT ESIA
TITLE
PROJECT AREA OF INFLUENCE IN THE RAIL AREA
CONSULTANT
DATE - JJ/MM/AAAA 28/08/2026
DESIGNED LBA
REVIEWED LBI
APPROUVED RMO
PROJECT N° 500054.02.01
FORMAT A3
PCS WGS 1984 UTM 28N
FIGURE

6.5.1 Geology and geomorphology

The rail area crosses the regions of Tiris Zemmour and Dakhlet Nouadhibou, whose geological context is briefly presented in sections 6.4.3.1 and 6.6.2. The locality of Choum is located within the Reguibat Shield, a vast geological province composed of very ancient Precambrian basement rocks (ranging from the Archean to the Paleoproterozoic). This basement is mainly made up of metamorphic and igneous rocks, including gneisses, granites, amphibolites, quartzites, as well as metasedimentary series with granulite facies. These formations are widely exposed, although locally covered by recent wind-blown sand deposits (SNIM, 2024).

From a geomorphological perspective, the railway zone is characterized by a vast peneplain, the result of a long process of erosion and denudation. This flattened surface is covered by recent superficial formations and is dotted with inselbergs, such as the guelbs, which are residual reliefs formed by differential erosion of the crystalline basement.

6.5.2 Hydrography and surface water

A desktop review was conducted based on the existing data presented in the SNIM ESIN (SNIM, 2024) and a hydrographic network assessment based on MERIT Hydro global hydrography datasets (Dai Yamazaki, 2019).

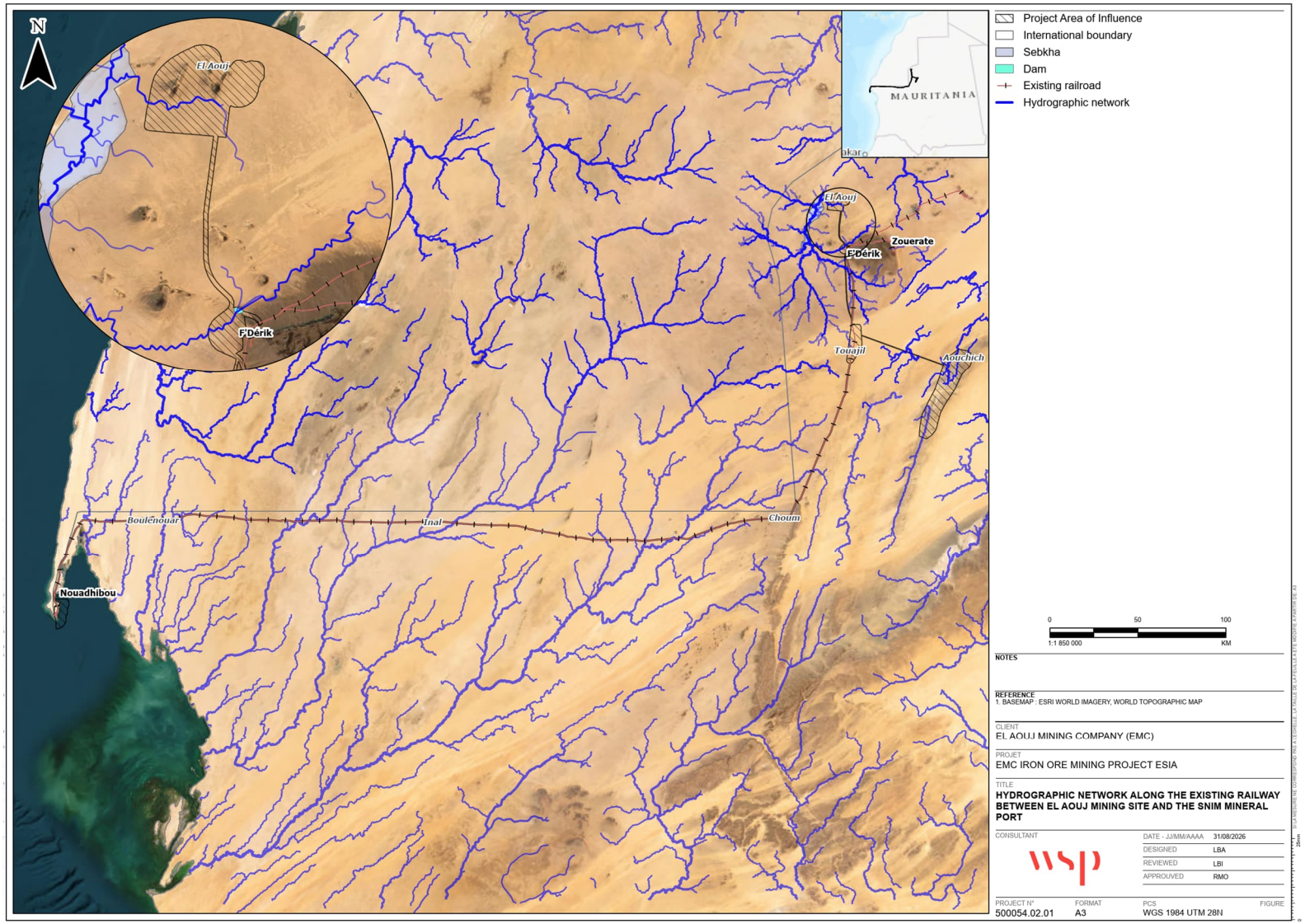
The railway connecting Nouadhibou to Zouerate crosses a Saharan region characterised by extreme aridity and virtually non-existent hydrography. The area has a hydrography typical of Saharan regions, dominated by temporary flows and saline depressions.

In the northern part of the railway, runoff flows towards the Sebkhas located west of the Sebkha d'Idjil, or northwards towards the Sebkha de Mijek, where it accumulates seasonally during rainy periods. South of the Kedja dunes of Idjill to Nouadhibou, the watersheds originate in the Western Sahara, cross Mauritania and flow towards the Atlantic Ocean, following a northeast/southwest direction.

The railway connecting Choum to Nouadhibou crosses these watersheds, running along the east-west border with Western Sahara. Surface water resources in this region are limited and consist mainly of oueds (temporary watercourses) and seasonal pools (SNIM, 2024).

Due to irregular rainfall, these water bodies are not permanent. Their retention time depends on the intensity and frequency of rainfall: ponds can persist from a few days to several months, providing temporary habitats for wildlife. Figure 6-12 shows the hydrographic network along the existing railway between the ATOMAI mining site and the city of Nouadhibou.

Figure 6-12: Hydrographic network along the existing railway between El Aouj site and the SNIM mineral port



6.5.3 Hydrogeology

The railway corridor extending from Zouérate to Nouadhibou encompasses several hydrogeological units, including the Senegal-Mauritania Basin unit, the Precambrian rock unit, and the Taoudeni Basin unit (Mahmoud, Caractérisation hydrogéologique de l'aquifère du continental terminal dans le secteur Boulanoir en Mauritanie, 2018).

- **Senegal-Mauritania Sedimentary Basin**

This unit constitutes one of the country's most significant aquifer systems. It is characterized by a multilayered, unconsolidated aquifer with heterogeneous intergranular flow. Hydrogeological properties vary according to grain size, sorting degree, and sediment consolidation. The aquifer comprises highly permeable layers of sandstone, sand, and gravel, interspersed with low-permeability clay and silt strata.

This system also includes extensive continuous aquifers in the Trarza and Taoudenni regions, as well as aquifers within the river valley.

- **Precambrian Basement**

Precambrian basement rocks, found in the northern part of the country and near the coastal zone, form local aquifers with low productivity. These aquifers are discontinuous and generally unfavorable for exploitation due to their limited storage capacity and recharge potential.

- **Taoudenni Basin**

The Taoudenni Basin features both continuous and discontinuous aquifers and serves as an important source of recharge for the country's deep aquifers. The permeable unit within this basin plays a key role in groundwater storage and transfer. Between Zouerate and Nouadhibou, particularly in the Choum region, lies a geological transition zone marked by the presence of small, localized water pockets within depressions associated with wadis

6.5.4 Air quality

Air pollution in the area is primarily caused by sand dust and emissions from iron ore rail traffic between Zouérate and Nouadhibou (SNIM, 2024)

Project activities will result in an increase in rail transport of ore between the F'Derick mine site and the Nouadhibou ore terminal. The existing railway corridor passes through several localities, whose locations are presented in **Figure 8-6** (see Section 8.3). Considering the nature and scope of the planned activities within this area, no additional air quality studies were considered necessary for the characterization of baseline conditions.

6.5.5 Noise levels

The primary sources of noise emissions in Nouadhibou include strong winds, passing trains and vehicle traffic (SNIM, 2024).

No historical data on acoustic measurements is available for this extended area. The project's activities within the railway zone will be restricted to an increase of transportation of iron ore from the mining sites to the mineral port of Nouadhibou. Noise measurements were carried out south of F'Derik town in a remote location (refer to section 6.6.6.3) and can be classified as background noise levels during times when no trains are passing.

In June 2025, WSP also conducted spot assessments of environmental noise near the railway tracks southeast of F'Derik to establish baseline acoustic levels during train passages in the rail corridor. One-minute LAeq measurements were taken at various distances.

A first measurement was taken 10 meters from the railway during an ore train passage and showed an average sound level of 86dBA (LAeq over 1 minute). Sound levels dropped below the IFC residential threshold of 55dBA between 200 and 250 meters, with 51dBA recorded at 250 meters.

6.5.6 Soil quality

Historical data on the chemical characterization of the soil in the region is not available. All activities related to El Aouj ore transportation will be carried out within the existing rail facilities (no extension). Soil characterization conducted at a limited number of spotted locations along the railway cannot be considered representative of the overall soil conditions throughout the entire route. Consequently, no comprehensive chemical soil analysis was performed for the railway corridor.

6.5.7 Natural hazards

The railway areas in Dakhlet-Nouadhibou and Tiris-Zemmour face climatic risks. As per a September 2020 Think-Hazard report, Dakhlet-Nouadhibou is highly vulnerable to coastal flooding, extreme heat, and water scarcity, with moderate tsunami risk and minimal threat from earthquakes, landslides, forest fires, and urban flooding. Tiris-Zemmour also has high risk of extreme heat and water scarcity, but very low risk for other hazards such as earthquakes, landslides, fires, and flooding (ThinkHazard, 2020).

6.6 Mine Area

The El Aouj project's mining site is located in northern Mauritania, within the Tiris Zemmour Wilaya, a region known for its mineral potential. This area will host all mining operations related to the project, as well as technical facilities and the residential base. This section presents the physical baseline in the mine area.

6.6.1 Meteorology and Climate

6.6.1.1 Climate

The Wilaya of Tiris Zemmour is located in the hyper-arid Saharan climatic area and is covered by the Sahara Desert. The country is crossed by the Tropic of Cancer and, as a result, the wilayas of Tiris-Zemmour is subject to latitudinal oscillations in the flows of the inter-tropical convergence area of continental trade winds. According to the Köppen-Geiger climate classification system, the region has a BWh climate, which is indicative of a hot desert climate (World Bank Group, 1990-2020). This climate is characterised by a very long dry season and a short-wet season, with significant spatial and interannual variability in precipitation. Climatic conditions in the Tiris Zemmour region are dominated by extremely hot and arid summers, with maximum temperatures reaching up to 47°C, and dry, relatively cool winters, with average daytime temperatures around 22°C and significantly lower minima during the night. Annual rainfall is extremely low, often below 50 mm, and in some years, precipitation is virtually non-existent.

A CCRA produced by (WSP, 2023) assessed the physical climate risks for the Project. The major increasing risks identified related to climate change in the Tiris Zemmour region are heatwaves and heat stress.

For instance, in June 2025, Mauritania experienced an exceptional heat wave, with temperatures reaching up to **55°C** in some regions. The Tiris Zemmour region was not spared by this wave, with temperatures recorded under shelter reaching **48,52 °C** in July 2024 and **47,89°C** in August 2025 on the El Aouj weather station (Figure 6-13). These episodes are expected to become more frequent and severe, turning heatwaves into structural risks rather than seasonal anomalies.

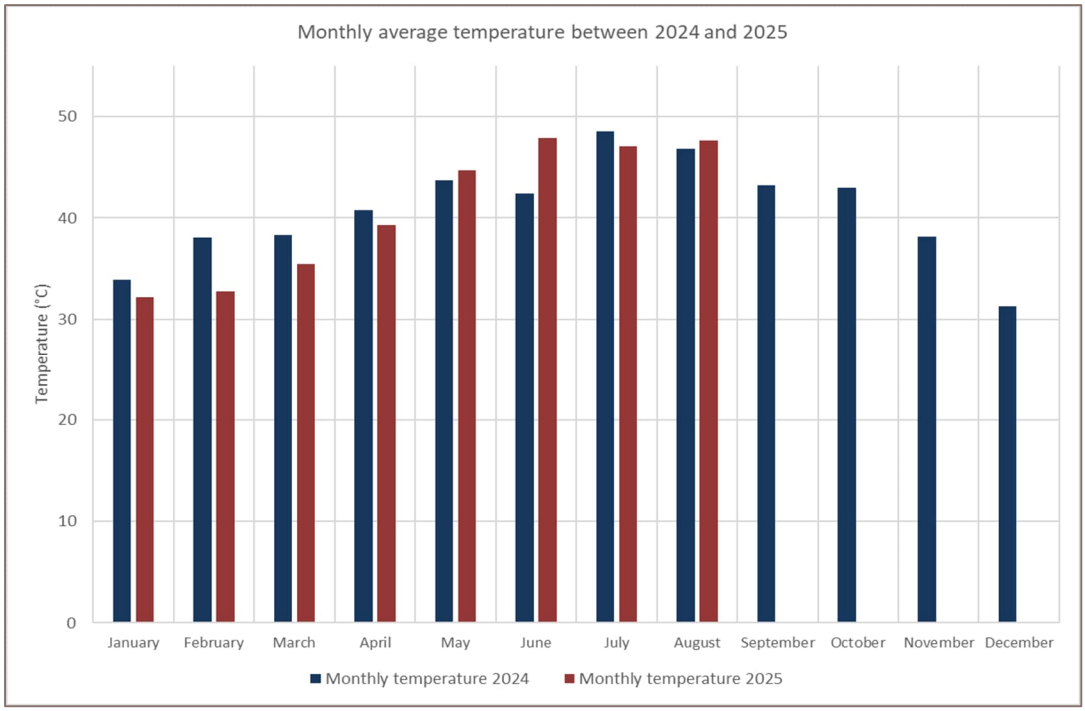


Figure 6-13: Daily average temperate at El Aouj Weather Station_01 January 2024 to 27 August 2025.

According to the CCRA (WSP, 2023), there is no evidence of an elevated risk of water scarcity, as the water resource is sourced exclusively from underground reserves and is not expected to be impacted by rising temperatures or anticipated heat waves. The sole surface water source in the mine area is the intermittent artificial reservoir at F'Derik, which is utilized for agricultural purposes during the rainy season and remains dry throughout the dry season. This situation indicates that any potential decrease in groundwater resources will be mainly the result of the exploitation of various human activities in the Zouérate region, which use the same aquifers, rather than the effects of climate change.

According to the CCRA, no significant trend is observed regarding the evolution of the volume of rainfall in the Tiris Zemmour region. Between 1950 and 2022, the average annual precipitation was 38.11 mm/year, with high interannual variability (standard deviation of 39 mm/year), ranging from almost 0 mm to nearly 200 mm in some years. According to the three climate scenarios analysed (SSP1-2.6, SSP2-4.5, SSP5-8.5), the models show no significant upward or downward trend in the cumulative annual volume of precipitation until 2100. It is expected to remain stable at around 100 mm/year.

A slight increase in peak intensity is projected under the intermediate and pessimistic scenarios (reaching up to 160 mm/day at a 100-year return period); however, this does not indicate an increase in total annual volume but suggests greater variability in extreme events. The CCRA indicates that the risks associated with extreme rainfall and severe storms could shift from low risk currently to medium risk between 2080 and 2100.

6.6.1.2 Meteorology

- **Temperature**

The data used for the temperature analysis was collected via the Meteostat website from the Zouérate weather station. The average maximum temperatures in the Tiris Zemmour region are around 32.9°C during the day and 19.8°C at night. In 2024, the average annual temperature varies between a minimum of 13°C and a maximum of 41.86°C. The graph below shows the average monthly temperatures recorded at the Zouerate weather station in 2024 (METEOSAT, 2024).

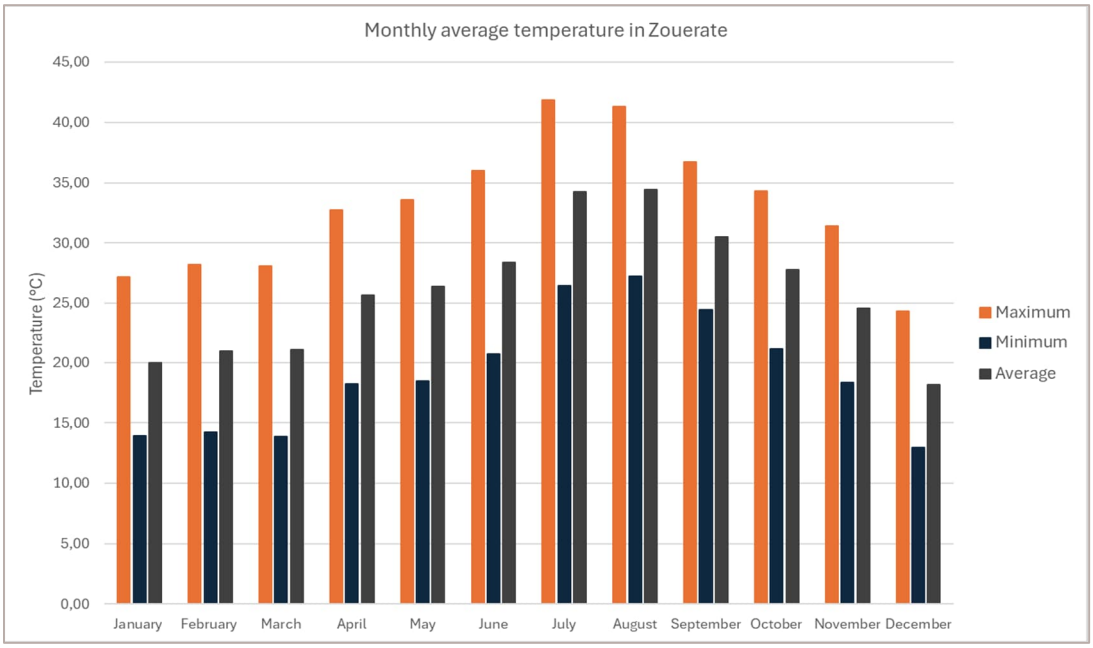


Figure 6-14: Average monthly temperatures in 2024 in Zouerate (METEOSAT, 2024).

- **Pluviometry**

The data used for the rainfall analysis was collected via the MÉTÉOSTAT website from the Zouérate weather station. Due to the desert climate, rainfall in the Tiris Zemmour region is rare and often irregular, almost non-existent. According to the data, the average annual rainfall recorded in Zouérate in 2024 was 14.4 mm. Table 6-3 below shows the average monthly rainfall at the Zouérate weather station in 2024.

Table 6-3: Average monthly rainfall in 2024 at Zouérate (METEOSAT, 2024).

Average monthly rainfall	Month											
	January	February	March	April	May	June	July	August	September	October	November	December
Quantity (mm)	0.0	0.0	0.0	6.4	0.0	0.0	0.0	0.0	5.8	0.3	1.8	0.1
Total (mm)	14.4											

- **Wind**

The continental trade winds, particularly the harmattan, play a role in the Tiris Zemmour region's climate, contributing to drought and low atmospheric humidity. According to available historical data, the predominant wind direction varies depending on the location, due to the local topography, particularly the presence of the Kedia d'Idjil massif, which alters air flows (URS , 2015):

- F'Dérik: prevailing winds from the north-east;
- Guelb Askaf Nord, located between F'Derik and Touajil: prevailing winds from the east;
- Zouérate: prevailing winds from the north to northwest

This relief acts as a natural barrier, influencing the deflection of winds, which explains the differences observed between nearby localities. Figure 6-15 shows the wind rose based on data recorded at the Zouerate weather station between 01 January 2020 and 05 November 2025, a five-year observation period.

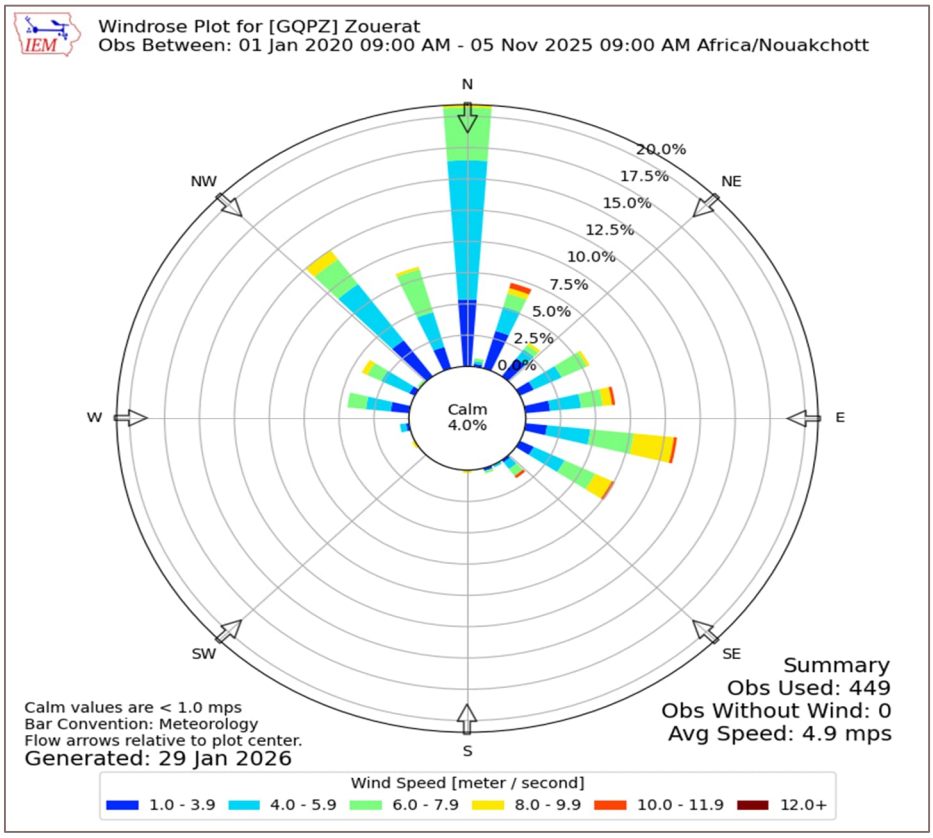


Figure 6-15: Wind rose from Zouerate weather station (IOWA ENVIRONMENT MESONET, 2025).

Between 2020 and 2025, the Zouerate region experienced winds dominated by a flow from the north, with secondary occurrences from the north-west and north-east. A few episodes of winds from the east were also recorded during this period, although they remained relatively infrequent. The average wind speed during this period is 17.64 km/h (4.9 m/s). Winds from the north are particularly pronounced, with generally low speeds and episodes exceeding 6 m/s.

6.6.1.3 Field data

A weather station was installed in the El Aouj mining area in 2023. It continuously records wind direction and speed, with measurements taken every ten minutes, providing an accurate set of climate data representative of local conditions. The graph in Figure 6-16 shows the wind rose based on data collected between 19 February 2023 and 27 August 2025. This analysis highlights the prevailing wind direction trends in the El Aouj mining area.

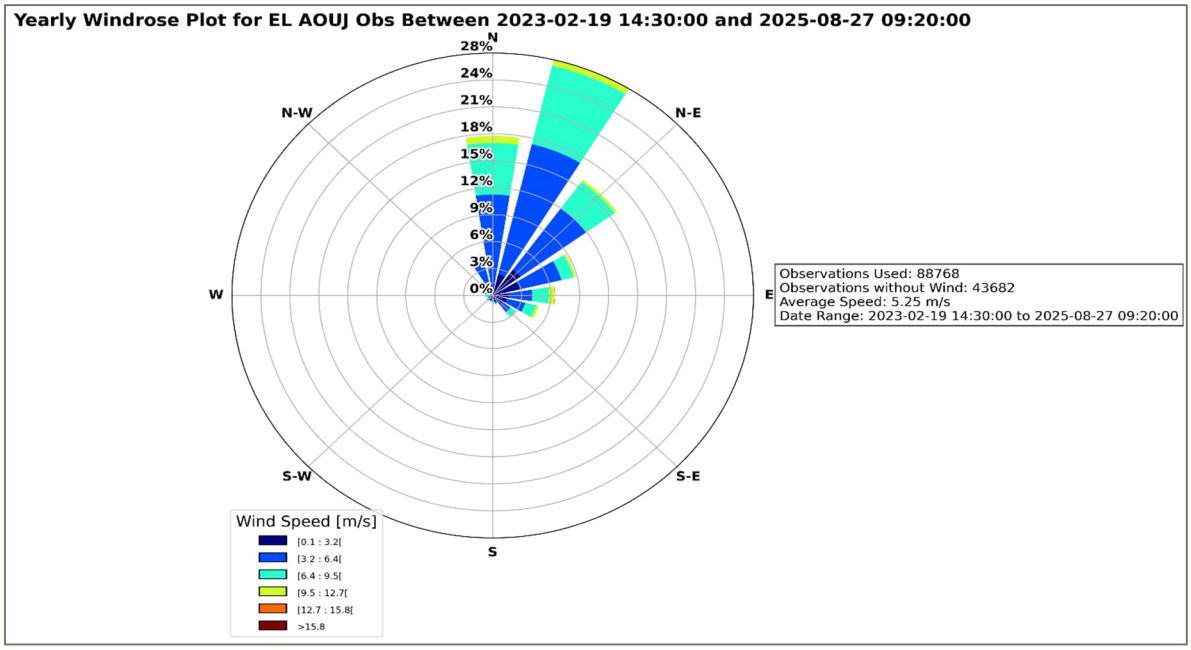


Figure 6-16: Wind rose from El Aouj weather station.

Between 2023 and 2025, the El Aouj mining area is subject to wind conditions strongly dominated by winds from the north (N), north-northeast (NNE) and northeast (NE). The average wind speed is 18.9 km/h (5.25 m/s), with a notable occurrence of calm periods. The speeds observed are mostly low to moderate, with a significant concentration of occurrences between 2 and 6 m/s.

6.6.2 Geology and geomorphology

6.6.2.1 Regional context

In the mine area, two main geological domains are present (see Figure 6-8 in section 6.4.3.1.1):

Reguibat Ridge

The Reguibat Ridge extends mainly into Mauritania and Western Sahara (central and western part) as well as Algeria (eastern part). It is a vast elongated NE-SW bulge forming the northern part of the West African craton. It is an ancient tectonic window formed by Archean and Paleoproterozoic rocks. It is composed of granites, gneiss, amphibolites and Birimian volcanic rocks. This region is also known for its large iron deposits, particularly in Zouerate and Kedia-Idjill, where ferruginous formations have been exploited since the 1950s.

The Reguibat Shield is Mauritania's main mining region, containing key hematite deposits like Kedia Idjill and several guelb-type magnetite-quartzite sites, including El Rhein, M'Haoudat, and El Aouj.

The El Aouj mining site is centred on the east of Guelb El Aouj. A preliminary EMC assessment of the analytical data for waste rock does not show evidence that acid rock drainage (ARD) will occur. Additionally, the residue samples lack sulphur, suggesting a low potential for ARD.

Taoudeni Basin

The Taoudeni Basin represents the most extensive intracratonic sedimentary basin in West Africa, spanning the territories of Mauritania, Mali, Guinea, Burkina Faso, Senegal, and Sierra Leone. In Mauritania, the basin is located southeast of the Reguibat Ridge, where it partially overlaps the ridge in a nonconforming manner. The basin originated at the end of the Proterozoic period, during an extended phase of thermal subsidence that resulted in the continuous accumulation of sedimentary deposits exceeding 6,000 metres in thickness through

to the Middle Paleozoic. The sedimentary series mainly consists of continental or shallow marine siliciclastic deposits with minor shallow marine carbonates. The lithology is fairly uniform, featuring alternating limestone, dolomite, sandstone, conglomerate, and mudstone.

The basin features horizontal to subhorizontal stratification and contains few significant faults. It is intersected by deep structural lineaments oriented N70–80°E, known as Guinean-Nubian lineaments, which formed prior to or during the Pan-African orogeny (600 Ma) and locally affect the geometry of the deposits.

During the Hercynian orogeny (360 - 290 Ma), the basin experienced mild folding, resulting in moderate uplift and slight deformation of sedimentary layers (Figure 6-17).

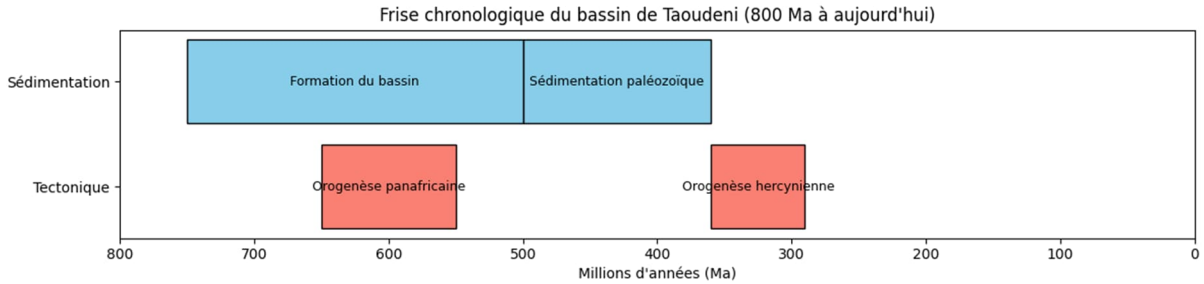


Figure 6-17: Timeline of the Taoudeni Basin formation (800Ma to present)

The Taoudeni basin is the main sedimentary structure grouping together all the aquifers that represent almost exclusively the source of water supply for the Tiris Zemour region, including the groundwater resource for the El Aouj Project (see section 6.6.4). Topography and landscape

The AoI is characterized by a topography dominated by a vast plain with arid and desert-like features, interspersed with discontinuous orographic formations. Geomorphological analysis enables the identification of several principal units:

- Plateaux and Rocky Massifs: This category notably includes the Kedjia d'Idjill, the highest point in Mauritania, reaching an altitude of 915 meters, as well as various reliefs composed of sandstone and other rocky formations (SNIM, 2024).
- Guelbs: These are morphological structures specific to the region, often filled with fine sediments, indicative of a distinctive geological dynamic.
- Sebkhas: These are flat-bottomed depressions characterized by high salinity. They result from the accumulation of temporary water followed by intense evaporation. The Sebkha Idjill serves as a prominent example of this type of formation.
- Sand Dunes of Azefal and El Hammami (URS, 2015): These semi-fixed to mobile dunes are shaped by prevailing north-easterly winds. Various forms are observed, including barchans, transverse dunes, and more complex structures that locally evolve into slouks.
- Ergs and Regs: The area comprise both expanses of sand dunes (ergs), either mobile or stabilized, and residual erosion surfaces covered with gravel or pebbles (regs), typical of Saharan environments (SNIM, 2024).
- Depression areas: These depressions, either structural in origin or resulting from erosion, serve as temporary collectors for wadis, which are active primarily during exceptional rainfall events. They hold significant hydrological and ecological importance.

In addition to these natural features, the landscape also incorporates human elements: permanent settlements, linear transport infrastructures (roads, tracks), as well as isolated nomadic encampments associated with traditional pastoral practices (URS, 2015).

6.6.3 Hydrology and Surface water

The AoI is characterized by a hydrographic network typical of arid environments, dominated by the presence of wadis. Wadis are ephemeral watercourses that generally remain dry outside of rainfall events. No permanent surface water sources have been identified in the immediate vicinity of the El Aouj mine. Rainfall in the region is scarce and highly irregular, typically occurring over short annual periods, often within a matter of hours (URS , 2015). Due to its intensity, rainfall can generate significant volumes of runoff and high flow rates within the wadi systems. Temporary ponds may form in depressions depending on the intensity and duration of precipitation. These ponds can persist from a few days to several months and serve as refuges for local wildlife.

Mine Area and Touajil wellfield

The mine area is characterized by an extreme scarcity of surface water resources, mainly due to low rainfall, high interannual variability in precipitation and recurrent droughts.

There are 5 main wadi catchments of relevance around the mine site:

Catchment A: Catchment A covers the largest area (approximately 7 120km^2) originates in Western Sahara to the west, extends to the Touajil region to the south, and encompasses the northern and southern slopes of the Kedja Idjill belt to the east. This feature is a key structural element of the regional hydrographic network. Runoff is diffuse across the Kedja dome, occasionally channeled by thalwegs that feed the plain's wadis. All surface flows converge towards the Sebkha Idjill, the watershed's sole outlet, where water evaporates or infiltrates into this low-lying area. Around Touajil and in the groundwater supply area, there are only a few minor channels rather than major wadi catchments.

Catchment B: This catchment extends over an area of approximately 420 km² and mainly covers the Toueirga wadi area, located north of the Kedja Idjill. Its outlet is located at the F'Derik dam. A secondary wadi collects runoff water from the northern flank of Guelb Atomaï and directs it toward the F'Dérick dam.

The F'Derick dam is a retention structure constructed in 2010 along the course of the Wadi crossing F'Derik, to mitigate flood risks and protect the locality of F'Derik. This dam is the main source of temporary surface water in the area. During flood events, water accumulates upstream of the dam to form a temporarily fertile wetland utilised by local communities for agricultural purposes. The retained water also supplies a well-used by the local population for recreational activities, particularly in the evenings and at weekends. Consequently, the area immediately north of the F'Derik dam is of significant sociocultural importance to the inhabitants of F'Derik and Zouérate (URS, 2015). No data on the chemical quality of the water in the F'Derik dam is currently available.

The following two catchments encompass the mine site and most of its infrastructure:

Catchment C : this watershed includes all the slopes located outside the future open pit, i.e. on the outer flanks of the V-shaped structure constituting the El Aouj mountain. It is in this watershed that almost all the mining infrastructure will be built. All the secondary collectors flow into a main wadi which bypasses the Guelb El Aouj to the south and reaches the depression of the Sebkha of Idjill about 8km westward.

Catchment D: this watershed collects all the runoff from the area in which the open pit will develop, i.e. inside the V-shaped structure constituting the El Aouj mountain. After the Guelb El Aouj, the network develops in a very flat area partially covered by dunes bars and where the water lines remain difficult to identify to emerge into a depression in connection with the northern end of the Sebkha of Idjil.

The Sebkha of Idjill is the only outlet for runoff water from the F'Dérik region and the El Aouj mine area.

Catchment E: this last watershed develops to the north of catchments C and D, on an area with a very flat relief but converge towards another Sebkha located about 26km to the north.

The hydrographic network has an essentially dendritic shape for the secondary collectors, and wide and sandy wadis, with poorly identified banks for the main collectors (Figure 6-18).

Aouchich Area

There is no permanent surface water in the vicinity of the Aouchich wellfield. There are three main wadi catchments of relevance covering the Aouchich wellfield area. The 3 catchment basins converge towards a low zone characterized by a succession of Sebkhas located near each other in the area between SP14 borehole, Akregit and Boutaha wells (Figure 6-19).

One of these 3 catchments is described as AWS1 (Aouchich Watershed 1) (1 400 km^2) and drains the entire northern part of Aouchich wellfield and empties into a large V shape Sebkha at the foothill of SP11 borehole. In this catchment, 3 main wadies converge to this Sebkha. 2 of those wadies run along the bottom hill of a cliff delimitating the western border of a large and elevated plateau developing eastward. The third wadi runs northward, curves around a chevron and reaches the northern part of the Sebkha near ABH1 borehole.

A second catchment (1 800 km^2) described as AWS2 extends south-north along the bottom of the cliff delimitating the western border of the plateau. The wadi runs toward north and reaches a Sebkha located between SP13 and SP14 boreholes.

The third catchment (AWS3: 300 km^2) extends south-north with a flow direction running toward north until a Sebkha located west of SP13 borehole.

Figure 6-18: Hydrographic network in the mine area

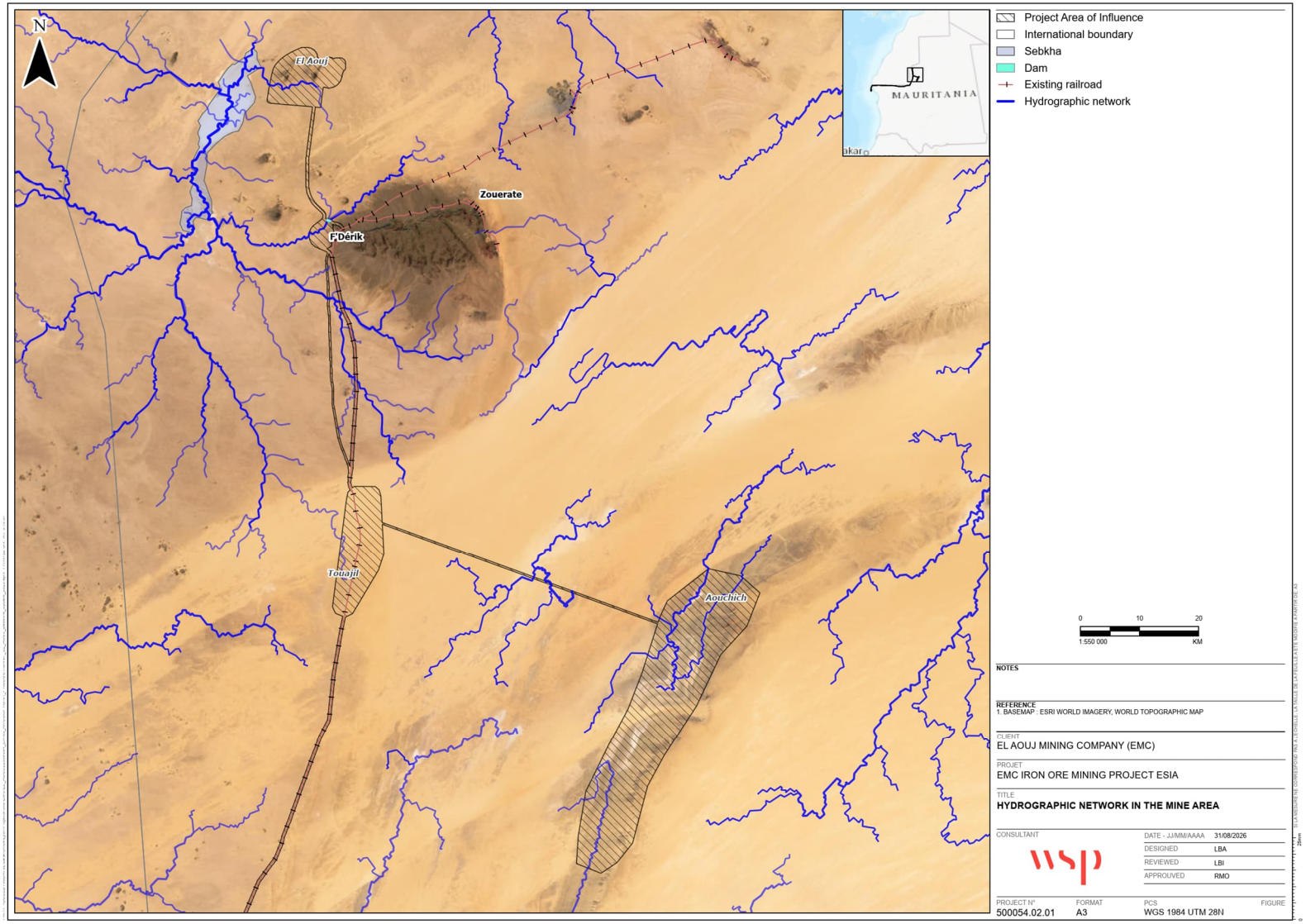
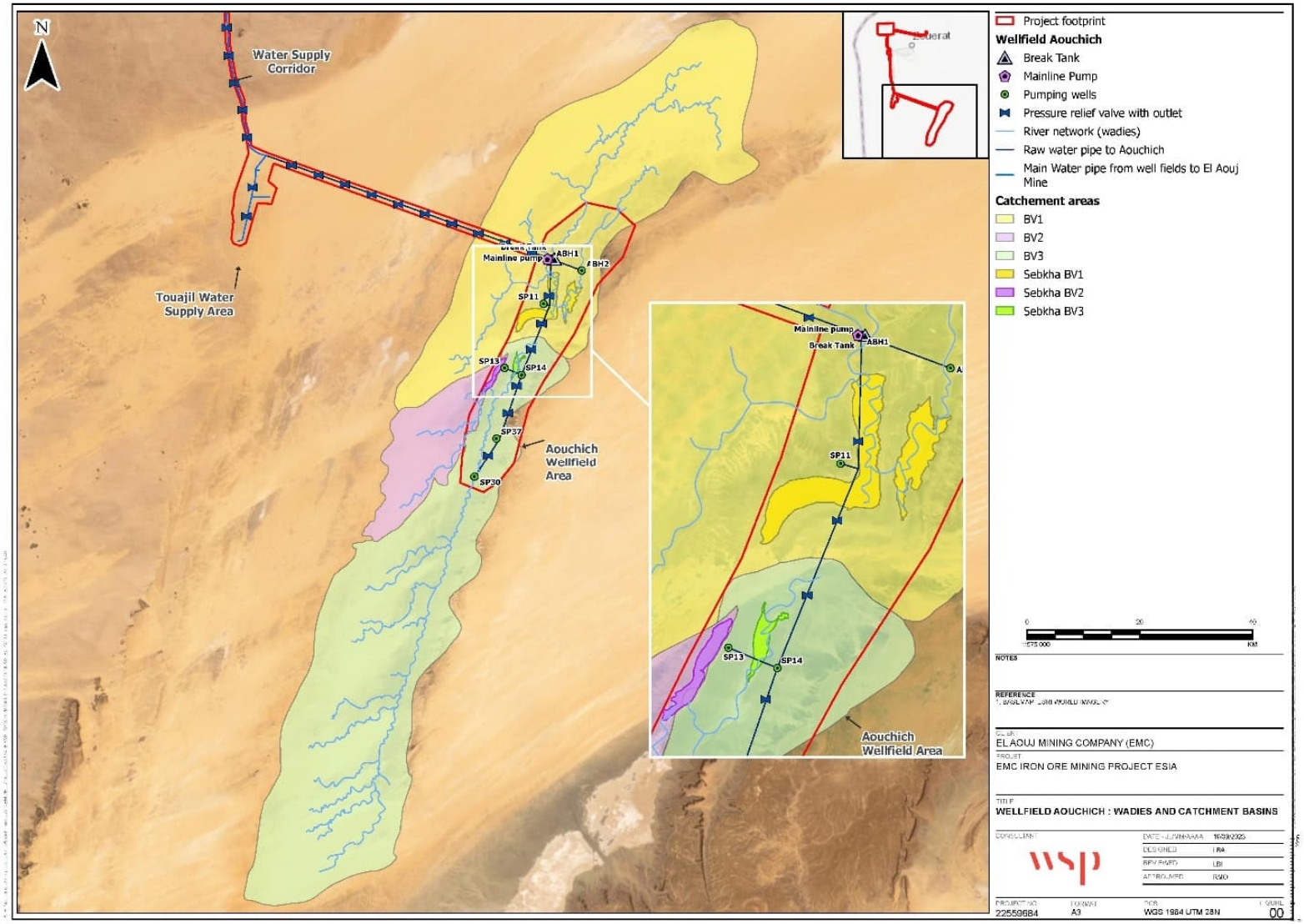


Figure 6-19: Hydrographic network and catchment in the Aouchich wellfield area



6.6.4 Hydrogeology

6.6.4.1 Hydrogeological regional context

The AoI is characterized by the presence of three major types of aquifers:

- Archaean basement aquifers,
- Aquifers within allochthonous units,
- Aquifers of the Taoudeni Basin.

All active mining operations, as well as projects currently under development in the region, source groundwater from abstraction fields located within the allochthonous units and the aquifer formations of the Taoudeni Basin.

Archean basement aquifers

The Archaean basement formations have an intrinsically low permeability due to their compact crystalline nature. The presence of groundwater within these formations depends entirely on the extent of fracturing. While fracturing can be intense in localised areas, it is generally filled with clay-rich weathering products, significantly reducing the effective porosity and transmissivity of the aquifers.

The regional crystalline basement around the mine site provides only limited groundwater, mainly supporting small-scale uses like hand-dug wells in fractured zones. Hydraulic conductivity is much lower than in the main abstraction area located within the Taoudeni basin. Hydrogeological studies found little groundwater during drilling and slow recovery rates typical of low-permeability rock with minimal usable water.

Aquifers in the allochthonous units

The allochthonous units are primarily located in the regions of Kédia d'Idjil and M'Haoudat, where they constitute aquifer systems of interest for the supply of fresh or slightly mineralised water for the town of F'Derik and the city of Zouérate. These systems may be grouped into two principal units: the Tazadit Unit and the Breccia Unit.

Tazadit Unit: This unit encompasses formations situated along the northern and eastern belts of the Kédia Idjill, notably the Tazadit, T1, and Seyala units, as well as those utilised for the water supply of the towns of F'Derik and Zouérate. The structure of the rocks, combined with the pronounced relief of the Kédia Idjill, facilitates localised aquifer recharge during episodes of significant rainfall. The groundwater is abstracted from banded hematite quartzite derived from recent storm recharge (Golder-Associates-Pty, 2008). There is no hydraulic interconnection between groundwater in the Kedia Idjill range and the Taoudeni Basin.

Breche Unit: To the southeast of the Kédia Idjill, at the boundary of the Taoudeni Basin, an aquifer unit has been identified beneath colluvial deposits: the Khreiza breche. This formation features a network of deep fractures, reaching depths between 180 and 300 metres. The water extracted from this unit is relatively fresh and exhibits signs of active recharge dynamics.

Aquifers in the Touadeni sedimentary basin

The Taoudeni Basin comprises a substantial sedimentary sequence flanked and underlain by Archaean basement rocks, reaching up to 1,800 meters in thickness at outcrop locations and potentially extending between 3,000 and 4,000 meters in depth toward the eastern regions. The aquifers in the basin occur in Precambrian to Cambrian sedimentary rocks.

The Taoudeni Basin aquifers are known from earlier work and from SNIM's wellfields, mostly close to the basin margin. All permeabilities and storage appear to be developed in secondary fracture systems of regional extent as a consequence of the basin's tectonic history and perhaps including fractures controlled by pre-existing structures in the underlying basement (Golder Associates, 2014). The sedimentary lithology dips gently to the

east and south-east at approximately 1 to 2 degrees. Figure 6-20 shows a geological section drawn E-W from south of the Touajil area to the Aouchich area (Golder-Associates-Pty, 2008).

The basin's aquifers are distributed across five principal stratigraphic units. These units are designated by the codes P1 to P5 and exhibit distinct lithological characteristics, thicknesses, and hydrogeological properties. Table 6-4 summarises the main hydrogeological importance of these formations, including their lithology, average thickness, and aquifer potential.

Table 6-4: Summary of hydrogeological formation and importance (source: Scott Wilson, 2007- (URS, 2015).

Group	Formation	Average thickness (m)	Hydrogeological importance	
P5 Assabet el Hassiane	Zreigat	400	Aquifer	Superior Atar (superior aquifer system)
	Tirembaz (Taguilatet)	215	Aquitard	
	T-n-Bessais	165	Aquifer	
P4 Atar (700 m)	Tifounke	30 - 150	Aquifer	Superior Atar (superior aquifer system)
	Touiderguilt	34 - 40	Aquifer	
	Aouleigate	70 – 80	Aquitard Aquiclude	Aouleigate-aquitard-aquiclude
	Aouinet Oulb Bou Drballa	60 - 65	Aquifer	Inferior Atar Very poor water aquifer (medium aquifer system)
	Terrarit	25 - 45	Aquitard	
	Tawaz	85 - 100	Aquifer	
	Tarioufet	55 - 70	Aquitard	
	Tod	110 - 120	Aquifer	
	Ksar Torchane	30 - 65	Aquitard	Aquiclude of Ksar Torchane
P3 Atar	Foum Char	50 - 135	Aquifer	Foum Chor-Char (inferieur aquifer system)
P2 Char	Azougui	101 - 300	Aquifer	
P1 Char	Agueni	36 - 40	Possibly poor aquifer	

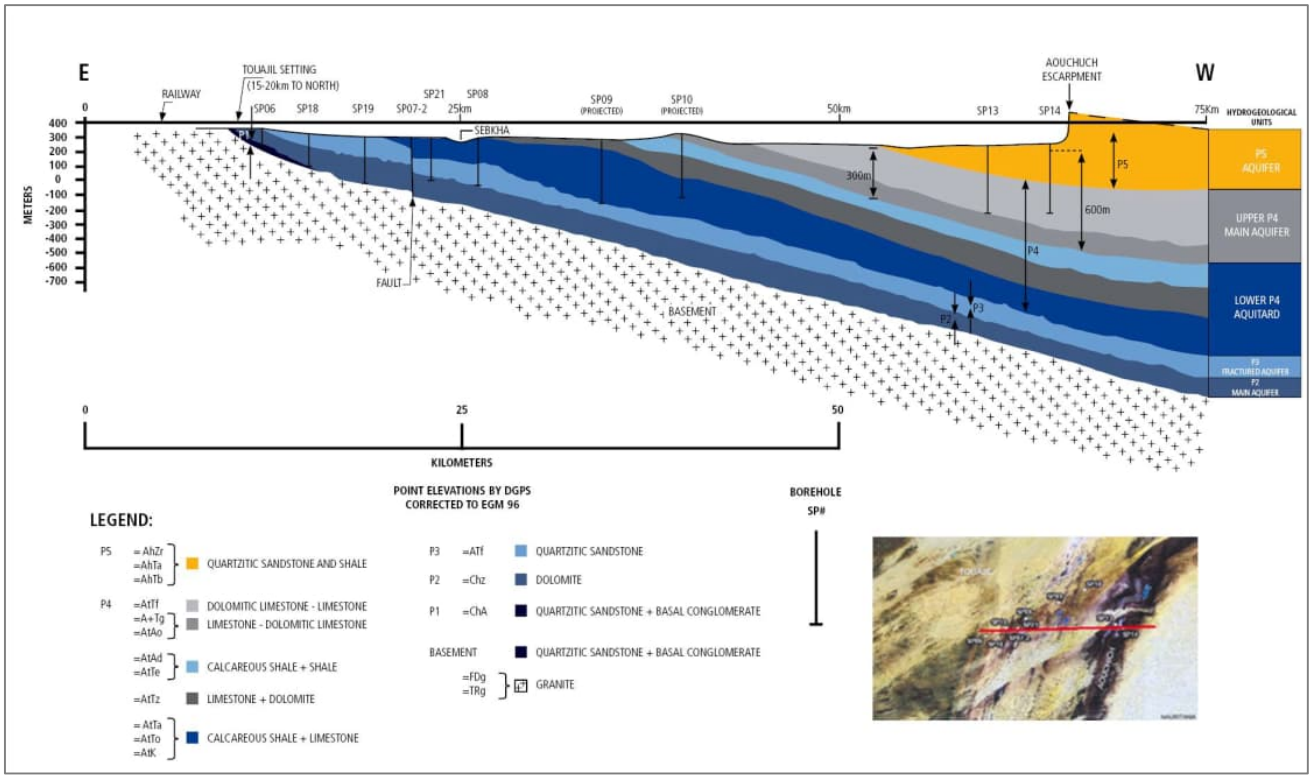


Figure 6-20: Section showing Lithology and Hydrostratigraphical Aquifer Units (Golder-Associates-Pty, 2008)

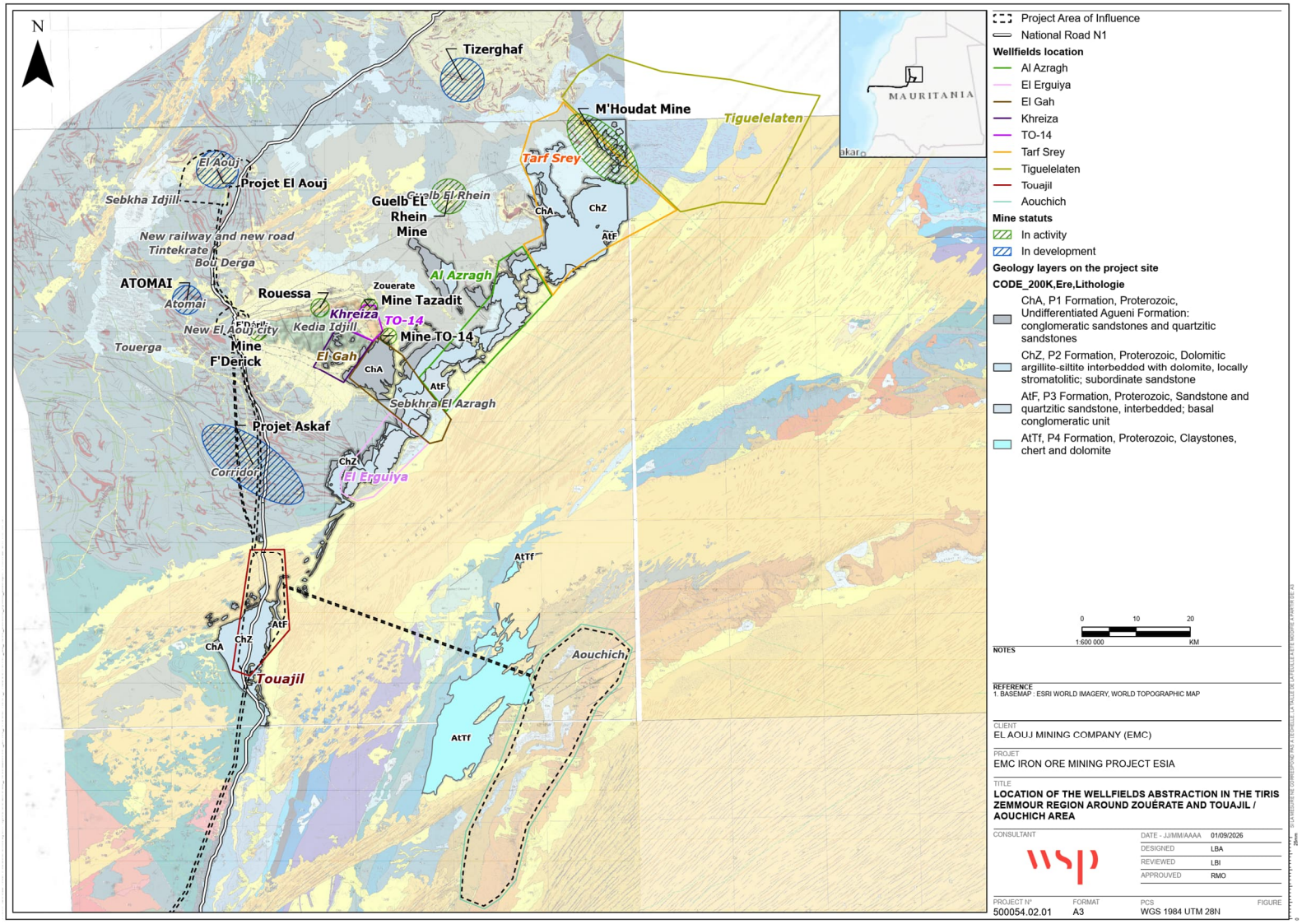
The P1 formation, which comprises the oldest geological units of the basin, outcrops to the west of Touajil along the edge of the Basin. It is overlain by progressively younger strata, whose outcrops extend eastwards from the western edge of Aouchich.

The Touajil aquifer unit outcrops along the western edge of the Basin, and comprises dolomite, termed the P2, which lies on the P1 quartzite. Groundwater occurrence is widespread in this unit. The targeted aquifer in P2 unit can be as thick at 200-300+ m at Touajil, representing saturated (aquifer) thicknesses as great as 150 – 250 m or more (and less near the basin margin) (Golder Associates, 2014).

The Aouchich area is characterised by the occurrence of medium to well-developed aquifer in the upper part of the P4 sequence. At Aouchich, the carbonate units within P4 may be 300 m thick or more, the base not having been intersected by drilling to 500 m depth (Golder Associates, 2014).

Figure 6-21 shows the surface geology of the area depicting the outcrop areas of the different hydrogeological units of importance for the study namely the P1, P2, P3, P4 and P5 units and illustrates the location of all the active groundwater abstraction fields in the Tiris Zemmour region and within the project's study area.

Figure 6-21: Location of the Wellfields in the Tiris Zemmour region around Zouérate and Touajil / Aouchich area



A desktop review and recent field surveys between 2023 and 2025 on boreholes and wells was conducted within the project's AoI. A total of 105 groundwater abstraction points (wells and boreholes) were recorded, of which 52 are currently operational (Table 6-5 and Figure 6-22). A large portion of these boreholes are today out of order (blocked, buried, dry or not visible anymore). The historical groundwater level data are limited to measurements obtained in 2007 and 2009 as part of the groundwater reserve assessment program conducted by Golder Associates (Golder-Associates-Pty, 2008) (Golder, Guelb El Aouj Iron Ore Project, MAuritania, Groundwater Monitoring Program - December 2007 to February 2009, 2009). These records have been systematically compared with current groundwater level and physico-chemical parameter data collected annually from March 2023 to July 2025 for the purposes of the present baseline assessment. Figure 6-24 illustrates the locations and current status of all boreholes identified within AoI

Table 6-5: Wells and boreholes in the Tiris Zemmour Project's AoI

Area	Well / borehole operational	Well / borehole out of order
El Aouj mine area	2/2	0/4
F'Dérik	4/1	2/0
Touajil	0/8	0/25
Corridor	0/9	0/7
Aouchich	6/18	0/6

1: El Aouj well

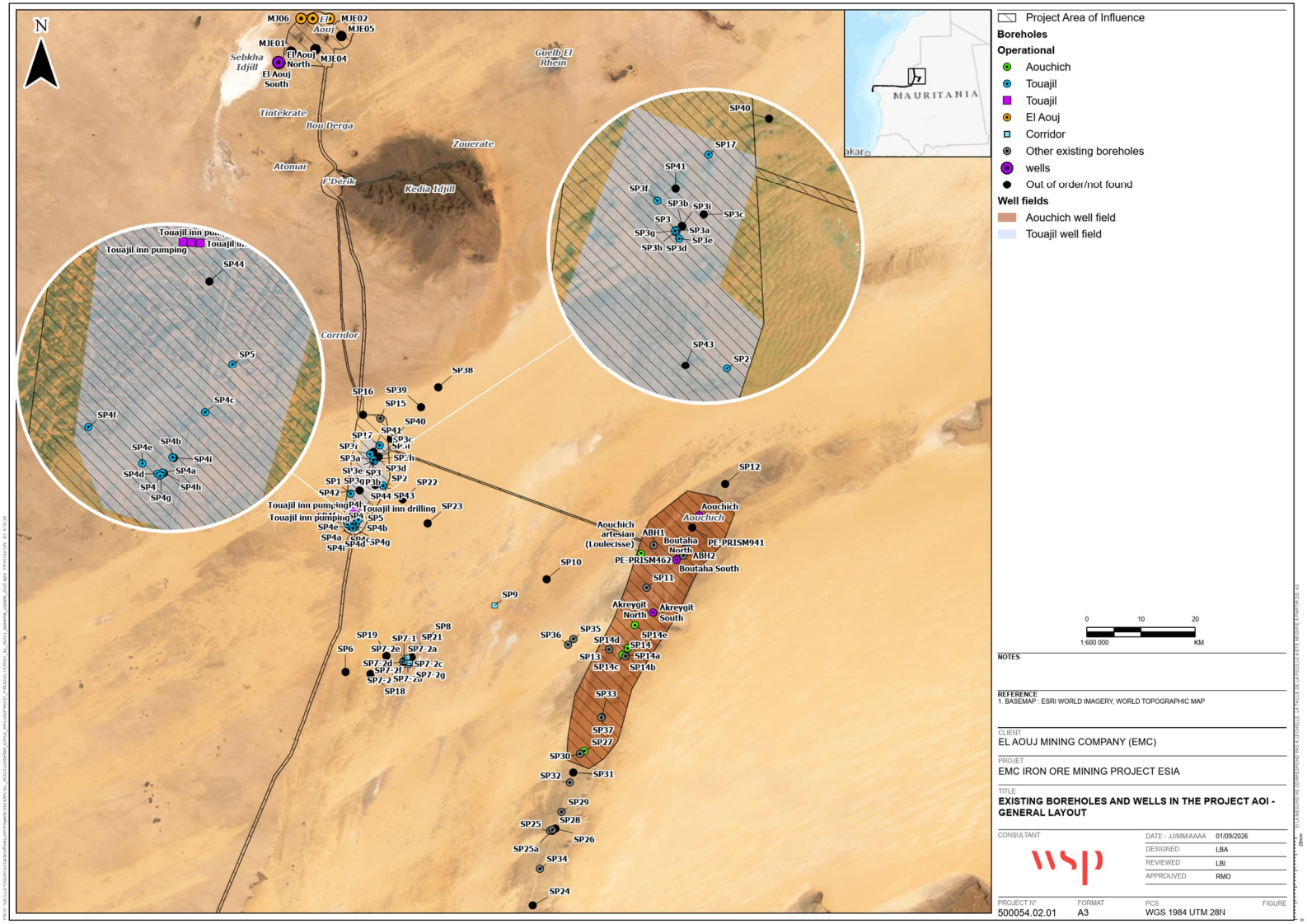
2: Touajil: SP03 borehole equipped with pump

3: F'Derik well

Figure 6-22: operational wells and boreholes in the AoI

Figure 6-23: Example of not operational boreholes in the Touajil wellfield.

Figure 6-24: Existing boreholes and wells in the Project AoI: general layout



6.6.4.2 El Aouj Area

The boreholes and wells around the El Aouj mine are located within archean basement outside the Taoudeni sedimentary basin where the Touajil and Aouchich wellfield will be developed (Figure 6-28).

Groundwater level

Boreholes

Six boreholes were drilled in 2013 around the El Aouj mine for monitoring purpose. Until 2024, 3 boreholes were still operational. Today, only 2 of them are operational, the others having been vandalized.

Annual groundwater level monitoring has been performed between 2022 and 2026. Along this period, only the furthest monitoring borehole (MJE06) located 4km west of the future open pit shows variations. The two other boreholes show constant static levels (Figure 6-25).

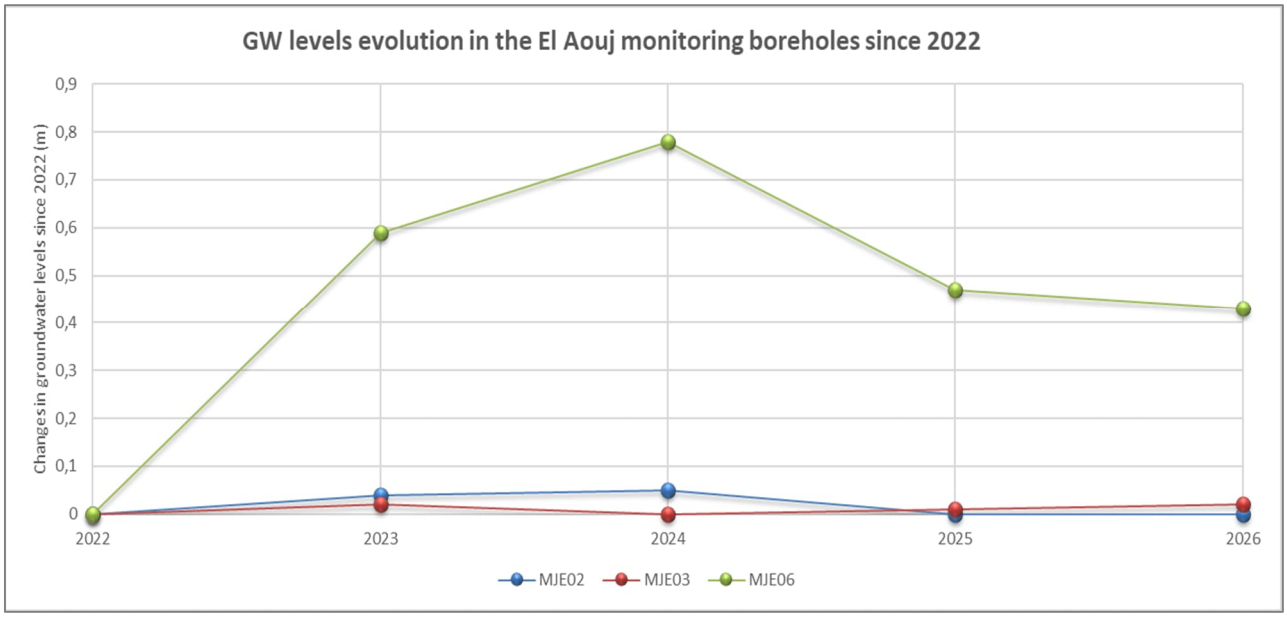


Figure 6-25: Groundwater levels trends in the El Aouj monitoring boreholes between 2022 and 2026

Hand dug wells

Two wells located 10 km southwest of El Aouj Mine, near the Sebkha Idjill (El Aouj north and El Aouj South) regularly used by herders were also monitored.

Interpreting the piezometric fluctuations and associated trends presents challenges due to the frequent use of these wells by shepherds for livestock watering. Water is extracted directly from the wells using pumps, which means that measured piezometric levels may not represent static or stabilized conditions at the time of assessment. A comparison between current data and piezometric levels recorded from 2013 to 2015 indicates that the El Aouj North well—most commonly accessed by shepherds—exhibits no significant change in static water levels (see Figure 6-26). Additional monitoring will be necessary to validate this observation. Similarly, the El Aouj South well, although less utilized by herders, does not demonstrate a marked trend.

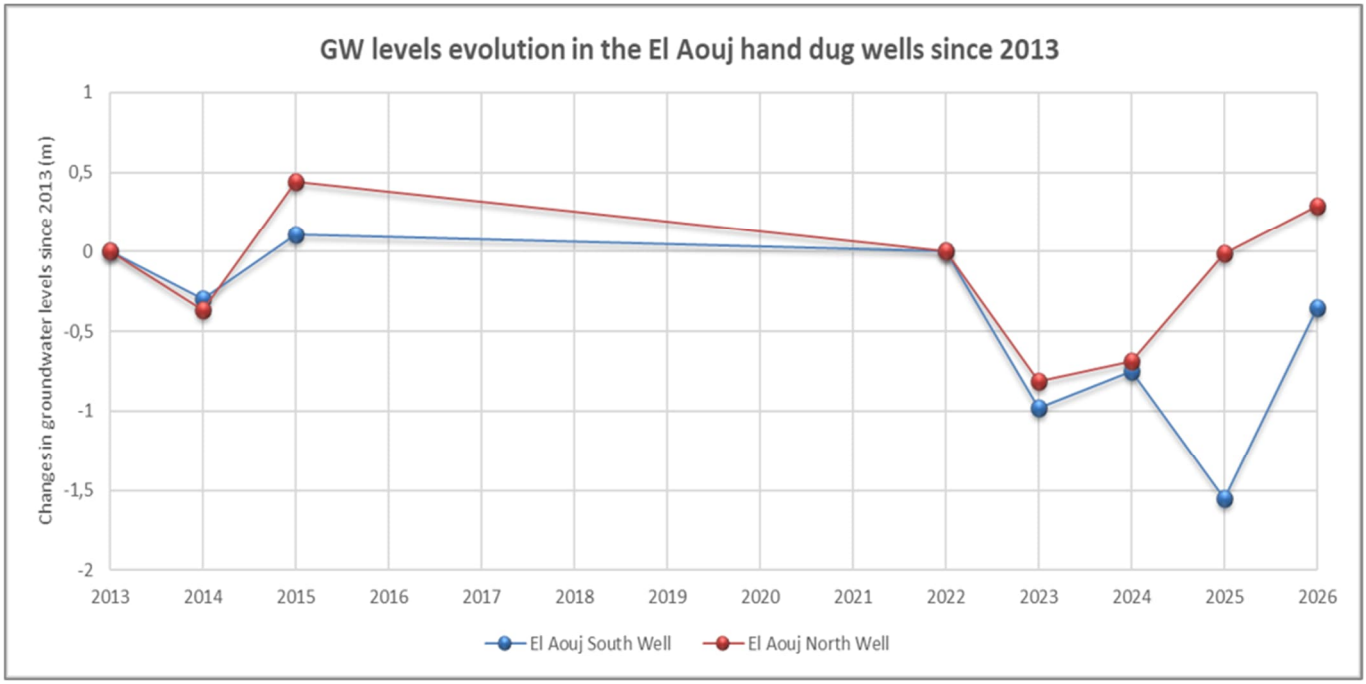


Figure 6-26: Groundwater levels trends in the El Aouj hand dug wells between 2013 and 2026

Conductivity

Analysis performed during a previous ESIA reveal that the waters at the El Aouj wells are of the calcium chloride type (URS , 2015). There is no record of conductivity at the boreholes around El Aouj and only few records allow an assessment of the variation of conductivity over time at the hand-dug wells of El Aouj. Average conductivity at the El Aouj hand-dug wells ranges between 4 and 5.3mS/cm, representative of a brackish water (fresh water <1.5mS/cm) (Figure 6-27). The two El Aouj wells show a slight increase in conductivity, which is more pronounced at the southern well.

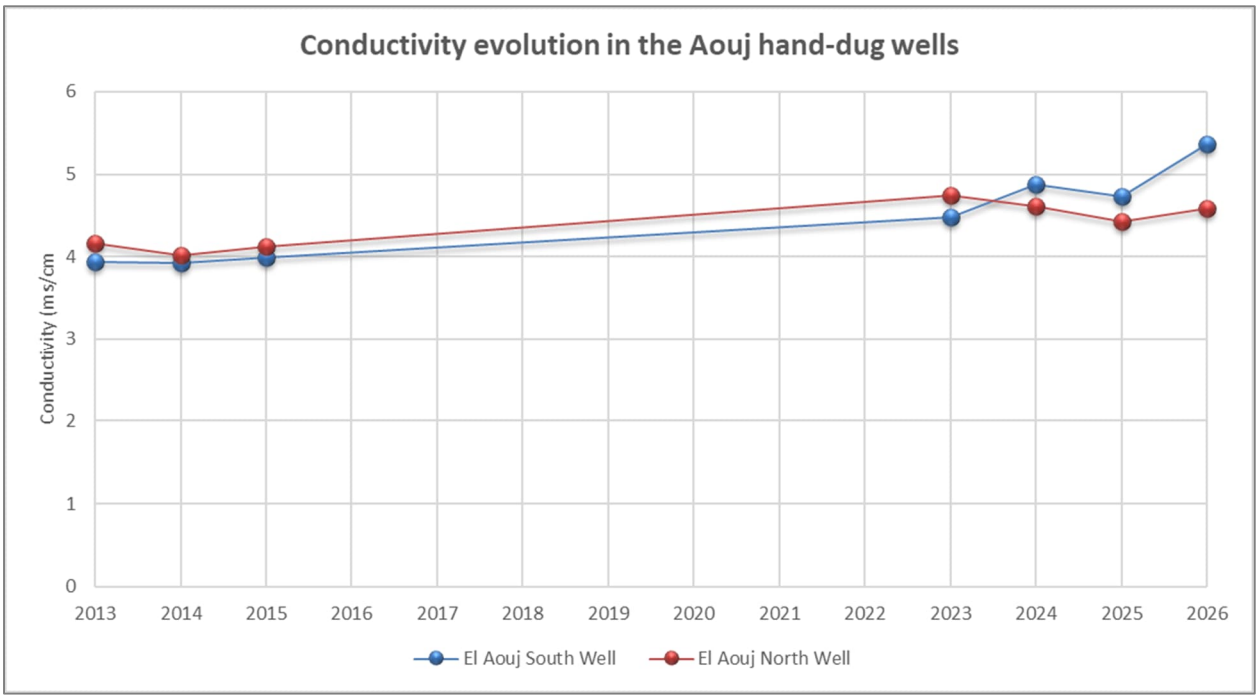
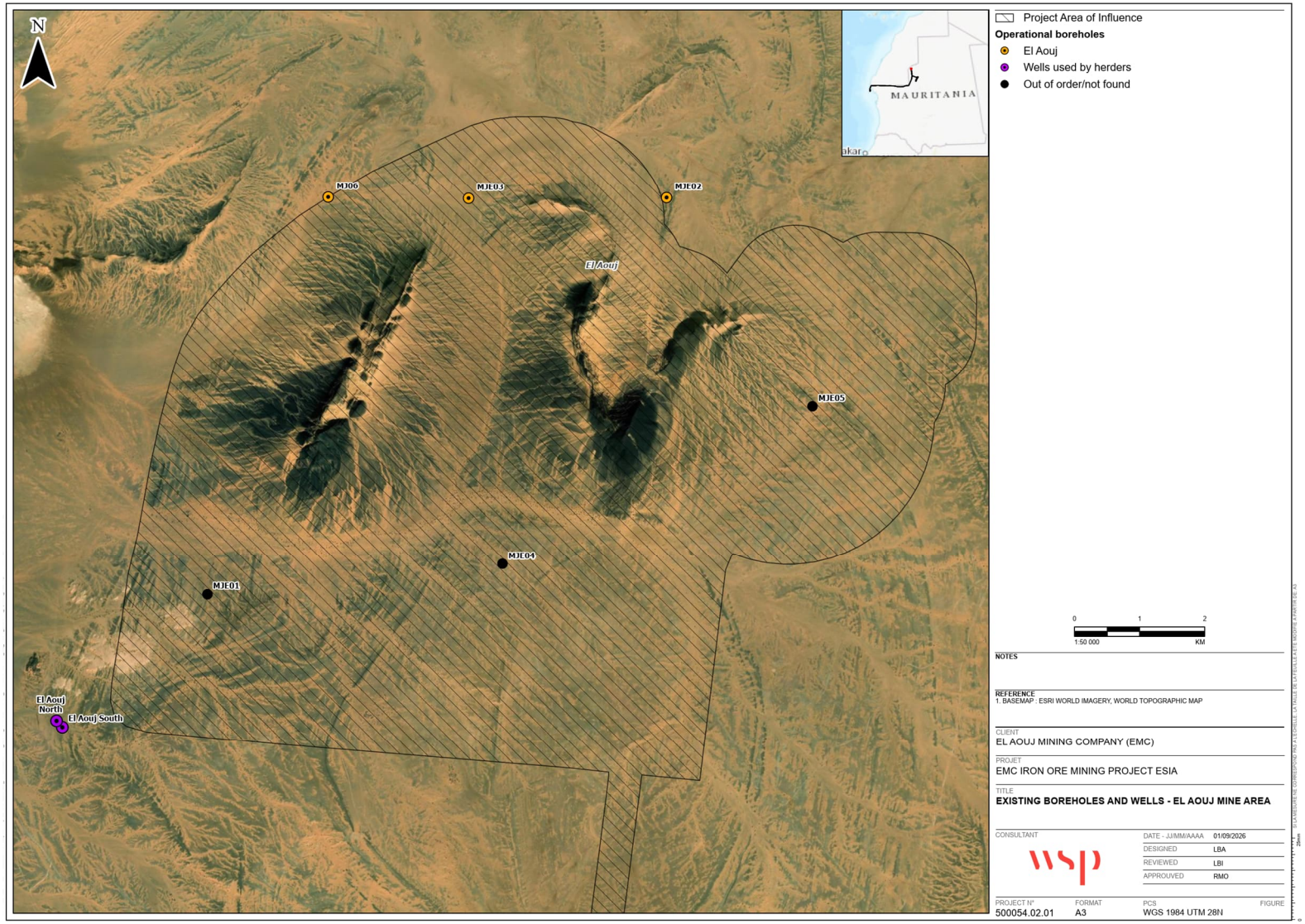


Figure 6-27: Groundwater conductivity evolution between 2013 and 2026 in the El Aouj mine area

Figure 6-28: Existing boreholes and wells El Aouj mine area



6.6.4.3 Touajil Area

Groundwater level

Boreholes

Touajil boreholes target the aquifer within the P2 unit. Until 2023, 13 boreholes were observed operational and were monitored for groundwater levels between 2007 and 2023 (Figure 6-31). In 2025 and 2026, only 8 boreholes could be monitored. Today, 26 boreholes are out of order or not accessible any more in the Touajil area. The three boreholes located within the Touajil oasis are operational but not accessible.

A total of 5 boreholes will be used for the development of the Touajil wellfield. Out of these 5 boreholes, 2 boreholes are operational (SP03, equipped with a pump, and SP04). The other boreholes are currently out of order and will be redrilled (SP02, SP05 and SP17). Access to SP03 was possible for GW monitoring until 2023. Access to SP04 is still possible.

All the monitored boreholes show a noticeable groundwater drawdown between 2007 and 2026. This drawdown ranges between -1.02 and -3.75 m (Figure 6-29).

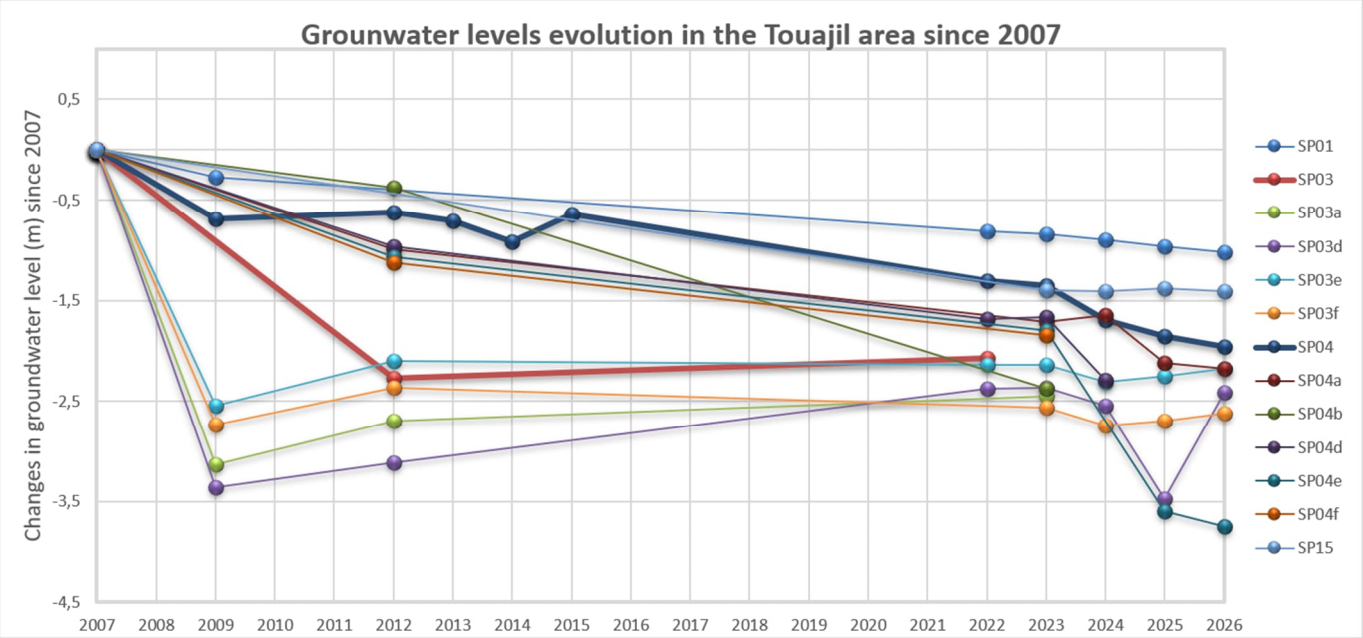


Figure 6-29: Differences in groundwater levels in the Touajil area between 2007 and 2026 (thick lines: boreholes planned to be used for GW extraction for the El Aouj Project)

This decreasing trend in GW levels is also confirmed over the last five years of monitoring for the majority of boreholes (Figure 6-32).

A clear drawdown is observed at the SP03 (pumping well) and its monitoring boreholes (SP03 a-e-f-d) during the measure in 2009 (Figure 6-30). This drawdown is due to the use of SP03 as a water source since mid-2008 for the bituminisation of the Zouérate – Touajil road. This well is still occasionally utilized by SNIM and, as such, does not provide a representative measure of the effective static levels within its area of influence.

in addition, the overall drawdown observed across all boreholes in the Touajil region may be attributable to the extraction of water from the P2 aquifer by other mining activities, located further northeast of the Touajil well field.

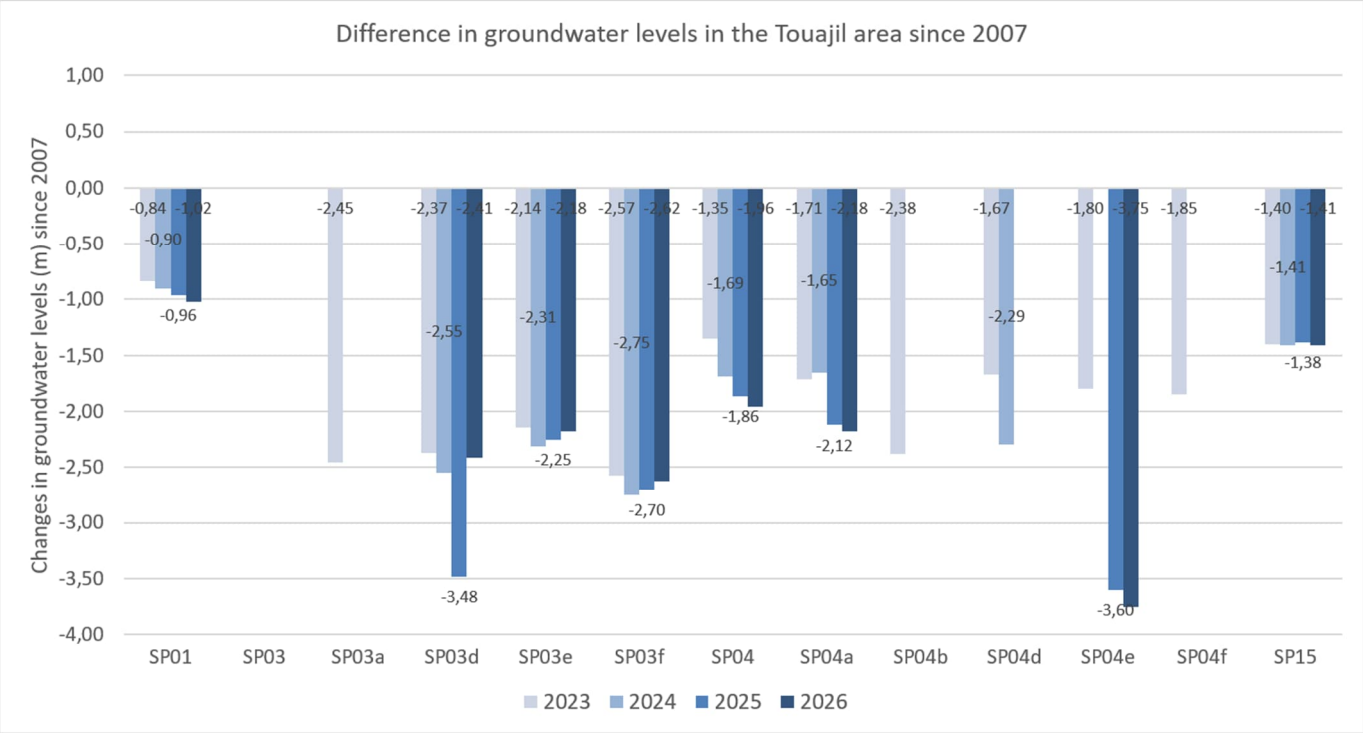


Figure 6-30: Evolution of the GW levels of the Touajil boreholes the last 4 years, compared to levels measured in 2007

Figure 6-31: Existing boreholes and wells Touajil area

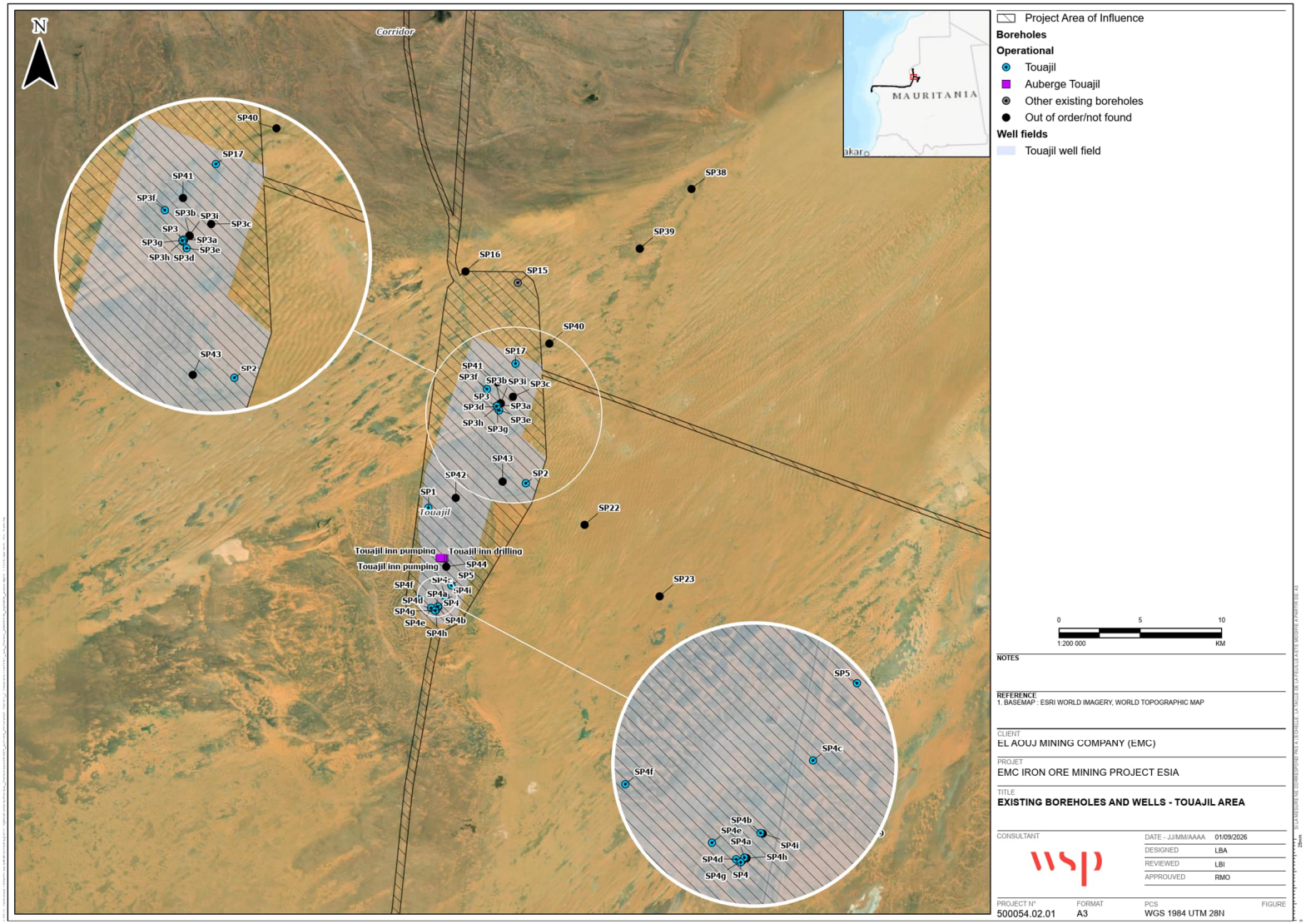
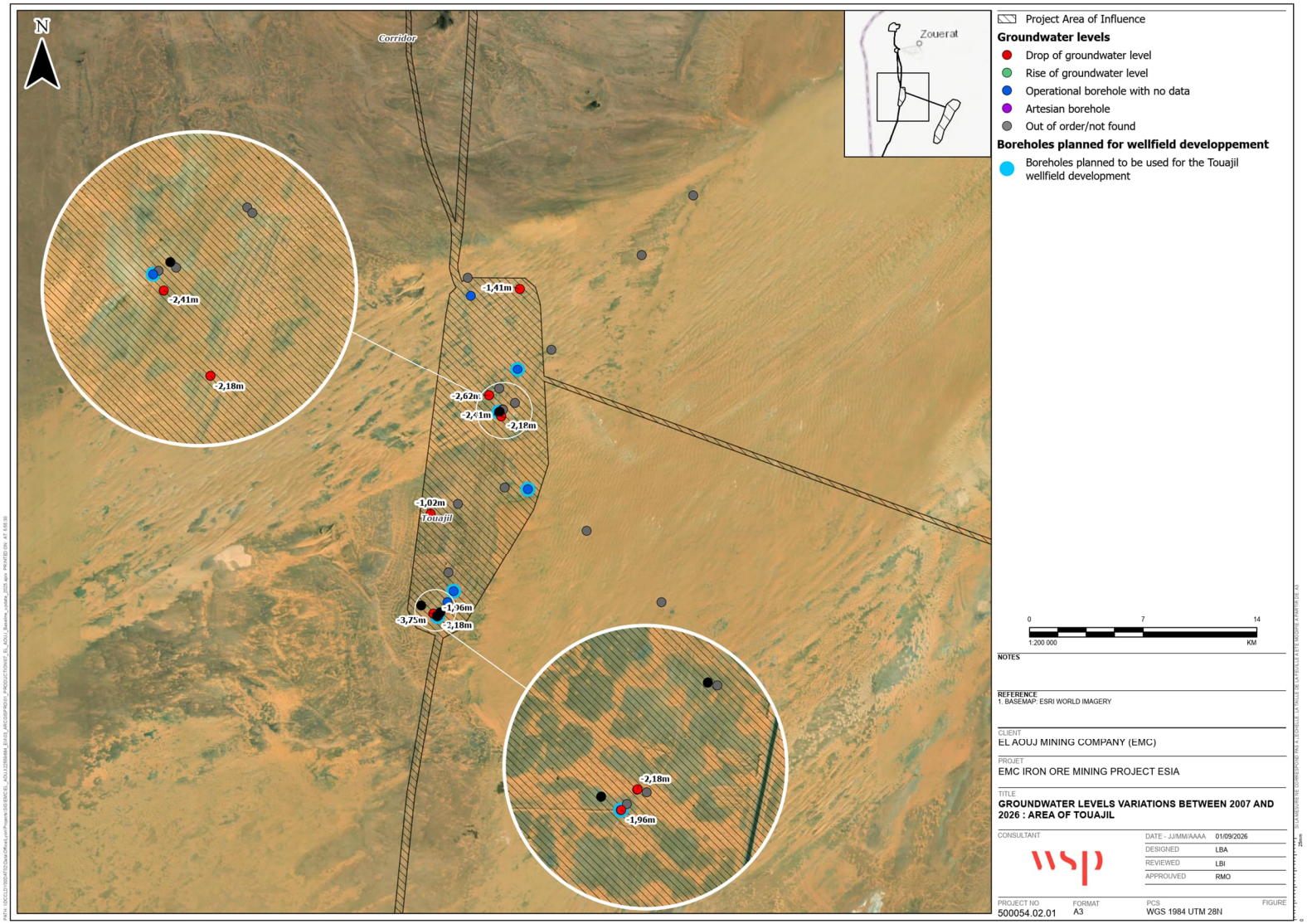


Figure 6-32: Touajil area: Groundwater levels variations between 2007 and 2026



Conductivity

Exhaustive groundwater quality assessment was performed in 2007 by Golder at most of each borehole of the Touajil area (Golder-Associates-Pty, 2008). The general groundwater chemistry in the Touajil area was determined using average concentration values derived from all available analytical results.

Notable differences are highlighted between the P2 and P3 units that constitute the aquifers of the area of interest (Figure 6-33):

Unit P3: the waters have a high brackish salinity with an average TDS of 7.706mg/L, with a predominance of sodium, chlorides and sulphates.

Unit P2: the average salinity is still brackish with an average TDS of 2.922mg/L, with a predominance of sulphates.

Aquifer	Touajil Type 1 P2	Touajil Type 2 P3
Salinity (TDS) (mg/L)	2,922	7,706
Sodium (Na^+) (mg/L)	212	2,119
Potassium (K^+) (mg/L)	15	47
Calcium (Ca^{2+}) (mg/L)	346	287
Magnesium (Mg^{2+}) (mg/L)	161	124
Chloride (Cl^-) (mg/L)	471	3,215
Sulphate ($S0_4^{2-}$) (mg/L)	1092	1,210
Nitrate ($N0_3^-$) (mg $N0_3^-$/L)	16	114
Bicarbonate (HCO_3^-) (mg/L)	212	153
Carbonate (CO_3^{2-}) (mg/L)	0	1.8
pH	8.0	7.8

Figure 6-33: General Groundwater Quality Estimate in the Touajil aquifers (Golder-Associates-Pty, 2008)

Historical and ongoing field monitoring at the Touajil boreholes show strong variations in conductivity ranging between 1.25 and 3.92mS/cm, with a possible tendency of more brackish waters in the northern part of the wellfield (SP03/SP15) and more fresh waters in the southern part of the wellfield (SP04/SP01) (fresh water <1.5mS/cm). These variations may result from tectonic compartmentalisation of blocks, which creates separate compartments with differing water quality within the same aquifer unit.

Measurements taken since 2013, and more frequently since 2023, show no notable change in conductivity.

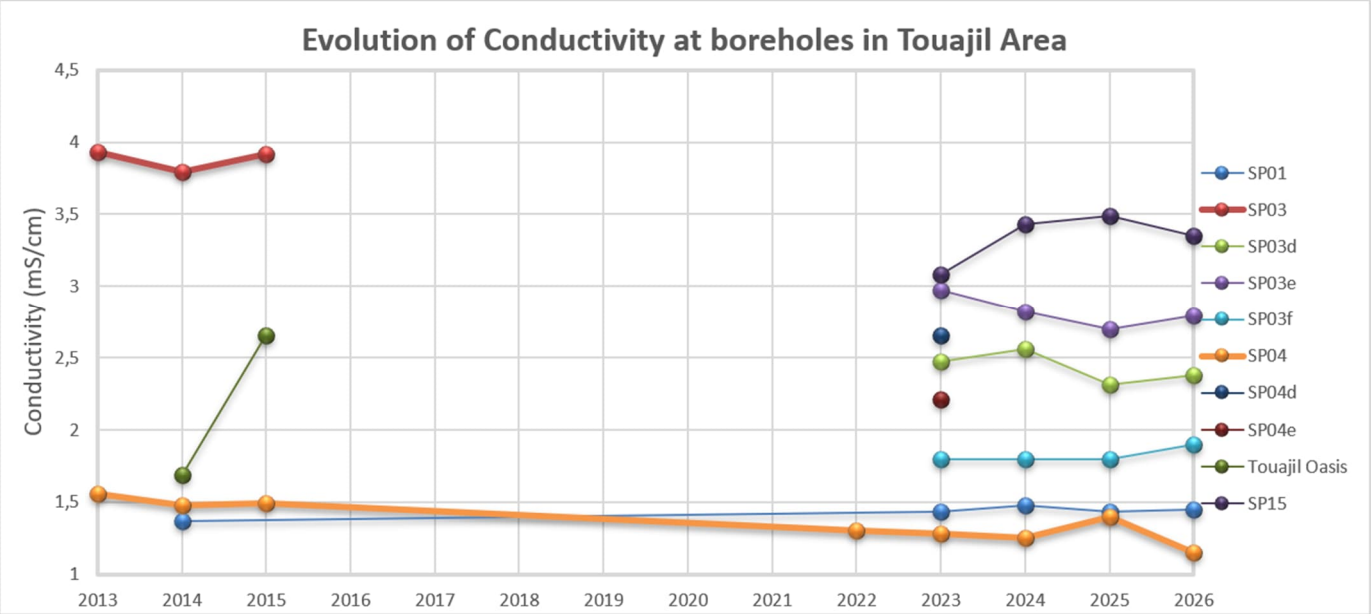


Figure 6-34: Groundwater conductivity evolution in the Touajil area.

Analytical results

The analysis of three groundwater samples collected in the Touajid sector (points SP04, SP04C and SP03d) indicates neutral to slightly alkaline borehole waters, with pH values ranging from 7.0 to 7.45, and low to moderate mineralisation, as shown by electrical conductivity values between 1,143 and 2,270 µS/cm and total dissolved solids (TDS) concentrations ranging from 816 to 1,627 mg/L. The waters show low turbidity (<1 NTU) and very low organic matter content (TOC <0.1 mg/L), indicating good clarity and a limited organic load. Concentrations of potentially toxic metals such as nickel, copper, chromium, zinc, lead, cadmium, mercury, aluminium and arsenic are generally below analytical detection limits or very low, with no evidence of significant metal contamination. Dissolved iron concentrations are relatively consistent, ranging from 1.02 to 1.16 mg/L. However, the ionic composition shows marked variability between boreholes, particularly for sulphates (67 to 580 mg/L), sodium (7.6 to 140 mg/L) and fluoride (0.24 to 1.25 mg/L), suggesting the influence of natural mineralisation from the geological formations intersected by the groundwater. Nitrate concentrations vary significantly between sampling points (3.3 to 32.1 mg/L), while nitrites and ammoniacal nitrogen remain very low or below detection limits. The low dissolved oxygen values (1.53 to 4.32 mg/L) are consistent with deep groundwater circulating under reducing conditions. Overall, these results indicate that the physicochemical quality of the groundwater is mainly controlled by the natural geological and hydrochemical characteristics of the aquifer, with no indication of notable anthropogenic contamination at the time of sampling.

The comparison between the analytical results obtained in 2026 and the historical data for the Touajil sector (Golder-Associates-Pty, 2008) highlights an overall lower degree of mineralisation in the groundwater sampled at points SP04, SP04C and SP03d. Total dissolved solids concentrations, respectively 816, 958 and 1,627 mg/L, are lower than the historical average value of 2,922 mg/L established for Touajil Type 1 waters associated with the P2 dolomitic aquifer, and substantially lower than the value of 7,706 mg/L characterising Touajil Type 2 waters associated with the P3 quartzitic aquifer. Recent sodium, potassium and sulphate concentrations are also lower than the historical reference averages, confirming the relatively less mineralised nature of the waters analysed in 2026. Point SP03d nevertheless stands out, with an electrical conductivity of 2,270 µS/cm, a TDS concentration of 1,627 mg/L and a nitrate concentration of 32.1 mg/L, which is higher than the historical Type 1 P2 average of 16 mg/L, while remaining well below the 114 mg/L reported for Type 2 P3. Recent pH values,

ranging from 7.00 to 7.45, also indicate near-neutral waters that are less alkaline than the historical values close to 8.

The analytical results obtained for boreholes SP03d, SP04 and SP04C are broadly consistent with the local hydrogeological setting, as these wells are screened within the P2 dolomitic aquifer of the Azougui Formation. The chemical composition of the groundwater reflects interaction with the surrounding dolomitic formations, which is the main factor controlling the natural mineralisation of groundwater in the Touajil sector.

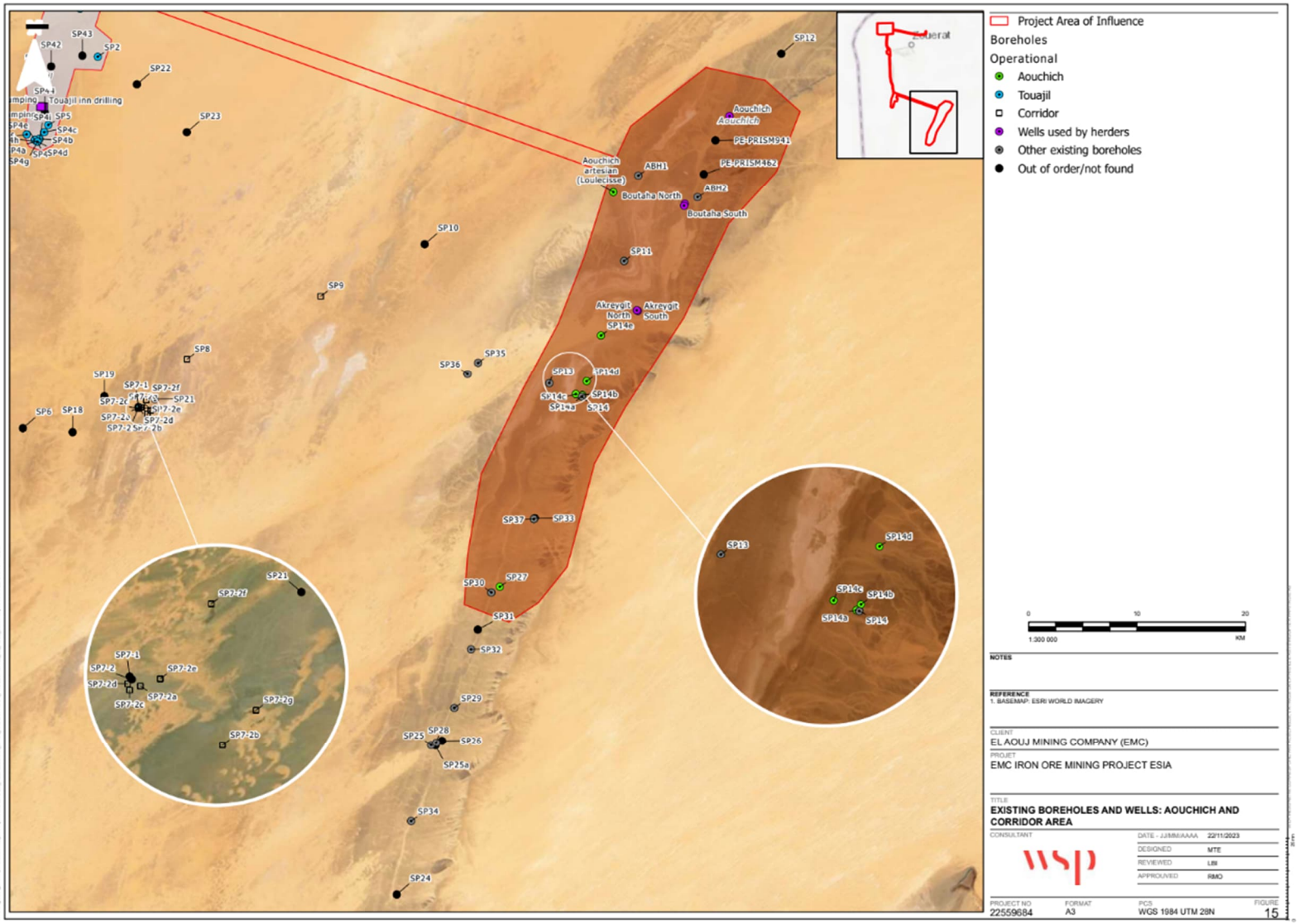
Analytical results of SP04, SP04C and SP03d ground water sampled in February 2026 are presented in Appendix F.

6.6.4.4 Corridor Area

Groundwater level

6 boreholes have been monitored since 2007. 3 other boreholes are artesian (SP07_2f - SP07_2g – SP08), (Figure 6-35). Today, a total of 7 boreholes is out of order or not accessible any more in the Corridor area.

Figure 6-35: Existing boreholes and well in Aouchich and the corridor area



No specific trend can be outlined from the recorded groundwater levels variations between 2007 and 2026 (Figure 6-36). Three boreholes show a drawdown currently ranging between -3.73 and -4.40 m, and three boreholes an increase ranging between 0.45 and 3.50 m. The aquifer P3 targeted by these wells is not subject to significant exploitation to date due to its high salinity.

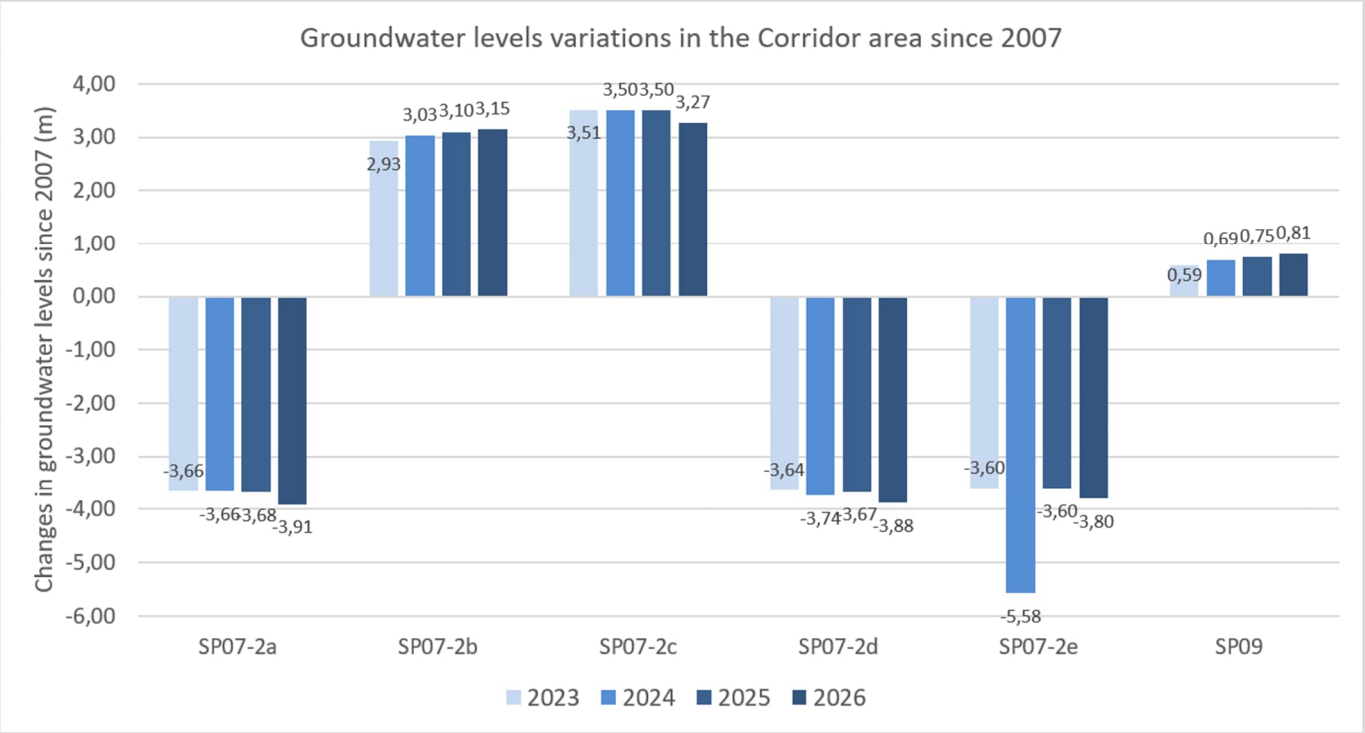


Figure 6-36: Evolution of the GW levels of the Corridor boreholes the last 4 years, compared to levels measured in 2007

Conductivity

P3 aquifer targeted by the boreholes in the corridor area show very high conductivities, with most of the wells showing a conductivity ranging from 7.86 to 13.38 mS/cm (brackish water), and one borehole with constant conductivity reaching 55.6mS/cm (salt water) (Figure 6-37).

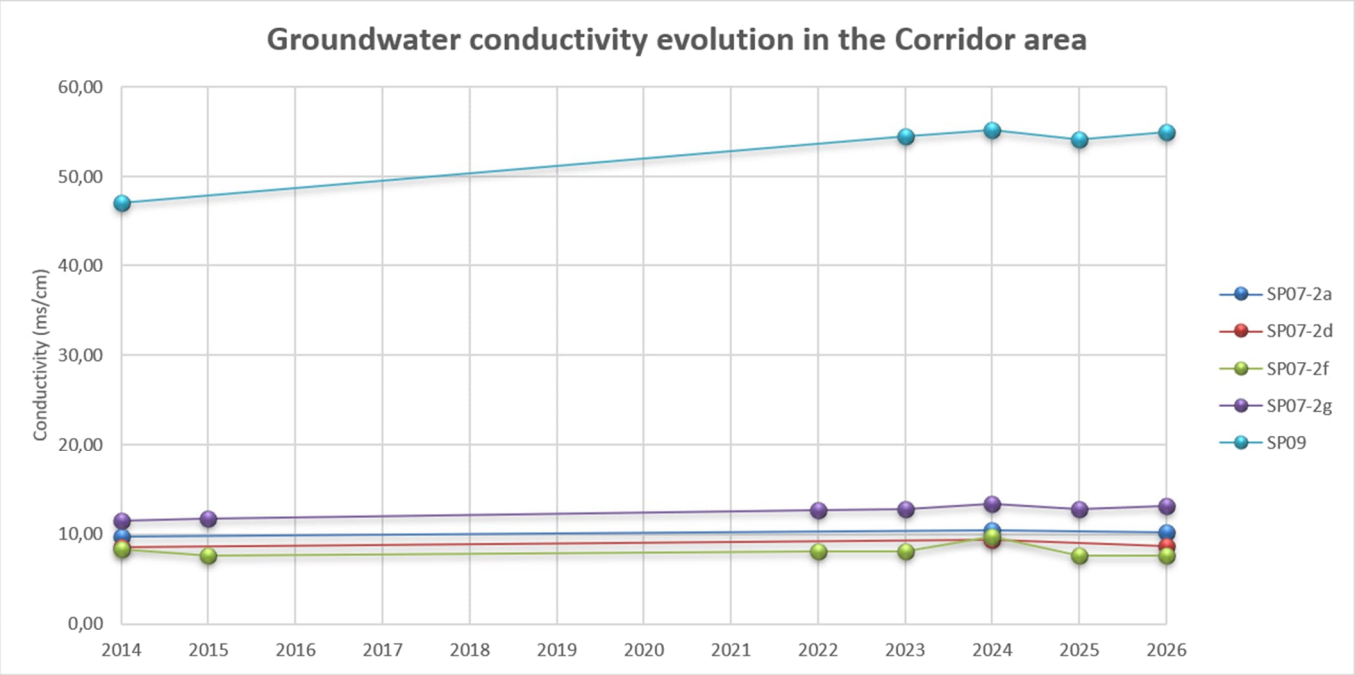


Figure 6-37: Groundwater conductivity evolution in the Corridor area since 2014.

Analysis conducted during the previous ESIA indicated that sodium chloride is the predominant water type (URS , 2015).

6.6.4.5 Aouchich Area

Groundwater level

The Aouchich boreholes target the P4 and P5 units. 18 boreholes were observed operational, of which 2 are artesian (SP11 and SP14c) (Figure 6-35).

Figure 6-38 presents the groundwater level variations between 2007 and 2026 in these 16 operational boreholes (not artesian). A total of 7 boreholes will be used for the development of the Aouchich wellfield. Out of these 7 boreholes, 5 boreholes are still operational (SP11 - SP13 – SP14 - SP30 & SP37), 4 boreholes present available groundwater levels data between 2007 and 2025, one is artesian (SP11), and 2 are not drilled yet (ABH1 & ABH2 (see Section 4.0).

The significant piezometric variations observed between 2007 and 2009, particularly in recoveries, could not be associated with a specific episode reported. No specific trend can be outlined from the recorded groundwater levels variations between 2009 and 2026. Ten boreholes (10) show a drawdown between 2007 and 2026. The drawdowns currently vary between -0.09 and -0.82 m. Five (5) boreholes show a level rise between 2007 and 2026. In 2026, those rises vary between 0.24 and 1.66 m (Figure 6-38). Out of the 4 boreholes, shown in Figure 6-39, which will be used as pumping wells for the Project's activities, two (2) show a decrease in groundwater levels (SP13 = -0.13 m; SP30 = -0.78 m) and two (2) shows an increase in groundwater levels (SP37 = 1.92 m; SP14=1.68m).

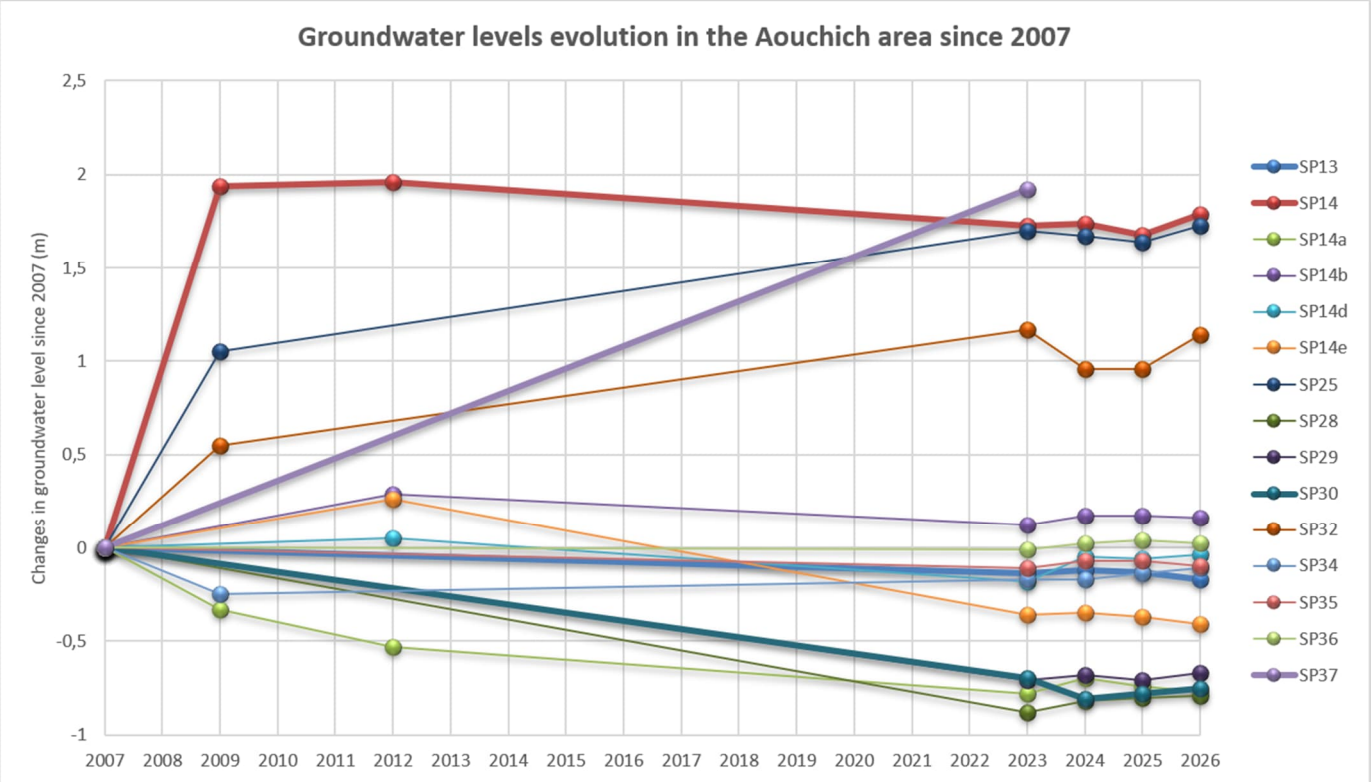


Figure 6-38: Groundwater level evolution in Aouchich area between 2007 and 2026 (thick lines: boreholes planned to be used for GW extraction for the El Aouj Project)

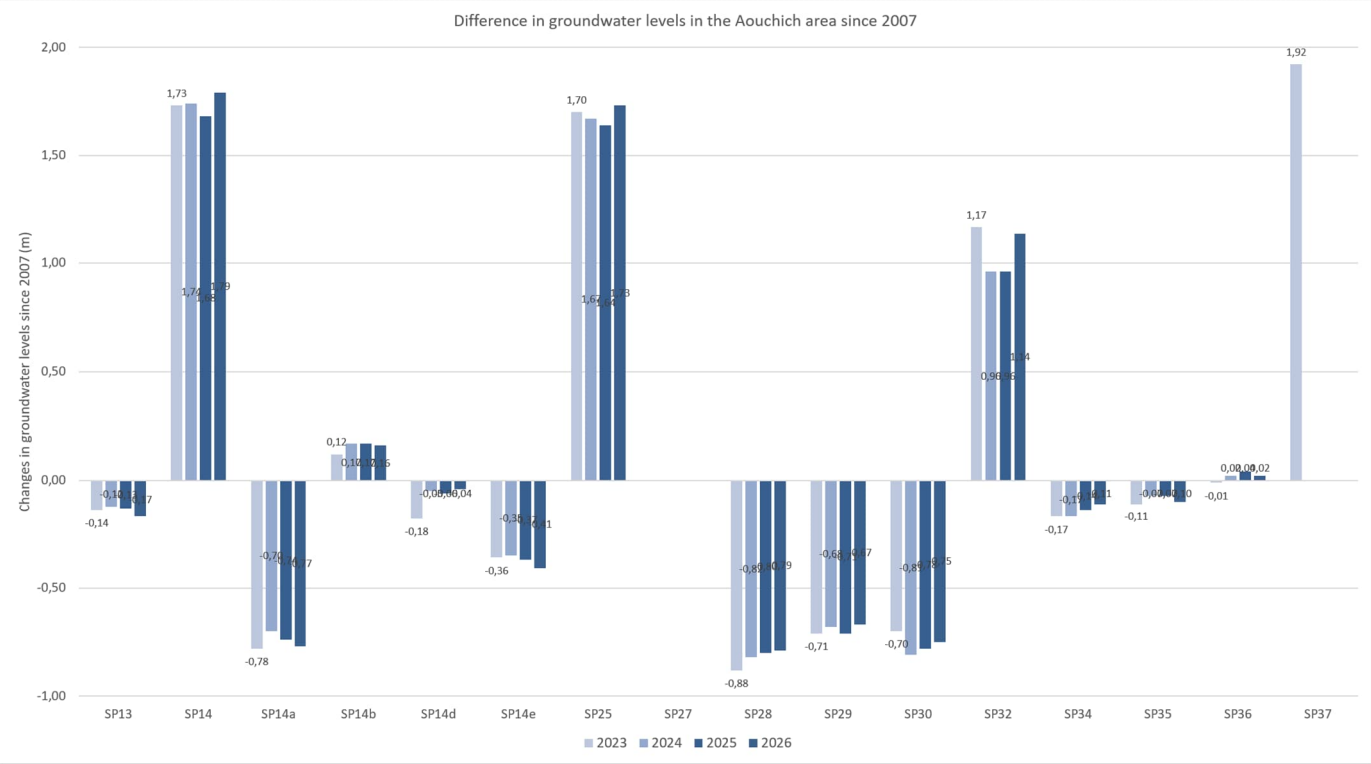


Figure 6-39: Evolution of the GW levels in the Aouchich boreholes the last 4 years, compared to levels measured in 2007

The lack of data between 2007 and 2023 does not allow to assess any trend between these two periods. However, the absence of a trend over the past 16 years can be explained by the absence of solicitation of Aouchich captive aquifer (P4) which is still today not accessible from the surface by local populations and not yet exploited by any activity developed in the area.

Hand-dug wells

5 hand-dug wells are operational in the Aouchich area. Groundwater levels were measured in 2007, 2012, 2014, 2015 and annually since 2023. Groundwater variations since 2007 are presented in Figure 6-40. One well has been categorised as artesian since 2007 (Loulecisse). Since 2007 and up to 2026, three hand dug wells show a constant piezometreic level, whereas two other located in the Akreygit area show constant drawdown since 2015 (-0.65m at Akreygit north and -1.06m at Akreygit South).

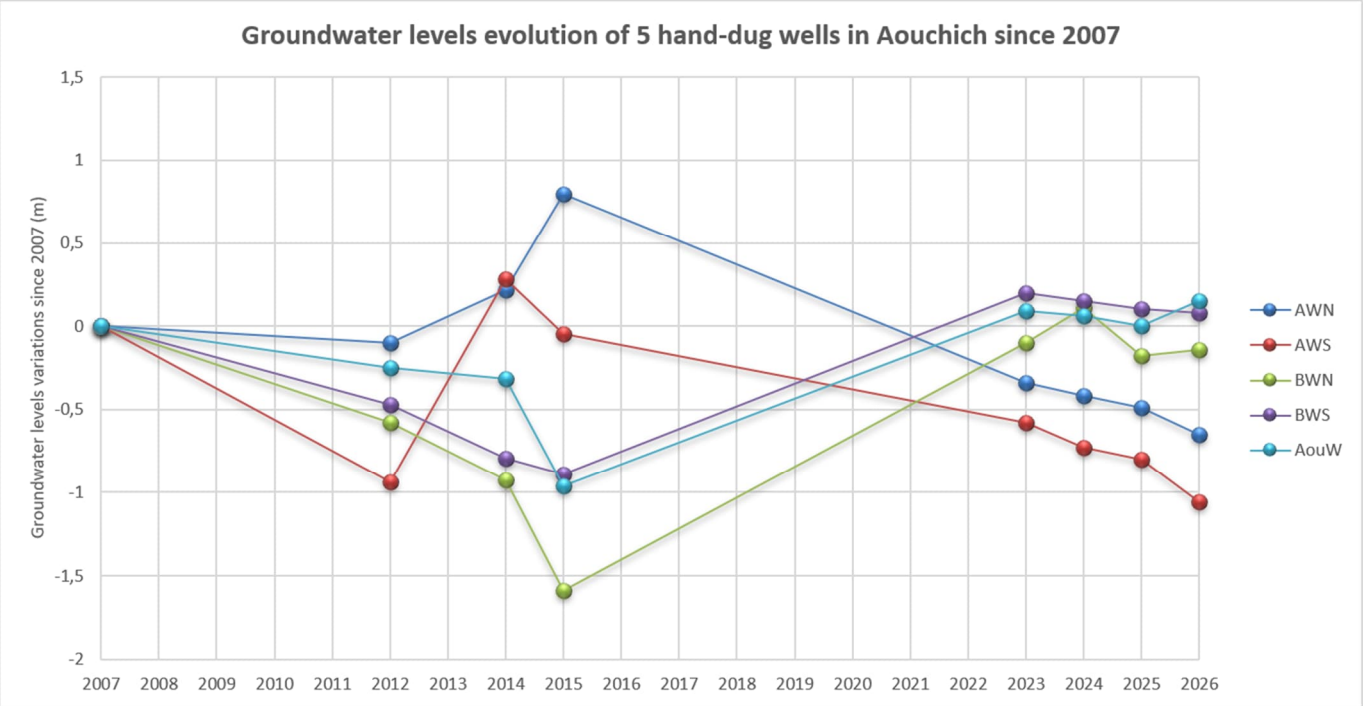
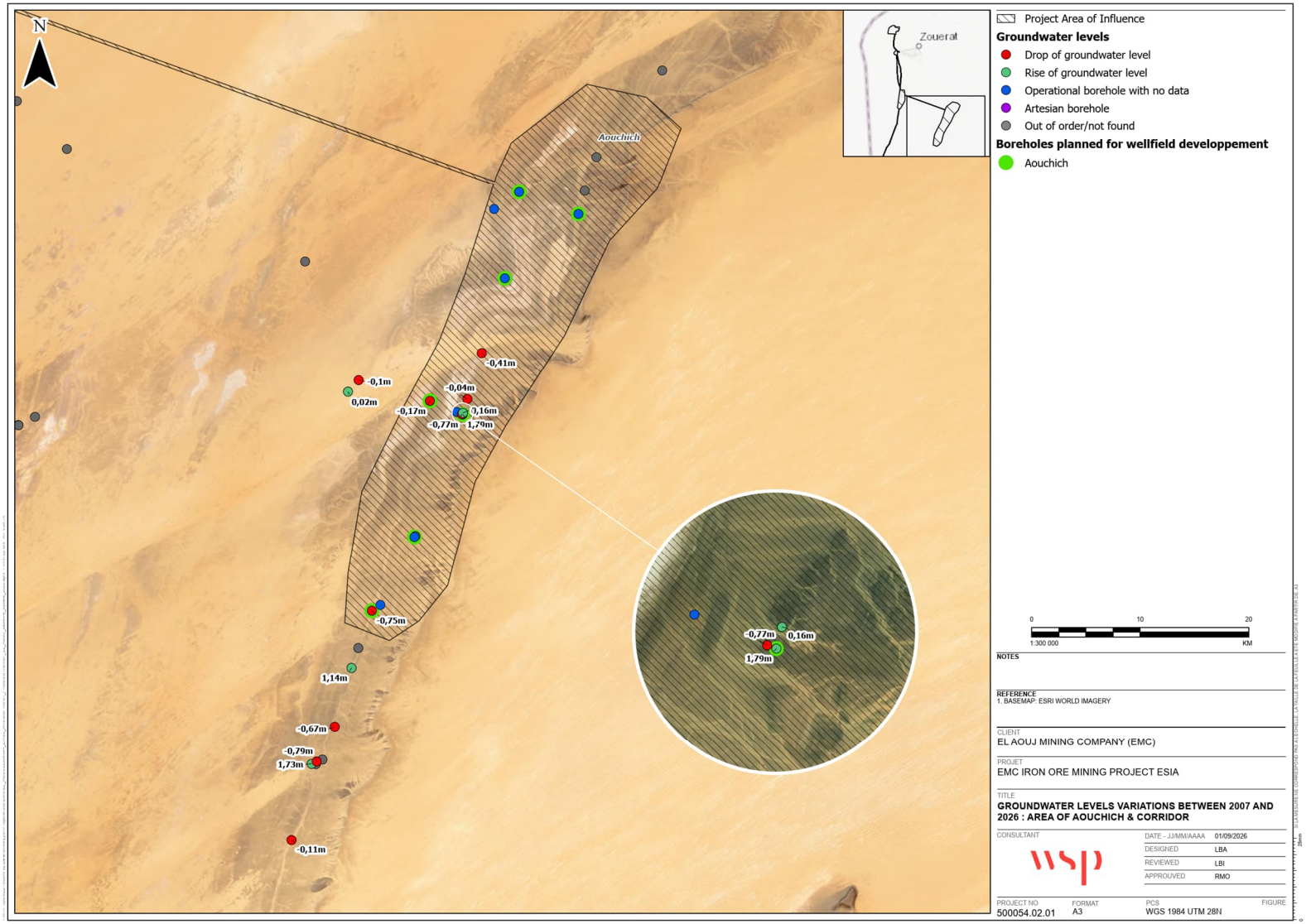


Figure 6-40: Evolution of the groundwater level of the 5 hand-dug wells in the Aouchich area*

*AWN = Akreygit Well North; AWS = Akreygit Well South; BWN = Boutaha Well North; BWS = Boutaha Well South; AouW = Aouchich Well

Figure 6-41: Aouchich and Corridor areas: Groundwater level variations since 2007



Conductivity

Exhaustive groundwater quality assessment was performed in 2007 by Golder at most of each borehole of the Aouchich area (Golder-Associates-Pty, 2008). The general groundwater chemistry in the Aouchich area was determined using average concentration values derived from all available analytical results.

Differences identified within the targeted P4 and P5 aquifer units appear to be primarily associated with geographic location rather than the specific properties of the aquifer units (Figure 6-42).

P4 Unit from SP14 and northward: the waters have a high salinity with an average TDS of 19 071mg/L, with a predominance of sodium, chlorides, sulphates and bicarbonates.

P4/P5 Units south of SP14: the average salinity is brackish with an average TDS of 2 350mg/L, with a predominance of sodium and chlorides.

Aquifer	Aouchich – South of SP14 P4 and/ or P5	Aouchich – SP14 P4
Salinity (TDS) (mg/L)	2,350	19,071
Sodium (Na^+) (mg/L)	424	5,660
Potassium (K^+) (mg/L)	12	64
Calcium (Ca^{2+}) (mg/L)	130	295
Magnesium (Mg^{2+}) (mg/L)	52	396
Chloride (Cl^-) (mg/L)	681	7,695
Sulphate ($S0_4^{2-}$) (mg/L)	255	3,081
Nitrate ($N0_3^-$) (mg $N0_3^-$/L)	34	116
Bicarbonate (HCO_3^-) (mg/L)	311	1,132
Carbonate (CO_3^{2-}) (mg/L)	22	98
pH	8.4	8.4

Figure 6-42: General Groundwater Quality Estimate in the Aouchich aquifers (Golder-Associates-Pty, 2008)

The historical and ongoing monitoring of groundwater conductivities in the Aouchich area is detailed in Figure 6-43 for boreholes and Figure 6-44 for hand-dug wells. Conductivity measurements at the boreholes through 2026 remain consistent with previous findings reported by (Golder-Associates-Pty, 2008): the highest conductivity values continue to be observed at the SP14 boreholes and at SP11 to the north, while lower conductivity readings are recorded further south of the SP14 boreholes. The lowest conductivities (SP35-36) are identified within the P4 unit, located east of SP14.

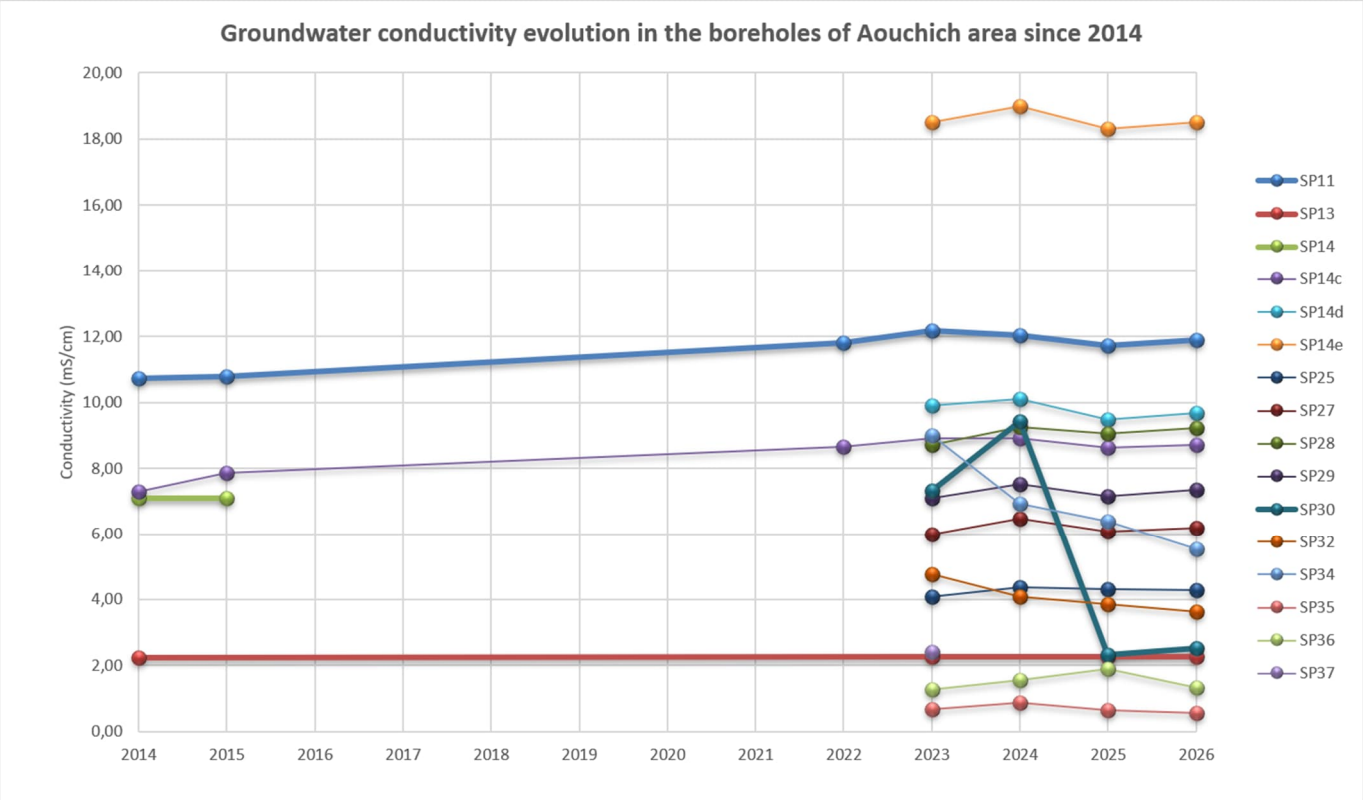


Figure 6-43: Groundwater conductivity evolution in the boreholes of Aouchich area since 2014 (thick lines: boreholes planned to be used for GW extraction for the El Aouj Project)

Conductivity monitoring carried out on hand-dug wells indicate that these wells capture shallow pockets of water, characterized by a high heterogeneity of conductivity levels (Figure 6-44). The observed values range from slightly brackish water (fresh water <1.5 mS/cm) to strongly brackish water (more than 8 mS/cm). The most significant differences were noted between the 2 wells of Boutaha, although located at a short distance from each other, attesting to the heterogeneity of the quality of the groundwater resources present. Apart from the case of the Boutaha South well, no significant variation in conductivity has been observed since the beginning of the monitoring of these wells.

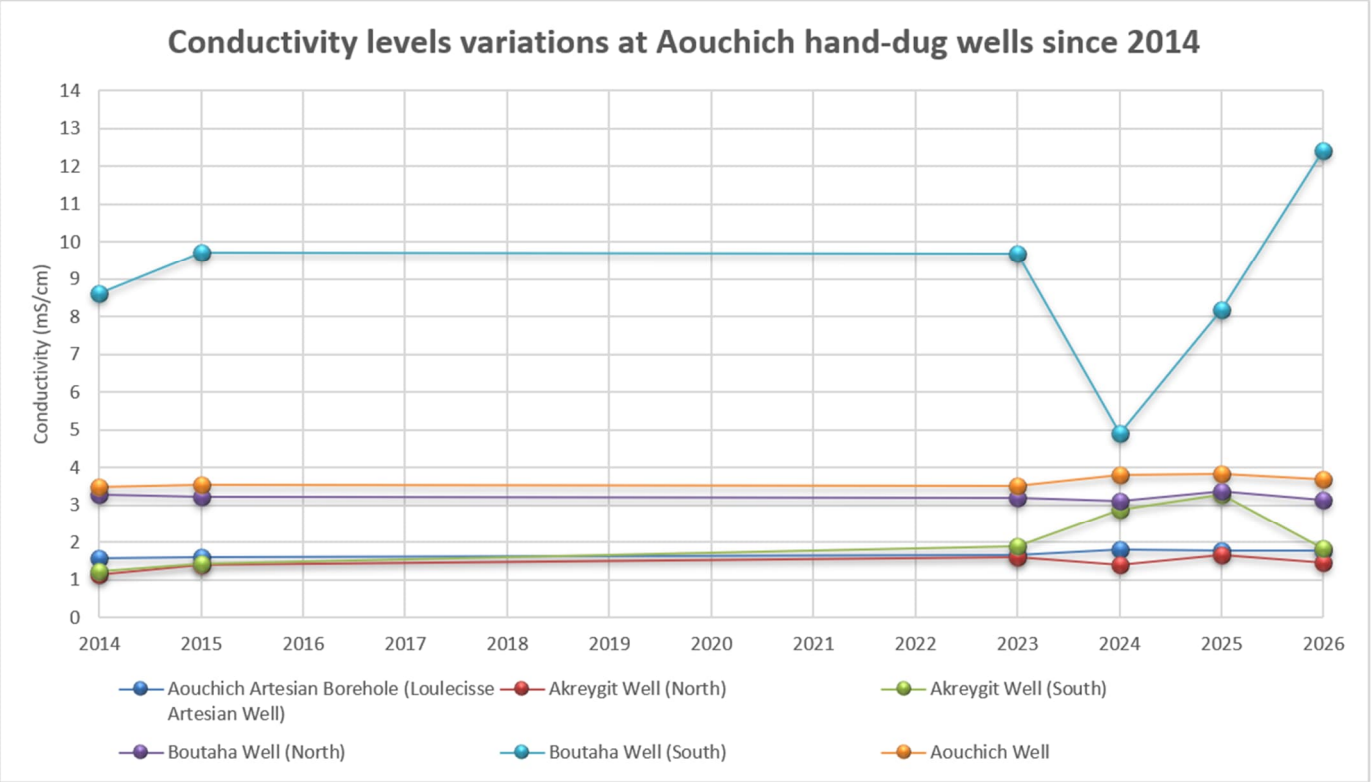


Figure 6-44: Groundwater conductivity evolution in the hand-dug wells of Aouchich area since 2014

6.6.5 Air quality

6.6.5.1 Desktop review

A desktop review of air quality was conducted using available data from the El Aouj mining area. The air quality is primarily influenced by the following activities (SNIM, 2024):

- Rail and road traffic, including the transportation of iron ore by train between the F'Derik and Nouadhibou mines, as well as the movement of both heavy and light vehicles.
- Mining operations, particularly extraction, crushing, loading, and transportation of iron ore.
- Prevailing winds originating from the Sahara Desert, which carry fine particles and sand dust, significantly contributing to the atmospheric particulate load in the area.

These activities generate emissions of suspended particulate matter (PM_{10} and $PM_{2.5}$), as well as pollutant gases such as nitrogen oxides (NO_x), sulfur dioxide (SO_2), and carbon monoxide (CO), which may adversely affect ambient air quality within the project's area of influence.

6.6.5.2 Field data

WSP conducted a field campaign in March 2023 in the mine area. During this field campaign, 2 air quality stations were installed for the measurement of the following parameters: $PM_{2.5}$, PM_{10}, SO_2, O_3, NO_2. One station was installed upwind of the mine site (El Aouj) and the other downwind of the mine site near the closest permanent receptor identified (Salt storage within housing at the entrance of the Sebkha Idjill). The locations of the 2 monitoring stations are presented in Figure 6-45 and Figure 6-46. The measurement dates for each station and parameter are provided in Table 6-6.

Table 6-6: Measurement dates for each location

Measurements	El Aouj	Sebkha Idjill
$PM_{2.5}$ and PM_{10}	21 to 31 March 2023 02 to 07 April 2023	21 to 26 March 2023
SO_2, O_3, NO_2	21 to 31 March 2023 02 to 07 April 2023	21 to 26 March 2023

Gas was measured with Radiello® passive samplers on a trapping medium, while particle levels were recorded by an electronic sensor (see Figure 6-46) with a 10-minute sampling frequency.

Figure 6-45: Air, Noise and Soil sampling location

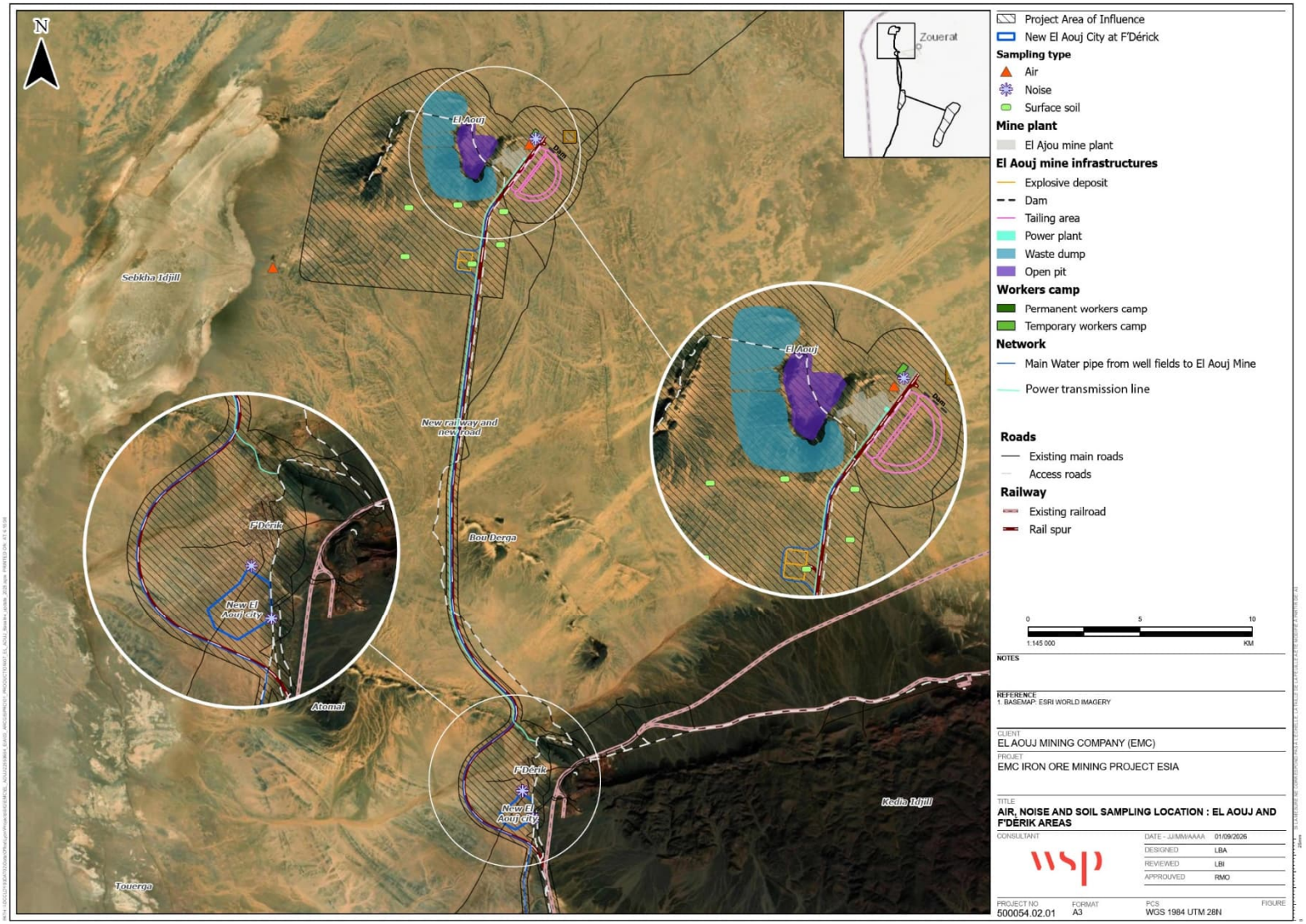


Figure 6-46: External PM and gas monitoring stations (Left = El Aouj; Right = Sebkha Idjill)

Additionally, the El Aouj weather station has been collecting data since January 2023 to monitor wind direction, wind strength, and other meteorological parameters.

6.6.5.3 Results

Gaseous pollutants

The passive gas measures are presented in Table 6-7. Both stations show almost identical values for all the elements measured (NO_2, SO_2 and O_3):

- NO_2: concentrations are below WHO recommendations guidelines;
- SO_2: concentrations are below the laboratory's limits of quantification and below the French quality threshold.
- O_3: concentrations are below the WHO and French regulation recommendations guidelines. Detail of the measures and interpretation are provided in the analytical results report in APPENDIX E.

In general, all gas measures remain below the reference criteria defined by WHO and/or the French regulation. However, it is to be noted that the WHO thresholds are based on a yearly average whereas the presented concentrations are based on only 6 days of monitoring. The current absence of human activity in the area where air quality was monitored does not, however, suggest any significant change in concentrations during the year.

Table 6-7: Gas results for both stations

Element measured	WHO[4] criteria (µg/m³)	FR[5] criteria (µg/m³)	Concentration (µg/m³)
El Aouj Station			
NO_2	10	40	1,7
SO_2	-	50	<0.2
O_3	60	120	56,9
Sebkha Idjill Station			
NO_2	10	40	1.7
SO_2	-	50	<0.2
O_3	60	120	56,5

Particles Matter (PM)

A summary of PM concentrations measured at El Aouj mine and Sebkha Idjill are presented in Table 6-8. The variations in PM concentrations are directly linked to wind intensity at the time of the measure.

Table 6-8: PM results for both stations

Date	El Aouj		Sebkha Idjill	
	PM 2.5 (µg/m³)	PM 10 (µg/m³)	PM 2.5 (µg/m3)	PM 10 (µg/m³)
WHO recommendation	**15**	**45**	**15**	**45**
Average	32.3	66.3	25.3	45.1
Min	12.9	27.2	15.0	28.3
Max	**103.6**	**202.7**	**131.5**	**55.8**

For both stations, the concentration of $PM_{2.5}$ and PM_{10} follow the same trends (Figure 6-47 and Figure 6-48).

At El Aouj station, $PM_{2.5}$ levels range from 12.9 to 103.6 µg/m³ (average 32.3 µg/m³), exceeding the WHO daily guideline by 15 µg/m³. PM_{10} levels range from 27.2 to 202.7 µg/m³ (average 66.3 µg/m³), which is 20 µg/m³ above the WHO reference guideline.

[4] https://www.who.int/fr/news/item/22-09-2021-new-who-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution

[5] « Décret 2010-1250 du 21 octobre 2010 relatif à la qualité de l'air ». French criteria for air quality are defined in the « Code de l'environnement (articles R221-1 à R221-3) »

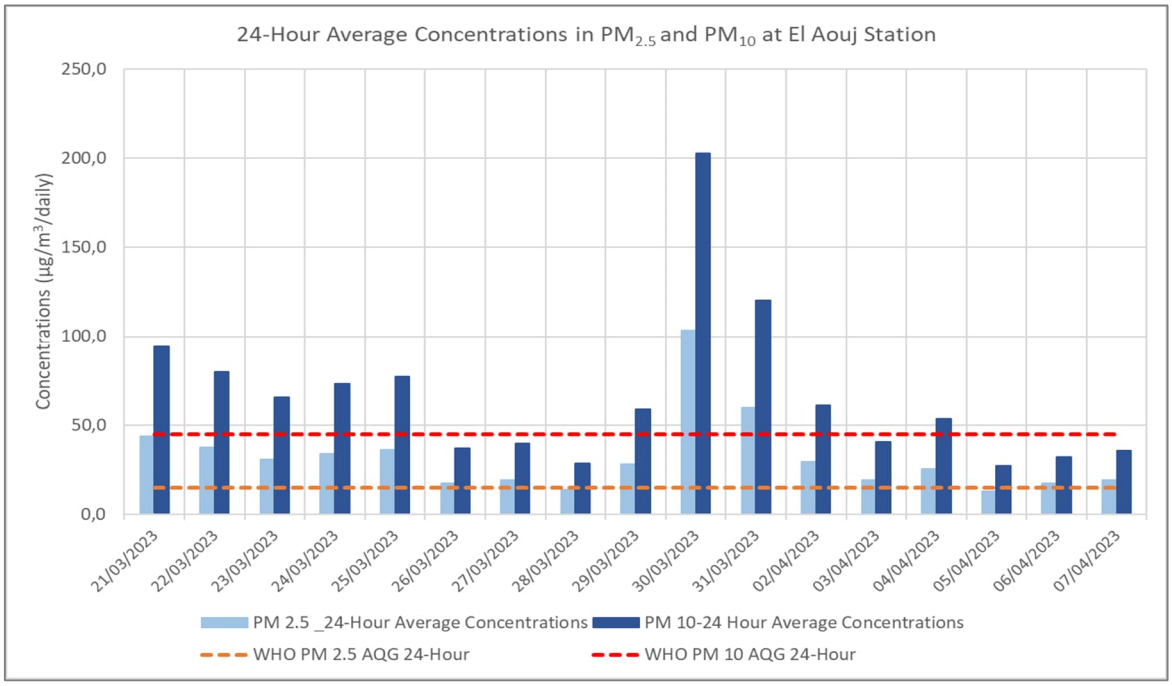


Figure 6-47: Daily average concentrations in $PM_{2.5}$ and PM_{10} at El Aouj station (21 March to 07 April 2023).

At the Sebkha Idjill station, the $PM_{2.5}$ concentrations vary between 15.0 and 31.5 µg/m³ with an average of 25.3 µg/m³ exceeding the guidelines set by the WHO requirements. The PM_{10} measurements vary between 28.3 and 55.8 µg/m³ with an average of 45.1 µg/m³ exceeding the guidelines set by the WHO (see Table 6-8).

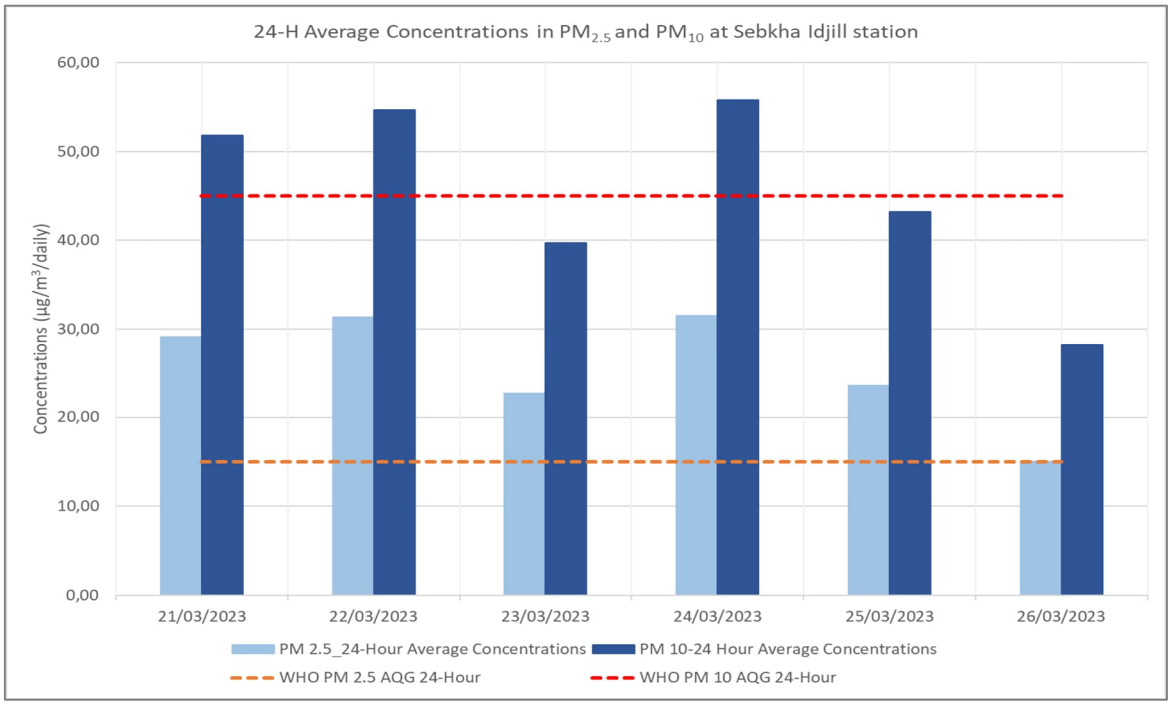


Figure 6-48: Daily average concentrations in $PM_{2.5}$ and PM_{10} at Sebkha Idjill station (21 to 26 March 2023).

6.6.6 Noise levels

6.6.6.1 Desktop review

A desktop review of ambient noise was carried out using available data from the mining area. Ambient noise in this zone is influenced by both natural and anthropogenic sources. The main natural source is wind, which generates continuous background noise in the soundscape. The human induced noise sources include:

- Road and rail traffic, particularly the movement of heavy and light vehicles, as well as trains transporting iron ore;
- Mining activities conducted by SNIM, including extraction, crushing, transportation, and loading of ore, along with associated operations;
- Urban activities in the town of F'Derik, such as vehicular and motorcycle movements and the use of generators.

These combined sources contribute to an overall increase in noise levels, which may have adverse effects on the quality of life of local populations and on wildlife.

6.6.6.2 Field data

A field campaign was carried out by WSP in June 2023 within the mine area. During this period, three noise measurements were recorded at three different locations (see Figure 6-45):

- Near F'Derik town: north of the new city, next to a house (potential sensitive receptor);
- Near F'Derik town: south of the new city, next to the main road;
- On the El Aouj mining site: at the weather station.

The measurement dates for each station are provided in the Table 6-9 below.

Table 6-9: Sampling times durations

Measurement location	Date	Start time	Stop time	Total measurement time
F'Derik (North)	13/06/2023	13:10:06	14:11:01	1h 0min 55 sec
F'Derik (South)	13/06/2023	14:26:01	15:27:10	1h 1min 9 sec
El Aouj	13/06/2023	11:01:04	12:02:20	1h 1min 16 sec

6.6.6.3 Result

El Aouj area

The measurement results from the El Aouj area indicate a maximum noise level of 61.5dBA and a minimum recorded value of 27.9dBA. The average noise level was 43.3dBA, which is significantly below the IFC recommended limits of 75dBA during daytime and 70dBA at night for industrial locations, as well as below the guidelines of 55dBA (day) and 45dBA (night) for residential areas. Details regarding recorded noise levels and the characteristics of the sampling locations are provided in Figure 6-49 and Figure 6-50.

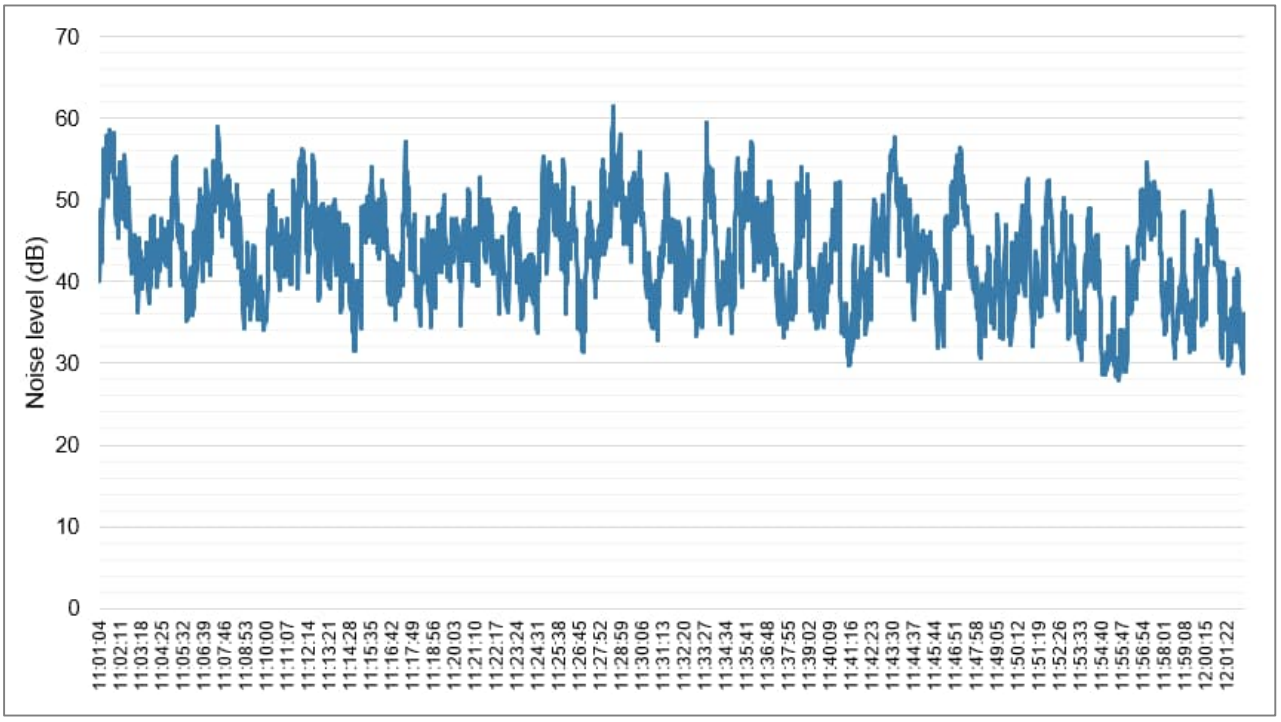


Figure 6-49: Noise records in El Aouj area

El Aouj Noise sampling point: view toward East

El Aouj Noise sampling point: view toward West

El Aouj Noise sampling point: view toward North

El Aouj Noise sampling point: view toward South

Figure 6-50: Surrounding environment of the El Aouj noise sampling point

F’Derik area

- **F’Derik North**

Measurements were taken north of the future El Aouj City in F’Derik town, near the closest house. Noise levels ranged from 28 dB to a peak of 72 dB, with the highest level caused by passing vehicles (see Figure 6-51 and Figure 6-52).

The average noise level (39.5 dB) is below the IFC recommended limits of 75 dB during the day and 70 dB at night for industrial sites, as well as below the 55 dB daytime and 45 dB nighttime limits recommended for residential areas.

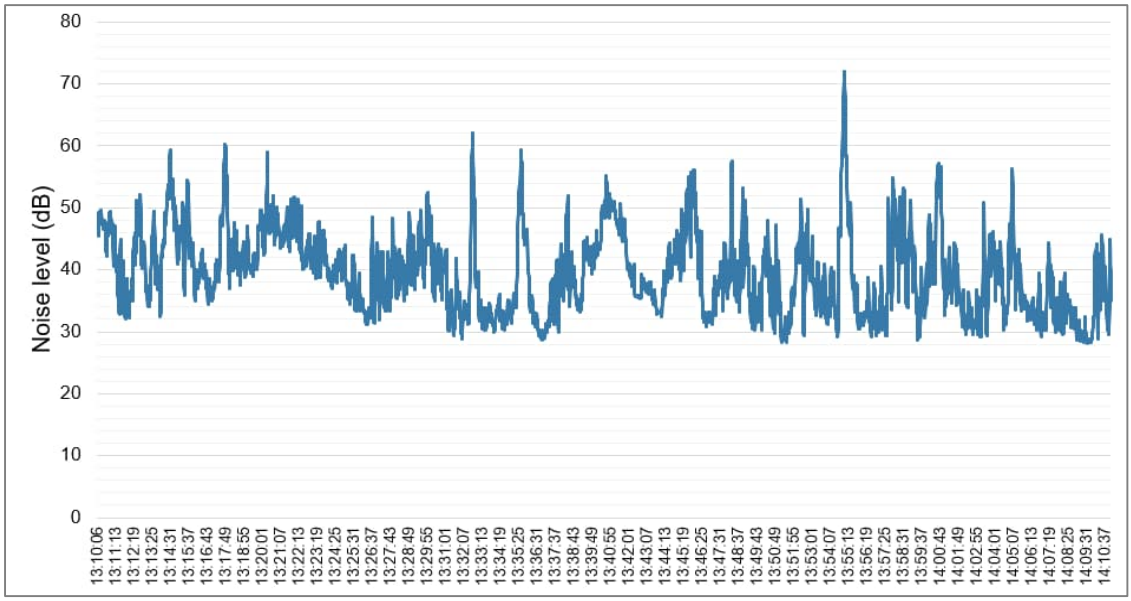


Figure 6-51: Noise records at F’Derik North area

F’Derik North sampling point: view toward East

F’Derik North sampling point: view toward West

F’Derik North sampling point: view toward North

F’Derik North sampling point: view toward South

Figure 6-52: Surrounding environment of the F’Derik North noise sampling point

- **F’Derik South**

Measurements were conducted south of the planned El Aouj City in F’Derik town, adjacent to the National Road connecting Zouérate and Nouadhibou. The recorded noise levels ranged from a maximum of 79.7 dB to a minimum of 26.9 dB (see Figure 6-53 and Figure 6-54). The highest measured noise level was associated with intermittent vehicle traffic.

The recorded average noise level of 39.3 dB is significantly below the IFC recommended limits of 75 dB (day) and 70 dB (night) for industrial sites, as well as the thresholds of 55 dB (day) and 45 dB (night) established for residential areas.

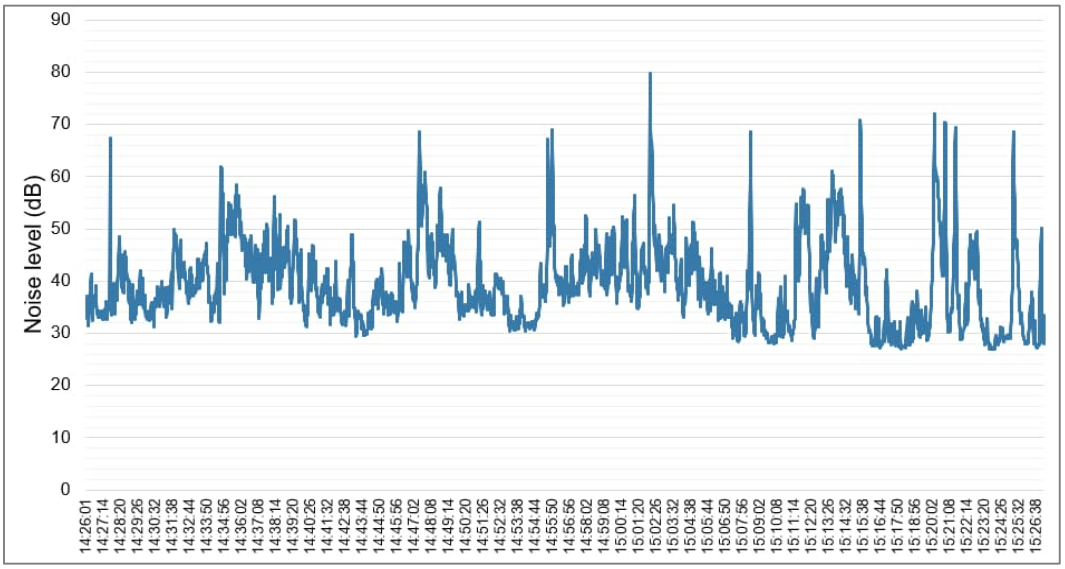


Figure 6-53: Noise records at F’Derik South area

F’Derik South sampling point: view toward East

F’Derik South sampling point: view toward West

F’Derik South sampling point: view toward North

F’Derik South sampling point: view toward South

Figure 6-54: Surrounding environment of the F’Derik South noise sampling point

6.6.7 Soil quality

6.6.7.1 Desktop review

The El Aouj mining region is distinguished by soils representative of arid Saharan conditions. The area displays a notably limited soil resource, with its composition predominantly featuring Aeolian sand deposits which constitute the predominant surface cover, extensive rock outcrops, gravel, and occasional discrete accumulations of alluvial sediments located within wadi channels. The primary soil type present is Leptosols, supplemented by salt flats located to the west of El Aouj East (Sebkha Idjill) and sand dunes extending to the east and south. Leptosols are characterised as very shallow soils lying directly above hard rock, consisting of a stony, sandy, silty, and clayey loam topsoil. Due to their poor quality, compounded by the arid climate and limited water resources, the soils in this region have minimal productive capacity and are highly susceptible to erosion.

Mine area soil characteristics

Within the mine site area, the landscape is defined by the rocky outcrop of El Aouj East. This area comprises cobbles and boulders embedded in a slightly sandy, gravelly matrix, particularly noticeable towards the toe of the guelb. The residual soils on the flanks of these rocky outcrops are generally only a few centimetres deep and contain very little, if any, organic material. Despite these limitations, the soils surrounding the guelb are capable of supporting some vegetation, most notably small trees, shrubs, and grasses, especially within the interconnected network of rocky wadi channels.

To the south of the mine site lies an expanse of low-level, undulating terrain and semi-flat grasslands. Soils along this route are more conducive to supporting vegetation, and as a result, grasses as well as small trees and shrubs are commonly found in these areas.

Soils in and Near F’Derik

The soils within and in close proximity to F’Derik largely mirror those found south of the mine site, consisting mainly of sands and gravel with a limited ability to sustain vegetation. Human activities, including livestock grazing, vehicle movement, and the expansion of F’Derik township, have led to significant soil compaction in the area. Consequently, vegetation is sparse and the landscape remains largely barren.

Further south of F’Derik, soil compaction has occurred as a result of vehicle traffic prior to the construction of the N1 Highway. The Azefal dune system, situated between the Askaf North guelb and Touajil, is similarly characterised by sparse vegetation, with only limited grasses present.

Soils of the Sebkha Idjill

Sebkha Idjill, located west of the El Aouj mining site, is a continental sebkha (not a coastal sebkha), that is, a closed depression subjected to episodic flooding followed by intense evaporation, which encourages the accumulation of salts at the surface and in the subsurface.

The soils of Sebkha Idjill belong to the family of extreme halomorphic soils, typical of arid sebkha environments, meaning they are subject to aeolian inputs, temporary lacustrine conditions, and the recrystallisation of abundant salts. These soils are weakly developed pedologically and have an unstable structure that is highly dependent on moisture. They are composed of fine to medium sands, silt, and clay in varying proportions, with very marked lateral and vertical heterogeneity.

The available studies do not provide prior analytical data on soil chemical quality, thereby limiting the assessment of potential soil contamination risks associated with adjacent mining and industrial operations.

6.6.7.2 Field data

In March 2023, WSP collected six soil samples from locations situated between 1 and 5 kilometres south of the mine site. These sites are positioned downwind and within the wadis that drain the surface area designated for the ore treatment infrastructure and waste facilities. The location of the samples is presented in Figure 6-45.

Soil samples were analysed for the following parameters: As, Fe, Cd, Cr, Hg, Se, Pb, Ni, Cu, Zn, pH, organic matter, TPH, PAH, and PSD.

6.6.7.3 Result

Across all six samples, the results for each element display similar orders of magnitude, as detailed below:

- **Organic matter:** The rates range from 0.4 to 0.8% MS, indicating a notably low level of organic matter content.
- Metals:
  - **Iron** concentrations vary from 12,300 to 20,800 mg/kg M.S.
  - **Zinc** concentrations vary from 14.2 to 27.0 mg/kg M.S.
  - **Chrome** concentrations vary from 13.9 to 24.2 mg/kg M.S.
  - **Nickel** concentrations vary from 8.36 to 15.3 mg/kg M.S.
  - **Arsenic** concentrations vary from 1.68 to 2.95 mg/kg M.S.
  - **Copper** concentrations vary from undetectable to 10.4 mg/kg M.S.
  - Concentrations of **cadmium**, **lead**, **selenium**, and **mercury** are not detected.
- **Total hydrocarbons** are not detected.
- **Polycyclic Aromatic Hydrocarbons** (PAHs) are not detected.
- **Volatile compounds** are not detected.

No soil contamination from human activities was identified at any of the soil sampled within the AoI.

Given the nature of the deposit being mined, which consists primarily of magnetite-bearing ferruginous quartzites, iron ore extraction and processing at the El Aouj project are not expected to result in significant concentrations of naturally occurring radioactive materials (NORM). This type of ore is generally not associated

with geological settings known to exhibit elevated uranium or thorium levels, such as uranium deposits, phosphorites, carbonatites, rare earth element ores or heavy mineral sands. Furthermore, the planned processing method, primarily based on mechanical operations and magnetic separation, does not involve any leaching or chemical treatment that could mobilise or selectively concentrate naturally occurring radionucleides. Consequently, no notable accumulation of NORM is expected in the ore concentrate, waste rock or processing tailings.

The same applies to acid rock drainage (ARD): given the nature of the deposit being mined, which consists primarily of magnetite-bearing ferruginous quartzites, acid mine drainage generation is not expected as part of the El Aouj project. The target ore consists predominantly of iron oxide minerals, and the available mineralogical information indicates that it is not associated with significant concentrations of sulphide minerals, particularly pyrite, whose oxidation upon exposure to water and oxygen is the main mechanism of acidic water formation. A preliminary assessment by EMC of the analytical data available for waste rock indicates that no sulphur was reported in the tailings samples analyse (URS, 2015). The planned operations, primarily involving mechanical extraction, crushing, grinding and magnetic separation, are not expected to alter this characteristic or trigger chemical reactions that could significantly acidify drainage water. Consequently, no notable generation of acid drainage is expected in the pit, waste rock dumps or processing tailings. Furthermore, no acid drainage has been reported from nearby mining operations.

6.6.8 Natural hazards

Climate

The Tiris-Zemmour region is exposed to natural hazards such as drought, water scarcity and flash floods. In fact, the region is prone to severe aridity, prolonged droughts and temperatures that can reach very high levels. The region is at high risk of extreme heat and heat wave. Detailed description of natural hazard related to Climate is presented in sections 6.2 and 6.3.

Earthquake

The risk of earthquakes is very low in Mauritania. The probability of an earthquake causing damage occurring in the next 50 years is estimated at less than 2%. This low risk is attributed to the country's geographical location, which is distant from major tectonic convergence zones.

Landslides

The risk of landslides is very low. The rainfall regime of this area, the slope of the soils, the geology, the characteristics of the soils, the land cover, and the very limited seismic risk, lead to a very low risk of localized landslides.

Wildfires

the risk of forest fire is very low due to the scarcity of sparse and limited vegetation that can cover some areas around the AoI. The likelihood of a brush fire causing disruption remains very low.

6.7 Conclusion of the physical environment context of the AoI of the Project

The Table 6-10 below presents a summary of the initial conditions related to the physical environment in the project study areas.

Table 6-10: Summary of physical baseline conditions

Topic	Description
Port area	
Geology	The port of Nouadhibou is located on the sedimentary basin of the Atlantic coast, which is part of the Senegal-Mauritania basin. The project study area is characterized by the presence of rock formations resulting from terminal continental deposits, currently referred to as the Mbidane formation.
Topography	The natural landscape is characterized by cliffs and numerous coastal caves, while the southern tip of the peninsula is marked by a beach shaped like a coastal arrow.
Climate	The port of Nouadhibou is located on the Atlantic coast and enjoys a subtropical desert climate with moderate temperatures, thanks to the combined effect of the cold Canary Current and the trade winds. The annual rainfall is low.
Sea water	Historical data on seawater quality has revealed the presence of certain metals and traces of hydrocarbons in the port area. Current activities at the port are likely to have an impact on marine water quality. Project activities in the port area are limited to the loading of iron ore for export.
Sediment	The historical data on seawater quality revealed the presence of certain metals and traces of hydrocarbons in the port area. Project activities in the port area are limited to the loading of iron ore for export.
Soil quality	The soil of the city of Nouadhibou consists mainly of loose sand, characteristic of Saharan coastal areas. Project activities in the port area are limited to the loading of iron ore for export.
Air quality	Air quality in the port area is mainly affected by natural and industrial sources of dust emissions. Project activities in the port area are limited to the loading of iron ore for export.
Noise	The mineral port is located in an industrial area with factories and ships nearby that generate noise and vibrations. Project activities in the port area are limited to the loading of iron ore for export.
Rail area	
Hydrology and surface water	Surface water resources are scarce and mainly limited to oueds and temporary ponds, which are fed seasonally by rainfall.
Hydrogeology	groundwater resources are predominantly sourced from shallow local aquifers.
Air quality	No data on air quality in the railway area was available. The main sources of dust emissions in this area are related to wind and the passage of trains transporting iron minerals between Zouérate and Nouadhibou.
Noise	At the time of the assessment, no air noise measurement data were available for the railway area. The main sources of noise are related to the passage of train transporting iron minerals between Zouérate and Nouadhibou.

Topic	Description
Mine area	
Geology	The mining area is located on the border between the Reguibat Dorsal geological province and the groundwater fields of the Taoudeni Basin. It consists of bedrock formations composed mainly of orthogneiss and greenstone belts.
Climate	The AoI is in an arid area with high temperatures and confirmed risks of heat waves and extreme heat. The climate features long dry seasons and brief wet periods.
Topography	The area's topography consists of plains, sand dunes, wadis, and sebkhas.
Surface water	The study area has no permanent surface water resources. Surface water is largely limited to the F'Dérick Dam, whose water availability is seasonal and directly dependent on local rainfall.
Groundwater	The aquifers that will be used for the Project's water supply are located in the Taoudeni Basin. In the Touajil area, the piezometric levels of boreholes targeting the P2 aquifer show a significant decrease between 2007 and 2025. Conductivity measurements conducted in this area reveal higher salinity in the P3 unit than in the P2 unit, with significant lateral variations but no significant change in conductivity levels between 2013 and 2025. In the Aouchich area, the piezometric levels of boreholes targeting the P4 and P5 units between 2007 and 2025 do not show a clear trend, with moderate variations probably related to the absence of water abstraction in the P4 aquifer in this area. The hand-dug wells show a slight regular drawdown since 2023. Conductivity measurements in the Aouchich boreholes reveal a higher salinity in the northern part of the AoI. Conductivity monitoring carried out on hand-dug wells indicate that these facilities capture shallow pockets of water, characterized by a high heterogeneity of conductivity levels. No significant variation in conductivity has been observed since the beginning of the monitoring of these wells.
Soil quality	The El Aouj mining region is distinguished by soils representative of arid Saharan conditions, predominantly comprising aeolian deposits (aeolian sand, sand dunes, alluvial sediments, surface gravels) Sebkha Idjill, located west of the El Aouj mining site, is characterized by soils with elevated salinity resulting from evaporitic mineral deposits. No soil contamination from human activities was identified at any of the soil sampled in the AoI.
Air quality	The air quality is primarily influenced by prevailing winds originating from the Sahara Desert, which carry fine particles and sand dust, significantly contributing to the atmospheric particulate load in the area, but also by anthropogenic activities such as mining operations, rail and road traffic.

Topic	Description
	$PM_{2.5}$ and PM_{10} measures carried out in the future mine site and at F'Derik reveal frequent concentrations above WHO guidelines for residential and also industrial areas. All gas measures remain below the reference criteria defined by WHO and/or the French regulation.
Noise	Ambient noise in the AoI is influenced by both natural and anthropogenic sources (mining activities, road and rail traffic, urban activities). Noise measures conducted within the future construction camp footprint and near the future El Aouj city at F'Derik (potential receptors) show noise levels significantly below the WHO recommended limits for residential areas.

7.0 BIOLOGICAL BASELINE

This chapter presents the biological baseline for the El Aouj Iron Ore Mining Project (the Project). The chapter is organized as follows:

- Section 7.1 describes the project area of influence (AoI), which includes the Port area (near Nouadhibou), the Mine area (located in the vicinity of F'Derik and Zouerate), and the Rail area (which connects the port and the mine);
- Section 7.2 provides an overview of the national and regional ecological context;
- Section 7.3 describes the baseline conditions of the Port area;
- Section 7.4 describes the baseline condition of the Rail area;
- Section 7.5 describes the baseline conditions of the Mine area.

7.1 Definition of the Project AoI for biodiversity

The Project AoI is the area allowing the assessment of all potentially significant impacts that might occur on receptors during the construction, operation or closure of the Project.

According to IFC Performance Standard 1, where a project involves physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts should be identified in the context of the project's AoI. The El Aouj Iron Ore Mining Project AoI was defined by considering the risks and impacts that could affect the biological environment, and encompasses the infrastructure and activities described in Table 7-1. There are three sectors where project infrastructure or activities are expected, including the Mine area (where ore will be extracted, processed and stored), the Rail area (where the Project will incrementally increase train traffic), and the Port area (where the Project will incrementally increase shipping traffic).

Table 7-1: Areas of influence according to PS1 and their corresponding areas likely to be affected by the Project

PS1 Area of influence	Areas likely to be affected by:
The area is likely to be affected by: ▪ The Project includes activities and facilities that are directly owned, operated, or managed (including by contractors) by the proponent and that are a component of the Project; ▪ Impacts from unplanned but predictable developments caused by the Project that may occur later or at a different location; or ▪ Indirect Project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.	Project infrastructure: ▪ Mine and process plant infrastructure; ▪ Bore wells (Touajil and Aouchich areas); ▪ Water pipeline; ▪ Extended road; ▪ Thermal and solar power plants; ▪ Temporary workers' accommodations; ▪ Permanent workers' accommodations (El Aouj City and workers' camp); ▪ Transmission line. Project activities and their potential direct and indirect impacts: ▪ Infrastructure construction; ▪ Use of borrow materials; ▪ Ore extraction and processing; ▪ Mine waste and tailings deposition; ▪ Industrial waste production; ▪ Access road use; ▪ Thermal and solar power plant operation; ▪ Water abstraction, treatment, transport and use from Touajil and Aouchich wellfields; ▪ Operation of workers' accommodation (El Aouj City and on-site permanent camp); ▪ Ore transportation (by train from the mine site to Nouadhibou and vessels from Nouadhibou port); ▪ Mine closure and rehabilitation. The Project description is included in Section 4.0.
Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the Project, from other existing, planned or reason.	Mine, port and rail areas potentially subjected to cumulative impacts from other existing planned or existing activities (e.g. other mines, other uses of the port and rail).

For the biodiversity component, the Project AoI was defined by taking into consideration the spatial extent of potential direct and indirect impacts of the Project. Direct impacts of the Project are located within Project footprint and may extend to a smaller area around Project activities (i.e., in the direct area of influence) while indirect impacts typically extend across a wider area and often relate to the socioeconomic sphere of influence of the Project. The Project AoI defined the spatial extent where most of the baseline data were collected. Some data was collected beyond the AoI to capture the regional context.

The Project AoI was defined by the environmental features surrounding the Project and the anticipated spatial extent of impacts around the different components of the project footprint (Figure 7-1, Figure 7-2). The Project AoI comprises three distinct areas, as follows:

- The **Mine AoI**, which was defined by applying buffer zones around the Project's proposed mine facilities and infrastructure, including part of the Kediet ej Jill Key Biodiversity area (KBA):
  - A 1 km buffer around the mine's infrastructure, with a wider area (almost 7 km) in the dominant wind direction to incorporate estimated dust dispersion and deposition,
  - A 250 m buffer of the rail spur between F'Derik and El Aouj, and between F'Derik and Touajil
  - A 250 m buffer around F'Derik town, the future worker City (El Aouj City) and the new permanent camp,
  - A 150 m buffer of the underground pipeline between F'Derik and Touajil,
  - A 150 m buffer of the underground pipeline between Touajil and Aouchich,
  - A smoothed polygon around the Touajil wellfield, accounting for a minimum buffer of 50 m around individual wells and off-road access requirements; and
  - A smoothed polygon around the Aouchich wellfield, accounting for a minimum buffer of 50 m around individual wells and potential off-road access requirements.
- The **Port AoI**, which was defined as:
  - A 1 km buffer encompassing terrestrial habitats around the mineral port and Nouadhibou's mining infrastructure; and
  - A 5 km buffer encompassing marine and coastal habitats around the mineral port.
- The **Rail AoI**, which includes:
  - A 250 m buffer of the railway between F'Derik and Nouadhibou; including emplacement of base camp 1 and 2

Figure 7-1: Biological project area of influence (port, rail and mine)

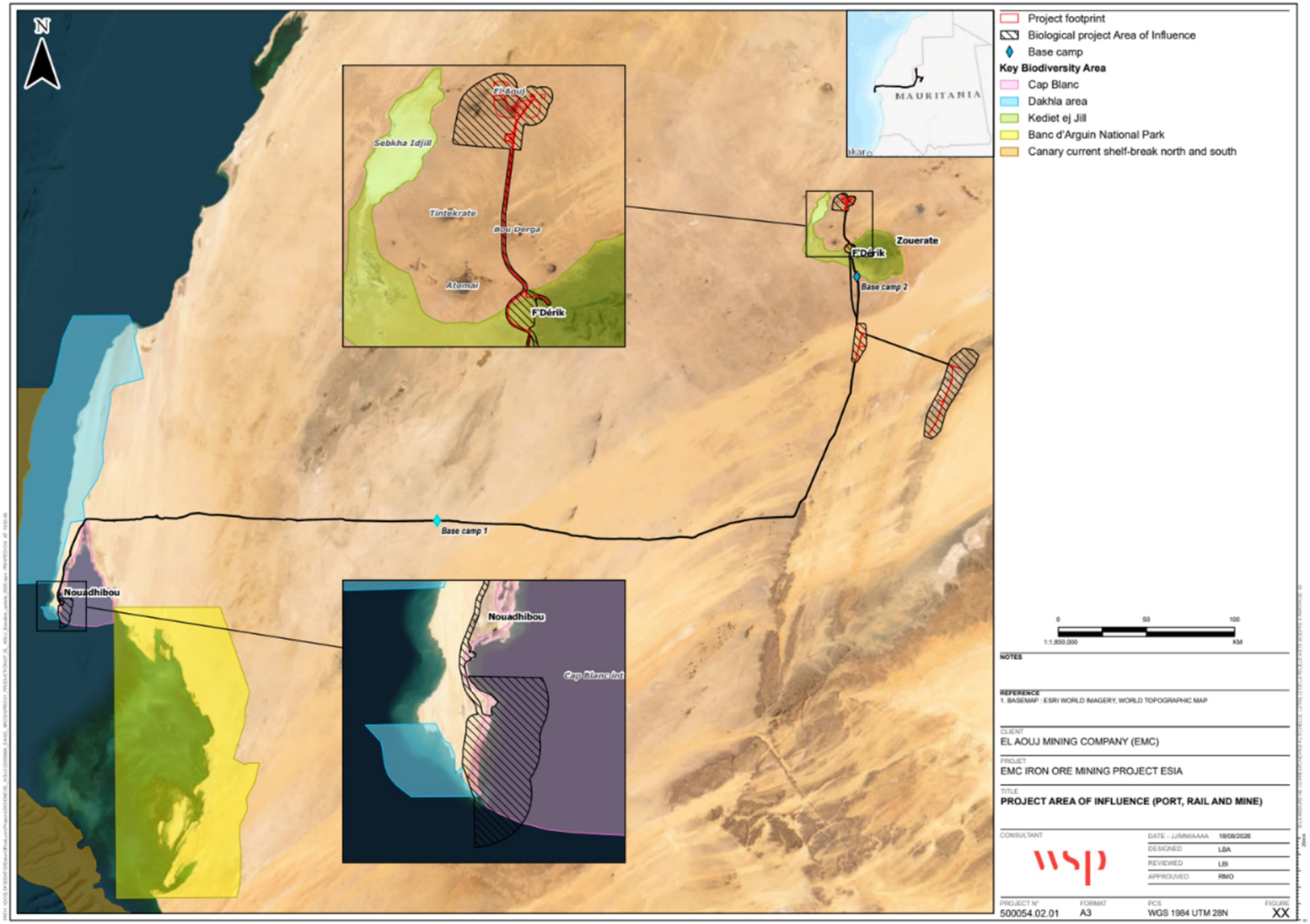
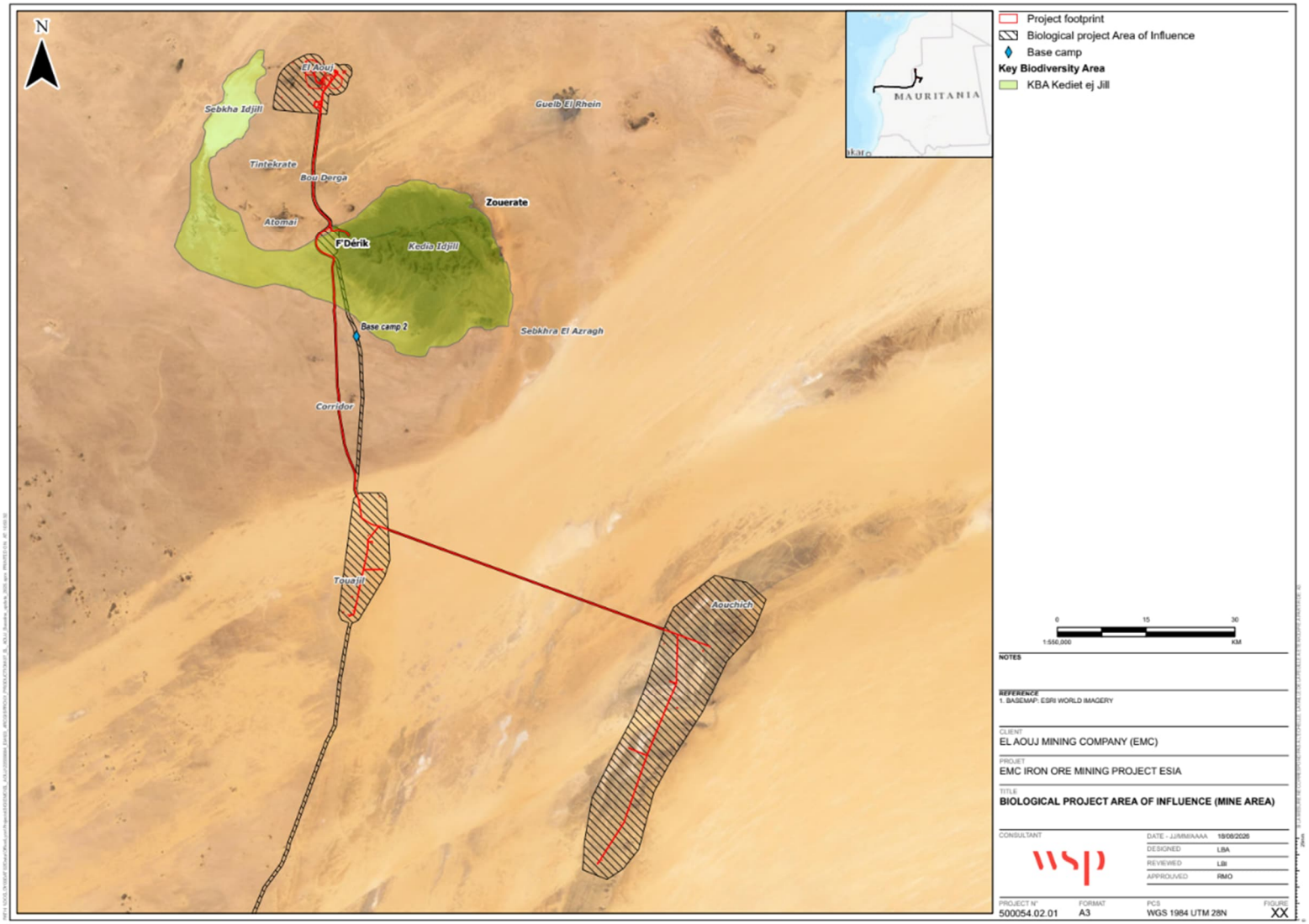


Figure 7-2: Project area of influence (Mine area)



7.2 Ecological context

Mauritania is subdivided into four major ecological zones (Arid Zone, Littoral Maritime, River Zone, Western Sahel, Eastern Sahel), each with its own fauna potential and species richness (URS, 2015) (Figure 7-3). The AoI is predominantly in the Arid zone where the fauna is represented by a very small group of animal species adapted to the very difficult Saharan climate (scarcity of rain, very limited vegetation), whereas in the Sahelian zone further south, the fauna is relatively varied due to the more favourable climatic conditions. The Project's ore deposits are in the hyper-arid ecoregion of North Africa, corresponding to the administrative region (wilaya) of Tiris Zemmour. The region is characterized by very arid landscapes and assemblages of flora and fauna species that have adapted to the dry, hot conditions (WSP, 2023). Although fauna richness is relatively low in the region, Tiris Zemmour includes three areas designated as Important Bird Areas (IBAs) and Key Biodiversity Areas (KBAs). All three IBAs are of international importance for conserving resident populations of desert birds (i.e., biome-restricted species) (Birldlife, 2023).

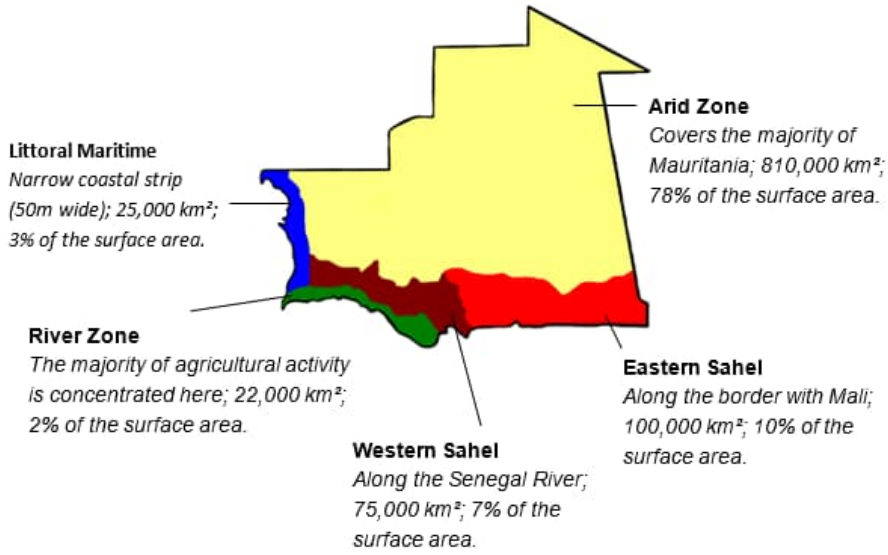


Figure 7-3: Ecological zones in Mauritania

Although Mauritania is predominantly desert, it includes remarkable natural areas such as the Senegal river valley, mountainous plateaus (Adrar, Tagant, Assaba, Afolle), and internationally recognized protected areas (Banc d'Arguin and Diawling National Parks). Terrestrial species richness is particularly concentrated in the Senegal river valley and in the mountainous plateaus (Brito et al., 2022), in areas well outside of outside of the Project AoI.

Mauritania has over 750 km of coastline, which combined with the marine habitats of its Economic Exclusion Zone (EEZ), supports important marine and coastal biodiversity (MEDD, 2024). Mauritania's rich marine biodiversity includes over 700 species of fish, 30 marine mammals, 6 sea turtles, and several hundred species of coastal birds (MEDD, 2024). The Project's Port area interacts with areas of important marine biodiversity.

Lastly, it should be noted that considerable biodiversity data gaps persist in Mauritania due to geographic isolation and socioeconomic challenges. There are no regional or national biodiversity databases. As a result, baseline characterization relied heavily on information gathered from field surveys, from international databases, and from previous studies (e.g., scientific articles, government reports, and other technical reports).

7.3 Port area

The Port area consists of existing facilities managed by SNIM (Société Nationale Industrielle et Minière), located on a peninsula known as Ras Nouadhibou or Cap Blanc. The SNIM port is approximately 7 km south of the city of Nouadhibou and services several iron ore mines of the Tiris Zemmour region. The port's facilities include the required infrastructure to receive, transfer, and store iron ore arriving from the rail network, and to load ore onto ocean going vessels for distribution to international markets. The port is generally described as an industrial site. Nonetheless, the port is in the Baie du Lévrier (Bay of Levrier), which is an ecologically sensitive area owing to the presence of nearby protected areas and internationally recognized areas (see Section 7.3.1).

Under existing conditions, Baie du Lévrier is influenced by the on-land port infrastructure and activities, maritime mineral transport operations, and occasional dredging. According to the Environmental and Social Impact Assessment (ESIA) of 2015, these activities have contributed to degraded water quality, which affects some marine biota through increased turbidity and suspended sediments, as well as the release of contaminants such as heavy metals and hydrocarbons (URS, 2015).

Occasional dredging occurs in Baie du Lévrier to maintain channel depth and allow large vessels to pass; however, a 2017 ESIA indicated that it was not yet possible to estimate the frequency of these maintenance dredgings, but that their extent would be smaller compared to the initial dredging works (Anteagroup, 2017). Although dredging activities may be limited, they disrupt benthic habitats, particularly seagrass beds, shellfish and underwater algae, which are crucial to the local ecosystem. A study by IMROP (2012) found that the increased water turbidity associated with dredging limited the photosynthesis of aquatic plants and destabilized fish populations that rely on these plants for food as well as nursery areas. The extent of these impacts in the Port AoI under existing conditions may be limited, given the limited need for dredging.

7.3.1 Legally protected areas and internationally recognized areas

Four protected areas and/or internationally recognized areas are located within 100 km from the SNIM port area, and a fifth site is about 150 km away (Table 7-2, Figure 7-4). Their proximity to the port highlights the potential for conflict between industrial activities and environmental preservation, and the need to consider the biodiversity values of these sites as part of the Project baseline.

Table 7-2: Legally protected and internationally recognized areas near El Aouj port facilities

Name	Type	Surface area (km²)	Distance and direction
Cap Blanc	Integral reserve Important Bird Area (IBA)	3,100	Directly overlaps the port AoI over 83.2 km²
	Satellite reserve to Banc d'Arguin National Park	2.1	
	Key Biodiversity Area (KBA)	1,063	
Canary current shelf-break (North)	KBA, IBA	10,953	30 km – West
Canary current shelf-break (South)	KBA, IBA	4,897	150 km – South
Banc d'Arguin National Park	UNESCO World Heritage Site KBA Ramsar wetland IBA	~ 12,000	100 km – South-east

Name	Type	Surface area (km²)	Distance and direction
Proposed national park			
Dakhla Area (Moroccan properties)	National Park (proposed), IBA, KBA	~ 20,000	Property is divided into three sectors: ▪ Southern-most sector (small) at the tip of Ras Nouadhibou slightly overlaps the boundary of the port AoI ▪ Central marine sector is ~20 km North of the port AoI ▪ Central inland sector is >150 km of the port AoI (in Morocco)

- **Cap Blanc Integral and Satellite Reserve, Key biodiversity Area and Important Bird Area**

The two areas, the integral reserve (3,100 km²) and the satellite reserve (2.1 km²) of Cap Blanc, are part of a biodiversity protection system in Mauritania, but they differ in their status, management, and conservation objectives. The integral reserve benefits from full protection status, whereas the satellite reserve, although also protected, is generally subject to less strict regulations relative to the integral reserve. Certain human activities may be permitted, provided they do not negatively impact the ecosystem.

The Cap Blanc Satellite Reserve was created as a satellite reserve to Banc d'Arguin National Park by decree 86-060 in 1986 (MEDD, 2024). The reserve was created to protect Mediterranean monk seal (*Monachus monachus*; Vulnerable (VU)) habitat on the tip of the Ras Nouadhibou Peninsula. The satellite reserve covers a 4.2 km coastal strip that extends 100 m inland and 400 m out to sea (IUCN and UNEP-WCMC, 2017).

The Cap Blanc Integral Reserve and Important Bird Area (IBA) are within and adjacent to the Port AoI and include both marine and terrestrial ecosystems. The site is contiguous with the Banc d'Arguin to the south and close to part of the Moroccan IBA, Dakhla National Park. Cap Blanc (also called Aguerguer), is part of the peninsula, lying between the railway line (from the iron-ore mines in Zouerate to the coast at Nouadhibou) and the ocean. It is characterized by numerous bays, islands and rocky outcrops.

Cap Blanc is a designated IBA owing to the presence of:

- Slender billed gull (*Larus genei*), which is listed globally as Least Concern (LC);
- Caspian tern (*Hydroprogne caspia*), which is listed globally as LC;
- Lesser black-backed gull (*Larus fuscus*), which is listed globally as LC;
- Sandwich tern (*Thalasseus sandvicensis*), which is listed globally as LC;
- Ruddy turnstone (*Arenaria interpres*), which is listed globally as Near Threatened (NT); and
- Waterbirds species group.

The presence of important concentrations of sandwich terns and Caspian terns also trigger the designation of KBA. Other birds such as corn crake (*Crex crex,* LC) have been recorded here while Audouin's gull (*Larus audouinii*; VU) sometimes occurs in small numbers.

The vegetation of the terrestrial areas includes sweet tabaiba (*Euphorbia balsamifera*), desert grass (*Panicum turgidum*), frankenia (*Frankenia corymbose*), *Echiochilon chazaliei,* tuberculate sea lavender (*Limonium tuberculatum*), small cordgrass (*Spartina maratima*), *Traganum nudatum,* broomweed (*Salsola baryosma*) and *Zygophyllum waterlotii*. The aquatic and littoral flora includes dwarf eelgrass (*Zostera noltii*), little neptune grass (*Cymodocea nodosa*), Arguin sea-blite (*Suaeda arguinensis*), shrubby glasswort (*Arthrocnemum macrostachyum*) and shoreline purslane (*Sesuvium portulacastrum*).

In addition to bird and flora biodiversity, Cap Blanc supports the world's largest population (a few hundred individuals) of Mediterranean monk seals. Four species of marine turtle, including green turtle (*Chelonia mydas;* Endangered (EN)), hawksbill turtle (*Eretmochelys imbricata*; Critically Endangered (CR)), leatherback turtle (*Dermochelys coriacea*; EN), and loggerhead turtle (*Caretta caretta*; EN), have been recorded in the KBA (BirdLife International, 2025).

The reserve is also a major resting site for seabirds. Large populations of waders, gulls, terns, and northern gannets (*Morus bassanus;* LC) are observed here. Terns and marsh terns (*Chlidonias* spp.) make post-breeding migratory stops here (> 30,000 individuals) and also visit during the breeding season (< 10,000 individuals). Numerous barn swallows (*Hirundo rustica;* LC) have also been sighted, along with a group of Rüppell's vultures (*Gyps rueppelli;* CR) near the SNIM port (Anteagroup, 2017).

- **Canary Current Shelf Break (North and South)**

The sites are located on the Northern Mauritanian shelf-break and on the Southern Moroccan shelf-break (with water depths ranging between 50 m and 1,000 m) of the highly productive waters of the Canary current.

The northern Canary Current Shelf-Break is closest to the Port AoI (to the west), and the southern shelf-break is located south of the Port AoI. Both sites are designated as KBAs and IBAs because they support important concentrations of waterbirds. The sites are known to be intensively used for foraging by several bird species, including local breeders and several migrants from the north and south hemispheres. Eight species qualify the site as an IBA, with significant populations of European storm-petrel (*Hydrobates pelagicus*; LC), band-rumped storm-petrel (*Hydrobates castrol*; LC), Cory's shearwater (*Calonectris borealis*; LC), Audubon's shearwater (*Puffinus lherminieri*; LC), northern gannet (LC), red phalarope (*Phalaropus fulicarius*; LC), pomarine jaeger (*Stercorarius pomarinus*; LC), and great skua (*Catharacta skua*; LC) (BirdLife International, 2025). These same eight species are listed in the KBAs' description, although none of them meet the KBA trigger Criteria (Key Biodiversity Areas, 2025). The sites are designated as regional KBAs, meaning that they were identified using legacy Criteria and thresholds that do not meet the current global KBA Criteria.

- **The Banc D'Arguin National Park and Ramsar site**

The Banc d'Arguin National Park, almost 100 km from the Port AoI, was established in 1976 and protects 40% of Mauritania's coastline between Nouakchott and Nouadhibou, in the northern coastal region. The park includes shallow seabeds (less than 5 meters water depth), marine seagrass beds, intertidal mudflats, intertidal sandbanks, ancient mangrove forests, channels, and creeks, as well as coastal desert habitats. The total area of intertidal mudflats is around 55,000 hectares, and there are between 60,000 and 80,000 hectares of seagrass beds. The mudflats and seagrass beds are populated by a wide variety of invertebrates (notably molluscs and crustaceans), and at high tide, they serve as important feeding or spawning grounds for commercially significant deep-water fish. At low tide, these areas provide important feeding grounds for wading birds (Ramsar, 2023).

A total of 190 plant species has been recorded in the park, including both marine and terrestrial species. Adjacent to the park lies one of the richest fishing areas in the world, on account of the upwellings off of Ras Nouadhibou and Ras Timirist and the predominance of seagrass and other productive shallow benthic habitats. Spanning an area of 12,000 km², this marine and coastal park occupies the eastern half of the Arguin Gulf, stretching from Minou Point in the north (beyond Cap d'Arguin) to the town of Mamghar in the south (past Cap Timiris), and includes the islands of Arguin and Tidra.

An estimated 2,250,000 migratory birds' winter at this site, representing over 30% of the total estimated wader population along the East Atlantic migration route. Additionally, pallid harrier (*Circus macrourus,* NT) and lesser kestrel (*Falco naumanni*, LC) are occasionally observed during migration, while a small number of Audouin's gull (VU), up to 15 individuals, are regularly recorded. Lesser flamingo (*Phoenicopterus minor*, NT) is an occasional visitor in small numbers.

In addition to bird biodiversity**,** the park supports a large and diverse marine fauna with several taxa of high conservation priority. These include four species of sea turtles: green turtle, hawksbill turtle, leatherback turtle, and loggerhead turtle, and the Mediterranean monk seal. Many cetacean species have also been recorded, including harbour porpoise (*Phocoena phocoena;* VU), Atlantic humpback dolphin (*Sousa teuszii*; CR), bottlenose dolphin (*Tursiops truncatus*; LC), Risso's dolphin (*Grampus griseus*; LC), rough-toothed dolphin (*Steno bredanensis*; LC), killer whale (*Orcinus orca*; DD), and Fin whale (*Balaenoptera physalus*; EN). The Dorcas gazelle (*Gazella dorcas*; VU), fennec fox (*Vulpes zerda*; LC) and Ruppel's fox (*Vulpes rueppellii*; LC) are also found in the terrestrial sections of the reserve. In 2020, a total of 1,700,000 individuals across 45 bird species were counted (BirdLife International, 2025).

An interview with Mr. Nami Mohamed Kaber SALIHY, Director of the Banc d'Arguin National Park, conducted in April 2025 is available in Appendix G.

- **Dakhla National Park**

Dakhla National Park has been on Morocco's tentative list for potential inscription as a UNESCO World Heritage site since October 12, 1998. This inclusion on the tentative list means that Morocco has identified the park as a potential site for future inscription, but it does not guarantee its eventual inscription (UNESCO, 2024).

The site is in the former Western Sahara, split into two distinct parts, Aguerguer and Safia. The coastal sector, called Aguerguer or Côte des Phoques, is located 20 km away from the Port AoI and covers a 180 km stretch of coastline from south of Sebkhat Lamhar Touil to the Mauritanian border. It is bordered inland by the road between Dakhla and Lagouira and extends 12 nautical miles out to sea. An isolated part of the Presqu'île du Cap Blanc, south of the Mauritanian town of Nouadhibou, is also included in this sector. The site qualifies as both a KBA and IBA.

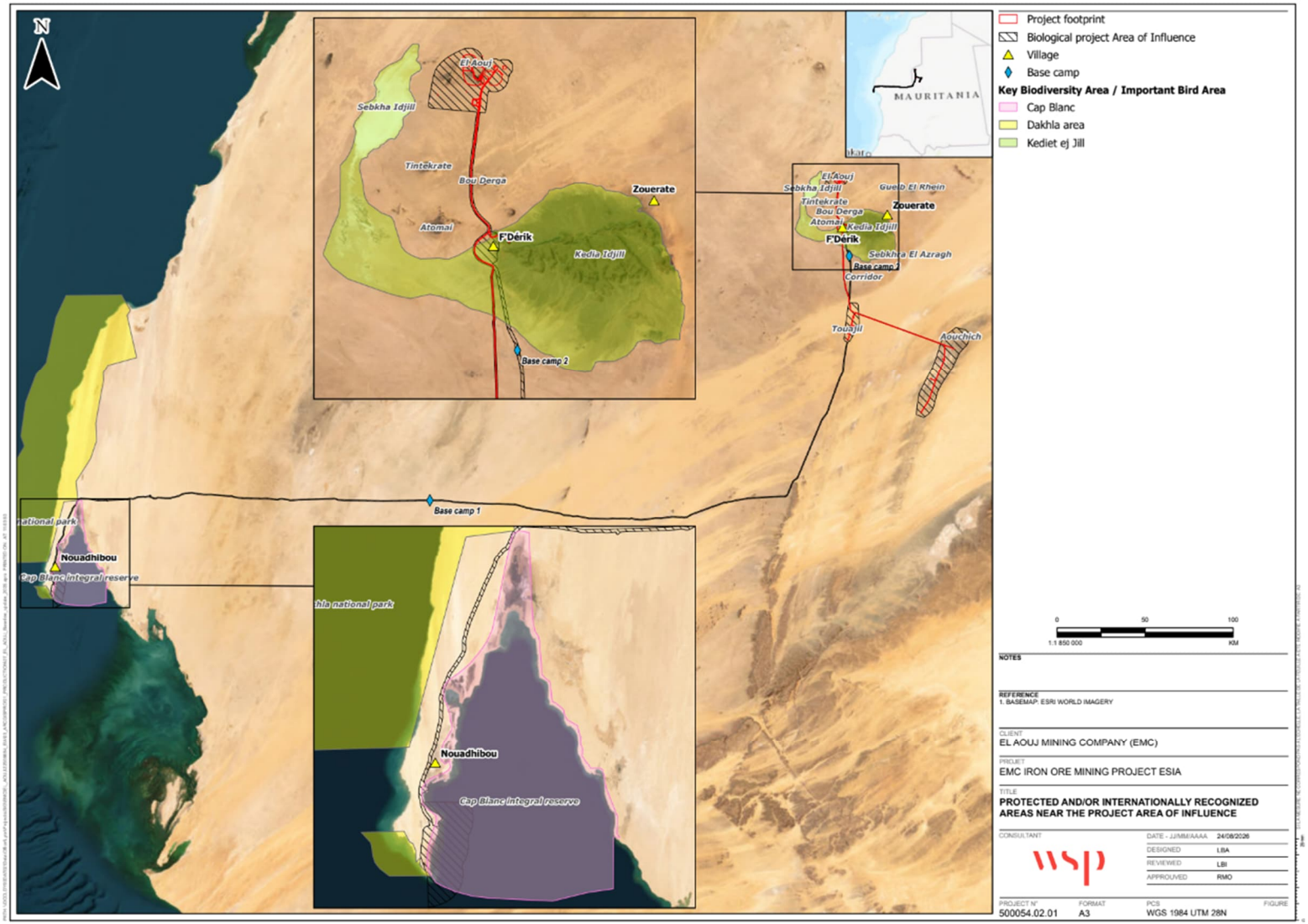
Habitats of the Aguerguer sector include high coastal cliffs and caves, and weathered sandstone buttes and ravines. Vegetation includes salt-tolerant coastal species such as seablite (*Suaeda spp*.), saltbush (*Atriplex spp*.), and small cordgrass. The Presqu'île du Cap Blanc is an important migration staging-post for waders and seabirds on their way to and from the Banc d'Arguin National Park. The site meets IBA thresholds because it contains globally important concentrations of 16 bird species, although it is unclear which species are associated with what sector (i.e., Aguerguer or Safia). Species meeting the IBA trigger Criteria include: desert lark (*Ammomanes deserti*; LC), pale rock martin (*Ptyonoprogne obsolete*; LC), Egyptian nightjar (*Caprimulgus aegyptius*; LC), pharaoh eagle-owl (*Bubo ascalaphus*; LC), sanderling (*Calidris alba*; LC), bar-tailed lark (*Ammomanes cincture*; LC), greater hoopoe-lark (*Alaemon alaudipes*; LC), crowned sandgrouse (*Pterocles coronatus*; LC), white-crowned wheatear (*Oenanthe leucopyga*; LC), trumpeter finch (*Bucanetes githagineus*; LC), mourning wheatear (*Oenanthe lugens*; LC), desert sparrow (*Passer simplex*; LC), lesser black-backed gull,

sandwich tern, and ruddy turnstone, and spotted sandgrouse (*Pterocles senegallus*; LC). The number of royal tern (*Thalasseus maximus*; LC) has approached the IBA threshold but without exceeding it.

The same 16 species are listed in the KBA's description, although none of them meet the KBA trigger Criteria (Key Biodiversity Areas, 2025). The site is designated as a regional KBA, meaning that it was identified using legacy Criteria and thresholds, that do not meet the current global KBA Criteria, based on existing information.

In addition to supporting bird biodiversity, the Aguerguer region is one of the last strongholds of the Mediterranean monk seal. Fifteen other marine mammals, all whales and dolphins, many of which are globally threatened, have also been recorded within the proposed national park.

Figure 7-4: Protected and/or internationally recognized areas near the Project Area of Influence (Port, rail and mine)



7.3.2 Terrestrial biodiversity

Terrestrial biodiversity in the Port AoI was described from a review of existing information.

7.3.2.1 Habitats and flora

Terrestrial vegetation of the Cap Blanc Peninsula is scarce due to arid conditions. It primarily consists of small shrubs and native plants adapted to the dry, coastal conditions. These plant species, such as chazaliei sea-lavender (*Limonium* sp.) are rare, but play an important role in maintaining local ecological balance. Trees are largely absent, and the low vegetation is sparse. Glasswort (*Salicornia sp.*) and moquin's saltbush (*Traganum moquini*) can be observed (Anteagroup, 2017). Between the railway and the coastline, there are a few species, including some native coastal (oceanic) plants like *Echiochilon chazaliei* and tuberculate sea-lavender (*Limonium tuberculatum*) (Dia, 1995). None of the species recorded in the region are considered globally threatened, and none have restricted distribution ranges.

The coastal flora of Mauritania, though limited in diversity due to pedological conditions and ocean spray, includes characteristic species such as *Zygophyllum waterlotii* (now *Tetraena gaetula*), *Traganum moquinii*, and *Polycarpaea nivea* (Naegele, 1960; Jaouen, 2019). Surveys of the coastal vegetation between Nouadhibou and Ndiago highlight notable herbs and shrubs, including species like *Sesuvium portulacastrum* and *Spartina maritima* (Hmeyada A. , 2022). At Cap Blanc, previous studies reported species such as *Lotus chazaliei*, *Zygophyllum simplex*, and *Limonium chazeli*, though the latter may have been mistaken for *Tetraena gaetula* (Anteagroup, 2017). Halophilic vegetation, including *Atriplex sp.*, *Nitraria retusa*, and *Tamarix sp.*, is found on coastal breaches, often accompanied by exotic plants such as *Casuarina equisetifolia* (ResIP, 2023).

Within the port site, the vegetation is in an extremely poor state. It is limited to a few sparse bushy halophytes. The formation includes seven species (*Caroxylon imbricatum*, *Nuccularia perrenii*, *Polycarpaea nivea*, *Suaeda monodiana*, *Tetraena guaetula*, *Traganum moquinii*, and *T. nudatum*), distributed across three families (Amaranthaceae, Caryophyllaceae, and Zygophyllaceae) (Golder, Etude d'impact environnemental et social (EIES), Projet mine de fer Atomai en Mauritanie, 2020).

None of the flora species observed or expected in the Port AoI are considered globally threatened on the IUCN Red List or have a restricted distribution range.

Based on the Forestry Code (n°2007-055, 2007), the following species are nationally protected: *Acacia senegal*, *Acacia albida (*synonym *Vachellia tortuosa), Acacia nilotica, (*synonym *Vachellia nilotica), Grewia bicolour (*synonym *Grewia rothii), Khaya senegalensis, Sterculia setigera, Ziziphus sp., Hyphaene thebaica, Sclerocarya birrea, Aristida pungens, Borassus flabellifer, Raphia sudanica, Commiphora africana, Dalbergia melanoxylon.*

In the administrative region of Dakhlett Noudahibou, the following species are also protected under the Forestry Code: *Maerua crassifolia, Capparis decidua, Vachellia tortilis raddiana* (synonym *Acacia raddiana*)*, Balanites aegyptiaca, Vachellia flava* (synonym *Acacia flava*)*,* and *Tamarix senegalensis.* With the possible exception of *Tamarix senegalensis*, none of the nationally protected species are expected in the Port AoI.

Available information on vegetation assemblages, existing landcover mapping (e.g., Naia 2021) and satellite image review indicate that terrestrial habitats in the Port AoI consist of a mix of degraded natural habitats and modified habitats (see below). Habitats within the mineral port are modified, owing to the presence of anthropogenic disturbance and infrastructure.

- **Modified habitats**

IFC PS6 (IFC, Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, 2019) defines modified habitats as "*areas that may contain a large proportion of plant and/or animal*

species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.

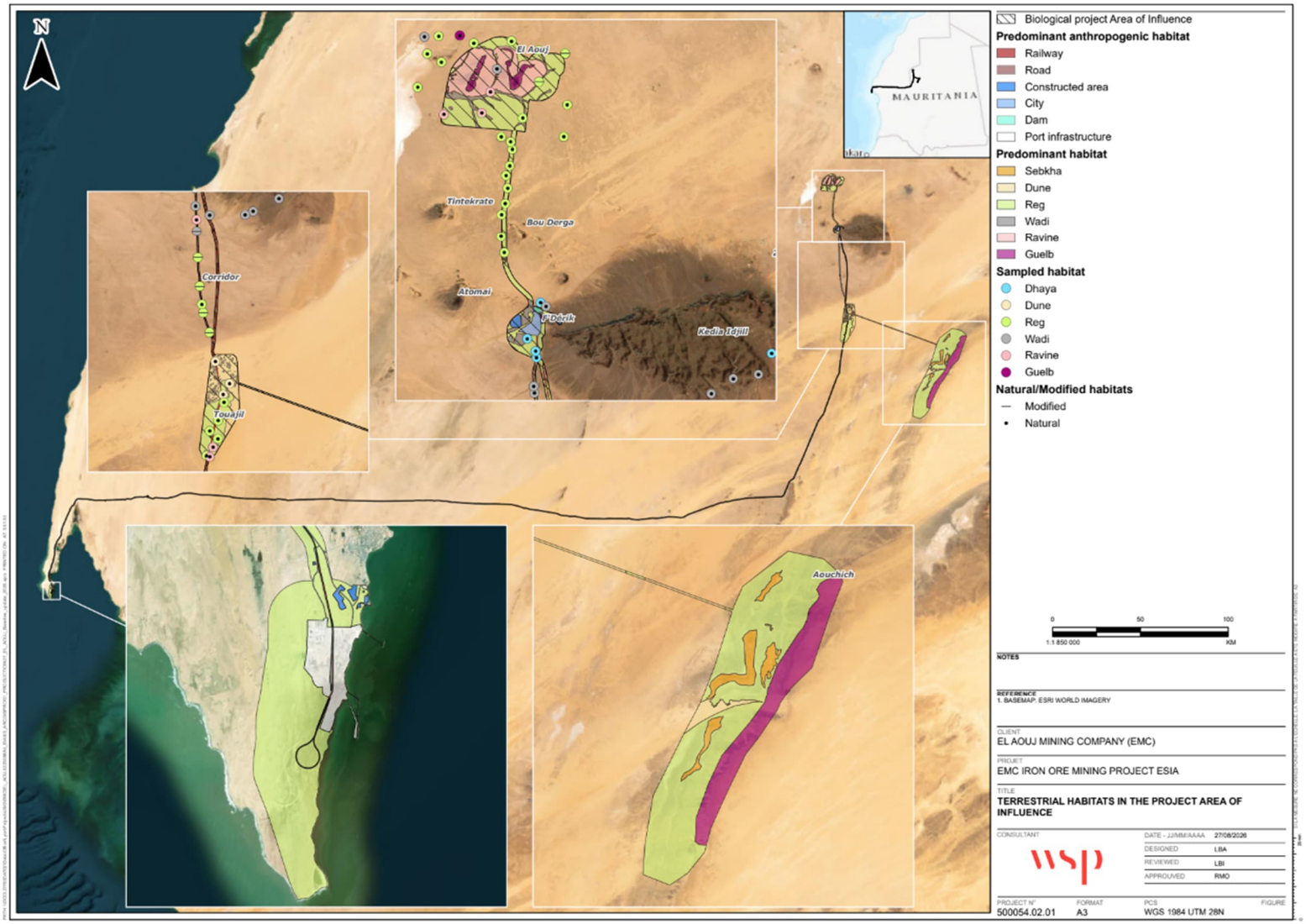
- **Natural habitats**

IFC PS6 (IFC, Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, 2019) defines natural habitats as "*areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition*". In general, natural habitats maintain ecological function and a large proportion of native species.

Table 7-3: Definition of the identified habitats in the Port area

Habitat	Definition
Regs	Stony surface cleared of fine elements by the wind (wind deflation), sometimes they are sanded, in which case they are vegetated
Anthropogenic features	Human-made features such as roads, power lines, rail lines, settled areas and cultivated areas.

Figure 7-5: Terrestrial habitats in the Project area of influence (Port, rail and mine)



7.3.2.2 Mammals

There are limited fauna studies in the Port AoI. The most comprehensive study of mammals was conducted by Brito et al. (2022) who compiled data from 21 overland expeditions across Mauritania as well as records from over 100 bibliographic references. According to this study, the region around the Port AoI hosts between 20 and 29 mammal species, including 1 to 2 threatened species. However, Brito et al.'s (2022) study is based on a broad 100x100 km grid, which may over-represent the number of species expected at the industrial port site. The area further west of the port is less species-rich, with 1 to 9 mammal species (0 threatened species) (Brito, 2022).

Stray dogs are frequently observed around the industrial port site and may influence the presence of other mammals. Rodents of the genus *Gerbillus* are most likely to be present. No globally threatened or restricted range terrestrial mammals are expected at the port.

7.3.2.3 Reptiles

Reptiles are sparse in the Port AoI, and limited studies have been conducted in the area. Around Baie de l'Étoile, to the north of the AoI, lizards of the genus *Acanthodactylus* were recorded. On the Cap Blanc Peninsula, two lizard species characteristics of the area were also found: the golden fringe-fingered lizard (*Acanthodactylus aureus*; LC) and the helmeted gecko (*Diplodactylus galeatus*; LC) (SNIM, 2009). According to the IUCN Red List, helmethead gecko (*Tarentola chazaliae*; VU) may occur in the Port AoI, but is unlikely to occur at the port site itself. This restricted-range species is associated with succulent vegetation on sandy and stony soils, and dunes or rocky plateaus with shelters or refuges (Wilms, 2013).

7.3.2.4 Birds

Marine birds

Mauritania's coastal and marine habitats host a diverse array of seabirds, including species like the Eurasian spoonbill (*Platalea leucorodia*, LC) and a sub-species of the grey heron species (*Ardea cinerea monicae*). Most seabirds in Mauritania are found around Cap Blanc and in Banc d'Arguin National Park. Field surveys conducted in 2015 recorded 11 species on the southern tip of Cap Blanc, including terns, swallows, cormorants, giant gulls, waders, and vultures (Anteagroup, 2017).

In Mauritania, at least 70 species of seabirds are known to occur occasionally, including 11 vagrant species and 16 that breed in the region. During systematic boat-based surveys 48 seabird species were recorded. There was no evidence to suggest that these species are numerous at sea, except possibly in nearshore waters for cormorants, scoters, and *Chroicocephalus* gulls. Seabird populations were more abundant in coastal areas during spring and early summer (Camphuysen, 2022).

The Satellite Reserve of Cap Blanc is considered a major resting site for seabirds, primarily visited by black terns (*Chlidonias niger*, LC) and other tern species (*Sterna spp.*) during their migratory stopovers and breeding periods. The common tern (*Sterna hirundo*, LC) and the black tern typically frequent the more coastal areas of Baie du Lévrier and were recorded during a 2009 study. Many terns, seagulls, pelicans, and a cormorant were also observed. Most were feeding on shoals of small fish, likely sardines. Two shorebirds, and plovers (*Charadrius* sp.), were also identified on SNIM's boat embarkation dock (SNIM, 2009).

Camphuysen (2022c) conducted a broad survey off the west coast of Mauritania, between Cap Blanc and Saint-Louis (Senegal) and recorded 24 seabird species. The most abundant included the northern gannet, Cory's shearwater (*Calonectris borealis*, LC), and Wilson's storm petrel (*Oceanites oceanicus*, LC). About 97% of the birds originated from breeding grounds in the Arctic, Subarctic, or temperate Europe. The neritic zone hosted the highest densities (53.5% of observations), with piscivorous species being dominant. During the study, 116

fishing vessels, including trawlers and pirogues, were documented. In some instances, trawlers attracted up to 3,500 birds (Camphuysen, 2022c).

Seasonal trends

Camphuysen (2022a) observed that that marine areas within the EEZs of Morocco, Western Sahara, Mauritania, and Senegal were heavily used by seabirds during the winter period (October to March). This pattern is also supported by the study of Garthe et al. (2016), which identified the northwest African waters as a major wintering area for northern gannets breeding in Iceland. Similarly, studies such as that of Paiva et al. (2015) highlight distinct foraging ecology patterns in these regions. In particular, the spatial and trophic ecology of species like the Cape Verde shearwater (*Calonectris edwardsii*, NT) show important shifts in foraging behaviour across different breeding phases. Furthermore, areas frequented by industrial fishing fleets tend to attract even more seabirds during their incubation periods (Camphuysen, 2022a).

Another study by Camphuysen (2022b) showed a dominance of piscivorous and plankton-feeding species such as the northern gannet, highly abundant in winter, and petrels and shearwaters, including the Cape Verde shearwater. Camphuysen (2022b) observed high densities near the continental shelf break and in upwelling zones. For coastal areas it has been shown that seabird populations are more abundant during spring and early summer. Seasonal abundance peaks in winter for migratory species from the Northern Hemisphere.

Migratory birds

Banc d'Arguin National Park is crucial for migratory birds (see Section 7.3.1). It is home to species such as the greater flamingo (*Phoenicopterus roseus*, LC) and the royal tern, which use the nutrient-rich waters of the area as a migratory stopover (IMROP, 2012; Anteagroup, 2017). The park also supports large populations of waders and gulls, with over 30,000 individuals of terns and gull-billed terns present during the breeding season (IUCN, 2008). The Port AoI is comparatively much less important for migratory birds; however, migrants do pass through the area on their way to and from Banc d’Arguin National Park.

Globally important concentrations of migratory birds are not present at the port site itself; however, the Port AoI overlaps with the Cap Blanc IBA, which may contain significant populations of ruddy turnstone, slender-billed gull, lesser black-backed gull, Caspian tern, and sandwich tern. By contrast, Banc d’Arguin National Park definitively hosts globally important concentrations of migratory birds, in particular limicolous migrant birds (UNESCO, 2024).

The Mauritanian shelf plays a critical global role as a foraging hotspot for migratory seabirds from both hemispheres. During the northern summer (March/April to October/November), the continental shelf hosts Antarctic and Subantarctic birds that migrate northward to overwinter there, and during the northern winter (September to May), the region supports species from the Arctic, Subarctic, and Northern Temperate zones (Camphuysen, 2022a).

According to (Camphuysen, 2022b) common terns dominate the tern populations off Northwest Africa for most of the year, with roseate and Arctic terns being much rarer (0.1% and 5.1% respectively, compared to 94.8% common terns). Arctic terns undertake remarkable migrations, traveling annually from the Arctic to the Antarctic, covering up to 90,000 km across the Atlantic, Indian, and Southern Oceans. Common terns winter mainly in the upwelling waters off the West African coast. They stop over around the Canary Islands during both spring and autumn migrations. Royal terns breed locally in large numbers in Banc d’Arguin, with egg-laying from mid-April to mid-June. Their presence offshore in April–June reflects the egg-laying phase, and not the chick-rearing. Sabine’s gulls (*Xema sabini*, LC) winter in the South Atlantic and begin northward spring migration between March and early May. They spend 2 to 3 weeks off Northwest Africa between mid-March and June, using the

productive marine waters off Northwest Africa as a crucial stopover along their 28,000 km migration route, guided by zones of high marine productivity (Camphuysen, 2022b).

Species of Conservation Concern

A list of potential species of conservation concern was generated from the Integrated Biodiversity Assessment Tool (IBAT). The list was screened to identify species with evidence of occurrence in Baie du Lévrier and/or the Port AoI. Species included:

- Curlew sandpiper (*Calidris ferruginea*; VU). Species is present in Banc d'Arguin National Park and in the Cap Blanc Integral Reserve. In winter, the species is mainly found in coastal brackish lagoons, mudflats and sandbanks, estuaries, and salt marshes (IUCN 2025). These habitats are well represented in Banc d'Arguin National Park but are not found in the Port AoI. The species may occur in the Port AoI on occasion.
- Audouin's gull (*Larus audouinii*; VU). Species is present in Banc d'Arguin National Park and in the Cap Blanc Integral Reserve. During the non-breeding period it is typically associated with sheltered bays, either sandy or with cliff margins, and feeds in coastal and pelagic habitats (IUCN 2025). The species is likely to occur in the Port AoI.
- Grey plover (*Pluvialis squatarola*; VU). Species is present in Banc d'Arguin National Park. Grey plover is present in Mauritania during the non-breeding period. During this time, it frequents intertidal mudflats, saltmarshes, sandflats and beaches of oceanic coastlines, bays and estuaries. During migration it may also be found inland on lakes, pools or grasslands (IUCN 2025). These habitats are present in Banc d'Arguin National Park and at the southern tip of the Peninsula in the Cap Blanc Satellite Reserve. The species is likely to occur in the Port AoI.
- Egyptian vulture (*Neophron percnopterus;* EN). The Port AoI overlaps with Egyptian vulture passage range, which corresponds to areas where individuals could occur during short periods of time during their migration between breeding and non-breeding areas. A few observations of the species have been recorded along the Ras Nouadhibou Peninsula between 2014 and 2023, according to the GBIF database. Available information indicates that a few Egyptian vultures likely pass through the Port AoI seasonally.
- Rüppell's vulture (*Gyps rueppelli*; CR). Although the Port AoI is located outside of the mapped global distribution range for the species, a small group of Rüppell's vultures was reportedly observed near the SNIM port in a 2017 study (Anteagroup 2017). In addition, the GBIF database includes a few occurrence records for Rüppell's vulture near the tip of the Ras Nouadhibou Peninsula. Available information indicates that Rüppell's vulture occasionally occurs in the Port AoI.

7.3.2.5 Chiroptera

The bats of Mauritania are under-recorded but based on data available for the wider Sahelian region (Hutson, 2001) none of the species potentially present in the Port AoI are nationally rare, globally threatened or have restricted distribution ranges (URS, 2015). According to the IUCN Red List of Threatened Species, 16 bat species occur in Mauritania, with one listed as NT and the remainder as LC. Bat species most likely to occur in the Port AoI are those that are disturbance tolerant and use human features (e.g., buildings, bridges) as roosts.

7.3.3 Marine biodiversity

7.3.3.1 Marine habitats and flora

Aquatic vegetation in Baie du Lévrier mainly includes marine algal species and seagrass meadows. Seagrass meadows are vulnerable habitats due to their sensitivity to environmental change, including encroachment, altered water quality and high turbidity. Seagrass meadows serve as critical nursery grounds for fish and as grazing areas for sea turtles (Anteagroup, 2017). Seagrass beds and algae play a crucial role in the region, particularly in sediment stabilization and the protection of juvenile fish. Sediment study campaigns conducted in 2009, 2013, and 2014 indicate that marine flora near the mineral port is almost non-existent.

Seagrass meadows along the coastal zones of West Africa (Mauritania, Senegal, The Gambia, Guinea-Bissau, Guinea, Sierra Leone, and Cape Verde) were surveyed between 2019 and 2022. (Sidi Cheikh, 2023). Four seagrass species were identified:

- *Cymodocea nodosa*: predominantly found in the subtidal areas at depths up to 4 meters. It is present in Banc d'Arguin National Park, where it often coexists with *Halodule wrightii*.
- Shoal grass (*Halodule wrightii)*: a dominant tropical species found in all surveyed countries. It is also found in the Banc d'Arguin National Park, representing the northern limit of its distribution. It grows on sandy or muddy substrates in both sheltered and exposed areas.
- Dwarf eelgrass (*Zostera noltii*): A temperate-affinity species, it has been documented in Mauritania, particularly in sheltered intertidal areas. It forms dense meadows in muddy substrates.
- Beaked tasselweed (*Ruppia maritima*): observed in hypersaline lagoons, particularly in particularly in sheltered bays east of the Cap Blanc peninsula (Sidi Cheikh, 2023).

Mauritania's seagrass meadows were estimated to cover up to 52,300 ha. This extent represents 84% of the West African coverage and is primarily distributed within the Banc d'Arguin National Park, which contains several large seagrass beds, of Zostera, Cymodocea, and Halodule (Anteagroup, 2017). Based on satellite image analysis, researchers observed a clear increase in seagrass coverage since the 1970s in the Banc d'Arguin. These meadows provide important habitats for sea turtles, dugongs, and various fish species. They also play a key role in carbon sequestration (blue carbon), with the Banc d'Arguin National Park being the third most significant site globally for carbon storage in marine ecosystems (Grootjans, 2020). The marine habitats also support diversity of phytoplankton. None of the areas mapped as seagrass meadows by Sidi Cheik (2023) occur in the Port AoI. The nearest mapped seagrass meadow is in Baie de l'Étoile (located north of the Port AoI) and includes *Cymodocea nodosa* and *Zostera noltei*.

A total of 40 phytoplankton species from seven families have been identified in Baie de l'Étoile, with most species belonging to the Bacillariophyceae, Dinophyceae (some of which are toxic), and Dictyochophyceae classes (IMROP, 2012). The Port AoI likely supports a similar assemblage of phytoplankton.

Marine habitats in the Port AoI are considered natural habitats. They can generally be described as shallow waters (up to 30 m) with sediments consisting of fine to medium sand, and localized presence of mud, silt and medium to coarse sand (refer to Section 6.4.2).

A range of studies have been undertaken in the Baie du Lévrier to understand the potential impacts to water quality and marine habitats from human activity, including flour mill discharges, discharges from various outfalls, and activities associated with the mineral port. These studies showed localized environmental impacts (i.e., decline in dissolved oxygen, presence of heavy metals, mercury in fish from the Baie de l'Étoile), though were not considered significant on a larger scale (IMROP, 2014). However, these studies were fragmented, did not

cover the entire Baie du Lévrier, and were completed to address specific requirements. As a result, it is difficult to get a clear understanding of the overall water quality in the Baie du Lévrier. The studies also highlight the presence of several toxic algae species in Mauritanian waters, harmful to both humans and aquatic animals (IMROP, 2014).

7.3.3.2 Benthic fauna

The benthic fauna of Baie de l'Étoile (over 20 km away from the port) is rich and diverse, particularly in the shallow, sandy seabeds. A commercially exploitable Venus clam (*Venus verrucosa*) bed, located at depths between 3 and 10 meters on sandy bottoms, was mapped in 1987 (IMROP, 2012).

Benthic fauna density in Baie de l'Étoile exceeds 6,000 organisms per square meter (IMROP, 2012), although significant variation was observed with densities ranging from 1,000 to 2,000 individuals/m² to as high as 6,663 organisms/m² (URS, 2015). IMROP found extensive seagrass beds primarily composed of annelids (mostly polychaetas), molluscs, and crustaceans, along with sandier areas largely populated by crabs, with an estimated 30,000 to 50,000 burrows/ha (IMROP, 2012). A similar composition was found in a 2017 study by Anteagroup, which recorded over 178 species of benthic macrofauna. Polychaetas, particularly abundant in the region, play a crucial role in the decomposition of organic matter suspended in the water (Anteagroup, 2017). Studies conducted by IMROP are summarized in Table 7-4.

Table 7-4: Composition of the benthic fauna from previous studies

Taxa	2009[a]	2010[b]	2013[c]	2016[d]	2023[e]
Season / period	**Spring**	**February**	**n. a**	**February**	**March-September**
Location	**Baie du Lévrier**	**Baie du Lévrier**	**MEEZ***	**Baie du Lévrier and Channel**	**Baie du Lévrier**
Annelids	41%	32%	33%	50.6% & 39.3%	44.67%
Molluscs	31%	41%	40%	32.3% & 45.9%	35.37%
Arthropods	-	17%	17%	13.8% & 11.9%	15.19%
Echinoderms	-			1% & 0.2%	1.36%
Other phyla	-			2.3% & 2.7%	3.40%
Average organism densities (individuals/m²)	6,663	-	-	2,145 & 603	1,906.46 ± 450.33
Average Biomass (g/m²)	-	10.36 – 128.76	7.25 – 153.28	5,304.51 & 3,760.42	-
Taxonomic richness	56	11 to 30	9 to 29	8 and 7	7 to 87

[a] (SNIM, 2009) [b] (Tecsult International Limitée , 2010) [c](IMROP, 2014) [d] (Anteagroup, 2017) [e] (IMROP, 2024)

*Mauritania Exclusive Economic Zone

Benthic fauna diversity appears stable in Baie du Lévrier, and the higher number of taxa recorded in 2023 may be attributed to improved collection system performance. The Shannon diversity index (H) ranged from 1.59 and 4.89, indicating important levels of diversity (IMROP, 2024). The Port AoI includes the navigation channel, and therefore the Port AoI is expected to exhibit a range in benthic fauna density, with a spatial and temporal pattern that correlates with the disturbance regime (e.g., fewer organisms in dredged areas and shortly after dredging activities). Available information suggests that benthic fauna in the Port AoI is dominated by annelids, molluscs, and arthropods.

Invasive marine invertebrate species in Banc d'Arguin National Park were identified using DNA barcoding during sampling conducted in 2021 and 2022. A total of 17 species were identified, belonging to three major taxa: Cnidaria, Bryozoa, and Arthropoda. Two species were recorded for the first time in West Africa: *Amathia brasiliensis* and *Amathia cf. vidovici*. Among the species detected, four are exotic species, including hydroids (*Bougainvillia*, *Pennaria*), bryozoans (*Amathia*, *Bugula*, *Schizoporella*), and barnacles (*Amphibalanus sp.*). The likely vectors for their introduction are maritime traffic and fishing activities, which increase the vulnerability of the Banc d'Arguin National Park to biological invasions driven by anthropogenic activities (Carlos, 2024). The presence of exotic species in the broader region suggests that these species could be present or could spread to the Port AoI.

7.3.3.3 Fish and cephalopods

The Mauritanian Exclusive Economic Zone (EEZ) is renowned for its high productivity and rich biological diversity. Among the 703 fish species recorded in the EEZ, no fewer than 170 are considered to have commercial value (IMROP, 2013).

Pelagic fish are most commonly recorded in Mauritania's waters. This is partly explained by its position as a transitional and passage zone for many species, whether associated with temperate or tropical environments (Chavance, 1991), but also due to the upwelling phenomenon, which is generally characterized by large populations of small pelagic fish (Bakun, 1996). Annual pelagic fish catches in Mauritania reach 900,000 tons, of which 80% are small fish such as sardinellas (*Sardinella* spp.), anchovies (*Engraulis encrasicolus*, LC) horse mackerel (*Trachurus* spp.), and yellow mullet (*Mugil cephalus*, LC). Species like the gilthead seabream (*Sparus aurata*, LC) and the yellow mullet, both threatened and under heavy local fishing pressure, frequent the Baie du Lévrier. The biophysical conditions of Baie du Lévrier are considered favourable for the reproduction and feeding of numerous fish species (IUCN, 2008). The remaining 20% of the catch consists of demersal fish, which live on the seabed.

In Baie du Lévrier, 70 species have been recorded, dominated by Senegal seabream (*Diplodus Bellotti*, LC), white seabream (*D. sargus*, LC), Canary dentex (*Dentex canariensis*, LC) and rubberlip grunt (*Plectorhynchus mediterraneus*, DD) with some using shallow waters as nursery zones (e.g., meagre (*Argyrosomus regius*, LC)). Surveys undertaken in 2011 in the Baie de l'Étoile documented 19 resident and 39 transient fish species, with species richness varying by season (hot and cold seasons) and during the transitional periods between them. Baie de l'Étoile is known for its high species diversity, with some species typical of lagoon estuaries and salt marshes (IMROP, 2012). In the shallow coastal areas, drum sciaenid communities are found, almost exclusively with Guinean affinities, inhabiting fine sediments (muddy-sandy and sandy-muddy) in the coastal part of the continental shelf, which has the warmest water temperatures. These species are highly dependent on the richest coastal bottom areas, which provide abundant food (Chavance, 1991). The waters off Nouadhibou support commercially and ecologically important fish, such as European sea bass (*Dicentrarchus labrax*, NT) grouper (Serranidae), and other species typical of warm temperate Atlantic waters. Species like bluefin tuna and even whale sharks are seasonally present.

Commercially exploited cephalopod molluscs have been recorded in Baie du Lévrier and are expected to occur in the Port AoI. There is significant fishing of cephalopods, particularly octopus (*Octopus vulgaris*, LC) which inhabit shallow waters (less than 10 meters) near the coast. Other cephalopods in Baie du Lévrier include European squid (*Loligo vulgaris*, DD), which spawns in these waters (ACCC, 2006), and common cuttlefish (*Sepia officinalis,* LC) (Chavance, 1991). Cephalopods are impacted by overfishing, mainly due to foreign fishing operations (Anteagroup, 2017).

Species of Conservation Concern

A list of potential species of conservation concern was generated from IBAT. The list was screened to identify species with evidence of occurrence in the region, which includes Baie du Lévrier and Banc d'Arguin National Park (Table 7-5). There are 26 fish species of conservation concern that could potentially occur in the Port AoI, based on occurrence records from the broader region. These include 7 CR species, 7 EN species, and 12 VU species.

Table 7-5: Fish species of conservation concern with evidence of occurrence in the region around Baie du Lévrier

Species	Common name	IUCN status
Aetomylaeus bovinus	Duckbill eagle ray	CR
Alopias vulpinus	Common thresher	VU
Carcharhinus obscurus	Dusky shark	EN
Dasyatis pastinaca	Common stingray	VU
Ginglymostoma cirratum	Atlantic nurse shark	VU
Glaucostegus cemiculus	Blackchin guitarfish	CR
Gymnura altavela	Spiny butterfly ray	EN
Hypanus rudis	Smalltooth Stingray	CR
Isurus oxyrinchus	Shortfin mako	EN
Isurus paucus	Longfin mako	EN
Leptocharias smithii	Barbeled houndshark	VU
Mustelus mustelus	Common smoothhound	EN
Mustelus punctulatus	Blackspotted smoothhound	VU
Mycteroperca marginata	Dusky grouper	VU
Paragaleus pectoralis	Atlantic weasel shark	EN
Pseudotolithus senegalensis	Cassava croaker	EN
Pseudotolithus senegallus	Low croaker	VU
Pseudupeneus prayensis	West African goatfish	VU
Rhinobatos albomaculatus	Whitespotted guitarfish	CR
Rhinobatos irvinei	Spineback guitarfish	CR
Rhinobatos rhinobatos	Common guitarfish	CR
Rhinoptera marginata	Lusitanian cownose ray	CR
Rhizoprionodon acutus	Milk shark	VU
Torpedo marmorata	Marbled torpedo ray	VU
Trachurus trachurus	Atlantic horse mackerel	VU
Zanobatus schoenleinii	Striped panray	VU

7.3.3.4 Sea turtles

Loggerhead turtles (EN), green turtles (EN), leatherback turtles (VU) and hawksbill turtles (CR) are found along the Mauritanian coast (BAD, 2017). Turtle nesting sites have also been identified along the Mauritanian coast; however, no nesting sites are identified in Baie du Lévrier (Kot, 2023).

A 2023 study highlighted the importance of the Banc d'Arguin National Park as a foraging site for adult green turtles nesting at the Joao Vieira and Poilao Marine National Park in Guinea-Bissau. Using satellite tags from 46 turtles between 2018 and 2021, researchers showed that nearly 50% of the turtles migrated to the Banc d'Arguin National Park after nesting. The site, rich in seagrass beds and macroalgae, is of considerable importance for feeding and survival and hosts approximately 150,000 juvenile and subadult turtles. Genetic studies suggest that some turtles foraging in the Banc d'Arguin area originate from the American continent, emphasizing its role in the global connectivity of turtle populations (Catry, 2023).

A total of 383 stranded turtles from four species were recorded along the coast of Mauritania in 2014 (IMROP, 2014). Green turtles represented 90% of observations, while loggerhead turtles accounted for 5%. Most of the strandings were observed in the region near Nouakchott, with many these strandings occurring in June 2013 (250 turtles). This phenomenon remains unexplained. Sea turtle mortalities appear to be concentrated around campsites, suggesting the possibility of hunting for human consumption, despite hunting bans. Necropsies on carcasses are not performed systematically, mainly because carcasses are often too decomposed to allow for such studies (IMROP, 2014).

Another study on sea turtle strandings by Hama (2019) recorded 1,787 stranded turtles along the Mauritanian coastline between 2009 and 2016. These strandings included green turtles (93%), loggerhead turtles (5%), leatherback turtles (2%), and olive ridley turtles (*Lepidochelys olivacea*, VU, 1%). Most stranded turtles were immature individuals, particularly for green turtles and loggerhead turtles. Identified causes of mortality included anthropogenic threats such as entanglement, boat collisions, and poaching (Hama, 2019).

Green turtles are the most likely species to be encountered in the Port AoI. Observations of sea turtles in the Port AoI would be seasonal and periodic, and likely to include individuals in transit to and from Banc d'Arguin National Park. Preferred feeding habitats of sea turtles (i.e., seagrass beds) are not present in the AoI, and therefore the Port AoI is not expected to support regular occurrences of these animals.

7.3.3.5 Mediterranean monk seal

The Mediterranean monk seal is a nationally protected species found near the SNIM port area. The Mediterranean monk seal is considered the most endangered pinniped in the world (Octopus Foundation, 2025). It exists primarily as three geographically and genetically isolated subpopulations in the eastern Mediterranean Sea, off the coasts of the Cabo Blanco peninsula (i.e., on the borders of Mauritania and Western Sahara and overlapping the Port AoI), and throughout the archipelago of Madeira. The Mediterranean monk seal has an estimated global population of fewer than 1,000 individuals (Karamanlidis, 2023). Conservation measures implemented over the last decades have resulted in an increasing population trend and gradual downlisting of the monk seal's conservation status, from CR (1996-2015) to EN (2015-2023), and now VU (Karamanlidis, 2023). The Mediterranean monk seal colony near the Port AoI includes over 350 individuals (approximately 35% of the global population), which is almost four times the local population's size of 100 individuals estimated in 1998 (CBD-Habitat, 2022; CBD-Habitat, 2024). Similarly, the annual number of pup births per year has increased from 24 to 80 between 1998 and 2020 (CBD-Habitat, 2022).

Monk seals seek refuge in sea caves for resting and breeding, an adaptation to increasing human disturbances. Historically, monk seals hauled out on open beaches for resting and pupping (Karamanlidis, 2023). The local monk seal population is associated with three caves (Fernandez de Larrinoa, 2021) distributed along a 1 km stretch of coastline at the tip of the Cabo Blanco Peninsula (located on land, less than 3 km away from the Port AoI) (IUCN-MMPATF, 2024). This clustered distribution pattern makes the population vulnerable to cave collapses, sea level rise, and disease (Karamanlidis, 2023). In general, the species is threatened by habitat degradation, negative interactions with fisheries (accidental captures and intentional killings), limited availability of food resources, stochastic events (storms, landslides), and viral outbreaks (Karamanlidis, 2023). Monk seals may also be vulnerable to collisions with oil tankers and other vessels, spills, and strandings. The frequency of such mortality events is not documented; however, the relatively high adult survival rates of the local population suggest these events are likely rare. Median adult male and female survival rates are estimated at 0.94 and 0.97, respectively (Fernandez de Larrinoa, 2021).

Tracking of monk seals has indicated that the local population uses an area that extends approximately 80 km north and south of their breeding caves (CBD-Habitat, 2014). Marine habitats are used for feeding and resting (Karamanlidis, 2024) Typically, seals will use habitats between the shoreline and the 200 m isobath (Karamanlidis, 2024). Males also use the beaches within the Cap Blanc Satellite Reserve (IUCN-MMPATF, 2024). Monk seal diet is opportunistic, including fish, cephalopods, and crustaceans.

The distribution of GPS tagged individuals between 2007 and 2018 is shown in Figure 7-6 (for 14 adult males) and Figure 7-6 (for 15 juveniles) (Fernandez de Larrinoa, unpublished data). Location data of both adult males and juveniles are concentrated along the western side of the peninsula, along the coastline of Western Sahara. There is a high concentration of monk seal locations northwest of the town of Nouadhibou, opposite the Baie de l'Étoile. From these data, it appears that the Port AoI is not used regularly by monk seals, but rather it likely corresponds to a transit area between heavily used site on the western coastline and Baie de l'Étoile. Juveniles are periodically present in Baie de l'Étoile (approximately 20 km north of the port), as shown in Figure 7-6. Occasionally, some individuals travel to Banc d'Arguin National Park (P. Fernandez de Larrinoa, pers. comm.). It is important to note that the distribution patterns illustrated in Figure 7-6 are based on a small subset of the monk seal population, and do not include adult females. The extent to which the movement and distribution patterns of the 29 tagged individuals are representative of the broader population is uncertain.

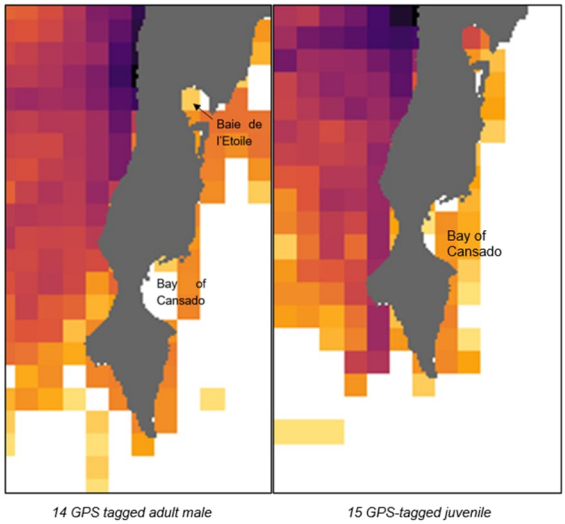


Figure 7-6: Distribution of 14 GPS-tagged adult male (at left), 15 GPS-tagged juvenile (at right) Mediterranean monk seals between 2007 and 2018. The density of location data varies from low density (light yellow) to high density (dark purple), (Fernandez de Larrinoa, unpublished data).

Overall, the available information indicates that monk seals are at times present within the Port AoI; however, core areas of activity appear to be outside of the Port AoI, along the western coastline of the peninsula, in Western Sahara.

A summary of an interview with Pablo Fernández de Larrinoa, Director of the Monk Seal Conservation Program (Fundación CBD-Hábitat/Annajah), conducted in April 2025 is included in APPENDIX H.

7.3.3.6 Cetaceans

The waters off Mauritania, specifically around the Mauritanian shelf and shelf break areas support 26 cetacean species, including globally threatened Atlantic humpback dolphin (*Sousa teuszii*; CR), blue whale (*Balaenoptera musculus*; EN), sei whale (*Balaenoptera borealis*; EN), and sperm whale (*Physeter macrocephalus*; VU). Cetaceans tend to concentrate around areas of cold-water upwellings and continental slopes (Camphuysen, 2022; Camphuysen, 2022b). Dolphins and small cetaceans are common in coastal and neritic waters, while larger cetaceans are predominantly observed in deeper oceanic waters (Camphuysen, 2022b). Off the west coast of Mauritania, between Cap Blanc and Saint-Louis (Senegal), nine marine mammal species were identified. These included the Atlantic spotted dolphin (*Stenella frontalis*; LC), the sperm whale, and the blue whale. Cetaceans were more frequently encountered in deep waters (> 800 m), while dolphins were most often observed in coastal areas (Camphuysen C. J., 2022c).

The Atlantic humpback dolphin is a top predator commonly found near the coast. It is renowned for its "collaboration" with Mauritanian fishermen by driving schools of mullet toward their nets and onto the shore (BAD, 2017). Its population extends along the western African coast, from Mauritania to southern Angola, and it is known to occur in Banc d'Arguin National Park (Collins, 2017). Although its global extent of occurrence completely overlaps the Baie du Lévrier and the Port AoI, research indicates that Atlantic humpback dolphins do not routinely occur between Banc d'Arguin National Park and Dakhla Bay (in Western Sahara, over 400 km from the national park) (Collins et al. 2017). The species may occur in the Port AoI, with rare occurrences likely attributable to transient individuals travelling between known areas of occupancy.

Based on studies by Camphuysen (2022, 2022b, 2022c) and occurrence records from the GBIF database, sei whales, and sperm whales have been observed in waters outside of the Port AoI, in areas further offshore with deeper waters. These globally threatened species are unlikely to occur in the Port AoI.

Common dolphins (*Delphinus delphis*; LC), Atlantic spotted dolphins, Atlantic white-sided dolphins (*Lagenorhynchus acutus*; LC), and long-finned pilot whales (*Globicephala melas*; LC) are abundant during the summer months along the continental slope when the thermal front migrates northward (Anteagroup, 2017). The humpback whale (*Megaptera novaeangliae*; LC) migrates through Mauritania's waters from the northeastern Atlantic to the Cape Verde Islands. The West African upwelling zone is considered a breeding area for North Atlantic humpback whales. Mauritania's EEZ also appears to be frequented by another humpback whale population from the South Atlantic (Anteagroup, 2017).

Overall, cetaceans may occur in the Port AoI; however, the shallow waters of the Port AoI (up to 30 m) are unlikely to support regular occurrences of most whale cetaceans, which tend to occupy Mauritania's continental slope. Dolphins are the most likely cetaceans to be observed in the Port AoI.

7.3.4 Summary of the Port area biodiversity

The Port AoI includes infrastructure and activities that overlap with marine and terrestrial environments of Baie du Lévrier and the Ras Nouadhibou peninsula. Sensitive biodiversity values in and around the Port AoI were identified from a review of existing information.

The Port AoI directly overlaps with two protected areas or internationally recognized areas, including:

- Cap Blanc integral reserve, which is designated as an IBA and KBA. The IBA and KBA overlap each other; however, the spatial extents of these sites differ with the IBA covering 3,100 km^2 and the KBA covering 1,063 km^2. These sites predominantly include the marine habitats of Baie du Lévrier but also extend inland to include some onshore and shoreline areas of the Ras Nouadhibou peninsula. The sites are designated as IBA/KBA because they support important concentrations of coastal migratory birds.
- Cap Blanc Satellite Reserve, which is a satellite reserve of Banc d'Arguin National Park. It covers a 4.2 km coastal strip at the tip of the Ras Nouadhibou Peninsula and extends 100 m inland and 400 m out to sea. The area was designated to protect Mediterranean monk seal habitat, although available data suggest that monk seals are concentrated outside the reserve, further north along the western side of the peninsula in Western Sahara.

There are four other protected areas and/or internationally recognized areas in proximity to the Port AoI. These include:

- Banc d'Arguin National Park (approximately 100 km for the AoI), which is designed as a UNESCO World Heritage Site, Ramsar wetland, KBA and IBA. This exceptional site is Mauritania's biodiversity hotspot. In addition to supporting globally important concentrations of migratory birds, it provides habitats for many high conservation priority species such as sea turtles and marine mammals and supports one of the richest fishing areas in the world.
- Dakhla Area KBA/IBA, which is a site that is subdivided into three sectors and is also proposed as a national park. The smallest and southernmost sector intersects the boundary of the Port AoI at the tip of the Ras Nouadhibou peninsula, while the central sector is approximately 20 km from the AoI. The site is designated because it supports considerable concentrations of migratory birds, with the southernmost sector noted as being an important migratory staging post for waders and seabirds moving in and out of Banc d'Arguin National Park.
- Two marine KBAs/IBAs, Canary Current Shelf Break North (approximately 30 km from the AoI) and Canary Current Shelf Break South (approximately 150 km from the AoI). These areas are designed due to their importance for marine birds.

Marine habitats in the Port AoI correspond to natural habitats. They are characterized by shallow waters (up to 30 m) with sediments consisting of fine to medium sand, and localized presence of mud, silt and medium to coarse sand, and limited vegetation. These habitats support a rich and diverse benthic invertebrate community, dominated by annelids, molluscs, and arthropods. Plankton studies in Baie de l'Étoile recorded 40 phytoplankton species, and the presence of several toxic algae species has been recorded in the region's marine habitats. Alien invasive species, including hydroids, bryozoans, and barnacles have been detected in Banc d'Arguin National Park, and therefore may pose a risk to marine habitats of the Port AoI under existing conditions.

Although important seagrass beds occur in the region, they are not present in the Port AoI. Known seagrass beds are located outside the AoI, in Banc d'Arguin National Park and Baie de l'Étoile.

Regarding terrestrial habitats, the coastal ecosystem in the Port AoI contains anthropogenic features such as railway, roads, port infrastructures and reg habitats. These regs can be modified or natural based on the level of degradation. Previous surveys within the Project footprint confirmed poor flora species richness (7 species) and little vegetation ground cover. No alien invasive plants were observed, and no globally threatened or nationally protected species were identified.

Mauritania's costal and offshore waters are globally recognized for their high productivity fisheries and rich biological diversity. The biophysical conditions of Baie du Lévrier are considered favourable for the reproduction

and feeding of numerous fish species. Previous studies have documented at least 70 fish species in Baie du Lévrier and 58 species in Baie de l'Étoile. Many more species have the potential occur periodically in the Port AoI as Mauritania's EEZ supports over 700 species of fish. There are 26 fish species of conservation concern that could potentially occur in the Port AoI, based on occurrence records from the broader region (i.e., from Baie du Lévrier to Banc d'Arguin National Park). These include 7 CR species, 7 EN species, and 12 VU species (Table 7-5)

Four species of globally threatened sea turtles are known from the Mauritanian coast; however, no nesting sites are identified in Baie du Lévrier or in the Port AoI. Green turtles (EN) are the most likely species to be encountered in the Port AoI. Observations of sea turtles in the AoI would be seasonal and periodic, and likely to include individuals in transit to and from Banc d'Arguin National Park, where individuals are known to feed on seagrass beds.

The Port AoI overlaps with the distribution range of a local population of Mediterranean monk seal (VU), which includes over 350 individuals and accounts for approximately 35% of the species' global population. Based on a small subset of GPS tagged individuals (29 individuals including males and juveniles), it appears monk seals are concentrated along the western side of the Ras Nouadhibou peninsula, along the coastline of Western Sahara (i.e., outside of the Port AoI). There is a high concentration of monk seal locations northwest of the town of Nouadhibou, opposite the Baie de l'Étoile. Overall, the available information indicates that monk seals are at times present within the Port AoI; however, core areas of activity appear to be outside of the Port AoI.

The waters of Mauritania, specifically around the shelf and shelf break areas, support 26 cetacean species including four globally threatened species. Dolphins and small cetaceans are common in coastal and neritic waters, while larger cetaceans are predominantly observed in deeper oceanic waters and unlikely to occur in the shallow waters of the Port AoI. Although the global extent of occurrence of the Atlantic humpback dolphin completely overlaps Baie du Lévrier and the Port AoI, research indicates that they do not regularly occur between Banc d'Arguin National Park and Dakhla Bay (in Western Sahara). Atlantic humpback dolphins may occur in the Port AoI, with rare occurrences likely attributable to transient individuals travelling between known areas of occupancy. Other globally threatened cetaceans are unlikely to occur in the Port AoI.

The Ras Nouadhibou peninsula mainly supports migratory seabirds and shorebirds, which are known to occupy the Cap Blanc IBA (which overlaps the Port AoI) and Banc d'Arguin National Park (located approximately 100 km from the Port AoI). Bird richness and abundance vary by season, with more species present during the overwintering and migratory periods. Five globally threatened species have been documented in the region and could occur in the Port AoI. These include grey plover (VU) and Audouin's gull (VU), which likely occur in the Port AoI, as well as curlew sandpiper (VU), Egyptian vulture (EN) and Rüppell's vulture (CR) which may occasionally occur in the Port AoI.

Non-avian terrestrial fauna is limited in the Port AoI, consistent with the harsh climatic conditions, limited vegetation cover, and degree of anthropogenic activity associated with the existing mineral port. Broader landscape-scale studies indicate that the area hosts few mammal species (between 1 and 9). Stray dogs are frequently observed around the port site and likely influence the presence of other mammals. Small rodents are the most likely to be encountered, particularly around the port site. Reptiles in the Port AoI include geckos and fringe-fingered lizards. Helmethead gecko (VU) may occur in the Port AoI but is unlikely to occur at the port site due to lack of suitable habitat.

In summary, the Port AoI contains high value biodiversity, which is mainly associated with the marine and costal ecosystems. The Port AoI intersects two internationally recognized areas (KBA/IBA and a satellite reserve) and is within 100 km of three other internationally recognized areas.

7.4 Rail area

The Project will benefit from the existing rail network between F'Derik and the mineral port, which will be used to transport ore between the El Aouj mine and the port facilities. Although the rail infrastructure is currently used to meet the needs of SNIM, the Project will contribute to an increase in train traffic. Baseline for the Rail area was established from a desktop review of existing information.

7.4.1 Legally protected areas and internationally recognized areas

The existing rail line between Zouerate and Nouadhibou does not pass through any legally protected areas (reserves or parks), KBA, IBA, or RAMSAR sites. Figure 7-7 below shows IUCN and UNEP-WCMW protected areas from 2020 (Naia, 2021). According to UNEP-WCLW, only 0.6% of the terrestrial and inland waters are protected in the South of the country, most of them are located near the Senegal river, and 3.7% of the marine environment is protected (UNEP-WCMC, 2024).

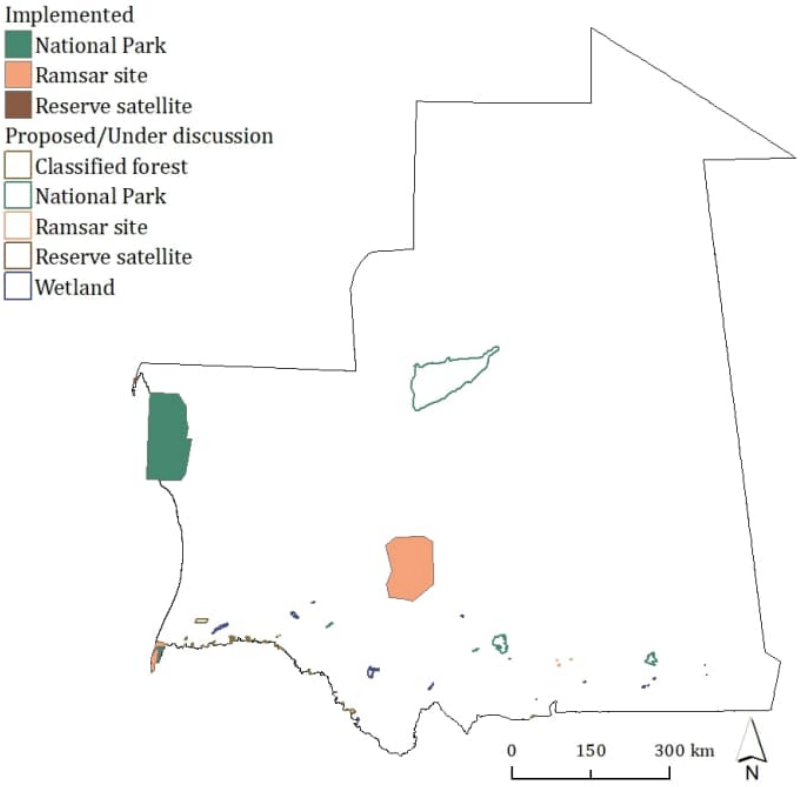


Figure 7-7: Protected and/or internationally recognized areas near the Project Area of Influence (Naia, 2021).

7.4.2 Habitats and flora

The rail line crosses two ecoregions, with most of the line intersecting the Saharan ecoregion and a smaller portion inside the Sahelian ecoregion. Taxonomically, the Sahelian domain is characterized by its plant component, which is by far the richest in terms of species, with over 1,200 plant species spread across 115 families. Among these, 8 families (Poaceae, Cyperaceae, Asteraceae, Euphorbiaceae, Convolvulaceae, Malvaceae, and Cruciferae) account for more than fifty percent of the species. The Saharan region of the country

includes other ecosystems of the same name, which are often associated with Mediterranean ecosystems due to their plant formations. The main habitats in the Tiris Zemmour region are linked to large geomorphological units: a vast peneplain almost entirely covered by recent formations, dotted with inselbergs (guelbs and kedias) and more or less pronounced wadis. Wadis typically have the most abundant and diverse vegetation, likely due to the greater availability of water in the soil (SNIM, Société Nationale Industrielle et Minière. NIES-PEI Chemin FER MR_SNIM_VF_Oct24.pdf. , 2024).

The railway crosses 872 km between Zouerate and Nouadhibou. Habitats across this region correspond to hyper-arid cover types, which means the presence of scattered bushes or no vegetation cover. These areas receive scarce and irregular rainfall, sometimes absent for extended periods. Based on land cover classification by Naia (2021), habitats along the rail area consist mainly of yellow dunes, regs, compact soils and sandy regs (Figure 7-8). Yellow dunes are fixed dunes composed of yellow sand with sparse shrubs, isolated *Acacia* sp. or with no vegetation cover. Compact soils are floodplains with soils composed of silt and/or clay and with sparse or no vegetation cover. Sandy regs are floodplains with soil composed of similar amounts of gravel and sand, with sparse or no vegetation cover. Regs are floodplains covered by gravel and usually with no vegetation cover (Naia, 2021).

In the northernmost areas of the rail line, the vegetation is scarce, comprising mainly bunchgrass species, such as *Panicum turgidum* and camel grass (*Cymbopogon schoenanthus*). Areas with higher vegetation density are restricted to seasonal floodplains and oases. In the Sahel, trees are sparse, consisting mainly of *Acacia* sp. and extensive fields of cram-cram (*Cenchrus biflorus*). Considering the six habitats identified during field surveys for the Mine area, the Project Rail area is dominated by regs (see Figure 7-8).

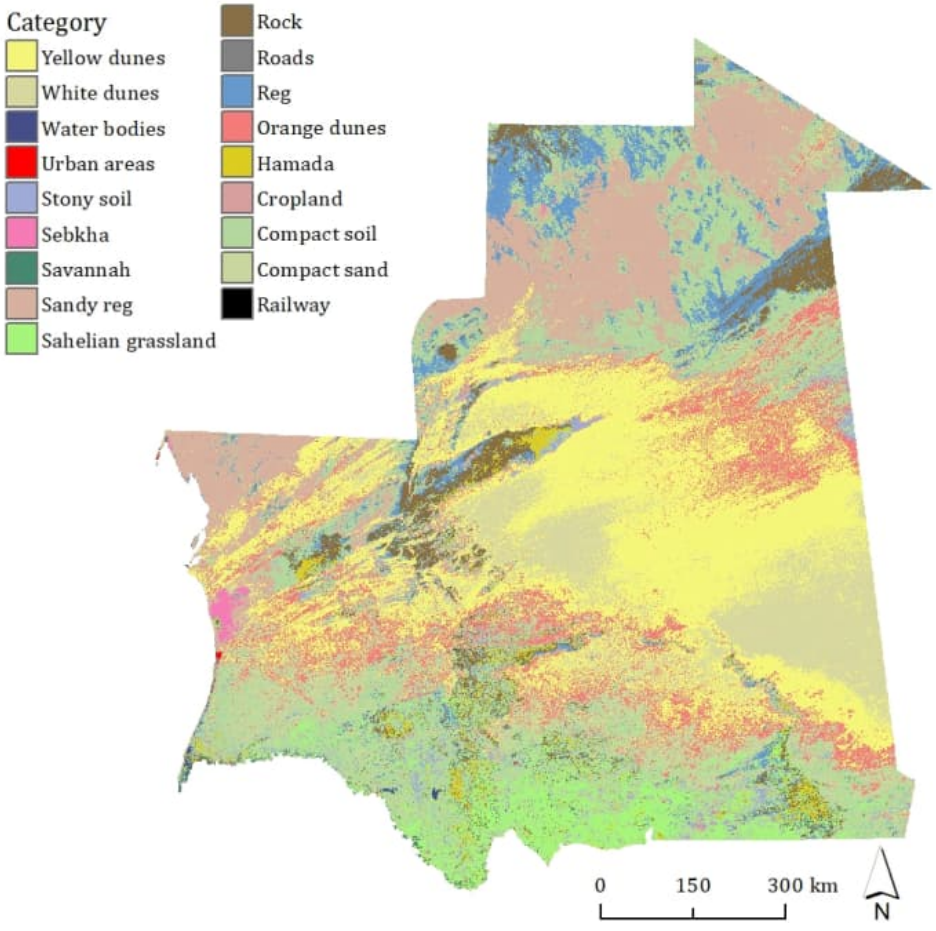


Figure 7-8: Land-cover categories (Naia, 2021)

7.4.3 Terrestrial fauna

On a global scale Mauritania hosts a rich and diverse fauna, including the highest concentration of waders in the world and millions of migratory birds that spend the winter there. Resident populations of bustards, guinea fowl, francolins, and sandgrouse can also be found. The ostrich is present in some areas at the edge of the desert. The main threats to Mauritania's ecosystems include overgrazing, overexploitation of non-timber forest products, habitat fragmentation, poaching, climate change, and bushfires. At the regional scale of Tiris Zemmour, the landscape is desert-like, and there are no notable sensitive biodiversity zones, except for some more or less human-managed grazing areas during the rainy periods. These areas are located outside the Rail AoI (SNIM, Société Nationale Industrielle et Minière. NIES-PEI Chemin FER MR_SNIM_VF_Oct24.pdf. , 2024).

The Rail AoI primarily crosses arid and desert areas, with a low density of fauna but with a diversity of species adapted to extreme conditions. In these reg and sandy reg habitats, species such as the fennec fox, the African wolf (*Canis lupaster*), and wild cats like the sand cat (*Felis margarita*) are found, though they are sporadic and often dispersed. Rodents and small mammals such as gerbil (*Gerbillus gerbillus*) and African ground squirrel (*Euxerus erythropus*) also inhabit these areas, showing relatively stable populations despite difficult conditions. The animal density in this region is generally low due to the aridity and lack of permanent vegetation.

Distribution grids of mammal species richness are shown in Figure 7-9, with the number of extant species on the left and threatened species on the right (Brito et al., 2022). These estimates are based on the review of 6,718 published and unique observations, which were combined into a dataset for detailed analysis. Brito et al.'s (2022) study shows that mammal species richness along the rail line is mostly between 1 and 9 species, but with 10 to 19 species potentially present in areas closer to mine. One threatened species, the Dorcas gazelle (VU), was identified by Brito et al. (2022) as occurring in sampling grids that overlap the Rail AoI (Brito et al., 2022).

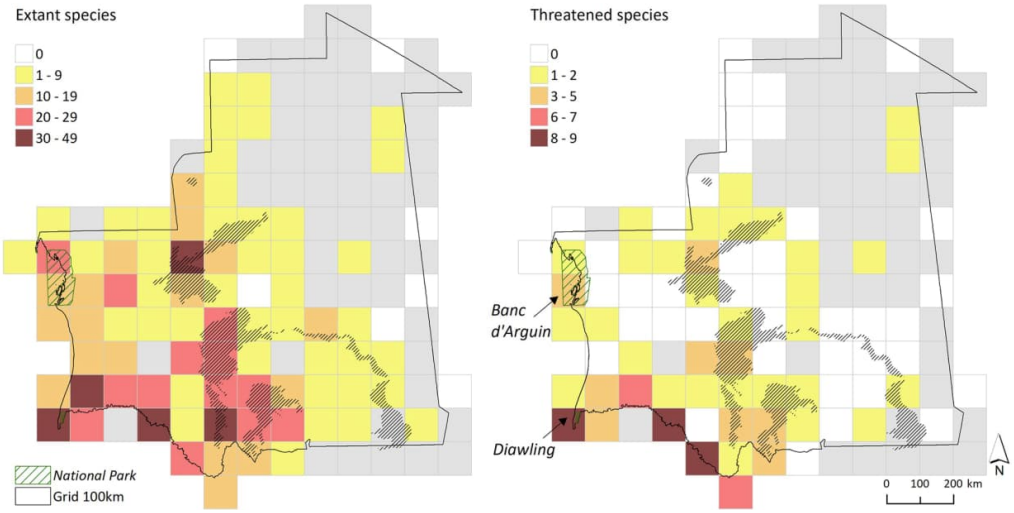


Figure 7-9: Distribution grids of mammal extant and threatened (based on IUCN red list; NT, VU, EN or CR) species richness (Brito et al., 2022)

Nature Map Explorer was used to screen for the potential presence of areas of conservation significance in the Rail Area. The database integrates data from the IUCN Red List (2019), the Global Assessment of Reptile Distributions (GARD) (2017), and the Botanical Information and Ecology Network (BIEN) database (2019) to create a species richness map. This map uses a colour gradient to illustrate areas of higher and lower species richness (NatureMap, (n.d.)). The map layer represents the number of amphibian, bird, mammal, and reptile

species, as well as a representative subset of plant taxa, whose distributions overlap within each 10 km grid cell. In the Rail area between Zouerate and Nouadhibou, the species richness indicated on the map is low, as reflected by the light colour in Figure 7-10. This same colour covers much of Mauritania, with only a few coastal areas or the region around Atar showing slightly higher richness (NatureMap, (n.d.)).

Based on a review of species distribution patterns available from the IUCN Red List (2026), the Rail AoI could include:

- 40 bird species, including 37 species listed as LC, 2 species listed as VU, and one species listed as EN. Globally threatened species include:
    - African houbara (*Chlamydotis undulata*; VU) – the species is associated with sandy and stony semi-desert, occurring in treeless areas with sparse shrub and herbaceous layers. The species was recorded at the mine site in 2013 by URS (2013) but was not detected in subsequent surveys. According to the species' most recent assessment (2023), it is uncertain if African houbara is extant within the Rail AoI.
    - Spanish imperial eagle (*Aquila adalberti*; VU) – the Rail AoI overlaps with the species' passage range, meaning that vagrant individuals could occur in the area from time to time but Spanish imperial eagles are unlikely to regularly occur in the AoI. The population is mainly distributed in Europe.
    - Egyptian vulture (*Neophron percnopterus*; EN) - the Rail AoI overlaps with the species' passage range, meaning that vagrant individuals could occur in the area from time to time but Egyptian vultures are unlikely to regularly occur in the AoI.
- 28 reptile species, including 26 species listed as LC, one species listed as DD, and one species listed as VU. The helmethead gecko is listed as VU and is a restricted range species whose distribution overlaps Ras Nouadhibou. As described in Section 7.3.2.3, helmethead gecko is associated with succulent vegetation on sandy and stony soils, and dunes or rocky plateaus with shelters or refuges. It could potentially occur in the portion of the Rail AoI that overlaps Ras Noudhibou.
- 1 amphibian species, the sub-Saharan toad (*Sclerophrys xeros*; LC) has a distribution range that partly overlaps the Rail AoI. This toad species is frequently associated with dry riverbeds and around oases and can breed in temporary pools.
- 22 mammal species, including 20 listed as LC, 1 species listed as DD, and 1 species listed as VU. Dorcas gazelle (VU), also identified by Brito et al. (2022), typically inhabits sparsely vegetated rocky plains. It requires access to forage (high-quality, moisture rich plants) and makes seasonal movements based on the availability and distribution of forage. Dorcas gazelle could move through the Rail AoI on occasion; however, the rail corridor is unlikely to provide high quality foraging opportunities.

Overall, the density and richness of fauna in the Rail AoI is considered low. This pattern reflects the presence of modified habitat, the sensory disturbance associated with train traffic, and the limited vegetation cover adjacent to the rail line.

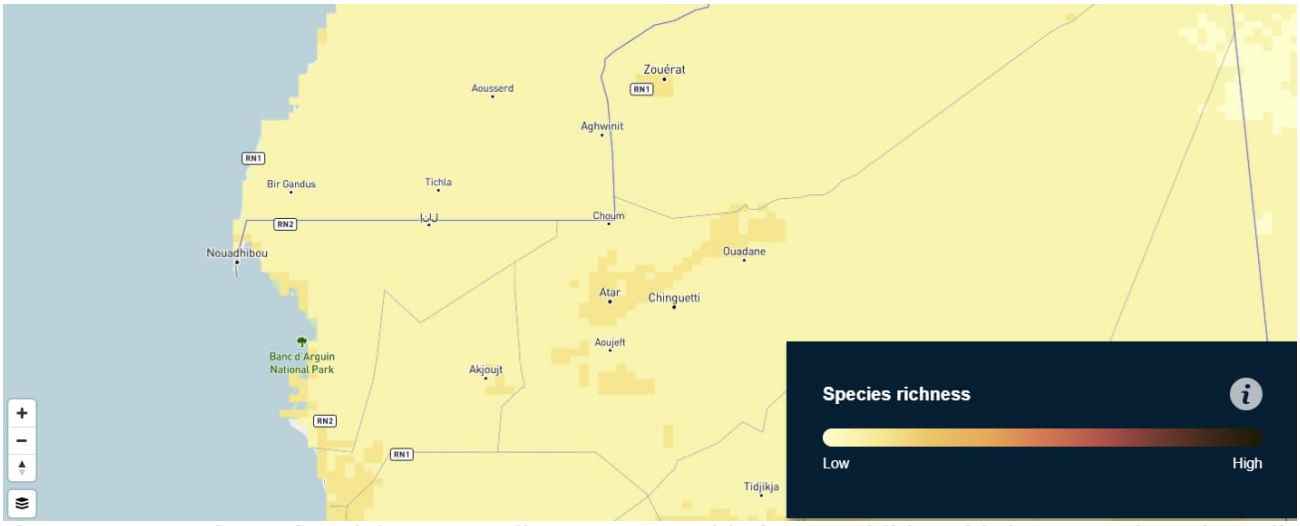


Figure 7-10: Total species richness gradient map considering amphibian, bird, mammal, and reptile species (NatureMap, (n.d.)).

7.4.4 Summary of the Rail area biodiversity

The Rail AoI traverses a few habitats with low vegetation density and are characterized by hyper-arid, drought-adapted flora. Most of the Rail AoI consists of modified habitat, owing to the presence of the existing rail line.

Faunal density in this region is generally low, with possible presence of species such as the fennec fox, African wolf, sand cat, gerbil, and African ground squirrel. Two VU species have distribution ranges that overalap the Rail AoI: Dorcas gazelle and helmethead gecko. Although Dorcas gazelle occurs across the broader region and may occasionally use habitat within the Rail AoI, the species does not meet IFC PS6 thresholds for Critical Habitat designation (Section 7.6). It is neither EN or CR, nor range-restricted, nor congregatory, and no evidence suggests the presence of regionally significant populations within the AoI. Helmethead gecko was considered in the critical habitat assessment for the Port area as its distribution in Mauritania is limited to the Ras Noudhibou peninsula.

7.5 Mine area

The Mine area is located in northern Mauritania in the administrative region of Tiris Zemmour. The main ecosystem in the North of Mauritania is sand desert (erg) with little to no permanent human settlements or roads. The general ecological context of the region is similar to that described in Section 7.2.

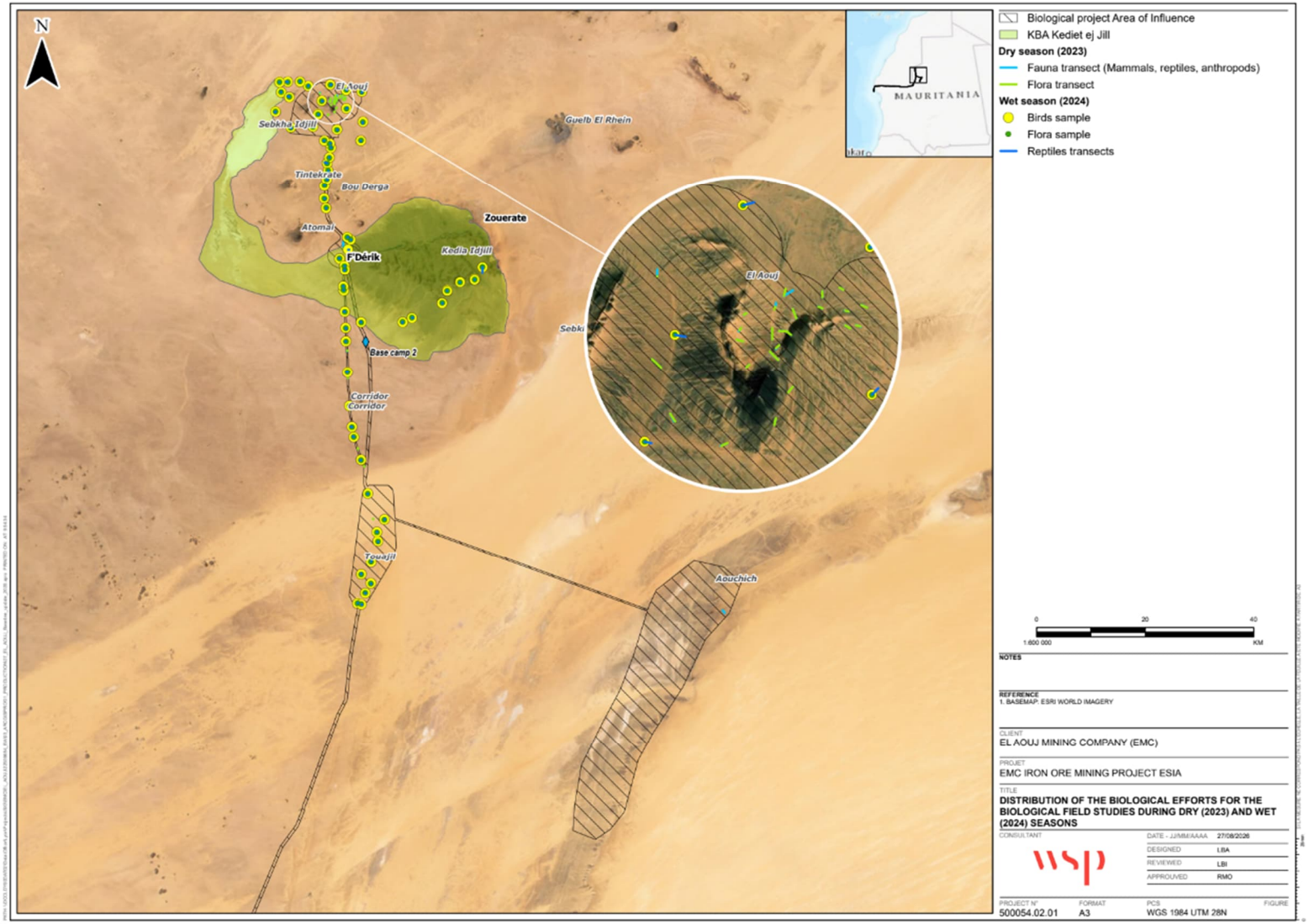
The field results presented in this section include those from the 2015 ESIA prepared by URS, which included data from field campaigns performed in 2012 and 2013. More recent data collected during field campaigns performed by WSP in 2023 and 2024 are also included. The investigation effort performed during the dry season 2023 and the wet season 2024 is presented in Figure 7-11 below.

Raw data from 2012 and 2013 studies (URS, 2015) were not available to inform the present study. The information available included the list of species observed during field surveys; therefore, the analyses presented herein are largely based on the 2023 and 2024 data but incorporate URS conclusions and observations where relevant.

Publicly accessible meteorological datasets do not provide observed rainfall values for Zouérate in 2023. The Mauritanian National Meteorological Office (ONM) is the only authority holding verified annual rainfall records for this locality. However, climate datasets consistently show that Zouérate receives on average 50–65 mm of rainfall per year, making any significant precipitation event in 2023 notably above the regional climatic baseline.

Data gathered in 2012-2013 are considered too outdated to be considered for biodiversity assessments. However, they were summarized and included in results tables to provide additional context about past inventories conducted across the Mine area. Data were used to inform species lists but were not considered in the analysis of current species richness patterns and seasonal trends.

Figure 7-11: Distribution of the biological efforts for the biological field studies during dry (2023) and wet (2024) seasons



7.5.1 Legally protected areas and internationally recognized areas

Legally protected areas

No national parks, ecological reserves or exceptional forest ecosystems occur in the Mine AoI.

Internationally recognized areas

The Mine AoI intersects one internationally recognized area, the Kediet ej Jill area, which consists of both an IBA and a KBA (Table 7-6 and Figure 7-4).

Table 7-6: Internationally recognized areas in the mine area of influence

Type	Name	Surface (ha)	Distance
Important Bird Area	Kediet ej Jill	110,000 ha	Directly overlaps the port AoI over 2,240 ha
Key Biodiversity Area	Kediet ej Jill	103,667 ha	

Kediet ej Jill IBA covers approximately 110,000 ha and includes species that meet two IBA listing criteria, A1 and A3 (BirdLife International, 2025):

- A1 is established when the site is known or considered to regularly host a significant number of globally threatened species. For Kediet ej Jill, this criterion is met by the Nubian bustard (*Neotis nuba*) listed as NT by the IUCN.
- A3 (A02) is established when the site is known or thought to hold a significant component of the group of species whose distributions are largely or wholly confined to one biome-realm. In the case of Kediet ej Jill, this criterion is met by several desert-restricted species (Table 7-7).

Table 7-7: Populations meeting IBA Criteria ("trigger species") at Kediet ej Jill.

Species	Red List	Season (year/s of estimate)	IBA Criteria
Crowned sandgrouse (*Pterocles coronatus*)	LC	resident (2001)	A3
Nubian bustard (*Neotis nuba*)	NT	resident (2001)	A1
Pharaoh eagle-owl (*Bubo ascalaphus*)	LC	resident (2001)	A3
Greater hoopoe-lark (*Alaemon alaudipes*)	LC	resident (2001)	A3
Bar-tailed lark (*Ammomanes cinctura*)	LC	resident (2001)	A3
Desert lark (*Ammomanes deserti*)	LC	resident (2001)	A3
Pale rock martin (*Ptyonoprogne obsoleta*)	LC	resident (2001)	A3
Streaked scrub-warbler (*Scotocerca inquieta*)	LC	resident (2001)	A3
Fulvous babbler (*Argya fulva*)	LC	resident (2001)	A3
White-crowned wheatear (*Oenanthe leucopyga*)	LC	resident (2001)	A3
Mourning wheatear (*Oenanthe lugens*)	LC	resident (2001)	A3
Desert sparrow (*Passer simplex*)	LC	resident (2001)	A3
Trumpeter finch (*Bucanetes githagineus*)	LC	resident (2001)	A3

Source: BirdLife International (2024)

Kediet ej Jill is a steeply sloping rocky escarpment, measuring 20 km by 5 km, which lies to the east of the town of F'Derik. The escarpment runs east west and rises to 915 m, the highest point in Mauritania. Several ephemeral streams flow from the escarpment into the surrounding desert and drain westwards into the adjacent Sebkhet ej Jill (salt flat), west of F'Derik.

Iron ore extraction at Kediet ej Jill began in 1962 by MIFERMA (Mining Company of Iron Ore in Mauritania), before being nationalized in 1974 and taken over by SNIM. Areas disturbed by mining and related activities were observed during field surveys and are also visible on satellite imagery.

7.5.2 Habitats

Habitats were mapped based on a review of existing information (Section 7.5.2.1) and from field surveys (Section 7.5.2.2). Habitat mapping was completed in accordance with the IFC PS6 (IFC, 2012; IFC, Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, 2019) definitions of natural and modified habitats, as described below. Habitat maps and descriptions of habitat types in the Mine AoI are included in Section 7.5.2.3.

7.5.2.1 Desktop review

Regional context

The El Aouj mine is located in the northern part of the country, within the expansive Sahara Desert. This predominantly arid area features habitats composed of sand dunes, rocky zones, and unique geological formations, such as the guelbs of El Aouj, Kediet ej Jill, Atomai, and El Rhein, which are mountainous ranges surrounded by dunes. The region is part of the broader administrative area of Tiris Zemmour, which is characterized by mineral formations and mining activities, particularly iron ore extraction. The morphology of the region is flat and homogenous, except for a few areas where rocky peaks (guelbs) or small elongated ranges (Kedia) emerge from the reg zones. The elongated reliefs are mostly reinforced by outcrops of ferruginous quartzite. To the south-east of the Mine AoI, the formations of the Taoudeni basin form a series of small cliffs running parallel to one another, known as the Aouchich region. Further south-east, these same formations gradually disappear beneath the sands of the large dune massifs (WSP, 2023).

Habitats in the El Aouj region face several natural and anthropogenic threats, mainly related to climate pressures and human activities.

- Climate change and desertification: This arid area is subject to increased desertification, exacerbated by climate change. Drought and soil degradation lead to the loss of vegetation, reducing habitats for local species. Desertification particularly affects the wadis, which are essential as rare seasonal water points in the desert (GIEC, 2019).
- Mining activities: The El Aouj region is a mineral extraction zone, with ongoing and planned mining projects. Mining operations disturb habitats, particularly rock formations (guelbs) and desert areas, due to extraction, transportation, and generated pollution. This also affects air and water quality, which can have repercussions on biodiversity (European Investment Bank, 2004).
- Wind erosion: Dunes and regs are particularly sensitive to wind erosion, amplified by the loss of vegetation and soil trampling. This alters the topography of the dunes and reduces soil stability, disrupting habitats and causing sand dispersion into other fragile ecosystems (Global Environment Facility (GEF), 2021)
- Grazing: Overgrazing by goats and camels in the El Aouj area can reduce plant biodiversity and decrease soil stability in these environments. This degradation negatively impacts soil regeneration in desert ecosystems and promotes erosion (Ward, 2005).

7.5.2.2 Field methodology

Three field campaigns were completed as part of the 2015 ESIA (URS, El Aouj Iron Ore Project ESIA - Chapiter 4 - ESIA Method, 2015), and two field campaigns were performed by WSP in 2023 and 2024. Table 7-8 summarizes the dates, duration and seasons of the habitat field surveys.

Table 7-8: Habitats field surveys campaigns.

Year	Office	Local consultant	Season	Dates	Number of days	Number of sampling units
2012	URS	Unspecified	Dry season	January 23 to February 2, 2012	11 days	Around 50 transects
2012	URS	Unspecified	Dry season	March 26 to 30, 2012	5 days	
2013	URS	Unspecified	Wet season	October 21 to 25, 2013	5 days	
2023	WSP	Green Sahel Expertise (GSE) Dr. Amhedou Soule	Dry season	May 4 to 7, 2023	4 days	37 transects
2024	WSP	Green Sahel Expertise (GSE) Dr. Amhedou Soule	Wet season	October 7 to 13, 2024	7 days	61 plots

Table 7-9 summarizes the methodologies used for each field survey. Successive field studies did not use the exact same methodology.

Table 7-9: Habitat field survey methods.

Field campaign	Methods used
URS 2012-2013 *(No detailed descriptions of methods were provided)*	A vehicle-based reconnaissance survey was undertaken to verify the setting of the Project and its associated habitat context and variation. Due to the flat landscape, it was possible to observe 2 to 4 km in all directions. Driven transect survey routes were chosen to survey representative examples of habitats present in the Mine AoI, and to inform selection of sites to be investigated in greater detail to record flora and fauna. Transect routes followed the alignment of proposed linear infrastructure (as proposed at the time). Areas along the driven transect routes were selected for inspection on foot to record the flora present and to verify observations made during the driven transects.
Dry season 4-7 May 2023	37 flora transects were surveyed: 25 transects in the El Aouj area (TA) and 12 transects in the Water Corridor area (TC) (see APPENDIX I-A, Table 1). Habitats were assessed by the flora expert during the flora inventory.

Field campaign	Methods used
	Qualitative habitat quality assessments were carried out during the vehicle-based reconnaissance, along surveyed transects, and during point surveys. The goal was to document the relative level of human disturbance to distinguish between natural and modified habitats.
Wet season 7-13 October 2024	61 flora plots were surveyed and used to inform habitat descriptions (see APPENDIX I-A, Table 2). For each plot, a small stake was hammered into the ground where the coordinates were recorded. Using a pre-measured string of 56.4 m, a circle was drawn, marking a 1 ha boundary. After classifying the habitat, the expert surveyed the plot to identify species and their relative abundance (*cf.* DAFOR scale, Table 7-14) and vegetation cover. Vegetation condition was recorded through visual observation of the state of the plants present (e.g., in good condition, degraded, in poor condition, grazed, overgrazed). The location of the sampling plots was initially determined on a map by WSP in various habitats and then adjusted on site according to different constraints. The type of surface soil, the vegetation present and the topography enabled the expert, Dr Amhedou SOULE, to determine the type of habitat at each point. These habitats were then divided into micro-habitats.

7.5.2.3 Results

Habitat identification

Six habitat types were identified in the mine AoI, including guelbs, regs, ravines, wadis, dunes and dhayas (Table 7-10). A subcategory of regs was identified also identified from field studies: sandy regs, which are regs with a surface layer of sand.

Table 7-10: Definition of the identified habitats in the Mine area (WSP, 2023)

Habitat	Definition
Guelbs	Correspond to rocky outcrops
Regs	Stony surface cleared of fine elements by the wind (wind deflation), sometimes they are sanded, in which case they are vegetated
Ravines	Drainage channel dug by water runs off on a slope. When their sandy bottom is silted up, they are comparable to silted-up regs and are more conducive to the development of vegetation
Wadis	Intermittent watercourses in dry regions, often formed by the clustering of ravines. Soil and hydrological conditions are favourable to the development of vegetation
Dunes	Landform consisting of a mass of sand accumulated over a greater or lesser width and generally on a fairly steep slope
Dhayas	These are small areas of stagnant, shallow water, characterized by the absence of a drainage system. They are closed ecosystems where water escapes only through

Habitat	Definition
	evaporation or infiltration. In the study area, there are often depressions created by human activities during road construction. The F'Derik dam, also known as Rabt F'Derik, is comparable to a large pond.
Anthropogenic features	Human-made features such as roads, power lines, rail lines, settled areas and cultivated areas.

These habitats are described in more detail below and illustrated in Figure 7-12, Figure 7-13, Figure 7-14, Figure 7-15, Figure 7-16, Figure 7-17 and Figure 7-18. The Mine AoI is dominated by the reg habitat. Between F'Derik and Touajil, two habitats occur: Azefal dunes system and regs.

Guelbs

Guelb and their rocky areas are difficult to access. They form a refuge area for numerous plant species favoured by livestock or used by local populations for medicinal purposes, including vevelty mignonette (*Reseda villosa),* Sahara dill *(Ammodaucus leucotrichus)* and Peren's nucularia *(Nucularia perrenii).* The rocky outcrops are often characterized by flora communities identical to those in ravines, but poorer (WSP, 2023).

The Guelb of El Aouj is not favourable for vegetation growth due to the geology and lack of soil and water, but some vegetation occurs on the slopes of the surrounding gullies (loose, eroded rock). These areas provide some value for wildlife, providing functions such as burrows, nests, or resting sites (Figure 7-12).

Figure 7-12: Guelb habitat in the Project area

Regs

Regs are vast and flat areas appearing as stony plains resulting from bedrock degradation (Figure 7-13). They cover a large part of the Project AoI and represent large bare areas that may be sandy or rocky. Perennial plants are almost non-existent in regs because water is too scarce, and the soil is not deep enough. This means that they have no characteristic plants, as they form a transition between two classes of soil. They are characterized mostly by *Panicum turgidum* and sometimes by Oliver's fagonia (*Fagonia oliveri)*, Arabian bean-caper (*Zygophyllum arabicum),* clustered heliotrope *(Heliotropium ramosissimum),* graceful farsetia *(Farsetia stylosa),* desert gymnocarpos *(Gymnocarpos sclerocephalus)* and feathered needle grass (*Stipagrostis plumosa)* (WSP, 2023).

Figure 7-13: Sandy reg habitat in the Project area

Ravines

Ravines are geomorphological and hydrogeological formations created by an elementary form of erosion from concentrated runoff of water down a slope (Figure 7-14). Ravines can form networks and join the hydrographic network. They support a shrubby vegetation mostly formed by *Vachellia tortilis*, *Maerua crassifolia*, and *Capparis decidua*. The herbaceous stratum is dominated by *Panicum turgidum*, *Aristida mutabilis*, spiny star thistle (*Atractylis aristata*), spreading boerhavia (*Boerhavia repens*), and *Fagonia oliveri* (WSP, 2023).

Figure 7-14: Ravine (left) and sandy ravine (right) habitats in the Project area

Wadis

A wadi is a dry riverbed or valley in the northern regions of Africa (Figure 7-15). It is generally dry, except during the rainy season, when it can form an oasis. Wadis of the Saharan type seldom flow, and when they do, it is only for a few hours a year and rarely along their entire length. These wadi sand beds are the geomorphologic element supporting the highest flora diversity. They are characterized by lines of *Vachellia tortilis* often associated with *Maerua crassifolia*, *Vachellia flava*, and C*apparis decidua*. The herbaceous strata include

Panicum turgidum, *Fagonia oliveri*, *Zygophyllum arabicum*, and kapok bush (*Aerva javanica*). Species abundance is widely affected by their degree of grazing: the most grazed species are the rarest (WSP, 2023).

Figure 7-15: Wadis habitat in the Project area

Dunes

A dune is a relief made up of sand blown by wind or water, usually in the form of a mound, ridge or hill (Figure 7-16). They are found on coastlines and in deserts. Dune systems are formed by an enormous amount of moving sand, exposed to wind and in constant transformation. They are characterized by the dominance of *Stipagrostis pungens*, *Panicum turgidum*, *Stipagrostis plumosa*, *Fagonia oliveri* and *Tetraena gaetulum* (WSP, 2023).

Figure 7-16: Sand dune in the Project area

Sebkha

In Mauritania, the term "sebhka" refers to a specific type of habitat, often associated with wetland areas or salt marshes in coastal regions. These habitats are characterized by saline soils and are often located near lagoons, rivers, or coastal zones. Sebkhas are present in certain parts of the wellfield area; however, none of them surround the sampling points. Additional sebkhas are also found on the western side of the Project's AoI (Figure 7-17).

Figure 7-17: Sebkha in the Project area

Dhayas

Dhayas are often dug by humans to collect and store rainwater or to capture water from temporary flows, such as those of wadis. Being dependent on rainfall, dhayas are often threatened by prolonged periods of drought. They create micro-ecosystems around which animal and plant life organize, life that would otherwise be absent without these water points. The F'Derik dam is considered a dhaya (Figure 7-18).

Figure 7-18: Dhayas in the Project area (dam at F'Derik)

Habitat distribution

As previously described, six types of habitats were identified in the Project AoI. Some of these habitats are considered modified habitats under the definition of the IFC PS6 due to their degree of disturbance or because of their nature (linear infrastructures, buildings, settled areas).

Table 7-11 shows the proportion of each habitat type and the proportion of natural/modified habitats in both the Project footprint and the AoI. The habitat repartition in the Project AoI around the mining site is illustrated in Figure 7-19, Figure 7-20, Figure 7-21, Figure 7-22. The habitat mapping layer was produced by WSP using satellite imagery in order to identify and visualize the habitats present within the AoI and to determine the spatial extent and surface area of each habitat type.

Table 7-11: Summary of habitat inventory

Habitat types	Surface habitat (ha)	Survey area		
		Modified plot	Natural plot	Percentage of natural habitats
Dhaya	43.60	0	5	100
Dune	9,260	0	3	100
Guelb	575.6	0	1	100
Ravine	3,595.5	0	6	100
Reg	43,336.6	6	26	81
Wadis	50,885	1	13	93
Total	107,696	**7**	**54**	**88,5%**

All sampling points associated with dhayas, dunes, guelbs, or ravines were identified as natural by the local experts, based on species assemblages and degree of anthropogenic disturbance. Although dhayas are human-made structures (i.e., a modified habitat by definition), it is treated as a natural habitat due to its ecological importance in the region. Nineteen percent (81%) of the sampling points located in regs were considered natural, and 93% of the sampling points in wadis were considered natural. Overall, 11% of the sampling points were in modified habitats and almost 89% were in natural habitats.

Figure 7-19: Terrestrial habitats in the Project area of Influence (Mine area).

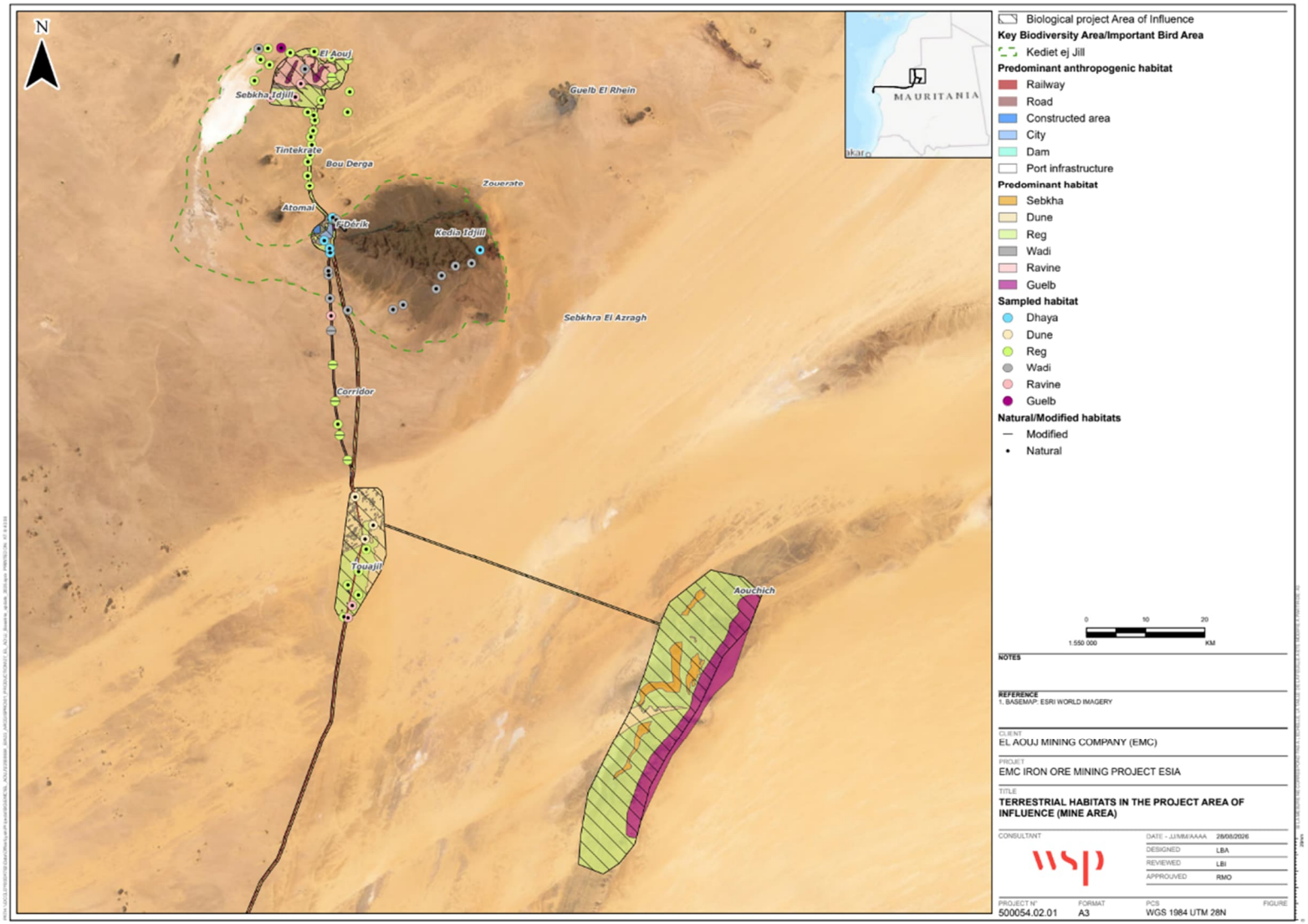


Figure 7-20: Terrestrial habitats in the Project area of Influence - El Aouj area

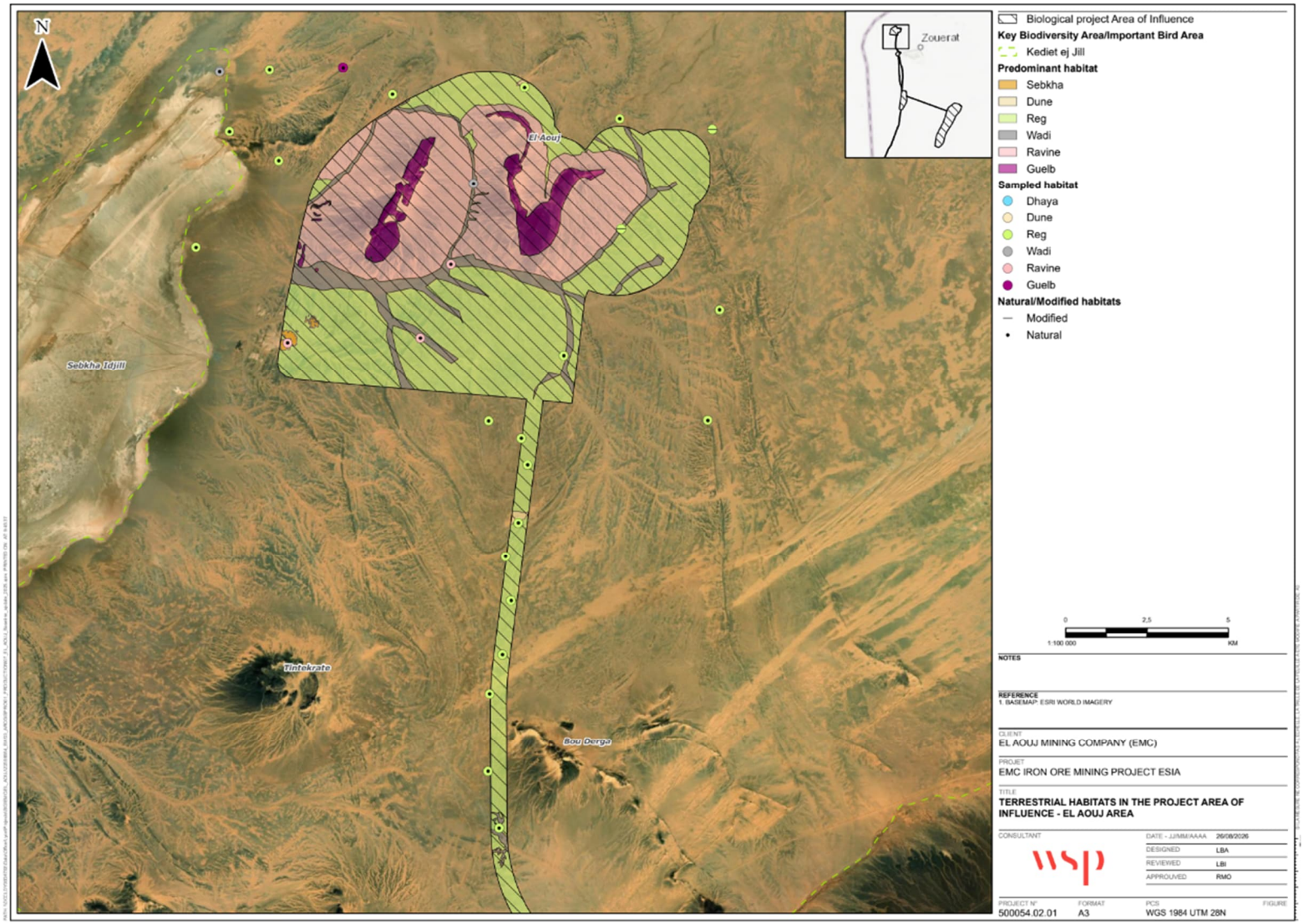


Figure 7-21: Terrestrial Habitats in the Project area of Influence - F'Derik, Corridor and Touajil area

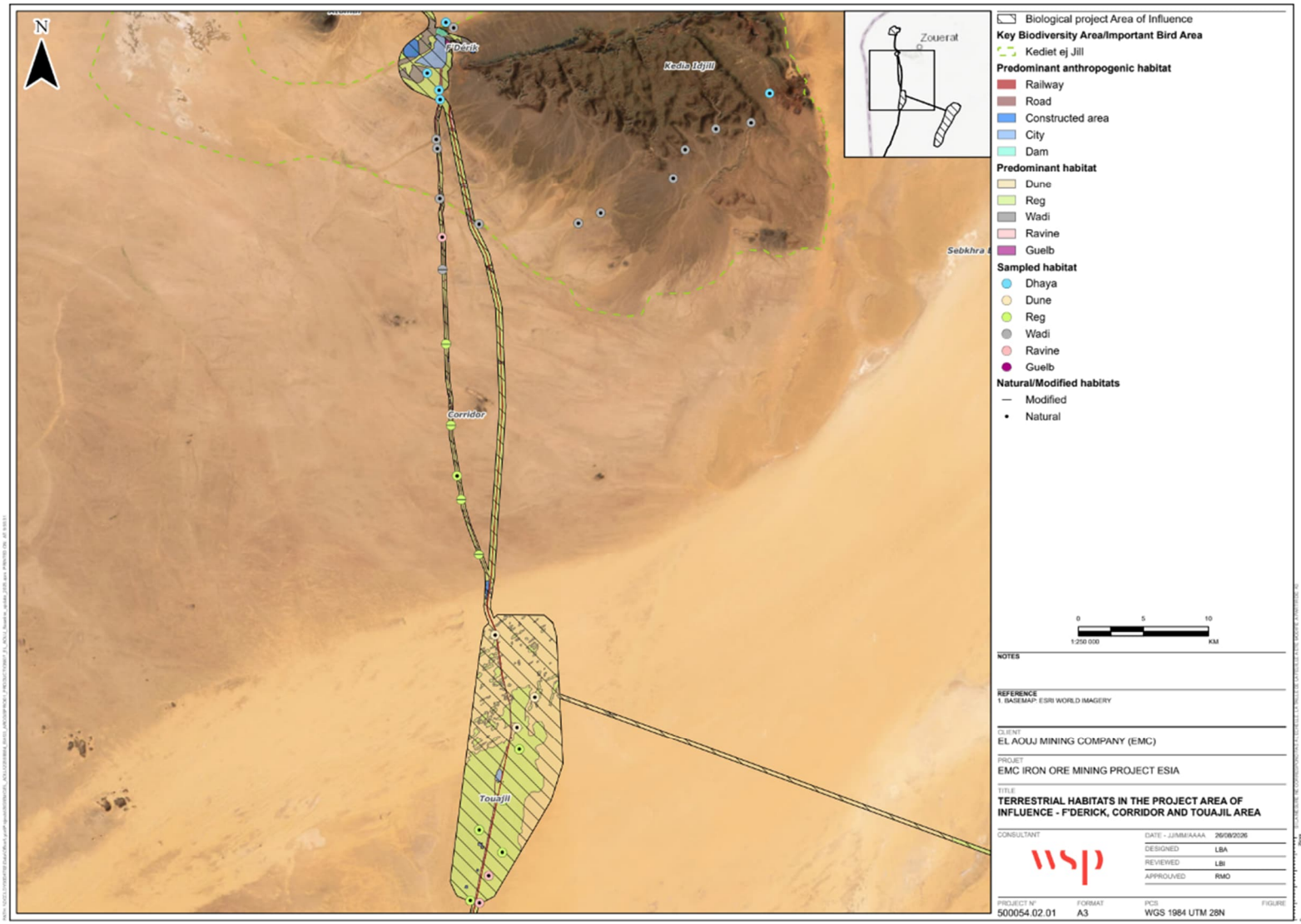
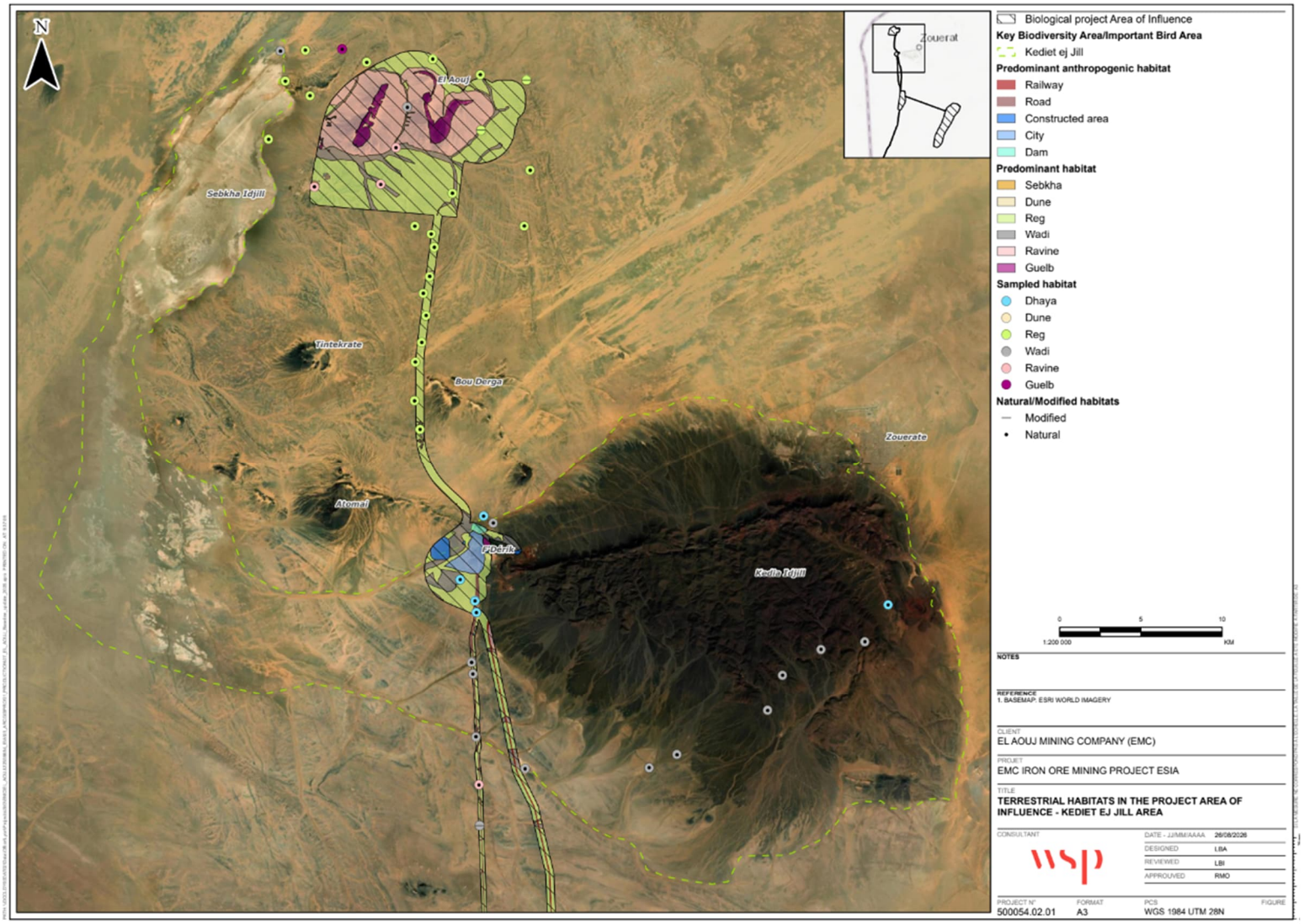


Figure 7-22: Terrestrial habitats in the Project area of influence - Kediet ej Jill area



Habitat condition

As illustrated in Figures 7-19 through 7-22, habitats in the Mine AoI are predominantly natural habitats. Most vegetation survey plots (89%) inventoried in 2024 can be qualified as being in 'good' condition, meaning that anthropogenic disturbance was absent or very limited and that the flora species composition and vegetation cover was within the range of what is expected in similar undisturbed habitats in the region. Eleven percent (11%) of surveys plots were categorized as modified habitats owing to the presence of human disturbance and would therefore be considered of 'poor' condition. These conditions were mainly observed within regs. Some extent of degradation from livestock grazing was noted in 5 vegetation plots (about 1% of plots), with the grazing intensity being significant enough to classify the habitat as modified in only two instances.

Natural habitats in the Mine AoI are sparsely vegetated. Vegetation cover recorded ranged from 10% cover to 70%. An exception applies to guelb habitats, which are rocky outcrops largely devoid of vegetation because they do not have the requisite edaphic conditions to support the establishment of vegetation. On average, dhayas had the highest proportion of vegetation cover (43%), which can be explained by the seasonal presence of water at the F'Derik dam. Wadis averaged 39% vegetation cover, ravines average 35% vegetation cover, dunes averaged 30% vegetation cover, and regs averaged 28% vegetation cover.

7.5.3 Flora

7.5.3.1 Desktop review

The desktop review focused on identifying flora species of conservation concern that could occur in the Project AoI. At the international level, these include species globally listed as CR, EN or VU on the IUCN Red List of Threatened species and those listed on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 2023). At the national level, these included protected and partially protected species identified under national law (n°2007-055, 2007) repealing and replacing law n°97-007 of 20 January 1997 concerning the Forestry Code (WSP, 2023).

With reference to the national laws, there are five regionally protected species within the geographical limits of the wilaya of Tiris Zemmour. These species are: *Maerua crassifolia*, *Vachellia tortilis*, *Vachellia flava, Panicum turgidum, Aristida pungens*. It is noted that no justification is provided to explain why these species are regionally protected. Many of them are secure in other countries and no information is given on their international, continental (Africa) or national (Mauritania) distribution.

With reference to the international designations, none of the flora species expected in the Project AoI are considered threatened on the IUCN Red List, and two (Euphorbia spp.) are listed in CITES of Wild Fauna and Flora Appendix II (CITES, 2023).

7.5.3.2 Field methodology

Five field campaigns were conducted in the Mine AoI between 2012 and 2024. Table 7-12 summarizes the dates, duration and seasons of the flora field surveys.

Table 7-12: Flora field surveys.

Year	Office	Local consultant	Season	Dates	Number of days	Number of sampling units
2012	URS	Unspecified	Dry season	January 23 to February 2, 2012	11 days	Around 50 transects
2012	URS	Unspecified	Dry season	March 26 to 30, 2012	5 days	

Year	Office	Local consultant	Season	Dates	Number of days	Number of sampling units
2013	URS	Unspecified	Wet season	October 21 to 25, 2013	5 days	
2023	WSP	Green Sahel Expertise (GSE) Dr. Amhedou Soule	Dry season	May 4 to 7, 2023	4 days	37 transects
2024	WSP	Green Sahel Expertise (GSE) Dr. Amhedou Soule	Wet season	October 7 to 13, 2024	7 days	61 plots

Table 7-13 summarizes the methodologies used for each field survey. Successive field studies did not use the exact same methodology.

Table 7-13: Flora field surveys methods.

Field campaign	Method used
URS 2012-2013 *(No detailed descriptions of methods were provided)*	A vehicle-based reconnaissance survey was undertaken to verify the setting of the Project and its associated habitat context and variation. Due to the flat landscape, it was possible to observe 2 to 4 km in all directions. Driven transect survey routes were chosen to be representative examples of the habitats present in the project AoI. Transect routes generally followed the alignment of all proposed linear infrastructures (as proposed at the time). A subset of areas along the driven transect routes were selected for inspection on foot to record the flora species present and to verify observations made during the driven transects.
Dry season 4-7 May 2023	37 transects were surveyed: 25 transects in the El Aouj area (TA) and 12 transects in the Water Corridor area (TC). The exact position of the transects inside the sampling areas, and their length were determined based on the site conditions, with a minimum length of 100 m per transect. The observer recorded all observed flora species and the relative abundance of each species (for each transect) using the DAFOR scale, Table 7-14. The start and end points of the transects were recorded in a hand-held GPS unit[1]. The sampling strategy for the Aouchich area was constrained by the remoteness of the area and its corresponding health and safety risks. This placed limitations on available survey time. In total, 18 sampling points were inventoried to provide an overview of the local flora assemblages.

Field campaign	Method used
	Interviews were carried out opportunistically with pastoralists (nomadic herders) in the Project study area. These made it possible to obtain information about traditional knowledge and the status of key forage species.
Wet season 7-13 October 2024	61 flora plots were surveyed and used inform habitat descriptions. For each plot, a small stake was hammered into the ground where the coordinates were taken. Using a pre-measured string of 56.4 m, a circle was drawn, marking the 1 ha boundaries. After determining the habitat, the expert surveyed the plot to identify species and their relative abundance (*cf*. DAFOR scale, Table 7-14) and vegetation cover. The vegetation condition was also recorded through visual observation of the state of the plants present (e.g., in good condition, degraded, in poor condition, grazed, overgrazed). The location of the sampling plot was initially determined on a map by WSP in various habitats and then adjusted on site according to different.

1 - To compare the 2023 and 2024 results, the transects were standardized by surface area by considering a width of 1 meter (50 cm on each side of the transect).

The transect and plot coordinates for the flora inventories during dry season 2023 and wet season 2024 campaigns are included in APPENDIX I-A, Table 1 and Table 2. Flora abundance was assessed using the Dafor scale, as described in Table 7-14.

Table 7-14: DAFOR scale of relative abundance

Species percentage abundance	DAFOR term	Abbreviation
51-100%	Dominant	D
31-50%	Abundant	A
16-30%	Frequent	F
6-15%	Occasional	0
1-5%	Rare	R
0%	Not present	X

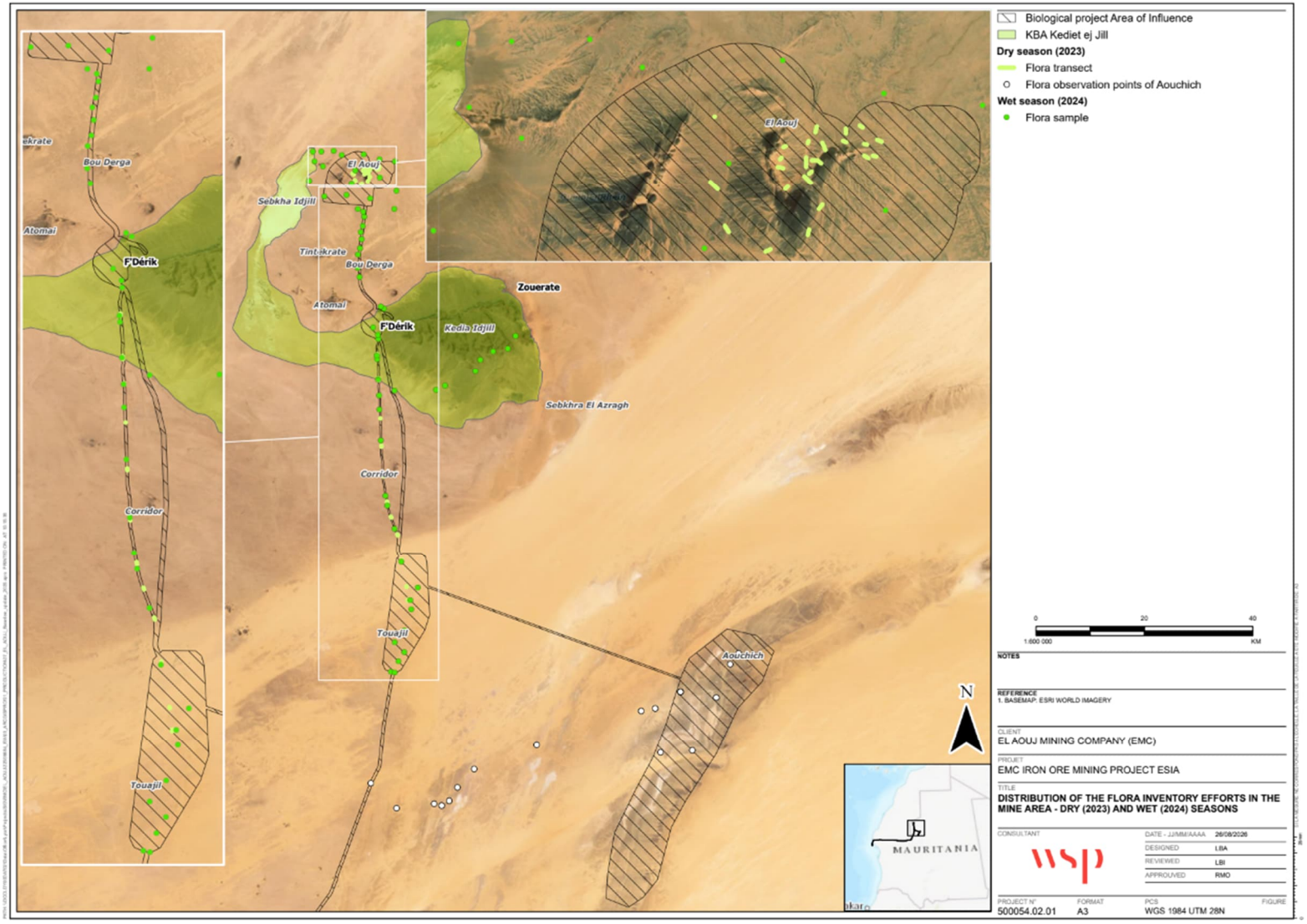
The investigation effort performed in each habitat type during each of the field survey campaign is presented in Table 7-15. The distribution of survey effort during the dry season (2023) and the wet seasons (2024) is presented in Figure 7-23.

Table 7-15: Flora investigation efforts in each habitat type.

Habitat types	Dry season 2023		Wet season 2024	
	Number of transects	Total length of transects (m)	Number of plots	Surface (ha)
Dhayas			5	5

Habitat types	Dry season 2023		Wet season 2024	
	Number of transects	Total length of transects (m)	Number of plots	Surface (ha)
Dunes	3	392.9	3	3
Ravines (with guelbs)	6	858.5	7	7
Reg	20	2,941.7	32	32
Wadis	8	1,634.5	14	14
Total	**37**	**5,827.6**	**61**	**61**

Figure 7-23: Distribution of the flora inventory efforts in the Mine area - dry (2023) and wet (2024) seasons



7.5.3.3 Results

A list of expected and observed species in the AoI was generated based on data provided in the 2015 URS ESIA, the dry and wet season field surveys (2023 and 2024) and literature review (Table 7-16). A total of 100 flora species were observed over the successive field inventories, and 10 additional species were identified as potentially present based on the literature review. In total, 110 flora species occur or potentially occur in the mine AoI. Of these, 7 are listed on the IUCN Red List as LC, 3 are listed on appendix II of CITES, 4 species are protected in Mauritania, and 3 species are protected in Tiris Zemmour (Table 7-16). Non-native invasive species were not identified in the literature review nor were they observed during field surveys. This result was expected because the arid conditions of the Mine AoI is not conducive for the establishment of most non-native plants because they lack the specialized adaptations required to survive in a desert ecosystem. The 2012–2013 baseline data are presented here for completeness; however, their interpretation must consider substantial differences in survey design, sampling effort, and methodological approaches between past and recent field campaigns. As a result, the 2015 ESIA data should not be used as a reliable basis for temporal comparisons.

Table 7-16: Expected and observed flora species in the mine area.

Flora species	Protection status[1]	Literature	Field observations		
			2012, 2013 URS	Dry season 2023	Wet season 2024
Abutilon pannosum	-	X	X	X	X
Acanthorrhinum ramosissimum	-	X		X	
Aerva javanica	-	X	X	X	X
Ammodaucus leucotrichus	-	X		X	
Anastatica hierochuntica	-	X	X	X	
Andrachne telephioides	-	X		X	X
Aristida mutabilis	-	X		X	X
Artemissia sp	-	X		X	
Asphodelus tenuifolius	-	X	X	X	
Asteriscus graveolens	-	X	X	X	X
Astragalus akkensis	-	X		X	
Astragalus eremophilus	-	X		X	
Astragalus sp.	-				X
Astragalus vogelii	-	X	X	X	
Atractylis aristata	-	X	X	X	
Balanites aegyptiaca[2]	Protected in Tiris Zemmour	X			X
Bassia muricata	-				X
Blepharis linariifolia	-	X		X	
Boerhavia repens	-	X		X	X

Flora species	Protection status[1]	Literature	Field observations		
			2012, 2013 URS	Dry season 2023	Wet season 2024
Brocchia cinerea (synonym *Cotula cinerea*)	-	X	X	X	
Calligonum comosum	-	X			
Calotropis procera	LC		X		
Capparis decidua	Protected in Tiris Zemmour	X	X	X	X
Caroxylon imbricatum	-	X			
Caylusea hexagyna	-	X		X	X
Centaurea bimorpha	-	X			
Centropodia forskaolii (synonym *Asthenatherum forskaolii*)	-	X	X	X	X
Citrullus colocynthis	-	X	X	X	X
Colchicum gramineum (synonym *Androcymbium gramineum*)[3]	-				X
Commicarpus helenae	-		X		
Convolvulus microphyllus	-		X		
Convolvulus prostratus (synonym *Corchorus depressus*)	-	X	X	X	X
Cornulaca monacantha	-		X		
Crotalaria saharae	-	X		X	
Cullen plicatum	-	X			X
Cynanchum boveanum (synonym *Glossonema boveanum*)	-		X		
Cyperus conglomeratus	LC	X		X	X
Cyperus laevigatus	LC	X		X	
Deverra scoparia	-	X			
Dichanthium foveolatum (synonym *Eremopogon foveolatus*)	-	X			
Echium horridum	-	X		X	
Enneapogon scaber	-	X		X	
Ephedra sp.	-	X		X	
Eremobium aegyptiacum	-		X		
Eremobium longisiliquum (synonym *Eremobium aegyptiacum* subsp *longisiliquum*)	-	X		X	
Erodium glaucophyllum	-	X			

Flora species	Protection status[1]	Literature	Field observations		
			2012, 2013 URS	Dry season 2023	Wet season 2024
Euphorbia calyptrata	CITES Appendix II	X	X	X	X
Euphorbia granulata	CITES Appendix II	X	X	X	X
Euphorbia inaequilatera	CITES Appendix II		X		
Farsetia longisiliqua	-				X
Farsetia stylosa	-	X		X	
Forsskaolea tenacissima	-	X	X	X	X
Gymnocarpos sclerocephalus (synonym *Sclerocephalus arabicus*)	-	X	X	X	
Heliotropium bacciferum	-				X
Heliotropium ramosissimum	-	X	X	X	X
Hyoscyamus muticus	-	X	X		X
Indigofera senegalensis	-				X
Iridaceae	-		X		
Kebirita roudairei	-				X
Kickxia aegyptiaca	-	X	X	X	X
Lasiurus scindicus (synonym Lasiurus hirsutus)	-				X
Launaea arborescens	-	X			
Launaea resedifolia (synonym *Launaea fragilis* subsp. *Fragilis*)	-	X			
Linaria sp.	-		X		
Lotus glinoides	-		X		
Lupinus tassilicus	-		X		
Maerua crassifolia	Protected in Tiris Zemmour	X	X	X	X
Moltkiopsis ciliata	-	X			
Monsonia nivea	-	X	X	X	X
Morettia canescens	-				X
Morettia philaeana	-	X			
Nanorrhinum monodianum (synonym *Kickxia monodiana*)	-	X			
Neurada procumbens	-	X	X	X	X
Nucularia perrinii	-	X	X	X	X

Flora species	Protection status[1]	Literature	Field observations		
			2012, 2013 URS	Dry season 2023	Wet season 2024
Pancratium trianthum	-	X	X	X	X
Panicum turgidum	-	X	X	X	X
Paronychia arabica	-	X		X	
Pentzia monodiana	-		X		
Pergularia tomentosa	LC	X	X	X	X
Plantago amplexicaulis	-	X			
Plocama reboudiana (synonyms *Gaillonia reboudiana* and *Jaubertia reboudiana*)	-	X	X	X	
Polycarpaea nivea	-	X			
Polycarpaea repens	-		X		
Polygala erioptera	LC		X		X
Portulaca oleracea	-				X
Pulicaria incisa	-		X		
Reseda villosa	-	X		X	
Salvia aegyptiaca	-	X	X	X	X
Schouwia purpurea (synonym *Schouwia thebaica*)	-	X	X	X	
Searsia tripartita	LC				X
Seetzenia lanata (synonym *Seetzenia africana*)	-	X	X	X	X
Senna alexandrina	-				X
Senna italica (synonym *Cassia italica*)	-	X	X	X	X
Stipagrostis obtusa	-	X		X	
Stipagrostis plumosa	-	X	X	X	
Stipagrostis pungens (synonym *Aristida pungens*)	Protected in Mauritania	X	X	X	X
Stipagrostis sp.	-				X
Tephrosia purpurea	-				X
Tribulus mollis (synonym *Tribulus ochroleucus*)	-	X	X	X	X
Trichodesma africanum	-	X		X	X
Vachellia flava (synonyms *Acacia flava* and *Acacia ehrenbergiana*)	LC and protected in Mauritania	X	X	X	X

Flora species	Protection status[1]	Literature	Field observations		
			2012, 2013 URS	Dry season 2023	Wet season 2024
Vachellia tortilis raddiana (synonym *Acacia raddiana*)	Protected in Mauritania	X	X	X	X
Ziziphus lotus	Protected in Mauritania				X
Zygophyllum arabicum	-	X		X	X
Zygophyllum bruguieri	-				X
Zygophyllum gaetulum (synonym *Tetraena gaetula*)	-	X		X	
Zygophyllum glutinosum (synonym *Fagonia glutinosa*)	-	X	X	X	
Zygophyllum mayanum	-				X
Zygophyllum olivieri (synonym *Fagonia olivieri*)	-	X	X	X	
Zygophyllum simplex	-		X		
Total	**-**	**77**	**54**	**61**	**54**

1 Source: (IUCN, 2019), (CITES, 2023). Annex II = species recorded in CITES Appendix II.
2 Source: (n°2007-055, 2007). *Balanite aegyptica* is written *Balanites egyptica* in the Forestry Code.
3 The European population of *Colchicum gramineum* (synonym *Androcymbium gramineum*) is assessed as Vulnerable (VU); however, this assessment does not correspond to the population that occurs in Mauritania. According to (Royal Botanic Gardens Kew, 2025) the species is native to northern Africa (Algeria, Egypt, Libya, Mauritania, Morocco, Niger, Tunisia, Western Sahara), and that regional population has not been assessed by the IUCN.

Twenty-six (27) species were found in all field studies conducted in 2012, 2013, 2023, and 2024, representing approximately 28% of the species observed. Thirty-three (33) species were detected in both the dry and wet seasons of 2023 and 2024 (35%). Some species were observed only during one survey period (between 2023 and 2024), suggesting a seasonal adaptation or varying environmental conditions affecting their presence. Of the 61 flora species recorded in 2023, 27 were not detected in 2024, while 21 of the 54 species observed in 2024 were absent from the 2023 dataset. This inter-annual difference likely reflects natural seasonal variability in plant emergence and detectability, driven by differences in rainfall patterns, phenological stages, and germination timing between survey periods.

The following sections discuss flora species richness, including richness patterns by habitat type and Project area, flora abundance, vegetation cover and composition, and a summary of observations in the Aouchich area.

Flora species richness

Flora species richness was calculated by summing all flora species recorded in each transect for dry season 2023 and in each plot for wet season 2024. Flora species richness is detailed in APPENDIX I-B, Table 3 for dry season 2023 and Table 4 for wet season 2024.

Flora species richness is illustrated for the El Aouj area in Figure 7-24 and Figure 7-25 for the dry and wet seasons, respectively. Species richness along the Water Corridor area is shown in Figure 7-26 and Figure 7-27 for the dry and wet seasons, respectively. Figure 7-28 illustrates species richness in the Kediet ej Jill area recorded during the wet season.

During the dry season, 61 species were recorded with species richness ranging from a minimum of 5 species to a maximum of 22 species. In the wet season, the lowest species richness was 2 species, while the highest

reached 15 species. Vegetation cover is presented as percentages, with the lowest density at 10% and the highest at 65%. APPENDIX I-D, Table 10 provides a summary of habitat types, species richness, and vegetation cover for each plot.

Figure 7-24: Flora species richness in the El Aouj area – Dry season (2023)

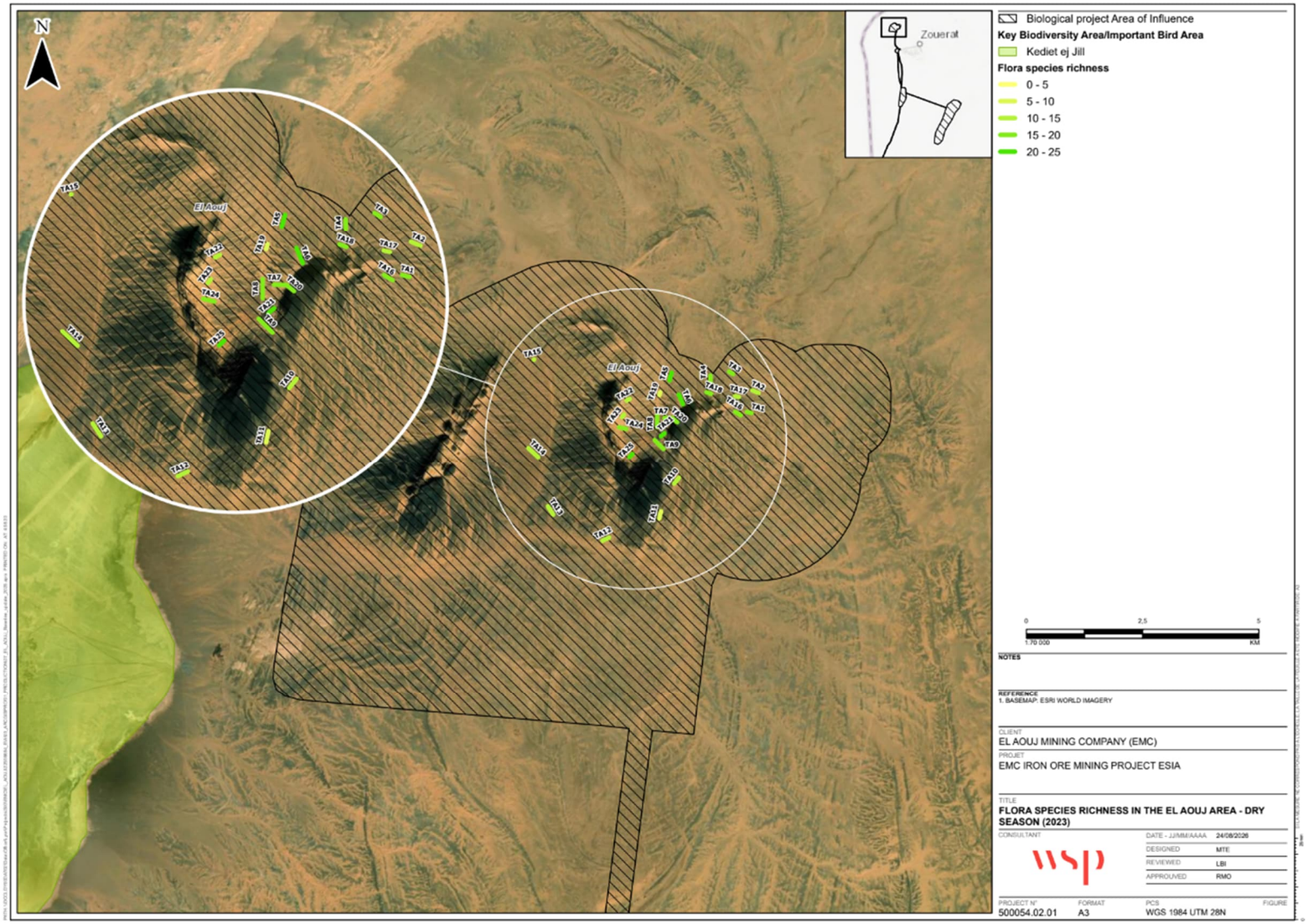


Figure 7-25: Flora species richness in the El Aouj area – Wet season (2024)

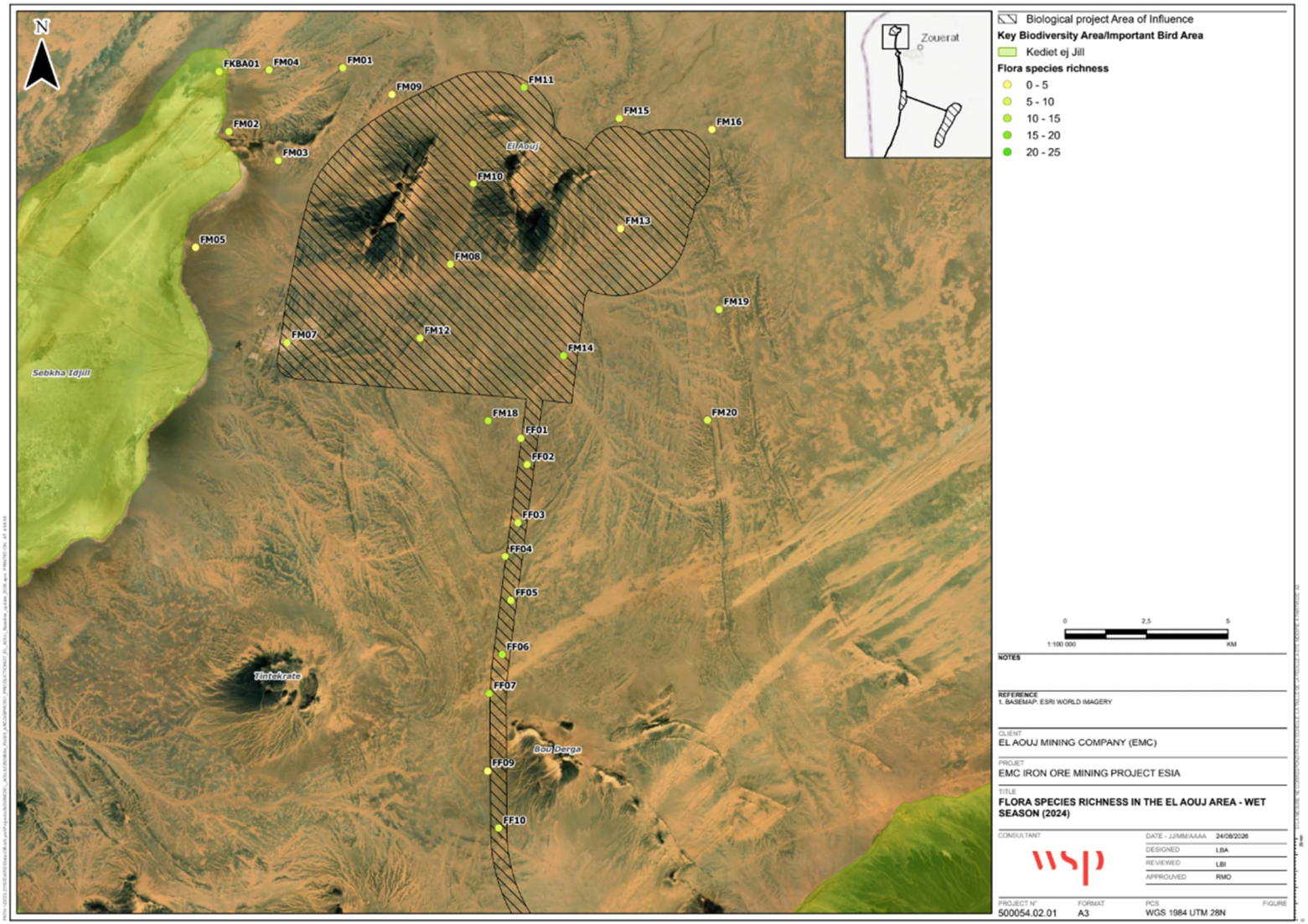


Figure 7-26: Flora species richness in the F'Derik, Corridor and Touajil area - Dry season (2023)

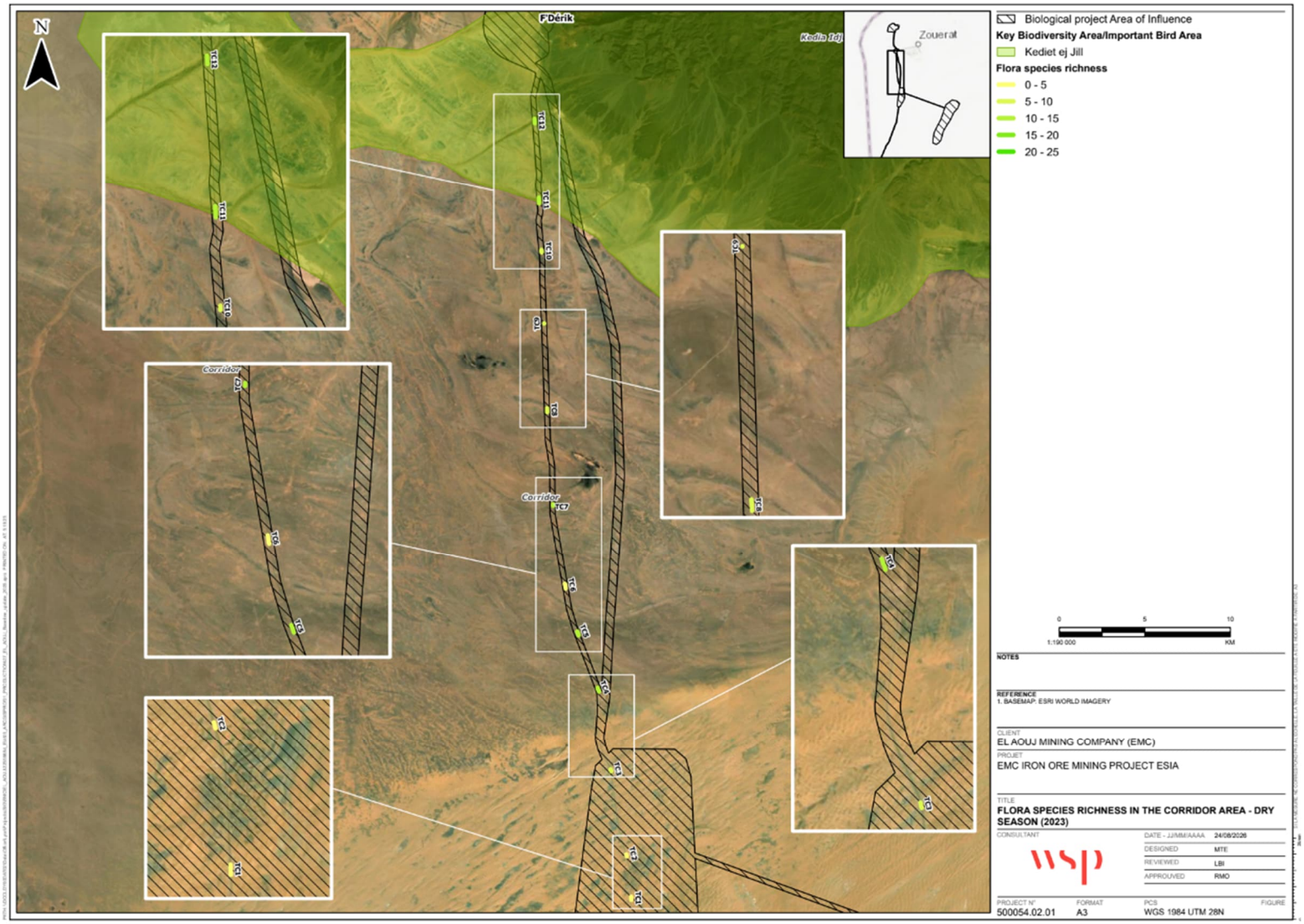


Figure 7-27: Flora species richness in the F'Derik, Corridor and Touajil area - Wet season (2024)

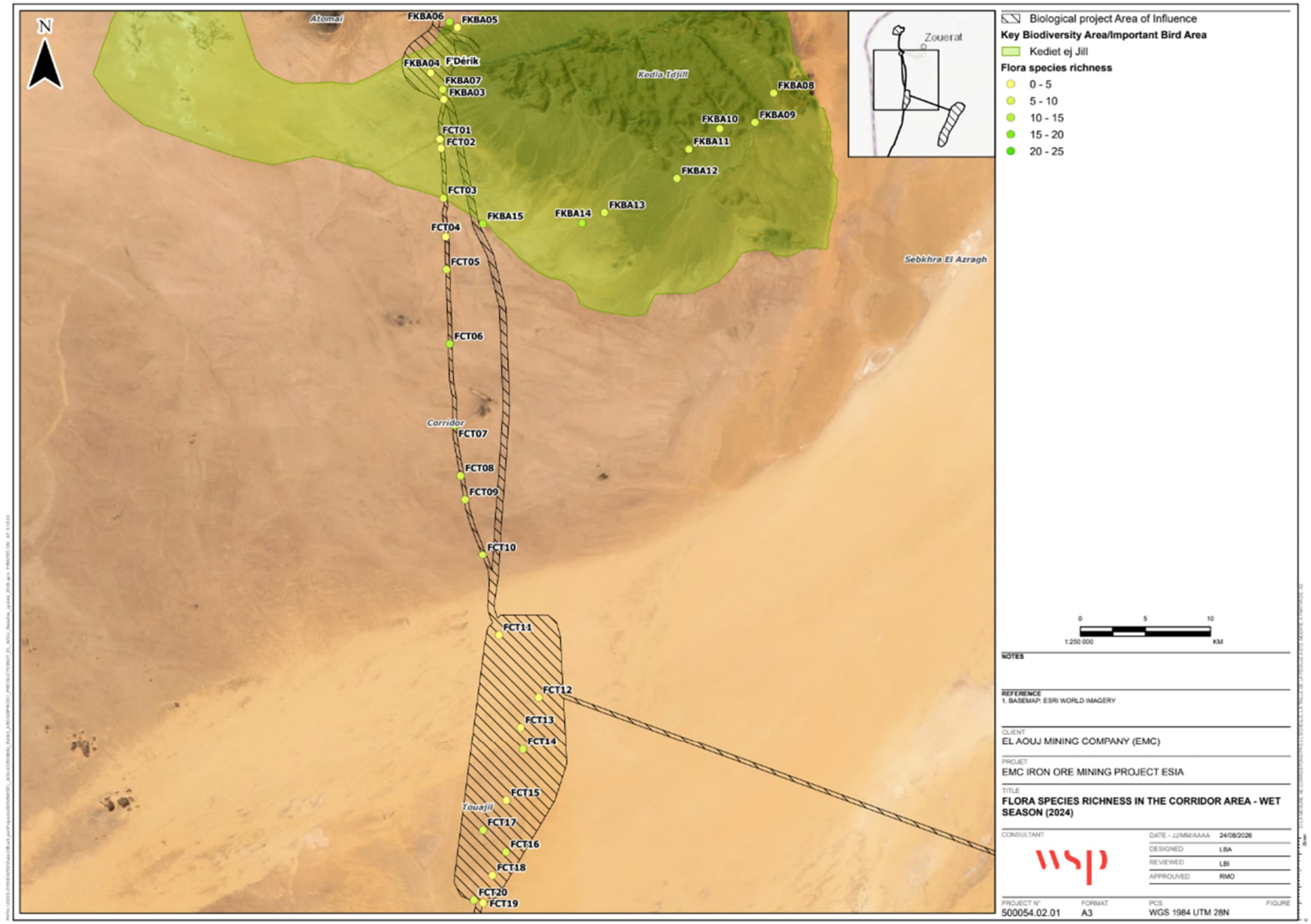
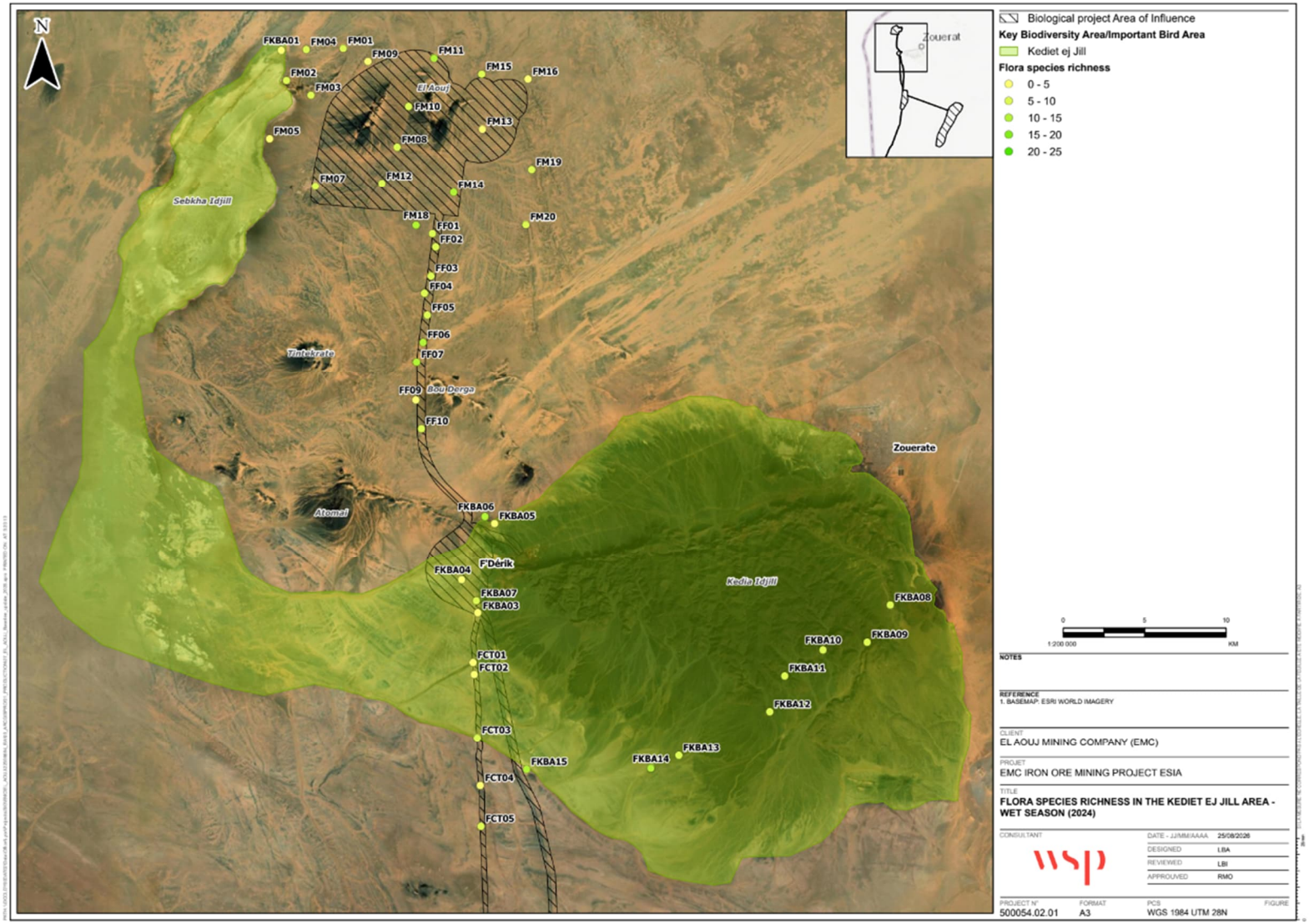


Figure 7-28: Flora species richness in the Kediet ej Jill area - Wet season (2024)



Flora species richness by habitat

In 2023 (dry season), the average species richness was highest in ravine habitats, even though reg habitats presented a higher number of total flora species. In 2024 (wet season) wadis were the richest habitats (Table 7-17, Figure 7-29).

Table 7-17: Flora species richness across habitat types in the Project AoI

Habitats	Dry season 2023		Wet season 2024	
	Number of transects	Mean species richness	Number of plots	Mean species richness
Dhayas			5	7.8
Dunes	3	5.3	3	4.0
Ravines in Guelbs	6	17.5	7	6.0
Regs	20	14.2	32	7.7
Wadis	8	11.9	14	8.1
Total	**37**	**13.5**	**61**	**7.4**

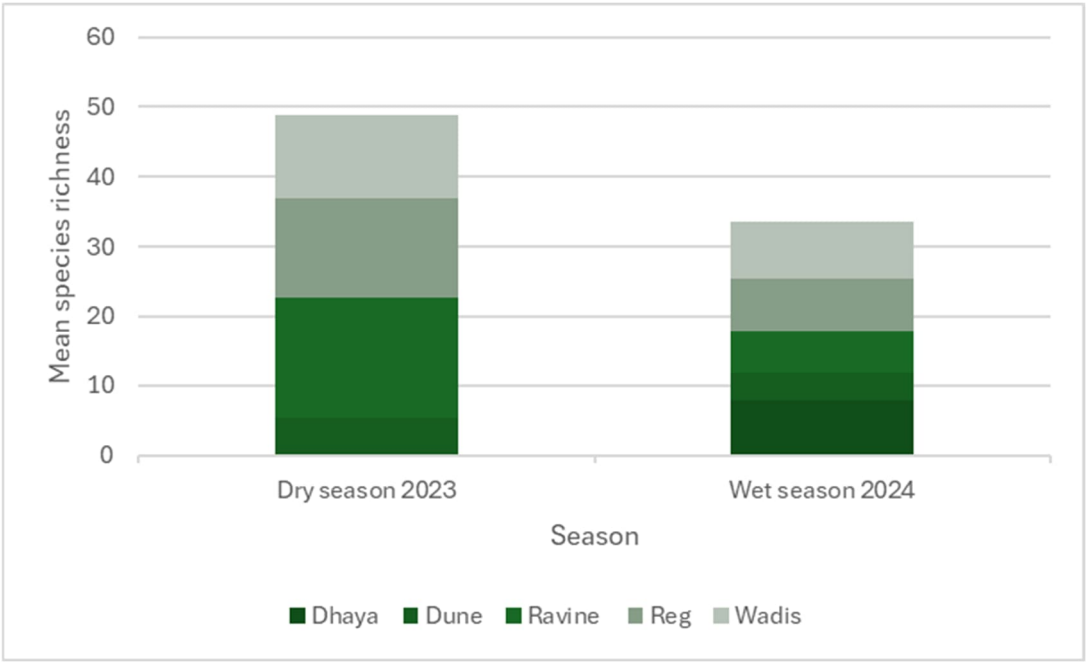


Figure 7-29 : Mean flora species richness by habitat type and season

Ravines could be the most hospitable habitats during the dry season, as they are drainages dug by the run-off of water on a slope. When their sandy bottom is silted up, they are comparable to silty ponds and are more conducive to the development of vegetation. Habitats with water/moisture are less stressful and allow species to establish themselves more easily. Although species richness appears to be higher along transects surveyed

in ravines, it was noted that flora abundance appears to be higher in wadis and ravines, corresponding to higher abundances of vegetation in the moistest areas.

Wadis are most productive during the wet season. The average species richness was lower during the wet season than in 2023 dry season. In October, the wet season might have just started. This means that many seeds in the soil seed bank would have only begun germinating. These young shoots are not yet sufficiently developed to be identified and counted as distinct species. In contrast, at the end of the dry season, only plants adapted to arid conditions (e.g., perennials or succulents) persist, but they are often well-established and easily identifiable.

Flora species richness in the different Project areas

During the dry season (2023), 61 flora species were recorded across the 37 sampled transects. Fifty-two (52) species were recorded in El Aouj area, and 34 species were recorded along the Water Corridor area. The mean species richness in the El Aouj area was two times that of the Water Corridor (Table 7-18). This can be explained by differences in habitat: the El Aouj area is covered by a guelb with ravines and large wadis at the bottom of the slopes, while the Water Corridor area is mainly covered by sandy dunes and regs.

During the wet season, 54 flora species were recorded across the 61 sampled plots. Thirty-six (36) species were recorded in El Aouj area, 33 species were recorded along the Water Corridor, and 35 species were recorded in the Kediet ej Jill area (KBA). The highest mean species richness in the El Aouj area reaches 6.52 species (Table 7-18, Figure 7-30).

Table 7-18: Flora species richness in the Project AoI

Project areas	Dry season 2023			Wet season 2024		
	Total transects	Species richness	Mean species richness	Total plots	Species richness	Mean species richness
El Aouj area	25	52	6.52	27	36	3.64
Water corridor	12	34	1.67	20	33	2.34
Kediet ej Jill				14	35	2.14

*The 2023 data were collected by transects, while the 2024 data were collected by plots; the covered areas are not the same.

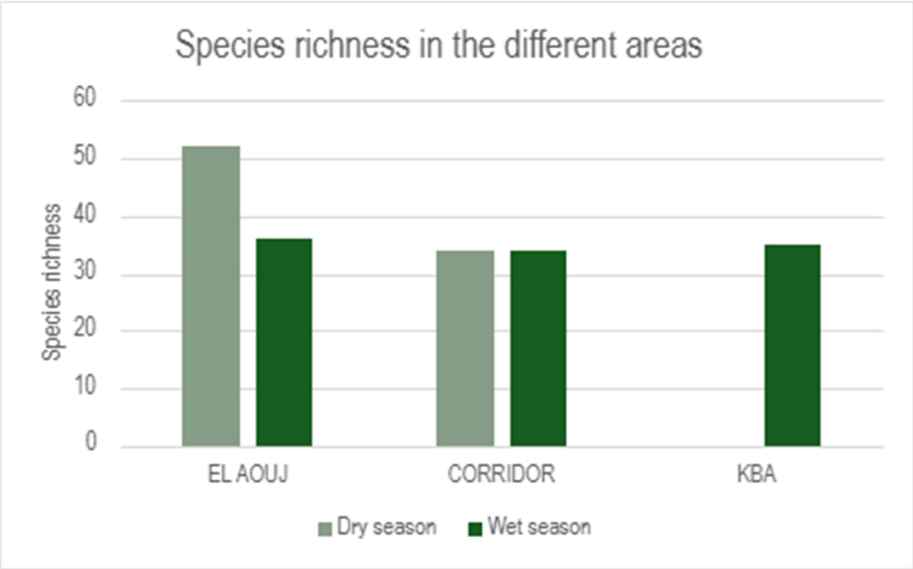


Figure 7-30: Mean flora species richness by Project area and season

The variation in species richness and vegetation cover between the dry and wet seasons indicates how sensitive the flora in these areas is to seasonal changes in climate, particularly water availability. The data suggests that, in general, the wet season might not always provide a significant boost in species richness in these specific locations. The pattern observed may be related to timing of wet season surveys. Surveys corresponded to the onset of the wet season when the soil seed bank had germinated but plants were not yet established in the plots. Indeed, on-site, many small seedlings were observed but not counted as they were impossible to identify. The differences observed between areas (El Aouj, Water Corridor, and Kediet ej Jill) highlight the importance of local environmental conditions, such as soil type and topography, in influencing plant communities. Areas with higher vegetation density and species richness seemingly contain natural habitats with more favourable physical conditions for plant growth and survival.

Flora species abundance

Flora abundance was categorized according to the DAFOR scale in both sampling periods. APPENDIX I-C presents abundance data, including along transects in the 2023 dry season (Table 5 for El Aouj area and Table 6 for the Water Corridor area) and within plots in the 2024 wet season (Table 7 for El Aouj area, Table 8 for the Water Corridor area, and Table 9 for the Kediet ej Jill area). Species assigned a rare abundance in the Project AoI are available in Table 7-19.

During the dry season (2023), more than 32% of observed species were identified with an abundance rating of rare on at least one of the transects in which they were recorded, and more than 75% of observed species were identified as rare on all the transects where they were recorded. Of the species identified, 6 appear in only one transect: *Abutilon pannosum, Astragalus akkensis, Blepharis linariifolia, Eremobium longisiliquum, Monsonia nivea, Reseda villosa.* During the wet season, almost 80% of species detected were categorized as having a rare[6] abundance in all the plots in which they were recorded.

[6] Species were identified as ‘rare’ in the Project AoI based on field observations and do not correspond to species that have been designated as rare plants in the region or in Mauritania.

Table 7-19: Species assigned a rare abundance in the Project AoI.

Rarest species[1]	IUCN status and Protection status
Aerva javanica	DD
Androcymbium gramineum	-
Balanites aegyptiaca	LC, Protected species in Tiris Zemmour and Dakhlett Nouadhibou
Centropodia forskaolii	LC
Cyperus conglomeratus	LC
Farsetia longisiliqua	DD
Indigofera senegalensis	-
Lasiurus hirsutus	-
Neurada procumbens	LC
Portulaca oleracea	LC
Searsia tripartita	LC
Seetzenia lanata	-
Trichodesma africanum	-
Ziziphus lotus	Protected species in Mauritania

1- Species were identified as 'rare' in the Project AoI based on field observations and do not correspond to species that have been designated as rare plants in the region or in Mauritania.

Heliotropium ramosissimum, Panicum turgidum, and *Vachellia tortilis raddiana*, which appeared in more than 35 (respectively 40, 51, 35) plots out of the 61 studied. The species *Heliotropium ramosissimum*, *Panicum turgidum*, and *Vachellia tortilis* are common in arid regions and share several ecological traits. These species are well-adapted to dry, semi-arid environments with limited water availability and high temperatures, which could explain their abundance in this region. Their ability to thrive under harsh conditions, including drought and heat, makes them resilient and widespread.

The flora abundance patterns observed in the Mine AoI, during both the wet and dry seasons, suggest that most species are not abundant and that vegetation is relatively scarce year-round. This pattern supports the general conclusion that the floral abundance of the Project AoI is relatively poor due to the dryness of the region and the known progressive decline in vegetation cover resulting from regular droughts over the past three decades.

Vegetation cover and composition

Floral diversity and total vegetation cover are low. The composition and structure of the recorded vegetation are considered representative of the arid ecological zone of northern Mauritania. The following cover patterns were noted across habitats:

- Within regs, the dominant habitat type, sparse cover of small trees (mainly *Vachellia tortilis*) was noted as covering less than 1% of the total surveyed surface, while grasses (mainly *Panicum turgidum*) and other herbaceous species covered less than 8%.
- The wadi system supported a flora comparable to the adjacent reg habitat, with sparse scrubby cover consisting of *Vachellia tortilis raddiana* and *Panicum turgidum* (approximately 5% cover). *Maerua crassifolia* and *Capparis decidua* were rarely present in wadis.

- The guelb is surrounded by a flat reg plain that is sparsely vegetated. The vegetation present was dominated by the desert grass *Panicum turgidum* at less than 5 to 8% total cover, with scattered scrubby trees of *Vachellia tortilis raddiana* and even less frequently *Maerua crassifolia*. Where there were sandy deposits, *Stipagrostis pungens* was occasional but never dominant.
- The vegetation also included a range of herbaceous plant species, particularly *Pergularia tomentosa, Heliotropium ramosissimum, Stipagrostis plumosa, Citrullus colocynthis, Euphorbia granulata, Euphorbia calyptrata, Nucularia perrinii*, *Pancratium trianthum*, *Zygophyllum glutinosum, Zygophyllum olivieri* and *Centropodia forskaolii*.

Overall, the flora assemblages recorded were typical of desert habitats in North Africa and representative of the reg habitat (URS, 2015).

During the wet season 2024, vegetation cover was assessed for each plot. On average, total vegetation cover in the El Aouj area was 35%, in the corridor area 25%, and in the KBA 41%. Although the KBA is primarily composed of guelbs with ravines or wadis, field data were mainly collected in wadis with higher vegetation cover, explaining the high percentage. The plots with the lowest vegetation cover were around 10% (in the corridor area, in reg habitats), while the highest were over 60% (in the El Aouj area and KBA within wadis). Moreover, vegetation cover is lower in the regs (28%), dunes (30%), and ravines (35%), followed by wadis (39%) and dhayas (43%). Observations aligned with expectations, as the more humid areas had the highest vegetation cover, while the driest areas had the lowest vegetation cover (see APPENDIX I-D, Table 10).

Aouchich overview

The Aouchich area was visited in 2023. Between the Daghveg borehole and the Aouchich well, on the reg or sandy regs, there was evidence of good quality grazing, represented by degraded cover of *Nucularia perrinii*, *Panicum turgidum*, *Pergularia tomentosa* and *Ziziphus lotus*.

Near the Aouchich cliff, the shrubby vegetation is distributed in a linear pattern, forming a *khat* (line in Arabic). The vegetation is mainly composed by *Vachellia flava* and *Maerua crassifolia* exposed to over-grazing. The herbaceous strata included *Panicum turgidum, Pergularia tomentosa, Euphorbia calyptrata, Senna italica* and *Zygophyllum glutinosum.*

The Aouchich well (88 km from the paved road) is located on the edge of a sebkha with *Zygophyllum gaetulum* and *Hyoscyamus muticus*.

7.5.4 Reptiles

7.5.4.1 Desktop review

The previous desktop study (URS, 2015) identified records of small spotted-lizard (*Mesalina guttulata*), “sand fish” (*Scincus albifasciatus*) and false cobra (*Scutophis moilensis*) documented in the vicinity of F’Derik and records of awl-headed snake (*Lytorhynchus diadema*) and desert agama (*Trapelus mutabilis*) from Touajil. Historically, an isolated relict population of Spanish terrapin (*Mauremys leprosa*) occurred in a wetland at Kediet ej Jill near F’Derik, but this population was lost when the wetland disappeared as a consequence of iron ore mining. This species is now extinct in Mauritania (URS, 2015).

7.5.4.2 Field methodology

Five field campaigns were conducted for the Project between 2012 and 2024. Table 7-20 summarizes the dates, duration and seasons of the reptile field surveys.

Table 7-20: Reptile field survey campaigns.

Year	Office	Local consultant	Season	Dates	Number of days	Number of sampling units
2012	URS	Unspecified	Dry season	January 23 to February 2, 2012	11 days	Around 50 transects
2012	URS	Unspecified	Dry season	March 26 to 30, 2012	5 days	
2013	URS	Unspecified	Wet season	October 21 to 25, 2013	5 days	
2023	WSP	Green Sahel Expertise (GSE) M. Abou Pathé Guey	Dry season	May 4 to 7, 2023	4 days	38 transects
2024	WSP	Green Sahel Expertise (GSE) Dr. Mohamed Vall Debalahi	Wet season	October 7 to 13, 2024	7 days	62 transects

The successive field studies applied different methods, as described in Table 7-21 below.

Table 7-21: Reptiles field surveys methods.

Field campaign	Methods used
URS 2012-2013 *(No detailed descriptions of methods were provided)*	A vehicle-based reconnaissance survey was undertaken to verify the setting of the Project and its associated habitat context and variation. Due to the flat landscape, it was possible to observe 2 to 4 km in all directions. Driven transect survey routes were chosen to be representative of the habitats in the Project AoI. Transect routes generally followed the alignment of proposed linear infrastructure (as proposed at that time). Areas along the driven transect routes were selected for inspection on foot to record species observed and verify observations made during the driven transects. The focus of survey effort was macrofauna as the survey area was not considered to contain attributes (rare habitats, high habitat diversity, habitats associated with areas of high endemism) that would be reasonably expected to support populations of rare microfauna (invertebrates). However, incidental records were made of invertebrates when observed and identified.
Dry season 4-7 May 2023	38 transects were surveyed: 25 transects in the El Aouj area (TA) and 13 transects in the Water Corridor area (TC). Local experts used both transects and transects-based surveys to identify reptiles across the AoI to target all habitat types. A general reconnaissance was completed by vehicle ahead of targeted surveys to identify priority areas for sampling.

Field campaign	Methods used
	Transects were established to cover the El Aouj area, the Water Corridor area and the Aouchich area in the Project AoI. Transects were surveyed on foot and consisted of 100 m x 50 m transects distributed among five main habitat types: guelbs, regs, ravines (within guelbs), wadis, and dunes. One transect was also located in the market gardens, upstream the F'Derik dam as the local water source attracts many fauna species. In general, transects were concentrated in vegetated areas and in areas with more varied topography, as these habitats were more likely to harbour a greater diversity of fauna. Species occurrence was recorded based on direct observations or indirect observations of signs of fauna presence (e.g., tracks, scat, nests, molts, food remains).
Wet season 7-13 October 2024	62 non-linear transects of approximately 200 meters were surveyed on foot to search for individuals or signs of presence (burrows, tracks, debris, faeces, animal remains). The search focused on habitats likely to attract reptiles, such as rocky areas and shrubs. Given the characteristics of this taxon, the searches were carried out in the morning and evening to maximize encounters with individuals. The location of the sampling transects was initially determined on a map by WSP in various habitats and then adjusted in the field according to site constraints.

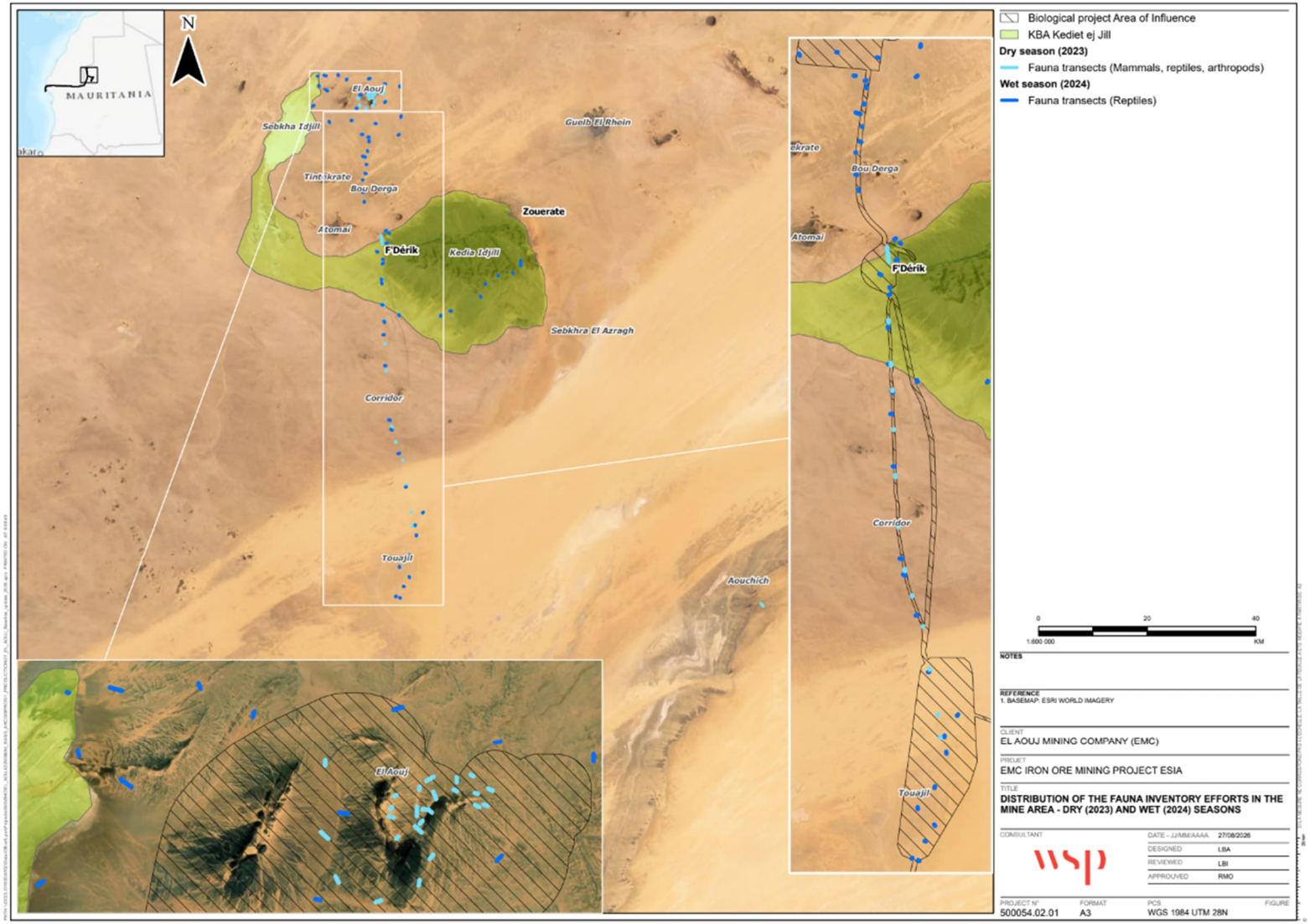
Coordinates for the reptile inventory sites surveyed in 2023 and 2024 are presented in APPENDIX J-A, Table 13 and Table 14. The distribution of survey effort across habitat types is presented in the Table 7-22 and is illustrated in Figure 7-31

Table 7-22: Fauna investigation effort in each habitat type.

Habitat types	Dry season 2023		Wet season 2024	
	Total number of transects in each habitat	Total length of transects in each habitat (m)	Total number of transects in each habitat	Total surface of transects in each habitat (m)
Dhaya			5	1,535.7
Dunes	7	1,022.1	3	401.7
Garden	1	1,651.2		
Ravines (with guelbs)	7	1,201.6	7	1,251.8
Reg	16	2,332.7	33	6,911.1
Wadis	7	1,296.9	14	2,238.4
Total[1]	**38**	**7,504.4**	**62**	**12,338.6**

1 The sum of columns may not correspond to the total due to rounding.

Figure 7-31: Distribution of the fauna inventory effort in the Mine area during dry (2023) and wet (2024) seasons.



7.5.4.3 Results

The list of observed and potentially present reptile species is presented in Table 7-23. Tracks and burrows were also recorded when encountered. These incidental observations thus add a species of viper to the list of species present. Tracks were observed once in a ravine habitat and once in a dune habitat.

Table 7-23: Expected and observed reptile species in the Mine area.

Scientific name	Reptile species	Protection status International [a, b] / National [c] / CITES	Literature		Field observations		
			2012, 2013 URS	Desktop 2023	2012, 2013 URS	Dry season 2023	Wet season 2024
Acanthodactylus aureus	Golden Fringe-fingered Lizard	LC		X			
Acanthodactylus boskianus	Bosc's fringe-toed lizard	LC		X			
Acanthodactylus dumerili	Fringe-toed lizard	LC			X		
Acanthodactylus longipes	Long fringe-fingered lizard	LC		X			X
Agama castroviejoi	Agama boueti	LC		X			
Agama impalearis	Common agama	LC			X		
Bitis arietans	Puff adder	LC		X			
Cerastes cerastes	Desert horned viper	LC		X	X	X	
Cerastes vipera	Sahara sand vipera	LC		X		X	
Chalcides sp	Chalcides sp.	-		X			
Hemidactylus sp	Hemidactylus sp	-		X			
Lytorhynchus diadema	Crowned leaf-nosed snake	LC	X				
Mesalina guttulata	Small spotted desert racer	LC	X				
Mesalina olivieri	Olivier's sand lizard	LC		X			
Mesalina pasteuri	Pasteur's lizard	LC		X			
Psammophis schokari	Forskal's Sand Snake	LC		X			
Scincus albifasciatus	Sand fish	LC	X	X			
Scutophis moilensis	Moila snake	LC	X				
Tarentola annularis	White-spotted wall gecko	LC		X	X		X
Trapelus mutabilis	Desert agama	LC	X				
Uromastyx dispar	Southern Saharan spiny-tail lizard	LC / CITES Appendix II		X	X	X	X

Scientific name	Reptile species	Protection status International [a, b] / National [c] / CITES	Literature		Field observations		
			2012, 2013 URS	Desktop 2023	2012, 2013 URS	Dry season 2023	Wet season 2024
Varanus griseus	Desert monitor	LC / CITES Appendix I		X		X	
Total			5	16	5	4	3

[a] Source: (IUCN, 2025): LC = least concern.

[b] Source: (CITES, 2023)

[c] Source: Mauritanian status law (n°97-006, 1997) P = protected.

Recent taxonomic revisions have affected some North African lacertid genera, particularly *Acanthodactylus*. The synonymizing of *A. boskianus khattensis* and *A. b. nigeriensis*, and the phylogenetic repositioning of *A. hardyi* and *A. masirae* (Tamar et al., 2016), has led to an update of the nomenclature checks. Although the Mesalina species recorded in the Project AoI remain valid, the genus is known to present taxonomic instability (Hosseinian et al., 2015). These considerations have been integrated into the interpretation of reptile baseline data.

The desktop review indicates that 23 reptile species could be present in the Mine AoI (including two taxa identified to genus level: *Hemidactylus* and *Chalcides*). Eight (8) species were observed during the field surveys in the Mine area. All observed species are classified as LC, and two are listed on CITES appendices: *Varanus griseus* (Appendix I) and *Uromastyx dispar* (Appendix II).

Reptiles being ectothermic animals, means that their body temperature is determined by the external temperature. They use heated surfaces, such as rocks, to absorb heat through conduction. This allows them to increase their body temperature and be more active, which is essential for physiological functions such as digestion, locomotion, and foraging. They benefit from the heat stored during the day when temperatures drop as night approaches, during the night, or early in the morning. The health and safety controls implemented to reduce the risks to the survey team imposed some constraints on survey timing, which may have affected the survey results (i.e., low number of species observed). *Uromastyx dispar* is strictly diurnal and highly heat-tolerant, becoming most active from late morning through the afternoon when temperatures are highest. *Acanthodactylus longipes*, like most Saharan lacertids, is also diurnal but tends to concentrate its activity earlier in the day—during the morning and early afternoon—to avoid extreme surface heat. *Tarentola annularis*, on the other hand, is a fully nocturnal gecko, emerging after sunset and remaining active throughout the night, similar to other *Tarentola* species.

Reptile species richness

Reptile species richness is detailed in APPENDIX J-B, Table 15 for dry season 2023 and Table 16 for wet season 2024. Reptile species richness is illustrated for the El Aouj area in Figure 7-32 and Figure 7-33 for the dry and wet seasons, respectively. Species richness along the Water Corridor is shown in Figure 7-34 and Figure 7-35 for the dry and wet seasons, respectively. Species richness for Kediet ej Jill is illustrated in Figure 7-36 for the wet season.

During the dry season 2023, 4 species were recorded in the El Aouj area. None of them are internationally or nationally protected. At the transect level, the number of species recorded range from 0 to 3 species. During

the wet season 2024, a total of 3 species and 1 unspecified viperine were recorded in the El Aouj area. Similar to the dry season, the number of species recorded per transect ranged from 0 to 3 species. There was no apparent seasonal variability in reptile species richness.

Uromastyx dispar was the only species recorded across all field surveys conducted in 2012-2013, 2023, and 2024. This species, known as the Southern Saharan spiny-tail lizard, primarily inhabits rocky areas, caves, and gravelly regs (WSP, 2023). Notably, in the Tiris Zemmour region, particularly in the El Aouj area, four distinct phenotypes have been observed. These morphological variations may be linked to factors such as sex, age, and sexual activity, which can trigger changes in morphology, including colour alterations, in certain species. Figure 7-37 below represents the most common phenotypes observed in the Project area.

Figure 7-32: Reptile species richness in the El Aouj area - Dry season (2023).

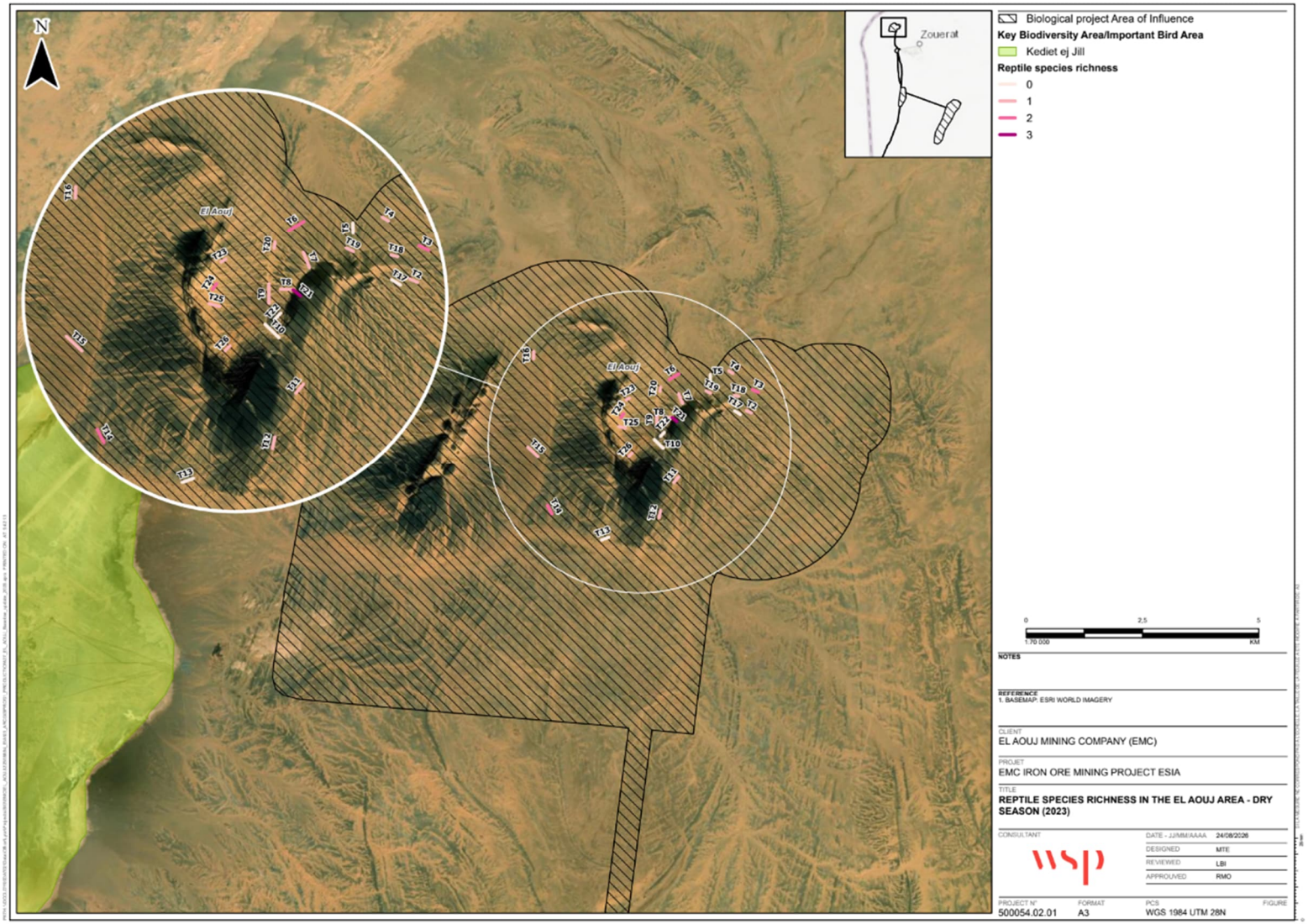


Figure 7-33: Reptile species richness in the El Aouj area - Wet season (2024).

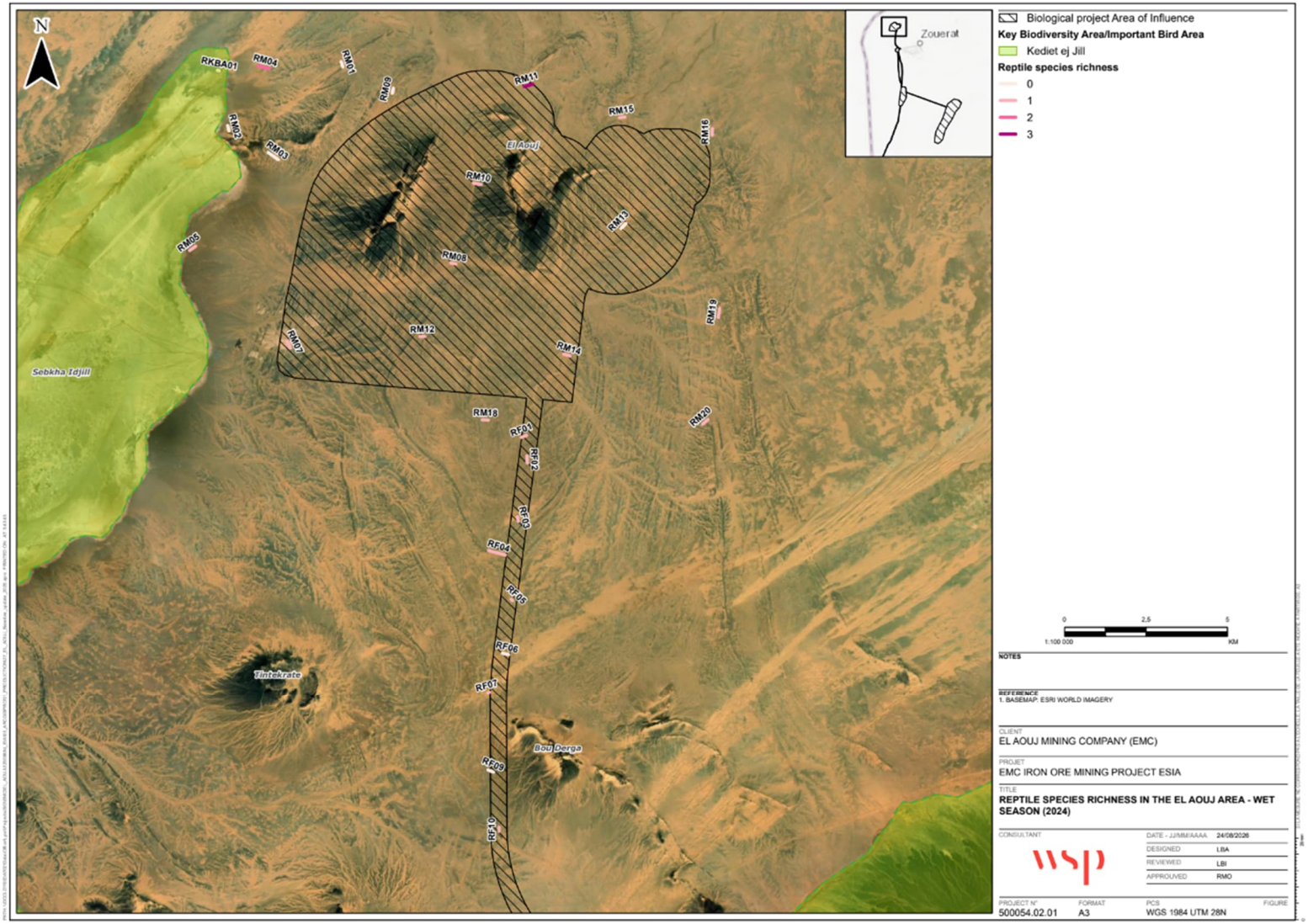


Figure 7-34: Reptile species richness in the F'Derik, Corridor and Touajil area - Dry season (2023)

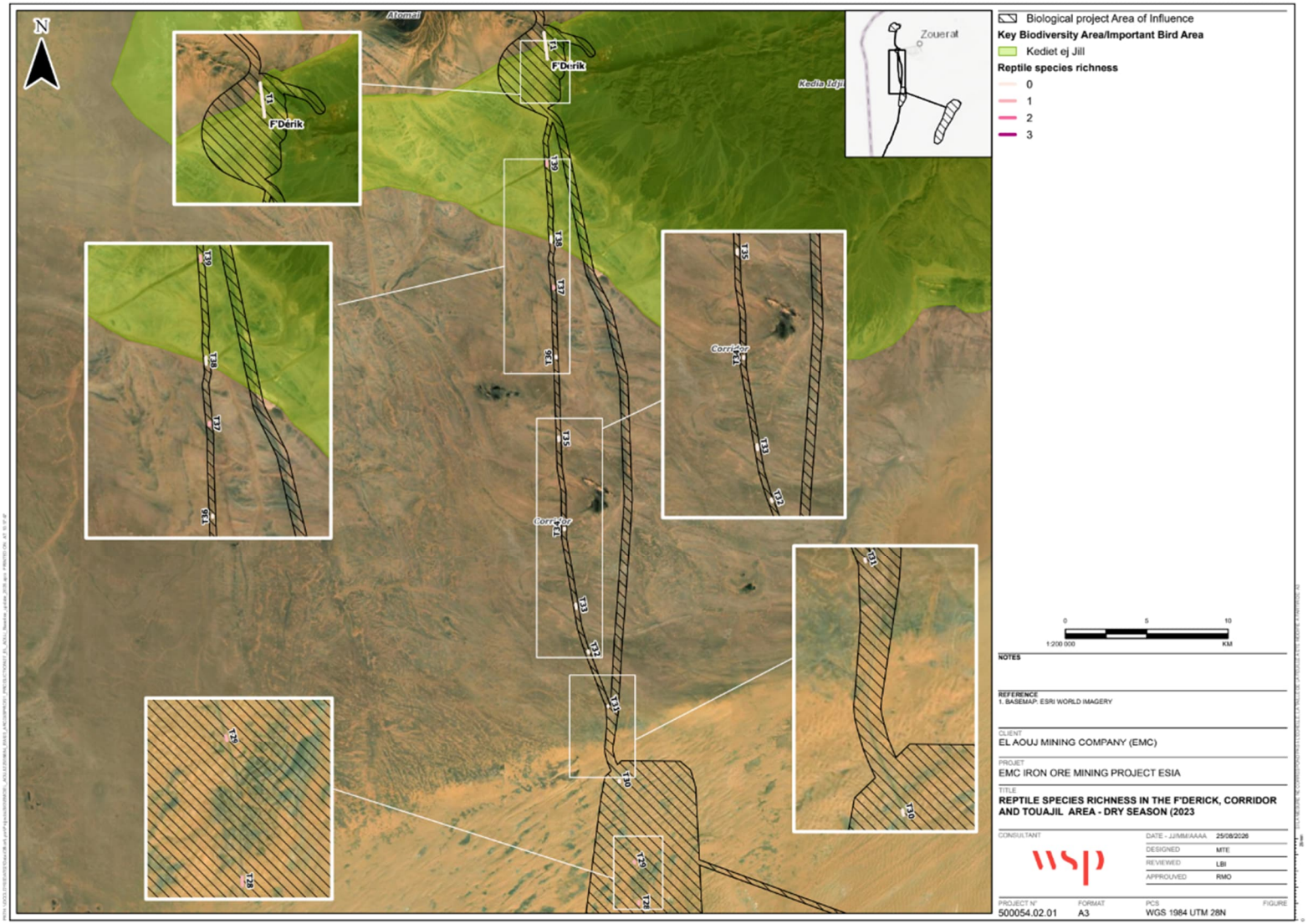


Figure 7-35: Reptile species richness in the F'Derik, Corridor and Touajil area - Wet season (2024).

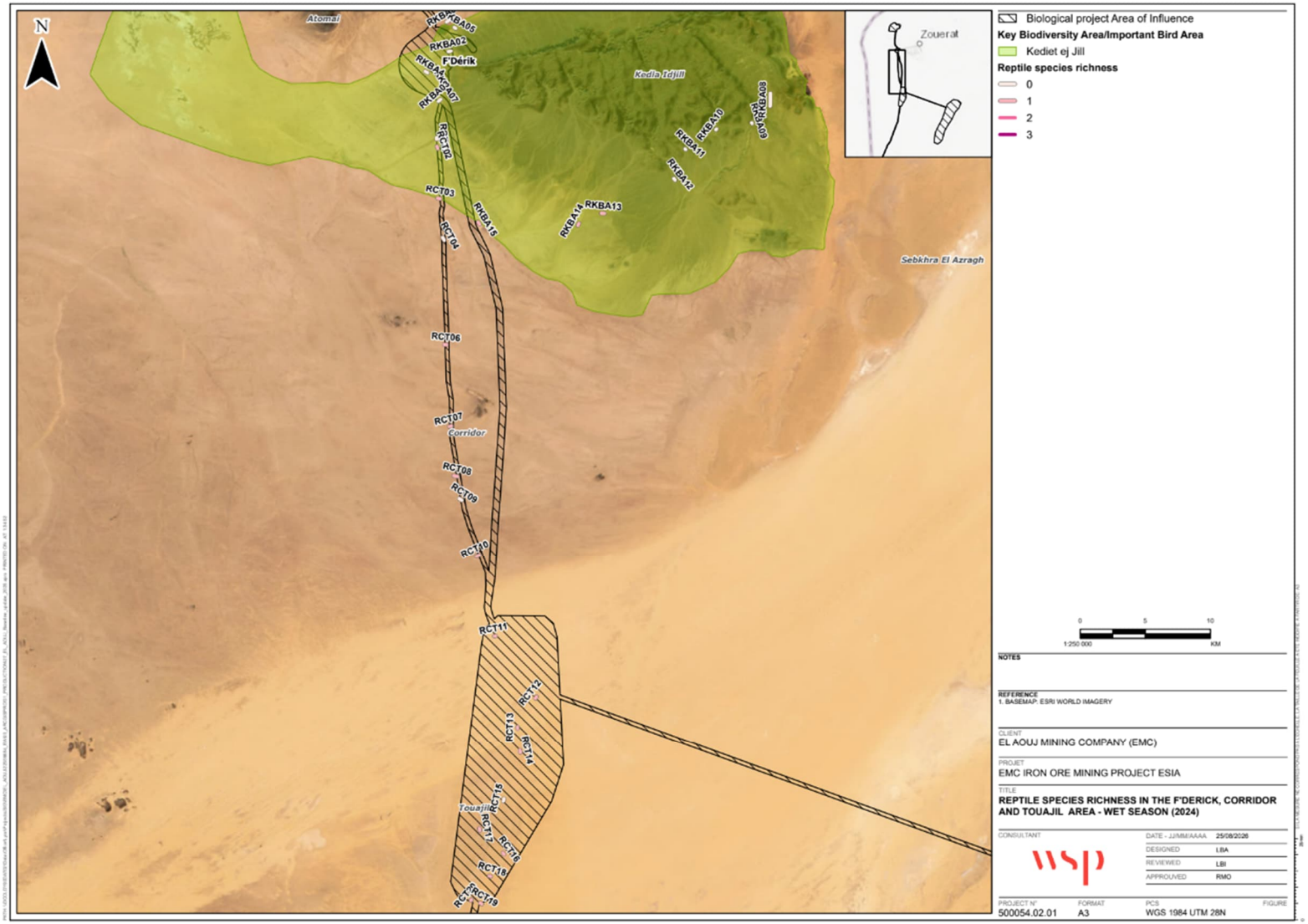


Figure 7-36: Reptile species richness in the Kediet ej Jill area - Wet season (2024).

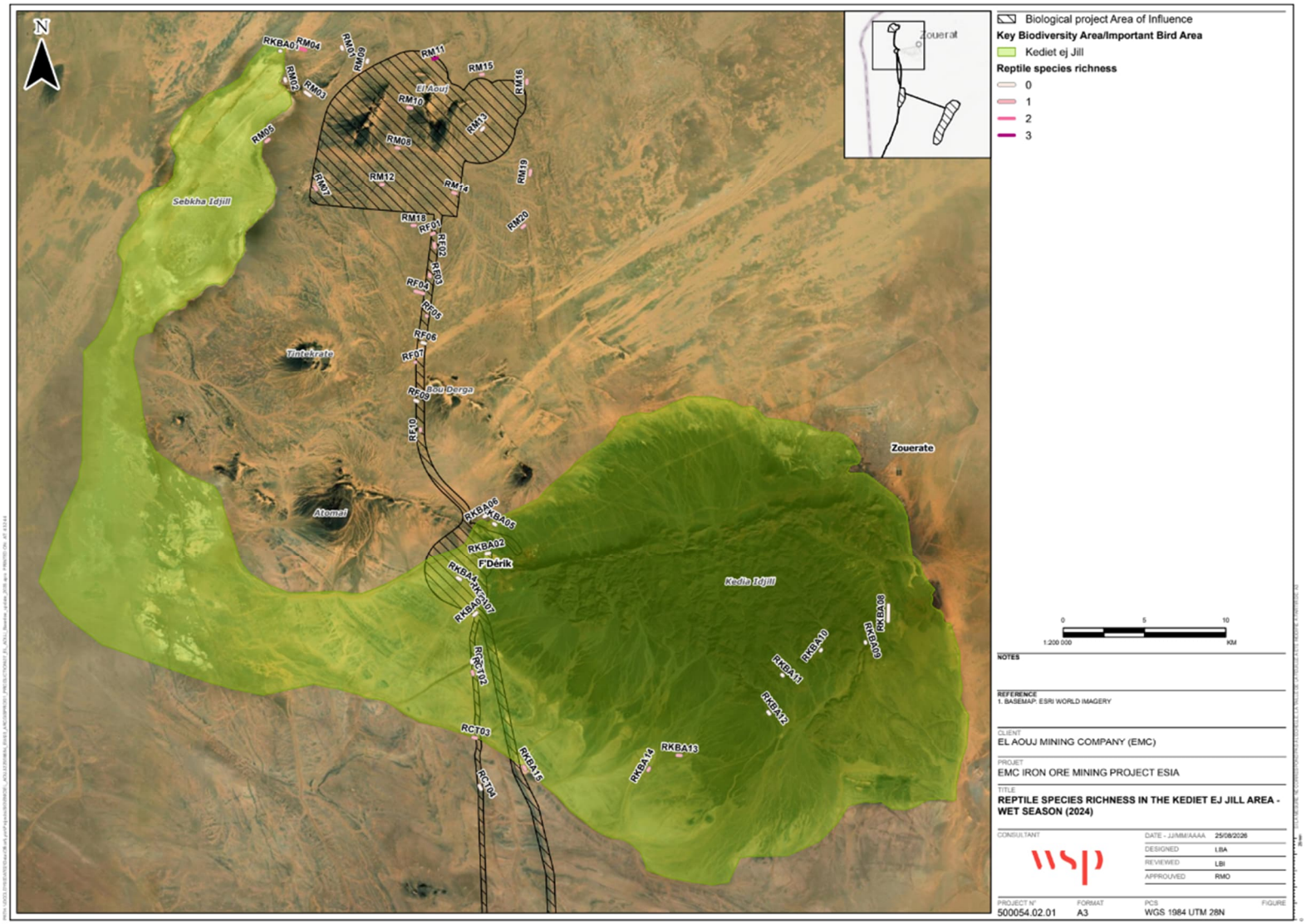


Figure 7-37: Four phenotypes of the same species: *Uromastyx dispar*

Reptile species richness by habitat

On average, observed species richness was highest in ravines (within guelbs) and in wadis during the dry season. Otherwise, species richness was higher in reg and wadis during the wet season (Table 7-24). Mean species richness was very low. There was no notable difference in species' richness among habitats nor between seasons.

Table 7-24: Reptiles species richness across habitat types in the Project AoI

Habitats	Dry season 2023		Wet season 2024			
				Total species richness		
	Number of transects	Total Species richness [a]	Number of transects	Natural habitats	Modified habitats	Total
Dhaya			5	0	0	0
Dunes	7	1	3	1	0	**1**
Garden	1	0				
Ravines in guelbs	7	3	7	2	0	**2**
Reg	17	3	33	3	2	**3**
Wadis	7	1	14	2	0	**2**
TOTAL	**39**	**4**	**62**	**3**	**2**	**3**

a Excludes observations of tracks or burrows not attributable to a specific species.

Reptile species abundance

Reptile abundance is detailed in APPENDIX J-C, Table 17 for dry season 2023 and Table 18 for wet season 2024. During the dry season 2023, four species were observed, with three of them being very low in abundance. The most abundant species was spiny-tailed lizard (*Uromastyx dispar flavifasciata*) with 23 individuals detected. The spiny-tailed lizard mainly uses rocks, caves and gravelly regs. More than 20 individuals were detected along 23 of the 39 transects surveyed, unlike the other species, which were only found once or twice across all the dry season transects (WSP, 2023). It is an herbivorous, terrestrial, sedentary, diurnal, and heliophilous saurian. This species thrives in stony and rocky biotopes in desert and semi-desert environments. However, this species cannot be found in sandy niches such as dunes, which constitute barriers to its movement. It was abundant in all but the most degraded (disturbed or compacted through human activity) reg habitats. This species was less common in the vicinity of F'Derik due to the poor quality of the habitat, and presumably from human disturbance and hunting (this species is eaten by the local people) (URS, 2015).

During the wet season 2024, four species were recorded, with *Acanthodactylus longipes* (46 individuals) and spiny-tailed lizard (14 individuals) being the abundant. Tracks and burrows were also recorded, mainly from

these two species, but also indicating the presence of geckos and snakes. Twenty-one (21) transects had one or more spiny-tailed lizard burrows out of the 62 surveyed transects (Table 7-25).

Acanthodactylus longipes is commonly found in arid regions. These lizards are characterized by their long, slender bodies and adaptations to desert life, including specialized feet for fast movement across sandy environments. They primarily feed on insects and small invertebrates. This species is commonly found in North Africa and the Middle East, including regions such as Mauritania, where it can be observed in rocky and sandy habitats.

Table 7-25: Reptile abundance in the Project AoI

Species	Dry season 2023	Wet season 2024		
	Observable Abundance	Transects with presence of tracks	Transects with presence of burrows	Observable Abundance
Acanthodactylus longipes	0	9	4	46
Ceraste vipera	1	0	0	0
Cerastes cerastes	2	0	0	0
Tarentola annularis	0	1	0	3
Uromastyx dispar flavifasciata	23	0	21	14
Varanus griseus	1	0	0	0
Viperidae	0	2	0	0

7.5.5 Mammals

7.5.5.1 Desktop review

Historically, large fauna existed in the region like *Addax nasomaculatus, Hystrix cristata* or species of the genus *Oryx, Gazella* or *Struthio*, among others. These species have completely disappeared due to mostly unfavourable climatic conditions (desertification and absence of rain) and anthropic activities (poaching) (WSP, 2023).

The review sought to identify species of conservation concern with potential to occur in the Mine AoI. At the national level, protected species were identified by the Hunting and Nature Protection Code and the Forestry Code

- Law (n°97-006, 1997), repealing and replacing law no. 75-003 of 15 January 1975 on hunting and nature protection code.

At international level, fauna species of conservation concern were identified based on listings from the IUCN Red List of Threatened species and CITES.

Field studies conducted in the initial study area of 2012-2013 (Mine area, infrastructure corridor, F'Derick and water corridor and supply area) noted the presence of mammal species that are common and widespread in the arid ecological zone of northern Mauritania. These included, for example, the fennec fox, the Cape hare (*Lepus capensis*), the African wolf, and the dromedary (*Camelus dromedarius*). Observations of Cape hare and

fennec fox were widespread across the survey area, but these species are likely to occur at very low density, in accordance with their known ecology. No protected, nationally or internationally threatened, or restricted-range mammal species were recorded during previous surveys (URS, 2015).

Indirect evidence (tracks and dung) was found in 2012 and 2013 to substantiate the presence of golden jackal and rodents such as jerboa and gerbil. In 2012, African wild cat (*Felis silvestris lybica*) is mentioned to possibly occur in the Project AoI (URS, 2015).

7.5.5.2 Field methodology

Five field campaigns were conducted for the Project between 2012 and 2024. Table 7-26 summarizes the dates, duration and seasons of the field surveys for the mammals.

Table 7-26: Mammal field survey campaigns.

Year	Office	Local consultant	Season	Dates	Number of days	Number of sampling units
2012	URS	Unspecified	Dry season	January 23 to February 2, 2012	11 days	Around 50 transects
2012	URS	Unspecified	Dry season	March 26 to 30, 2012	5 days	
2013	URS	Unspecified	Wet season	October 21 to 25, 2013	5 days	
2023	WSP	Green Sahel Expertise (GSE) M. Abou Pathé Guey	Dry season	May 4 to 7, 2023	4 days	37 transects
2024	WSP	Green Sahel Expertise (GSE) M. Med vall dit Debalahi	Wet season	October 7 to 13, 2024	7 days	4 camera traps and incidental census during fauna and flora inventories

Successive field studies used different methods as described in Table 7-27.

Table 7-27: Mammals field surveys methods.

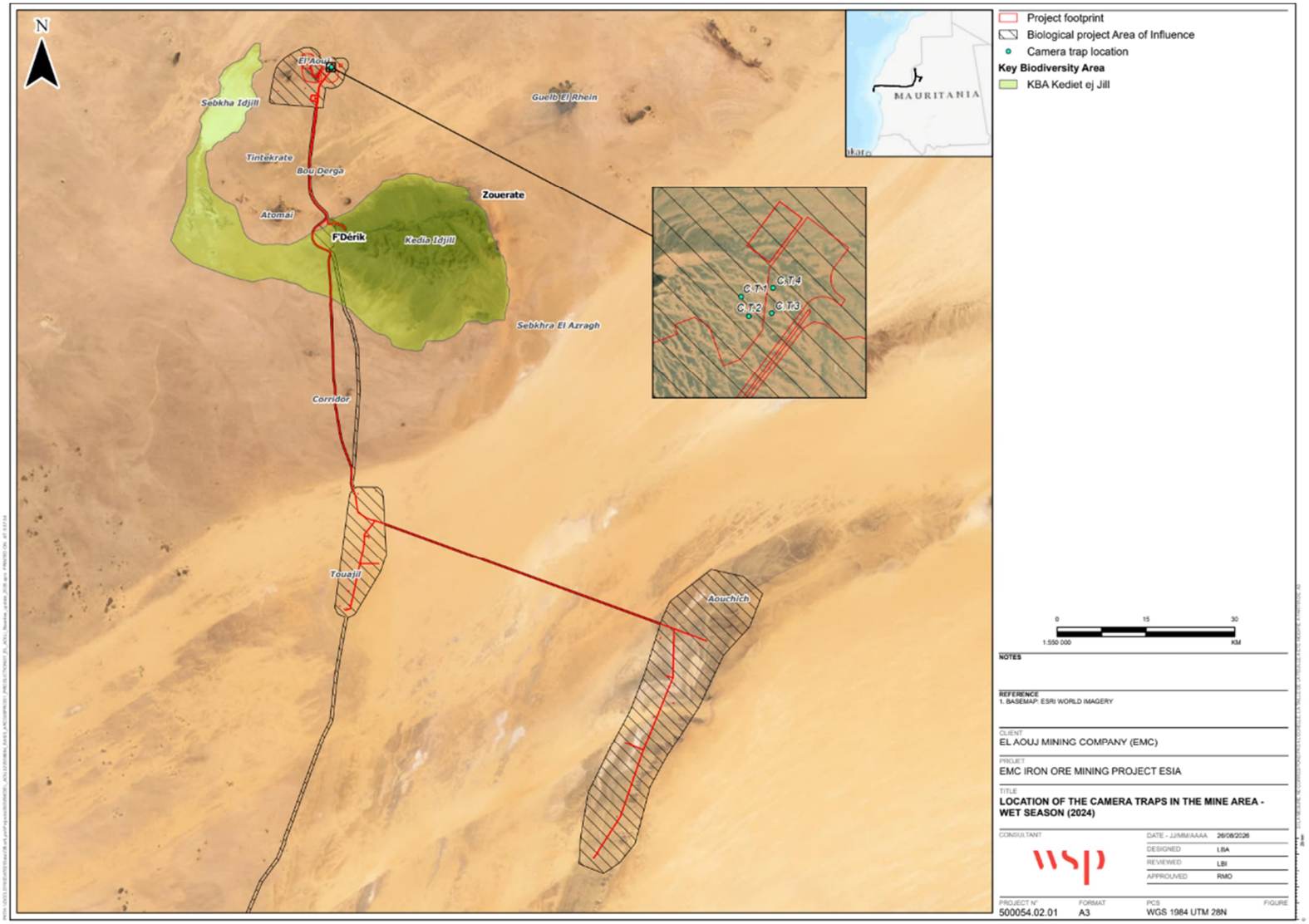
Field campaign	Methods used
URS 2012-2013 *(No detailed descriptions of methods were provided)*	A vehicle-based reconnaissance survey was undertaken to verify the setting of the Project and its associated habitat context and variation. Due to the flat landscape, it was possible to observe 2 to 4 km in all directions. Driven transect survey routes were chosen to be representative of the habitats present in the Project AoI. Transect routes generally followed the alignment of proposed linear infrastructures (as defined at that time). Areas along the driven transect routes were selected for detailed inspection on foot, allow to record mammal species present and to verify observations made during the driven transects.

Field campaign	Methods used
Dry season 4-7 May 2023	37 transects were surveyed: 25 transects in the El Aouj area (TA) and 12 transects in the Water Corridor area (TC). Local experts used both transects and plot-based surveys to identify mammals across the AoI and to target all habitat types. A general reconnaissance was completed by vehicle ahead of targeted surveys to identify priority areas for sampling. Transects were established to cover the El Aouj area, the Water Corridor area and the Aouchich area, consisting of 100 m x 50 m transects distributed among five main habitat types: guelbs, regs, ravines (within guelbs), wadis, and dunes. One transect was established in the market gardens, upstream the F'Derik dam as the local water source attracts many fauna species. In general, transects were concentrated in vegetated areas and areas with more varied topography, as these habitats are more likely to harbour a greater diversity of fauna. Species occurrence was recorded based on direct observations (i.e., visual or auditory observations) or indirect observations of signs of fauna presence (e.g., tracks, scat, nests, molts, food remains).
Wet season 7-13 October 2024	Mammals were recorded as incidental observations during reptile-focused surveys. Direct observations, mammal burrows, droppings, and tracks were documented along with corresponding GPS coordinates. Four camera traps were set near the El Aouj mine, in an area where they could be monitored by security guards. They were attached to small trees at approximately 40 cm above the ground facing open areas, avoiding tall grass or branches within the camera's detection field to prevent triggering in case of wind. Each camera was deployed for a 26-hour period.

The transects coordinates for the fauna inventories during dry season 2023 are presented in APPENDIX K-A, Table 11 and the location of the camera traps coordinates for the fauna inventory during wet season 2024 are presented in APPENDIX K-A, Table 12.

The distribution of survey effort during the dry season (2023) and the wet seasons (2024) is presented in Figure 7-31**,** and camera trap locations are shown in Figure 7-38**.**

Figure 7-38: Location of the camera traps in the Mine area - Wet season (2024)



7.5.5.3 Results

Table 7-28 presents the list of mammal species present of potentially present in the AoI as compiled from a combination of desktop reviews and field campaigns.

Table 7-28: Expected and observed mammal species in the Mine area.

Scientific name	Mammal species	International [a, b] / National [c] Protection status / CITES	Literature		Field observations		
			2012, 2013 URS	2023	2012, 2013 URS	Dry season 2023	Wet season 2024
Addax nasomaculatus	Addax	CR / CITES Appendix I	X				
Ammotragus lervia	Aoudad[d]	VU / P / CITES Appendix II	X	X			
Camelus dromedarius	Dromedary camel	-			X		X
Canis lupaster	African wolf	LC	X	X	X	X	X
Capra aegagrus hircus	Domestic goat	-			X		X
Equus asinus	Donkey	-			X		X
Felis margarita	Sand cat	LC	X	X		X	
Felis silvestris lybica	African wild cat	LC			X		
Gazella dorcas	Dorcas gazelle	VU	X				
Gerbillinae sp	Gerbil sp	-			X		
Gerbillus nancillus (Synonym *Gerbillus mauritaniae)*	Mauritanian gerbil	DD	X				
Hyaena hyaena	Striped hyaena	NT	X				
Jaculus jaculus	Lesser Egyptian jerboa	LC	X	X			X
Lepus capensis	Cape hare	LC	X		X	X	
Mellivora capensis	Honey badger	LC		X		X	
Mice	Mice	-		X			
Nanger dama	Dama gazelle	CR / CITES Appendix I	X				
Pachyuromys duprasi	Fat-tailed gerbil	LC		X			
Paraechinus aethiopicus	Desert hedgehog	LC		X		X	
Pipistrellus reuppellii	Ruppell's pipistrelle	LC			X		
Rattus sp.	*Rattus sp.*	-		X			
Vulpes pallida	Pale fox	LC		X		X	
Vulpes zerda	Fennec fox	LC / CITES Appendix II		X	X	X	

Scientific name	Mammal species	International [a, b] / National [c] Protection status / CITES	Literature		Field observations		
			2012, 2013 URS	2023	2012, 2013 URS	Dry season 2023	Wet season 2024
Xerus erythropus	Striped ground squirrel	LC		X		X	
Total			**10**	**12**	**10**	**8**	**5**

[a] Source: (IUCN, 2025) : LC = least concern; NT = Near threatened, VU = Vulnerable, CR = Critically endangered, DD = Data deficient

[b] Source: (CITES, 2023)

[c] Source: Mauritanian Law (n°97-006, 1997): P = Protected

[d] It is unlikely to be present in the AoI due to historical hunting pressure.

A total of 24 mammal species and taxa were recorded across successive inventories, with 15 of them directly observed in the field. All wild fauna observed during surveys are classified as LC while the remaining species are domestic species such as donkeys, camels, and goats or were not identified to species level (e.g., *Gerbillinae*).

The aoudad (*Ammotragus lervia*) is the only nationally protected species, and it is included in CITES Appendix II (CITES, 2023). According to the Mauritanian law (n°97-006, 1997), the aoudad is fully protected. The species was not detected during surveys; however, it is identified in the literature and breeders claim that this species is present in the region.

Addax (*Addax nasomaculatus)* is included in CITES Appendix I (CITES, 2023). They have been rumours of Addax along the Mali/Mauritania border (Majabat Al Koubra), but no confirmed sightings for several years. In early March 2007, the fresh tracks of about 15 Addax were seen in central Mauritania, in an area where they had not been reported for over 20 years but these reports have not been followed up and it is unclear whether any Addax survive in Mauritania (IUCN, 2025).

Dorcas Gazelle (*Dorcas gazella*) isn't mentioned in CITES appendix in Mauritania (CITES, 2023). Dorcas Gazelle formerly occurred over the entire Sahelo-Saharan region from the Mediterranean to the southern Sahel and from the Atlantic to the Red Sea, and extending into southern Israel, Syria and Jordan (marginal occurrence). And Horn of Africa (IUCN, 2025).

During the dry season 2023, 4 mammal species were directly observed on transects: fennec fox, African wolf, Cape hare and sand cat. Each of these species were observed once along one transect (respectively T18, T11, T14, T20). Other species were detected from tracks, indirect or incidental observations. Fennec fox, included on CITES Appendix II (CITES, 2023), prefers landscapes consisting of vast stretches of desert, including sand dunes, rocky plains, and semi-arid zones. Cape hare is a territorial animal, capable of significant movements, mostly within its home range of up to 21 ha (Rühe, 2004). Finally, the large number of rodent burrows observed during the dry season is indicative the abundance of these nocturnal species, notably mice, rats, lesser jerboa (*Jaculus jaculus*), striped-ground squirrel), and fat-tailed jird (*Pachyuromys duprasi*).

During the wet season 2024, 2 wild mammal species were observed: African wolf and lesser Egyptian jerboa. Other observations involved domesticated species. The African wolf was captured on camera (Figure 7-39) at 8 pm in the El Aouj Mine area. Due to its tolerance of dry conditions and its omnivorous diet, it can live in a wide variety of habitats, reaching 3,800 m in elevation, ranging from savanna, to shrubland, and grassland habitats. It is the only mammal species observed across all field studies (2012-2013, 2023, 2024). A lesser Egyptian jerboa was found dead in the proposed rail spur area (Figure 7-40). The habitat of this species varies across

the range, from sand dunes to rocky substrates, however, it is always found near vegetation. It is a strictly nocturnal species, and its remains are commonly found in owl pellets.

Figure 7-39: *Canis lupaster*

Figure 7-40: *Jaculus jaculus*

The species recorded in 2024 were predominantly domestic species. Field surveys were preceded by heavy rainfall, leading to the emergence of young shoots, which may explain the increased grazing activity. It is important to note that most species in arid environments are nocturnal, and since surveys were conducted during the day, observations, even opportunistic ones, were limited.

There were too few mammal observations to draw conclusions about seasonal patterns. Nonetheless, species belonging to the Gerbillinae family, observed in 2015 and 2024, depend on the availability of food resources, which are greater during the wet season due to the germination of plants from the soil seed bank. This period also coincides with their reproductive season, possibly explaining why they might be more likely to be observed in the wet season. The African wolf, observed in all seasons, does not exhibit particular seasonality based on observations.

Indirect observations of tracks and other signs helped confirm the presence of mammals, although the exact species could not be identified. The photos below show mammal tracks that appear to be from felids/canids (Figure 7-41).

Figure 7-41: felids or canids tracks

Domestic animals

Herds of domestic animals, such as dromedaries, donkeys and goats, and a smaller number of sheep, were present in the Project AoI. Figure 7-42 shows examples of livestock breeding in the Project AoI (WSP, 2023).

The area covered by the transects does not have a high forage potential, which means that it is not as rich in species of forage value, but it is the presence of water that attracts pastoralists to the area. *Nucularia perrenii*, for example, is very rare and can only be found at the summit of El Aouj (WSP, 2023).

Figure 7-42: Left side: grazing area in El Aouj; Right side marker at F'Derik

7.5.6 Arthropods

Formal surveys for arthropods were not completed, but incidental observations were noted during other inventories. Some observations were reported by nomadic herders interviewed in 2023.

Arthropods are numerous in the desert. The encountered groups include scorpions, terrestrial crustacea (isopods), acarian-like tics, insects (beetles, ants, termites, butterflies, and *Platypus* beetles) and arachnids. Ants were present in every habitat surveyed. Species documented during 2023 surveys and interviews are listed in Table 7-29.

Table 7-29: Arthropods species recorded in the project area – Dry season 2023 (WSP, 2023).

Scientific name	Arthropod species	IUCN Status	Dry season 2023		
			Expert observation	Breeders' interviews	Literature review
Scorpio maurus	Large-clawed scorpion	-	X		X
Platypus cylindrus	Oak pinhole borer	LC	X		X
-	Isopod	-	X		X
-	Mites (ticks)	-	X		X
-	Spider	-	X		X
-	Butterfly	-	X		X
-	Termites	-	X		X
-	Ants	-	X		X
-	Beetle	-		X	X

None of the arthropods detected in the AoI are nationally protected under the Mauritanian law (n°97-006, 1997). Similarly, no globally threatened arthropods were encountered. The most common arthropods in the AoI are termites. During the dry season surveys, seven (7) termite mounds were found in 4 of the 39 fauna transects. Termites are considered keystone species in many ecosystems (deserts, savannahs, tropical forests) due to the role they play in the mineralization of organic matter.

Arthropods were not the focus of field surveys in 2024. However, several unidentified butterfly species were observed, as well as beetles (*Sternocera orissa*) and coleopterans belonging to the *Pimelia* genus (Figure 7-43). The species belonging to this genus play a crucial ecological role in these environments by decomposing organic matter.

Figure 7-43: Left side: *Sternocera orissa*; Right side: Species belonging to Pimelia genus

7.5.7 Avifauna

7.5.7.1 Desktop review

The region around the El Aouj Mine area supports a notable diversity of birds despite the harsh climatic conditions of the region. Although the region is considerably less diverse than Mauritania's coastal areas, many species well adapted to desert conditions persist in the region. The topographical diversity created by the guelb formations in the region presumably contributes to supporting avian species richness. Of note is the presence of the Kediet ej Jill IBA/KBA, located in proximity to the Mine area (refer to Section 7.5.1 for a description). The IBA/KBA is delineated around a large guelb, to the east of the Mine area, and also includes an expansive sebkha, located to the west and south of the Mine area. Information on species potentially present in the Project AoI were gathered from BirdLife International (2024) and the IUCN Red List of Threatened Species (2024).

7.5.7.2 Field methodology

Five field campaigns were conducted for the Project between 2012 and 2024. Table 7-30 summarizes the dates, duration and seasons of the field surveys for the avifauna.

Table 7-30: Avifauna field survey campaigns.

Year	Office	Local consultant	Season	Dates	Number of days	Number of sampling units
2012	URS	Unspecified	Dry season	January 23 to February 2, 2012	11 days	Around 50 transects

Year	Office	Local consultant	Season	Dates	Number of days	Number of sampling units
2012	URS	Unspecified	Dry season	March 26 to 30, 2012	5 days	
2013	URS	Unspecified	Wet season	October 21 to 25, 2013	5 days	
2023	WSP	Green Sahel Expertise (GSE) M. Abou Pathé Guey	Dry season	May 4 to 7, 2023	4 days	38 transects
2024	WSP	Green Sahel Expertise (GSE) M. Abou Pathé Guey	Wet season	October 7 to 13, 2024	7 days	62 plots

The successive field studies used different methods as described in Table 7-31.

Table 7-31: Avifauna field surveys methods.

Field campaign	Methods used
URS 2012-2013 *(No detailed descriptions of methods were provided)*	A vehicle-based reconnaissance survey was undertaken to verify the setting of the project and its associated habitat context and variation. Due to the flat landscape, it was possible to observe 2 to 4 km in all directions. Driven transect survey routes were chosen to be representative of the habitats present in the Project AoI. Transect routes generally followed the alignment of proposed linear infrastructures (as defined at the time). Areas along the driven transect routes were selected for detailed inspection on foot (i.e., walked transects) to generate species lists and to verify observations made during the driven transects. The stated objectives of the bird survey were to establish the value of the survey area for resident and migratory bird species; the status and typicalness of this bird fauna in a local, national and international context; and the likely impacts of the Project on birds. Data gathered in spring 2012 and autumn 2013 encompassed both migratory seasons. Surveys were focused in the El Aouj guelb, along the infrastructure corridor, and around the F'Derik area.
Dry season 4-7 May 2023	Birds were surveyed over the 38 transects: 25 transects in the El Aouj area (TA) and 13 transects in the Water Corridor area (TC). A general reconnaissance was completed by vehicle ahead of targeted surveys to identify priority areas for sampling. Transects were established to cover the El Aouj area, the Water Corridor area and the Aouchich area within the Project AoI. Transects were surveyed on foot and consisted of 100 m x 50 m transects distributed among five main habitat types: guelbs, regs, ravines (within guelbs), wadis, and dunes. One transect was

Field campaign	Methods used
	established in the market gardens, upstream the F'Derik dam as the local water source attracts many fauna species, including migrating avifauna. Species occurrences were recorded based on direct observations (i.e., visual or auditory observations) and indirect observations (i.e., signs of bird presence such as nests, feathers).
Wet season 7-13 October 2024	62 plots were surveyed. To the extent possible, observations were made in the morning and late afternoon, corresponding to times of day when bird species are most active due to the significant midday heat. Species identification was supplemented with behavioural data on the individuals (e.g., in flight, on the ground, singing). The studied area was relatively flat and visually open, facilitating avifauna observation from the fixed observation points. The location of the sampling plots was initially determined on a map by WSP in various habitats and then adjusted in the field site according to local constraints.

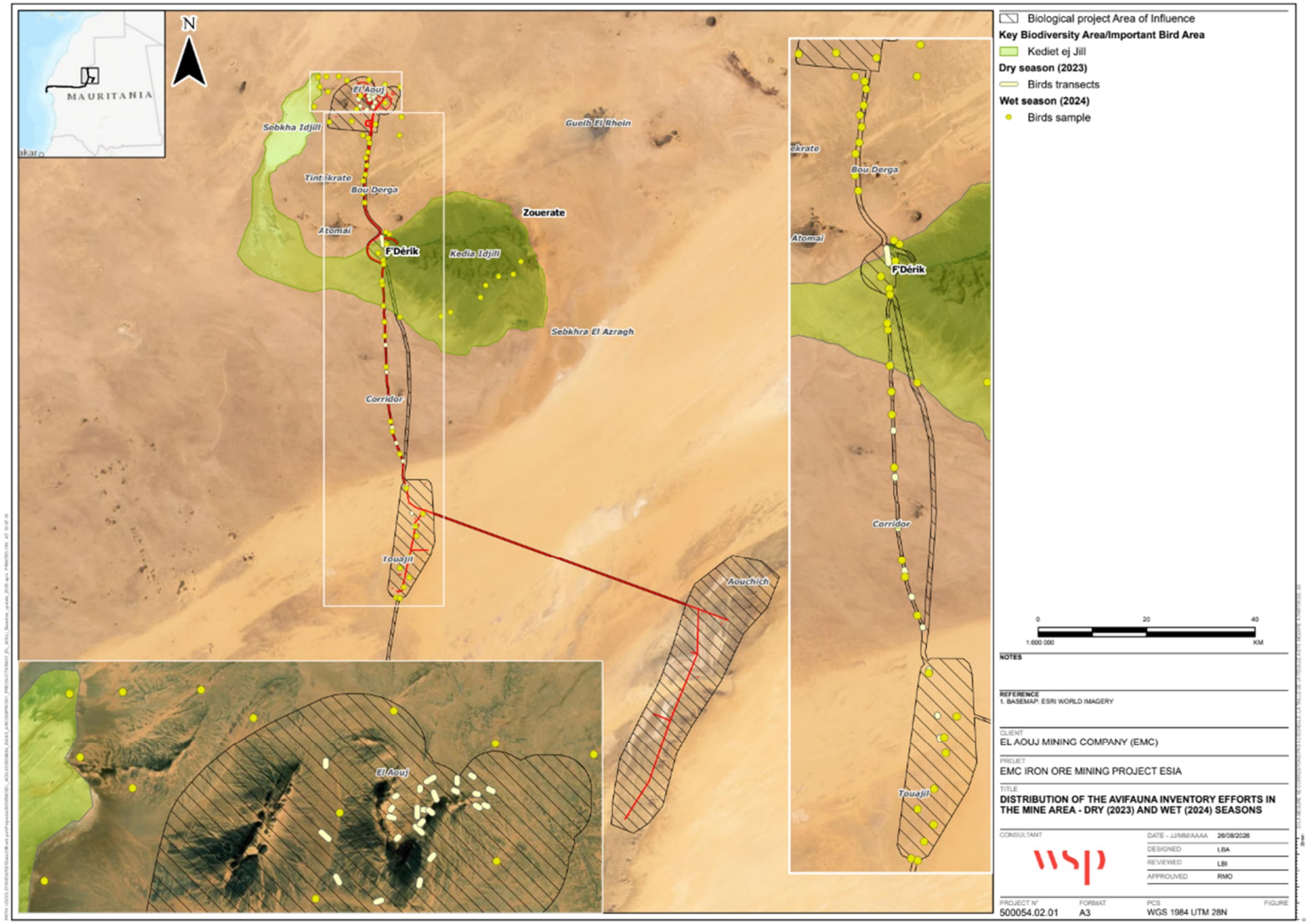
The transects coordinates for the avifauna inventories during dry season 2023 and wet season 2024 campaigns are presented in APPENDIX L-A, Table 19 and Table 20. The distribution of survey effort by habitat type is presented in Table 7-32 and the survey locations are presented in Figure 7-44.

Table 7-32: Avifauna investigation efforts in each habitat type.

Habitat types	Dry season 2023		Wet season 2024	
	Total number of transects in each habitat	Total length of transects in each habitat (m)	Total number of plots in each habitat	Total surface of plots in each habitat (ha)
Dhaya			5	5
Dunes	7	1022.1	3	3
Garden	1	1651.2		
Ravines (with guelbs)	7	1201.6	7	7
Reg	16	2332.7	33	33
Wadis	7	1296.9	14	14
Total[1]	**38**	**7504.4**	**62**	**62**

1 The sum of columns may not equal the total due to rounding.

Figure 7-44: Distribution of the avifauna inventory efforts in the Mine area - dry (2023) and wet (2024) seasons



7.5.7.3 Results

Species observed and potentially present in the mine area are summarized in Table 7-33. In total, 74 species were observed during field surveys (2012-2013, 2023, 2024) and another 3 species are potentially present in the AoI only based on information gathered from the literature.

Fifty-two (52) species were recorded as part of the 2012, 2013 field studies (URS 2015), 31 species were recorded during the 2023 dry season, and 27 species were recorded during the 2024 wet season.

Table 7-33: Expected and observed bird species in the mine area.

Scientific name	Commun English name	IUCN status[a] CITES[b]	Migratory species[c]	CMS[d]	Literature	Field observations		
						2012, 2013 URS	Dry season 2023	Wet season 2024
Alaemon alaudipes	Greater hoopoe-lark	LC	No	No	X	X	X	X
Ammomanes cinctura	Bar-tailed lark	LC	No	No	X	X	X	
Ammomanes deserti	Desert lark	LC	No	No		X		
Anthus cervinus	Red-throated pipit	LC	No	No	X		X	
Anthus trivialis	Tree pipit	LC	Yes	Yes				X
Apus affinis	Little swift	LC	No	No		X		
Apus apus	Common swift	LC	Yes	No	X	X		
Aquila chrysaetos	Golden eagle	LC	No	No	X		X	
Ardea cinerea	Grey heron	LC	Yes	Yes		X		X
Ardeola ralloides	Squacco heron	LC	Yes	Yes				X
Argya fulva	Fulvous babbler	LC	No	No		X		X
Bubo ascalaphus	Pharaoh eagle-owl	LC	No	No	X		X	
Bucanetes githagineus	Trumpeter finch	LC	No	No		X		
Burhinus oedicnemus	Eurasian thick-knee	LC	No	No		X		X
Buteo rufinus	Long-legged buzzard	LC	No	No		X		
Calandrella brachydactyla	Greater short-toed lark	LC	No	Yes	X	X	X	X
Caprimulgus ruficollis	Red-necked nightjar	NT	Yes	No	X		X	
Charadrius dubius	Little ringed plover	LC	Yes	Yes		X		

Scientific name	Commun English name	IUCN status[a] CITES [b]	Migratory species[c]	CMS [d]	Literature	Field observations		
						2012, 2013 URS	Dry season 2023	Wet season 2024
Chlamydotis undulata	**African houbara**	**VU CITES App. I**	**No**	**Yes**	**X**	**X**		
Ciconia ciconia	White stork	LC	Yes	Yes	X		X	
Circaetus gallicus	Short-toed snake eagle	LC	Yes	Yes	X	X	X	
Circus aeruginosus	Western marsh harrier	LC	Yes	No	X		X	
Columba livia	Rock dove	LC	No	No	X		X	
Corvus ruficollis	Brown-necked raven	LC	No	No	X	X	X	X
Curruca deserti	African desert warbler	LC	No	No	X	X		
Curruca ruppeli	Ruppell's warbler	LC	No	No		X		
Cursorius cursor	Cream-coloured courser	LC	No	No		X		X
Delichon urbicum	House martin	LC	Yes	No		X		
Egretta garzetta	Little egret	LC	Yes	Yes				X
Eremopterix leucotis	Chestnut-backed sparrow-lark	LC	No	No	X		X	X
Eremopterix nigriceps	Black-crowned sparrow lark	LC	No	No	X	X	X	
Falco biarmicus	Lanner falcon	LC CITES App. II	No	Yes	X	X		X
Falco naumanni	Lesser kestrel	LC CITES App. II	Yes	Yes	X	X	X	
Falco pelegrinoides	Peregrine falcon	LC CITES App. I	Yes	Yes		X		
Falco tinnunculus	Common kestrel	LC CITES App. II	Yes	No		X		
Gyps africanus	**White-backed vulture**	**CR**	**No**	**No**	**X**		**X**	
Hirundo rustica	Barn swallow	LC	Yes	No	X	X	X	

Scientific name	Commun English name	IUCN status[a] CITES[b]	Migratory species[c]	CMS[d]	Literature	Field observations		
						2012, 2013 URS	Dry season 2023	Wet season 2024
Lanius excubitor	Great grey shrike	LC	Yes	No		X		
Lanius meridionalis	**Iberian grey shrike**	**VU**	**No**	**No**	**X**		**X**	**X**
Lanius senator	Woodchat shrike	NT	Yes	No		X		X
Leptoptilos crumenifer	Marabou stork	LC	No	No	X		X	
Lonchura cantans (syn. *Euodice cantans*)	African silverbill	LC	No	No		X		
Milvus migrans	Black kite	LC	Yes	No		X		
Monticola solitarius	Blue rock trush	LC	No	Yes		X		
Motacilla alba	White wagtail	LC	Yes	No	X	X		X
Motacilla flava	Western Yellow wagtail	LC	Yes	No	X	X	X	
Musciapa striata	Spotted flycatcher	LC	Yes	No		X		X
Neotis nuba	Nubian bustard	NT	No	No	X			
Oena capensis	Namaqua dove	LC	No	No	X	X	X	X
Oenanthe deserti	Desert wheatear	LC	No	No	X	X	X	X
Oenanthe leucopyga	White-crowned wheatear	LC	No	Yes	X	X	X	X
Oenanthe moesta	Morning wheatear	LC	No	No				X
Oenanthe oenanthe	Northern wheatear	LC	Yes	No		X		X
Passer domesticus	House sparrow	LC	No	No		X		
Passer simplex	Desert sparrow	LC	No	Yes		X		X
Phylloscopus bonelli	Western Bonelli's warbler	LC	No	Yes		X		
Phylloscopus collybita	Common chiffchaff	LC	Yes	Yes		X		

Scientific name	Commun English name	IUCN status[a] CITES [b]	Migratory species[c]	CMS [d]	Literature	Field observations		
						2012, 2013 URS	Dry season 2023	Wet season 2024
Pinarocorys erythropygia	Rufous rumped lark	LC	No	Yes	X		X	
Platalea leucorodia	Eurasian spoonbill	LC CITES App. II	Yes	No				X
Plegadis falcinellus	Glossy ibis	LC	Yes	No				X
Pterocles coronatus	Crowned sandgrouse	LC	No	No	X			
Pterocles senegallus	Spotted sangrouse	LC	No	No		X		
Ptyonoprogne fuligula	African rock martin	LC	No	No	X	X	X	
Ptyonoprogne rupestris	Eurasian crag martin	LC	No	No		X		
Riparia riparia	Collared sand martin	LC	Yes	No		X		
Spiloptila clamans	Cricket warbler	LC	No	No	X	X	X	
Streptopelia capicola	Ring-necked dove	LC	No	No	X		X	
Streptopelia decaocto	Eurasian collared dove	LC	Yes	No				X
Streptopelia roseogrisea	African collared dove	LC	No	Yes	X	X	X	
Streptopelia senegalensis	Laughing dove	LC	No	Yes	X		X	X
Sylvia cantillans (syn. *Curruca cantillans*)	Subalpine warbler	LC	Yes	Yes		X		
Sylvia conspicillata (syn. *Curruca conspicillata*)	Spectacled warbler	LC	No	No		X		
Sylvia hortensis (syn. *Curruca hortensis*)	Western orphean warbler	LC	No	No		X		
Sylvia melanocephala (syn. *Curruca melanocephala*)	Sardinian warbler	LC	Yes	No		X		
Torgos tracheliotos	**Lappet-faced vulture**	**EN**	**No**	**No**	**X**			
Tyto alba	Common barn owl	LC	No	No	X		X	

Scientific name	Commun English name	IUCN status[a] CITES [b]	Migratory species[c]	CMS [d]	Literature	Field observations		
						2012, 2013 URS	Dry season 2023	Wet season 2024
Upupa epops	Common hoopoe	LC	Yes	No	X	X	X	X
Total			**30**	**12**	**39**	**52**	**31**	**27**

[a] IUCN Red List - https://www.iucnredlist.org/

[b] CITES Appendices I, II, III - https://cites.org/eng/app/appendices.php

[c] Migratory species - The Eurasian African Bird Migration Atlas - https://migrationatlas.org

[d] Convention on the Conservation of Migratory Species of Wild Animals (CMS) – https://www.cms.int/en/species?field_species_class_tid=421

Out of the 74 species detected during field surveys, 7 species were observed across all survey years, and 7 new species were observed during the 2024 field surveys. Most species detected in the Mine area are globally listed as LC (68 species), 2 are listed as NT, 2 are listed as VU, 1 is listed as EN, and 1 is listed as CR. Species potentially present include 3 species listed as LC, 1 listed as NT, and one listed as EN.

Those of conservation concern include:

- White-backed vulture (*Gyps africanus*, CR). The species was recorded during the 2023 field survey; however, white-backed vultures are typically associated with more vegetated areas in southern Mauritania. The species' global distribution range does not overlap the project AoI, suggesting that the observation during the field surveys may represent a vagrant observation. White-backed vultures are wide-ranging species that can travel over long distances.
- Lappet-faced vulture (*Torgos tracheliotos*, EN). The species was not recorded during field surveys but was reported as present by nomadic herders interviewed in 2023 (WSP 2023). The species is considered extinct in the project AoI, and it is possible that local breeders misidentified the vulture species.
- African houbara (*Chlamydotis undulata*, VU). The species was detected during studies associated with the 2015 ESIA (URS 2015). The African houbara was detected at the mine site, along the infrastructure corridor, near F'Derick and in the water corridor and supply area (URS 2015).
- Iberian grey shrike (*Lanius meridionalis*, VU). The species was detected during 2023 and 2024 surveys. It typically occurs in open habitats with thorny bushes. The Iberian grey shrike also occurs in areas cultivated for cereal crops (BirdLife International 2024).

Six bird species recorded are listed on the CITES appendices, including African houbara (*Chlamydotis undulata)*, Eurasian spoonbill (*Platalea leucorodia*), common kestrel (*Falco tinnunculus*), lanner falcon (*Falco biarmicus*), lesser kestrel (*Falco naumanni*), and peregrine falcon (*Falco pelegrinoides*).

Surveys and the desktop review identified 30 migratory species in the Mine area, including 12 that are listed in the Convention on the Conservation of Migratory Species of Wild Animals (CMS). Survey results from the 2015 ESIA (URS, 2015) were not presented by season, precluding the ability to assess trends in species detections across seasons.

The wet season corresponds to the period when European migratory species leave breeding grounds with diminishing resources as winter approaches, heading to more hospitable areas, mainly in Africa. With the arrival

of rain, temporary wetlands form, attracting waders and aquatic birds such as herons and spoonbills. Passerines also arrive to feed on the abundant insects during this period. Although species richness was similar between the 2023 dry season and 2024 wet season, a higher proportion of migratory species was detected during the wet season. Many migratory species, such as egrets, herons, and ibis share aquatic or wetland habitats, which are most developed following seasonal rains. Several water-dependent bird species such as *Egretta garzetta*, *Platalea leucorodia*, and *Plegadis falcinellus* were recorded in the hyper-arid Mine area, far from any permanent wetland habitats. Their presence is therefore considered occasional and opportunistic, as reflected by the very low numbers observed. However, in the current report they are presented as if they regularly use the site, which is not supported by the ecological context or the field data. Other species like the greater short-toed lark (*Calandrella brachydactyla*) and the tree pipit (*Anthus trivialis*) prefer dry or grassy terrestrial habitats.

Several species with meeting KBA criterion A3 were observed in the Mine AoI. Three species were recorded in 2012-2013. One species was observed in both 2012-2013 and 2023, while two species were recorded in both 2012-2013 and 2024. Two species were observed during all three field surveys (Table 7-34).

Table 7-34: Observed species meeting IBA Criteria ("trigger species") at Kediet ej Jill.

Species	IUCN Status	IBA Criteria	Type of Observation(s)	
			Literature[1]	Field Surveys
Alaemon alaudipes	LC	A3	Yes	2012 & 2013 URS; 2023; 2024
Ammomanes cinctura	LC	A3	Yes	2012 & 2013 URS; 2023
Ammomanes deserti	LC	A3	No	2012 & 2013 URS
Argya fulva	LC	A3	No	2012 & 2013 URS; 2024
Bubo ascalaphus	LC	A3	No	No
Bucanetes githagineus	LC	A3	No	2012 & 2013 URS
Neotis nuba	NT	A1	Yes	No
Oenanthe leucopyga	LC	A3	Yes	2012 & 2013 URS; 2023; 2024
Oenanthe lugens	LC	A3	No	No
Passer simplex	LC	A3	No	2012 & 2013 URS; 2024
Pterocles coronatus	LC	A3	Yes	No
Ptyonoprogne obsoleta	LC	A3	No	2012 & 2013 URS
Scotocerca inquieta	LC	A3	No	No

1- Species observations from the literature identify those species for which occurrences have been recorded beyond the entries included in the 2001 IBA designation.

Bird species richness

Bird species richness is illustrated for the El Aouj area in Figure 7-45 and Figure 7-46 for the dry and wet seasons respectively, for the Water Corridor area in Figure 7-47 and Figure 7-48 for the dry and wet seasons respectively, and for the Kediet ej Jill area in Figure 7-49 (wet season only). As indicated in the section above, a total of 74 species were observed across the Mine area.

During the 2023 dry season, 29 species were recorded in the Mine area with transect-level richness ranging from 0 species to 17 species. During the 2024 wet season, 27 species were recorded with plot-level richness ranging from 0 species to 6 species. The highest species richness was recorded in a garden (2023) and next to the F'Derik dam (2024).

Bird species richness for the 2023 dry season is detailed in APPENDIX L-B, Table 21 and for the 2024 wet season in APPENDIX L-B, Table 22.

Figure 7-45: Avifauna species richness in the El Aouj area - Dry season (2023).

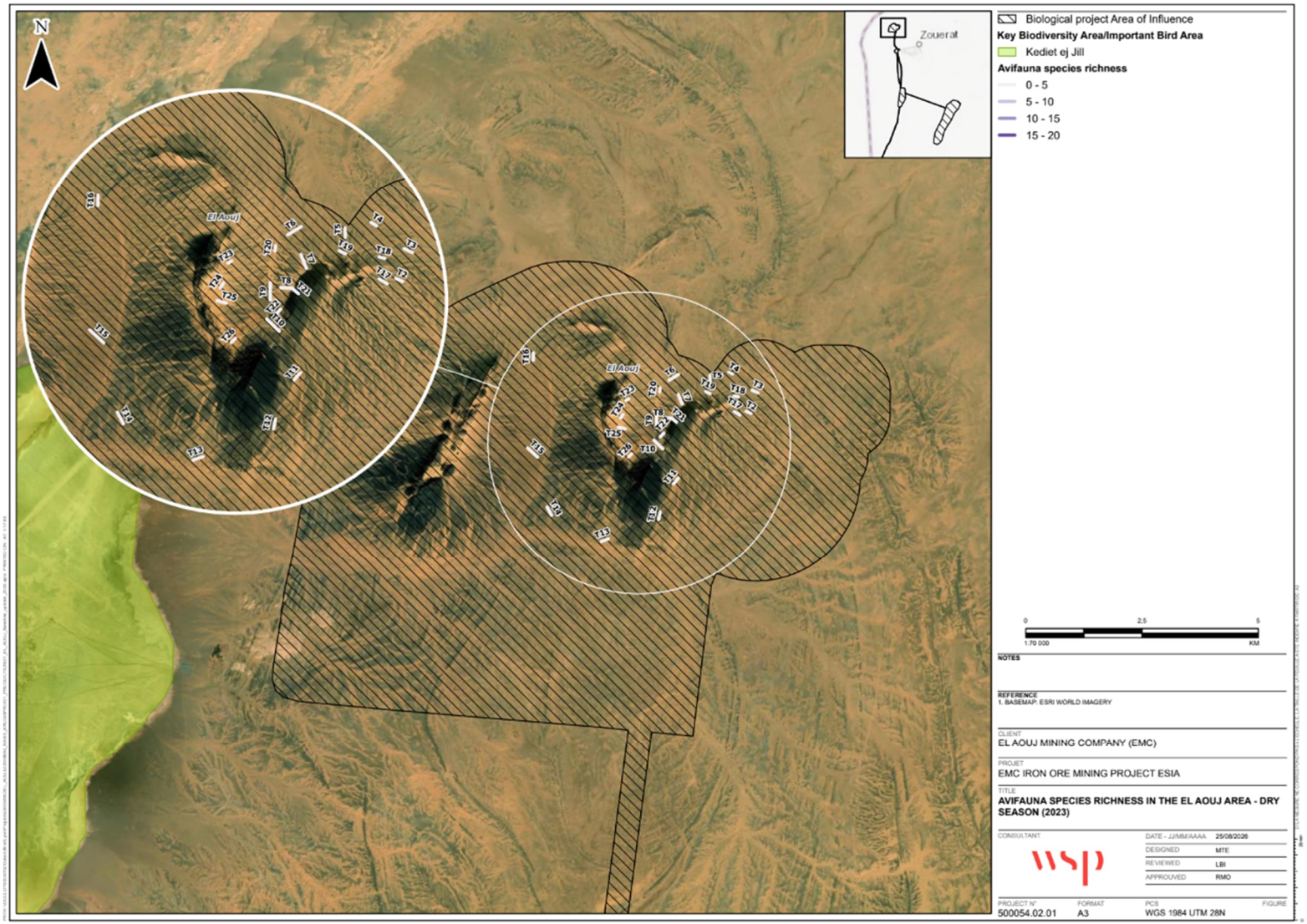


Figure 7-46: Avifauna species richness in the El Aouj area - Wet season (2024).

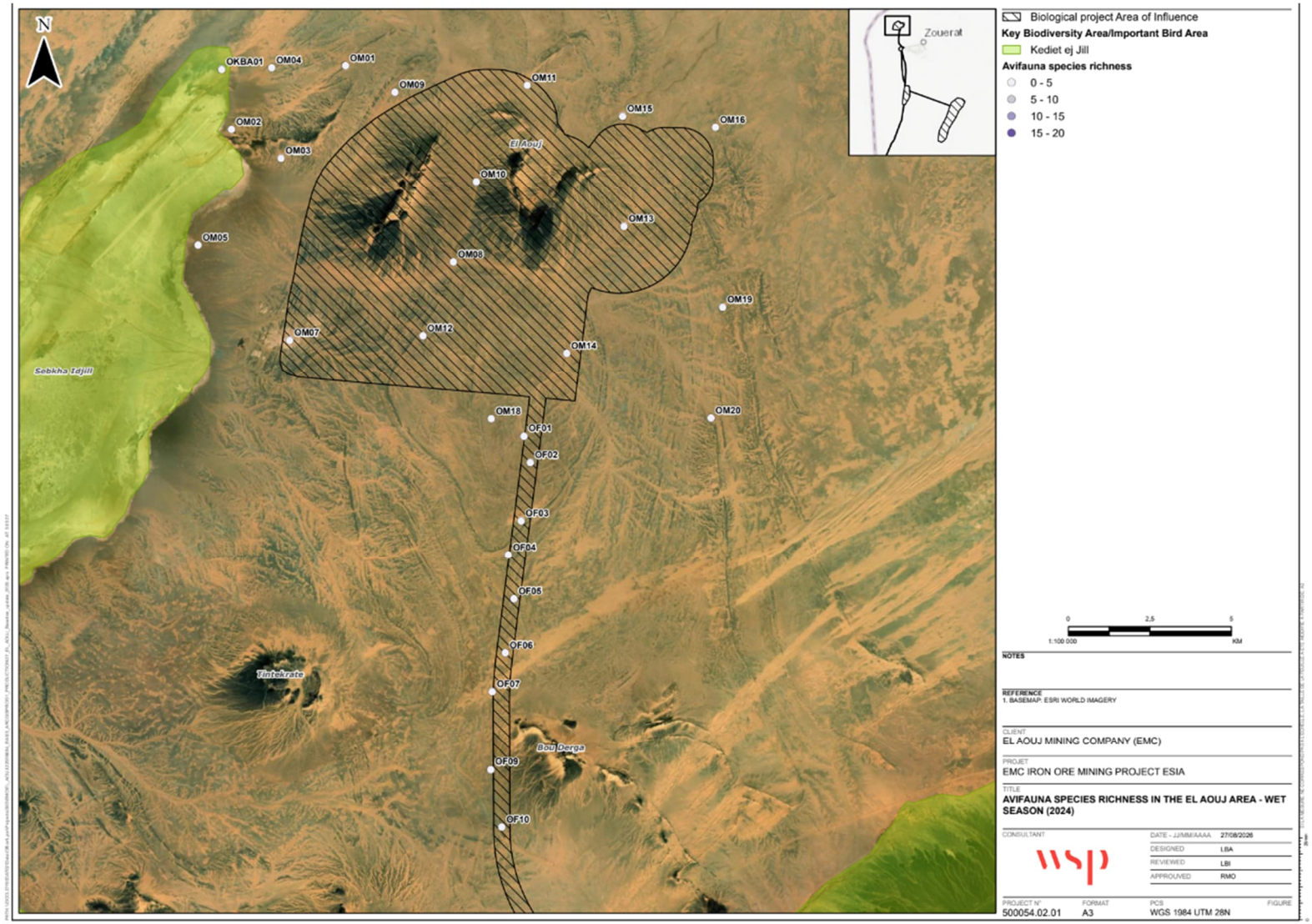


Figure 7-47: Avifauna specific richness in the F'Derik, Corridor and Touajil area - Dry season (2023)

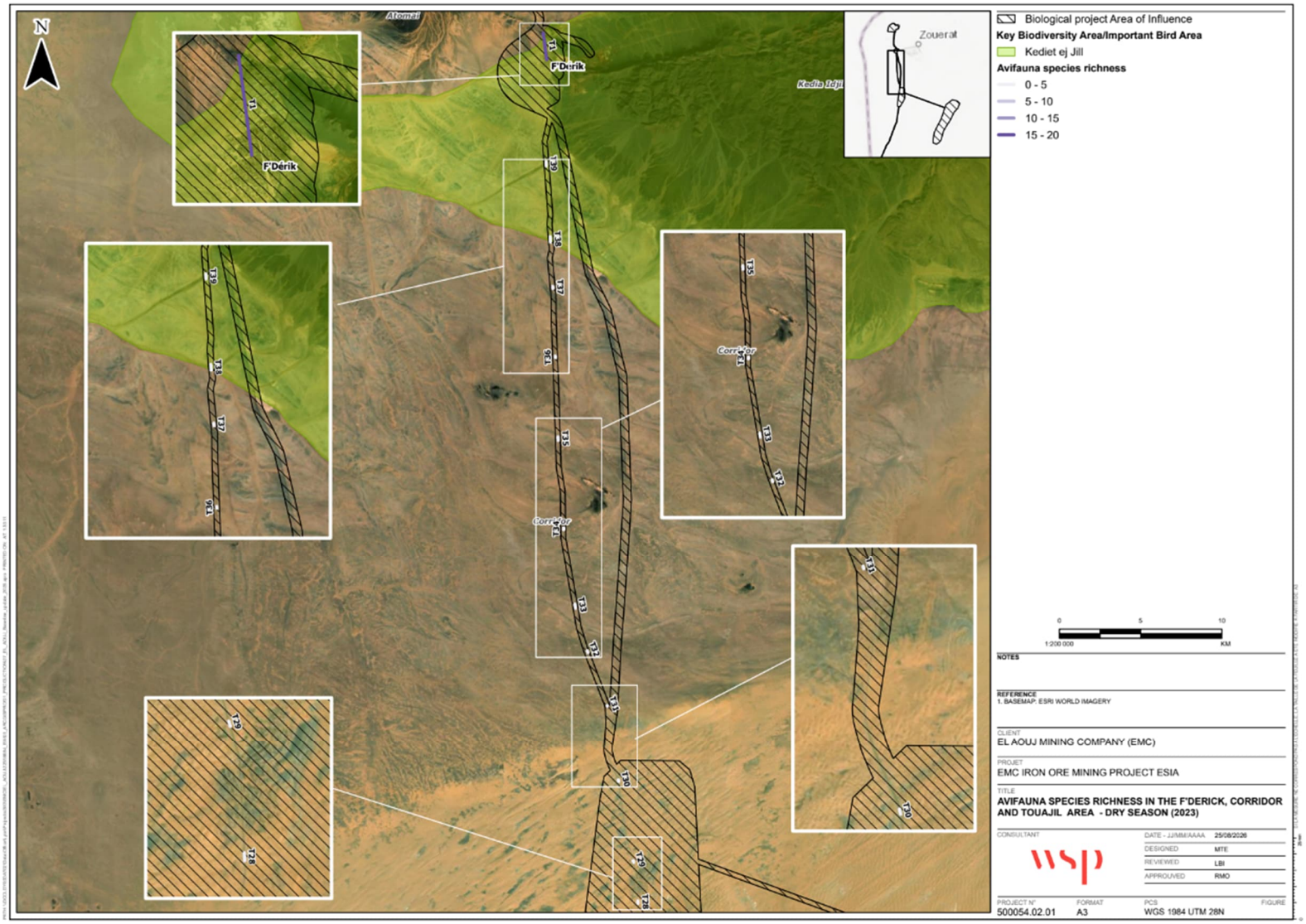


Figure 7-48: Avifauna specific richness in the F'Derick, Corridor and Touajil area - Wet season (2024).

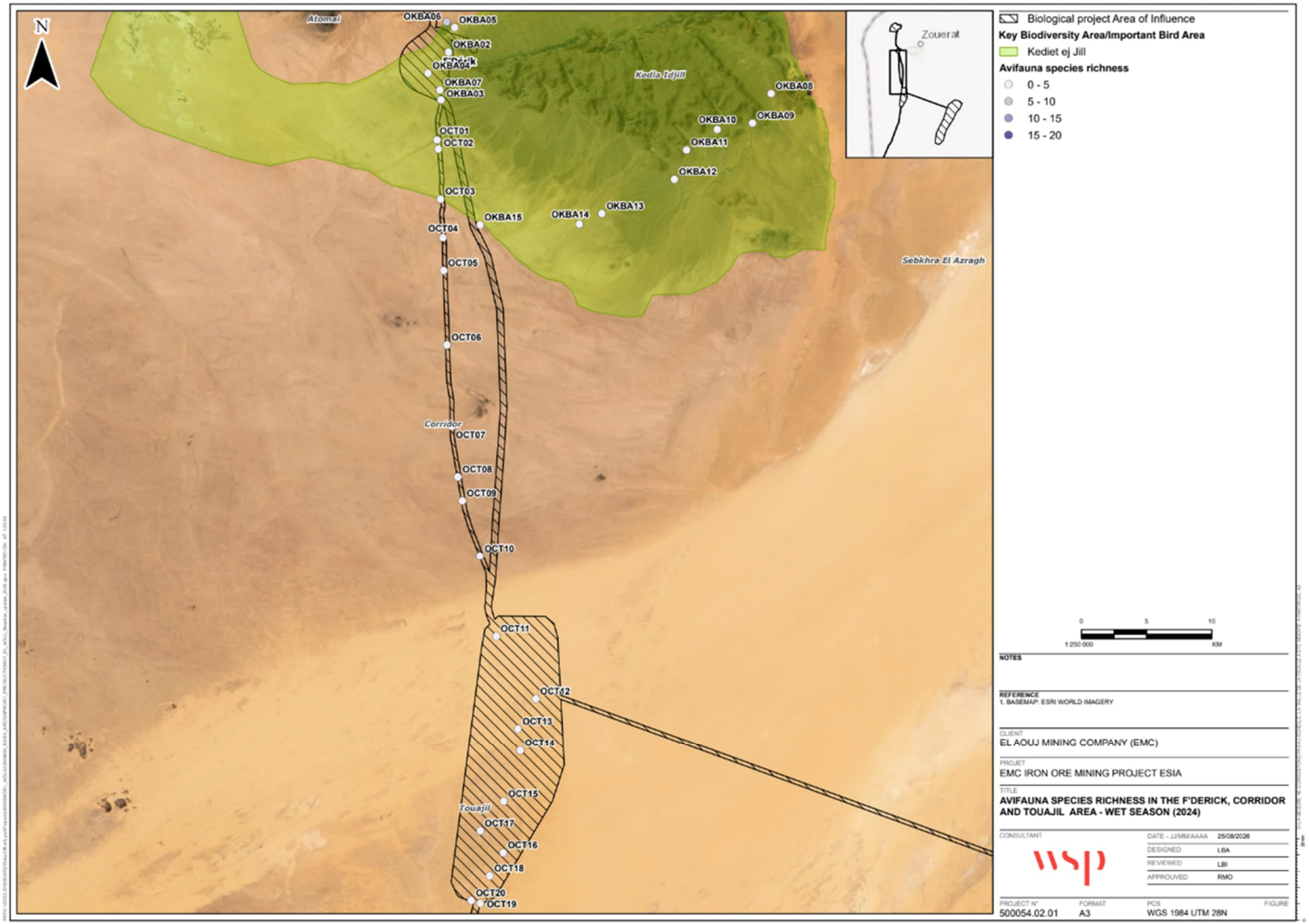
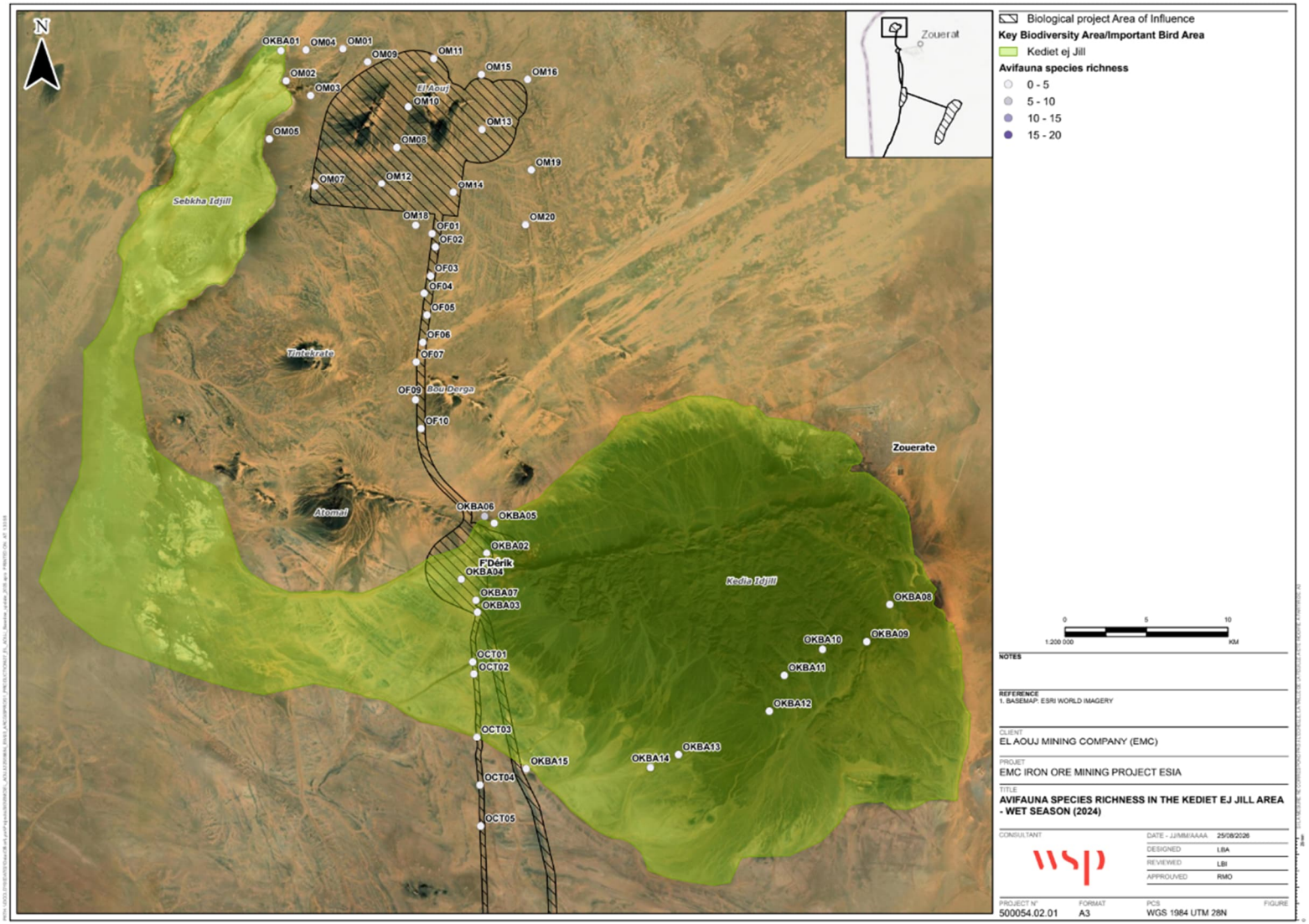


Figure 7-49: Avifauna species richness in the Kediet ej Jill area - Wet season (2024).



Bird species richness by habitat

Average species richness in 2023 was highest in garden and wadis. In 2024, average species richness was highest in wadis and in the dhaya (dam) (Table 7-35).

Table 7-35: Observed bird species richness across habitat types in the Project AoI

Habitats	Dry season 2023			Wet season 2024		
	Number of transects	Total species richness	Mean species richness	Number of plots	Total Species richness	Mean species richness
Dhaya				5	4	1.20
Dunes	7	1	0.33	3	2	1.00
Garden	1	17	17.00			
Ravines in guelbs	7	5	0.71	7	3	0.43
Reg	17	4	0.35	33	11	1.15
Wadis	7	7	1.57	14	17	1.50
TOTAL	**39**	**29**	-	**62**	**27**	-

Given the higher sampling effort in 2024, average species richness was compared statistically (Kruskal-wallis test) across four habitat categories: dhaya, dunes, ravines, reg, and wadis (Figure 7-50). No significant difference in average species richness was detected among habitat types (H (df = 5) = 3.96, p = 0.5539).

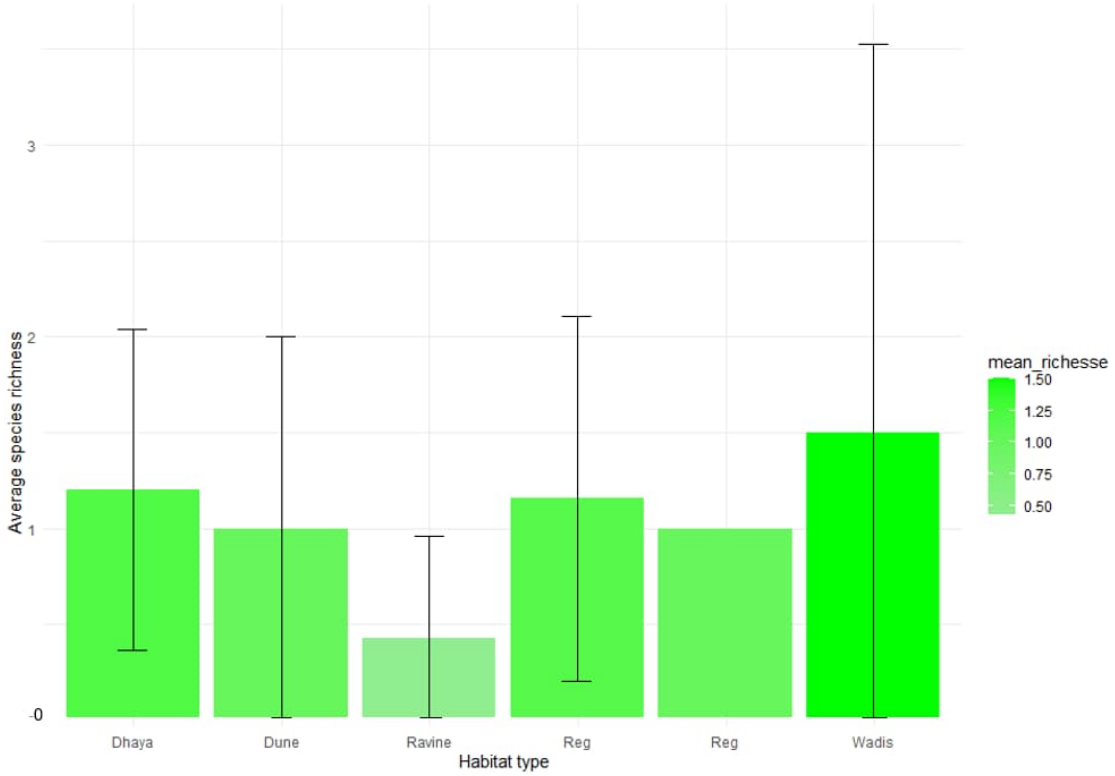


Figure 7-50: Average bird species richness by habitat types with range of richness values shown as black bars.

Bird abundance

Bird abundances recorded totalled 109 individuals in 2023 (across 39 transects) and 160 individuals in 2024 (across 62 plots). Detailed bird abundance data are included in APPENDIX L-C, Table 23 for dry season 2023 and Table 24 for wet season 2024. The abundance results are summarized in Table 7-36 below. In general, the average abundance of birds in most habitat types was higher during the wet season.

Table 7-36: Observed bird abundance across habitat types in the Project AoI

Habitats	Dry season 2023			Wet season 2024		
	Number of transects	Abundance	Mean abundance	Number of plots	Abundance	Mean abundance
Reg	17	8	0.47	33	76	2.30
Ravines in Guelbs	7	8	1.25	7	6	8.85
Wadis	7	19	2.72	14	58	4.14
Dunes	7	2	0.28	3	6	2.00
Garden	1	72	72.00			
Dhaya				5	14	2.80
TOTAL	**39**	**109**	**2.79**	**62**	**160**	**2.58**

During the dry season (2023), the largest numbers of individuals observed per transect was 72 individuals (in a garden). Otherwise, wadi habitats had more birds with 5 or 6 individuals recorded along transects. The most abundant species are listed as LC, except for the white-backed vulture (*Gyps africanus)* listed as CR (Table 7-37).

Six individuals of white-backed vulture were recorded at one location (T1-F'Derik Dam) by the avifauna expert in 2023. However, white-backed vulture has a distribution range limited to the south of Mauritania (Birdlife, 2022), and whilst widespread in sub-Saharan Africa, it is considered absent from desert areas (Mundy, et al., 1992). Even if recorded by the avifauna expert during the field survey, likelihood that white backed vulture has regular occurrences in the Project AoI is considered low.

Table 7-37: Most abundant bird species and their IUCN status (based on field work surveys in 2023)

Species	Common name	IUCN status	Abundance
Gyps africanus	White-backed vulture	CR	6[a]
Aquila chrysaetos	Golden eagle	LC	10[a]
Oena capensis	Namaqua dove	LC	8[a]
Corvus ruficollis	Brown-necked raven	LC	6[a]
Ptyonoprogne fuligula	African rock martin	LC	10[b]

a. All observed individuals at one single observations site (T1- F'Derik Dam). Presence of white-backed vulture was reported by nomadic herders; however, the local avifauna specialist was unable to validate this observation.

b. 6 individuals observed at T1- F'Derik Dam, 2 at T7 and 2 at T10.

Observations of 10 individual golden eagles in the same micro-site is unlikely given the species' solitary and territorial behaviour. However, the observations were clustered around the F'Derik Dam, which might represent an abundant food source.

During the wet season (2024), the 3 plots with the most individuals observed (respectively 11, 11 and 19 individuals) were in the KBA area. The associated habitat was wadi, near the F'Derik dam. The most abundant species detected in 2024 are LC (Table 7-38).

Table 7-38: Most abundant bird species and their IUCN status (2024)

Species	Common name	IUCN status	Abundance
Corvus ruficollis	Brown-necked raven	LC	49
Passer simplex	Desert sparrow	LC	21
Eremopterix leucotis	Chestnut-backed sparrow-lark	LC	24

7.5.8 Bats

The bats of Mauritania are under-recorded but based on more comprehensive data available for the wider Sahelian region (Hutson, 2001) none of the species potentially present in the Project AoI are nationally rare, globally threatened (on the IUCN Red List) or have restricted distribution ranges (endemic) (URS, 2015). According to the IUCN Red List of Threatened Species, 16 bat species occur in Mauritania, with one listed as NT and the remainder as LC. Data gathered in 2012 recorded a species of pipistrelle bat, probably (based on the echolocation frequency) Rüppell's pipistrelle (*Pipistrellus rueppellii*; LC). Rüppell's pipistrelle is a common African species that is widespread in steppe and semi-desert habitats (Benda, 2004).

According to the Mammal Diversity Database, 3 bat species ranges overlap the Mine area. Egyptian mouse-tailed bat (*Rhinopoma cystops,* LC), greater mouse-tailed bat (*Rhinopoma microphyllum,* LC) and Egyptian free-tailed bat (*Tadarida aegyptiaca*) (Mammal Diversity Database, 2020). No observations of Egyptian mouse-tailed bat have been recorded in the Mine area since 1950, and no observations of greater mouse-tailed bat or Egyptian free-tailed bat have been recorded in the Mine area (GBIF, 2023).

Given the limited presence of trees, bat species most likely to occur in the Mine area are likely to include those that use rocky features or human features (e.g., buildings) as roosts.

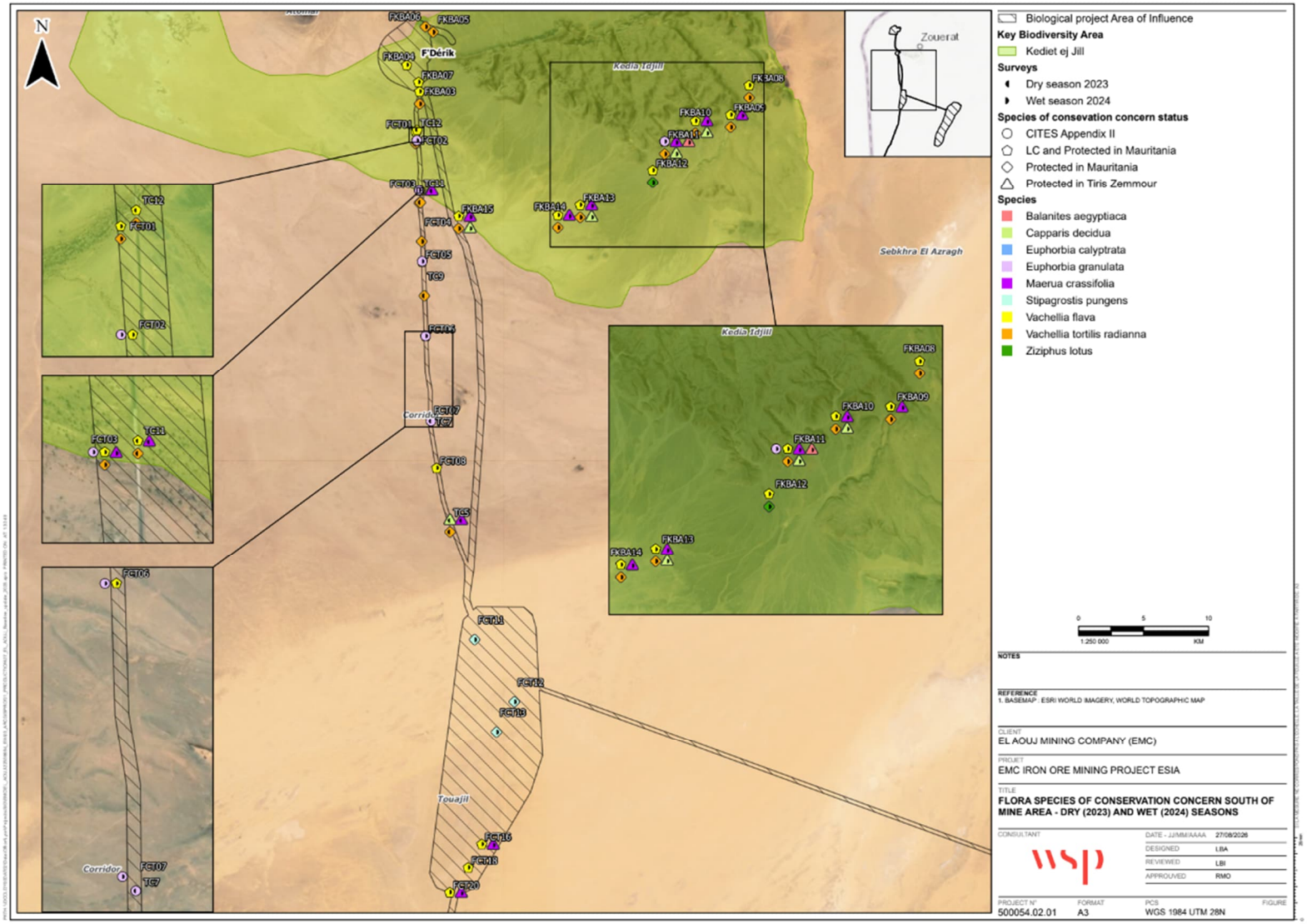
7.5.9 Summary of the mine area biodiversity

Habitats and Flora

Six habitat types were identified during field studies: dhayas, dunes, ravines, regs, and wadis. It was noted during field surveys that regs were most frequently degraded by human disturbances. In contrast, other habitats (dunes, ravines, and wadis) were considered largely undisturbed. The following are key observations from the flora studies:

- A total of 110 flora species could occur in the Mine area AoI, with 100 species confirmed present over the successive field inventories of 2012, 2013, 2023, and 2024, and additional species were identified based on the literature review.
- Of all the recorded species present or potentially present, 3 are listed on Appendix II of CITES, 4 species are protected in Mauritania, and 3 species are regionally protected in Tiris Zemmour. None of these species are globally threatened or have a restricted distribution range.

Figure 7-51: Flora species of conservation concern in the Mine area - dry (2023) and wet (2024) seasons



Fauna

The field studies conducted in 2012, 2013, 2023 and 2024 recorded 98 fauna species (8 reptiles, 16 mammals and 74 birds) in the Mine AoI. When considering results from the desktop reviews, a total of 124 fauna species are present or potentially present in the Mine AoI.

- None of the reptile species observed are globally threatened or have restricted distribution ranges. Two are included on CITES appendices: the desert monitor (Appendix I) and the southern Saharan spiny-tail lizard (Appendix II).
- None of the mammal species observed are globally threatened or have restricted distribution ranges, and it is noted that the species list includes three domesticated species (donkeys, camels, and goats). One mammal observed, fennec fox, is listed on CITES Appendix II.
- Three bird species observed are globally threatened, including African houbara (VU), Iberian grey shrike (VU), and white-backed vulture (CR). The observation of white-backed vulture (in 2023) likely represents a vagrant observation of this highly mobile species because the Mine AoI is outside of its global distribution range, and it is typically associated with vegetated habitats in southern Mauritania. Six bird species detected are included on CITES appendices: African houbara (Appendix I), Eurasian spoonbill (Appendix II), common kestrel (Appendix II), lanner falcon (Appendix II), lesser kestrel (Appendix II), and peregrine falcon (Appendix II). Thirty (30) migratory birds were detected during surveys.

Focusing on 2023 and 2024 field observations, 6 reptile species, 12 mammal species and 48 bird species were recorded, including species of conservation concern (Table 7-39).

Table 7-39: Summary of the species of interest of conservation in the different habitats (2023 and 2024 seasons)

Year	Species richness	CITES	Triggering KBA	CR	EN	VU
REPTILES						
2023	4	2		0	0	0
2024	3	1		0	0	0
Total	**6**	**2**		**0**	**0**	**0**
MAMMALS						
2023	8	1		0	0	0
2024	5	0		0	0	0
Total	**12**	**1**		**0**	**0**	**0**
BIRDS						
2023	31	1	3	1	0	1
2024	27	2	4	0	0	1
Total	**48**	**3**	**5**	**1**	**0**	**1**

KEDIET EJ JILL KBA

The Project area of influence overlaps 2 240 ha of the Kediet ej Jill. Field studies in 2024 included dedicated survey effort in the Kediet ej Jill KBA, including 14 vegetation plots, 15 avian survey plots, and 15 reptile/general fauna transects. Areas of the KBA affected by the Project are…

Surveys documented a total of 57 species of flora, reptiles and birds (Table 7-40). The flora assemblage included 35 plant species, reflecting a botanical composition typical of arid and semi-arid ecosystems. The reptile community was represented by 2 species, with a combined observed abundance of 5 individuals,

suggesting a modest but ecologically relevant presence. The avian assemblage was particularly diverse, with 20 bird species documented and a total abundance of 62 individuals. These included both resident and migratory species, some of which are known to use the KBA site for breeding, foraging, or as a stopover during migration. The bird species richness and abundance contribute to the ecological significance of the Kediet ej Jill. Two of the bird species observed trigger the KBA/IBA Criteria: fulvous babbler (*Argya fulva*; LC*)* and white-crowned wheatear (*Oenanthe leucopyga*; LC). A single fulvus babbler was observed in the KBA in 2024 and it was not detected outside the KBA. White-crowned wheatear was observed at two plots inside the KBA in 2024 with an abundance of 1 individual plot. A single individual of white-crowned wheatear was also observed in 2023 along one transect outside the KBA. Three additional bird species that trigger the KBA criteria were observed in the Mine AoI, but not within the KBA:

- Greater hoopooe-lark (*Alaemon alaudipes*) with four detections in 2023 (abundances of 1 to 2 individuals per transect) and seven detections in 2024 (abundances of 1 to 2 individuals per plot)
- Bar-tailed lark (*Ammomanes cincture*) with one detection of two individuals along a single transect in 2023
- Desert sparrow (Passer simplex) with 11 detections in 2024 (abundances of 1 to 2 individuals per plot)

Table 7-40: Observed species in the KBA (data from 2024 field study)

Flora species	Reptile		Bird	
	Species	Abundance	Species[1]	Abundance
Balanites aegyptiaca	*Uromastyx dispar*	3	*Anthus trivialis*	2
Boerhavia repens	*Acanthodactylus*	2	*Ardeola ralloides*	1
Capparis decidua			*Ardea cinerea*	4
Caylusea hexagyna			***Argya fulva***	**1**
Citrullus colocynthis			*Burhinus oedicnemus*	2
Corchorus depressus			*Calandrella brachydactyla*	1
Cullen plicatum			*Corvus ruficollis*	16
Euphorbia granulata			*Egretta garzetta*	6
Forsskaolea tenacissima			*Eremopterix leucotis*	2
Heliotropium ramosissimum			*Motacilla alba*	1
Hyoscyamus muticus			*Muscapa striala*	4
Indigofera senegalensis			*Oena capensis*	1
Kebirita roudairei			***Oenanthe leucopyga***	**2**
Maerua crassifolia			*Oenanthe moesta*	4
Morettia canescens			*Oenanthe oenanthe*	1
Pancratium trianthum			*Platea leucorodia*	2

Panicum turgidum		*Plegadis falcinellus*	1
Pergularia tomentosa		*Spiloptila senegalensis*	8
Polygala erioptera		*Streptopelia decaocto*	2
Portulaca oleracea		*Upupa epops*	1
Salvia aegyptiaca			
Searsia tripartita			
Seetzenia africana			
Senna alexandrina			
Senna italica			
Stipagrostis pungens			
Stipagrostis sp.			
Tephrosia purpurea			
Tribulus ochroleucus			
Trichodesma africanum			
Vachellia flava			
Vachellia tortilis			
Ziziphus lotus			
Zygophyllum bruguieri			
Zygophyllum mayanum			

[1] Bold species are those triggering KBA/IBA Criteria for Kediet ej Jill.

Figure 7-52: Reptile and mammals' species of conservation concern in the Mine area - dry (2023) and wet (2024) seasons

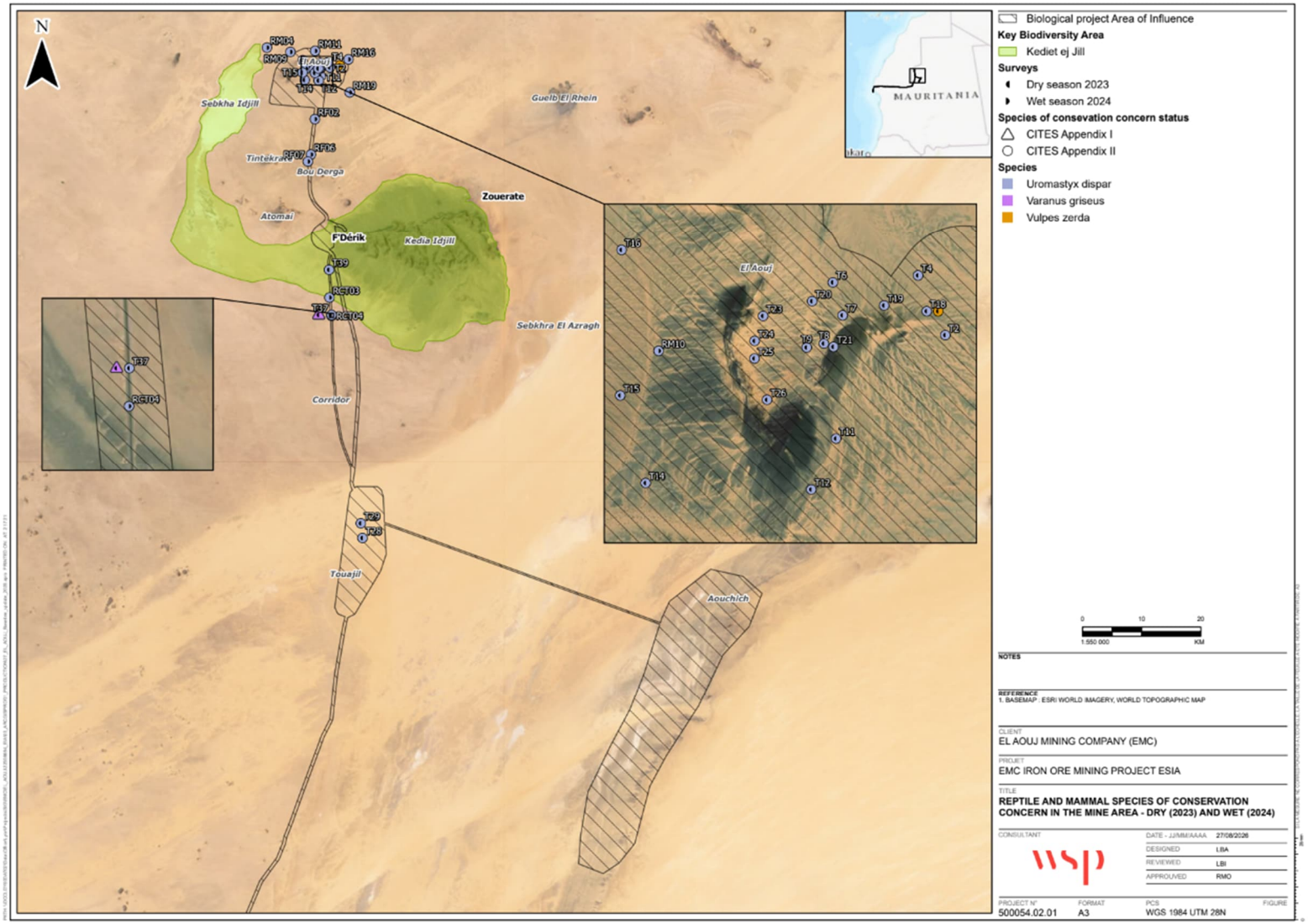
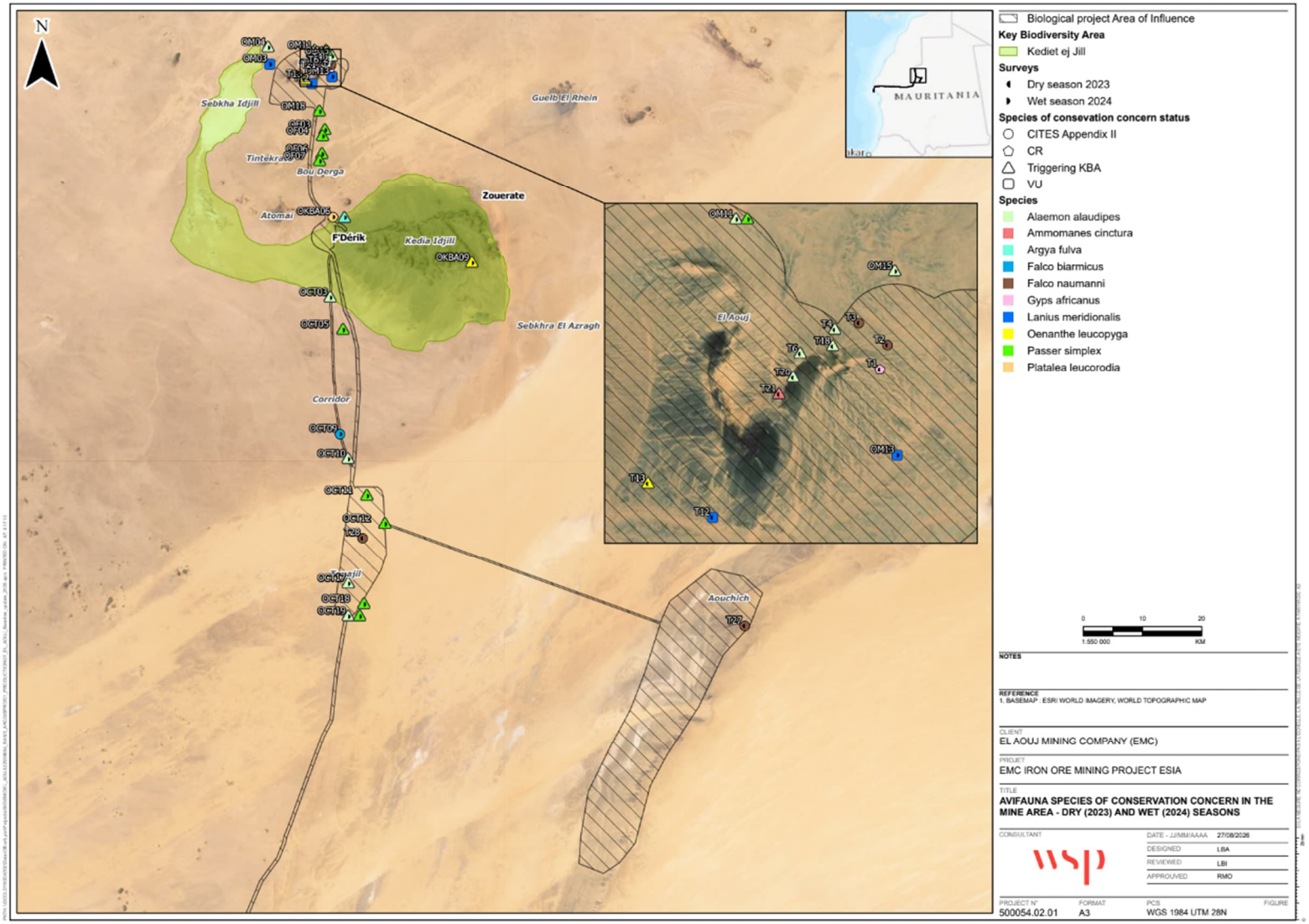


Figure 7-53: Avifauna species of conservation concern in the Mine area - dry (2023) and wet (2024) seasons



7.6 Critical habitat assessment

The assessment of critical habitats is based on the requirements of Performance Standard 6 (PS6) of the International Finance Corporation (IFC), along with the technical guidance provided in Guidance Note 6 (GN6). These standards form the reference framework for identifying and managing biodiversity-related impacts in projects financed by international institutions. PS6 emphasizes the importance of adopting a landscape-level approach, which involves defining Ecologically Appropriate Areas of Analysis (EAAAs) to assess biodiversity value at relevant ecological scales. A key requirement of PS6 is that projects must conduct a comprehensive assessment of critical habitats, using defined criteria related to species rarity, vulnerability, concentration, and ecological dependency.

The determination of critical habitats includes the following steps:

- A preliminary identification of the candidate species and ecosystems that could meet critical habitat Criteria 1 to 4. This list was derived from the species and ecosystems identified during the field investigations, supplemented by data sourced from the IUCN Red List of Threatened Species, World Database on Protected Areas (WDPA), and World Database of Key Biodiversity Areas (KBA), accessed via the Integrated Biodiversity Assessment Tool (IBAT), available at https://www.ibat-alliance.org. Candidate species and ecosystems included:
  - Criterion 1 – Critically Endangered (CR) and Endangered (EN) species
  - Criterion 2 – Endemic and restricted range species
  - Criterion 3 – Migratory and congregatory species
  - Criterion 4 – Highly threatened or unique ecosystems
- The identification of EAAAs for these species and ecosystems.
- A quantitative and/or semi-quantitative screening of candidate species and ecosystems against thresholds identified for critical habitat criteria 1 to 4 in paragraphs GN70 to GN80 of Guidance Note 6 (IFC, 2019).
- A qualitative assessment of critical habitat criterion 5 (key evolutionary processes) that considers the ecological context of the region in terms of types of species assemblages, type of ecosystems present, and biophysical features described in paragraphs GN81 to GN82 of Guidance Note 6 (IFC, 2019).
- An ecosystem approach to assigning critical habitat within the Project AoI for those species or ecosystems that trigger critical habitat in the relevant EAAA.

The following sections present the critical habitat assessment for the Port area, Rail area, and Mine area.

7.6.1 Port area

7.6.1.1 Ecologically appropriate areas of analysis

To assess the potential presence of critical habitat, two EAAAs were delineated for the Port area, one for marine biodiversity and one for terrestrial biodiversity.

Marine EAAA

The Marine EAAA includes Baie du Lévrier and extends south to El Mamghar, encompassing most of the aquatic environment of Banc d'Arguin National Park (PNBA). The northern limit of the EAAA includes the southern sector of the Dhakla Key Biodiversity Area (KBA). The Marine EAAA covers approximately 9,650 km² and

represents a contiguous area of shallow marine habitats around the Project AoI (**Figure 7-54**).

Terrestrial Port EAAA

A Terrestrial Port EAAA was defined to assess terrestrial biodiversity for the Port area. This zone covers the entirety of the Ras Nouadhibou Peninsula, from the tip of Cap Blanc inland to the limit of Baie du Lévrier. A buffer of 25 m was applied around the peninsula to capture important intertidal areas. The Terrestrial Port EAAA is approximately 325 km² (**Figure 7-55**).

Figure 7-54: Marine Ecological Appropriate Area of Assessment (Port area)

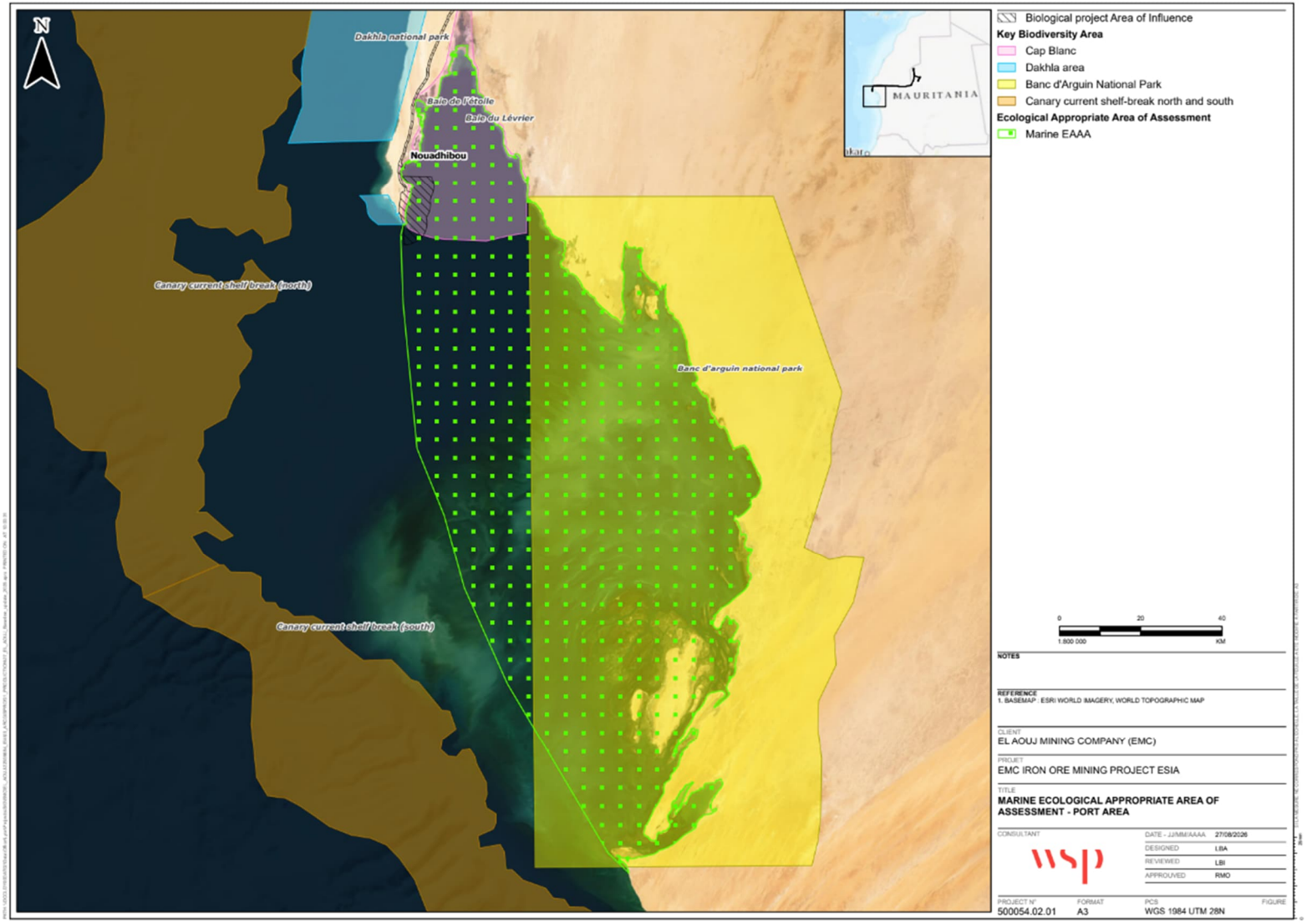
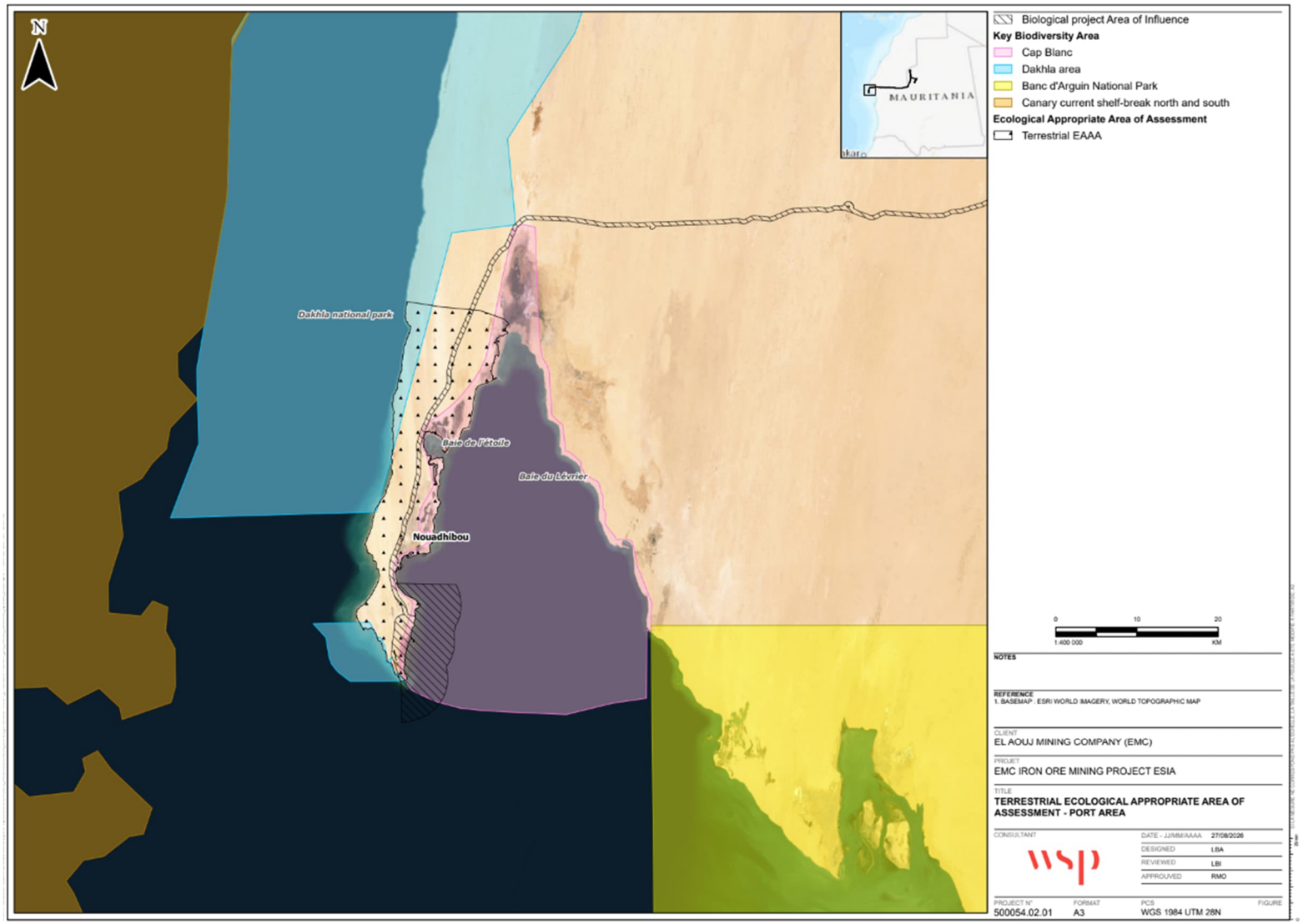


Figure 7-55: Terrestrial Ecological Appropriate Area of Assessment (Port area)



7.6.1.2 Critical habitat screening

For Criteria 1 to 3, a hierarchy of information was applied to screen candidate species against established thresholds for critical habitat determination. The following approaches were applied, in order of preference:

- Population estimates. The ratio of the number of mature individuals in the applicable EAAA to the global number of known mature individuals.
- Global area of occupancy (AOO). The ratio of the number of occupied sites in the EAAA to the number of globally known sites.
- Global extent of occurrence (EOO). The ratio of the EAAA's area to the species' global distribution range (i.e., the EOO). Alternatively, the linear length of coastline in the EAAA relative to the linear length of coastline in the species' EOO.
- Expert opinion. As applicable, expert opinion is based on information from the literature, observations from field surveys, and consultation with external experts.

Occurrence data and population sizes were primarily sourced from the Global Biodiversity Information Facility (GBIF, 2025), BirdLife International (BirdLife International, 2025), and the IUCN Red List of Threatened Species (IUCN, 2025), providing complementary records to support species presence and distribution assessments. Geospatial data obtained from IBAT were processed using ArcGIS to calculate each species' global EOO and to quantify the degree of spatial overlap between the EOO and the EAAA (i.e., to determine the proportion of the EOO that occurs inside the EAAA).

For migratory species, bird species that trigger KBA/IBA Criteria in Cap Blanc were considered. None of these are classified as globally threatened (VU, EN, or CR) on the IUCN Red List and none of these are endemic; therefore, they were not considered under criteria 1 and 2, only under criterion 3.

Because the Project AoI does not contain ecosystems that have been assessed by the IUCN as globally threatened, the screening of ecosystems focused on determining whether ecosystems met criterion 4b: other areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning (paragraph GN80; IFC, 2019). This was done by considering expert reports and conservation plans. Otherwise, habitats or ecosystems were considered as critical habitat if they supported critical habitat triggering species.

For criterion 5, the habitats and ecosystems of the Project AoI were qualitatively evaluated by reviewing the site's physical attributes and biological assemblages to determine if they correspond to:

- Landscapes with high spatial heterogeneity.
- Environmental gradients (ecotones) forming unique transitional habitats.
- Edaphic interfaces (juxtapositions of soil types) associated with unique plant communities characterized by both rarity and endemism.
- Important areas of connectivity between habitats.
- Sites of demonstrated importance to climate change adaptation for species or ecosystems.

7.6.1.2.1 Criterion 1 - Endangered and critically endangered species

Critical Habitat criterion 1 focuses on species classified as CR, EN or VU species on the IUCN Red List. A critical habitat qualifying (CHQ) species meets one of the following thresholds:

- 1a. At least 0.5% of the global population of a CR or EN species is present within the EAAA and at least 5 reproductive units of the species are found within the EAAA.

- 1b. Areas that support globally important concentrations of a VU species, where the loss of such habitat would likely result in the species being uplisted to EN or CR, and that meet the thresholds outlined in GN72.
- 1c. Where appropriate, areas containing important concentrations of nationally or regionally listed EN or CR species (GN72, IFC 2019).

A detailed screening table for criterion 1 is available in APPENDIX M-Table 1. The following sub-sections present the assessment of aquatic species (using the Marine EAAA), terrestrial species (using the Terrestrial EAAA), and birds (using the Marine or Terrestrial EAAA, as appropriate).

Aquatic species – Marine EAAA

A total of 80 aquatic species were considered under criterion 1, including fish, molluscs, reptiles and marine mammals. These include all species whose EOO overlapped with the marine EAAA. Among these species, 17 are classified as CR, 24 as EN, and 39 as VU.

Available inventory data highlighted the presence of 30 aquatic species recorded within the Marine EAAA boundaries between 2020 and 2025. For some species, earlier records from previous inventories were also considered to complement recent data. Species with no evidence of occurrence in the EAAA were screened out of the assessment. Of the remaining 30 species, 15 species are classified as VU, 8 as EN, and 7 as CR (IUCN, 2025).

Based on the analysis of occurrence data and spatial overlap, 4 aquatic species meet the thresholds required to trigger critical habitat designation under criterion 1 (Table 7-41 and APPENDIX M-Table 1). A rationale for critical habitat designation for each of the three species is discussed below.

Table 7-41: Aquatic species triggering critical habitat designation under criterion 1 (Port area)

Species	IUCN Status	Recorded in the EAAA	Criterion1(a)	Criterion 1(b)	Criterion 1(c)	Critical habitat
Chelonia mydas	EN	Yes	Yes	No	No	Yes
Monachus monachus	VU	Yes	No	Yes	No	Yes
Mustelus punctulatus	VU	Yes	No	Yes	No	Yes
Sousa teuszii	CR	Yes	Yes	No	No	Yes

Green turtle (*Chelonia mydas*)

Banc d'Arguin National Park is highly important for adult green turtles, especially for foraging. Nearly 50% of the turtles migrate to Banc d'Arguin National Park after nesting and the park hosts approximately 150,000 juvenile and subadult turtles (Catry, 2023). The Banc d'Arguin National Park is also a Ramsar site, notably due to the importance of the presence of green turtles, whose abundance exceeded 32,000 individuals during a 2020 survey (UNESCO, 2024) (see also Section 7.3.3.4). The species meets the quantitative thresholds for the identification of critical habitat in the EAAA under criterion 1a.

Major green turtle suitable habitats, as listed by the IUCN, include neritic habitats (macroalgal/kelp and seagrass habitat), oceanic habitats (epipelagic habitats between 0 and 200m), intertidal habitats (sandy shorelines, beaches, sand bars, and spits), and costal sand dunes. Most of these habitats do not occur inside the Project AoI; however, the AoI contains shallow epipelagic habitats, and sandy shoreline and beaches. There is no occurrence data confirming green turtle presence in the AoI. Nonetheless, green turtles may occur in the AoI periodically, with occurrences likely to be limited to a few individuals transiting through the AoI to access high

value habitats in Banc d'Arguin or in Baie de l'Étoile. Although critical habitat is present in the EAAA, available evidence indicates that green turtle **critical habitat is not present in the AoI**.

Mediterranean monk seal (*Monachus monachus*)

Mediterranean monk seal primarily uses marine caves throughout its entire range for resting, entering the water, and giving birth. However, some subpopulations have increasingly been observed resting on open beaches and in the water (IUCN, 2025). The global population is estimated at 1,000 individuals (IUCN, 2025), of which 400 are established within the EAAA (Fernandez de Larrinoa, 2021).

The 200-hectare satellite reserve, located at Cap Blanc, constitutes the habitat of the monk seal colony, (UNESCO, 2023). An important marine mammal areas (IMMAs) was also defined around Cap Blanc (Figure 7-56), as discrete portions of habitat, important to marine mammal species, that have the potential to be delineated and managed for conservation (Marine Mammal Protected Areas Task Force, 2019). It extends 19,333 km^2 including the marine portion of the AoI and part of the Marine EAAA. On the Cap Blanc peninsula, only three caves are used for hauling out and giving birth. The maximum depth and duration of dives for a nursing female were 78 meters and 15 minutes, respectively, and up to 100 meters for an adult male (IUCN, 2025). These areas would correspond to habitats of the epipelagic zone.

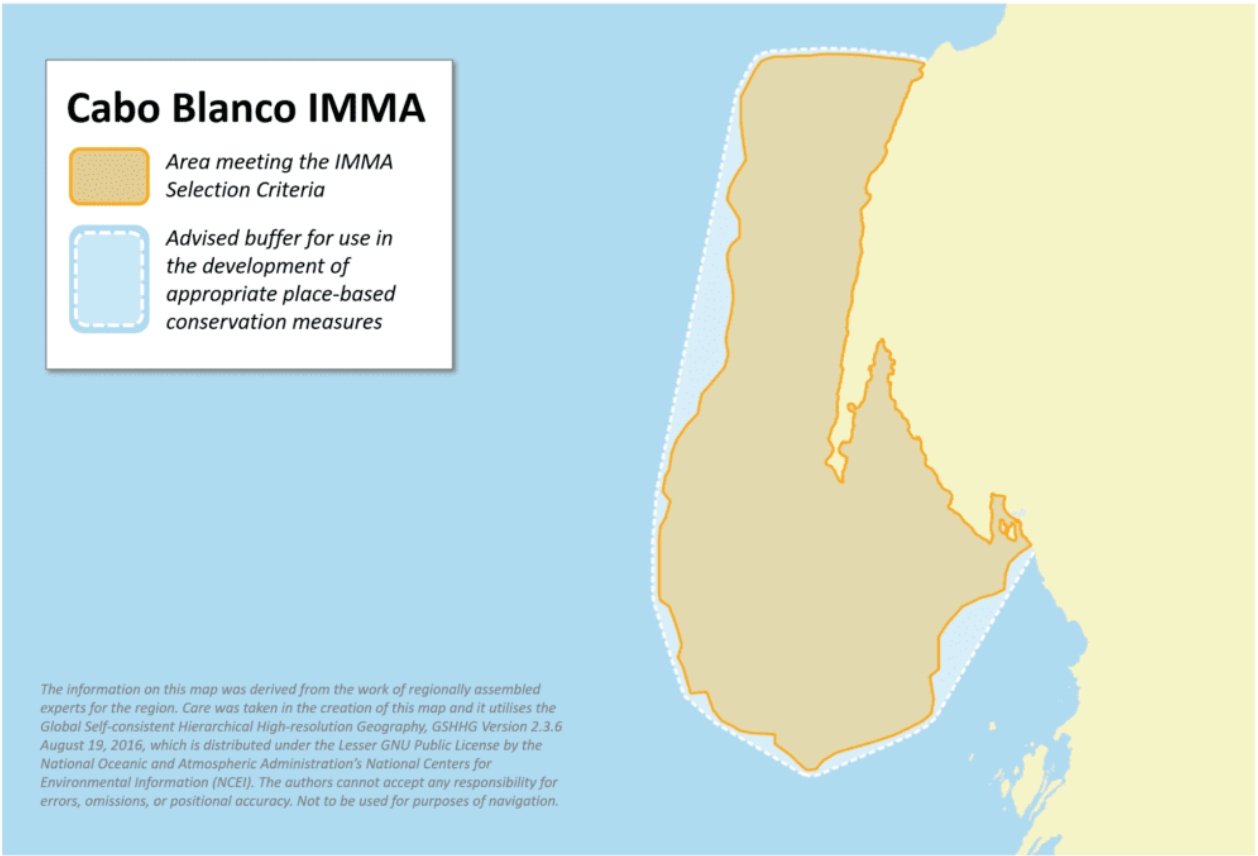


Figure 7-56: Cap Blanc Important Marine Mammal Areas

Available evidence indicates that the EAAA meets the quantitative thresholds for identifying critical habitat under criterion 1b. The most important habitats for the local population are the caves used for pupping and hauling out, which are to the west of the continental shelf outside of the AoI. The AoI nonetheless includes potential

foraging habitat for monk seal, and potential haul out habitat along the tip of the peninsula. As described in Section 7.3.3.5, the available information indicates that monk seals are at times present within the Port AoI; however, core areas of activity are outside of the AoI, along the western coastline of the peninsula, in Western Sahara. **Critical habitat is present in the AoI**.

Blackspotted smoothhound (*Mustelus punctulatus*)

Blackspotted smoothhound is demersal on the continental shelf and slope on sandy and gravelly substrates and sea grass beds, from the surface to a depth of 300 m (IUCN, 2025). Few data are available on this species. Seventeen observations were recorded within the EAAA between 2020 and 2025, with a peak of 10 observations in 2020. Only 255 observations were recorded worldwide between 2000 and 2025, with a peak of 152 in 2010 (GBIF, 2025). Further, the marine EAAA contains approximately 1.5% of the species EAA. Based on available occurrence records and distribution data, the EAAA is considered to include at least 0.5% of the blackspotted smoothhound's global population. Given data limitations, it is uncertain if the loss of the EAAA's population would result in an uplisting of the species from VU to EN or CR. Given that the EAAA includes 7% of known global occurrence records for the species between 2020 and 2025 and the recognized importance of the EAAA's protected areas and KBAs for marine biodiversity, it was precautionarily assumed that the EAAA meets the quantitative thresholds for the identification of critical habitat under criterion 1b. The paucity of occurrence records for blackspotted smoothhound means there is considerable uncertainty with the designation of critical habitat for this species. The assessment applied a precautionary approach in addressing this uncertainty.

The major important habitats for blackspotted smoothhound, as listed by the IUCN, are neritic habitats with subtidal habitats with loose rock/pebble/gravel, sandy, or seagrass bottoms, and deep benthic habitats on the continental slope and bathyal zone (200 to 4,000m). Marine habitats in AoI are sandy bottom subtidal habitats and are considered critical habitat for blackspotted smoothhound. **Critical habitat is present in the AoI**.

Atlantic humpback dolphin (*Sousa teuszii*)

Atlantic humpback dolphin is distributed population along the western African coast, from Western Sahara to southern Angola (Collins, 2017). The species regularly occurs in Banc d'Arguin National Park, and the EAAA contains over 5% of the species' EOO. The species therefore meets the quantitative threshold for identifying critical habitat under criterion 1a. Although the Atlantic humpback dolphin's global extent of occurrence completely overlaps Baie du Lévrier and the Port AoI, research indicates that they do not routinely occur between Banc d'Arguin National Park and Dakhla Bay (in Western Sahara, over 400 km from the national park) (Collins et al. 2017). The species may occur in the Port AoI, with rare occurrences likely attributable to transient individuals travelling between known areas of occupancy.

Critical habitat for Atlantic dolphin includes shallow waters (<30 m) of Banc d'Arguin National Park. **Critical habitat is not present in the AoI**.

Terrestrial species – Terrestrial EAAA

Two terrestrial species were considered under criterion 1: one mammal and one reptile (APPENDIX M-Table 1). These represent all globally threatened terrestrial species whose EOO overlaps the Terrestrial EAAA. Within the Terrestrial EAAA, one species was screened for assessment: the helmethead gecko (*Tarentola chazaliae*, VU) (Table 7-42).

Table 7-42: Terrestrial species assessed in detail under criterion 1 (Port area)

Species	IUCN Status	Recorded in the EAAA	Criterion1(a)	Criterion 1(b)	Criterion 1(c)	Critical habitat

Tarentola chazaliae	VU	Yes	No	No	No	No

Helmethead Gecko does not meet the quantitative thresholds of criterion 1 for the identification of critical habitats in the AoI.

Birds – Marine and Terrestrial EAAAs

9 bird species were assessed under criterion 1 (APPENDIX M-Table 1). These include species whose EOO overlaps with the Marine EAAA, the Terrestrial EAAA, and bird species during field studies. Marine shorebirds were assessed using the Marine EAAA, while terrestrial birds were assessed using the Terrestrial EAAA.

Available inventory data highlighted the presence of 3 bird species recorded within the Marine EAAA boundaries between 2020 and 2025. For some species, earlier records from previous inventories were also considered to complement recent data. Of them, *Calidris ferruginea* (VU), Larus audouinii (VU) and *Pluvialis squatarola* (VU) are waterbirds triggering KBA/IBA Criteria in Cap Blanc. In addition, Rüppell's vulture (*Gyps rueppelli*, CR) was recorded in the Terrestrial EAAA during the 2017 study (Anteagroup, 2017). Only C*alidris ferruginea* triggers critical habitat in the EAAA (Table 7-43).

Table 7-43: Bird species assessed in detail under criterion 1 (Port area)

Species	IUCN Status	Recorded in the EAAA	Criterion 1(a)	Criterion1 (b)	Criterion 1(c)	Critical habitat
Calidris ferruginea	VU	Yes	No	Yes	No	Yes
Gyps rueppelli	CR	Yes	No	No	No	No
Larus audouinii	VU	Yes	No	No	No	No
Pluvialis squatarola	VU	Yes	No	No	No	No

Curlew sandpiper (*Calidris ferruginea)*

The curlew sandpiper's global population numbers between 420,000 and 960,000 individuals (BirdLife International, 2025). Present within the Banc d'Arguin National Park, this species was recorded between 2014 and 2017, with numbers ranging from 52,721 to 76,069 individuals, representing about 9.3% of the global population. Curlew sandpiper populations also meet IBA/KBA Criteria in Banc d'Arguin National Park and in Cap Blanc Integral Reserve. This migratory species meets the quantitative thresholds required for the identification of critical habitats under criterion 1b.

In winter, the species is mainly found in coastal brackish lagoons, mudflats and sandbanks, estuaries, and salt marshes (IUCN, 2025). During the overwintering period, when curlew sandpipers can be found in the EAAA, it is typically associated with marine intertidal habitats, including mud flats and sand flats (IUCN, 2025). These habitats are well represented in Banc d'Arguin National Park but are not found in the Project AoI. **Critical habitat for curlew sandpiper is not present in the Project AoI**.

7.6.1.2.2 Criterion 2 - Endemic and restricted range species

Criterion 2 involves restricted-range species, which are identified based on the thresholds defined as follows:

- For terrestrial vertebrates and plants, restricted-range species are those with an EOO of less than 50,000 km².
- For marine species, the provisional threshold is an EOO of less than 100,000 km².

- For coastal, riverine, and other aquatic species in habitats not exceeding 200 km in width at any point (e.g., rivers), restricted range is defined as a global linear geographic span of ≤500 km (i.e., the distance between the furthest occupied locations) (GN74, IFC 2019).

Quantitative thresholds to identify critical habitat under criterion 2 include:

- Areas that regularly supports ≥10% of the global population size of a restricted-range species; AND
- Areas with ≥10 reproductive units (GN75, IFC 2019).

A detailed screening table for criterion 2 is available in APPENDIX M-Table 2. The following sub-sections present the assessment of aquatic species (using the Marine EAAA), terrestrial species (using the Terrestrial EAAA), and birds (using the Marine or Terrestrial EAAA, as appropriate).

Aquatic species – Marine EAAA

A total of 80 aquatic species were considered in the criterion 2 assessment, fish, mollusc, reptiles and marine mammals. These include all species whose EOO overlap with the Marine EAAA.

Available inventory data highlighted the presence of 30 aquatic species recorded within the Marine EAAA boundaries between 2020 and 2025 (APPENDIX M-Table 2). For some species, earlier records from previous inventories were also considered to complement recent data. However, only one aquatic species—Smalltooth stingray *(Hypanus rudis*)—has both confirmed presence within the EAAA and a global EOO of less than 100,000 km², qualifying it as a restricted-range species under IFC PS6 (Table 7-44).

Table 7-44: Aquatic species assessed in detail under criterion 2 (Port area)

Species	IUCN Status	EOO (km²)	Restricted range	Criterion 2	Critical habitat
Hypanus rudis	CR	74 163,79	Yes	No	No

The proportion of Smalltooth stingray's EOO overlapping with the EAAA is approximately 4.2%, which is below the threshold required to infer that the EAAA regularly supports ≥10% of the global population. Furthermore, there is insufficient data available to confirm the presence of ≥10 reproductive units within the EAAA. Therefore, Smalltooth stingray **does not trigger critical habitat in the EAAA under criterion 2**.

Terrestrial species – Terrestrial EAAA

Two terrestrial species were considered for assessment under criterion 2, and one was retained for detailed screening: helmethead gecko (*Tarentola chazaliae*; VU), which has a global EOO estimated to be less than 50,000 km² (Table 7-45).

Table 7-45: Terrestrial species assessed in detail under criterion 2 (Port area)

Species	IUCN Status	EOO (km²)	Restricted range	Criterion 2	Critical habitat
Tarentola chazaliae	VU	18 817.4	Yes	No	No

Based on the available data, although the species is reported in inventories of the EAAA, the recorded occurrences represent less than 10% of the global population. In addition, less than 1% of the helmethead gecko's EOO overlaps with the EAAA, indicating that it is unlikely that more than 10% of the global population

is represented within the terrestrial EAAA. **Therefore, no critical habitat has been identified within the terrestrial Port EAAA under criterion 2.**

Birds – Marine and Terrestrial EAAAs

All bird species identified have global EOO values exceeding 100,000 km², and therefore none meet the definition of restricted-range species under IFC PS6 GN74. **No bird species trigger a critical habitat designation under criterion 2.**

7.6.1.2.3 Criteria 3 – Migratory and congregatory species

Critical habitat criterion 3 involves migratory and congregatory species, with thresholds to trigger critical habitats defined as follows:

- 3a. Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle.
- 3b. Areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.

A detailed screening table for criterion 3 is available in APPENDIX M-Table 3. The following sub-sections present the assessment of aquatic species (using the Marine EAAA), terrestrial species (using the Terrestrial EAAA), and birds (using the Marine or Terrestrial EAAA, as appropriate).

Aquatic species – Marine EAAA

A total of 80 aquatic species were considered under criterion 3 and only one of these species is classified as migratory and has confirmed occurrences within the Marine EAAA (Table 7-46; APPENDIX M-Table 3).

Table 7-46: Aquatic species assessed in detail under criterion 3 (Port area)

Species	IUCN Status	Triggering KBA / IBA	Migratory species	Criterion 3(a)	Criterion3(b)	CH in Marine EAAA
Sphyrna lewini	CR	No	Yes	No	No	No

Based on the available data, a single record of scalloped hammerhead (*Sphyrna lewini*) was reported in the Marine EAAA in 2020 (GBIF, 2025). There is no evidence to suggest that the species meets the quantitative thresholds for critical habitat designation. Therefore, **no critical habitat is designated under criterion 3 for aquatic species in the Marine EAAA**.

Terrestrial species – Terrestrial EAAA

No terrestrial migratory or congregatory species were identified in the Terrestrial EAAA; therefore, none were screened in for assessment under criterion 3.

Birds – Marine and Terrestrial EAAAs

Sixteen (16) species were considered in the assessment of criterion 3, from IBAT data and from IBA/KBA data. Eleven (11) of these are migratory and were assessed against criterion 3. These comprise all migratory bird species whose EOO overlap with the Marine EAAA, based on their habitat types, they are divided into two categories—terrestrial and marine—consistent with the criterion 2 assessment regarding restricted habitats.

Seven species trigger IBA/KBA criteria:

- Two meet an IBA/KBA criteria of Cap Blanc, are migratory and are highly recorded in the EAAA: *Calidris ferruginea* and *Pluvialis squatarola*. These two species meet critical habitat criterion 3(a), but no evidence indicates that the EAAA supports ≥10% of the populations during periods of environmental stress, such as droughts or extreme weather events.
- Five species meet the IBA/KBA criteria of Cap Blanc and are migratory species: *Arenaria interpres, Hydroprogne caspia, Larus fuscus, Larus genei, Thalasseus sandvicensis,* along with the addition of waterbirds (Table 7-47). Only *Thalasseus sandvicensis* meets criterion 3(a).

Table 7-47: Migratory bird species assessed in detail under criterion 3 (Port area)

Species	IUCN Status	Triggering KBA / IBA	Migratory species	Criterion 3(a)	Criterion 3(b)	CH in Marine EAAA
BIRDS – MARINE EAAA						
Arenaria interpres	NT	Yes	Yes	No	No	No
Calidris ferruginea	VU	Yes	Yes	Yes	No	Yes
Hydroprogne caspia	LC	Yes	Yes	No	No	No
Larus fuscus	LC	Yes	Yes	No	No	No
Larus genei	LC	Yes	Yes	No	No	No
Pluvialis squatarola	VU	Yes	Yes	Yes	No	Yes
Rissa tridactyla	VU	No	Yes	No	No	No
Thalasseus sandvicensis	LC	Yes	Yes	Yes	No	Yes
BIRDS – TERRESTRIAL EAAA						
Acrocephalus paludicola	VU	No	Yes	No	No	No
Falco cherrug	EN	No	Yes	No	No	No
Neophron percnopterus	EN	No	Yes	No	No	No

Considering the available data on *Calidris ferruginea, Pluvialis squatarola* and *Thalasseus sandvicensis* in the Marine Port EAAA, these species are triggering a critical habitat under the criterion 3.

Curlew sandpiper (*Calidris ferruginea*)

As described under criterion 1 (Section 7.6.1.2.1), the Marine EAAA includes approximately 9.3% of the global population. Curlew sandpiper therefore triggers critical habitat in the EAAA under Criteria 3a. Suitable habitats for curlew sandpiper include mud flats and sand flats (IUCN 2025). These habitats are well represented in Banc d'Arguin National Park but are not found in the Project AoI. **Critical habitat for curlew sandpiper is not present in the Project AoI**.

Grey plover (*Pluvialis squatarola*)

According to surveys conducted within the Banc d'Arguin National Park between 2014 and 2017, the population of grey plover was estimated at 26,070 to 30,202 individuals, corresponding to approximately 1.6% of the global population, estimated at 1,000,000 to 2,500,000 individuals (BirdLife International, 2025). The species is regularly recorded at Cap Blanc Satellite Reserve and belongs to the waterbird group whose populations meet the criteria for IBA and KBA. However, no recent species-specific population estimates are available in Cap Blanc (BirdLife International, 2025). Grey plover meets the quantitative thresholds to identify critical habitat

under criterion 3a. There is however insufficient evidence to support the identification of critical habitat under criterion 3b.

Grey plover is present in Mauritania during the non-breeding period. Outside of the breeding season the species frequents intertidal mudflats, saltmarshes, sandflats and beaches of oceanic coastlines, bays and estuaries. During migration it may also be found inland on lakes, pools or grasslands (IUCN, 2025). These habitats are present in the Marine EAAA, mainly in Banc d'Arguin National Park at also at the southern tip of the peninsula in the Cap Blanc Satellite Reserve. **Critical habitat for grey plover is present in the AoI**.

Sandwich Tern (*Thalasseus sandvicensis*)

In 2019, 20,000 individuals were recorded within the Cap Blanc KBA, while the number of mature individuals is estimated at 325,000 – 430,000, representing approximately 5% of the population (BirdLife International, 2025)

During the breeding season the species forms colonies on sandy islands, rocky calcareous islets, sand-spits, sand-dunes, shingle beaches and extensive deltas with immediate access to clear waters with shallow sandy substrates rich in surface-level fish. It shows a preference for raised, open, unvegetated sand, gravel, mud or bare coral substrates for nesting. Outside of the breeding season the species frequents sandy or rocky beaches, mudflats fringed by mangroves, estuaries, harbours and bays, often feeding over inlets and at sea (IUCN, 2025). Suitable non-breeding habitats of high importance for sandwich tern include subtidal sandy and sandy mud (IUCN, 2025). These habitats are found in the Project AoI. **Critical habitat for Sandwich tern is present in the Project AoI**.

7.6.1.2.4 Criteria 4 - Highly threatened or unique ecosystems

Threatened or unique ecosystems meet the thresholds for criterion 4 if the EAAA contains ecosystems that correspond to:

- 4a. Areas representing ≥5% of the global extent of an ecosystem type meeting the Criteria for IUCN status of CR or EN.
- 4b. Other areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning.

Marine habitats of the Marine EAAA include those of the neritic and intertidal zones. Within the marine neritic zone, important habitats include seagrass meadows (*Cymodocea nodosa*, *Halodule wrightii*, *Zostera noltei*) outside of the AoI, particularly in the Baie de l'Étoile. Marine neritic zones also include habitats with soft-bottom sandy and sandy-mud substrates, which encompass intertidal mudflats extensively are used by waterbirds. The marine intertidal zones include mudflats, saltmarshes with halophilic vegetation (e.g. *Spartina maritima*, *Sesuvium portulacastrum*), and sandy beaches and spits used as roosting areas for seabirds. On land, the peninsula supports terrestrial desert and coastal shrubland habitats, characterized by sparse halophytic vegetation and small shrubs adapted to arid coastal conditions (e.g. *Traganum moquinii*, *Tetraena gaetula*, *Limonium chazaliei*).

A review of the IUCN Red List of Ecosystems and national ecosystem assessments confirms that none of the habitats within the AoI are classified as VU, EN or CR (IUCN-CEM, 2022). **Critical habitat was not identified under criterion 4a** (Table 7-48).

Table 7-48: Highly threatened or unique ecosystems triggering a critical habitat designation under criterion 4 (Port area)

Ecosystems	IUCN Status	Criterion 4(a)	Criterion 4(b)	Critical Habitat
Seagrass beds	-	No	Yes	Yes

Seagrass beds (or meadows) were assessed under the criterion 4b (Table 7-49). Seagrass beds correspond to an ecosystem of high national conservation priority, as evidenced by their inclusion as a highly vulnerable ecosystem in Mauritania's National Biodiversity Strategy (MEDD, 2024). Seagrass meadows are vital ecosystems that support aquatic fauna by providing nursery grounds, shelter, and abundant food resources for a wide range of marine species, including fish and invertebrates. These habitats enhance juvenile survival by offering protection from predators and contribute significantly to biodiversity by hosting complex communities. Additionally, seagrass beds deliver essential ecosystem services such as sediment stabilization, water filtration, and carbon sequestration, making them crucial for both marine life and broader environmental health (Camara Lima, 2023). Known seagrass beds in the Marine EAAA are located outside the AoI, in Baie de l'Étoile and in Banc d'Arguin National Park. Seagrass beds are considered critical habitat under Criteria 4b in the EAAA; however, this ecosystem is not present in the AoI. **Critical habitat identified under Criteria 4b is not present in the AoI**.

7.6.1.2.5 Criteria 5 – Areas associated with key evolutionary processes

Criteria 5 is not considered applicable to the Project AoI. The area is not known to have features that support key evolutionary processes (high spatial heterogeneity, ecotones, edaphic interfaces, biological corridors, or support climate change adaptation functions).

Critical habitat is not identified under Criteria 5.

7.6.2 Rail area

None of the biodiversity features identified as occurring or potentially occurring in the Rail AoI (Section 7.4) met the criteria for inclusion in the critical habitat screening. A critical habitat assessment was not deemed necessary.

7.6.3 Mine area

7.6.3.1 Ecologically appropriate area of analysis

Two EAAAs were defined within the Mine area by considering the biodiversity values that could potentially trigger critical habitat. Biodiversity values screened into the assessment were limited to globally threatened species (i.e., those listed as VU, EN or CR by the IUCN red list), including birds and mammals. The EAAAs were delineated by considering their ranging patterns to define ecologically relevant boundaries for the critical habitat assessment.

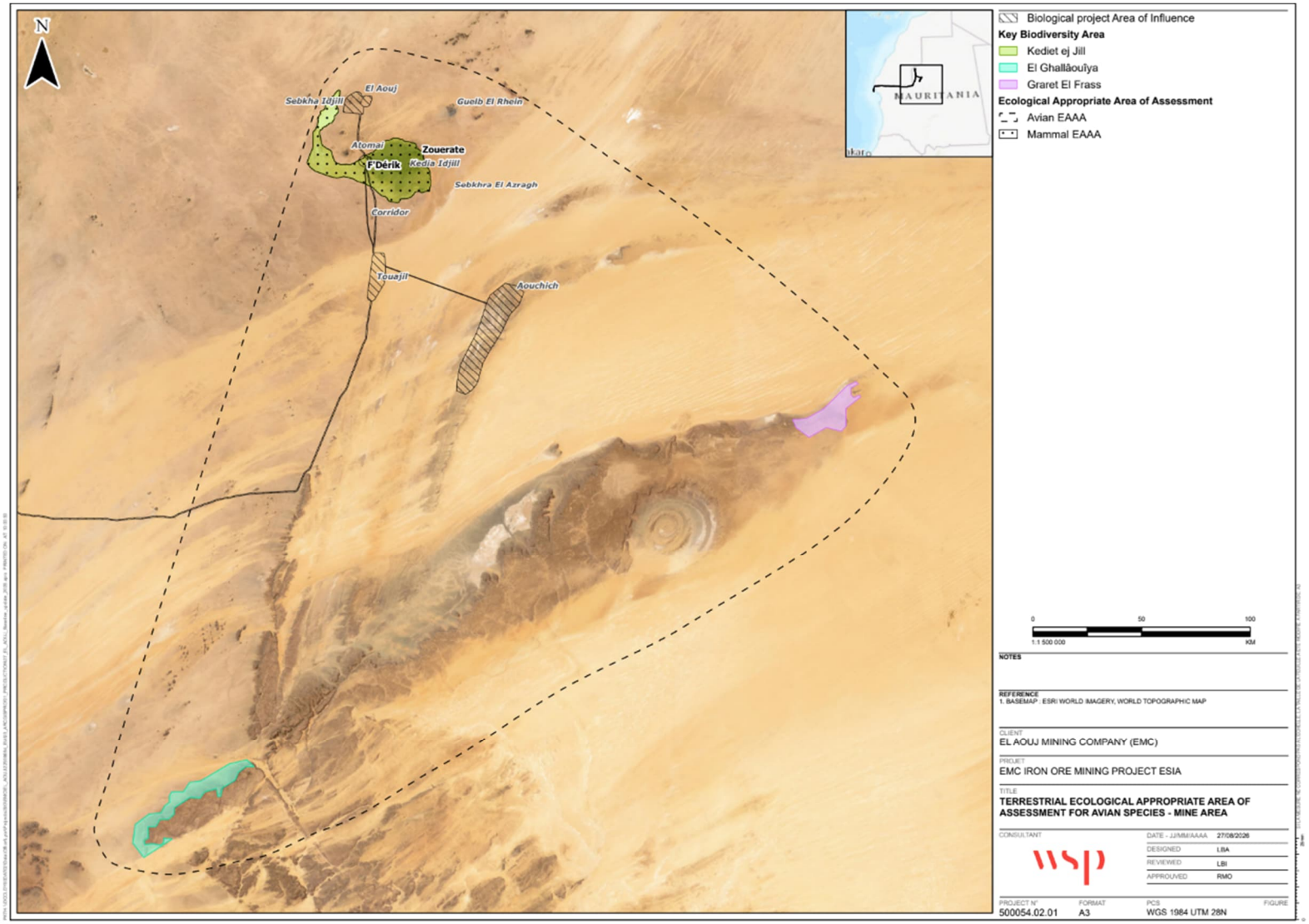
Avian EAAA

For birds, the Avian EAAA was defined by drawing a minimum convex polygon around three regional IBAs: the Kediet ej Jill IBA closest to the Project, El Ghallâouîya IBA and Ibi (graret el Frass) IBA. The IBAs were identified due to their importance to resident bird populations, and all three IBA support a similar avian community (BirdLife International, 2025). The spatial extent encompassed within the Avian EAAA presumably represents an area where birds move between regionally important habitats of the three IBAs. The Avian EAAA covers an area of 85 700 km² (Figure 7-57).

Mammal EAAA

A second EAAA was defined to screen the mammal species of conservation concern, specifically the Aoudad (*Ammotragus lervia*). The Aoudad is an ungulate species with a local population that is associated with the Kediet ej Jill KBA. The species is believed to be restricted to the KBA (Cassinello, 2022); therefore, the boundaries of the KBA were used as the EAAA. The Kediet ej Jill KBA covers an area of 1,036 km² and is illustrated on (Figure 7-4).

Figure 7-57: Mammal and avian Ecological Appropriate Area of Assessment (Mine area)



7.6.3.2 Critical habitat screening

7.6.3.2.1 Criterion 1 - Endangered and critically endangered species

A detailed screening table for criterion 1 is available in APPENDIX N-Table 1.

Mammal EAAA

Two mammal species listed as VU have an EOO that overlaps with the Mammal EAAA. They include the aoudad (*Ammotragus lervia*; see section 7.5.5.3) and Dorcas gazelle (*Gazella dorcas* (GBIF, 2025)). Both species are identified as present in the EAAA, based on information from the literature review (Table 7-49).

Table 7-49: Mammal species assessed in detail under criterion 1 (Mine area)

Species	IUCN Status	Recorded in the EAAA	Criterion 1(a)	Criterion 1(b)	Criterion 1(c)	Critical habitat
Ammotragus lervia	VU	Yes	No	No	No	No
Gazella dorcas	VU	Yes	No	No	No	No

Aoudad (*Ammotragus lervia*)

The Aoudad's global distribution range is estimated at 6,624,571 km^2 (Cassinello, 2022). The Aoudad EAAA would not meet the quantitative thresholds for determining CH under criterion 1. Available information indicates that no aoudads have recently been observed in the Kediet ej Jill KBA (Cassinello, 2022), providing further evidence that the species is unlikely to meet the quantitative threshold for critical habitat designation under criterion 1. **Critical habitat for Aoudad is not identified in the Mammal EAAA**.

Dorcas gazella (*Gazella dorcas*)

Dorcas gazelles have an EOO that extends broadly across northern Africa, and therefore the proportion of its EOO within the Mammal EAAA does not meet the quantitative thresholds for designating critical habitat. Further, its presence in the EAAA is highly uncertain given the limited evidence available. **Critical habitat for Dorcas gazelle is not identified in the Mammal EAA.**

Avian EAAA

A total of 10 globally threatened bird species have EOOs that overlap the Avian EAAA, among them five have documented occurrences in the Avian EAAA (Table 7-50).

Table 7-50: Bird species assessed in detail under criterion 1 (Mine area)

Species	IUCN Status	Recorded in the EAAA	Criterion 1(a)	Criterion 1(b)	Criterion 1(c)	Critical habitat
Chlamydotis undulata	VU	Yes	No	No	No	No
Gyps africanus	CR	Yes	No	No	No	No
Lanius meridionalis	VU	Yes	No	No	No	No
Neophron percnopterus	EN	Yes	No	No	No	No
Torgos tracheliotos	EN	Yes	No	No	No	No

African Houbara (*Chlamydotis undulata*)

The African houbara is unlikely to meet the quantitative thresholds for determining critical habitat in the Avian EAAA under criterion 1. Its estimated EOO is 3,400,000 km^2 (BirdLife International, 2023d) indicating that the Avian EAAA includes about 2,50% of its distribution range. The relative importance of the Avian EAAA is not well understood; however, none of the three regional IBAs list the African houbara as an IBA listing criterion. African houbara were detected during field surveys of 2012-2013; however, no evidence of this species was recorded in 2023 or in 2024. There is insufficient information available to conclude that the loss of the local Avian EAAA population would result in an uplisting of African houbara (from VU to EN or CR). **Critical habitat for African houbara is not identified in the Avian EAAA.**

White-backed Vulture (*Gyps africanus*)

White-backed vulture (*Gyps africanus*) was recorded during the field survey in 2023, but this apparent detection constitutes an irregular observation. White-backed vultures are typically associated with more vegetated areas in southern Mauritania. Further, the species' global distribution range does not overlap the Avian EAAA; its northern distribution limit is near Mauritania's southern border with Senegal. It is considered therefore unlikely that the Avian EAAA would support regular occurrences of the individuals. The species observation during the field survey may represent a vagrant observation, which is plausible given that white-backed vultures are wide-ranging species that can travel over long distances. **Critical habitat for white-backed vulture is not identified in the Avian EAAA.**

Iberian Grey Shrike (*Lanius meridionalis*)

According to BirdLife International (2017) Iberian grey shrike are restricted to areas of south-western Europe; however, (Borrow, 2015) indicate that the species is resident in Mauritania and is somewhat common. The IUCN's species status assessment assigns a status of VU to the species and does not appear to account for Iberian grey shrike populations in western Africa. It is therefore unlikely that this species meets the criterion for triggering critical habitat in the Avian EAAA. Specifically, it is unlikely that the potential loss of Iberian grey shrike in the Avian EAAA would result in the change of the species listing status to EN or CR. **Critical habitat for Iberian grey shrike is not identified in the Avian EAAA.**

Egyptian Vulture (*Neophron percnopterus*)

There is little information available on the species. It is mainly Europe that still supports this species, while Mauritania now supports it only very marginally, if at all. Europe forms 25-49% of the global range, so a very preliminary estimate of the global population size is 12,400-36,000 mature individuals, roughly equating to 18,600-54,000 individuals, although further validation of this estimate is needed (BirdLife International , 2021). **Critical habitat for Egyptian vulture is not identified in the Avian EAAA.**

Lappet-faced Vulture (*Torgos tracheliotos*)

Interviews conducted in the field with local livestock breeders indicated that lappet-faced vulture is present is present in the Project AoI. The species is considered extinct in the Avian EAAA, and so it is possible that local breeders misidentified the vulture species. Accordingly, it is unlikely that the Avian EAAA would support regular occurrences of lappet-faced vulture. **Critical habitat is not identified for lappet-faced vulture in the Avian EAAA.**

7.6.3.2.2 Criterion 2 - Endemic and restricted range species

Considering observed species and species EOO overlapping EAAA, no restricted-range species were identified for assessment in the Mine area's EAAA (APPENDIX N-Table 2). **No critical habitat is identified under criterion 2.**

7.6.3.2.3 Criterion 3 – migratory and congregatory species

A detailed table of criterion 3 is available APPENDIX N-Table 3.

Avian EAAA

Thirty (30) migratory species were observed in the field in the most recent survey years (2023 and 2024).

In addition, two bird species have been confirmed within the Avian EAAA (IBAT data), *Chlamydotis undulata* and *Neophron percnopterus,* only one is migratory species: *Neophron percnopterus.*

Moreover, thirteen bird populations meet IBA/KBA Criteria of Kediet ej Jill, Ibi or El Ghallâouîya. Two are migratory species: *Ptyonoprogne obsoleta, Oenanthe lugens (*Table 7-51*)*.

Table 7-51: Bird species assessed in detail under criterion 3 (Mine area)

Species	IUCN Status	Triggering KBA / IBA	Migratory species	Criterion 3(a)	Criterion 3(b)	Critical habitat
Species observed in the field						
Anthus trivialis	LC	No	Yes	No	No	No
Apus apus	LC	No	Yes	No	No	No
Ardea cinerea	LC	No	Yes	No	No	No
Ardeola ralloides	LC	No	Yes	No	No	No
Caprimulgus ruficollis	NT	No	Yes	No	No	No
Charadrius dubius	LC	No	Yes	No	No	No
Ciconia ciconia	LC	No	Yes	No	No	No
Circaetus gallicus	LC	No	Yes	No	No	No
Circus aeruginosus	LC	No	Yes	No	No	No
Delichon urbicum	LC	No	Yes	No	No	No
Egretta garzetta	LC	No	Yes	No	No	No
Falco naumanni	LC	No	Yes	No	No	No
Falco pelegrinoides	LC	No	Yes	No	No	No
Falco tinnunculus	LC	No	Yes	No	No	No
Hirundo rustica	LC	No	Yes	No	No	No
Lanius excubitor	LC	No	Yes	No	No	No
Lanius senator	NT	No	Yes	No	No	No

Species	IUCN Status	Triggering KBA / IBA	Migratory species	Criterion 3(a)	Criterion 3(b)	Critical habitat
Milvus migrans	LC	No	Yes	No	No	No
Motacilla alba	LC	No	Yes	No	No	No
Motacilla flava	LC	No	Yes	No	No	No
Musciapa striata	LC	No	Yes	No	No	No
Oenanthe oenanthe	LC	No	Yes	No	No	No
Phylloscopus collybita	LC	No	Yes	No	No	No
Platalea leucorodia	LC	No	Yes	No	No	No
Plegadis falcinellus	LC	No	Yes	No	No	No
Riparia riparia	LC	No	Yes	No	No	No
Streptopelia decaocto	LC	No	Yes	No	No	No
Sylvia cantillans	LC	No	Yes	No	No	No
Sylvia melanocephala	LC	No	Yes	No	No	No
Upupa epops	LC	No	Yes	No	No	No
IBAT data						
Neophron percnopterus	EN	No	Yes	No	No	No
IBA/KBA Criteria of Kediet ej Jill, Ibi or El Ghallâouîya						
Oenanthe lugens	LC	Yes	Yes	No	No	No
Ptyonoprogne obsoleta	LC	Yes	Yes	No	No	No

Based on previous data (See criterion 1 - Egyptian Vulture (*Neophron percnopterus*)), it is not triggering critical habitat under criterion 3.

Neophron percnopterus was not observed during field studies or identified from the desktop review, and there are no observations in available databases (GBIF, 2025). The IBA designation was based on 2001 data, and updated field surveys conducted later did not confirm regular presence or abundance of this IBA trigger species within the Avian EAAA.

Listed species are not triggering critical habitat under criterion 3.

Indeed, the species are not triggering a critical habitat under criterion 3.

7.6.3.2.4 Criterion 4 – Highly threatened or unique ecosystems

Overall, most sampled habitats identified in the Mine AoI are natural, with six habitat types defined (see Table 7-10: Definition of the identified habitats in the Mine area Table 7-10): guelbs, regs, ravines, wadis, dunes and dhayas. A subcategory of regs was noted during field study: sandy regs, which are regs with a surface layer of sand. None of the habitats identified in the Mine AoI correspond to ecosystems that are listed as VU, EN or CR by the IUCN. Similarly, the Mine AoI does not contain any threatened or unique ecosystem that are identified as having high conservation priority nationally. **No critical habitat is identified under criterion 4.**

7.6.3.2.5 Criterion 5 – Areas associated with key evolutionary processes

Criteria 5 is not considered applicable to the Mine AoI. The area is not known to have features that support key evolutionary processes (high spatial heterogeneity, ecotones, edaphic interfaces, biological corridors, or support climate change adaption functions). **No critical habitat is identified under criterion 5.**

7.6.3.2.6 Kediet ej Jill Key Biodiversity Area and Important Bird Area

The critical habitat assessment considered whether the Kediet ej Jill KBA may correspond to critical habitat, given that KBAs and IBAs are identified for their conservation importance. The **KBA is not designated as critical habitat** for the following reasons:

- All species identified as meeting the Criteria for KBA or IBA designation are listed as LC or NT, all are considered resident populations, and none are identified as having a restricted distribution range (see Table). None of these species correspond to critical habitat criteria 1 to 3.
- Field observations from within the KBA do not indicate the presence of globally important concentrations of species in the KBA. The KBA and IBA designations were attributed in 2001 using legacy criteria and limited data. Specifically, no population estimates were reported in the 2001 listing, and no updates have been published since 2001. The condition of the KBA may have changed over the past 25 years. For example, extensive mining/quarrying activities were observed in the KBA during field surveys, and these disturbances are also visible on satellite imagery. If the site was re-assessed at present day, it is uncertain if it would meet current IBA and KBA listing criteria.

7.6.4 Summary of Critical Habitat Analysis

Eight biodiversity values trigger critical habitat in the EAAAs associated with the Port. These include three bird species, two mammals, one reptile, one fish and one ecosystem (Table 7-52). Four species have critical habitat that overlaps the Project AoI.

No critical habitat or critical habitat qualifying species were identified along the Rail area or in the Mine area's EAAAs.

Table 7-52: Summary of the species triggering critical habitat in the Port's Ecologically Appropriate Areas of Analysis and in the Port Area of Influence

Species	IUCN Status	Applicable EAAA	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Critical habitat in EAAA	Critical habitat present in the AoI	Critical habitat description
Bird										
Curlew sandpiper (*Calidris ferruginea*)	VU	Marine EAAA	Yes	No	Yes	-	-	**Yes**	**No**	Banc d'Arguin National Park, in coastal brackish lagoons, mudflats and sandbanks, estuaries, and salt marshes
Grey plover (*Pluvialis squatarola*)	VU	Marine EAAA	No	No	Yes	-	-	**Yes**	**Yes**	Intertidal mudflats, saltmarshes, sandflats beaches, bays and estuaries
Sandwich tern (*Thalasseus sandvicensis*)	VU	Marine EAAA	No	No	Yes	-	-	**Yes**	**Yes**	Subtidal sandy and sandy-mud habitats, sandy or rocky beaches
Mammals										
Mediterranean monk seal (*Monachus monachus*)	VU	Marine EAAA	Yes	No	No	-	-	**Yes**	**Yes**	Core areas of occupancy are coastline, caves, and nearshore areas on the western side of Ras Nouadhibou Peninsula (on Western Sahara side). Epipelagic habitats of AoI likely used for movement and feeding.
Atlantic humpback Dolphin (*Sousa teuszii*)	CR	Marine EAAA	Yes	No	No	-	-	**Yes**	**No**	Banc d'Arguin National Park, in slallow waters (<30m)
Reptiles										
Green turtle (*Chelonia mydas*)	EN	Marine EAAA	Yes	No	No	-	-	**Yes**	**No**	Baie de l'Étoile and Banc d'Arguin National Park, primarily in sea grass beds
Fish										
Blackspotted smoothhound (*Mustelus punctulatus*)	VU	Marine EAAA	Yes	No	No	-	-	**Yes**	**Yes**	Sandy bottom subtidal habitats
Habitats/Ecosystems										
Seagrass beds	-	Marine EAAA	-	-	-	Yes	-	**Yes**	**No**	Baie de l'Étoile and Banc d'Arguin National Park

7.7 Conclusion on the biodiversity context

The Port area, located along the Ras Nouadhibou Peninsula, is considered the most ecologically sensitive area in the context of the Project AoI. The AoI around the port overlaps with:

- the Cap Blanc IBA/KBA, which covers much of the Baie du Lévrier and some extents of the peninsula's coastline.
- the Cap Blanc Satellite Reserve, a small legally protected area at the tip of the Cap Blanc peninsula (annexed to Banc d'Arguin National Park).
- the Dakhla KBA/IBA and proposed national park, located mainly in the waters at the tip of and along the western side of the Ras Nouadhibou Peninsula.

The Port AoI is also in proximity to the Canary current shelf-break north KBA/IBA, which is located about 30 km west of the port. Located approximately 100 km southeast of the port is the Banc d'Arguin National Park, which is also recognized as a UNESCO World Heritage Site, a Ramsar wetland, and KBA/IBA. Banc d'Arguin National Park corresponds to the Mauritania's most important biodiversity site, and it considered globally important because it supports important concentrations of migratory birds and provides habitat for sea turtles and fish nursery areas. The marine habitats are considered natural habitats, with evidence of varying degrees of degradation attributed mainly to industrial port activity along the coast (including periodic dredging) and the presence of Nouadhibou.

Overall, the Port area and its surroundings support important biodiversity, including important pelagic and demersal fish populations, sea turtles and marine mammals (e.g., the Mediterranean monk seal). The review identified at least seven globally threatened species (listed as VU, EN or CR) in the Port area, with the potential for many more globally threatened marine species (fish, sharks, rays) to occur periodically in the region. The Critical Habitat Assessment identified the presence of critical habitat within the Marine EAAA and the Port AoI under criterion 1, criterion 3, and criterion 4:

- Under criterion 1, critical habitat is triggered by green turtle, Atlantic humpback dolphin, Mediterranean monk seal and blackspotted smoothhound, with confirmed presence and suitable habitats in the AoI for the latter two species.
- Under criterion 3, critical habitat is triggered by curlew sandpiper, grey plover, and Sandwich tern, with suitable intertidal habitats present in the AoI for grey plover and Sandwich tern.
- Under criterion 4, critical habitat is triggered by seagrass beds, which are not present in the AoI.

The critical habitats identified within the Port AoI include coastal and intertidal marine habitats, notably sandy beaches, mudflats, sandbanks, and subtidal sandy-mud substrates, which support migratory and threatened species such as the Mediterranean monk seal, blackspotted smoothhound, sandwich tern, and grey plover. Beyond the AoI, critical habitat is present in Banc d'Arguin National Park and Baie de l'Étoile.

The Mine area is in a desert environment, dominated by natural habitats. Habitats have a varying degree of degradation, including from livestock grazing, human settlements and frequent droughts; however, non-native invasive species are absent from the area. In general, there is a low density of anthropogenic disturbances, and likewise a low density of human settlements. The biodiversity of the Mine area is typical of the Saharan ecoregion, with low species abundance, low to moderate species richness, and low potential for regular occurrences of globally threatened species. The risk for introducing non-native invasive species is considered low, given the arid conditions. No critical habitats or critical habitat qualifying species were identified in the Mine area.

In general, wadi habitats support the most important biodiversity in terms of species richness and abundance within the Mine area. Wadi habitats are described as dry riverbeds or valleys, where runoff from seasonal precipitation is collected. A notable exception is the F'Derik dam (a human-made feature), which tends to have high concentrations of fauna owing to the scarcity of water resources in the region.

The Mine area's AoI overlaps with the Kediet ej Jill KBA/IBA, which is concentrate on a large, rocky mountainous formation (guelb) and extends into a sebkha feature created by the seasonal surface water drainage from the guelb. The IBA/KBA is not associated with globally threatened species (i.e., those listed as VU, EN or CR), but rather it is of conservation importance because it supports several biome-restricted bird species (i.e., desert species). Most of the KBA's biodiversity is mass on the guelb, in the formation's deep ravines and surrounding wadis.

Sensitive species confirmed present in the Mine AoI include African houbara[7] (*Chlamydotis undulata*; VU) and Iberian grey shrike (*Lanius meridionalis*; VU). White-backed vulture (*Gyps africanus*; CR) was observed during 2023 surveys but the species' global distribution range does not overlap the Project AoI, suggesting that the observation likely corresponds to a vagrant observation. Lappet-faced vulture (*Torgos tracheliotos*; EN) was identified as present in the AoI by local livestock breeders, but this may be a misidentification given that the species is considered extinct in the Mine AoI. Although sensitive mammal species such as Aoudad (*Ammotragus lervia*; VU*)*, Dorcas gazelle (*Gazella dorcas*, VU), addax (*Addax nasomaculatus*; CR), and dama gazelle (*Nanger dama*; CR) were identified as potentially present from literature reviews, their presence is considered highly unlikely in the AoI.

Lastly, the Rail area's AoI consists of an existing rail line that is bordered by natural habitats that include dunes, regs, compacted bare soil, and sandy regs. The Rail area's AoI does not intersect legally protected areas or internationally recognized areas. Based on the information reviewed, the Rail area has relatively low species richness (for fauna and flora) and a low likelihood of supporting globally threatened species. No critical habitat or critical habitat qualifying species were identified in the Rail area.

[7] African houbara was detected in field surveys conducted in 2012-2013 (URS 2015) but has not since been recorded in the AoI.

8.0 SOCIAL BASELINE

This chapter outlines the baseline social environment for the El Aouj iron ore mining project, focusing on community dynamics, socio-economic structures, and territorial issues in the relevant port, rail, and mining areas.

8.1 Methodology Approach

8.1.1 Definition of Project AoI for social studies

The project's Social Area of Influence (SAoI) refers to the geographical space within which the project's potentially significant effects on social receptors may occur. It serves as the analytical boundary for the assessment of social impacts, taking into account community interactions and vulnerability factors present within the study area. In line with IFC Performance Standard 1, where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts will be identified in the context of the project's Area of Influence (AoI). This area of influence encompasses the elements described in Table 8-1 below.

Table 8-1: Areas of influence and their corresponding project areas

PS1 Area of influence	Project area of influence
The area is likely to be affected by: ▪ The project including activities and facilities that are directly owned, operated, or managed (including by contractors) by the proponent and that are a component of the project; ▪ The area covered by the drawdown of the aquifers that will be exploited for the mine's water needs ▪ Impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or ▪ Indirect project impacts on physical environment or on ecosystem services upon which biodiversity and Affected Communities' livelihoods are dependent.	Project infrastructure: ▪ Mine and process plant infrastructures ▪ Bore wells (Touajil and Aouchich areas) ▪ Water pipeline ▪ Extended road ▪ Thermal and solar power plants ▪ Temporary workers' accommodation ▪ Permanent workers' accommodation (El Aouj City and workers camp) ▪ Transmission line Project activities and their potential direct and indirect impacts: ▪ Infrastructure construction ▪ Use of borrow materials ▪ Ore extraction and processing ▪ Mine waste and tailings deposition ▪ Industrial waste production ▪ Access roads use ▪ Thermal and solar power plant operation ▪ Water abstraction, treatment, transport and use from Touajil and Aouchich wellfields ▪ Operation of workers' accommodation (El Aouj City and on-site permanent camp) ▪ Ore transportation (by train from the mine site to Nouadhibou and vessels from Nouadhibou port) ▪ Mine closure and rehabilitation. A detailed description of the project is in Section 4.0.
Cumulative impacts that result from the incremental impact, on areas or resources used or directly	Mine, port, and rail corridor communities are potentially subject to cumulative social impacts from

PS1 Area of influence	Project area of influence
impacted by the project, from other existing, planned or reason.	other mining operations, increased port activities, other rail users, or broader regional development and population movement.

As part of the definition of the Project's AoI, clarification is required regarding the status of existing infrastructures used for Project logistics.

The railway network and the mineral port are existing infrastructures currently used to meet the needs of SNIM. Therefore, these infrastructures are not considered as "associated facilities" for the El Aouj Project. However, the Project will benefit from these infrastructures:

(iii) to transport its ore from the El Aouj mine to the mineral port; and

(iv) to temporarily store and load the ore onto cargo ships for delivery to the final client destination.

A comprehensive assessment of the impacts generated by the use of these infrastructures within the framework of the El Aouj Project (e.g. increased rail and maritime traffic, risk of contamination, risk of collision) will therefore be carried out as part of the ESIA.

The project's AoI has been defined based on the spatial distribution of communities, human settlements, and social receptors located near the project footprint. It encompasses the following elements:

- All social receptors, including pastoralist camps and socio-cultural infrastructure located within the Project's Area of Influence.
- Settlements in proximity to the Project:
  - F'Derik, located approximately 25 km south of the El Aouj mining site, is the main human settlement in the immediate vicinity of the project. The city of F'Derik will be home to the El Aouj workers' camp.
  - Zouerate, located approximately 30 km from the El Aouj mining site, is the largest nearby human settlements. It has administrative, social and commercial infrastructure and services.
  - Touajil, located approximately 80 kilometres south of the El Aouj mine, is home to the catchment area intended to supply water to the project, as well as the associated pipeline. This area also includes a permanent human settlement and a palm plantation.
  - Sebkha Idjill, located to the south-west of the El Aouj mining site, it constitutes a seasonal activity area for artisanal salt extraction**.**
  - Touerga, a small town administratively attached to the F'Derik agglomeration, located approximately 23 kilometres south of the El Aouj mining site. It hosts temporary camps of nomadic herders as well as permanent settlements occupied by residents originating from F'Derik and Zouerate
  - Aouchich, situated approximately 100 kilometres south-east of the El Aouj mining site, hosts a water catchment field intended to supply the project, along with the associated pipeline. This area also includes a pastoral camp, grazing lands, and water points used by herders.

The project's SAoI also includes seasonal grazing lands used by herders for livestock, as well as a historic trade road linking local communities to the salt works of Sebkha Idjill. This road retains regional economic significance, particularly with regard to the livelihoods of local populations. To account for the potential effects of the project on pastoral and economics activities, a buffer area has been defined within the mining area, including:

- A 1 km buffer around the mine's infrastructure, with a wider area (almost 7 km) in the dominant wind direction to incorporate estimated dust dispersion and deposition,
- A 250 m buffer of the rail spur between F'Dérik and El Aouj, and between F'Dérik and Touajil
- A 250 m buffer around F'Dérik town, the future worker City (El Aouj City) and the new permanent camp,
- A 150 m buffer of the underground pipeline between F'Dérik and Touajil,
- A 150 m buffer of the underground pipeline between Touajil and Aouchich,
- A smoothed polygon around the Touajil wellfield, accounting for a minimum buffer of 50 m around individual wells and off-road access requirements; and
- A smoothed polygon around the Aouchich wellfield, accounting for a minimum buffer of 50m around individual wells and potential off-road access requirements.

The **Port AoI**, which was defined as:

- A 1 km buffer encompassing terrestrial habitats around the mineral port and Nouadhibou's mining infrastructure; and
- A 5 km buffer encompassing marine and coastal habitats around the mineral port.

The **Rail AoI**, which includes:

- A 250 m buffer of the railway between F'Derik and Nouadhibou; including emplacement of base camp 1 and 2.

Project AoI and the main human settlements located in the mining area are shown in Figure 8-1 and Figure 8-2.

Figure 8-1: Location of the Project area of influence (AoI)

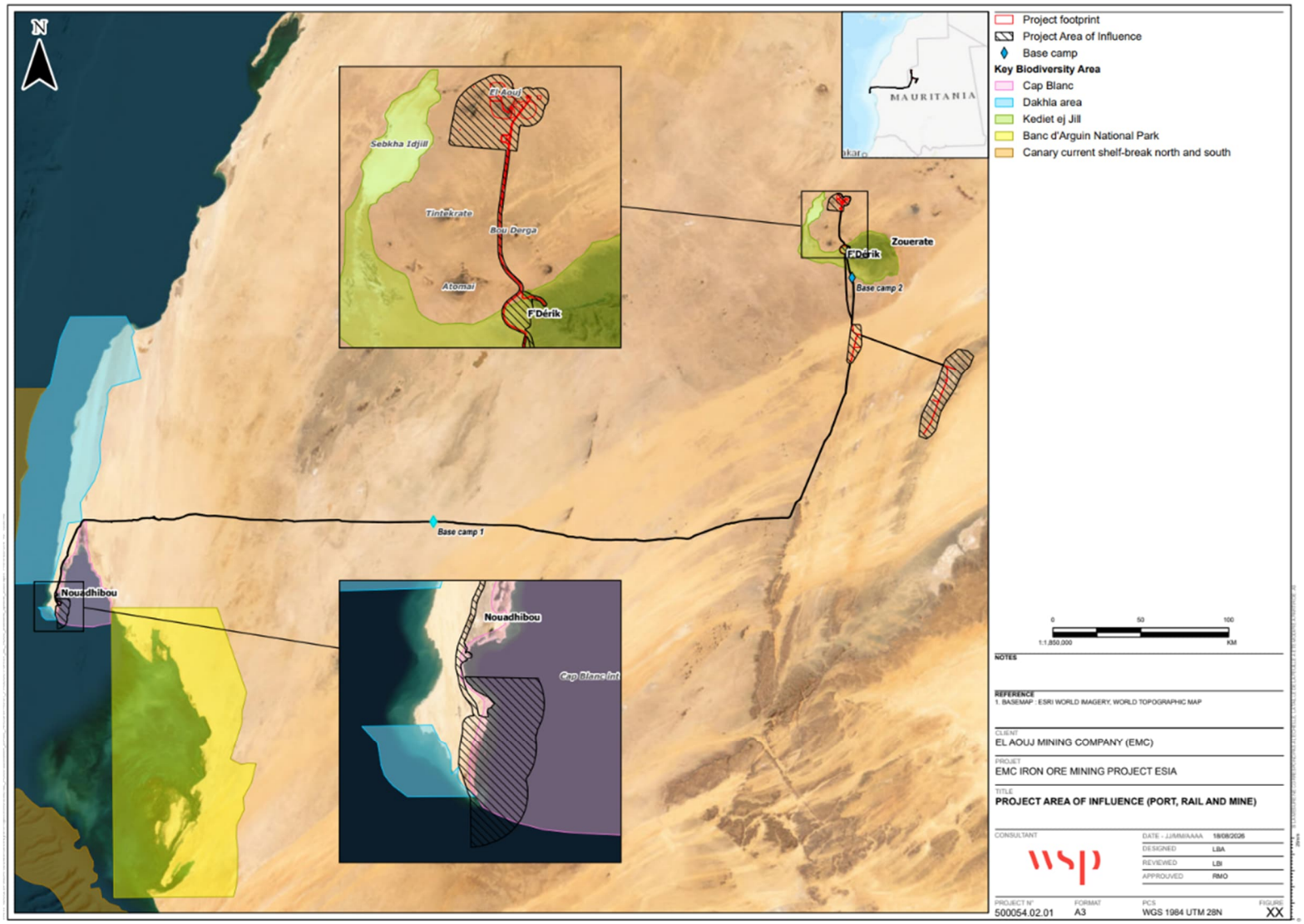
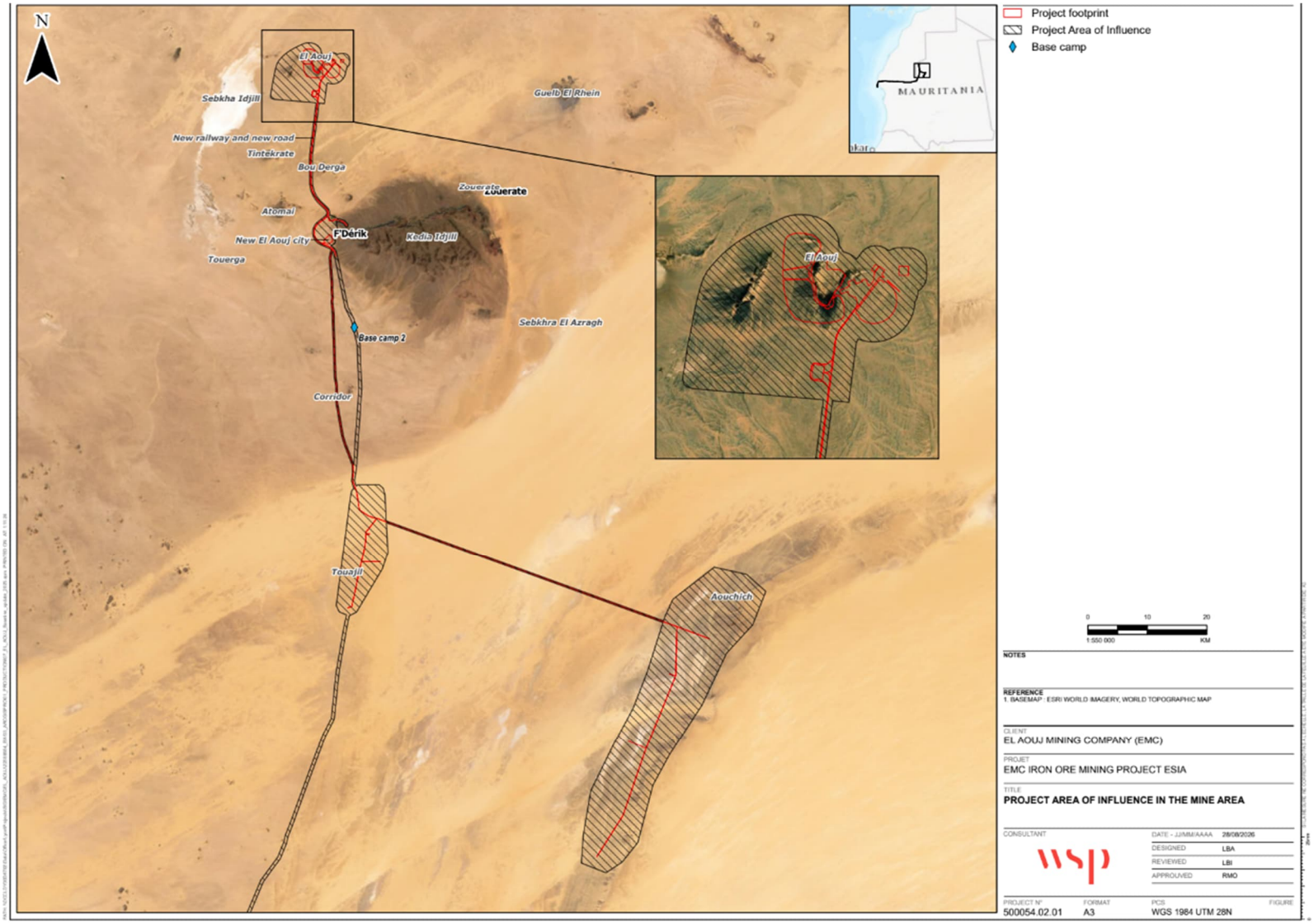


Figure 8-2: Area of Influence and the main social receptors in the mine area



8.1.2 Data collection

Data collection was based on a participatory and multidisciplinary approach. This approach combined the analysis of secondary data from existing sources with primary data collection through community consultations and focus groups organized within the mining area. The detailed methodology used for data collection and processing is presented below.

8.1.2.1 Secondary data collection

The project site has been the subject of several studies, including the Environmental and Social Impact Assessment (ESIA) conducted by URS in 2015, as well as a partial update of the ESIA conducted by WSP in 2023. As part of the 2025 update of the social baseline of El Aouj mining Project, WSP conducted a desktop review based on previous studies carried out within the project's area of influence, as well as on recent available data. This phase involved the collection, analysis, and synthesis of information from the following sources:

- El Aouj Project, Partial update Environmental and Social Impact Assessment (ESIA) in 2023 (WSP, 2023);
- El Aouj Project, Environmental and Social Impact Assessment (ESIA) in 2015 (URS, 2015);
- Project for the Modernisation of SNIM's Infrastructure and rolling stock, Environmental and Social Impact Assessment (ESIA) in 2024 (SNIM, 2024);
- Dredging project for the channel of the mineral port of Nouadhibou, Environmental and Social Impact Assessment (ESIA) in 2017 (ANTEA GROUP, 2017);
- ESIA, Guelb el Aouj Project (Wilson, 2008);
- ESIA, Guelb II Project, SNIM (AECOM, 2009);
- Rapid Health Impact Assessment (HIA), Askaf and El Aouj Projects (International SOS, 2011);
- ESIA, Askaf Project (URS, 2013) which included statistics from national and international organizations (World Bank, International Monetary Fund, United Nationals);
- A pastoralist survey, URS 2013;
- A high-level sensitivity mapping exercise to identify social receptors, URS 2013.

The public consultation requirements as part of the ESIA approval, conducted in 2015 through meetings with the authorities and public meetings in Zouerate, Touajil and F'Derik, were also collected to complement the social baseline as part of the available documentation informing the understanding of baseline conditions.

In addition to the studies mentioned above, several other publications were consulted as part of the 2025 update ESIA of the study (see Section 15.0).

8.1.2.2 Primary data collection

Between 2013 and 2025, primary data was collected in the mine area using a participatory approach, including baseline surveys, focus groups discussions (FGDs) and key informant interviews (KIIs) with key stakeholders, site visits and random community interviews. These methods were used to establish and update the social baseline by documenting livelihoods, land and resource use, access to services, social organization, and vulnerability patterns within Project SAoI.

8.1.2.2.1 Data collection 2012–2013

The first round of socio-economic surveys was carried out in support of the Askaf Project between April and July 2012, followed by a pastoralist survey and sensitivity mapping in September 2013. In 2012, 1,083 households were surveyed across Zouerate (796 households), F'Derik (119 households), Touajil (61

households) and pastoralist settlements (107 households), covering approximately 5,700 individuals. In addition, 243 income-generating activities (IGAs) were surveyed. Complementary qualitative work included 23 focus group discussions and 28 semi-structured interviews, together with key informant interviews and more than 200 choice modelling questionnaires during public consultations.

In 2013, URS conducted a pastoralist survey with 12 households and a sensitivity mapping exercise that identified 37 social receptors, including grazing areas, wells, camps, and socio-cultural resources. These surveys provided disaggregated information on livelihoods, sedentarisation patterns, and natural resource use.

Together, the 2012–2013 surveys established the first integrated baseline of social dynamics in Zouerate, F'Derik, Touajil, and surrounding pastoralist areas, forming the foundation for subsequent ESIA updates.

8.1.2.2.2 Data collection in 2023

As part of 2023, WSP carried out a social field mission in May 2023 to F'Derik, Zouerate, Touajil and surrounding mine site areas. This mission included: 8 focus group discussions (and 15 key informant interviews with authorities, elected officials, NGOs and local institutions. Additional random interviews at socio-economic sites including the El Aouj borehole, F'Derik seasonal dam, the Touajil auberge, and Touerga settlements. In total, approximately 146 people from the mining area were consulted during this field mission through focus group discussions and individual interviews.

In May 2023, WSP conducted consultations for the social baseline update in F'Derik, Zouerate, Touajil and surrounding mine site areas. The objective was to capture recent socio-economic dynamics and complement previous studies, in order to determine whether changes in the social context warranted a revision of the 2015 ESIA.

The consultations were carried out between 2 and 10 May 2023 by an international social expert, supported by a national social consultant, a representative of the Mauritanian Ministry of Environment, and the EMC Environmental Officer. A second round of targeted engagements was conducted between 4 and 12 May 2023 by a Mauritanian ecosystem services consultant.

The methodology included focus group discussions (FGDs), semi-structured key informant interviews, and random in-situ interviews at key socio-economic sites.

- Focus group discussions (FGDs):

A total of eight FGDs were conducted in Touajil, F'Derik, and Zouerate, each bringing together 7–25 participants from specific stakeholder groups (youth, women, and pastoralists). The discussions followed a semi-structured approach designed to explore: Knowledge and perception of the El Aouj Project, concerns and expectations.

  - Perception of SNIM
  - Access to basic social services
  - Livelihood activities and economic opportunities
  - Social cohesion and community development challenges
  - Ecosystem services and cultural heritage
  - Security and perceived risks
  - Main changes over the past decade
  - Preferred communication channels and type of information expected from the Project

- Key informant interviews (KIIs):

- Conducted with authorities, heads of administrative services, elected officials, and NGOs. These explored:
- Knowledge and perception of the El Aouj Project
- Institutional mandates and activities
- Main contextual changes over the past ten years
- Obstacles in fulfilling institutional responsibilities and achieving objectives

- Random in-situ interviews:
  - Conducted with community members encountered at key socio-economic sites within the Project AoI. The discussion followed a semi-directive approach in order to understand their activities and the use of the location.

In line with international best practice, the 2023 consultations sought to ensure inclusivity, representativeness, and reliability, while complementing the initial consultations conducted by URS in 2015. Feedback gathered was used both to update the social baseline and to inform the preparation of the Stakeholder Engagement Plan (SEP). Table 8-2 below provides a summary of the consultations conducted in May 2023. Minutes, photographs, and attendance sheets are available in the Section 9.0.

Table 8-2: Primary socio-economic data collection activities conducted in 2023

Date	Location	Category of stakeholders met	Number of stakeholders attending	Data collection method
03/05/23	Zouerate (Maaden office)	Administration: Maaden	3	Interview
04/05/23	Zouerate (SNIM foundation office)	OCS: SNIM foundation	1	Interview
04/05/23	F'Derik (around the dam)	Community: gardeners	2	In situ interview
04/05/23	F'Derik (around the dame)	Community: pastoralist	1	In situ interview
04/05/23	El Aouj infrastructure corridor	Community: pastoralists	3	In situ interview
04/05/23	El Aouj borehole	Community: pastoralists	3	In situ interview
05/05/23	Touajil (SNIM base)	Community: Women	14	Focus group
05/05/23	Touajil (SNIM base)	Community: Youth	8	Focus group
05/05/23	Touajil (SNIM base)	Community: Pastoralists	7	Focus group
05/05/23	Touajil (Auberge)	Business: Auberge employees	2	In situ interview
06/05/23	F'Derik (Youth centre)	Community: Women	20	Focus group
06/05/23	F'Derik (Youth centre)	Administration: Head Doctor	1	Interview
06/05/23	F'Derik (Youth centre)	Community: Youth	23	Focus group
06/05/23	F'Derik (Youth centre)	Community: Pastoralists	8	Interview
07/05/23	Zouerate (SOMASERT hotel)	Community: Pastoralists	7	Focus group

Date	Location	Category of stakeholders met	Number of stakeholders attending	Data collection method
07/05/23	Zouerate (SOMASERT hotel)	CBO: Child protection local NGO Director	1	Interview
07/05/23	Zouerate (Cooperative workshop)	CBO: women cooperative (stone jewellery)	5	In situ Focus group
07/05/23	F'Derik (around the dam)	Community: Youth	5	In situ Focus group
08/05/23	Zouerate (Wilaya)	Authorities: Wali	5	Interview
08/05/23	Zouerate (Mugaata)	Authorities: Hakem	1	Interview
08/05/23	Zouerate (Town Hall)	Local Government: Mayor	2	Interview
08/05/23	Zouerate (Town Hall)	Administration: Pastoralism Regional Director	1	Interview
08/05/23	Zouerate (Town Hall)	Administration: Agriculture Regional Director	1	Interview
08/05/23	Zouerate (Regional Council)	Local Government: Regional Council deputy president	1	Interview
08/05/23	Zouerate (Environment Regional office)	Administration: Environment Regional Director	1	Interview
09/05/23	F'Derik (Mugataa)	Authorities: Hakem	3	Interview
09/05/23	F'Derik (City Hall)	Local Government: Mayor	2	Interview
09/05/23	Zouerate (Education regional office)	Administration: Education Regional Director	9	Focus Group
09/05/23	Zouerate (Health regional office)	Administration: Health Regional Director	1	Interview
10/05/23	Zouerate (Africa 70 office)	NGO: Africa 70 local Ambassador	2	Interview
10/05/23	Zouerate	NGO: Women head of household association local manager	1	Interview
10/05/23	Touerga	Community: household	2	Interview

8.1.2.2.3 Data collection in 2025

In June 2025, additional socio-economic data collecting was undertaken with the objective of completing the social baseline and responding to observations made by IFC during its review of the 2023 ESIA update. Consultations followed a standardized protocol to ensure inclusivity, representativeness and reliability of the information gathered.

The consultations took place between 17 and 21 June 2025 and were facilitated by two WSP international experts, supported by two local GSE specialists in socio-economy and cultural heritage. Sessions were conducted in Hassaniya and French. The minutes of the public consultation and the list of participants are presented in the Section 9.0.

The 2025 program consisted of six structured focus group discussions (FGDs), complemented by key informant interviews (KIIs) and site visits. The FGDs targeted the following stakeholder groups:

- Salt collectors in Sebkha Idjill;
- Intangible cultural heritage holders in Aouchich;
- Pastoralists (local and nomadic);
- Institutional actors managing pastoral resources;
- Women in vulnerable situations in F'Derik;
- Small local economic actors and youth in Zouerate.

Each FGD was initially planned to bring together 6 to 12 participants, but in practice the group size ranged from 6 to 31 participants, depending on availability and community interest. The groups were selected to reflect diversity in gender, age and vulnerability. Sessions lasted between 1.5 and 2 hours and were co-facilitated by a WSP consultant and a local GSE expert, one acting as moderator and the other as note-taker. When relevant, moderation was conducted in Hassaniya to ensure inclusivity. Discussions followed thematic questionnaires, complemented by participatory tools such as seasonal calendars (for salt and pastoral cycles), participatory mapping (for transhumance routes and cultural sites), and oral storytelling (for intangible heritage). Separate sessions were organized for women and for cultural custodians, with female facilitators engaged to provide a safe space for participation.

Key informant interviews were conducted in F'Derik with the Hakem, municipal representatives, traditional leaders, and the mining operator (EMC). The interviews were followed by a site visit to the 140-ha parcel in F'Derik designated for the planned workers' camp and housing area in F'Derik ("El Aouj City"), in order to document the land situation.

Additional site visits were carried out to observe salt production at Sebkha Idjill and to assess irrigation and water supply at the Touajil auberge, where palm groves and vegetable cultivation are maintained. The visit in Touajil also included an interview with the auberge administrator, attended by EMC and WSP representatives. Table 8-3 provides a summary of the consultations conducted in June 2025. Minutes, photographs, and attendance sheets are presented in the Section 9.0.

Table 8-3: Primary socio-economic data collection activities conducted in 2025

Date	Location	Category of stakeholders met	Number of stakeholders attending	Data collection method
18/06/25	F'Derik (Maison des jeunes)	Community: Salt collectors / agricultural workers (Sebkha Idjill)	15 men	Focus group
18/06/25	F'Derik (Maison des jeunes)	Community: Intangible cultural heritage holders (Aouchich)	21 (14 women, 7 men)	Focus group
18/06/25	F'Derik	Community: Pastoralists and farmers	08 men	Focus group
18/06/25	F'Derik	Authorities / institutions: pastoral resource management actors	05 men	Focus group
19/06/25	F'Derik (Maison des jeunes)	Community: Women in vulnerable situations	31	Focus group

Date	Location	Category of stakeholders met	Number of stakeholders attending	Data collection method
19/06/25	F'Derik (Maison des jeunes)	Community: Small economic actors and youth	22 (8 women, 14 men)	Focus group
19/06/25	F'Derik (Hakem office)	Authorities: Hakem, municipal representatives	04 (01 women, 03 men)	Interview
19/06/25	Sebkha Idjill	Community: Salt collectors (production sites)	25 (01 women, 24 men)	Site visit
21/06/25	Touajil auberge	Business: Auberge administrator	1 administrator + 3 reps	Interview + site visit

8.1.2.3 Data analysis

The analysis of the social baseline combined secondary sources and field data collected between 2013 and 2025. Earlier surveys and baselines, including the 2012–2013 Askaf Project socio-economic and pastoralist surveys, the 2015 ESIA, and the 2023 ESIA update, were systematically reviewed and compared with recent statistics available at regional, national, and international levels. These sources provided demographic, economic, and sectoral reference data.

The findings from June 2025 consultations, including focus group discussions (FGDs), key informant interviews (KIIs), and site visits in Zouerate, F'Derik, Touajil and Sebkha Idjill, were then triangulated with this existing evidence. The triangulation process involved:

- Cross-checking quantitative and qualitative data (e.g., demographic statistics with community perceptions).
- Validating consistency of stakeholder perspectives across groups (e.g., pastoralists, women, youth, institutional actors).
- Comparing historical baselines with recent field evidence to identify stability or change in livelihoods, access to services, and resource use.
- Documenting new or emerging vulnerabilities (e.g., water stress at Touajil, marketing challenges for cooperatives, salt collection dynamics).

This multi-source validation ensured that the social baseline reflects both historical dynamics and current socio-economic realities in the project area of influence.

Limitations

The social baseline builds on a combination of secondary sources and primary data collected between 2012 and 2025. While this provides a comprehensive picture of the socio-economic context, several limitations must be acknowledged:

- Age of early baseline data (2012–2013):

The first socio-economic and pastoralist surveys were conducted in 2012–2013 (as part of the Askaf Project). Given the time elapsed, these data are no longer sufficient on their own to inform impact assessment in line with IFC standards. They were therefore used only as a historical reference to identify long-term trends and were systematically triangulated with more recent consultations in 2023 and 2025.

- Remoteness and accessibility:

The project area is remote, which limited the frequency and duration of field missions and introduced logistical constraints. Seasonal variations in livelihoods (pastoral mobility, salt harvesting, water availability) also posed challenges to ensure that consultations captured the full range of socio-economic dynamics.

- Evolving socio-economic context**:**

Rapid changes linked to mining development, migration, and climate variability mean that some statistical datasets quickly become outdated. The 2025 update was therefore designed to capture recent dynamics and address observations made by IFC regarding the need for more current and representative data.

- Mitigation measures applied in 2025**:**

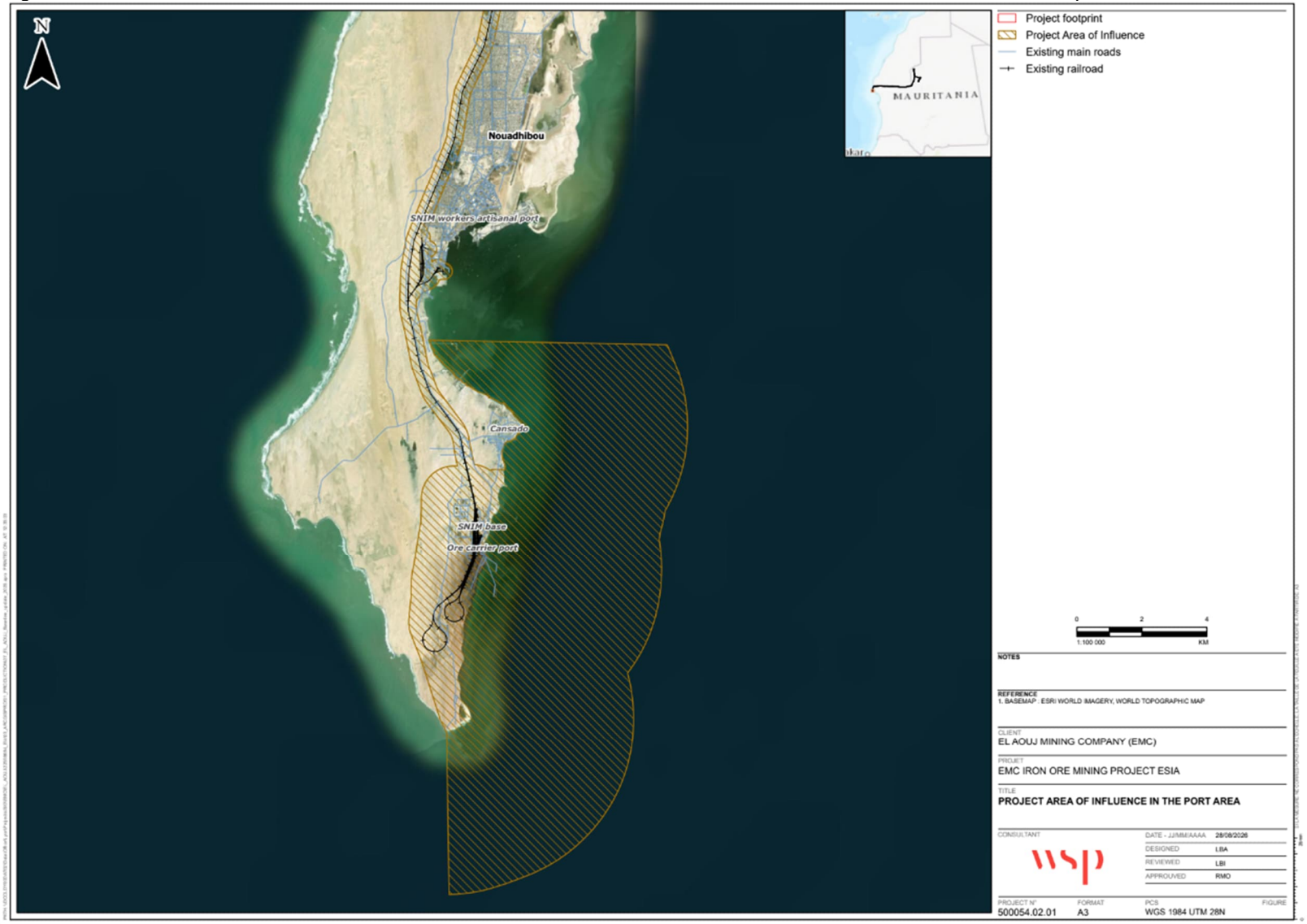
The 2025 consultations were carried out with standardized protocols, including defined participant selection criteria, structured group sizes (6–12 participants per FGD, although actual attendance sometimes exceeded this range), gender-sensitive facilitation, tailored thematic questionnaires, and participatory tools (mapping, seasonal calendars, oral histories). Consultations were also timed to coincide with relevant seasonal activities (salt collection, pastoral movements, water stress in oases). Systematic documentation (structured notes, anonymized participant lists, photographic evidence, participatory maps) and triangulation with institutional perspectives improved data quality and reliability.

This combined approach enabled the identification and compilation of demographic, economic, and social data available from national institutions, while capturing updated community perspectives. It also ensured that the baseline reflects current social and economic conditions, in line with international good practice.

8.2 Port Area

The mineral port of Nouadhibou will be used for the loading and export of iron ore from the El Aouj project to international markets. The project's area of influence is strictly limited to the perimeter of the mineral port, due to its exclusive role in the storage, handling and loading of ore from the El Aouj site. The port is situated about 7 kilometers south of Nouadhibou city, along Mauritania's Atlantic coast, within the Dakhlet Nouadhibou region. It is managed by SNIM, which is an important company in Mauritania's extractive industry. This section describes the social context in the port area, highlighting the socio-economic dynamics, existing infrastructure and community interactions related to port activities. Figure 8-3 shows the Nouadhibou port area, with the main social receptors identified in proximity to the port.

Figure 8-3: Area of Influence and the main social receptors in the port area



8.2.1 Population and Social Organisation

8.2.1.1 Population

The city of Nouadhibou is located in the Dakhlet Nouadhibou Wilaya (region) of Mauritania. Nouadhibou is the second most populated city in Mauritania after the capital Nouakchott. It is a major urban centre, serving as an administrative and economic hub with significant port-related activities that attract a diverse and growing population. According to the latest data from the General Population and Housing Census conducted by the National Agency for Statistics and Demographic and Economic Analysis (ANSADE) in 2025, the wilaya has a total population of 186,954 inhabitants, including 104,336 men and 82,618 women. The population density is estimated at 4.9 inhabitants per km². In addition, the average household size is estimated at 5.6 people.

The population of Nouadhibou is estimated at 173,525 inhabitants, including 77,650 women and 95,875 men. More than 60% of the population is under the age of 25. In 2013, the city had 118,167 inhabitants, comprising 50,892 women and 67,275 men. Over the last decade, the city of Nouadhibou has experienced rapid population growth, driven mainly by rural exodus and migration. Figure 8-4 illustrates the evolution of the population in Nouadhibou between 2013 and 2023 (ANSADE, 2018-2022).

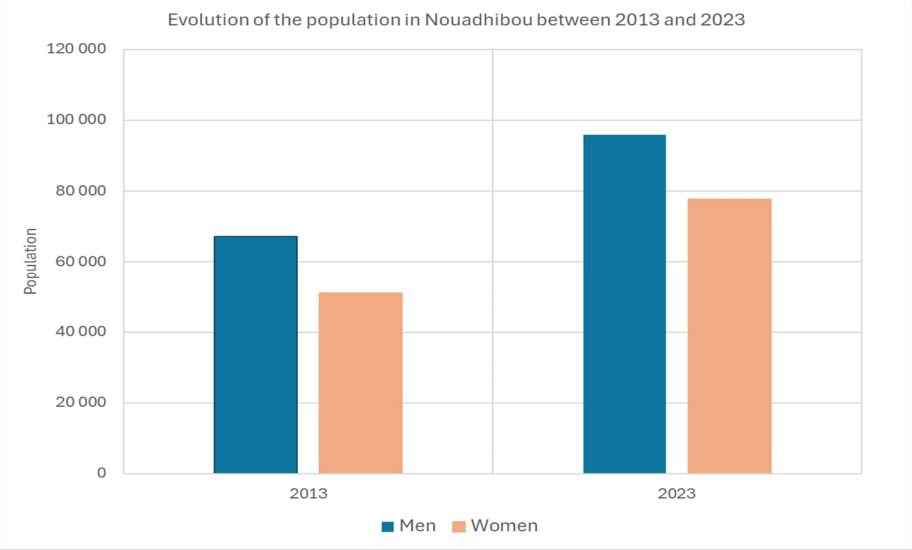


Figure 8-4: Evolution of the population in Nouadhibou between 2013 and 2023 (ANSADE, 2018-2022).

The graph illustrates significant population growth in the city of Nouadhibou, whose population increased from 118,167 inhabitants in 2013 to 173,525 inhabitants in 2023, representing an increase of nearly 47% over a ten-year period. According to the socio-economic survey conducted by ANTEGROUP in 2017 in the study area, the population structure by gender shows a strong male predominance, with 75% men compared to 25% women (ANTEAGROUP, 2017). This disparity can be explained mainly by migratory dynamics linked to the economic attractiveness of the area, which functions as an employment hub that mainly attracts male workers seeking professional opportunities.

8.2.1.2 Social organisation

The social organisation of Mauritania is shaped by a combination of ethnic, tribal and statutory factors, rooted in the country's nomadic traditions and Islamic heritage. The population is primarily composed by several socio-ethnic groups, including the Moors, Fulani, Soninke and Wolof. This ethnic diversity is accompanied by a linguistic plurality that shapes communication practices throughout the country. Arabic is the official language of Mauritania, while Hassaniya, a widely spoken Arabic dialect, is extensively used in everyday interactions. French is also used, particularly in administration, education, and business, making it an important functional

language in institutional and professional settings. Additionally, Pulaar, Soninke, and Wolof are recognized as national languages and remain essential means of communication within the various ethnic communities.

In Nouadhibou, the spatial distribution of the population remains uneven, with high density observed in the city center, where economic activities and essential services are concentrated. Urbanization is gradually expanding toward peripheral districts, which are experiencing rapid growth but often lack basic infrastructure and public services, particularly in sanitation, road networks, access to drinking water, and socio-community facilities.

At the local level, Nouadhibou hosts diverse West African migrant communities whose presence is closely linked to the port and maritime economy. According to ANSADE (2023), the city hosted 15,032 migrants in 2021. Their distribution by nationality, main reasons for migration, activity status and sectors of employment is summarised in Table 8-4.

Table 8-4: Migrant distribution in Nouadhibou (2021) source: (ANSADE, 2021)

Category	Main findings
Total migrants	15,032 persons
Nationality	Senegalese 48.7%; Malians 35.4%; Guineans 4.8%; Others (Gambians, Bissau-Guineans, Sierra Leoneans, Nigerians, etc.) 11.1%
Main reasons for migration	Lack of opportunities in country of origin 14%; Job offers 7%; Family reunification 7.4%
Activity status	Employed 39.6%; Self-employed 44.5%; Inactive 15.9%
Sector of employment	Fishing 26.6%; Construction 20.2%; Trade 14.3%; Catering 11.9%; Services (domestic/guarding) 8%

8.2.2 Women and Vulnerable Groups

The city of Nouadhibou, Mauritania's second largest urban center and a major economic hub due to its port activity, shows significant gender disparities. Nevertheless, women play an important role in the city's socio-economic life and make a notable contribution to the local community. Many women are engaged in informal economic activities such as street vending, fish selling at the port and in local markets, and fish processing through drying and smoking. Others are employed in fish processing plants, while some work at the SNIM site and in local industries.

However, their participation in socio-economic activities remains limited due to socio-cultural, economic and structural constraints.

- Limited access to education and information: Literacy and school enrolment rates in the region are generally low, with a pronounced gender disparity. Women, particularly those living in outlying neighborhoods and surrounding rural areas, have limited access to formal education. This situation limits their ability to access information, social services and economic opportunities. Furthermore, prevailing patriarchal social structures limit women's participation in decision-making processes at both household and community levels, thereby hindering their empowerment and access to financial resources. According to ANSADE, female literacy in Dakhlet Nouadhibou wilaya was 88.7% in 2019, slightly lower than that of men (90%). This was above the national female average (72.3%) and serves as a proxy benchmark for Nouadhibou city.
- Low economic participation: Women are under-represented in formal economic sectors. They are mainly active in informal or domestic activities, which are often unpaid. In the fishing sector, which is one of the economic pillars of the city, women are heavily dependent on men for access to resources and port infrastructure. They are subject to mobility restrictions that limit their direct involvement in fishing activities.

In Dakhlet Nouadhibou wilaya, only 22.2% of women of working age were economically active in 2019, compared to 62.2% of men. Female unemployment reached 19.3% in 2019, compared to 8.2% for men, while female youth unemployment (ages 14–35) stood at 28.2% compared to 17.2% among young men (ANSADE, Nouadhibou en chiffres, 2023). Women's participation is also concentrated in lower-value fisheries activities: between 2016 and 2021, 311 women were trained as fish processors, compared to thousands of men trained as artisanal fishermen (ANSADE, 2023). Female-headed households**:** According to the World Bank Gender Data Portal, between 20% and 25% of households in Mauritania are female-headed at the national level. While Nouadhibou-specific figures are not reported by ANSADE (2023), this benchmark indicates that a non-negligible share of households in the Port Area may be led by women, who often face limited economic opportunities and weaker social safety nets. Women face heightened vulnerability in the port area of Nouadhibou due to their structural dependence on men for access to fisheries and financial resources. This situation significantly limits their economic autonomy and their ability to fully participate in the city's economic activities.

- In addition to women, other vulnerable groups have been identified in the city of Nouadhibou: Unemployed youth, exposed to economic and social insecurity: According to World Bank World Development Indicators (ILO-modelled estimates, accessed via FRED), the youth unemployment rate (ages 15–24) in Mauritania was 23.5% in 2023 and 23.2% in 2024. While Nouadhibou-specific figures are not available, the city's dependence on fisheries and port-related activities suggests that fluctuations in these sectors directly affect opportunities for young people in the Port Area.
- Elderly people without family support, often isolated and lacking access to basic services: Although Nouadhibou-specific statistics are not available, elderly persons are recognised in Mauritania's social protection strategy (World Bank, 2025) as a particularly vulnerable group.
- People with disabilities, facing physical and institutional barriers: According to the Disability Data Initiative, based on the Mauritania Demographic and Health Survey (2019–2021), 27.4% of adults aged 15 and over in Dakhlet Nouadhibou reported at least one functional difficulty (seeing, hearing, mobility, cognition, self-care, or communication), compared to 24.8% at the national level.
- Migrants, often excluded from social protection schemes and economic integration opportunities.

The city of Nouadhibou is considered a prime destination for foreign migrants seeking employment, due to the many economic opportunities it offers, but also as a transit point to Europe, given its geographical location on the Atlantic coast. As presented above in Section 8.2.1.2, the International Organization for Migration (IOM), in collaboration with the National Agency for Statistics and Demographic and Economic Analysis (ANSADE), estimated that Nouadhibou hosted 15,032 migrants (IOM, 2022).

8.2.3 Economic Activities and Livelihoods

The city of Nouadhibou is characterized by diversified economic activity, structured around strategic sectors such as fishing, trade, maritime transport and significant industrial activity. Fishing remains one of the essential pillars of the local economy, both in terms of job creation and the generation of export-related income. Trade and related services also play a decisive role in the urban economic dynamic, reinforced by Nouadhibou's geographical position, which makes it a regional trade hub. Maritime transport, supported by the presence of the port of Nouadhibou, is a key infrastructure facilitating the export of fishery and mining products, as well as the import of consumer goods.

8.2.3.1 Trade

Trade is an important part of the local and regional economy and plays a key role in supporting local businesses and stimulating economic growth. Commercial activities are divided between formal and informal sectors. The formal sector encompasses general trade, import and export, grocery stores, construction material sales, open-

air markets and electrical appliance sales. The informal sector, which is also well-developed, includes small businesses, street vending, the retail sale of fish products and kiosks.

The city currently has a total of seven markets: a large central market located in the heart of the city center, as well as six neighborhood markets spread across the northern area. In addition, there are a multitude of shops, mainly located near large shopping centers and along the main thoroughfares (ANTEA GROUP, 2017). A variety of foodstuffs are sold, including fish (fresh, dried and processed), agricultural products (vegetables, fruit, cereals), basic commodities (flour, rice, sugar) and various everyday consumer goods.

According to ANSADE (Nouadhibou en chiffres, 2023), commerce and services together employed 13,421 people in Nouadhibou in 2019, representing 27.4% of total employment in the wilaya. Street vending and small-scale trading remain particularly important for women, who are over-represented in informal food retail and processing activities.

At the same time, livestock trading is an important complementary activity. It contributes not only to supplying the local market and food security, but also to generating income for some households. Although largely informal, this activity plays a significant role in the economic resilience of communities. In 2019, livestock commerce accounted for around 6% of Nouadhibou's informal market sales, reflecting its continued contribution to household subsistence strategies (ANSADE, 2018-2022).

These commercial activities play an important role in improving living conditions and socio-economic development for many households in Nouadhibou.

8.2.3.2 Fishing

The Bay of Nouadhibou has abundant fishery resources. It is the main landing site for artisanal fishing in Mauritania and a hub for the frozen seafood industry, particularly octopus, as well as to produce fishmeal and fish oil. The fishing sector is divided into two main categories: artisanal and industrial (ANTEA GROUP, 2017).

In 2024, the wilaya of Dakhlet Nouadhibou granted 1,081 industrial fishing licenses. The sector employs a large workforce, with 10,002 seafarers working in industrial fishing. At the same time, artisanal fishing is a major source of livelihood and employment. Over the same period, 8,596 artisanal fishing licences were granted, with 49,840 artisanal fishermen operating in the region (ANSADE, 2025). These indicators demonstrate the strategic importance of the fisheries sector in the local economy, both in terms of job creation and its contribution to exports and household income. The main data on fisheries production for the year 2024 are presented in Table 8-5.

Table 8-5: Segment captures in the Wilaya in 2024 source: (ANSADE, 2025)

Captures	2024
Pelagic	637 807 individuals
Demersal	27 512 individuals
Cephalopods	15 197 individuals
Crustaceans	4 862 individuals
Total	685 378 individuals

In 2023, the artisanal and coastal fleet comprised 8,430 vessels, 95% of which were dedicated to artisanal fishing, confirming the predominance of this segment in the national fisheries sector. Furthermore, 57% of this fleet was based in Nouadhibou, highlighting the city's key role as a major maritime hub. Artisanal production reached 339,207 tonnes, representing 40% of Mauritania's total fisheries production, estimated at 845,627 tonnes for the same year. This significant contribution highlights the economic weight of the artisanal sector in

the fisheries value chain. In Nouadhibou, coastal and artisanal fishing is mainly carried out along the coastline, which is characterized by shallow waters and near to the shore. It most often takes place in waters less than 20 m deep, where the seabed is accessible to small boats, and generally less than 6 nautical miles from the coast.

Nouadhibou was also home to 7 of the 20 ice factories in the country, reinforcing its strategic position in fish preservation, distribution and marketing activities. These infrastructures play an essential role in preserving the quality of fishery products and securing supply chains.

Furthermore, women play a central part in the sector. Nationally, they represent 76% of fishmongers and 71% of artisanal processors, with a high concentration of these activities in Nouadhibou. Their contribution is essential, both for the promotion of products and for the economic revitalisation of local communities. Fish caught in the Nouadhibou area are destined for international export, regional trade and local markets. Fishing provides a livelihood and income for local communities, while also providing a significant source of employment.

The Dredging Project for the channel of the mineral port of Nouadhibou, ESIA (ANTEAGROUP, 2017) reported that artisanal fisheries in Nouadhibou rely on access to the port and to ice factories located near the mineral port. However, their operations are constrained by restricted navigation zones and industrial port traffic. Artisanal landing sites are located mainly along the Bay of Nouadhibou, near Cansado and the city shoreline, in proximity to the mineral and artisanal ports.

At the same time, industrial fishing is mainly carried out by foreign fleets (particularly Chinese and Turkish), using freezer vessels or factory ships, often under fishing agreements concluded with the Mauritanian government. In 2022, 1,080 industrial fishing licenses were issued, employing 11,992 sailors, with a total catch of 649,777 tonnes (ANSADE, 2018-2022), Table 8-6.

Table 8-6: Comparative overview of fisheries indicators (2022 vs. 2023) - (ANSADE, 2018-2022)

Indicator	2022 (ANSADE)	2023 (Gov. Mauritania, IMROP, ANSADE, IRENA)
Artisanal fishing licenses	7,991	–
Active artisanal seafarers	47,172	–
Artisanal fleet units	–	8,430 (95% artisanal)
Share of fleet in Nouadhibou	–	57%
Artisanal production	357,685 t	339,207 t
Industrial fishing licenses	1,080	–
Industrial seafarers	11,992	–
Industrial production	649,777 t	–
National fisheries production	–	845,627 t
Ice factories in Nouadhibou	–	7 of 20 national
– = No information is available; t = tons		

The analysis of the marketing of Mauritanian fishery products reveals three main types of distribution channels: the short circuit, the intermediate circuit, and the long circuit (ANTEA GROUP, 2017).

- The short circuit mainly serves the local market. It is divided into two sub-circuits: on one hand, the intra-peri urban circuit of large coastal cities, and on the other hand, the inland circuit that supplies the rest of the country. The first focuses primarily on the sale of fresh fish, usually whole. Nearly three-quarters of the fresh fish consumed locally are sold in Nouakchott and Nouadhibou.

- The intermediate circuit extends across the West African sub-region. It mainly involves salted and dried fishery products, but also frozen products intended for export to neighboring countries.
- The long circuit targets international markets. It includes processed, frozen, salted-dried, or transformed products. These products can remain in the commercial circuit for a long period, ranging from two weeks for smoked products to several months for salted-dried or frozen products, before being exported.

As a result of these regulatory restrictions, artisanal boats are only permitted to operate outside the areas reserved for industrial maritime traffic, which tends to concentrate their activities in fishing zones located further north or south along the Baie du Lévrier. In practice, this spatial configuration leads to frequent proximity between cargo vessel navigation channel and the pathways followed by artisanal pirogues (AMI, 2020).

Media sources have reported several navigation incidents in recent years involving interactions between industrial vessels and artisanal boats in the waters around Nouadhibou. These include offshore sinkings reported in 2023 resulting in the loss of artisanal fishermen, as well as collisions documented in 2022 and 2024 involving small coastal craft and larger industrial vessels. More recently, in September 2025, a serious collision between a Mauritanian vessel and a Russian vessel off the coast of Nouadhibou resulted in five Mauritanian fishermen reported missing and seven injured, triggering search-and-rescue operations and a formal investigation by the authorities (CHARTIER., 2025). Although these accounts do not constitute an official accident database, they indicate that coexistence between dense artisanal fishing activity and industrial maritime traffic can be challenging in the bay (MADAR, 2025).

As neither publicly accessible datasets nor the secondary sources reviewed provide information on vessel routes, traffic patterns or artisanal pirogue movements around the Nouadhibou port, and no primary data collection was undertaken in this area as part of the baseline update, these reported incidents are used as contextual baseline information. They support an understanding of broader navigation conditions in the Baie du Lévrier and the types of navigation-related risks faced by artisanal fishing communities in the wider coastal area. Nonetheless, as these events lie outside the boundaries of the Project's Social Area of Influence, they are considered contextual baseline information rather than indicators of Project-specific conditions.

Fishing areas are established in accordance with Decree No. 2015-159, issued on October 1, 2015. Article 41 of this decree prohibits fishing in port security areas defined by the Ministry of National Defense under Decree No. 2010/010/PM of January 20, 2010, which created security areas for the ports of Nouakchott and Baie du Lévrier in Nouadhibou. Article 41 also specifies that fishing activities are prohibited within access channels and port facilities.

The channel of the Nouadhibou mineral port is therefore restricted to fishing activities. This regulated area includes the iron ore loading docks operated by SNIM, as well as vessel entry and exit routes for commercial maritime traffic. This measure aims to prevent the risks associated with the coexistence of fishing activities and industrial maritime traffic in the area (Journal-Officiel, 2015). The project's area of influence in the Nouadhibou zone is limited to the mineral port, which is part of the fishing restriction zone due to the channels and port facilities in place.

The Figure 8-5 show the areas of interest for coastal fishing. This figure provides a detailed representation of fishing-restricted zones within Mauritania's Exclusive Economic Zone (EEZ), with a particular focus on Nouadhibou, the country's principal fishing hub. It clearly distinguishes the different zones where fishing is restricted according to the type of activity, in accordance with national regulations.

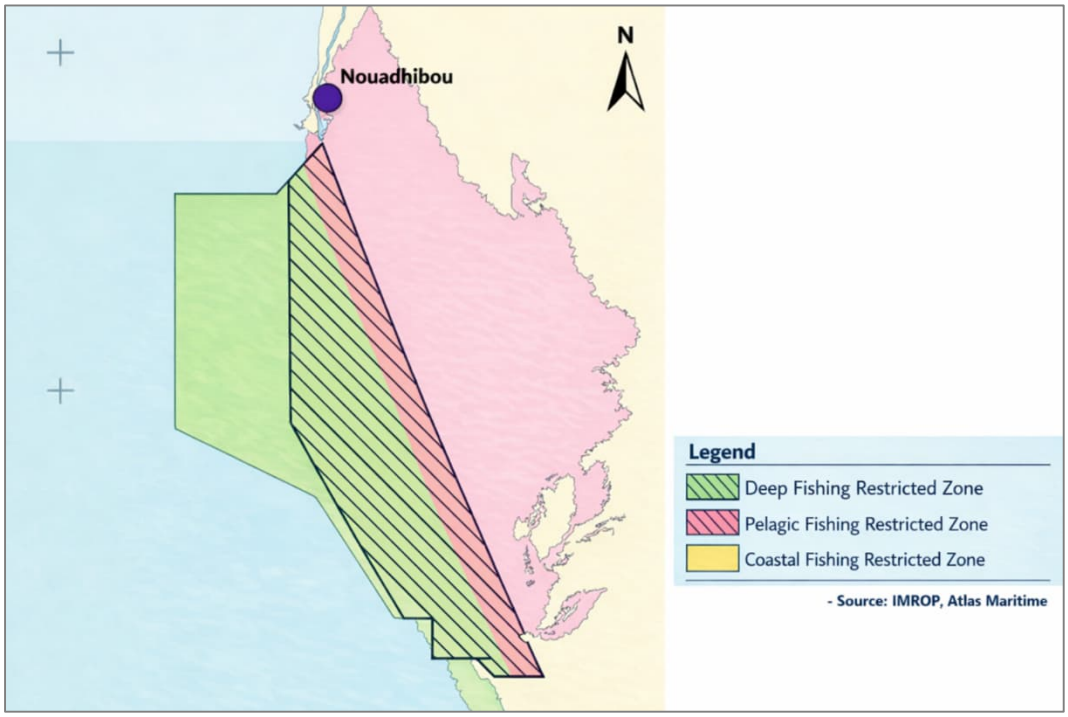


Figure 8-5: Area of interest for coastal fishing in Mauritania (source: ANTEA GROUP, IMROP)

8.2.3.3 Agriculture

The city of Nouadhibou, located in the extreme north-west of Mauritania, has challenging natural conditions due to its arid desert climate, with very low annual rainfall (less than 50 mm). This climate does not allow for large-scale agriculture and is a major obstacle to farming for the inhabitants of the wilaya (CERAI, 2016).

Despite these limitations, the subsistence farming has developed in the outlying neighborhoods, mainly in the form of family gardening and greenhouse vegetable growing. Crops are diversified, with species such as tomatoes, eggplants, beetroot and lettuce grown throughout the year. Arboriculture is also practiced, with a predominance of date palms, which are well suited to local conditions. According to ANSADE (Nouadhibou en chiffres, 2023), the cultivated area for vegetables in the wilaya reached 48.3 hectares in 2021, producing about 780 tonnes, mainly tomatoes, aubergines, lettuce and beetroot. These activities are concentrated in peri-urban gardens around Nouadhibou and in surrounding zones such as Boulenouar and Chami, which supply food to the city and its port markets. In historical terms, market gardening in Nouadhibou expanded alongside urban growth and rising demand for fresh produce. By 2017, over 450 farmers were registered in the wilaya and organized into 75 cooperatives overseen by the Union of Market Gardeners' Cooperatives of Nouadhibou (ANTEA GROUP, 2017).

Historically, market gardening in Nouadhibou has developed in parallel with urban expansion and increased demand for fresh produce. As of 2017, more than 450 farmers were registered within the wilaya, organized into 75 cooperatives supervised by the Union of Market Gardeners' Cooperatives of Nouadhibou. Despite constraints imposed by arid conditions, agriculture remains an important supplemental source of food and income for households located in peri-urban areas (ANTEA GROUP, 2017).

8.2.3.4 Livestock

Due to its geographical location, which is more favourable to fishing and import-export activities in the port, livestock farming remains underdeveloped in the Nouadhibou region. It is mainly a subsistence activity practiced

by nomads, semi-nomads, and rural and peri-urban populations, particularly in areas such as Boulenouar, Inal, and the Chami region (Ministère de l'agriculture, 2017). Nevertheless, livestock farming continues to play a decisive role in food security and income generation for rural and peri-urban households. Livestock flows regularly converge on local markets and slaughterhouses in Nouadhibou, contributing to meat supplies and the economic vitality of the pastoral sector.

The livestock population of the Nouadhibou wilaya for the year 2024 is estimated at 351 cattle, 16,043 goats, 28,757 camels, 15,027 sheep, 12 horses, 265 donkeys and 8,200 poultry. These statistics reflect the predominance of camelids and goats, which are characteristic of the country's arid and semi-arid areas. Livestock farming is therefore an important source of livelihood, particularly for nomadic and semi-nomadic communities. Furthermore, no data on transhumance flows was available for the years 2024 and 2025, which limits the analysis of seasonal livestock movements and their impact on pastoral resources (ANSADE, 2025). Transhumance flows remained relatively limited due to the region’s arid conditions.

Livestock farming plays a complementary role in the local economy, particularly through the supply of meat (goats, sheep, poultry) to Nouadhibou markets and as an additional source of household income, despite natural constraints such as aridity and lack of pasture.

8.2.3.5 Port

The port of Nouadhibou is a major logistics infrastructure and a strategic lever for Mauritania's economic development. It remains a key hub for Mauritania's economy, particularly for mineral exports and fishing activities. Current data shows active maritime traffic with several ships present but limited by specific port capacities. Located on the Atlantic coast in the north-west of the country, it performs essential functions in the following areas:

- The export of iron ore, mainly operated by the Société Nationale Industrielle et Minière (SNIM), via facilities at the mineral port located south of the city of Nouadhibou.
- Fishing activities, including artisanal and industrial fishing, with infrastructure for landing, processing and storing fish products.
- Regional and international maritime transit, thanks to its geostrategic position and its capacity to accommodate commercial vessels, contributing to the integration of the city of Nouadhibou into global logistics chains.

The city of Nouadhibou has several strategic port infrastructures, divided according to their functional purpose:

- The Autonomous Port of Nouadhibou: Mauritania's main commercial port, located in the center of the city, it is a strategic location for maritime activities.
- The artisanal port: also located in the city center, it is dedicated to artisanal fishing activities.
- The mineral port: located about 10 km south of Nouadhibou city center, it specializes in the export of SNIM iron ore.
- The oil port: located near the mineral port, it is used for the reception, storage and shipment of petroleum products.

The Autonomous Port of Nouadhibou (PAN) plays a key role in both the local and national economy as Mauritania’s main fishing port. Equipped with modern infrastructure tailored to the preservation of fishery products, it is a vital link in the sector’s value chain. The port offers 700 meters of quay equipped with three ice distribution tunnels, facilitating the preservation and quality of catches. Ship repair workshops and dry dock

facilities, including floating docks of 300 and 1000 tons (ANTEAGROUP, 2017), are also available at the port, providing essential technical services to the fleet and generating both direct and indirect employment.

In addition to boosting the local economic fabric, the Autonomous Port of Nouadhibou makes a significant contribution to state revenues through port fees, taxation, and related activities, thereby reinforcing its strategic role in the country's economic development.

8.2.3.6 SNIM Activity

The Société Nationale Industrielle et Minière (SNIM) exports iron ore from the Nouadhibou mineral terminal, a strategic infrastructure at the heart of Mauritania's economy. In 2023, this activity accounted for approximately 9% of gross domestic product, 14% of public revenue, and 37% of the total value of national exports.

SNIM's operations employ a large workforce, both in its industrial and port facilities, and generate many jobs in the region. The company also contributes to administrative employment, particularly through its head office in Nouadhibou. In 2023, SNIM had 6,500 employees and exported more than 14 million tons of iron ore to the international market (AfBD, 2024).

As part of its corporate social responsibility policy, SNIM has established the SNIM Foundation, which is responsible for implementing the company's social initiatives. This initiative aims to facilitate a structured framework for collaboration between the company and local communities, contributing to the socio-economic development of the city of Nouadhibou.

8.2.3.7 Employment

According to data from ANSADE between 2018 and 2022, the wilaya of Dakhlet Nouadhibou has a relatively diversified economic structure, including the fishing, mining, port and commercial sectors. However, the unemployment rate remains high, particularly among young people and women. In terms of employment in the city of Nouadhibou, the fisheries sector (small-scale and industrial fishing) is the main source of job creation in the area. It is followed by the mining industry, which is also a significant source of employment. The population of working age in the wilaya of Dakhlet Nouadhibou is estimated at 128,278. The demographic structure remains largely dominated by youth, giving the region significant labour potential. However, the unemployment rate for young people aged 14 to 35 stands at 34.6%, illustrating significant pressure on the labour market (ANSADE, 2025).The data from the socio-economic survey conducted by ANTEGROUP in 2017 in the Nouadhibou area, indicate that the average monthly income per household is estimated at MRU 14,320, which corresponds to an average annual income of MRU 171,843.

This income level places Nouadhibou above the national average (MRU 12,000 and MRU 13,000 per month at that time), reflecting a higher level of local economic dynamism than that observed in other areas of the country. More recent World Bank poverty profiles (2025) confirm that Nouadhibou remains one of Mauritania's least poor regions, although significant intra-urban disparities persist.

8.2.3.8 Tourism

Nouadhibou's geographical location and climate make it a preferred destination for tourists. Although tourism is not yet a major economic driver at the national level, it plays a significant role in certain local micro-sectors, particularly through community-based ecotourism.

The city boasts numerous natural resources and recognized tourist attractions, which represent a significant potential for economic development in the region. It is home to the Banc d'Arguin National Park, a UNESCO World Heritage Site, renowned for its unique landscapes combining sandbanks and wild islands. This exceptional site offers an unforgettable experience for nature lovers. Nouadhibou also features beautiful beaches, such as the Baie de l'Étoile and the Baie du Lévrier, ideal for swimming and relaxation. About 20 KM south of the city lies Cap Blanc, a spectacular site overlooking the Atlantic Ocean, known for its impressive cliffs

and the remains of a stranded cargo ship. This location is also famous for sightings of monk seals, a rare species. Moreover, the city has several private hotel infrastructures that welcome a growing number of visitors each year.

In addition, other economic activities in the city include public administration (national and local), banking, and insurance services. These services play a supporting role in local economic operations, particularly in the areas of logistics, maritime trade, and financial flow management.

8.2.4 Social Infrastructure and Services

8.2.4.1 Water

Access to drinking water in Nouadhibou remains limited due to the geographical context, which lacks surface water resources, freshwater and groundwater that can be exploited on a large scale. The supply relies mainly on the Boulenouar catchment area, located about 90 km from the city. This site has around 20 boreholes, 16 of which are in service, with an estimated daily production of 12,000 m³ (ANTEA GROUP, 2017).

The water is transported by pipeline to the Nouadhibou pumping station, where it is treated to make it drinkable and then distributed through the network managed by the Société Nationale de l'Eau (SNDE), which supplies connected households.

According to 2019 EPCV data, 95.6% of the urban population in Nouadhibou has access to drinking water, compared to 3% in rural areas (ANSADE, 2020) ANSADE (2023) also highlights that industrial demand for water in Nouadhibou has grown, particularly from the fishing industry and port-related services, increasing competition for limited supply.

The city center and administrative areas generally have better access to the network. In contrast, in outlying areas, residents often depend on tanker trucks, community fountains or informal supply systems. In addition to domestic use, water is also used for industrial purposes, particularly in the fishing industry and agriculture, especially market gardening.

8.2.4.2 Electricity

The Mauritanian Electricity Company (SOMELEC) serves as the principal entity responsible for the production and distribution of electricity throughout Mauritania. In Nouadhibou, electricity generation is primarily conducted via thermal power plants utilizing diesel, fuel oil, and gas oil. The city’s power supply is provided by a thermal facility with an installed capacity of 38.5 MW (ANTEA GROUP, 2017).

In response to growing demand for electricity and the need to diversify energy sources, a large-scale strategic project is underway. It involves accelerating the construction of a high-voltage power line connecting Nouakchott to Nouadhibou. The project aims to enable the exploitation of the Boulenouar wind farm, which has an estimated installed capacity of 100 MW. Its commissioning, expected before the end of the year, should help secure Nouadhibou's electricity supply in the long term, while reducing dependence on fossil fuels (SNIM, Notice d'Impact Environnemental et Social (NIES) des travaux d'extension des infrastructures du chemin de fer, 305 pages., 2024).

According to data from the Permanent Survey on Household Living Conditions (EPCV 2019), access to electricity is almost universal in urban areas, with a coverage rate of 99.4%. However, this rate drops dramatically in rural areas, reaching only 19.5%, highlighting significant regional disparities in access to energy.

At the same time, the Société Nationale Industrielle et Minière (SNIM), a key player in the regional economy, has its own electricity production units in Nouadhibou to meet the specific needs of its industrial facilities. These units include:

- A wind farm with a capacity of 4.5 MW.
- A thermal power plant integrated into the refinery, with a capacity of 7 MW.

These facilities enable SNIM to ensure a certain degree of energy independence for its operations, while contributing to the overall effort to diversify production sources.

8.2.4.3 Health

Nouadhibou has a relatively well-structured healthcare system composed of several types of medical facilities. The city includes two hospitals, a regional hospital and a polyclinic, which provide referral services and specialized care. In addition, eleven health centers and five health posts have been identified, ensuring local-level healthcare coverage across the entire wilaya. The Nouadhibou Regional Hospital is the main hospital in the Dakhlet Nouadhibou wilaya. In 2024, the main diseases reported in the wilaya reflect an epidemiological profile dominated by diarrheal diseases, respiratory infections, and chronic conditions. Morbidity data indicate a total of 2,330 cases of diarrhea, making it one of the most common reasons for medical consultations. Malaria remains present in the region, although at low levels, with 28 confirmed cases and 4 severe malaria cases reported during the period. Non-communicable diseases also remain significant, with 346 identified cases of hypertension. Acute respiratory infections led to 3,739 consultations, highlighting ongoing health risks linked to environmental factors (ANSADE, 2025).

8.2.4.4 Education

Mauritania is engaged in an ambitious education reform through the National Education Sector Development Program (PNDSE III) for the period 2023–2030. This program aims to strengthen basic education, promote primary education and improve girls' access to education, in line with UNESCO recommendations (UNESCO, 2022).

- Public Primary Education

The city of Nouadhibou has 36 public primary schools. These facilities accommodate a total of 19,150 pupils, including 9,306 boys and 9,844 girls. This level of enrolment reflects a strong demand for primary education and highlights the need to maintain, and possibly expand, school capacity and pedagogical resources to effectively meet demographic growth and learning needs.

- Public secondary education is provided through;
- 4 lower secondary schools (collèges); and
- 6 upper- secondary schools (lycées).

These institutions serve a total of 9,048 students, including 4,198 boys and 4,850 girls. This educational infrastructure helps ensure significant secondary-level coverage at the local level. Compared to national averages, Nouadhibou records higher enrolment rates, particularly at the primary level where gender parity has largely been achieved. At secondary level, however, girls' participation remains below that of boys. Despite this relative advantage, challenges remain. These include overcrowded classrooms, shortages of teachers (especially in mathematics and science), and an uneven distribution of schools, particularly in newly established peri-urban settlements (ANTEA GROUP, 2017; ANSADE, 2023).

Household responsibilities and domestic labour are cited among the leading causes of school absenteeism for girls in Mauritania. A World Bank youth policy note (2024) found that among adolescents aged 12–16, 32% of girls dropped out due to early marriage or pregnancy, compared to 21% of boys leaving for economic reasons. Financial barriers also weigh heavily: the cost of school materials and uniforms can represent 10–15% of annual household expenditures in poorer families, disproportionately affecting migrant households in Nouadhibou (UNHCR, 2023; Columbia SIPA, 2022).

Mauritania applies a bilingual education system, with Arabic as the language of instruction at the primary level and French introduced progressively in later primary years and throughout secondary education. This policy can create learning challenges in Nouadhibou, where students and teachers with limited proficiency in French may experience difficulties in comprehension and progression. UNICEF (2022) reported that less than 40% of primary teachers in Nouadhibou had received formal training in bilingual pedagogy, which constrains effective curriculum delivery. Infrastructure indicators also highlight deficits: Hamap Humanitaire (2023) documented that in eight Nouadhibou secondary schools, the average ratio was one functional toilet per 200 pupils, compared to the international benchmark of one per 60. This situation particularly affects girls' attendance during adolescence. More broadly, IIEP-UNESCO (2022) reported that 47% of schools in Mauritania lack adequate water and sanitation facilities, and 35% lack electricity.

Administrative barriers also persist in Mauritania, with the European Country of Origin Information Network (ECOI, 2022) estimating that around 8% of children nationally are unable to enrol at the correct level due to missing birth certificates or school records.

The city also has several technical and vocational training centers, which play a vital role in developing local skills:

- The IMROP (Mauritanian Institute for Oceanographic Research and Fisheries);
- The Naval Academy;
- The Technical Training Centre in Nouadhibou;
- The Maritime School.

8.2.4.5 Housing

Nouadhibou is Mauritania's second largest city and a rapidly growing urban area, mainly due to the attractiveness of its economic activities such as fishing, trade and the presence of a free trade zone. The urban fabric is mainly composed of permanent buildings constructed of cement, concrete or breeze blocks, often painted in light colors (sand, off-white). Some buildings have several floors, with flat roofs and balconies.

In the outlying neighborhoods, there are both solid buildings and more precarious dwellings made of clay, sheet metal or unfinished breeze blocks. In rural areas, however, housing generally consists of mud houses and seasonal camps, often occupied by nomadic populations.

8.2.4.6 Transport

The city of Nouadhibou has several transport infrastructures: roads, railways, an airport and a port, which supports its economic development and facilitates national and international trade.

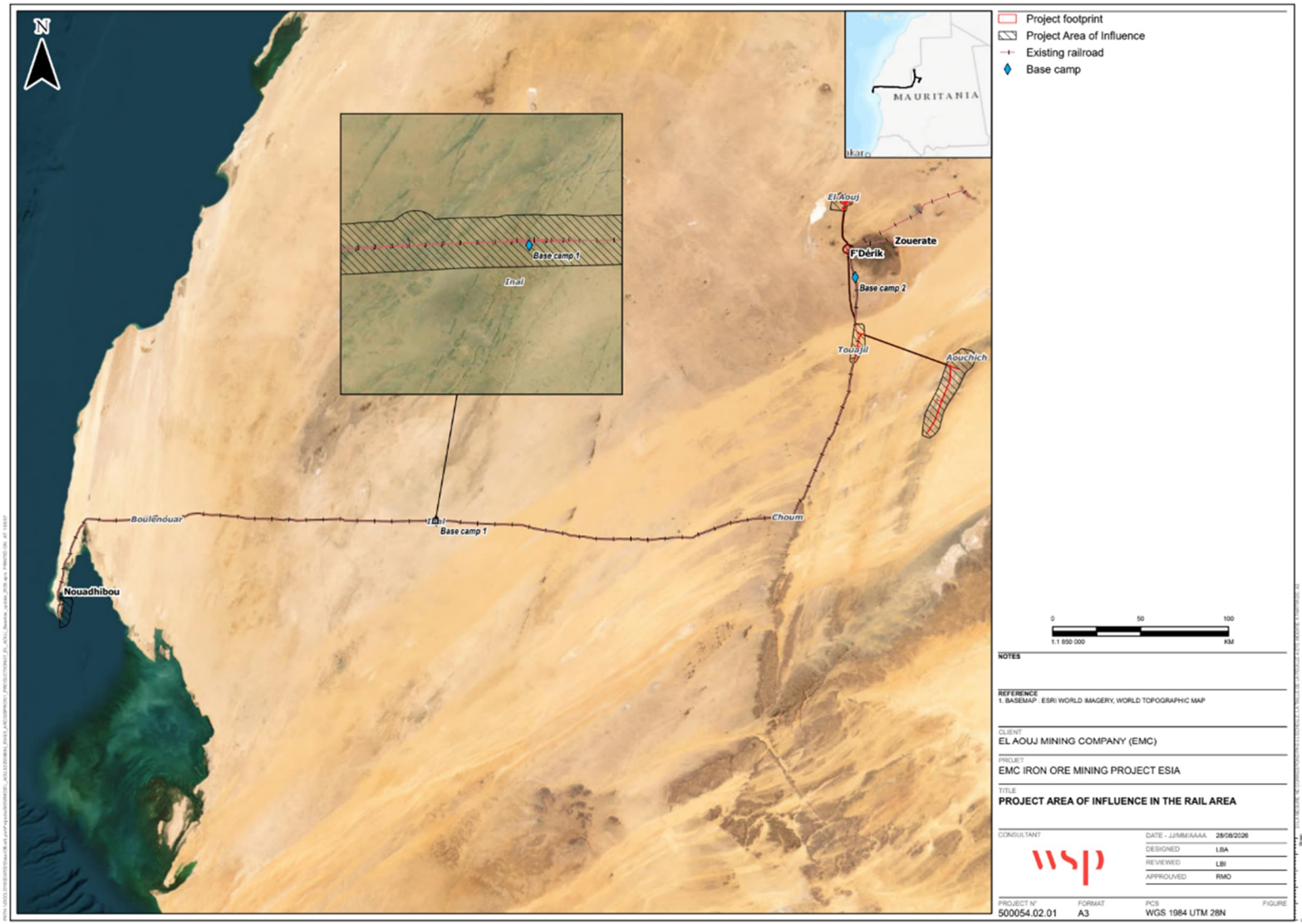
- Road network: Nouadhibou is connected to Nouakchott and neighbouring regions by the RN2 national road. This paved road stretches approximately 470 km from Nouadhibou to Nouakchott and plays an essential role in the transport of people and goods. Road transport remains the most widely used means of transport for the local population;
- The railway is the main means of transport for iron ore in Mauritania. It is a single-track line 704 kilometres long, linking the iron mines of Zouerate to the mineral port of Nouadhibou. This infrastructure is operated by the Société Nationale Industrielle et Minière (SNIM). In addition to transporting ore, the line is also used for passenger transport, providing regular services between the towns of Zouerate, Fderîck, Choum and Nouadhibou (SNIM, Notice d'Impact Environnemental et Social (NIES) des travaux d'extension des infrastructures du chemin de fer, 305 pages., 2024);

- Airport: Nouadhibou International Airport handles commercial flights to Nouadhibou and offers regular connections to the capital Nouakchott, the city of Zouérate and other international destinations;
- Maritime: the port of Nouadhibou includes several terminals namely a mineral port, an autonomous port, a traditional port and an oil port. It plays a strategic role in iron ore exports, fishing activities and national and international maritime trade.

8.3 Rail Area

The railway between F'Derik and Nouadhibou will be used to transport iron ore extracted from the El Aouj mine to the mineral port of Nouadhibou for shipment abroad. The project's area of influence is limited to the railway footprint and the social receptors located in the immediate surroundings of the rail area. The railway between F'Derik and Nouadhibou crosses two wilayas: Tiris-Zemmour and Dakhlet-Nouadhibou. This section describes the social baseline along the railway zone, taking into account demographic dynamics, lifestyles, local economic activities and existing community interactions around the corridor. Figure 8-6 shows the route of the railway between Zouerate and Nouadhibou, as well as the main social receptors identified along the railway.

Figure 8-6: Area of Influence and the main social receptors along the railway between F'Derik and Nouadhibou



8.3.1 Population and Social Organisation

8.3.1.1 Population

Most of the population living along the railway line is concentrated in the two main urban centers, Nouadhibou and F'Derik, which serve as the economic and social hubs of the railway corridor. The remaining population is distributed across smaller localities, including Touajil, Choum, and Boulenouar, which act as territorial relay points along the corridor. In addition, a significant portion of residents live in seasonal nomadic camps, particularly in the Inal area, where population movements are closely linked to pastoral activities.

Demographic data from the various localities were collected by ANSADE. The population distribution and its evolution between 2013 (ANSADE, 2020) and 2023 (ANSADE, 2023) are summarized in the Table 8-7 below.

Table 8-7: Evolution of the population along the railway between 2013 and 2023 (ANSADE, 2018-2022).

Localities	2013		2023	
	Male	Female	Male	Female
Nouadhibou	67 275	50 892	95 875	77 650
Boulenouar	1 487	1 132	1946	1423
Inal	190	146	134	49
F'Derik	2 545	2 170	9 619	2 004
Touajil	-/-	-/-	-/-	-/-
Choum	-/-	-/-	1131	1037
-/- = no data.				

8.3.1.2 Social organization

Mauritanian communities are composed of several socio-ethnic groups, including the Moors, the Fulani, the Soninke, and the Wolof. This sociocultural diversity is accompanied by linguistic plurality that is deeply rooted in everyday practices. Arabic is the country's official language, while Hassaniya (the local Arabic dialect) is widely used in oral communication. French also holds an important place in administration, education, and business, complementing the other national languages, notably Pulaar, Soninke, and Wolof, which are commonly spoken within their respective communities. This linguistic and cultural diversity plays a key role in social dynamics, modes of communication, and community interactions throughout the country.

8.3.2 Women and Vulnerable Groups

Women play a significant role in the local economy within the railway area between Nouadhibou and F'Derik. They are actively involved in several productive sectors, including local trade, fish processing and various craft activities such as milk processing, weaving and the manufacture of traditional objects. Despite this essential contribution, their economic participation remains limited by major structural obstacles. They have restricted access to credit, rarely receive appropriate technical assistance and often live in isolated areas, whether in rural localities or temporary camps. Added to this are socio-cultural constraints that reduce their influence in decision-making processes. As a result, women have few employment opportunities and often remain economically dependent on men, which leads to them being classified as a vulnerable group.

Other population groups are also considered vulnerable along the railway corridor. These include households living in the immediate vicinity of the railway line, livestock farmers and herders, unemployed young people face difficulties in entering the labour market due to the lack of local economic opportunities. Elders without family

support, people with disabilities and individuals suffering from chronic illnesses or poor health are also groups requiring special attention.

8.3.3 Economic Activities and Livelihoods

8.3.3.1 Trade

In the rail area, trade is conducted both formally and informally, with dynamics that vary depending on the localities crossed by the railway. General trade relies mainly on shops, open-air markets and import-export activities fuelled by the movement of goods along the railway line. This commercial fabric is particularly active in urban centers. Small trade, meanwhile, is characterized by street vending, kiosks, and retail trade along roadsides or near train stations and stops. These informal activities, often carried out by families or young people, are an essential source of income for many households. The products sold in the region come mainly from Nouadhibou, which serves as a major logistics hub. These include milk, rice, pasta, mineral water, and fruit and vegetables.

The railway plays a central role in the commercial vitality of the area. In addition to transporting ore, trains are used to transport goods between different localities. Traders use empty wagons on the return journey to transport various products, including fish, agricultural products and foodstuffs.

In some rural areas along the railway, improvised train stops are used by local people to trade goods or provide informal passenger transport. Although irregular, these practices demonstrate the importance of the railway as a means of economic and social exchange in a region where transport alternatives remain limited (SNIM, Notice d'Impact Environnemental et Social (NIES) des travaux d'extension des infrastructures du chemin de fer, 305 pages., 2024).

8.3.3.2 Agriculture

In northern Mauritania, agriculture is of the oasis type due to climatic and water constraints that limit large-scale cultivation. Oases play a central role in the local economy, particularly in the wilayas of Adrar and Tiris Zemmour. They enable the production of dates, as well as fruit and vegetables grown in a traditional agroecological system combining palm trees, fruit trees and food crops on the same plot of land (SNIM, Notice d'Impact Environnemental et Social (NIES) des travaux d'extension des infrastructures du chemin de fer, 305 pages., 2024).

8.3.3.3 Pastoralism activities

Pastoralism is one of the main economic activities in the regions crossed by the railway line linking F'Derik, Zouérate, Choum, and Nouadhibou. According to data from the Ministry of Livestock, the livestock farming system in Mauritania remains predominantly extensive and based on mobility. This sector plays a central role in the national economy, accounting for around 10.1% of gross domestic product in 2020 and nearly 70% of the added value of the rural sector (Mauritanian Investment Promotion Agency). It also employs a significant portion of the working population, estimated at around 10%, while 60 to 70% of rural households derive their income directly from livestock farming. These factors illustrate the strong dependence of rural populations on pastoral activities (Ministère de l'agriculture, 2017).

The wilayas of Tiris Zemmour and Adrar, which are crossed by or near the railway corridor, are classified among the country's main grazing areas. Their geographical configuration, characterized by vast open spaces, is conducive to transhumant pastoralism. Along the railway line, two livestock farming systems exist side by side: transhumant livestock farming based on seasonal mobility in search of pastures and water sources, and sedentary livestock farming practiced near gathering centers or semi-permanent camps. The livestock in the area consists mainly of cattle, camels, goats, and sheep, species adapted to the arid climatic conditions of

northern Mauritania. For livestock farmers, the main source of livelihood is the sale of animals, but also the marketing of derived products such as milk, butter, hides, and certain locally made handicrafts. The presence of the railway also influences economic practices. The regular passage of mining convoys creates temporary gathering points where pastoral families set up camps near the line. In these transit areas, they sell handicrafts, fresh or fermented milk, and tea, which allows them to diversify their sources of income in addition to livestock farming.

Overall, pastoralism remains an essential economic and social pillar in this part of the country. It structures the organization of space, dictates seasonal movements, and forms the basis of livelihoods for a large proportion of households living near the railway line. However, the passage of trains between Zouerate and Nouadhibou poses risks to livestock during periods of mobility for herders in the area, particularly those who move freely in areas bordering the railway.

8.3.3.4 SNIM Activity

The railway connecting Zouerate, F'Derik and Nouadhibou is the essential infrastructure for transport of iron ore from SNIM's mining areas to the port of Nouadhibou.

SNIM has exploited this infrastructure for several decades and implements significant technical measures to guarantee the safety of the network, the security of convoys and the fluidity of transport. The importance of this railway line requires constant maintenance, supervision and improvement, particularly in this desert area exposed to sand encroachment and significant temperature variations.

In the railway area, SNIM regularly carries out preventive maintenance operations to prevent major damage and ensure continuity of operations. These operations include rail rectification, replacement of sections with deformations or defects, and general ballast maintenance. The SNIM workers use specialized equipment to align the track, compact unstable areas and check fastening systems. Preventive maintenance aims to anticipate risks and ensure the safety of trains.

The mining train consists of several diesel-electric locomotives able to pull more than 200 wagons loaded with iron ore. The speed of the convoy is adjusted according to the topography, sensitive areas and weather conditions. Each convoy requires precise coordination between SNIM teams located in F'Derik, Zouérate, Choum and Nouadhibou. Among the localities mentioned that have SNIM workers present, the locality of Choum plays an essential role as an intermediate point along the corridor. The locality offers a temporary parking area, refueling points for teams and spaces allowing rapid intervention in the event of technical malfunctions. It is located in an area particularly prone to sand accumulation, which requires regular rail clearance operations.

As part of its railway line extension project, SNIM plans to add 42 kilometers of track to improve the connection between the El Aouj and Atomai mining sites and the main line. This extension responds to the need to increase production and transport capacity to support the ramp-up of mining operations. It requires significant work, including earthworks, ballast laying, the installation of signaling systems, and the creation of new maintenance points. The aim is to strengthen transit capacity while improving traffic flow (SNIM, Notice d'Impact Environnemental et Social (NIES) des travaux d'extension des infrastructures du chemin de fer, 305 pages., 2024).

Rail Safety Context

Available secondary sources also report several railway-related incidents that have occurred along the Nouadhibou–Zouerate line in recent years. These include the derailment of a mineral train at the entrance of the central station area in Nouadhibou in November 2023, which caused material damage to three wagons but no injuries (AMI, 2023); a fatal accident in 2018 in which a young man was struck by the train approximately 40

kilometres north of Choum (Alakhbar (Mauritanie), 2018); and a 2019 collision between a SNIM train and a road freight truck at PK 46 near Nouadhibou, resulting in significant material damage and temporary traffic disruption (Sahara Media, 2019).

Although these media reports do not constitute a formal accident database, they provide useful contextual insight into existing safety conditions along the railway corridor and illustrate the types of risks that may arise where rail operations intersect with dispersed settlements, pastoral mobility and road transport.

As no primary data collection was undertaken along the railway for this baseline, and publicly accessible datasets on railway safety remain limited, these reported events are used as contextual information to describe existing operating conditions within the Project's Social Area of Influence.

According to the SNIM Activity Report 2024, ongoing modernisation of the railway infrastructure and maintenance systems has improved the reliability and safety of train operations, although no formal accident statistics are published.

8.3.4 Social Infrastructure and Services

8.3.4.1 Water

Access to potable water is a crucial issue for the health and economic development of several localities in Mauritania. Between 2008 and 2020, the percentage of the population with access to basic services, including drinking water supply, increased significantly, from 54% to 72%, with a clear disparity between urban areas (89%) and rural areas (50%). Drinking water supply in the rail area is provided locally by each wilaya (SNIM, Notice d'Impact Environnemental et Social (NIES) des travaux d'extension des infrastructures du chemin de fer, 305 pages., 2024).

In the municipality of Choum, an artesian well with a capacity of 20 m^3/h is the main source of drinking water. Despite this infrastructure, some neighborhoods remain dependent on alternative solutions, such as tanker trucks, to overcome supply difficulties (SNIM, 2023).

8.3.4.2 Health

The cities of Nouadhibou and Zouerate host the region's main healthcare facilities and serve as centers of excellence for specialized care along the railway corridor. Several healthcare facilities are located in the various provinces crossed by the railway line. The main facilities identified are as follows:

- Nouadhibou Regional Hospital.
- Zouerate Regional Hospital.
- SNIM Polyclinic (Nouadhibou)
- 6 health centres.
- 9 health posts.
- Military infirmaries.

Despite this network, communities along the corridor still face structural constraints in terms of human resources, availability of medical equipment and regular access to medicines. To mitigate these gaps, periodic medical caravans are deployed in localities such as Choum, Touajil, F'Derik and Zouerate, complemented by occasional specialised consultations. These mobile interventions improve access to primary healthcare for remote and underserved communities, provide screening and support for chronic conditions, and help reduce pressure on referral facilities in Zouerate. (SNIM Foundation, Annual Report 2023; SNIM RSE Report 2024)

Additionally, SNIM operates eleven Workplace Health Units (Unité de Santé au Travail - UST) along its operational bases, including facilities located on the railway alignment, providing first aid and routine care to workers and supporting medical evacuations when needed. Cases requiring advanced intervention are evacuated to Nouakchott or, when necessary, to international facilities (RSE SNIM, 2024)

The epidemiological profile is characterized by a rapid increase in communicable and non-communicable diseases, particularly diarrhoea, malaria, cardiovascular diseases, chronic respiratory infections, diabetes and cancer, which represent a growing public health challenge. In addition, occupational diseases, frequently linked to work accidents or to exposure-related conditions such as silicosis, remain a significant concern. (SNIM, Notice d'Impact Environnemental et Social (NIES) des travaux d'extension des infrastructures du chemin de fer, 305 pages., 2024).

8.3.4.3 Education

Educational infrastructure along the railway line is mentioned in the Dakhlet Nouadhibou and Tiris Zemmour Wilayas. While the municipality of Choum has educational facilities such as a primary school and a secondary school with approximately 90 students. In December 2024, a modern school with 12 classrooms was inaugurated by the SNIM Foundation to improve access to education in the municipality (SNIM, Notice d'Impact Environnemental et Social (NIES) des travaux d'extension des infrastructures du chemin de fer, 305 pages., 2024). Children living in areas far from the urban centers mentioned face significant difficulties in accessing education, particularly those from nomadic or sedentary populations. These children are often forced to travel long distances to reach a school, which is a major obstacle to their education.

Educational support along the railway corridor also includes targeted initiatives implemented by the SNIM Foundation. In 2024, the Foundation organised exam-preparation courses for pupils residing in rail-adjacent communities, allowing students in localities such as Choum to benefit from additional academic support. Children living along the railway line also received school supplies and uniforms, and some participated in merit-based educational programmes, including the annual colonie de vacances, which brings together high-performing students from Zouerate, Nouadhibou and settlements located along the corridor. These interventions help reduce educational disparities in remote areas and improve access to learning opportunities for low-income households (RSE SNIM, 2024).

8.3.4.4 Housing

In Nouadhibou and F'Derik, housing is mainly concentrated in urban areas. It is mostly built from durable materials such as cement, concrete or breeze blocks, and is often painted in light colors (sand, off-white). Some buildings have one or more floors, with flat roofs and sometimes balconies. Outside these urban centers, in rural areas, housing generally consists of clay houses, rudimentary structures and seasonal camps, often occupied by nomadic populations.

The municipalities of Choum and Boulenouar, located along the railway line, have mixed housing, combining permanent buildings (cement, concrete, breeze blocks), traditional rural dwellings and a few tents or temporary shelters, generally associated with transit.

8.3.4.5 Transport

There are two main transport infrastructures in the area: the road network and the railway. These two modes of transport play a complementary role in economic development and population mobility.

- Road network: the RN1 national road is the main road linking the town of Choum to the mining city of F'Derik and Zouerate. It is a paved road approximately 193 kilometers long, which runs alongside the railway line between Choum and F'Derik. This infrastructure facilitates the transport of goods and people between these

strategic locations for mining activity. However, beyond Choum towards Nouadhibou, no paved road has been identified. The lack of paved roads in this part of the country severely limits direct road access to the coast, increasing dependence on the railway for trade between different locations.

- Railway: Mauritania has a single-track railway operated by the Société Nationale Industrielle et Minière (SNIM). This 704-kilometre railway line connects the iron mines of Zouerate to the mineral port of Nouadhibou, passing through the main localities of Boulenouar, Choum, Touajil and F'Derik. The railway line runs largely along the border between Mauritania and Western Sahara, as far as Choum, before turning north towards Zouerate. This strategic configuration allows large quantities of ore to be transported daily to the Atlantic coast, facilitating international export. The trains operating on this line are among the longest in the world, with a length of up to 2.5 kilometers. They usually consist of 3 to 4 locomotives, pulling between 150 and 200 hopper wagons loaded with iron ore, as well as a variable number of service wagons. In addition to transporting minerals, some trains include passenger carriages and freight wagons, thus playing an important role in the mobility of local populations and opening up remote areas (SNIM, Notice d'Impact Environnemental et Social (NIES) des travaux d'extension des infrastructures du chemin de fer, 305 pages., 2024).

8.4 Mine Area

The El Aouj project's mining site is located in northern Mauritania, within the Tiris Zemmour wilaya, a region historically shaped by extractive activities. The mining area will host all operations related to iron ore extraction, including technical facilities, water and energy supply systems, as well as the associated infrastructure required for the site's operation. Work camps will also be developed to accommodate workers and ensure essential living conditions in the region. This section presents the baseline social conditions in the mining area, highlighting demographic characteristics, local economic activities, population mobility, as well as land use and pastoral practices.

8.4.1 Administrative Division and Governance

8.4.1.1 National organisation

Mauritania's territorial organization is structured around administrative divisions:

- Wilayas (regions): These are the country's major geographical and administrative units. Each region is headed by a governor appointed by the President of the Republic. These regions are subdivided into moughataas;
- Moughataas (department): These are smaller administrative units, headed by a hakem (prefect);
- Decentralized collectivities (communes): These can be urban or rural. Each commune is headed by an elected mayor.

The administrative divisions have not changed since 2015: Wilayas (regions), moughataas (department) and baladeyas (commune). However, the organic law n° 2018-010 of February 12, 2018, has created elected regional councils (with implications at regional and local levels, including in Tiris Zemmour). Figure 8-7 shows the administrative division in the wilaya of Tiris Zemmour.

The regions and municipalities are decentralized entities with regional and municipal councils and regional presidents. Organic Law No. 2018-010 gives the regions powers in the areas of economic, social, cultural and scientific development within their territory. They are administered by a Regional Council, elected by direct universal suffrage for a five-year term, and an Executive headed by a Regional President.

8.4.1.2 Regional and Local organisation

The mining site is located in the north of Mauritania in the Wilaya of Tiris Zemmour. The wilaya is subdivided into three Moughataas: Bir Moghrein, F'Derik and Zouerate, with officials known as Hakems. Within each Moughataa are one Baladeya (municipality/commune) with same names (Bir Moghrein, F'Derik and Zouerate) led by an elected Mayors. The region covers an area of 252,900 km2, it borders Morocco and Dakhlet Nouadhibou to the north, Algeria to the east and north-east, Mali to the south and Adrar to the west.

A major change in the political and administrative organisation of the region is the creation of the Regional Councils by Organic Law N° 2018-010 of February 12, 2018. The Tiris Zemmour Regional Council comprises 11 elected councillors and a President. The number of councillors depends on the population size and Tiris Zemour has the smallest regional council in. Mauritania. Councillors are elected for a 5-year mandate and 2023 marked the second elections cycle since the creation of the Regional Council in 2018. During the Regional Council's first mandate, implementing legislation was published to clarify the roles, responsibilities, budget, and organisations of the Councils.

A Regional Council building was erected in Zouerate with 52 office and an auditorium, in accordance with the national architectural standards for regional councils. In April 2023, the building was delivered but was not yet fully equipped. The Council obtained budgetary autonomy in 2021 with an annual investment budget (MRU 500,000) in 2022, approx. US$15,000) and an annual operating budget (MRU 4,3 million in 2022, approx. US$125,000). The SNIM foundation assisted the Regional Council through annual institutional support of MRU 500,000 (US$15,000) in 2022. The Council has not yet developed its own revenue streams.

A gradual transfer of competencies is under way, which were previously shared between the wilaya and other territorial administrations. Due to the initial mandate run-in period and limited financial resources, the Council's s achievements during its first mandate were limited.

According to the legislation, the Regional Council is competent for:

- Secondary and vocational education, including the Zouerate Lycée technique (vocational training high school);
- Healthcare;
- Commerce;
- Inter-urban road network;
- Implementation of the Regional Strategy.

The Regional Council is designated as the implementing body for the region's "Strategie regionale de Croissance Accélérée et de Prospérité Partagée" (SCRAPP – Regional Strategy for accelerated growth and shared prosperity), a regional planning document valid until 2030. The document was prepared in 2022, under the supervision of the Wali, using a participative approach and aligns within the National Accelerated Growth and Prosperity Sharing Strategy (SCAPP – Stratégie de Croissance Accélérée et de Prospeérité Partagée). At the time of the baseline update, the final version of the Tiris Zemmour SCRAPP had not yet been officially published, although an interim synthesis document was available.

The SCRAPP synthesis document presents a recent regional baseline and diagnosis, supported by statistics in key economic and social areas that were an important source of information for the update of the ESIA social baseline. The SCRAPP vision is depicted as "establishing by 2030 a development and economic growth hub in this part of the national territory". This vision comes with 6 objectives:

- reduce the incidence rate of poverty and extreme poverty by at least 50% by 2030;

- promote growth by exploiting economic opportunities and optimizing public investments in productive sectors;
- promote social development through investment in social capital and access to basic social services;
- develop growth by supporting infrastructure to exploit the mining and energy potential of the region;
- promote balanced urban development, fighting precariousness and exclusion;
- build the capacity of the public administration, the regional council, the municipalities and civil society organisations in overseeing, implementing and monitoring public actions.

To achieve these objectives the SCRAPP details 27 interventions grouped into 9 sub-objectives and structured around three strategic pillars: 1/ promotion of strong, sustainable and inclusive growth, 2/ development of human capital and access to basic social services and 3/ strengthening governance at all level.

The cost of priority SCRAPP strategic investments for the 2023-2025 period is estimated at MRU 10,739,120,000 (approx.US$ 310 million). Approximately 75% of this amount is allocated to the construction of the road linking Zouerate to the Algerian border Excluding this road project, the estimated investment budget is reduced to MRU 2,659,120,000 (approx. US$ 80 million). The SCRAPP does not specify detailed funding mechanisms for these investments. The SCRAPP does not specify. At the municipal level, neither Zouerate nor F'Derik has a valid communal strategic planning document. F'Derik previously developed a Communal Development Plan (Plan de Développement communal – PDC) with support from the the Program National Integrated Support Programme for Decentralisation, Local Development and Youth Employment (Programme National Intégré d'Appui à la Décentralisation, au Développement Local et à l'Emploi des jeunes - PNIDDLE), implemented between 2014 and 2019 with funding from the World Bank and the European Union. The municipality reported that this programme contributed to several local investments, including the construction of a kindergarten, a playground, and cemetery fencing. The PDC was not renewed due to financial constraints. Both municipalities currently operate through annual action plans. Low tax revenue mobilization is recognized by both municipalities as a major constraint to local development. Zouerate has recently invested municipal funds to acquire a tax revenue mobilization software, developed under a World Bank-funded national programme. At the time of the field visit, the municipal personnel had completed training on the software and deployment of the system was planned to follow the municipal elections.

The mining area includes the following human settlements: Zouerate, F'Dérik, Touerga, Touajil and Sebkha Idjil (salt exploitation site).

Zouerate

The city of Zouerate is located approximately 30 KM to the east of the El Aouj project's mining site. It represents the largest population center in the Tiris Zemmour region and serves as the main urban hub of the area. It is the administrative capital of the wilaya and one of the most dynamic economic centers in northern Mauritania, owing to its strategic role in the mining industry. The city benefits from a range of key infrastructure and services, including the administrative facilities, social services (education and healthcare), and commercial and logistical infrastructure. This urban configuration gives Zouerate a central role in regional development and in providing operational support to nearby mining projects in the region.

F'Derik

The city of F'Derik, located approximately 25 kilometers south of the El Aouj project mining site, is the main human receptor in the project's direct area of influence. Its geographical location and history make it a major point of interest for socio-territorial analysis. It was once the administrative capital of the Tiris Zemmour wilaya, before the expansion of SNIM's mining industry in Zouerate. It is also home to military barracks, illustrating the strategic presence of the armed forces in this border and desert area. This military presence plays a decisive

role in maintaining regional security and stability, particularly in a Sahelian context marked by cross-border instability.

Touajil

The settlement of Touajil is a small locality situated in the wilaya of Tiris Zemmour, approximately 70 kilometres north-east of the town of F'Derik. It serves as a secondary human settlement within the extended area of influence of the El Aouj project. The locality has limited infrastructure, with restricted access to essential services such as potable water supply, basic healthcare, and educational facilities. Despite these constraints, Touajil is home to permanent human settlements, a local inn, and a palm plantation, which constitutes a key component of the local economy, particularly in the fields of agriculture and hospitality.

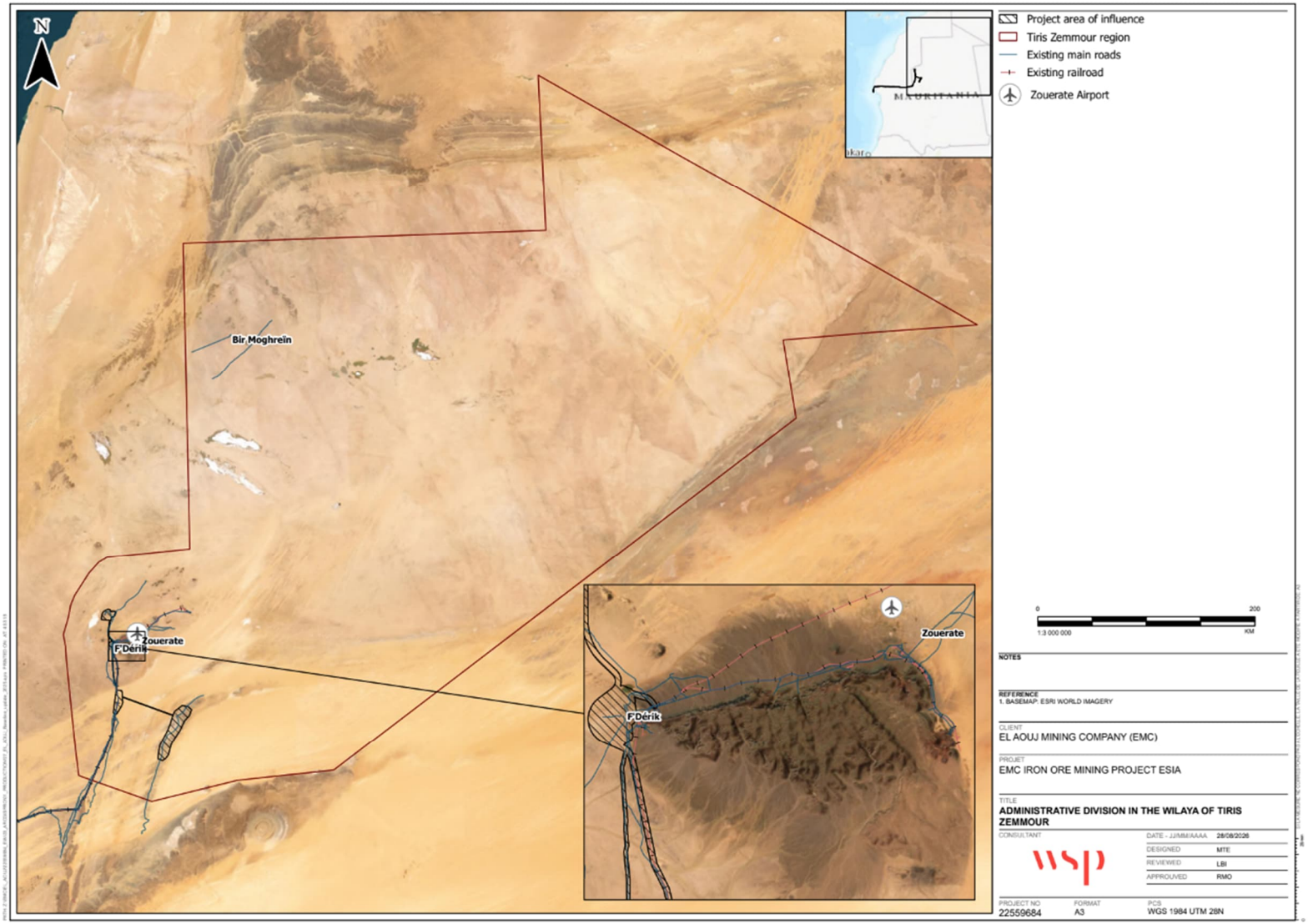
Toueirgha

Toueirgha is located approximately 4 kilometers north of the city of F'Derik. It is mainly inhabited by nomads and pastoralists, who have set up camps or semi-permanent settlements there. It is also a popular place of rest for the inhabitants of F'Derik, particularly due to its proximity and peaceful surroundings. Administratively, Toueirgha is part of the municipality of F'Derik.

Sebkha Idjil

The Sebkha d'Idjil is a saline depression to the west of the El Aouj mining site. It is home to the salt works and, during the working period, brings together dozens of operators from the surrounding towns.

Figure 8-7: Administrative division in the wilaya of Tiris Zemmour



8.4.2 Partner and development actors

8.4.2.1 Role of SNIM

SNIM, the state-owned mining company, remains the main employer in the region. It also has a preeminent role as a development partner in the baseline area, a role that gives the company significant influence in the region. It owns and maintains significant physical infrastructure in the region, including the railway line, the water supply, much of the housing stock in Zouerate, the electricity supply in Zouerate, F'Derik and Touajil and clinics for its employees in Zouerate and Touajil. SNIM's charitable foundation continues to provide funding for basic social services infrastructure, as well as making donations. The foundation's initiatives are a mix of initiatives for its employees and retired employees and for the general community. From its creation in 2007 until 2012, the foundation's beneficiaries were located around the company's infrastructure: Nouadhibou, the railway corridor, Touajil, F'Derik and Zouerate. Bir Mogrhein was also covered. In 2012, the foundation was declared to be of public interest and expanded its activities to cover the entire Mauritanian territory. The foundation is exclusively funded by the SNIM through an annual contribution of 2.5% of net profits. Thus, large fluctuation in the annual budget have been recorded, ranging at their highest from MRU 6.7 million in 2008 to MRU 660 million in 2012. In the last foundation annual report dated 2021, the budget was MRU 474 million. The foundation's mission is the fight against poverty and precariousness, and it was active in 2021 in the following areas:

- Access to health;
- Access to education;
- Access to water;
- Access to electricity;
- Support for local development;
- Support and donations for retired employees;
- Support and donations for regional and local institutions, cultural and sports associations and vulnerable people.

Table 8-8 shows the extent of the initiatives funded by the SNIM foundation in Touajil, F'Derik and Zouerate in 2021, excluding interventions specifically targeting SNIM employees and retired employees.

Table 8-8: Initiatives funded by the SNIM in Touajil, F'Derik and Zouerate in 2021.

Settlement/town	Amount (MRU)
Touajil	
Gas donation and ambulance maintenance	73,068
Annual medical donation	39,489
Motivation bonus for medical staff	100,000
School supplies	19,836
Construction of two water reservoirs of 70T and 10T	653,040
Construction of an abattoir	898,243
Donation for Ramadan.	21,450
Donation for disabled people	22,000
Total Touajil	1,827,126 (Approx. $52,750)

Settlement/town	Amount (MRU)
F'Derik	
Annual medical donation	118,467
Motivation bonus for medical staff	156,000
Supply of a back-up generator for the health centre	515,524
Refurbishment of the health centre	393;980
School supply	99,176
Supply of 250 table-benches for schools	537,500
Construction of a hangar and a water reservoir at the Sebkha Idjill	1,262,530
Water supply network and fencing for the agriculture cooperatives	1,171,778
Repair and equipping of 5 boreholes	436,875
Donation for Ramadan.	62,000
Construction of a mosque	2,077,879
Contribution to the functioning budget of the Commune	200, 000
Supply of office equipment to the commune	100,000
Supply of the Moughataâ meeting room equipment	199,400
Donation to disabled people	106,000
Total F'Derik	7,437,109 (Approx. $214 750)
Zouerate	
Annual contribution to the budget of the hospital	4,500,000
Motivation bonus for hospital staff	1,100,000
Donations to the poor, prisoners and injured for medical care	300,000
Medicine donation to the health centre	199,160
Funding of vaccination campaign and fight against Covid	499,320
Supplies for the hospital and health centre	490,000
Equipment supply for the hospital	1,800,000
Equipment supply for the health centre	450,000
Refurbishment and extension of the health centre	2,234,488
Equipment supply of a health post	137,255
Equipment supply for the regional health services	99,500
School supplies	608,940
Equipment supply for the regional education services	492,341
Refurbishment and extensions of 13 schools	10,815,582
Refurbishment and equipment for the vocational school	241,480
Supply of a 10m3 water truck for the commune	10,436,250
Extension of the desalting water plant (1,000 m3/day)	250,230,772

Settlement/town	Amount (MRU)
Water distribution for the population of Zouerate	1,958,350
Electric network extension (260 customers and 50 public lighting poles)	9,177,719
Supply of a septic tank emptying truck	3,565,000
Supply of a garbage truck and accessories	4,322,940
Donation of equipment to youth and civil society associations	2,043,973
Construction of a market	3,166,594
Donation for Ramadan	552,000
Contribution to the functioning budget of the Commune	300,000
Donation to beggars and mentally disabled people	340,000
Donation to women head of households and vulnerable families	50,000
Miscellaneous	434,450
Total Zouerate	310,546,114 (Approx. $9 million)
Regional administration	
Contribution to the functioning budget of the Regional Council	300,000
Contribution to the functioning budget of the Wilaya Subvention	300,000
Supply of office equipment for the Wilaya and the Mughataa	500,000
Supply of generators for the office and residence of the Wali	470,000
Total Regional Administration	1,570,000 (Approx. $45,000)

In 2023, the National Industrial and Mining Company (SNIM) laid the foundation stone for the F'Derik mining project, aiming to reach an annual production capacity of two million tons of iron ore, thereby strengthening its position in the international market.

As part of its corporate social responsibility commitments, the SNIM Foundation has launched several key development projects, including (SNIM, 2023):

- Improving access to drinking water: funding of 34 solar-powered boreholes, enabling the mobilization of 522,899 m³ of water, as well as the expansion of the reverse osmosis unit in Zouerate, with an annual output of 1,080,000 m³.
- Maintenance and development of water infrastructure: servicing of 35 boreholes along the mining corridor and equipping 11 new boreholes in the Moughataa of Choum and F'Derik.
- Modernization of transport infrastructure: upgrading the transport network to facilitate mining operations and support local development.
- Support for local associations in socio-economic development: launch of initial agricultural projects in Choum, F'Derik, and the TO14 mining site, benefiting local communities. These projects incorporate innovative farming techniques such as greenhouse cultivation and drip irrigation, along with training sessions on agro-market gardening project management and high-yield seed selection.

- Rural electrification: acquisition and installation of 20 solar kits in Touajil, with an estimated investment of 240,000 MRU.

Figure 8-8 shows the implementation of greenhouse cultivation and drip irrigation systems by women's associations in F'Derik, following technical and financial support from the SNIM Foundation.

1: Greenhouse cultivation

2: Irrigation systems

Figure 8-8: Greenhouse cultivation and drip irrigation systems by women's associations in F'Derik (source: cooperative of women in F'Derik), June 2025.

In 2024, SNIM achieved exceptional records in terms of iron sales and production, with 14.307 million tonnes of iron produced. This performance far exceeded the targets set at 14 million tonnes for each category. SNIM is also planning a project to upgrade the railway infrastructure and equipment between Zouerate and Nouadhibou (SNIM, 2024).

8.4.2.2 Other actors

Sectorial national programs funded with the assistance of international donors were identified as active in recent or future years in the area such as the PNIDDLE (World Bank) for decentralisation and local development, the Program for Natural Resource Governance (GIZ) which conducted an Environmental and Social evaluation of the artisanal gold treatment centre or the PRAPS II (World Bank) for Regional Sahel Pastoralism support.

The region has an active body of community-based organisation (CBOs), mostly women's cooperative and youth organizations. An international NGO, Africa 70 (Italy) was identified as supporting the CBOs in F'Derik and Zouerate, with equipment and/or contributions to small projects. A national NGO, "Association des Femmes Chefs de Ménage" is active in working with vulnerable households headed by women.

8.4.3 Population and Social organisation

8.4.3.1 Population

According to the results of the latest General Population and Housing Census (RGPH), carried out by the National Statistics Agency (ANSADE) in 2023, Mauritania has an estimated population of 4.9 million inhabitants, with a density of 5 inhabitants per square kilometre, of whom 61.2% live in urban areas. The population is predominantly young, with 61% under the age of 25 years old (ANSADE, 2023).

The Tiris Zemmour Wilaya, has a population of 79 129 inhabitants, including 46 899 men and 32 230 women in 2023. The local population of the Zouerate and F'Derik is estimated at 74 003 inhabitants (43 343 men and 30 660 women) in 2023. This gender imbalance is explained by the influx of young men looking for employment in

Zouerate. According to the National Living Conditions Survey (EPCV), the population increased by approximately 50%, reaching 83,462 inhabitants in 2019. The following table shows the evolution of the population in the Wilaya of Tiris Zemmour between 2013 and 2023 (ANSADE, 2023).

Table 8-9: Evolution of the population in the Wilaya of Tiris Zemmour between 2013 and 2023.

Moughataa	2013		2023	
	Male	Female	Male	Female
Zouerate	24 966	19 683	33 724	28 656
F'Derik	2 545	2 170	9 619	2 004
Birmoughrein	2 108	1 789	3 556	1 570
Total	29 619	23 642	46 899	32 230
	53 261		79 129	

Over the last decade, the Wilaya has experienced population growth associated with economic activity, internal mobility and natural population growth. The following graph Figure 8-9 illustrates the evolution of the population in the Wilaya between 2013 (ANSADE, 2020) and 2023 (ANSADE, 2023).

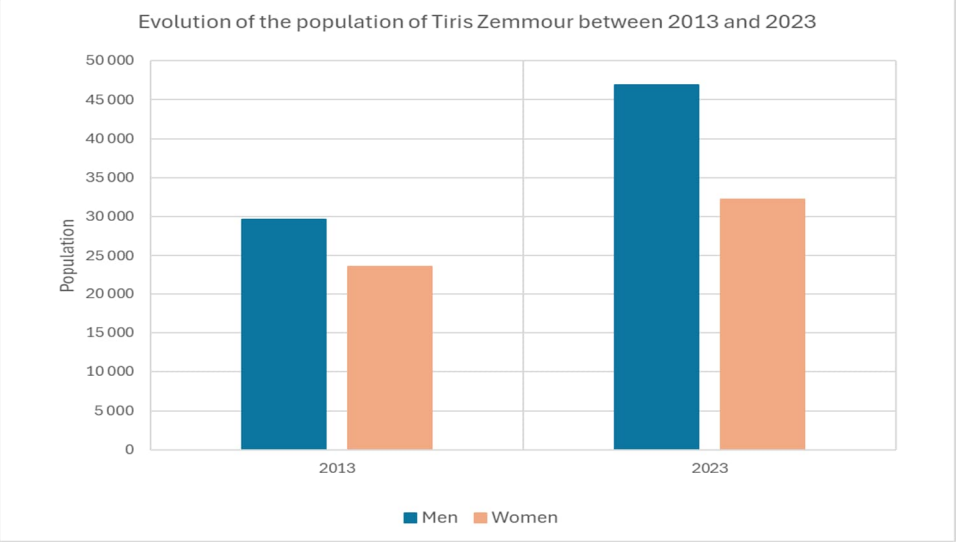


Figure 8-9: Evolution of the population of Tiris Zemmour Wilaya between 2013 and 2023 (ANSADE, 2023).

The graph highlights demographic growth in the wilaya of Tiris Zemmour, with the population increasing from 53 261 inhabitants in 2013 to 79 129 in 2023, a rise of nearly 48.6% over ten years.

As outlined in Sections 8.4.7.8 and 8.4.7.9, mining activities are associated with population and settlement changes in the Tiris Zemmour region. Between 2013 and 2023, the population of Zouerate increased from 44,649 to 62,380 inhabitants, while the population of F'Derik increased from 4,715 to 11,623 inhabitants. The SNIM Cumulative Impact Assessment reports that Zouerate's population increased by almost 40% between 2013 and 2023 and identifies in-migration of working-age men associated with artisanal gold mining as a factor in this growth. As described in Section 8.4.7.8, this influx has been associated with increased demand for housing and municipal services and an increase in shops and services in Zouerate. Industrial mining is also associated with employment and residential development. As described in Section 8.4.7.9, SNIM employs

approximately 3,500 people based in Zouerate and F'Derik, and a residential area comprising 600 houses for SNIM employees was commissioned in Zouerate in 2022.

8.4.3.2 Social organisation

In Mauritania, the population is divided into four main socio-ethnic groups: the Moors, the Fulani (Pulaar-speaking populations), the Soninkés and the Wolofs. The main languages spoken are Arabic (in its local form, Hassaniya) and French. The other national languages are Pulaar, Soninke and Wolof. The Wilaya of Tiris Zemmour is home to a diverse array of communities, some of which migrate to the cities of Zouerate and F'Derik in pursuit of economic and employment opportunities offered by the mining and commercial sectors. Their presence contributes to transformations in the local social fabric and promotes local cultural diversity.

In the cities of F'Derik and Zouerate, numerous development associations are active, including women's associations specializing in artisanal production, youth organizations engaged in cultural and sporting activities, as well as market gardening cooperatives. These entities play a vital role in energizing the local community and fostering the mobilization of populations around key themes such as social cohesion, employment, and economic and community-based initiatives.

8.4.4 Women and Vulnerable Groups

In rural areas, a large proportion of the population lives below the poverty line (19 100 MRU in 2019, compared to 16 945 MRU in 2014). Access to basic social services (education, health, drinking water and electricity) remains limited. According to EPCV report 2019-2020, 41.2% of the population lives in poverty in rural areas, compared to 14.4% of the population in urban areas. In 2019, only 15% of the population in rural areas had access to sanitation services, leaving 85% of the population vulnerable to disease. Access to water remains a major challenge due to Mauritania's desert climate.

The Wilaya registered a decrease in the poverty rate from 19.7% in 2014 to 15.6% in 2019, but an increase in extreme poverty from 3.7% to6.8%. The MASEF updates the list of economically vulnerable households in the Wilaya and delivers support through several state programs. In general, F'Derik is described by stakeholders as having a higher proportion of economically vulnerable households. Households of the Wilaya whose survival depends exclusively on either agricultural or pastoral activities can be considered more vulnerable to external factors such as drought. Disabled people and women heading households are also groups with fewer opportunities to benefit from the positive economic impacts of mining (ANSADE, 2020).

The cities of Zouerate and F'Derik are home to a significant number of women who actively contribute to socio-economic dynamics and local development initiatives. According to the findings of the focus group held in June 2025 with women in vulnerable situations in the city of F'Derik, the principal sources of livelihood identified include market gardening, general trade, handicrafts, and the dyeing of veils. These activities enable women to supplement household income and contribute to social expenses.

Some have organized themselves into cooperatives and associations engaged in income-generating activities such as small-scale trade, catering, and the sale of artisanal goods. However, a portion of this female population remains without independent financial resources and relies solely on the income of their spouses.

According to the results of the focus group carried out in June 2025 in F'Derik, women's cooperatives play a central role in local social dynamics. These structures pursue multiple objectives, including strengthening social cohesion, solidarity among members, and promoting the role of women in society. They provide spaces for expression, collaboration and empowerment, enabling women to become actively involved in community issues. These actions illustrate not only women's ability to contribute to local economic development, but also their determination to make their voices heard in a traditionally male-dominated sector. Through these commitments, the women of F'Derik are asserting their place in society and helping to transform gender-related social representations.

Despite their commitment, these women continue to face structural challenges that hinder their economic autonomy and access to more sustainable opportunities. These women are considered vulnerable. Indeed, women encounter numerous difficulties in enhancing their production capacity in the fields of market gardening and handicrafts, as well as in accessing regional markets. These obstacles are primarily linked to inadequate logistical resources, including transport, storage, and appropriate equipment.

Other identified vulnerable groups include households without income, unemployed youth, elderly individuals without family support, and people living with disabilities.

Targeted social support is also provided through the SNIM Foundation, including assistance to vulnerable households, support for persons with disabilities, and backing for women's cooperatives and social shops. These initiatives contribute to diversifying income sources and reducing household vulnerability, although they do not replace formal social protection mechanisms (Foundation SNIM, 2023).

8.4.5 Gender-based violence

The gender-based violence (GBV) topic is not described in the 2015 ESIA. According to the UN Women global database on violence against women, the gender inequality index in Mauritania ranks 161 out of 191 countries. Prevalence data on different form of violence against women are presented in Table 8-10.

Table 8-10: Prevalence data on different form of violence against women (UN Women, 2021)

Form of violence	Percentage
Lifetime physical and/or sexual intimate partner violence	9.3%
Physical and/or sexual intimate partner violence in the past 12 months	6.4%
Child marriage (less than 18)	37%
Female genital mutilation/cutting	66.6%

Female genital mutilation is more common among women aged 15 to 49 living in rural areas (77.1%) than among those living in urban areas (51.3%). The prevalence of female genital mutilation is inversely correlated with women's level of education and wealth (Orchid Project, 2023). The prevalence of genital mutilation by region is shown in Figure 8-10.

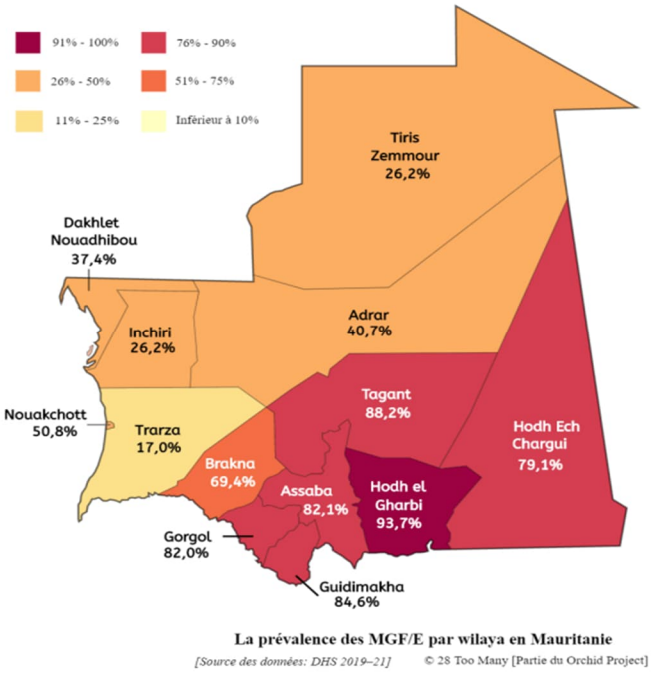


Figure 8-10: prevalence of genital mutilation by region in Mauritania (Orchid Project, 2023)

GBV in the Tiris Zemmour region represents a critical challenge for social stability and the protection of human rights. The combination of structural factors (geographical isolation, poor access to health and legal services), economic factors (the development of gold mining in the area, the influx of gold miners), and social factors (family, traditional norms) creates a risky environment for women and girls.

In response to this situation, a multisectoral platform to combat GBV has been set up in Zouerate with the support of the Ministry of Social Affairs and UNFPA. Although recent, this mechanism is a key tool for coordination between the health, justice, security, and social services sectors, aimed at improving prevention, awareness, and care for cases of GBV in the region (C.R.I.DE.M, 2021).

8.4.6 Land Use

8.4.6.1 General Land Use Context

The El Aouj Project is located in the Tiris Zemmour region of northern Mauritania, an arid desert environment with sparse permanent settlements and extensive areas traditionally used for extensive livestock grazing.

Land in the mine's AoI is primarily used for nomadic and semi-nomadic pastoralism, supported by wells and boreholes that enable seasonal movements.

Key characteristics of current land use:

- Pastoral Corridors: The area is crossed by well-established routes for seasonal livestock migration. These corridors are vital for local herders, whose livelihoods depend on the availability of grazing and water.
- Wells and Water Points: Several wells and boreholes (e.g., in Touajil, Aouchich) provide essential water sources for animals and herder camps.
- Salt Extraction: To the north, Sebkha Idjill is used for traditional saltworks activities, an economic resource for some communities. It will be important to confirm whether any land claims or dependencies exist that may overlap with Project infrastructure.

- Gathering and Hunting: Small-scale gathering of plants and occasional hunting are practised but do not constitute primary livelihoods in this zone due to the harsh climate and low vegetation cover.
- Agriculture: There is no significant crop farming within the mine AoI due to soil and climatic constraints.

8.4.6.2 Human Settlements in the Mine Area

The Area of Influence (AoI) for the El Aouj Mine includes a sparsely populated Saharan landscape with a few key permanent towns and a more mobile population of nomadic pastoralists and seasonal camps.

Permanent Settlements:

- The main town within the mine's AoI is F'Dérik, which serves as a local urban centre for administrative, commercial, and social services. It is the closest major settlement to the planned mining area;
- Nearby settlements such as Zouerate (outside the immediate mining footprint but connected by road and rail) provide additional population hubs, services, and potential labour supply;
- Smaller hamlets and villages, including Touajil, Touerga, and temporary settlements around water points, are scattered across the wider mine AoI.

Pastoralist Camps:

The majority of the surrounding area is used for extensive pastoral activities. Mobile herders use seasonal camps to access pasture and water points across the desert landscape. According to the "Profil du Nomadisme pastoral en Mauritanie" (FAO, 2010), these camps are often temporary and move with the availability of grazing resources. The main land uses associated with pastoralism include:

- Seasonal pasture areas and transhumance corridors.
- Water wells and boreholes, which are critical resources for both people and livestock.

Some families of nomads and pastoralists reside in tents or in dwellings made of banco, constructed for seasonal use during the rainy period, typically from July to September. This form of temporary housing reflects their lifestyle, which is adapted to climatic conditions and the cycles of transhumance.

A total of 74 cultural heritage sites were recorded within or along the boundaries of the areas of influence considered (see Table below and the cultural Heritage Gazetteer in Appendix Q). Of these 74 sites, 11 comprise camps, occupation sites, water sources or wells.

Table 8-11: Cultural heritage and sites utilised by the pastoralists

Site Type	Infrastructure corridor	Water supply corridor	Touajil water supply area	Aouchich water supply area	Total
Camp	0	6	0	0	6
Findspot	0	1	1	0	2
Grave	2	3	1		6
Military and tombs	0	0	0	1	1
Monument	0	1	0	0	1
Occupation	0	1	0	0	1
tool scatter	0	0	2	0	2

Open-air mosque	0	3	0	0	3
Scatter		0	2	0	2
Tomb	2	14	22	8	46
Water source	0	0	1	0	1
Well	0	0	0	3	3
Total per zone	4	29	29	12	74

Within the pipeline RoW, 6 sites recorded as camps were identified (ASK014, ASK015, ASK151, ASK155, ASK156 and ASK157). The Cultural Heritage Gazetteer records evidence of 10 settings within these sites. At least 4 tent settings are explicitly quantified, comprising 1 tent pitch at ASK014 and 3 tent settings at ASK015. No dwellings were identified at these sites.

The Water Supply Corridor also contains 1 occupation site. The Touajil Water Supply Area contains 1 water source, while the Aouchich Water Supply Area contains 3 wells. No sites belonging to these categories were recorded within the Infrastructure Corridor. With the exception of water points, which remain in permanent use, pastoral camps are temporary and mobile. Certain parts of the area of influence may therefore continue to be visited or used, although the geographical distribution and frequency of such use may vary.

Figure 8-11 shows nomadic and pastoral camps, both temporary and permanent, observed in the mining area, in connection with mobility and the pastoral space in the localities of Toueirga and Aouchich.

1: View of pastoralist camp in Aouchich

2: View of Touerga settlement

Figure 8-11: View of human settlement in the mine area in May 2023

8.4.6.3 Customary Land Tenure and Access Rights

Land tenure and access

Mauritania's current land tenure system is primarily based on Ordinance No. 83-127 of 5 June 1983, which governs land and property reorganization. This foundational legal text establishes the principles for land management across the national territory. According to Article 2 of the Ordinance, the State recognizes and guarantees private land ownership, provided that it contributes, in accordance with the principles of the "Chariâa", to the country's economic and social development.

In accordance with the Decree No. 2000-089 of July 17, 2000, the management of state-owned rural land must be carried out in a participatory manner, involving the relevant administrative authorities, local elected officials, as well as representatives of civil society and rural professional organizations. In the wilaya of Tiris Zemmour, this responsibility falls to the administrative and local authorities, who are tasked with ensuring equitable access to land and preventing any potential conflicts related to its use.

Statutory land tenure is based on an administrative registration process, followed by the issuance of land concessions or titles. In rural areas, land is granted either through a provisional concession, valid for five years and subject to a development obligation, or through a definitive concession, granted after verification of land development, registered in the land registry, and legally enforceable against third parties.

In rural areas, the allocation of provisional and definitive concessions is granted following the opinion of the respective competent commissions:

- The Hakem, for areas not exceeding 10 hectares;
- The Wali, for areas between 10 and 30 hectares;
- The Minister of Finance, for areas between 30 and 100 hectares;
- The Council of Ministers, for areas exceeding 100 hectares.

Furthermore, anyone wishing to obtain a provisional concession for land in a rural area must submit a request to the Hakem of the relevant territory (Journal Officiel, 2000).

Workers' Camp and Housing Area (F'Derik)- land status

The site selected for the construction of housing for the project's workers is located south of the town of F'Derik, approximately 2 kilometers from the Moughataa (sub-prefecture) of F'Derik. It covers an area of 140 hectares and falls under the state land and property management regime applicable in rural areas.

No historical activity has been identified on the land, which remains free from any occupation or human intervention. It was selected following a field visit conducted on August 24, 2015, by the company EMC, in collaboration with the administrative and local authorities of F'Derik. On this occasion, the authorities confirmed that the land was free of any occupation or activity and issued a favorable opinion for its allocation to the El Aouj Project, through an official letter signed by the Wali of the Tiris Zemmour region (see APPENDIX O).

This letter was forwarded to the Ministry of Finance for the issuance of the land allocation decree. The request, which has been under review since 2015, must be submitted to the Council of Ministers for approval, which is conditional upon the effective start of EMC's work on the El Aouj mining site.

According to statements from the Mayor of F'Derik, the land is officially recognized at the Moughataa level as being reserved for the El Aouj Project. Its specific purpose is well known and accepted by the local population. In 2016, the company EMC installed boundary markers around the land to secure its perimeter while awaiting the official issuance of the land allocation title.

According to the results of interviews conducted in June 2025 at the project site with the Hakem and the Mayor of F'Derik, the land is free from any occupation. Its selection was made through a participatory process, following consultations with the administrative and local authorities of F'Derik and the Tiris Zemmour region.

A joint site visit was carried out on 20 June 2025, by WSP, in the presence of the administrative and local authorities of F'Derik (Hakem, Deputy Hakem, Mayor, and a representative of the National Gendarmerie), as well as representatives of the company EMC. Following this visit, no signs of site occupation or historical activity related to the site were observed. The immediate surroundings of the future site include:

- To the East: A building foundation under construction is visible approximately 30 meters from the installed boundary markers, beyond the defined buffer zone. The RN1 national road, connecting F'Derik to Zouerate, is also located in this direction.
- To the West: The land is flat, unoccupied, and scattered with shrubs.
- To the North: An abandoned small hut is located about 30 meters from the boundary markers, also beyond the buffer zone. A few residential houses from the town of F'Derik are visible approximately 100 meters away.
- To the South: The land is also flat, covered with some shrubs, and shows no visible signs of occupation.

Figure 8-12 shows the immediate surroundings of the site for the workers' camp, as observed during the site visit conducted on 20 June 2025 in F'Derik.

1) View west to east of the future works camp site

2) Aerial view of the site (Google Maps)

Figure 8-12: Immediate surroundings of the site, observed during the site visit in June 2025.

The site corresponds to the planned El Aouj City described in Section 4.2.5.3 of the Project Description. The development comprises approximately 880 residential units to be developed in three phases, together with associated infrastructure and services. As described in Section 4.2.5.3.2, planned infrastructure relevant to F'Derik also includes the supply of potable water to the town and a wastewater treatment system serving El Aouj City and F'Derik. The location and proposed layout of El Aouj City are presented in Section 4.2.5.3.

8.4.7 Economic activities and Livelihoods

In the mining area, the main economic activities include livestock farming, salt mining in Sebkha Idjill, trade and agriculture. These activities are the main sources of income and livelihood for the local population, while also playing a strategic role in the local economy. In addition, iron mining by the Société Nationale Industrielle et Minière (SNIM) is a major activity, contributing significantly to the national economy and employment in the region. The following sections describe the main economic activities.

8.4.7.1 National Economy and Evolution in key Socio-economic Indicators

- National Economy

The country's economy is dominated by extractive industries (particularly iron ore, gold, oil and gas), fishing, livestock farming, agriculture and services. The Mauritanian economy experienced accelerated growth, reaching

4.3% in 2024 compared to 3.4% in 2023. It appears to be progressing with more sustained growth and better controlled inflation. GDP per capita, meanwhile, shows a slight decrease compared to 2023 (World Bank, 2024).

Table 8-12 presents a summary of the main indicators of the national economy recorded between 2023 and 2024.

Table 8-12: Table: national economy (World Bank, 2024).

	2023	2024
Gross Domestic Product (GDP)	US $ 10.45 billion	US $ 10.77 billion
Gross National Income (GNI) per capita	US $ 2,149	US $ 2,082
Annual growth rate	3.4 %	4.3 %
Inflation	5 %	2.6%

According to the IMF 2024 report, the primary sector is dominated by fisheries and livestock, the secondary sector by mining and manufacturing, while the tertiary sector is dominated by trade and other services (FMI , 2024).

Mauritania's monetary system underwent a change in 2018, marked by a change in the currency scale and the introduction of new ouguiya currency notes. The aim was to restore the ouguiya currency in financial transactions, protect the purchasing power and reduce the quantity of currency in circulation in the country. The ouguiya is Mauritania's official currency, used since 1973 after the country abandoned the CFA franc. This first currency has the ISO code MRO and has now been replaced by the second ouguiya in circulation since the beginning of 2018 with a new ISO code MRU.

This reform led to a change in the currency scale from 10 to 1, in other words, the currency loses a zero (10 old ouguiyas are worth 1 new ouguiya). Banknotes are issued in denominations of 50, 100, 200, 500 and 1,000 ouguiyas. At the international level and as of June 16th, 2023, 1 Euro was worth 37.6 MRU and 1 US Dollar was worth 34.36 MRU.

- Evolution in key Socio-economic Indicators

Table 8-13 provides an overview of the trends observed in key socio-economic indicators.

Table 8-13: Evolution of key socio-economic indicators

Element	2015 EIES indicators	2021-2024 indicators
UN Human Development Index (HDI):	159th out of 187 countries (UNDP, 2011)	164th out of 191 countries (UNDP, 2024)
% population living below the poverty line	21% of the urban population and 59% of the rural population (ANSADE, 2020)	28.2% of the population (FAO, 2021).
Population	3.5 million (UN, 2011)	4.9 million (ANSADE, 2023)
Average household size	5.8 persons (MICS, 2017)	6.1 person per household (ANSADE, 2020)
Life expectancy	No data available	64 years (UN, 2023)
Annual population growth rate	2.4% (RGPH, 2018)	2.6% (World bank, 2021).

Element	2015 EIES indicators	2021-2024 indicators
% population resident in urban area	42% (World Bank, 2024)	56% (World Bank, 2024)
% population under the age of 15	Close to 50%, (ONS, 2023)	41% (UNFPA, 2022)
Life expectancy at birth - men	60 years (World Bank, 2024)	64 years (UN, 2023)
Life expectancy at birth - women	63 years (World Bank, 2024)	63.4 years (UN, 2022)
Average number of people per household	5.5 (no source)	6.2 (ONS, 2023)
Unemployment rate	10.05% (World Bank, 2024)	Youth unemployment estimated at 24% in 2023 (AfBD, 2024)
Enrolment for primary school	77% (World Bank, 2024)	80% (World Bank, 2024)
Literacy rate	62 % (World Bank, 2024)	67% (World Bank, 2024)
Maternity mortality rate	510 deaths in 100,000 (World Bank, 2024)	424 deaths in 100,000 (UNFPA, 2022)
Mortality rate for children under 5	51 per 1,000 (World Bank, 2024)	41 per 1,000 (World Bank, 2024)
Access to water	72% in urban areas and 53% in rural areas (MICS, 2017)	73.1% in urban area and 43.55% in rural area (ANSADE, 2020)
Access to electricity	About 39.5% (World Bank, 2015)	92,4% in urban area and 61.6% in rural area (ANSADE, 2020)
Mobile phone subscription	4% in 2001 92.7% in 2011 (no source)	97% (Mauritanian Telecommunication, 2021)

According to the results of the EPCV surveys conducted in 2019-2020, the prevalence of poverty fell from 30.9% to 28.2% (a drop of 2.7 points). Poverty remains a rural problem, with an incidence of 41.2% in rural areas, compared with 14.4% in urban areas (FMI , 2024). In terms of economic integration, the level of unemployment appears to be persistent, with a rate of 12.2% in 2019 (ANSADE, 2020) compared with 11.8% in 2017 (Bilan Commun Pays 2020). Unemployment affects women more than men in 2019, with rates of 17.3% and 9.3% respectively.

8.4.7.2 Employment and Unemployment

The Wilaya of Tiris Zemmour has significant human potential, with over 51.3% of its population aged between 14 and 64, i.e. of working age. This segment represents a total of 15,083 people, including 11,058 men and 4,025 women. This distribution highlights a significant gender disparity in access to the labor market, underscoring the need for inclusive policies aimed at strengthening women's economic participation (SNIM , 2024). The local workforce is mainly engaged in activities such as livestock farming, agriculture, trade, crafts, and mining, particularly through the Société Nationale Industrielle et Minière (SNIM).

SNIM is the largest employer in the Wilaya of Tiris-Zemmour. The unemployment rate in the Wilaya was estimated at 23.2% in 2019 (EPCV) and estimated the unemployment rate at 18.9% in Zouerate. Both numbers are greater than the national unemployment rate of 12.2% (ANSADE, 2020).

8.4.7.3 Trade

In the absence of recent statistical data, the assessment of the commercial sector in the region relies primarily on feedback from key stakeholders. These stakeholders report a significant expansion in the number of commercial establishments, particularly shops and kiosks in the urban centers of Zouerate and F'Derik. This growth is closely linked to the intensification of mining activities, especially in the region. Mining operations generate territorial attractiveness, leading to the arrival of a young, mobile population seeking economic opportunities in the area. This migratory flow creates increasing pressure on local demand for consumer goods and services, thereby progressively stimulating the development of a multifunctional commercial ecosystem.

The local economic fabric is tending to diversify, with the emergence of informal supply chains, microenterprises, and related services (logistics, catering, accommodation), often directly connected to the needs of workers in the mining sector. The commercial sector in the region is divided into two distinct segments:

- Formal sector: This segment includes registered and regulated economic activities, such as general trade, import-export operations, vehicle rental, and the distribution of household appliances. These activities are generally concentrated in urban centers and benefit from administrative and fiscal oversight.
- Informal sector: This segment consists of unregistered microeconomic units, operating mainly in the sale of fuel, basic food products, local crafts, and catering services. Although unstructured, this sector plays a vital role in daily supply and local employment.

In addition, the proximity to the Algerian border serves as a strategic lever for cross-border trade, facilitating the import of agricultural, sanitary, and industrial products. Beyond the income generated by mining operations, commerce represents a major economic driver, contributing to the diversification of household income sources and stimulating the local economy.

8.4.7.4 Artisanal activities

Artisanal activities are predominantly carried out by women organised in cooperatives and remain the same as those identified in the 2015 ESIA: tent making, mat making, weaving, jewellery made using local stones, the preparation of couscous, meat drying, etc. (Figure 8-13).

Some of the stones used in jewellery are sourced in the SAoI by the women of the cooperative: around F’Derik for the black and white stone they call “Stone of F’Derik”, Touajil and Lazrag for the red stone called Lebrah and M’hewda for the stone called “El Matloua”. The activity appears to have been imported by women who came to settle in Zouerate through a family member working for SNIM. The women of the cooperative who were met are now aging and, according to them, the younger generation is not interested in the activity, which is considered too tedious as it is not sufficiently mechanised.

Figure 8-13: Stone jewellery made by RIDWAN women cooperative in Zouerate (left), Weaving in F'Derik (right) in May 2023.

8.4.7.5 Agriculture

The north of Mauritania is characterized by mainly oasis-based and market gardening agriculture, due to climatic and water constraints that make large-scale farming difficult. The arid climate, marked by high temperatures and very low rainfall, severely limits the availability of water, an essential resource for agriculture.

Oasis agriculture relies on irrigation systems, allowing the cultivation of date palms and other species adapted to desert conditions. Market gardening, meanwhile, is mainly developed around areas where access to water is easier, particularly thanks to water reservoirs or dams in the mining area. Agriculture is the livelihood for some households and plays an important role in local food security.

According to the findings of the focus group conducted in June 2025, the city of F'Derik exhibits two main forms of agriculture: seasonal rain-fed farming and irrigated agriculture, primarily in the form of market gardening.

- Seasonal agriculture is practised in areas downstream of two water retention basins: one located in Melikli, approximately 10 kilometres from F'Derik, and the other in Oum Dhfeirat, nearly 38 kilometres away. This type of agriculture is highly dependent on rainfall, which is both scarce and irregular in the region. Furthermore, the extent of arable land available remains limited, significantly reducing its economic impact and its capacity to meet local food needs.
- Irrigated agriculture, particularly market gardening, plays a more significant role in the local economy. It is primarily driven by women's cooperatives, which are actively involved in agricultural production. These cooperatives (11 cooperatives, including 9 women cooperatives) cultivate over 3 hectares of land, thereby contributing substantially to the local supply of fresh vegetables.

The main crops include tomatoes, beetroot, and aubergines, which are sold directly in F'Derik, strengthening the city food autonomy and creating economic opportunities for women.

According to the Department's latest statistics, there are 80 ha of suitable agricultural land in Zouerate but there is a general lack of available land due to the footprint of SNIM's activities. In the city of Zouerate, palm groves have been developed, comprising approximately 5,000 date palms (SNIM , 2024). These plantations are irrigated using water provided by the National Industrial and Mining Company (SNIM), illustrating a form of synergy between industrial and agricultural activities in the region. The production of the latest agricultural campaign totalled 29 tons for Zouerate and 6 tons for F'Derik. In F'Derik, an attempt to grow 10 ha of wheat close to the F'Derik dam failed because of poor securing of the site and the incursion of ruminants. An invasive species is also having a negative impact on the fertile soil close to the F'Derik dam.

Recent community initiatives implemented by the SNIM Foundation have also supported small-scale agriculture in corridor localities such as Choum and F'Derik, including greenhouse cultivation and drip-irrigation plots, together with basic training on agro-market gardening and seed selection. These measures reinforce irrigated market gardening led by local cooperatives, particularly women's groups, by improving production regularity and local availability of fresh vegetables (Foundation SNIM, 2023).

Figure 8-14 shows the market gardening activities carried out by the women's cooperative of F'Derik, highlighting the main crops cultivated, namely tomato and eggplant.

1: Crops in the market gardens close to F'Derik

2: main crops in the mine area

Figure 8-14: Greenhouse cultivation and drip irrigation systems by women's associations in F'Derik (source: women's cooperative in F'Derik).

In addition, the locality of Touajil also hosts a date palm plantation, which relies on irrigation systems. This plantation is supplied by a borehole that captures groundwater, equipped with solar-powered pumps and two large-capacity reservoirs, ensuring sustainable water resource management. According to the site owner's representative, this is an old agricultural operation that has been active for over ten years. The dates produced, known for their superior quality, are marketed both locally and regionally. Date palm cultivation is a vital source of income for the farming family, while also contributing to regional food security and job creation. The Figure 8-15 below shows a view of the date palm cultivation observed at the Touajil agricultural site during the field mission carried out in June 2025.

Figure 8-15: Date palm cultivation observed at the Touajil in June 2025.

8.4.7.6 Pastoralism Activities

General context

The livestock sector in Mauritania represents one of the main pillars of the national economy. It provides as a source of income and livelihood for approximately 60 to 70 percent of the population, particularly in rural areas. This sector plays a strategic role in food security, job creation, and the development of natural resources.

The practice of pastoral mobility, notably transhumance, is an age-old tradition shared by all ethnic groups in the country. It often involves family movements, including children, and is based on adaptation to climatic conditions and the availability of grazing lands. The national livestock is estimated at (OIM, 2019):

- 2 million cattle.
- 1.4 million camels.
- 12 million sheep.
- 8 million goats.

These animals play a crucial role in food security, and in the production of milk, meat, hides, and manure used in agriculture.

The Wilaya of Tiris Zemmour is one of the country's main grazing areas and is characterized by a wide variety of pastoral systems. First, there are nomadic systems, based on high mobility of livestock, mainly camels and goats. Nomadic herders move continuously according to the availability of pastoral and water resources, following long-established traditional roads.

The region is also home to transhumant systems, in which herds migrate long distances for seven to eight months of the year. These movements are generally from the north to the south of the country, but can also extend beyond national borders, depending on the state of the pastures and seasonal rainfall.

Finally, Tiris Zemmour includes agropastoral systems characterized by more sedentary livestock. This type of farming, practiced mainly in urban or peri-urban areas, is based on the raising of cattle and small ruminants. It involves more intensive resource management, sometimes combining supplementary fodder and water supplies (GIZ, 2022).

It has significant pastoral potential, with vegetation growth not dependent on high levels of rainfall, unlike the southern Wilayas. Indeed, an annual rainfall of just a few dozen millimeters distributed across the territory is sufficient to support the development of relatively rich pastures (SNIM , 2024).

Mobility and pastoral resources use

According to the findings of the focus group conducted in June 2025, the pastoral system in the studied region is primarily based on the rearing of camels and goats. The main constraints identified by herders relate to the intense pressure on limited water resources and on pastures, whose availability is highly variable and dependent on climatic conditions.

Transhumance is organised according to the spatial and temporal distribution of rainfall and vegetation growth. The corridors mainly follow an axis that runs from north to south and from south to north of Mauritania. This movement is carried out based on the abundance of rainfall in the different regions of the north and south of the country. In the mine area, the corridors generally follow a west to east axis, with strategic stops at available water points for livestock watering. Three well points are available in the mining area for livestock watering:

- El Aouj well, located approximately 30 km west of F’Derik.
- Enajim well, around 200 km east of F’Derik.
- Lebeir well, also about 30 km west of F’Derik.

Figure 8-16 shows the El Aouj well and the herders met during the visit to the well in June 2025. The El Aouj well is the closest water point to the mining project site (El Aouj Guel).

1: El Aouj well, view west to east

2: El Aouj well, view south to north

Figure 8-16: El Aouj well, observed during the site visit in June 2025.

Local populations are familiar with the transhumance corridors, whereas non-local herders must rely on guides to navigate the mine area during their first visits. When rainfall is favourable, the area hosts a large concentration of livestock, including not only Mauritanian herds but also those coming from Mali, which remain there for several months. Access to pastures and water points is open and unregulated, allowing any herder entering in the region to benefit from the available resources.

Farmers particularly appreciate the northern region because of the quality of its ecosystem services. Indeed, F'Derik is a major area of attraction for transhumant herders, particularly between October and March, due to the presence of high-quality forage resources. The vegetation formations in the area are mainly composed of perennial grasses such as *Aristida pungens* and *Panicum turgidum*, along with localized shrub species, notably *Cassia italica*, *Acacia tortilis*, and *Acacia radiana* (SNIM , 2024). Among these, the plant Askaf (Nucularia perrinii Batt.) is especially valued for its nutritional content, particularly for camels.

During the focus group, herders marked the transhumance corridors on the map of the projected study area, specifically identifying the locations of water points used as geographical landmarks. These water points serve as key orientation markers for herders accessing the urban centers of F'Derik and Zouerate. Figure shows the main transhumance corridors used by herders, the locations of strategic water points (Laouj, Enajim, Lebeir), and areas with high concentrations of forage resources, particularly those rich in Askaf (Nucularia perrinii). This mapping provides a visual representation of the seasonal dynamics of pastoral mobility in a context of pressure on natural resources.

Local Support Service for Pastoral Activities

Based on interviews conducted with institutional stakeholders and livestock associations in June 2025, it appears that the veterinary service in F'Derik consists of two individuals. Their mandate is to support pastoral activities by ensuring prophylaxis and providing care to herds. This service organizes mandatory vaccination campaigns (against PPR, sheep pox, and pasteurellosis) in the Moughataa of F'Derik

Transhumance and Security

In the northern region of Mauritania, pastoral mobility dynamics have a cross-border character due to ecological complementarities between agro-pastoral zones and neighbouring countries. Herders report regular and safe movement between Mauritania and neighbouring countries, particularly Senegal, Algeria, and Mali. No security incidents have been reported in these border areas this year. As previously mentioned, in the mining area, in the mining area, transhumance mainly follows west-east corridors to the border with Mali. However, since 2023, the deterioration of the security situation in certain border localities of Mali has caused significant disruptions in transhumance flows (OIM, 2019).

Base on the focus group carried out in June 2025, mining activities are identified as constraints to pastoralism due to the disruption of certain transhumance corridors. These disruptions are mainly linked to rail and road traffic generated by the National Industrial and Mining Company (SNIM), particularly when livestock crosses transport infrastructure. In response to these challenges, SNIM has established a grievance mechanism to report any incidents likely to affect herders' movement along transhumance corridors.

Figure 8-17 illustrates the crossing of the railway by small ruminants and dromedaries in the mining area, highlighting the risks associated with interactions between pastoral activities and the passage of the SNIM train.

Figure 8-17: Livestock crossing railway in the mine area.

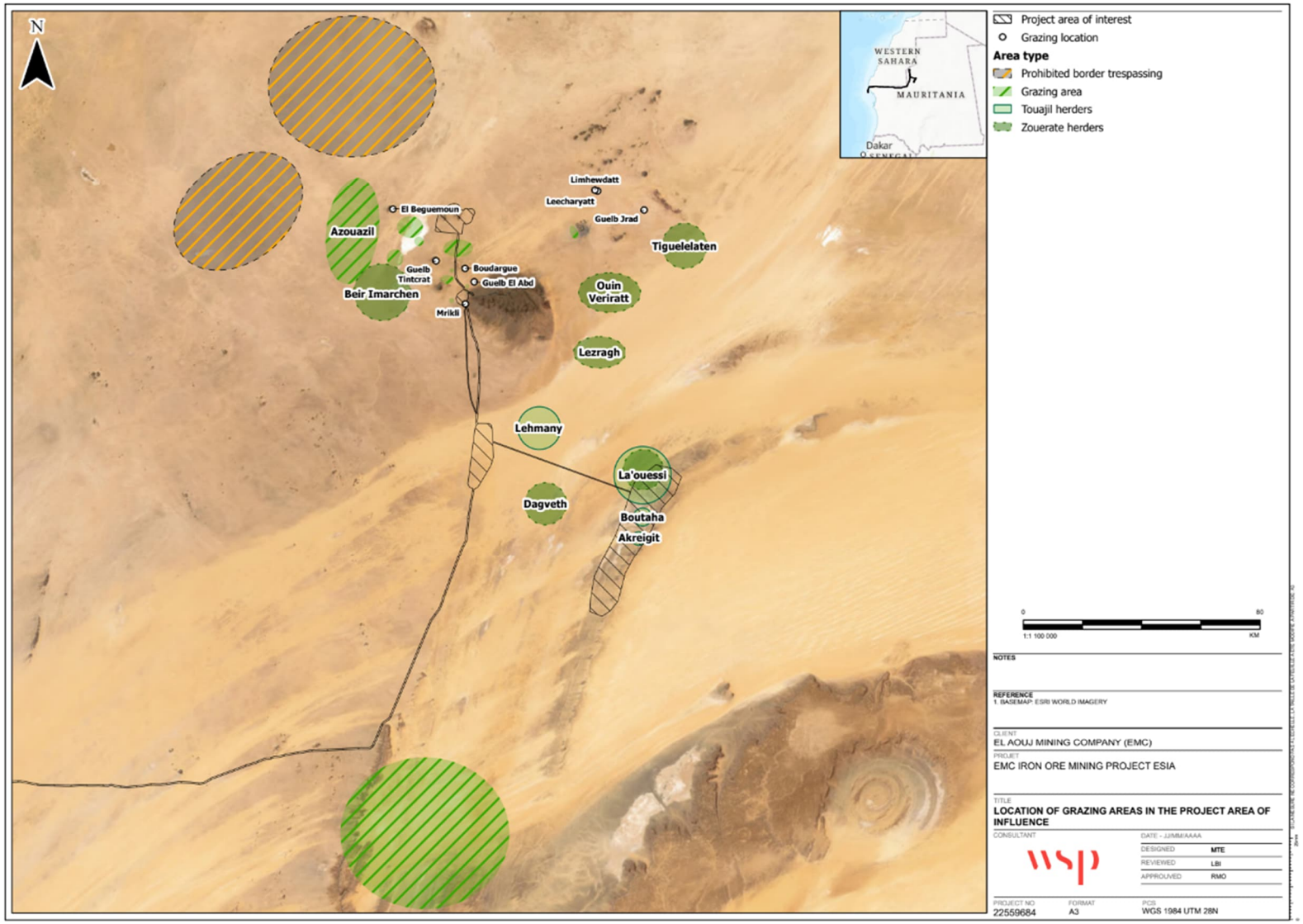
Consultations through focus groups of pastoralists in F'Derik, Touajil and Zouerate in 2023, interviews with pastoralists met at their nomadic camp or at water points during the ESIA update led to the following conclusions:

- The drought has continued to get worse in the past ten years with the consequence for some pastoralists of not setting up camps in the El Aouj site vicinity sometimes for two or three years in a row. However, the 2022 rainy season was exceptionally good with an increased presence of livestock in the Project AoI;
- The borders with Western Sahara have been officially closed and the Mauritanian authorities have made crossing of the border illegal, even for pastoralists, to avoid the occurrence of incidents: There are report of vehicles and individuals being targeted by the Sarawi military forces, with dramatic consequences. The Western area was previously an extensively used destination for the pastoralists of the area with high-quality grazing land. The consultation reveals that the borders are closed for vehicles but that it would still be possible but risky, to cross the border on foot with herds. People, mainly nomadic pastoralists appear to continue to move across the border (without vehicles) while sedentary and mixed sedentary nomadic pastoralists no longer do so. Closing of the border to vehicles is a challenge for supplying water to animals (water is brought to a pastural area in water tanks). As a result, pastoralists describe a decrease in the herds and/or a higher concentration of herds around the El Aouj borehole and El Aouj grazing land;
- The El Aouj Project site is described as of mediocre quality for pastural land (with the absence of the Askef plant renowned for its nutritive capacity) but valuable for its proximity to the El Aouj borehole and in the absence of access to the Western Sahara. The El Aouj borehole is managed by the Pastoralist Association. However, the El Aouj site area is not the only option for pastureland in the area;
- Accidents between animals and the SNIM train have been regularly evoked by the pastoralists. The SNIM train provides water for the population settled along the rail between Nouhadibou and Zouerate. This water is used by the population for personal consumption, small scale market gardening and livestock. Water tanks are filled along the railway, and their presence attracts wandering animals along the railway track. The SNIM has already started an initiative to prevent these accidents and relieve the pressure on water

delivery by train through the creation of new pastoral boreholes away from the railway. It is an element that will need to be taken into account when designing water points at the location of safety relieve valves along the water pipe or considering the cumulative impact of the project on the existing railway traffic;

- There are no official statistics on the number of pastoralists in the Project AoI, with numbers fluctuating widely depending on the rains. The administration estimates the number of individuals engaged in pastoralist activities at 700 in Zouerate and 500 in F'Derik and total livestock in the two mugataas of approximately 100,000 camels and 75,000 small ruminants.

Figure 8-18: Grazing and main transhumance corridors in the mine area



8.4.7.7 Salt Mining at Sebkha Idjill

As part of the update of the project's Environmental and Social Impact Assessment (ESIA) in 2025, a visit to the Sebkha Idjill salt exploitation site was organized, followed by a focus group meeting with beneficiary families, traders and workers from the site. The discussions focused on salt farming as a means of subsistence for local communities, as well as the potential associated impacts.

Historical

The results of the focus group and individual interviews conducted on site indicate that salt from Sebkha Idjill is viewed as both an economic resource and a cultural heritage. It has been harvested using traditional methods by the local families for over three centuries. The area belongs to two main traditional families who inherited it from their ancestors and have continued the historic artisanal extraction methods for decades. Renowned for its quality, this salt was once sold in neighboring countries, particularly Mali and Senegal.

The site covers an estimated between 175 and 380 km² and more than 2,000 families benefit directly or indirectly from the income generated by exploiting Sebkha Idjill's salt resources.

Extraction

Salt harvesting takes place every year during a campaign lasting two to three months in the dry season. Beneficiary families launch the campaign at F'Derik city hall after consulting with local authorities. The start date is determined based on how much salt remains and is then shared with the local and administrative authorities in F'Derik. The families then organize the recruitment of workers.

The salt is extracted in slabs around 60 cm thick and transported by managers' vehicles and camels. The salt is then crushed and stored in the open air, around 100 meters from the extraction site, before being enriched with iodine and sold. Between 150,000 and 200,000 tons of salt are extracted from the site during a campaign.

The Figure 8-19 illustrates the salt extraction operations within the Sebkha Idjill, as well as the open-air storage methods observed during the field mission conducted in June 2025.

1: salt extraction at Sebkha idjill

2: salt stored in the open air

Figure 8-19: Salt mining extraction and storage at the Sebkha Idjill in June 2025

Land Tenure and Dependencies

During the social baseline consultations conducted in June 2025, no competing land claims or additional dependencies on Sebkha Idjill were reported. Focus group discussions with salt collectors, combined with key informant interviews with the Hakem, municipal representatives, and traditional leaders, confirmed that the Sebkha is recognized as a customary property managed by two historic families and the commune. Seasonal access for labor is organized under this framework, and no other households or groups asserted rights or claims over the saline.

According to participants in the June 2025 focus group, the access to employment opportunities in the Sebkha is open to all Mauritanian nationals, with approximately 60% of the workforce originating from families traditionally associated with salt extraction. These figures reflect stakeholder perceptions collected during the 2025 baseline consultations.

Employment and trading

Salt extraction is seasonal work and generally lasts around three months. The season ends when the available salt stock has been completely extracted. In 2025, the site manager recorded 350 permanent employees at the Sebkha Idjill extraction site. Most workers come from the localities of F'Derik and Ouadane (Adrar region) and are housed in tents on site during the extraction period.

The extracted salt is stored and then gradually sold throughout the year. It is sold to local traders who themselves provide logistics and transport to Nouakchott or other regions of Mauritania. It is also sold to transhumant herders, who use it as a mineral supplement for their livestock.

According to a court ruling in 2010, the income from salt mining at Sebkha Idjill is divided between the traditional families, the manager, the workers, and the municipality of F'Derik. The distribution is as follows:

- Workers: 45% of operating income.
- Municipality of F'Derik: 6% of operating income.
- Manager: 20% of operating income.
- Traditional beneficiary families: the remaining share, distributed equally

A worker employed during a three-month season gets an average of 15,000 MRU per month, spread over the calendar year.

According to representatives of traditional families and administrative and local authorities in the city of F'Derik (the Hakem and the Mayor), who were present during the site visit, no conflicts related to land ownership or the sharing of income from salt exploitation at Sebkha Idjill have been reported. All those involved in the exploitation chain, including traditional families, benefit equitably from the income generated.

The salt exploitation campaign is well structured and jointly managed by the site manager and traditional families. This activity contributes significantly to improving the living conditions of many households in the region, while strengthening the local economy.

8.4.7.8 Artisanal gold mining

Since 2016, Mauritania has been experiencing a gold mining rush. Formal and informal gold mining is a significant source of income for households and the state.

Artisanal gold mining in the region started in an uncontrolled manner in 2016/2017 before being formalized by the Government of Mauritania in 2018 with the creation of artisanal mining corridors in several regions of the country. From this time, authorisation is needed to work on three mining sites in the Tiris Zemmour Region, located more than 700km from Zouerate. Zouerate serves as the primary logistical hub and gold processing center for mining operations. Oversight of the mining sites was initially managed by the mining police until the establishment of the specialized agency Maaden in 2020.

During its first year of operation, Maaden registered 2,000 vehicles and 80,000 persons applying for a professional artisanal gold mining card in the Region. The card can only be granted to Mauritanian nationals who can then employ foreigners. The number of miners on the sites fluctuates a lot, with rapid movements when a new mining site is opened by the authorities in any part of the country. According to Maaden’s estimation, there are today approximately 2,500 miners at the Guelb Ndour site, 3,000 at the Chegatt site and more at a

third site. Gold is extracted using artisanal techniques (manually dug trenches and holes) and roughly crushed on site manually, packed in 50-70kg bags and sent to the Zouerate processing site.

The artisanal gold processing site was opened by the government 5 km from Zouerate in 2018 in an attempt, to control the gold processing that was taking place within the residential areas of the town of Zouerate, using a mercury or cyanide lixiviation process. Process operators pay an annual fee (2,000 MRU/year) to install a crusher on site and carry out the first processing step which allows for a 30% gold recovery rate using mercury. At its peak, up to 800 crushers were installed on the site and up to 20 trucks per day from the extractive sites were registered. At the end of 2022, between 2,000 and 3,000 persons were working on the site. The activity has now declined with Maaden reporting a few trucks delivery per day. A large community from Sudan is working on the site but operators from the entire country, including Zouerate can be found. Residents of Zouerate are also found in the small restaurants and shops that opened at the site entrance. It is reported that the local population which was unfamiliar with gold processing at first was unaware of the value of tailings, which can be reprocessed to reach a higher gold recovery rate, and they considered them as waste. Now, semi-industrial companies buy the tailings and remove them to a processing site outside the Region.

In 2020, GIZ supported the Ministry of Mines and the Ministry of the Environment in financing an Environmental and Socio-economic assessment of the Zouerate gold processing site (not publicly available). The study revealed concerns about mercury pollution in the vicinity of the site and in the town of Zouerate. At the request of a part of the population and the local authorities, a new gold processing site has been prepared by Maaden, 200km from Zouerate in the same direction as the extraction sites. The closing of the Zouerate site is therefore presented as imminent by the authorities.

Pressure on water resources by the mining activities has been reported, which has led the Hakem of F'Derik to forbid pumping at the dam to preserve the resource for agriculture and leisure purposes. Finally, the gold processing site is now reported as mainly using SNIM brine from the reverse osmosis unit which limit the impact on the water resource.

The gold mining boom has had a significant impact on Zouerate's demography and socio-economic dynamics. The last national census dates back 2013 but several estimates of the population increase are circulating, presenting a demographic increase ranging from a +30% to +100% population for the city of Zouerate. Stakeholders are all describing an economic boom in Zouerate with a large increase in new shops and services (e.g. from 4 gas stations in 2015 to 17 today) and a sharp inflation in housing prices. This economic development is less perceptible in F'Derik or Touajil where miners have not settled. The communities and elected officials met report that gold mining has not had any positive impacts on the local economy. However, focus groups with youths from F'Derik and Touajil revealed that a non-negligible number of youths from the area have tried or are currently working in gold mining. The administrative authorities, although they clearly indicate that the gold mining rush has had no impact on F'Derik's demography, acknowledge that an economic impact is however perceptible with the feeling that more money is circulating in the community.

The negative impacts of the gold mining rush on Zouerate were largely commented on by all the stakeholders met. The main impacts described are:

- The environmental impacts with the use of mercury and cyanide;
- Inflation, for basic food and water as well as for housing. It must be noted that the inflation attributed to the increase in population was probably cumulative with the general inflation recorded during COVID and as resulting from the Ukrainian crisis in a country that imports most of its food and goods;
- The pressure on municipal services: healthcare (large increase in traumatic injuries), waste management, water usage etc.;

- An increase in the number of women-headed households with many reports of artisanal mining migrant workers marrying local women, having children, and then disappearing. The subject was considered as sufficiently important for the Wali to organise an awareness workshop on the subject;
- The pressure on the F'Derik water dam (before the ban).

As regards the safety aspects, a few reports of increases in petty theft were recorded during the consultations but the general feedback from the population is that they do not feel unsafe. Women explained that they can freely move unaccompanied without fear for their safety. One explanation given is that the area is under military control, due to the presence of borders with Western Sahara, Algeria and Mali, which prevents the criminality and trafficking that can often be witnessed in an artisanal gold rush environment.

8.4.7.9 SNIM Operation

SNIM which began iron ore mining operations in the early 1960s continued to expand in the last ten years with the opening of the Guelb II mining complex in 2015 which encompassed:

- An extension of the Guelb El Rhein mine;
- An ore enrichment process plant;
- An extension of the Guelb power plant;
- The operation of a new water catchment with a 55km water supply network;
- A brackish water processing plant.

The complex is located 20 km North-East of Zouerate. It provides a 30% capacity increase for SNIM production.

The second SNIM extension project is the F'Derik 1 Project which is due to enter into operation in late 2023. The project includes:

- The reopening and extension of the F'Derik mine which was operated between 1967 and 1983;
- The re-construction of a handling site, including primary and secondary crushers;
- The mine is located 1km East of F'Derik.

The company remains the largest employer in the region with approximately 3,500 employees based in Zouerate and F'Derik. A new residential area of 600 houses was commissioned in 2022 for SNIM employees in Zouerate.

8.4.8 Social Infrastructure and Services

8.4.8.1 Water and sanitation

The changes to the 2015 ESIA description of water and sanitation are as follows:

- In F'Derik, the distribution of drinking water is now provided by the National Agency for Water and Rural Energy Services (ENSER). This service, which was previously free or informal, is now structured and subject to pricing, in accordance with national policies on sustainable water resource management. This change aims to improve service quality, ensure infrastructure maintenance and increase user accountability. However, key informants indicated that the agency faces difficulties in recovering payment. Water continues to be pumped from a SNIM borehole located in the F'Derik mountain. In Zouerate, the Guelb II Project included an extension of the water extraction system of up to 2,000 m^3/day and the construction of reverse osmosis treatment plant. Currently, more than 50% of the water produced by SNIM is used by the local population. However, water shortages persist, and additional water is supplied through the SNIM service train from Nouadhibou when needed. A new project to further increase daily water

production by an additional 1,000 m³/day is under construction. Water is provided free of charge in SNIM housing areas in Zouerate and is directly managed by the company. Water is available in one- or two-hour supply slots every two days, during which households can fill their water storage tanks. In non-SNIM residential areas, water is a paid service that is highly subsidised and managed by M2E, a wholly owned SNIM subsidiary established in 2013. Water is supplied once a week, and the municipality also distributes water by tanker truck.

A sewage treatment plant was built by the SNIM in Zouerate in 2015 to treat wastewater generated by housing occupied by SNIM employees.

In addition to the public systems described above, community-level access to water along the Zouerate–F'Derik–Choum corridor has been strengthened through programmes implemented by the SNIM Foundation. These include the construction of boreholes equipped with solar pumps, the maintenance of existing water points, and the expansion of reverse-osmosis treatment capacity in Zouerate. These interventions help improve household water availability and provide strategically located watering points for pastoral movements, partially alleviating the seasonal shortages reported by local authorities (Foundation SNIM, 2023).

In addition to the existing water and sanitation infrastructure described above, the El Aouj Project includes planned water and sanitation infrastructure for F'Derik. As described in Sections 4.2.5.3.2 and 4.4 of the Project Description, approximately 840 m³/day (0.84 ML/day) of potable water will be supplied to F'Derik from the Touajil wellfield. Water will be treated by reverse osmosis at the mine site and conveyed by pipeline to a 1,200 m³ storage tank in F'Derik for distribution to EMC workers and their families and the wider F'Derik community. The Project also includes a wastewater treatment plant to be located more than 300 m southwest of the El Aouj City perimeter, which is planned to receive and treat wastewater from both El Aouj City and the existing town of F'Derik. Further details are provided in Sections 4.2.5.3.2 and 4.4 of the Project Description.Electricity

The household access rate to electricity increased from 96% in 2012 (URS, 2015) to 98.2% in 2019 (EPVC) meaning that the region ranks first nationally in terms of electricity access, ahead of Nouadhibou (90.2%) and Nouakchott (89.8%). Electricity supply in Zouerate and F'Derik is managed by M2E, using the power plant that was extended in 2015 as part of the Guelb II Project.

The power plant comprises 120 Heavy Fuel Oil (HFO) generators and 3 solar generators. Plans are in place to add an additional 30 HFO generators and 12 solar generators. Electricity supply is free of charge in F'Derik. In Zouerate, SNIM employees benefit from a free electricity consumption quota and are charged for any additional usage. For non-SNIM employees, electricity is a paid service. Power outages related to load shedding are common. In Touajil, households are connected to the SNIM base electricity supply system and receive electricity free of charge.

In addition, basic household access to electricity has been improved in several corridor localities through the targeted distribution of domestic solar kits (lighting, phone charging, television). This off-grid solution benefits isolated hamlets in particular and complements the urban supply in Zouerate and F'Derik, where load-shedding remains frequent (Foundation SNIM, 2023).

8.4.8.2 Health

Healthcare services in the mine area are structured around existing public facilities. Zouerate hosts the main regional hospital serving the wilaya of Tiris Zemmour. This hospital is complemented by health centres and health posts in surrounding localities, including F'Derik. F'Derik is equipped with a primary health centre providing basic healthcare services and referrals to Zouerate for specialised treatment.

The description of the health services presented in the 2015 ESIA therefore remains valid in terms of the structure and organisation of healthcare facilities in the area.

Since the 2015 ESIA, the main change observed concerns the nature and volume of cases handled by existing health facilities. In particular, there has been an increase in injuries linked to artisanal mining activities, including crushing, asphyxia and polytraumatic injuries. Injured miners are evacuated from the mining sites by Maaden to Zouerate hospital.

This creates a challenge as the hospital is not well staffed or equipped for serious polytraumatic injuries, given the increased demand for trauma care and limited specialized medical capacity. The regional health administration now ranks accidents as the third type of pathology treated at the hospital after respiratory diseases and diarrhoeal diseases.

According to recent institutional information referenced by SNIM (2024), respiratory diseases and diarrhoeal diseases remain among the most frequently reported pathologies in health facilities in Zouerate and F'Derik, alongside trauma-related injuries. Pulmonary and other respiratory conditions are regularly reported among the main causes of consultation in both localities.

The population increase in Zouerate has also increased the pressure on health infrastructure, while human and material resources have remained broadly unchanged.

Staffing levels and access to medicines remain a challenge in F'Derik. While the health centre is currently staffed with two permanent doctors, only 2 out of the 10 planned nursing positions are currently filled. The Chief doctor estimates that only 5 to 10% of the medicines required are available at the health centre. SNIM (2024) similarly highlights recurrent constraints related to staffing levels and the availability of medical supplies in peripheral health facilities.

At the national level, health statistics published by the National Statistical Office (ANSADE) and the Ministry of Health and consolidated by the World Health Organization (WHO), indicate that communicable diseases remain among the leading causes of morbidity in Mauritania. According to the ANSADE EPCV 2019–2020 and the WHO Mauritania country health profile (2022), respiratory infections and diarrhoeal diseases are consistently among the most frequently reported causes of consultation and hospitalisation nationwide.

During consultations, health officials and community members indicated that, in their view, the high prevalence of respiratory diseases observed in F'Derik and Zouerate may be linked to mining activities. These statements are reported as stakeholder perceptions and do not constitute a medical or causal assessment.

8.4.8.3 Education

The raw school enrolment rate for primary school remains higher than the national level at 89.5% compared to 68.3% nationally in 2019 (EPCV); and at 65.9% for secondary education compared 49.8% at the national level. These high rates are mainly explained by the concentration of an educated population working for SNIM and residing in Zouerate.

In Zouerate, the education infrastructure has not changed structurally since the 2015 ESIA. The city includes several primary and secondary schools, as well as a technical high school established in 2015, which offers a technician level diploma in industrial or domestic electricity, construction, welding, automobile mechanic or mining processing techniques (directed toward artisanal mining). However, the average number of pupils per class in Zouerate school has increased from 50 pupils per class in 2015 (2015 ESIA) to 80 pupils per class in 2015 (2023 SCRAP). Housing shortages and high rental prices in Zouerate remain a challenge for attracting and retaining teachers.

According to information published by the SNIM Foundation (2024), two fully equipped primary schools were constructed in Zouerate as part of its education support program. These schools include classrooms, administrative facilities, water supply systems and caretaker housing, and were fully funded by the SNIM Foundation. This contribution complements the existing public education infrastructure in the city.

F’Derik still has four primary schools, including one in Touajil and one in Touerga approximately 950 pupils across 22 classes. The school in Touerga (Figure 8-20) provides only two levels of education and experiences fluctuating attendance linked to the seasonal presence of families, with enrolment ranging from 3 to 20 pupils. The teacher assigned to this school commutes daily by taxi from Zouerate.

At the time of the 2015 ESIA, F’Derik had a junior high school (collège), which has since been extended to include the high school level. Nevertheless, continuation of schooling beyond primary education remains a challenge for girls from Touajil, as some families are reluctant to allow them to leave the household to live with relatives or acquaintances in Zouerate or F’Derik. Housing conditions for teachers in F’Derik are less constrained than in Zouerate; however, postings are generally considered less attractive due to more limited infrastructure and transport services.

According to the education administration, no increase in school drop-out rates linked to artisanal gold mining has been recorded. The administration also indicated that drug use is not considered a significant issue within schools, noting that preventive measures have been implemented to limit trafficking risks associated with the region’s proximity to international borders.

Figure 8-20: Touerga School, May 2023.

Recent investments have also supported the broader education system in the Mine Area. These include the construction or rehabilitation of classrooms and fully equipped schools (water supply systems, administrative offices, caretaker housing), the provision of school supplies and uniforms, and support programmes for exam preparation. These measures increase the capacity and retention of pupils in urban centres such as Zouerate and F’Derik, as well as in transit localities such as Choum, with benefits particularly evident for low-income households (Foundation SNIM, 2023).

8.4.8.4 Housing

In the mining area, housing is mainly concentrated in urban areas, particularly in F'Derik and Zouerate. The city of Zouerate is the largest urban center in the Tiris Zemmour wilaya and is experiencing significant population growth, driven by employment opportunities linked to SNIM's mining activities, gold activities and trade. Urban infrastructure consists mainly of permanent structures built from cement, concrete or breeze blocks. Some buildings are multi-storey and include balconies.

In F'Derik, the urban center has a mix of housing types: dwellings constructed from durable materials coexisting with more precarious clay-based structures. Outside these urban centers, the village of Touajil presents mixed

housing conditions, combining permanent houses (cement, concrete) with temporary dwellings. The localities of Toueirga and Aouchich, are characterized by housing made of clayor banco, as well as permanent and seasonal camps, often occupied by nomadic populations and transhumant herders.

Figure 8-21 illustrates the different types of housing observed in the mining area during the site visit in June 2025.

1: Housing in F'Derik, view east to west

2: Housing in F'Derik, view west to east

Figure 8-21: Housing in F'Derik, June 2025.

8.4.8.5 Transport

Several transport infrastructures are present within the project study area, including roads, rail and airport transport.

- Road transport: A significant improvement since the 2015 ESIA is the renovation and upgrade of the road linking Nouakchott to Zouerate. In addition, a road project connecting Zouerate to Tindouf (Algeria) is currently in its final financial closing stage and is widely anticipated by the population for its potential contribution to regional economic development. The national road (RN1) connects the capital Nouakchott to the project area by F'Derik and extends over approximately 700 kilometers. At F'Derik, a secondary bitumen road connects F'Derik to Zouérat. According to the URS 2015 report, the transport infrastructure within the baseline area is limited and the road network is poorly developed, the road network is mostly limited to gravel and informal roads. The N1 Highway north of F'Derik is formed of multiple informal and unformed tracks. A paved road begins in Touajil and ends in Zouerate via F'Derik. In Zouerate the main roads are also paved while in F'Derik all roads are unpaved. Public transport services are available in Zouerate but are not established between Zouerate and F'Derik; residents therefore rely on taxis or private vehicles. Traffic movement in the baseline area is very light. Access to the Sebkha Idjill salt extraction area is provided by multiple tracks branching from N1 Highway between F'Derik and Touajil and between F'Derik and El Aouj East.

  Road transport remains the primary mode of mobility in the mine area, with most daily activities relying on motorized transport.

- Rail transport: A railway line of more than 700 km connects the cities of Zouerate and Nouadhibou, passing through F'Derik and Choum for the transport of iron ore. This railway line is operated by the company SNIM and is primarily used for the transport of iron ore, representing a critical transport infrastructure within the project area.

- Zouerate international airport: Zouerate is equipped with an international airport offering regular flights to Nouakchott. The airport provides an essential connection for travelers and for personnel employed in the mining sector, including SNIM workers.

8.4.8.6 Telecommunication and Media

SNIM has installed optical fibre infrastructure along the railway, enabling access to 4G mobile technology in Zouerate and Touajil. In F'Derik, internet access is primarily provided through the mobile network. Discussions held with youth during focus group meetings indicated that most young people own smartphones and access the internet, although limited financial resources were cited as a constraint to regular connectivity in F'Derik.

Off-grid household equipment (solar kits) indirectly supports the use of digital tools, such as phone charging and access to television, including in areas without reliable grid connections. This improves access to information and connectivity for young households, although regular use remains constrained by the cost of mobile data (Foundation SNIM, 2023).

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8.4.9 Security

Mauritania has not experienced terrorist attacks on its territory since December 2011. The North-eastern part of the country was designated a military zone in 2008 in response to the risk of illegal transborder trafficking with Algeria, Mali and Western Sahara and to the risk of incursions by terrorist groups. Authorisation from the Wali is needed to move around in the military zone, as according to the Ministry of Defense "any individuals moving around or transiting in this part of the territory will be considered a military target". The Wali and F'Derik Hakem confirmed that territorial security remains a central responsibility of local authorities. In parallel, foreign ministries of several Western countries advise their nationals to limit travel to Zouerate to essential purposes only and to avoid travel in the other parts of Tiris Zemmour (Figure 8-22).

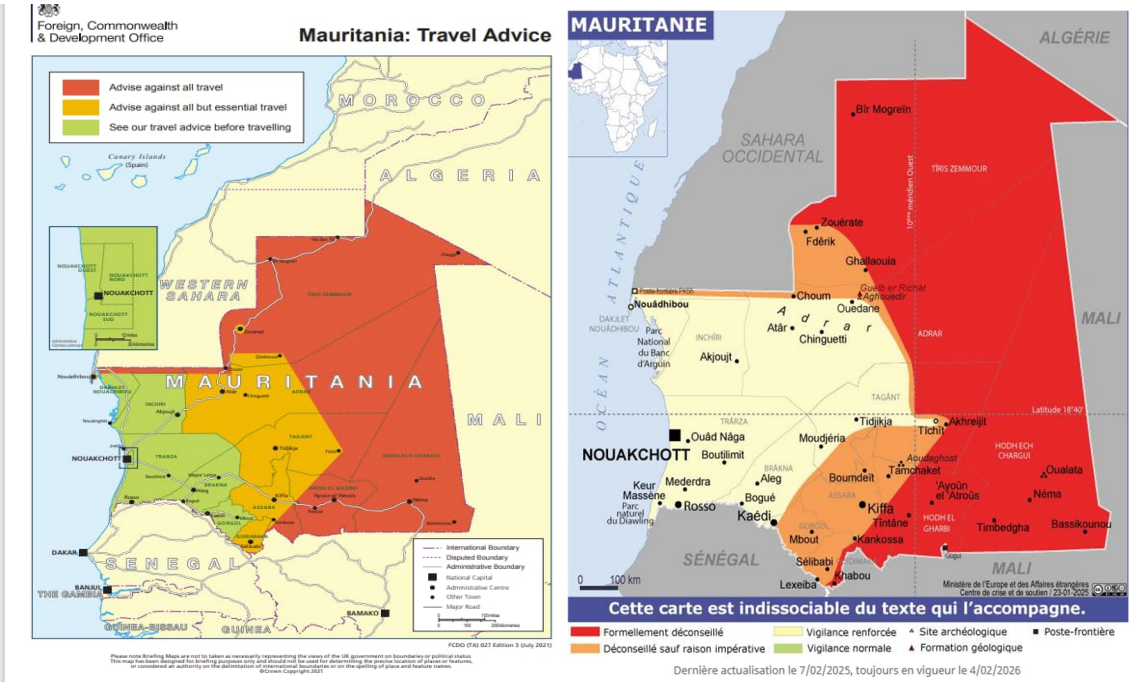


Figure 8-22: UK Foreign office travel advises (left), France Diplomacy Travel Advice (right), February 2026.

8.5 Conclusion of the social environment context of the AoI of the Project

The social baseline concludes with an assessment of receptor sensitivity, defined as the ability of each social component to absorb or adapt to project-induced change. The four-level sensitivity scale (High, Moderate, Low, Negligible) reflects the resilience and adaptive capacity of each component social environment.

These levels are defined as follows:

- **Negligible**: The receptor is not sensitive to project-related change and has a very high capacity to absorb impacts.
- **Low**: The receptor is generally resilient and can adapt to change with limited disruption.
- **Moderate**: The receptor has a reduced ability to adapt or absorb change and may experience noticeable effects.
- **High**: The receptor has little or no remaining capacity to absorb change and is highly susceptible to project-related impacts.

Based on these definitions, Table 8-14 presents a summary of sensitivity of each social component across the Port, Rail, and Mine areas.

Table 8-14: Summary of social baseline conditions and sensitivity

Topic	Rationale	Sensitivity
Port area		

Topic	Rationale	Sensitivity
Population and social organisation	The project port site lies ~7 km south of Nouadhibou, in proximity to residential areas such as Cansado. Nouadhibou is Mauritania's second-largest city and has experienced sustained population growth driven by internal migration. The population is diverse, with multiple socio-ethnic groups and languages, including West African migrant communities.	Low
Women and vulnerable groups	Women are active in fish processing, small-scale trade and service activities, but remain under-represented in formal port and industrial employment. Vulnerable groups in the port area include informal workers, seasonal labourers, low-income households, and migrant workers with limited access to social protection.	Moderate
Economic activities and livelihoods	Economic activities in the port area include artisanal and industrial fishing, fish processing, petty trade, transport services and port-related activities. Employment is predominantly informal and influenced by seasonal patterns in the fisheries sector.	Moderate
Social infrastructure and services	Nouadhibou concentrates the main regional schools, health facilities and municipal services, with electricity and water networks extending across the urban area. Access and service quality vary between neighbourhoods; the mineral-port perimeter itself is an industrial zone with minimal community-oriented facilities	Moderate
Rail area		
Population and social organisation	Settlements along the railway corridor are sparse, with small communities located around rail stops such as Choum. Social organisation is based on extended family and clan structures, and nomadic groups use the corridor seasonally.	Moderate to High
Women and vulnerable groups	Women have limited access to formal employment and are mainly involved in small-scale trade and household activities. Vulnerable groups include petty traders, pastoral households exposed to resource pressures and youth with few economic opportunities. Elderly people, people with disabilities, and chronically ill individuals also experience heightened vulnerability	High
Economic activities and livelihoods	Livelihoods include trade, services supporting railway activities, livestock herding and small-scale agriculture where water is available. Some households also rely on remittances from relatives working in mining or in Nouadhibou.	Moderate to High
Social infrastructure and services	Access to basic services is limited, with communities depending on wells, small health posts and primary schools in localities such as Choum. Specialised services are only available in larger towns such as Zouerate and Nouadhibou, and local service capacity remains limited due to remoteness and low settlement density..	High
Pastoralism	Pastoralism is a key livelihood, with seasonal transhumance relying on grazing areas and wells situated near the railway. Households remain vulnerable to drought and pressures on natural resources.	High
Mine area		

Topic	Rationale	Sensitivity
Administrative division and governance	The mine area lies within Tiris Zemmour wilaya, administered by the Wali (Zouerate) and the Hakem (F'Derik). Local governance is exercised by municipal councils, and customary land management coexists with statutory allocation, notably around Sebkha Idjill.	Negligible to Low
Partners and development actors	SNIM is the principal institutional actor, alongside municipal councils and selected development partners active in Zouerate and F'Derik.	Low
Population and social organisation	The area includes the urban centres of Zouerate and F'Derik, with populations linked to mining, trade and public administration; small settlements and nomadic groups are sparsely distributed across the desert.	Moderate
Women and vulnerable groups	Women participate in trade, education and services but remain under-represented in formal mining employment. Vulnerable groups include unemployed youth, seasonal workers, low-income households and migrants.	High
Land use	Land use comprises mining, salt extraction, pastoralism, oasis agriculture and settlements. Sebkha Idjill is under customary tenure, while state land is allocated for industrial projects and new housing near F'Derik.	Moderate to High
Economic activities and livelihoods	Livelihoods include mining employment (SNIM, EMC), artisanal salt production, trade, oasis agriculture, pastoralism and small-scale gold panning; the local economy is highly dependent on mining and complemented by subsistence and artisanal activities	Moderate to High
Social infrastructure and services	Zouerate and F'Derik concentrate the main schools, health centres, markets, electricity, water and telecommunications infrastructure. In rural hamlets and pastoral areas, service provision is sparse due to low settlement density, though partially supplemented by SNIM-supported measures such as boreholes equipped with solar pumps, expanded reverse-osmosis capacity in Zouerate, domestic solar kits for isolated households, and periodic outreach health caravans.	Moderate to High
Security	Security is provided by state authorities (Hakem, gendarmerie, police) and mining operators; the area is generally stable, with monitoring of cross-border movements.	Low

9.0 CULTURAL HERITAGE BASELINE

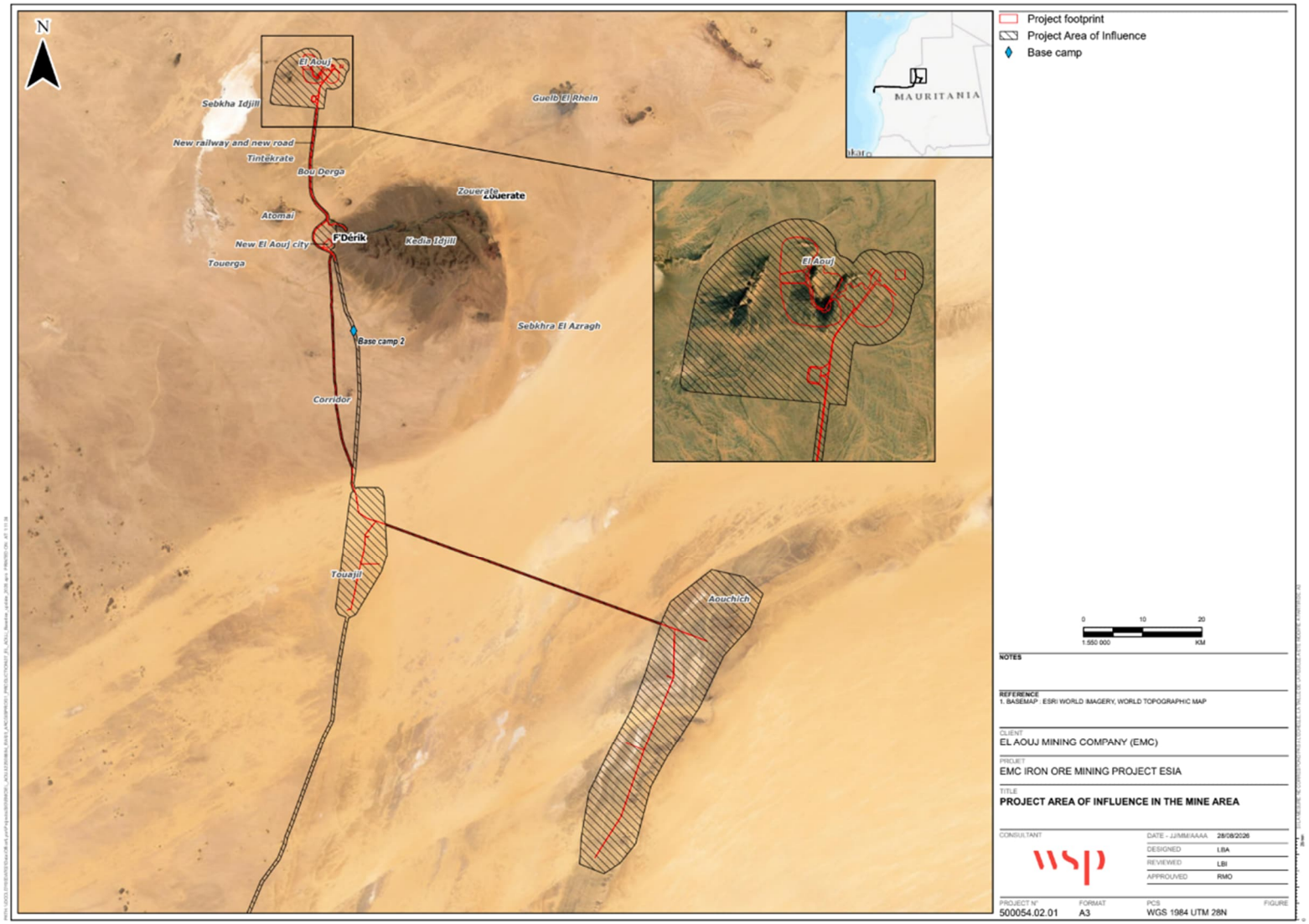
9.1 Definition of the area of influence

To collect robust information in support of the cultural heritage baseline study, the Project Area of Influence (AoI) aligns with the Social AoI detailed in Chapter 8.0. The AoI encompasses the Project's mine footprint, nearby communities, the Nouadhibou Port area and the railway connection between them.

For the mine area, the cultural heritage baseline has been compiled with reference to the most recently proposed Project footprint in 2026 including the new Aouchich water supply area and associated pipeline, and the redesigned renewable power supply area and the proposed transmission line. The Project plans to use Nouadhibou Port as a temporary storage and ore loading area, prior to product export and Société Nationale Industrielle et Minière's (SNIM's) existing railway line to transport ore between the mine and the port. The cultural heritage baseline study area therefore includes the following components associated with delivery of the proposed Project, also shown in **Figure 9-1.**

- All mine components and related supporting infrastructure where any ground disturbance is predicted to occur (hereafter, the Mine Site Area);
- The proposed transmission line and associated infrastructure;
- Settlements and associated (community) cultural receptors (i.e., mosques, cemeteries, cultural landscape features and sacred sites) as aligned with the Social Area of Influence (see Baseline chapter 8);
- Nouadhibou Port and the SNIM railway line connecting the port to the proposed mining area.

Figure 9-1: Cultural heritage baseline study area



9.2 Methodology

The general objective of the cultural heritage baseline survey, as part of the overall ESIA process, is to collect scientifically defendable, high-quality baseline data of sufficient breadth that can be used to characterise, as far as possible, the baseline cultural heritage conditions in the proposed Project area to enable the robust update of impact assessment to follow. In line with the requirements of Mauritania's Framework Law No. 2005-046 on the Protection of Tangible Cultural Heritage (Parliament of Mauritania, 2005) and International Finance Corporation (IFC) Performance Standard 8 (PS 8) (2012) cultural heritage is defined as follows:

'…(i) tangible forms of cultural heritage such as tangible moveable or immovable objects, property, sites, structures or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic and religious values; (ii) unique natural features or tangible objects that embody cultural values such as sacred groves, rocks, lakes and waterfalls; and (iii) certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.'

The original cultural heritage baseline reporting was undertaken by URS in 2015, based on the Project components at the time. This methodology comprised a desktop study of available documents and preliminary consultation data; basic predictive modelling; and field walkover inspection. The field walkover comprised visual verification of data gathered as part of a 2012 ESIA scoping study, assessing the condition of known sites and the potential for unknown buried archaeological remains. Detailed inspection and mapping of areas with dense concentrations of archaeological artefacts was also completed. The full methodology for the original baseline is presented in Section 12.1 of the 2015 ESIA report (URS, 2015).

The methodology guiding the cultural heritage baseline update (for 2023 and 2025) was outlined in a comprehensive Work Plan ((WSP, 2023) and WSP 2025). It comprised four phases, which are summarised below. These investigations focused on identifying and recording the full suite of archaeological and cultural heritage resources (tangible and intangible) within the AoI. Baseline field walkover inspection was undertaken between the 4th and 8th May 2023 by a suitably qualified sub consultant, Mr. Baouba Ould Mohamed Naffé, under the direction of WSP's Cultural Heritage and Archaeology Team, this walkover was complemented by the Stakeholder Engagement and Social consultation programme, to acquire data on local cultural resources and intangible heritage in participation with local communities. Mr. Baouba's summary field report is presented in APPENDIX P. The 2023 baseline programme was supplemented with additional community consultations in June 2025, which provided additional data on aspects of intangible heritage. The related field report is presented in Baseline Chapter 11 (Appendix D)

The specific objectives of the updated baseline cultural heritage study are as follows:

- Compile a consolidated cultural heritage baseline in relation to the most recently proposed Project footprint surveying areas not previously targeted for inspection – specifically at Aouchich, in the vicinity of the quarry / borrow pits and the proposed solar plant, while incorporating (desktop) information on the historical and archaeological context of the (existing) port and railway components;
- Understand the existing current condition of archaeological resources previously recorded (for the 2015 ESIA) within the Mine Site Area footprint, noting any accidental disturbance, looting and environmental damage that may have occurred in the intervening ten-year period; and

- Fill a gap in baseline information regarding local cultural and sacred resources, gathered in participation with potentially affected communities, including religious / spiritual sites and any associated intangible heritage practice, in full compliance with IFC PS 8 (2012).

Phase 1: Rapid Desktop Review

Prior to targeted visual inspection, a rapid desktop review and remote sensing exercise was undertaken to consider Mauritania's national inventory of registered sites, available satellite imagery and recent academic studies. A thorough review of the original dataset (gathered between 2012 and 2013) was also completed, to inform and provide context for, the most recent baseline update. Additionally, a review of local stakeholders was used to identify potentially affected communities (in consultation with the WSP Social Team).

Phase 2a: Targeted Visual Reconnaissance - Known Resources

Previously identified archaeological sites (URS, 2025) were prioritised for revisiting on a three-point scale (low, moderate and high) based on their potential cultural heritage value and the likelihood of external threats and pressures in the intervening period. These were mapped and targeted for rapid walkover survey (visual inspection only) to establish their current condition and determine any interim change (e.g., environmental degradation and / or looting). The findings from this phase, completed between 4th and 8th May 2023, are presented in Section 8.0, and summarised in APPENDIX P.

Phase 2b: Targeted Visual Reconnaissance – Supplementary Areas

The archaeological field team undertook a phase of rapid archaeological walkover (visual inspection) targeted to discrete locations informed by the updated project description (as per 2023), between 4th and 8th May 2023. This targeted new areas within the footprint added to the proposed Project since 2013 (e.g., Aouchich). Newly recorded resources were prefixed with 'WSP' (e.g., WSP-01) to distinguish them from resources recorded by URS in 2013. The findings from this phase are presented in Section 9.3.3.2, and summarised in APPENDIX P.

Phase 3: Community Consultation

The archaeological field team undertook targeted community consultations, in conjunction with WSP's Social Team, to enable the participatory identification of local religious and / or cultural resources within the AoI. Consultations involved focus groups and key informant (one-to-one) interviews, with the aim of sensitively and respectfully identifying and recording any local cultural sites that are considered to lie within or near to the Project footprint. More information on this phase is provided in Section 8.0(Social Baseline),.

Supplementary consultations specific to the cultural heritage baseline were also undertaken to better determine the potential for intangible cultural heritage during both the 2023 and 2025 Stakeholder Engagement programme. The field summary reports are presented in APPENDIX P.

A combined gazetteer of physical cultural heritage sites identified during all survey phases (URS, 2015 and WSP, 2023 & 2025) are presented in APPENDIX Q. For ease of cross-referencing, site IDs from the 2015 baseline remain as they were in the original report. APPENDIX R includes the cultural heritage baseline figures, mapping all known baseline resources in relation to the latest proposed Project footprint and surrounding AoI.

9.3 Baseline Summary

The consolidated results of the baseline cultural heritage studies are presented below. For the purposes of this baseline and in line with the definitions set out in Mauritanian Framework Law No. 2005-046 (Parliament of Mauritania, 2005) and the International Finance Corporation's (IFC's) Performance Standard (PS) 8 (2012),

'tangible cultural heritage' encompasses archaeological and historical resources and local cultural assets (e.g., sacred places). 'Intangible cultural heritage' includes traditional activities, unique local practices and associated belief systems.

9.3.1 Nouadhibou Port

The Port of Nouadhibou (hereafter, the Port) originated as a colonial era fishing port and trading hub in the 19th century. Detailed investigations focused on the historical settlement (i.e., landside area) are limited, with successive phases of modern residential and industrial development likely limiting the Port's archaeological potential. Dilapidated remnants the French colonial fort are sited on the southern edge of the bay, around 6.5 km from the rail terminal.

The Port is, however, internationally recognised for its maritime archaeology potential, with the Baie du Lévrier recognised as a notorious "ship graveyard" ((UK Hydrographic Office (UKHO) Data, 2025)). To improve safe navigation within the Port, a programme of extensive wreck clearance was completed between 2011 and 2012, recovering 74 vessels (Antea Group, 2017). This wreck removal campaign noted high-levels of previous disturbance to the seabed, with presumably few wrecks found in-situ (or well-preserved). Although there is a high potential for shipwreck sites beyond the cleared navigation channels, their current condition and provenance is predicted to be poor. The UK Hydrographic Office wreck database includes 171 known wrecks within the Port area / Baie du Lévrier (Figure 9-2), it is not known whether this includes those removed during the 2011-2012 clearance scheme.

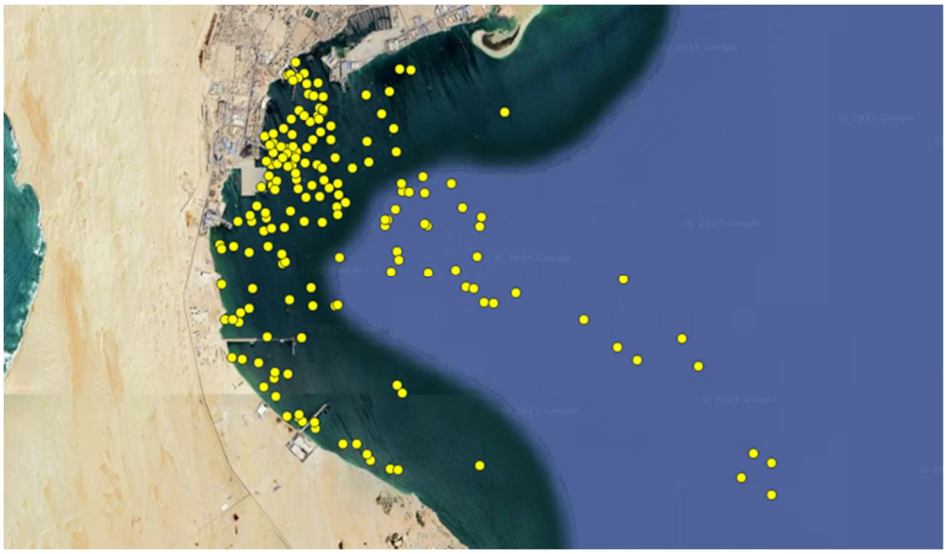


Figure 9-2: Known wreck sites within Baie du Lévrier (UK Hydrographic Office (UKHO) Data, 2025) , accessed 22/0/2025)

9.3.2 Rail area

The 600 km railway between Nouadhibou and Zouerate was constructed as a single gauge track in the 1960s, coinciding with initial mining explorations in the region (Pazzanita, A. G, 2008). Between 1961 and 1969, water was supplied to Nouadhibou from the Zouerate region, helping to partly resolve the city's lack of water (Antea Group, 2017). The iron ore mine and railway line opened in 1963. At capacity, the output of the mine was predicted to be six million tons, most of which would be exported to a new Usinor steelworks in Dunkirk, France (New York Times, 1964), with the journey from Zouerate to the port taking 12 hours. The trains operating on the line were some of the

longest and heaviest in the world, with over 200 hopper cars carrying almost 20,000 tons of iron ore being pulled by three or more locomotives (Pazzanita, A. G, 2008) (Figure 9-3).

Figure 9-3: Mine locomotives, 1964 (New York Times, 1964)

In 1974 President Mokhtar Ould Daddah nationalised the mines and railway, forming the Société Nationale Industrielle et Minière (SNIM). Between 1975 and 1979, the railway was targeted by guerrillas of the Polisario Front (Pazzanita, A. G, 2008). Trains were firebombed and tracks removed, significantly disrupting iron ore exports. The length of the railway and its location in a vast stretch of desert made it vulnerable to such attacks, despite the efforts of the Mauritanian armed forces and the French air force.

Normal operation of the railway resumed in the early 1980s following foreign assistance in repairing the railway (Pazzanita, A. G, 2008) . New locomotives and rolling stock were purchased and additional track laid to service new mining sites at el-Rhein and M'Haoudat, extending the length of the line to 690 km. The likelihood of historical period railway stock and infrastructure dating to the 1960s and 1970s along the corridor is unknown. The hash climate conditions would suggest any surviving remnants of railway heritage are poorly preserved but of potential moderate historical significance, representative of the immediate post-colonial era and the original development of Mauritania's mining industry.

9.3.3 Mine site area

9.3.3.1 Summary of 2015 baseline

The previous baseline conditions, specific to the Mine Site Area, are summarised following the original ESIA completed by URS in 2015.

9.3.3.1.1 Tangible Cultural Heritage

Overview

The existing cultural heritage baseline, targeted to the 2015 Project description of the Mine Site Area, and surveyed in 2012 and 2013, identified 269 resources ranging from Palaeolithic-period artefacts to Modern-dated tombs. Table 9-1summarises the distribution of these previously recorded resources across the baseline AoI.

These resources have been ascribed to areas based on the updated 2023 Project footprint (for example, there may be sites which were originally within the 2015 Infrastructure Corridor which are now within the 2023 Mine Site Area. **Table 9-1** shows the entirety of the Project footprint and the resource distribution.

Table 9-1: 2015 Baseline Summary

Project Area (2023 components)	Number of sites	Palaeolithic	Neolithic	Prehistoric	Protohistoric	Colonial	Independence	Modern (contemp.)	Islamic	Uncertain
El Aouj Mine Site Area	199	X	X	X	X	-	-	X	X	X
Infrastructure Corridor	21	X	-	-	X	X	-	-	X	-
F'Derik Area	16	-	-	-	X	X	X	-	X	X
Water Supply Corridor	31	-	X	-	X	X	-	X	X	X
Touajil Water Supply Area	2	X	-	-	-	-	-	-	-	-

A summary in relation to the existing baseline conditions (URS, 2015) in the area of the the different Project components is presented below.

El Aouj Mine Site Area

The 2015 URS baseline survey identified over 200 cultural heritage resources within or in the vicinity of the proposed Mine Site Area, comprising:

- 20 Palaeolithic tool scatters or findspots;
- 10 Neolithic rock art sites;
- Five Prehistoric occupation and rock art sites primarily depicting hunting, pastoral and warrior scenes;
- 131 Protohistoric tombs, or cemeteries;
- Two modern sites, comprising an outdoor mosque (imsid), and a trigonometric point;
- 28 Islamic grave sites; and
- Seven sites of unknown date, including two camp sites.

In some instances, archaeological sites contained material from more than one period. The western half of the Mine Site Area was found to contain the greatest concentration of resources, particularly palaeolithic scatters, with some scattered sites to the east. Neolithic rock art sites were recorded at the southern part of the Mine Site Area and appeared to follow a north-west to south-east aligned ridge with boulders and outcrops. The sites were located along the ridge, with some areas of clustering towards the centre. No sites were recorded in the south-eastern portion. All previously recorded resources in this location are depicted in APPENDIX R (Figure 2).

Infrastructure Corridor

The 2015 ESIA recorded 21 sites within the proposed Infrastructure Corridor. This includes one Palaeolithic site; 15 from the Protohistoric period; one from the colonial period and; four from the Islamic period. The Palaeolithic site (GEA373) was extensive, covering a large area and comprising tool scatters and debitage. The Protohistoric and Islamic periods were characterised by grave sites and the colonial period by the remains of a military building (GEA372). Overall, the sites were distributed along the length of the corridor. Protohistoric graves were generally in pairs or groups, with later Islamic graves located in close proximity. All previously recorded resources in this location are depicted in APPENDIX R (Figure 3).

F'Derik Area

The 2015 ESIA recorded 16 sites within the F'Derik area. This includes three from the Protohistoric-period, three from the colonial period (19th century), four from the period of Independence; four Islamic burials and two undated sites (with modern attributes). Graves and cemeteries are characterised as Protohistoric and Islamic. Military, administrative and domestic buildings characterised the colonial and Independence periods providing evidence of regional administrative change during the 1960s. A cemetery (ASK169), located in the north of F'Derik town, contains the concrete tomb of Cheikh El Wely (died 1954) and his father Cheikh Maalainine, who were important figures of resistance against the colonial occupation and have been declared as saints. The reinforced concrete tomb contains three chambers, each with a domed roof, and also contains two other family members. The site attracts pilgrims and tourists on Fridays and feast days.

The majority of the sites within the F'Derik Area were clustered at the north, within the northern part of F'Derik town. These resource locations are depicted in APPENDIX R (Figure 4).

Water Supply Corridor

The 2015 ESIA recorded 31 sites within the Water Supply Corridor. This includes two sites from the Neolithic period (an isolated find spot and surface scatter); 14 tomb sites from the Protohistoric period and one camp site from the colonial period. Nine resources from the modern (contemporary) period included camps and open-air mosques, while four from the Islamic graves were recorded, and, finally, one stone monument (and potential tomb) of uncertain date.

The Neolithic sites were observed in the southern part of the corridor and the colonial camp in the centre. The tombs, modern camps and open-air mosques (ASK153, ASK154 and ASK161) were noted along the entire length of the route without particular areas of concentration. These resource locations are depicted APPENDIX R (Figure 5).

Touajil Water Supply Area

The 2015 ESIA recorded two sites within the Water Supply Area. Both were Palaeolithic in date and comprised evidence of potential occupation in the form of tool scatters. These resources (BEE02 and BEE03) were recorded in the northern part of the Water Supply Area. These resource locations are depicted in APPENDIX R (Figure 6).Intangible Cultural Heritage

A preliminary overview of intangible cultural heritage was undertaken as part of a high-level survey between El Aouj and Aouchich to inform the ESIA for the El Aouj Project (Scott Wilson, 2008). This assessment noted historic manuscripts of F'Derik and the tribal history of the area. A comprehensive documentary study was undertaken as part of the 2015 baseline, to identify key features of Mauritanian intangible cultural heritage. The advent of mining in the Zouerate area in the 1960s was noted to have resulted in extensive and ongoing social change, including the

sedentarisation of former nomadic populations, industrialisation, and the in-migration of Mauritanian and international workers (URS, 2015). No consultations specific to cultural heritage were completed with potentially affected communities prior to WSP's 2023 baseline update, the results of the 2023 and 2025 consultations focussed on intangible activities are presented in Section 9.3.3.2.2.

9.3.3.2 Baseline Update (WSP 2023)

The updated baseline data come from the social survey performed by WSP in 2023 in order to update the first ESIA performed by URS in 2015.

9.3.3.2.1 Tangible Cultural Heritage

Overview

A field team led by Dr Baouba Mohamed Naffé; a local archaeological consultant, conducted a targeted field survey (visual reconnaissance) between 4th and 8th May 2023 according to the WSP provided Work Plan (WSP, 2023). The field team visited the El Aouj Mine Site Area and F'Derik areas to determine if any change had occurred to previously recorded resources and to identify and record new resources which may not have been visible during the original survey.

A total of 72 new resources were recorded as part of the 2023 baseline update, covering the Palaeolithic to the modern period. These resources are additional to those identified through the earlier baseline surveys and presented in Table 1. The additional resources recorded in 2023 were primarily located within the Touajil Water Supply Area and Aouchich Wellfield Area, with one additional resource recorded in each of the El Aouj Mine Site Area and F'Derik Area. Table 2 summarises these additional 2023 records.

The majority of the additional resources recorded were Neolithic tumuli and Islamic-period tombs. Flint scatters, pottery sherds, water wells and military sites were also observed.

Available baseline information identifies current community use and cultural significance for specific tangible cultural heritage resources. In F'Derik, ASK169 is visited by pilgrims and tourists on Fridays and feast days and is associated with figures of religious and historical significance, as described in Section 9.3.3.1.1. Additional information on community values and the significance of cultural heritage features and locations was identified through focus group discussions undertaken during the June 2025 consultations. The significance of cultural and sacred resources within the AoI is further considered in the consolidated baseline conclusions in Section 9.3.3.3.

The time periods adopted in the 2023 field report (APPENDIX P) and as described below, are aligned with the chronology outlined in the 2015 ESIA:

- Palaeolithic (Acheulean C.350,000 BP - c.70,000 BP; Aterian c.29,000 BP – 18,000 BP);
- Neolithic (c.8,500 BP – c.2,000 BP);
- Prehistoric (C.8,500 BP – C.1,000 BP);
- Protohistoric (c.2,000 BP – c.1,000 BP);
- Islamic (c. 300 – present);
- Colonial (c.1900 – 1960);
- Independence (c.1960 – present);

- Modern (Contemporary).

Table 9-2: Additional cultural heritage resources recorded during the 2023 baseline update

Area (2023 Project footprint)	Number of sites	Palaeolithic	Neolithic	Prehistoric	Historic	Modern (Contemporary)	Uncertain
El Aouj Mine Site Area	1	X	-	-	-	-	-
F'Derik Area	1	-	-	-	-	X	-
Touajil Water Supply Area	45	X	X	X	X	-	X
Aouchich Wellfield Area[8]	25	-	X	-	X	-	X

Four main resource categories were identified during the updated baseline survey phase:

- **Palaeolithic Sites** – characterised by a presence of stone tools (worked lithics).
- **Ceramic Sites** – mainly located in the sandy areas east of Touajil. Relatively rare, their association with flint sherds suggests a Neolithic date.
- **Prehistoric Burial Mounds** – characterised as piles of surface stones, often in a circular pattern. There are no precise dates, but they are considered to be Neolithic or pre-Islamic (8th millennium BC - 8th century AD). There were four types of mounds identified:
  - Simple – pile of circular stones covering the ground, with or without height;
  - Crescent – central part is extended on two sides by arched antennae and generally open to the east;
  - Hat – a circular pavement with a dome in the middle and with a circular base;
  - Conical – cone shaped, presumably well preserved.
- **Islamic Tombs** – smaller than prehistoric mounds, usually with an alignment of stones surrounding where the individual is buried and recognised by their orientation (usually north-south). Often a headstone with biographical information is present at the southern (head) end of the grave.

A summary in relation to the updated baseline conditions of each Project area is presented below

El Aouj Mine Site Area

- **Palaeolithic**

[8] Four Neolithic tomb sites (WSP-05, WSP-70, WSP-71 and WSP-73) were also recorded between 14km and 20.5km from the Project boundary but have been included in this section based on the Aouchich Wellfield Area being the closest part of the Project to these sites, and to provide additional historical context for the updated baseline study.

One Palaeolithic findspot (WSP-01) was recorded within the Mine Site Area, comprising a small, biface stone tool. WSP-01 was the only newly recorded resource within this area as part of the 2023 baseline survey (Figure 9-4). This location is depicted in the map provided in APPENDIX R.

Figure 9-4: Palaeolithic Findspot at El Aouj Mine Site Area (WSP-01) Acknowledgment: Baouba Ould Mohamed Naffé, 2023.

F'Derik Area

- **Modern**

One new site was recorded within the F'Derik area, in the form of remains of modern-dated, military structures. WSP-02 was recorded as a series of pillboxes lining a small ridge to the north of F'Derik dam. The pillboxes were linked to defence operations at the beginning of French colonisation (early 20th century). The structures would have been used to help conceal soldiers or fighters known as 'bellyshooters', due to the position they would have adopted whilst in the structures. This location is depicted in APPENDIX R (Figure 4).

Within the central areas of F'Derik, buildings of cultural and architectural significance are present, the current condition of these resources is believed to be very poor (GSE, 2025).

Touajil Water Supply Area

Within the Touajil Water Supply Area 45 new sites were recorded. These include tombs, graves, findspot scatters and water wells. The sites ranged in date from the Palaeolithic to the historical periods. These locations are depicted in APPENDIX R (Figure 6).

- **Palaeolithic**

Two palaeolithic tool scatter sites (WSP-13 and WSP-29) were recorded within the Touajil Water Supply Area.

- **Neolithic**

Twenty-three tombs within in the Touajil Water Supply Area were tentatively dated to the Neolithic period (Figure 9-5). WSP-24 and WSP-41 include large, crescent-shaped mounds. Seven tomb sites contained between two and five tumuli, forming groups. WSP-22 was notable in that it had two crescent shaped tombs built on natural blocks. WSP-42 contained five tumuli with long stones and slabs. And three of the tomb sites (WSP-15a/b, WSP-18 and WSP-23) had evidence of historical, Islamic tombs in proximity.

Figure 9-5: Neolithic Tomb within the Touajil Water Supply Area (WSP-06). Acknowledgment: Baouba Ould Mohamed Naffé, 2023.

Six artefact scatters sites were also recorded within the Touajil Water Supply Area: WSP-16, WSP-27; WSP-30; WSP-32, WSP-44 and WSP-45. WSP-16 and WSP-27 were recorded in the north and western parts of the Touajil Water Supply Area, comprising sites of pottery sherds and worked flint. To the west of WSP-27, site WSP-30 included fragments of grinding wheels and worked flint artefacts (Figure 9-6). WSP-44 and WSP-45 were recorded on the eastern boundary, with evidence of worked flint and a small quantity of pottery sherds.

Figure 9-6: Pottery Scatter within the Water Supply Area (WSP-16). Acknowledgment: Baouba Ould Mohamed Naffé, 2023.

- **Prehistoric**

The base of a paleo-lake (WSP-04) was recorded to the north-east of the Touajil Water Supply Area, ascribed to the Prehistoric period as a potential (historical) water source (Figure 9-7).

Figure 9-7: Paleo-lake at the Water Supply Area (WSP-04). Acknowledgment: Baouba Ould Mohamed Naffé, 2023.

- **Historic to Modern**

Fourteen historic, tombs and graves and one findspot were recorded within and close to the Touajil Water Supply Area. All but four of the burial sites were distinctly Islamic, with WSP-12 containing three or four probable tombs. WSP-31 was noted as a recent infant grave and WSP-43 as a recent tomb.

- **Uncertain**

An Islamic tomb or tumulus (WSP-11) of uncertain date was recorded to the north-east of the Touajil Water Supply Area. It was characterised by flat, rock slabs, some of which appeared to be piled on top of the other.

Aouchich Wellfield Area

Twenty-five new sites dated to the Neolithic and historic periods were recorded within or in close proximity to, the Aouchich Wellfield area, comprising tombs, wells and a military site. These resources were concentrated in the northern half of the area[9] . The distribution of these sites is shown in APPENDIX R (Figure 7).

- **Neolithic**

Fifteen tombs were recorded within or near to, the Aouchich Wellfield Area. Five contained multiple tumuli (WSP-53, WSP-56, WSP-61, WSP-64 and WSP-71). WSP-53 comprised one large tumulus with four smaller tumuli within a 40m radius. Similarly, WSP-64 comprised a large mound with scattered, smaller tumuli in the vicinity whereas WSP-56 had two simple burial mounds surrounded by upstanding plates. Site WSP-50 was found to be associated with a (historic period) Islamic tomb and WSP-52 comprised a large, hat-shaped tumulus (Figure 9-8).

Figure 9-8: Tumulus (WSP-52) at Aouchich Well Field Area. Acknowledgment: Baouba Ould Mohamed Naffé, 2023.

- **Historic**

[9] Four Neolithic tomb sites (WSP-05, WSP-70, WSP-71 and WSP-73) were also recorded between 14km and 20.5km from the Project boundary but have been included in this section based on the Aouchich Wellfield Area being the closest part of the Project to these sites, and to provide additional historical context for the updated baseline study.

Seven sites dated to the historic period (WSP-50, WSP-55, WSP-58, WSP-59, WSP-63, WSP-69 and WSP-73) were recorded within, or near to, the Aouchich Wellfield Area. All seven sites contained evidence of tombs. WSP-58 was notable in that it had three unusually aligned Islamic tombs, one comprising a small tumulus (mound).

- **Uncertain**

Three well sites (WSP-54, WSP-62, WSP-65 and WSP-66) were recorded within the Aouchich Wellfield Area and of uncertain date. The Aouchich well (WSP-62) was located close to the colonial military camp (WSP-63) and may be contemporary.

9.3.3.2.2 Intangible Cultural Heritage

The results of the 2023 and 2025 focus groups, facilitated by WSP's Social Team, indicated no local, traditional ceremonies within the AoI. It was generally observed that religion is formalised and political in nature, with the majority of inhabitants practicing Islam. The Wilaya (administrative area or district) organises a cultural week every three years, with the location rotating between the regional cities. However, the festival does not garner interest and, according to the consultee, is not fully appreciated. The results of focus group on intangible cultural heritage are presented in ESIA Chapter 11 (Appendix D).

The Mine Site Area, however, was noted during initial consultations in 2023 to be connected to local belief systems, with anecdotal evidence suggesting a "demon" is believed to reside in the confines of the future pit. Limited further details were provided, and the prevalence of this belief is not well-understood. Follow up queries in 2025 suggest that this may be one of two sites known by locals in F'Derik to be haunted, the exact location of these places is confidential / only known by the community (one is named *Guelb Imechken lazrag*, and another is a place in the northern part of F'Derik). Neither place could be mapped or inventoried during the time allocated for the 2025 update.

Other mystical places were noted during the 2023 consultation session, though according to the informants, none were within the near vicinity, e.g., rock engravings of spiritual importance located 300 km to the north of F'Derik and 140 km to the north-east of Zouerate. Culturally important sites for pastoralists, located approximately 500 km from the AoI, were also mentioned.

The 2025 consultations also documented local pastoral knowledge of transhumance routes. In the mine area, pastoral movements generally follow a west–east axis, although routes vary according to pasture availability, with water points constituting key passage and orientation points. Local populations are familiar with these routes. Further information on pastoral activities and transhumance routes is provided in the Social Baseline (Section 8.4.7.6) and the consultation findings in Chapter 11 (Appendix D).During the 2025 focus group updates, the sites of two sacred trees (no longer in existence) were referred to as culturally significant, as places of remembrance and oral history. The exact location of these sites is not known though they are not believed to be in the near vicinity since the site of the "Choumad tree" is halfway between F'Derik and Zouerate, and the "Aïba tree" is in Oudei Nhyar (see Baseline Chapter 11 (Appendix D).

The activities undertaken at the Idjil saltworks, in proximity to the F'Derik, are recorded as an important aspect of local identity and heritage (within 120 seasonally employed from the F'Derik community, many with generational connections to the saltworks). This was further characterised in the 2025 focus group meetings (additional details are provided in Baseline Chapter 8 . The history of the salt works can be traced to the 16th century, with the works at Idjil a strategic location on the caravanseri between southern Morrocco and the historic capital of Ghanian Empire at Koumbi Saleh, in present-day southeastern Mauritania (GSE, 2025). Community participants in the 2025 focus

groups report that the methods of salt extraction remain small-scale and traditional, with the product valued by nomadic herders for their livestock.

Traditional, gendered, activities were identified, including religious singing (*Medh*) weaving, textiles and jewellery making by women (also a source of income). The use of local plants (e.g., tree bark, leaves) was discussed in both the 2023 and 2025 focus groups, with the communities noting that they were used for medicinal purposes only and are not gathered for food (see Baseline Chapter 10 (Section 10.6.3.1.5). Other intangible activities recorded in 2025 include wood and leather working and furniture making – typically skills inherited by sons from their father. The furniture is typically suited to the nomadic environment (including accessories for camels).

9.3.3.3 Baseline conclusions: consolidated data set

The baseline study, compiled in 2015 and updated in 2023, has determined that the study area has a high potential for cultural heritage receptors of all periods. This comprises archaeological resources, including tool scatters (ancient) protohistoric tombs and historical resources such as forts and buildings from the colonial/Independence periods. Cultural resources, including modern camps, Islamic tombs and modern open-air mosques were also observed throughout the AoI. Intangible cultural heritage was noted to include formalised religion and local knowledge of natural resources and traditional medicine. Unique local beliefs were noted in connection to the proposed mine site and resident demon, though the prevalence of this belief (within the wider community) is unknown.

Archaeological Resources

The archaeological evidence within the AoI is a valued component representative of the ancient history of the region, confirming the occupation of the area since at least the Palaeolithic period. The archaeological resources are predominantly Palaeolithic tool scatters and isolated findspots; discrete Neolithic tool scatters; rock art depicting hunting scenes; mounds (tumuli) which were / are likely tombs; and Protohistoric tombs.

The tool scatters were concentrated in the El Aouj Mine Site Area and Touajil Water Supply Area, which may indicate a high potential for sub-surface features related to occupation or industrial activity, such as tool manufacture. The rock art sites were concentrated within the Mine Site Area and may be linked with the occupation scatters throughout in this area. Protohistoric tombs were recorded throughout the AoI, but with dense concentrations in the Mine Site Area, Touaji Water Supply Area and Aouchich Wellfield. No newly identified resources were located within the proposed water supply corridor during the 2023 survey phase.

Based on the evidence from both baseline studies, the greatest potential for sub-surface archaeological remains is within the Mine Site Area, particularly where there are hollows, flat plains and on the lower slopes of hills. The potential for further examples of rock art is also within the Mine Site Area, where there are rocky outcrops or boulders on ridgelines. The known archaeological resources baseline is considered to comprise both ‘non-replicable’ and ‘replicable’ cultural heritage assets (IFC PS 8, 2012a). The Neolithic tomb sites for example, may be defined as non-replicable in that they may contain dateable materials, including human remains which are unique in linking multiple, significant historical periods, whereas the material scatters, lithics etc are well-understood and well-represented by other sites There is a potential for previously unknown archaeological resources to exist (including below-ground) which may meet the definition of ‘non-replicable’ or ‘critical’ resources.

Historic Resources

The majority of historic resources (e.g., colonial era forts and military buildings) were primarily located within the F’Derik area, typically on flat plains to maximise visibility. These historic resources are considered to constitute

'replicable' cultural heritage assets, in which the particular eras and cultural values they represent are well represented by other sites and/ or structures' (IFC PS 8, 2012a).

Cultural and Sacred Resources

Cultural and sacred resources were identified throughout the AoI and were largely characterised by Islamic tombs, cemeteries, open air mosques, wells and camp sites. The Islamic tombs, cemeteries and open-air mosques are considered ' non-replicable' or 'critical cultural heritage' as they are representative of 'recognised heritage of communities who use, or have used within living memory, the cultural heritage for long standing cultural purposes' (IFC PS 8, 2012a).

Intangible Cultural Heritage

Intangible heritage, with regards to the Project, was represented by the cultural and social norms experiences by the local communities. This included long term employment in the salt extraction and mining industries; traditional ways of life ranging from nomadic to sedentary; local beliefs in a demon / spirits; traditional gendered activities (including crafts associated with nomadic groups) and the passing of knowledge regarding medicinal plants. The intangible heritage records unique belief systems and people's relationships and understanding of their physical and spiritual environment.

9.3.3.4 Limitations

The extent of the cultural heritage AoI for the baseline update was defined in consideration of the breadth of the Project footprint at the time the field surveys were completed (May 2023 and June 2025). Any subsequent design changes and/or alterations may require new surveys to be conducted (e.g., if the infrastructure layout is changed and extended). Furthermore, these field surveys were subject to constraints imposed by restrictive ground visibility, health and safety and inaccessibility. These constraints are typical of baseline field data collection and as a whole did not negatively impact on the objectives of this survey.

There was no intention to undertake any below-ground investigations during the surveyed completed in relation to the 2023 archaeology baseline update, but limited manual clearance of vegetation was necessary to clarify the extent of particular sites. Equally, there was no scope to remove surface objects en masse from identified sites, as this will be undertaken, if necessary, during further stages of work.

Consequently, the collection of archaeological baseline information provided a valuable baseline study of the visible cultural heritage resources within the AoI. However, it does not discount the possibility that other (potentially more important) remains may survive undiscovered in below-ground deposits, or in areas that are inaccessible to survey. The scope and suitability of additional work that may be required in order to further investigate the identified sites and other areas will be developed as information from this update is assessed.

Furthermore, the baseline information received in relation to cultural and sacred sites is limited to the information which the communities' representatives were willing to share with the field team and to those consulted. As such, there remains a potential for as yet unrecorded sacred sites (and related intangible activity and taboo), to exist throughout the AoI and in proximity to, or within, Project areas.

9.3.3.5 Summary: cultural heritage valuation

In an effort to summarise the relative significance of the cultural heritage resources identified during the 2023 baseline surveys, resources are attributed a "sensitivity" based upon their scientific or research value (World Bank, 1994; IFC 2012a and 2012b). A four-point qualitative system was developed and used to assign a sensitivity value

to each identified archaeological site, artefact location or cultural resource, as described in below. In summary, site sensitivity is derived from the consideration of each resource's form, survival, condition, complexity, context and period.

The Baseline Gazetteer (APPENDIX Q) includes a consolidated list of identified tangible cultural heritage resources, their GPS locations and sensitivity value.

- High

Archaeological and historic sites (both terrestrial and marine) considered to be of high importance with the greatest potential for further, significant associated discoveries to be made. This also includes rare and previously unstudied features with a high potential for further research. Highly significant cultural sites which have been frequented by the local community for longstanding cultural purposes and those which attract visitors from further afield. Nationally protected assets and UNESCO World Heritage assets and / or cultural heritage defined as 'critical', or 'non-replicable' cultural (as termed by IFC PS 8, 2012a).

- Medium

Archaeological and historic resources (both terrestrial and marine) considered to be of moderate importance with some potential for further, discoveries to be made. Cultural / sacred resources considered to be of moderate value to the community. Cultural sites which have been frequented by the local community for longstanding cultural purposes. Sites associated with oral history, and which may be representative of a number which no longer exist e.g., remnants of historic railway infrastructure. Including both 'replicable' and 'non-replicable' cultural heritage sites (as defined by IFC PS 8, 2012).

- Low

Archaeological and historic sites (both terrestrial and marine) considered to be of some limited importance with a low potential for further discoveries and/or are in a state of poor condition. Cultural sites which may be no longer in use but are known to the community and associated with settlement history/oral history. Cultural sites which are common and potentially 'replicable' (as defined by IFC PS 8, 2012a).

- Negligible

Archaeological and historical features considered to be of limited local importance including features which are very common and well understood, or those which are very poorly preserved and / or badly disturbed, offering very limited potential for further research. Cultural sites which are very common and 'replicable' - in the sense that new buildings can be readily established and / or cultural sites which are not in current use, with no enduring local importance or historic value.

A summary of the significance of cultural heritage resources in relation to the updated baseline is presented in **Table 9-3.**

Table 9-3: Summary of cultural heritage resources: Significance

Type	Subtype	Site IDs	Significance Value	Rationale
Archaeological	Neolithic tombs	WSP-05, WSP-06,	High	Archaeological resources considered to be of moderate

Type	Subtype	Site IDs	Significance Value	Rationale
		WSP-07, WSP-08, WSP-09, WSP-10, WSP-14, WSP-15a/b, WSP-16, WSP-18, WSP-22, WSP-23, WSP-24, WSP-25, WSP-26, WSP-28, WSP-34, WSP-35, WSP-36, WSP-37, WSP-38, WSP-39, WSP-41, WSP-42, WSP-46, WSP-50, WSP-51, WSP-52, WSP-53, WSP-56, WSP-57, WSP-59, WSP-60, WSP-61, WSP-64, WSP-67, WSP-68, WSP-70, WSP-71		importance with some potential for further, discoveries to be made. Including potentially 'non-replicable' cultural heritage sites (as defined by IFC PS 8, 2012).
Archaeological	Palaeolithic, Neolithic and Prehistoric occupation sites (scatters; findspots)	WSP-01, WSP-04, WSP-13, WSP-27, WSP-29, WSP-30, WSP-32, WSP-33, WSP-44, WSP-45	Moderate	Archaeological resources considered to be of moderate importance with some potential for further, discoveries to be made. Including 'replicable' cultural heritage.

Type	Subtype	Site IDs	Significance Value	Rationale
Archaeological	Tomb of unknown date	WSP-11	High	Cultural / sacred resources considered to be of the highest value to the community
Archaeological	Wreck sites, maritime resources	N/A	Low	Poor in-situ preservation – due to previous dredging activities to support safe navigation.
Archaeological	Industrial / railway heritage	N/A	Low	Poor in-situ preservation due to harsh climate conditions / exposure etc.
Cultural (sacred)	Historic tombs/graves	WSP-03, WSP-12, WSP-17, WSP-18, WSP-19, WSP-20, WSP-21, WSP-23, WSP-31, WSP-40, WSP-43, WSP-47, WSP-48, WSP-49, WSP-50, WSP-55, WSP-58, WSP-59, WSP-63, WSP-69, WSP-73	High	Cultural / sacred resources considered to be of the highest value to the community. Non-replicable or critical cultural heritage.
Cultural	Modern camp	WSP-02	Low	Cultural sites which are common and potentially 'replicable' with limited research potential.
Cultural	Well	WSP-54, WSP-62, WSP-65, WSP-66	Moderate	Cultural sites which have been frequented by the local community for longstanding cultural purposes.
Cultural and sacred	Intangible cultural heritage	N/A	High	Local cultural norms / intrinsic to local identity. Relating to traditional forms of social organisation and observed for long-standing cultural purposes.

9.3.4 Conclusion

The evolution of the cultural heritage component since 2015 is informed by the updated Project description, with targeted (visual) reconnaissance identifying 70 additional resources in 2023 and several aspects of local intangible heritage not previously recognised. Generally, no discernible change in the condition or environmental setting of archaeological resources previously recorded for the 2015 ESIA was observed, with no significant infrastructure, construction or settlement activity undertaken in the intervening period.

The archaeological baseline includes evidence of Palaeolithic activity within the Touajil Water Supply Area and a concentration of Neolithic-period tombs within the Aouchich Wellfield, particularly in the northern portion. Islamic tombs and 20th Century military remains were also observed, distributed across both locations. New assets were also located within the F'Derik (modern-dated military structures) and the Mine Site Areas (a Palaeolithic findspot). These typologies broadly reflect those compiled for the 2015 ESIA. The consolidated data from both surveys confirming that the AoI is rich in high-value, multi-period, archaeological resources.

The supplementary information regarding intangible cultural heritage gained in participation with affected communities includes data related to traditional beliefs; sacred places tied to landscape features associated with oral history; and, traditional, generational knowledge and skills, linked to unique local identities.

10.0 ECOSYSTEM SERVICES

The ecosystem services assessment (ESA) has been conducted in compliance with international best practices, namely International Finance Corporation (IFC)'s Performance Standards (PS) and African Development Bank (AfDB) Integrated Safeguards System (ISS) Operational Safeguard (OS). This chapter presents the results of the ESA.

10.1 Objectives and definitions

The objectives of the ESA are to:

- Identify the abundance of natural resources used by the local populations and characterize their seasonal variation, where possible;
- Identify existing and potential threats to areas recognized as important for natural resource use;
- Establish the significance (use, financial importance and level of dependency) of ecosystems in provisioning, regulating, cultural and supporting services for local communities;
- Identify the nature and extent of ecosystem services within the Project area and its vicinity;
- Identify priority ecosystem services (Types I and II) based on a systematic review and prioritization process.

Following definitions of ecosystem services and ecosystem service assessment, the methodology and results are presented in the following sections.

10.2 Definition of Ecosystem Services and Ecosystem services Assessment

An ecosystem is defined as a dynamic complex of plants, animals, micro-organisms, and non-living components interacting as a functional unit (MEA, 2005). Human communities are an integral part of ecosystems and are beneficiaries of many goods and services they provide. These benefits are recognised as Ecosystem Services (ES).

The concept of ES has grown in importance over the last decade, particularly following the Millennium Ecosystem Assessment (MEA). The definition of this concept comes from the evaluation report, which states that such services are the benefits people obtain from ecosystems (MEA, 2005; IFC, 2019). ES could be considered as the direct and indirect contributions of ecosystems to human well-being (Kumar, 2010).

Ecosystem services are the benefits that people derive from ecosystems. There are four types of ecosystem services (IFC's PS 6 2019 and AfDB ISS OS 6 2023):

- **Provisioning services**: which are the products that people obtain from ecosystems (food, freshwater, wood and fibre, fuel);
- **Regulating services**: which are the benefits that people obtain from the regulation of ecosystem processes (climate regulation, flood regulation, disease regulation, water purification);
- **Cultural services**: which are the non-material benefits that people obtain from ecosystems (aesthetic, spiritual, educational, recreational);

- **Supporting services**: which are the natural processes that maintain the other services (nutrient cycling, soil formation, primary production.

ES are divided into two types according to IFC's PS 6 (2019):

- **Type I**: Provisioning, regulating, cultural and supporting ecosystem services, over which the promoter (EMC) has direct management control or significant influence, and where impacts on such services may adversely affect communities;
- **Type II**: Provisioning, regulating, cultural and supporting ecosystem services, over which the promoter (EMC) has direct management control or significant influence, and on which the project directly depends for its operations.

The Ecosystem Services Assessment is completed to identify ES provided within the Project's Area of Influence (AoI) (cf. Figure 10-1) or ecologically associated with on-site ecosystems, and to determine the Priority Ecosystem Services (PES) as prescribed in IFC's PS6.

The PES are classified into two categories according to specific circumstances (IFC, 2019):

Type I ES will be considered priority under the following circumstances:

- Project operations are likely to result in a significant impact on the ES;
- The impact will result in a direct adverse impact on affected communities' livelihood, health, safety and/or cultural heritage; and
- The project has direct management control or significant influence over the ES.

Type II ES will be considered priority under the following circumstances:

- The project directly depends on the ES for its primary operations; and,
- The project has direct management control or significant influence over the ES.

The PES identified will need to be considered as part of the impact assessment to detail project related impacts and apply the mitigation hierarchy.

10.3 Project area of influence (AoI)

The project's Social Area of Influence (SAoI) refers to the geographical space within which the project's potentially significant effects on social receptors may occur. It serves as the analytical boundary for the assessment of social (and ecosystem services) impacts, taking into account community interactions and vulnerability factors present within the study area. In line with IFC Performance Standard 1, where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts will be identified in the context of the project's Area of Influence (AoI). This area of influence encompasses the elements described in Table 10-1 below.

Table 10-1: Areas of influence and their corresponding project areas

PS1 Area of influence	Project area of influence
The area is likely to be affected by:	Project infrastructure:

PS1 Area of influence	Project area of influence
The project, including activities and facilities that are directly owned, operated, or managed (including by contractors) by the proponent and that are a component of the project; The area covered by the drawdown of the aquifers that will be exploited for the mine's water needs Impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or Indirect project impacts on physical environment or on ecosystem services upon which biodiversity and Affected Communities' livelihoods are dependent.	Mining infrastructures Workers' camps and associated laydown areas Well fields Water pipeline Rail spur Ore Port in Nouadhibou Project activities: Extraction, processing, and storage of iron ore at the mine site Groundwater pumping Transportation of ore from the mine to the port (near Nouadhibou), along an existing rail line. Shipping of ore from existing port facilities. Increase in population (workers and public). A detailed description of the project is included in Section 4.0.
Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reason.	Mine, port, and rail corridor communities are potentially subject to cumulative social impacts from other mining operations, increased port activities, other rail users, or broader regional development and population movement.

As part of the definition of the Project's AoI, clarification is required regarding the status of existing infrastructures used for Project logistics.

The railway network and the mineral port are existing infrastructures currently used to meet the needs of SNIM. Therefore, these infrastructures are not considered as "associated facilities" for the El Aouj Project. However, the Project will benefit from these infrastructures:

i. to transport its ore from the El Aouj mine to the mineral port; and

ii. to temporarily store and load the ore onto cargo ships for delivery to the final client destination.

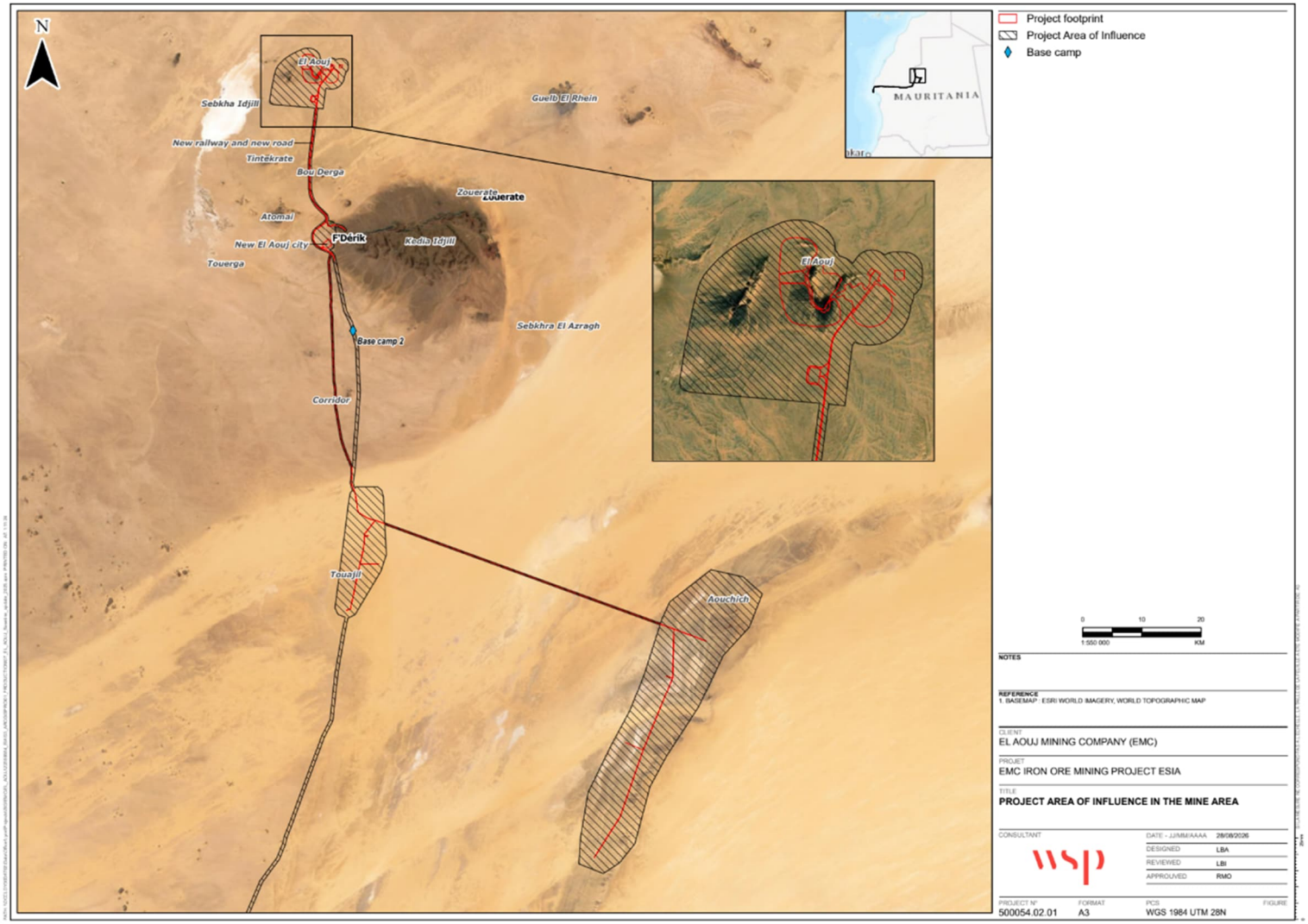
The project's SAoI has been defined based on the spatial distribution of communities near the project footprint. The project AoI was defined by the environmental features surrounding the project and the anticipated spatial extent of impacts around the different components of the project footprint. The project's physical area of influence encompasses the following elements:

- All social receptors, including pastoralist camps and socio-cultural infrastructure located within the Project's Area of Influence.
- Settlements in proximity to the Project:
  - F'Derik, located approximately 25 km south of the El Aouj mining site, is the main human settlement in the immediate vicinity of the project. The city of F'Derik will be home to the El Aouj workers' camp.
  - Zouerate, located approximately 30 km from the El Aouj mining site, is the largest nearby human settlements. It has administrative, social and commercial infrastructure and services.

- Touajil, located approximately 80 kilometres south of the El Aouj mine, is home to the catchment area intended to supply water to the project, as well as the associated pipeline. This area also includes a permanent human settlement and a palm plantation.
- Sebkha Idjill, located to the south-west of the El Aouj mining site, it constitutes a seasonal activity area for artisanal salt extraction**.**
- Touerga, a small town administratively attached to the F'Derik agglomeration, located approximately 23 kilometres south of the El Aouj mining site. It hosts temporary camps of nomadic herders as well as permanent settlements occupied by residents originating from F'Derik and Zouerate
- Aouchich, situated approximately 100 kilometres south-east of the El Aouj mining site, hosts a water catchment field intended to supply the project, along with the associated pipeline. This area also includes a pastoral camp, grazing lands, and water points used by herders.

- The project's area of influence also includes seasonal grazing lands used by herders for livestock, as well as a historic trade road linking local communities to the salt works of Sebkha Idjill. This road retains regional economic significance, particularly with regard to the livelihoods of local populations. To account for the potential effects of the project on pastoral and economics activities, a buffer area has been defined within the mining area, including:
  - A 1 km buffer around the mine's infrastructure, with a wider area in the dominant wind direction (almost 7 km were estimated considering dust dispersion in the dominant wind direction) including:
  - The Sebkha Idjill salt extraction works to the west of the Mine site area;
  - Non-permanent settlements near wells and the wadi system to the south of the Mine Site Area.
  - A 250 m buffer on each side of the rail spur between F'Dérik and El Aouj;
  - A 500 m buffer around the future worker City (El Aouj city) and the new permanent camp; as well as the city of F'Derik to the south of the Mine Site Area and Infrastructure Corridor;
  - A 150 m buffer on each side of the water supply corridor between Touajil and El Aouj, and Aouchich and El Aouj.
- The Project's Area of Influence also extends along the existing railway corridor between F'Derik and the mineral port of Nouadhibou, as well as the port infrastructure of Nouadhibou, due to their use for Project logistics and the potential for indirect and cumulative social impacts. To account for the potential effects of the Project on social receptors and land use, the following buffers have been applied within the Project's Social Area of Influence:
  - A 250 m buffer on each side of the railway between F'Derik and Nouadhibou;
  - A 1 km buffer on the terrestrial side of the mineral port and Nouadhibou's mining infrastructures, with a 5 km buffer wider area along the coast.

Figure 10-1: Project Area of Influence (AoI) considered for Ecosystem Services Assessment (ESA) – Mine Area



10.4 Methodology

As mentioned previously, the initial ESIA conducted for the El Aouj Mining Project did not cover ecosystem services within the Project AoI. Therefore, an ESA is conducted to properly understand and describe the baseline in terms of ES and identify priority ES.

This section describes the methodology for data collection and ESA and discusses limitations to the study.

10.4.1 Data collection

Multiple data sources were used to conduct the ESA, including the 2015 ESIA documents (URS, 2015), scientific literature, governmental documents and results from stakeholder consultations, field visit and surveys.

Although ES were not covered in the initial ESIA, 2015 documents for the El Aouj Mining Project such as the ESIA, Baseline Report and Public Consultation Report were used to identify potential ecosystem services within the Project AoI as well as their importance to local populations. Medicinal plants and forage resources, for instance, were covered in the initial ESIA although not in an ecosystem services perspective.

Scientific literature and governmental documents were also consulted to get a better understanding of ecosystem services used and their distribution within the Project AoI. Only limited information is available regarding ecosystem services specifically in the Tiris Zemmour wilaya or even more broadly in arid ecosystems. Some studies regarding species with use value in Mauritania (Hmeyada O. , 2009) or specifically in Tiris Zemmour and neighbouring wilaya Adrar (Daget, 2014); (Yebouk, 2020) were consulted. Data from the Global Biodiversity Information Facility (GBIF) and International Union for Conservation of Nature (IUCN) were used. Governmental documents such as census results were also consulted to get a better understanding of local populations and their potential recourse to and dependence on ES.

To complete the information compiled through the desktop study, a field visit, stakeholder interviews and focus groups were organized in May 2023 and May 2025, in communities located near the El Aouj Mining Project. These interviews are described in section 10.5 of this report. Furthermore, results from flora surveys conducted in the area from May 2023 an October 2024, were also used to assess the distribution of species of use value within the area. Results are interpreted in the biodiversity and social baseline chapter (respectively chapter 7.0 and chapter 8.0 of this ESIA).

10.4.2 Ecosystem Services Assessment (ESA)

The information collected during the desktop study field visit and stakeholder consultations was used to describe ecosystem services and identify priority ecosystem services (PES) in the Project AoI. PES have been identified based on the following prioritization criteria (Table 10-2):

- Level of dependence on the ES – for affected communities and their well-being (Type I) or for Project performance (Type II);
- Interaction with drivers of change on ES (Type I) or with Project operations (Type II);
- Replaceability/Management potential – accessibility and efficiency of possible alternatives to the affected ES.

Table 10-2: ES prioritization criteria

LEVEL OF DEPENDENCE ON THE ES – FOR AFFECTED COMMUNITIES AND THEIR WELL-BEING (TYPE I) OR FOR PROJECT PERFORMANCE (TYPE II)	
Low	A few households/communities are beneficiaries for this given ES or this ES contributes slightly to their well-being (Type I) or the Project depends slightly on ES and its performance is slightly affected by the loss. The intensity of use and the degree of dependence are low.
Medium	Benefit from the ES is important among local communities or generalised for given groups (Type I) or the ES loss could affect Project performance without compromising it (Type II). Intensities of benefit and degrees of dependence are variable.
High	Widespread or significant benefit for local communities and ES is of major importance for them (Type I). Project performance is considerably reduced by the ES loss (Type II). Benefit is high and degree of dependence is major.
Interaction with drivers of change on ES (Type I) or with Project operations (Type II)	
Low	The ES can slightly be impacted without changing significantly its availability for beneficiaries or for Project performance. The disturbance can be within the normal range of natural variations.
Medium	The ES can be altered at a point where the availability for beneficiaries or for Project performance can be reduced. However, the impact does not threaten the long-term viability of the ecosystem which provides the ES.
High	The ES can be lost, or a significant proportion of its availability could be reduced for beneficiaries or for Project performance. The long-term viability of the ecosystem which provides the ES is threatened.
Replaceability/Management potential – accessibility and efficiency of possible alternative to the ES affected	
Low	Highly specific ES, with no alternatives easily accessible or effective.
Medium	Some alternatives exist even if they are less favourable. Beneficiaries can access to the ES considering their capacity to pay or to find an effective alternative.
High	Many accessible and effective alternatives for beneficiaries

The first step of the PES identification process is the description of the level of dependence and replaceability of ES provided inside the study area. With the use of a matrix (Table 10-3), it is then possible to identify the ES that are more prone to be identified as a PES. When the replaceability of an ES is high, it cannot be a PES. Drivers of change on ES are identified by the analysis of anticipated impacts on physical, biological and social components related to Project activities. They notably comprise the following:

- Direct loss and fragmentation of natural or modified habitats;
- Degradation and disturbance of natural or modified habitats (modification to on-site hydrology, degradation of water quality, introduction of invasive species);
- Reduction in the availability and quality of resources due to demographic and economic changes related to induced access and the influx of people seeking socio-economic opportunities;
- Reduction in accessibility because of road barrier effect.

Direct loss and fragmentation of natural or modified habitat caused by the project will be very low, most of works and infrastructure remaining within the existing road right-of-way. It should be noted that the initial ESIA conducted by (URS, 2015) was used to identify potential interactions between the project and ES provided inside their study area (corresponding to our Mine area). If the impact assessment was to be updated, the assessment of project and ES interactions would need to be reviewed accordingly, which may result in a change of PES.

Table 10-3: Determination matrix for assessment of ES

LEVEL OF DEPENDENCE	INTERACTION PROJECT DRIVERS OF CHANGE AND OPERATIONS	REPLACEABILITY	PRIORITY ECOSYSTEM SERVICE
Low	Low	Low	Not PES
		Medium	Not PES
		High	Not PES
	Medium	Low	Not PES
		Medium	Not PES
		High	Not PES
	High	Low	PES
		Medium	Not PES
		High	Not PES
Medium	Low	Low	Not PES
		Medium	Not PES
		High	Not PES
	Medium	Low	PES
		Medium	Not PES
		High	Not PES
	High	Low	PES
		Medium	PES
		High	Not PES
High	Low	Low	Not PES
		Medium	Not PES
		High	Not PES
	Medium	Low	PES
		Medium	PES
		High	Not PES
	High	Low	PES
		Medium	PES

LEVEL OF DEPENDENCE	INTERACTION PROJECT DRIVERS OF CHANGE AND OPERATIONS	REPLACEABILITY	PRIORITY ECOSYSTEM SERVICE
		High	Not PES

10.4.3 Limitations

A few limitations were encountered while completing the ESA, including limited literature on ES in arid/desertic ecosystems. Indeed, studies on Mauritanian ES mostly covered the southern part of the country, where vegetation is more widespread. Also, seasonal variations in terms of vegetation cover might not be fully grasped during the two field visit organized for flora inventories and ES consultations. Lastly, only a small amount of ES could be georeferenced during field visits, limiting the consideration of ES spatial distribution in the ESA. Moreover, there are limited data for the Rail and the Port areas, baseline studies for these areas where only desktop and no specific consultation has been conducted in these areas.

10.5 Stakeholder consultations

As mentioned previously, stakeholders consultations were held in 2023 to gather additional information on ecosystem services within the Project AoI. The general objectives of the interviews on ecosystem services were to:

- Define the role of habitats in the well-being of communities and understand what resources and services, arising from these habitats, are present in the project area;
- Identify the natural resources and services resulting from the habitats in the project area for which the populations have the most concerns (e.g., reduced accessibility to certain areas for collecting plants or animals, punctual deterioration of water quality);
- Identify the components of the environment (specific habitats (wetlands, rivers, lakes, forests, savannas, etc.), seasons, types of soil, topography, etc.) that influence the availability of the resources used and the services that benefit local populations;
- Make a list of plants or animals consumed or harvested and identify their use;
- Identify and locate the habitats that are most important for the well-being of local populations;
- Provide insight on how the use of these resources could be affected by the Project to mitigate these impacts.

Specific ES focus groups and meetings were held with local community representatives, targeting natural resource users in the Project AoI, including women, pastoralists, youth and traditional medicine practitioners. Meetings with Regional technical services representative where also held in Zouerate. The various meeting activities are compiled in Table 10-4. They were led by a biologist, familiar with value use and pastoralist plant species. Figure 10-2 and Figure 10-3 show photos from some of these meetings. Signature lists and additional photos are provided in APPENDIX S and APPENDIX T.

Key questions regarding ecosystem services and their use by local populations were also included in the socioeconomic consultations led by a sociologist in charge of updating the social baseline. Useful information gathered during these consultation activities are presented in the ESA. Detailed information on the socioeconomic consultations is presented in the Social baseline report (R02_Volume II_c) of the updated ESIA (WSP, 2023).

As part of the 2025 update of the ESIA, further interviews were conducted with ecosystem service users to complement the information collected in 2023. These included focus group discussions with salt collectors in Sebkha Idjill, pastoralists in Zouerate and F'Derik, and institutional actors responsible for pastoral resource management in Zouerate. In addition, a qualitative interview and site visit were carried out with one administrator of the auberge in Touajil to assess water use and irrigation practices for the palm groves. This activity was not structured as a focus group, but provided important insights into ecosystem services related to water resources and small-scale tourism. These complementary activities helped to refine the understanding of how local communities depend on natural resources such as salt, water and pastures, and how seasonal variations may affect their availability.

Table 10-4: Stakeholders interviewed on ecosystem services

DATE	STAKEHOLDER	LOCATION	NUMBER OF PARTICIPANTS
7 May 2023	Herders	Aouchich	4
8 May 2023	Regional Technical Services – Livestock	Zouerate	1
	Regional Technical Services – Agriculture		1
9 May 2023	Agricultural Cooperative – Women	Zouerate	3
	Traditional Medicine Practitioner		1
	Crafts Cooperative – Women (stone jewellery)		8
	Agricultural Cooperative – Women	F'Derik	3
	Crafts Cooperative – Women		2
	Traditional Medicine Practitioner		1
10 May 2023	Youth	F'Derik	6
	Villagers	Toueirgue	5
	Pastoralists	El Aouj	3
	Sebkha Idjill Salt Mine Manager	Sebkha Idjill	1
11 May 2023	Herders	F'Derik	6
	Traditional Medicine Practitioner	Touajil	1
	Youth		8
	Women		5
12 May 2023	Pastoralists	El Aouj	4
18 June 2025	Salt collectors	Sebkha Idjill / F'Derik	15
18 June 2025	Pastoralists and farmers	F'Derik	8
18 June 2025	Pastoral resource management authorities,	F'Derik	5

DATE	STAKEHOLDER	LOCATION	NUMBER OF PARTICIPANTS
19 June 2025	Women in vulnerable situations	F'Derik	31
21 June 2025	Administrator of the auberge – interview & site visit (water use, palm groves	Touajil	1

Discussions with herders in Aouchich, 7 May 2023

Focus group with Women Agricultural Cooperative in Zouerate, 9 May 2023

Focus groups with Women Agricultural Cooperative in F'Derik, 9 May 2023

Focus group with Youth groups in Touajil, 11 May 2023

Figure 10-2: Photos of stakeholders interviews and focus groups, May 2023

1: Interview with administrator of the auberge at Touajil

2: Site visit (water use, palm groves) of the auberge at Touajil

Figure 10-3: Photos of stakeholders interviews and focus groups, May 2025

10.6 Ecosystem services assessment

A list of ES provided inside the study area has been developed based on a literature review on ES, the natural and modified habitats identified within the study area, and the interviews held with communities located in the Project AoI (Table 10-5).

The Project AoI is mostly made up of natural habitats, anthropogenic activities being limited to a couple towns and villages as well as mines. Five types of natural habitats are considered and will be referred to in the ESA. These habitats are:

- Guelbs: inselbergs, or isolated rock hills that rise abruptly from flat land.
- Regs: desert surface covered with closely packed pebbles, from which fine particles have been removed by winds. Regs can be bare or sandy, in which case vegetation can be found.
- Ravines: naturally dug by water runoff on a slope. When they are sandy, they are similar to regs and suitable to vegetation.
- Wadis: ephemeral desert watercourses often made up of several ravines. Conditions are suitable to vegetation.
- Dunes: hills made from sand accumulation, often with steep slopes.

For more information on the habitats of the Project AoI, see the biological baseline report (R02_Volume II_b) of the updated ESIA (WSP, 2023).

Natural and modified habitats have multiple vocations associated with a range of uses by local communities:

- Provisioning ES are mainly associated with specific species of use value found inside the study area.
- Cultural ES are mainly associated with specific habitats inside the study area, for tourism and recreation for instance.
- Regulation and support ES are related to interaction between biophysical and social components at a wider scale.

Due to their complexity and overarching quality, support ES have not been specifically assessed inside the AoI but are known to contribute to all types of ES.

Table 10-5: ES provided inside the Project AoI

ECOSYSTEM SERVICES	DEFINITION
Provisioning Services	
Agricultural potential and production	Areas with agricultural potential, including all crops and agricultural products grown by local communities for human and livestock consumption.
Livestock and forage resources	Forage resources, water and others supporting livestock and animals owned for consumption, domestic or commercial uses.
Hunting and bush meat	Animal species trapped or hunted for consumption, including insects, mammals, birds, amphibians and reptiles.
Fishing activities	Artisanal or industrial fishing activities as a subsisting activity or a commercial activity participating to local economy.
Wild food products	Products collected in the wild for food, other than animal proteins (vegetal products, mushrooms or honey).
Traditional medicine	Mineral, plant or animal used in order to maintain people's health as well as to prevent, diagnose, treat or care for physical and mental diseases.
Building. carpentry and craft materials	Mineral or vegetal material (ligneous or non-ligneous) used for construction purposes, to construct furniture and to make craft objects.
Biofuel	Animal or vegetal products used as energy sources.
Water resources	Groundwater and surface water used as tap water or for domestic, commercial or agricultural means. Comprises all the natural processes that regulate its quality or quantity.
Salt extraction	Salt artisanally extracted by local populations for livelihood.
Regulation Services	
Air quality control	Ecosystems influence in terms of gases exchange or filtration of physical or chemical particles in the air (e.g., dust, O2, CO2).
Climate regulation	Global: Ecosystems influence the absorption or emission of green gases and in the regulation of air masses.
	Regional and local: Ecosystems influence on regional and local temperatures, rainfalls or on other climatic parameters.
Water regulation	Ecosystems influence on the amplitude and period of water flow, water storage, aquifer filling and flood prevention.
Erosion control	Ecosystems prevent erosion by retaining soil and by intercepting rainfall, reducing the speed of runoff, etc.
Cultural Services	
Sacred components	Cultural or religious value that population attaches to an ecosystem, a place or a species.

ECOSYSTEM SERVICES	DEFINITION
Recreation and tourism	Nature, particularly protected areas and wildlife plays an important role in supporting tourism. Ecosystems and biodiversity are therefore an important source of employment and income generation.
Support Services	
Primary production	Production of organic matter by plants through photosynthesis and nutrient input. It forms the basis of the food chain.
Nutrients cycle	Nutrients cycle in the ecosystems (phosphorus, nitrogen, carbon, sulfur, etc.).
Habitat	Natural or modified areas which support flora and fauna communities.
Water cycle	Water transition through different receptors (atmosphere, terrestrial and aquatic habitats) in all its phases (solid, liquid and gaseous).

The following sections describe ES for which an impact is anticipated from the Project's implementation across the Project AoI, which is divided for this assessment in Port area, Rail area and Mine area. The description will allow a general understanding of the ES inside the Project AoI, including its availability and distribution, the local population's use of the ES and its dependency as well as the potential interaction of the project with the ES. This information will be the basis for the selection of PES according to the prioritization criteria and the determination matrix presented in the previous section.

10.6.1 Port area

10.6.1.1 Provisioning ecosystem services

10.6.1.1.1 Agricultural potential and production

Nouadhibou has a significant market gardening community. In 2017 over 450 farmers were registered in the wilaya and were organized into 75 cooperatives that are overseen by the Union of Market Gardeners' Cooperatives of Nouadhibou (ANTEA GROUP, 2017).

Subsistence farming has developed in the outlying neighborhoods, mainly in the form of family gardening and greenhouse vegetable growing. Crops are diversified, with species such as tomatoes, eggplant, beetroot and lettuce grown throughout the year. Arboriculture is also practiced, with a predominance of date palms, which are well suited to local conditions.

Table 10-6 below details the results of the ES prioritisation criteria assessment.

Table 10-6: Assessment of agricultural potential and production against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Medium**: A significant farming community has developed in Nouadhibou near the Port area and several households and individual are dependent on agriculture.
Interaction with drivers of change on ES or with project operations	**Low**: Interaction between the Project activities at the port and the agricultural potential and production is expected to be limited and restricted to the emission of dust resulting from ore transportation and loading.

PRIORITISATION CRITERIA	RESULTS
Replaceability/Management potential	**Low**: Considering the agriculture in Nouadhibou area is mainly family gardening and greenhouse vegetable growing and the city extension, there is a few replaceability potential.
Priority ecosystem services	**Not a PES**

10.6.1.1.2 Livestock and forage resources

Livestock farming remains in this area a subsistence activity (Ministère de l'agriculture, 2017) involving small ruminants (particularly goats and sheep) or poultry (chickens, turkeys, etc.) raised on family farms, and camels raised by nomadic or semi-nomadic populations (ANTEA GROUP, 2017). Livestock farming plays a complementary role in the local economy and remains vital for many households by representing an additional source of income.

Table 10-7 below details the results of the ES prioritisation criteria assessment.

Table 10-7: Assessment of livestock and forage resources against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: A number of individuals in the Port area are involved in livestock farming activities, representing a vital additional source of income.
Interaction with drivers of change on ES or with project operations	**Low**: Project activities in the Port area will locally increase noise and dust without changing the land availability and then without changing the availability of forage resources or grazing areas.
Replaceability/Management potential	**Medium**: Considering the area location between the border and the coast, the replaceability potential is existent in the Port area, but limited considering the area location between the border and the coast.
Priority ecosystem services	**Not a PES**

10.6.1.1.3 Fishing activities

The Bay of Nouadhibou is site for artisanal fishing in Mauritania. The fishing sector is divided into two main categories: artisanal and industrial (ANTEA GROUP, 2017).

Artisanal fishing is carried out using artisanal boats with 7,991 licenses for artisanal fishing issued in 2022, and 47,172 seafarers active in this sector, with a total catch of 357,685 tons. At the same time, industrial fishing is mainly carried out by foreign fleets with 1,080 industrial fishing licenses issued in 2022, a workforce of 11,992 sailors and a total catch of 649,777 tons (ANSADE, Dakhlet Nouadhibou en chiffres, 2018-2022). The main fish stocks consist of pelagic fish, sardines, lobsters, hake, octopus, demersal fish, corvina, mullet, cephalopods (ANTEA GROUP, 2017).

Table 10-8 below details the results of the ES prioritisation criteria assessment.

Table 10-8: Assessment of fishing activities against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: The artisanal and industrial fishing sector represents the main economic activity in the Port area.
Interaction with drivers of change on ES or with project operations	**Low**: Fishing is already prohibited in the Project area of Influence inside the channel used by ore transportation ships; the ore transportation boats won't interfere with the fishing activities.
Replaceability/Management potential	**Medium**: Fishing activities are already prohibited in the channel and the channel area won't be extended due to the El Aouj project activities.
Priority ecosystem services	**Not a PES**

10.6.1.1.4 Water resources

Access to drinking water in Nouadhibou remains limited due to the geographical context, which lacks surface water resources, fresh water and groundwater that can be exploited on a large scale. The supply relies mainly on the Boulenouar catchment area, located about 90 km from the city. This site has around 20 boreholes, 16 of which are in service, with an estimated daily production of 12,000 m³ (ANTEA GROUP, 2017).

Table 10-9 below details the results of the ES prioritisation criteria assessment.

Table 10-9: Assessment of water resources against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: Dependence of water is high, mostly for livestock and agriculture. Access to drinking water in Nouadhibou remains limited due to the geographical context.
Interaction with drivers of change on ES or with project operations	**Low**: The Project activities in the Port area won't modify the population access to water nor the water resources amount.
Replaceability/Management potential	**Low**: The water resource is vital and rare in a desertic country.
Priority ecosystem services	**Not a PES**

10.6.1.2 Regulation services

10.6.1.2.1 Air quality control

Air pollution has negative consequences for human health. Ore transportation and loading from mining trains to the boats will produce a huge amount of mineral dust in the port area.

Vegetation cover plays an important role in air quality control by capturing airborne pollutants and removing them from the atmosphere (Harris, Reis, Jones, Agarwala , & Nowak, 2019), but the Project AoI only has few trees. However, the marine winds will contribute to locally spread the dusts, limiting the concentration of dust in the atmosphere. So air quality will be controlled by the ecosystem through wind dispersion.

Table 10-10 below details the results of the ES prioritisation criteria assessment.

Table 10-10: Assessment of air quality control against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Low**: The capacity of ecosystem to control air quality is considered limited as vegetation cover is minimal in the Port area.
Interaction with drivers of change on ES or with project operations	**Low**: Important negative impacts on air quality are expected during the ore transportation and loading activities at the Port area. However, the Project will not significantly affect the ecosystem's already limited ability to control air quality.
Replaceability/Management potential	**Medium**: Vegetation can be increased in the Port area, albeit in a limited manner due to the aridity of the region.
Priority ecosystem services	**Not a PES**

10.6.1.2.2 Climate regulation

The consequences of increased carbon dioxide and other greenhouse gases in the atmosphere are felt by people around the world through the impacts of climate change on rainfall patterns, storm frequency and severity, temperature, and sea-level rise. By storing carbon in vegetation, ecosystems keep carbon dioxide out of the atmosphere, where it would otherwise contribute to climate change. Given the project area sparse vegetation, the impact on the climate regulation capacity of ecosystems is deemed limited.

Table 10-11 below details the results of the ES prioritisation criteria assessment.

Table 10-11: Assessment of climate regulation against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Low**: The contribution to global climate regulation is considered low due to sparse vegetation in the Port area.
Interaction with drivers of change on ES or with project operations	**Low**: Interaction is low as the project will not lead to any loss of vegetation cover in the Port area and is unlikely to affect climate regulation.
Replaceability/Management potential	**Medium**: Vegetation can be increased in the Port area, albeit in a limited manner due to the aridity of the region.
Priority ecosystem services	**Not a PES**

10.6.1.2.3 Water regulation

Ecosystems play a key role in water regulation processes by allowing evapotranspiration, water filtration and groundwater recharge (MEA, 2005). According to (Xu & Yu, 2020), arid ecosystems represent a crucial, yet poorly understood component of global water cycle. The port area being an arid ecosystem, it can be considered as important for the water regulation services.

Table 10-12 below details the results of the ES prioritisation criteria assessment.

Table 10-12: Assessment of water regulation against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: Water is central to both local livelihoods (small-scale agriculture, herding, human consumption) and project operations. Its availability and quality are highly dependent on ecosystem's ability to regulate water.
Interaction with drivers of change on ES or with project operations	**Low**: The Project won't be using water in the Port area.
Replaceability/Management potential	**Low**: Replaceability is deemed low as is related to local natural processes that can difficultly be replicated.
Priority ecosystem services	**Not a PES**

10.6.1.2.4 Erosion control

Erosion in arid regions like the Nouadhibou coast is often caused by wind (Lessani, Wang, & Nikmal, 2022) or tides. The poor vegetation in the port area and the absence of vegetation in the coastline do not represent a significant erosion control service.

Table 10-13 below details the results of the ES prioritisation criteria assessment.

Table 10-13: Assessment of erosion control against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: Erosion is a central issue in desert ecosystem and vegetation is key to stabilizing soil and acting as natural windbreakers. Although limited, vegetation in the Port area is necessary because of its erosion control capacity.
Interaction with drivers of change on ES or with project operations	**Low**: The vegetation is limited in the Port area and the Project won't remove plants in this area.
Replaceability/Management potential	**Low**: The replaceability potential is low due to the scarcity of vegetation in the Port area.
Priority ecosystem services	**Not a PES**

10.6.1.3 Cultural services

10.6.1.3.1 Tourism and recreation activities

The tourism attractivity of the Nouadhibou coast, the presence of a monk seal research observatory and the Banc d'Arguin constitute a tourist attraction in the Nouadhibou region. However, this does not represent an attraction in the project's area of influence around the ore port; however the ore transportation ships in the channel result in a massive traffic which might disturb the monk seals.

They mainly live on the west coast, where caves in the cliffs serve as their habitat. There is also a museum dedicated to monk seals within the Cap Blanc reserve, which hosts school trips and raises awareness among children and fishermen.

Table 10-14 below details the results of the ES prioritisation criteria assessment.

Table 10-14: Assessment of tourism and recreation activities against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Medium**: The coast is seen as a major attractivity for tourism in the region due to the presence of Monk seals and the Banc d'Arguin nearby. Nouadhibou is a cosmopolitan city and is home to several hotel set holiday cottages.
Interaction with drivers of change on ES or with project operations	**Medium**: The Port area is located far away from tourism attractivity sites and Project activities won't interfere with them. However, the boats presence and traffic may affect them and constitutes a risk of collision.
Replaceability/Management potential	**Medium**: Monk seals are present all along the coast and can be seen by tourists at different spots away from the Port area.
Priority ecosystem services	**Not a PES**

10.6.2 Rail area

10.6.2.1 Provisioning ecosystem services

10.6.2.1.1 Agriculture potential and production

In northern Mauritania, agriculture is of the oasis type due to climatic and water constraints that limit large-scale cultivation. They enable the production of dates, fruits and vegetables in a traditional agroecological system combining palm trees, fruit trees and food crops on the same plot of land (SNIM, 2024).

Table 10-15 below details the results of the ES prioritisation criteria assessment.

Table 10-15: Assessment of agricultural potential and production against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Medium**: In some sections of the Rail area, agriculture is of the oasis type due to climatic and water constraints that limit large-scale cultivation.
Interaction with drivers of change on ES or with project operations	**Low**: Project activities or improvement works on the railway won't modify land or water availability for agriculture in this area.
Replaceability/Management potential	**Low**: Considering the scarcity of water resource, there is a low potential for replaceability of agriculture.
Priority ecosystem services	**Not a PES**

10.6.2.1.2 Livestock and forage resources

The livestock sector in Mauritania is one of the main pillars of the country's economy and remains largely extensive as a large portion of the rural population (60 to 70%) gets their income from livestock farming (Ministère de l'agriculture, 2017). The livestock farming systems practiced along the railway line are based on transhumant pastoralism and sedentary livestock farming. The livestock population mainly consists of cattle, camels, sheep and goats.

Table 10-16 below details the results of the ES prioritisation criteria assessment.

Table 10-16: Assessment of livestock and forage resources against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: A large portion of the rural population gets their income from livestock farming.
Interaction with drivers of change on ES or with project operations	**Medium**: Project anticipated activities (ore transportation increasing the already existing railway traffic) and infrastructure (new siding and maintenance centres) are likely to disturb pastoralist search for grazing areas by modifying their displacement across the rail and increasing the collision risks.
Replaceability/Management potential	**High**: Considering the size of the Rail area and the sidings occurring on the easement areas already belonging to the SNIM, it is likely that the area usd is not currently used by pastoralists.
Priority ecosystem services	**Not a PES**

10.6.2.1.3 Water resources

Access to potable water is a crucial issue for the health and economic development of several localities in Mauritania. Drinking water supply in the rail area is provided locally by each wilaya (SNIM, 2024). In the municipality of Choum, an artesian well with a capacity of 20 m^3/h is the main source of drinking water. Despite this infrastructure, some neighborhoods remain dependent on alternative solutions, such as tanker trucks, to overcome supply difficulties (SNIM, 2023).

Table 10-17 below details the results of the ES prioritisation criteria assessment.

Table 10-17: Assessment of water resources against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: Access to potable water is a crucial issue and drinking water supply in the rail area is provided by wilayas, wells or tanker trucks. Dependence of water is high, mostly for livestock and agriculture.
Interaction with drivers of change on ES or with project operations	**Low**: Project activities won't modify the access of population and livestock to drinkable water.
Replaceability/Management potential	**Low**: Considering water scarcity in desertic areas and frequent drought in the country over the past years, the replaceability potential for this resource is very low.
Priority ecosystem services	**Not a PES**

10.6.2.2 Regulation services

10.6.2.2.1 Air quality control

Air pollution has negative consequences for human health. Ore transportation through mining trains on the railway will produce a large amount of mineral dust in the rail area.

Vegetation cover plays an important role in air quality control by capturing airborne pollutants and removing them from the atmosphere (Harris, Reis, Jones, Agarwala , & Nowak, 2019), but the Project AoI only has few trees, so air quality control by ecosystems is considered very limited.

Table 10-18 below details the results of the ES prioritisation criteria assessment.

Table 10-18: Assessment of air quality control against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Low**: Although air quality is a central issue of the ore transportation, the capacity of ecosystem to control air quality is considered limited as vegetation cover is minimal and air quality is already degraded.
Interaction with drivers of change on ES or with project operations	**Low**: Limited negative impacts on air quality are expected during the construction of overtaking lanes and maintenance centres by SNIM and during operation. However, the Project will not significantly affect the ecosystem's already limited ability to control air quality.
Replaceability/Management potential	**Low**: Few replaceability alternatives for air quality control exists in the Rail area.
Priority ecosystem services	**Not a PES**

10.6.2.2.2 Climate regulation

The consequences of increased carbon dioxide and other greenhouse gases in the atmosphere are felt by people around the world through the impacts of climate change on rainfall patterns, storm frequency and severity, temperature, and sea-level rise. By storing carbon in vegetation, ecosystems keep carbon dioxide out of the atmosphere, where it would otherwise contribute to climate change. Given the project area sparse vegetation, the impact on the climate regulation capacity of ecosystems is deemed limited.

Table 10-19 below details the results of the ES prioritisation criteria assessment.

Table 10-19: Assessment of climate regulation against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Low**: The contribution to global climate regulation is considered low due to sparse vegetation in the study area.
Interaction with drivers of change on ES or with project operations	**Low**: Interaction is low as the project will not lead to an important loss of vegetation cover and is unlikely to affect climate regulation.
Replaceability/Management potential	**Low**: Vegetation can be restored or increased around overtaking lanes and maintenance centres, albeit in a limited manner due to the aridity of the region.
Priority ecosystem services	**Not a PES**

10.6.2.2.3 Water regulation

Ecosystems play a key role in water regulation processes by allowing evapotranspiration, water filtration and groundwater recharge (MEA, 2005). According to (Xu & Yu, 2020), arid ecosystems represent a crucial, yet poorly

understood component of global water cycle. The rail area being an arid ecosystem, it can be considered as important for the water regulation services.

Table 10-20 below details the results of the ES prioritisation criteria assessment.

Table 10-20: Assessment of water regulation against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: Water is central for local livelihoods and its availability and quality are highly dependent on ecosystem's ability to regulate water. Arid ecosystems represent a crucial, yet poorly understood component of global water cycle.
Interaction with drivers of change on ES or with project operations	**Low**: The Project won't be using water in the Rail area.
Replaceability/Management potential	**Low**: Replaceability is deemed low as is related to local natural processes that can difficultly be replicated.
Priority ecosystem services	**Not a PES**

10.6.2.2.4 Erosion control

Erosion in arid regions such as Tiris Zemmour wilaya is often caused by wind, negatively affecting ecosystems and infrastructures (Lessani, Wang, & Nikmal, 2022). All vegetation in the Project AoI help with erosion control, specifically in wadis, ravines and sandy regs where it prevents erosion due to wind.

Table 10-21 below details the results of the ES prioritisation criteria assessment.

Table 10-21: Assessment of erosion control against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: Erosion is a central issue in desert ecosystem and vegetation is key to stabilizing soil and acting as natural windbreakers. Although limited, vegetation in the Rail area is necessary because of its erosion control capacity.
Interaction with drivers of change on ES or with project operations	**Low**: With vegetation already being limited in the Rail area, it is unlikely that project operations will impact plants in a way that will impact their capacity to act as sand stabilizer and windbreakers.
Replaceability/Management potential	**Medium**: Management measures such as artificial windbreakers and the plantation of sand stabilizing species can be implemented to improve erosion control capacity of ecosystems.
Priority ecosystem services	**Not a PES**

10.6.2.3 Cultural services

In the railway area (Boulenouar, Inal, Choum, and Touajil), communities are strongly linked to the ecosystem services provided by arid natural environments. Natural pastures play an important role in goat, camel, and small livestock farming in this region. Communities also benefit from regulatory services, which are essential in an

environment subject to intense desertification. Scarce rainfall and the presence of oasis contribute to water infiltration into the water table. This natural process is essential for maintaining wells in this region.

No cultural service has been identified along the railway.

10.6.3 Mine area

10.6.3.1 Provisioning ecosystem services

10.6.3.1.1 Agricultural potential and production

Agriculture employs approximately 10.5 % of the national population, although it constitutes a small share of Mauritania's GDP. According to the 2013 General Census of Population and Housing (GCPH), only about 1.2 % of the active population of F'Derik moughataa works in agriculture while the proportion is about 0.6 % in Zouerate moughataa (ONS, 2017).

Access to water is a central aspect of agricultural activities in the Project AoI. Lack of consistent water supply, quality of water, salinity of supply and poor sanitation services are the main issues concerning access to water. In this context, population practising agriculture are highly dependent on the water points at the wadis' floodplain for irrigation and water supply. At these points, soil quality is generally perceived to be rich, and a wide variety of vegetables and palm trees are grown. This is the case at the Touajil Auberge, located approximately 7 km south of Touajil, and in small gardens located on the northwestern side of F'Derik, behind the dammed wadi, and in various locations in Zouerate (AECOM, 2009). The main agricultural activities involve date palm trees and gardening underneath those trees.

Agricultural activities traditionally took place in the Mine area after rains. However, following the minimal amount of rain received in the last years, there has been a sharp decline in the number of people continuing to engage in agriculture. Rainfed agriculture used to be done in Toueirgue wadi, for instance, but hasn't been possible since the 1980s. The 2012 Quantitative Survey undertaken as part of the initial ESIA indicates that most households (95 %) are not engaged in agricultural activities (URS, 2015).

As stated in the updated Social Baseline, there are 70 ha of suitable agricultural land in Zouerate according to the Regional Department for Pastoral and Agricultural Development's latest data. In F'Derik, a total of 3 ha of land are cultivated by 11 cooperatives, 9 of which are women cooperatives.

According to 2023 stakeholder consultation activities, crops cultivated in the area are mostly market gardening products, including vegetables, sorghum, barley, wheat, and cowpea. However, lack of water and brackish water are greatly limiting production which was estimated at 29 tonnes in Zouerate and 6 tonnes in F'Derik during the latest agricultural harvest. Table 10-22 shows cultivated crops in Mine area. Cultivation occurs upstream of the F'Derik dam (see Figure 10-4), but rainfed agriculture is not widespread in the region due to several years of severe drought. In the F'Derik dam area, arable lands are available, and water is available in the dam reservoir roughly from August to November. The dam reservoir is also used by herders and artisanal gold miners, which reduces the amount of water available for agriculture. Following immense pressure on the dam's water resources, pumping water from the dam reservoir was forbidden on orders of the Hakim and Mayor in 2023. From December to July, the only source of water is from nearby wells, which is brackish.

Poor securing of agricultural field, resulting in the incursion of ruminants, and the presence of invasive species have also been identified as constraints to agricultural development in the F'Derik area.

The field visit in Touajil in May 2023 revealed that garden vegetables such as tomato, onion, eggplant and lettuce, are cultivated in the area, mainly by women cooperatives. Water used is provided by the Société Nationale Industrielle et Minière (National Society of Industries and Mines) (SNIM). At the Touajil Auberge, the same crops are cultivated along date palms (*Phoenix dactylifera*) (LC), although cultivation suffers from brackish water.

Figure 10-4: Arable land near F'Derik dam, May 2023

F’Derik in 2025

Field visit in the project area in March 2023 showed that oases were created around pressure relief valves on the water pipeline supplying the Guelb El Rhein mine operated by the SNIM (see Figure 10-5). Operated since the 1980s, the pipeline’s pressure relief valves, which were supposed to provide small amount of water to local populations have transformed into oases where palms have grown, and crops are cultivated, as shown on Figure 10-4 and censed in Table 10-22.

In 2025 consultations, the administrator of the Touajil Auberge indicated that the borehole supplying the site had been changed since 2023. Water continues to be drawn from the P2 aquifer with the same brackish quality. Farmers and women’s cooperatives also reported constraints including livestock incursions, invasive species, and marketing difficulties for garden products in Zouerate.

Table 10-22: Agricultural crops cultivated in the Mine area

LOCATION	CROPS CULTIVATED
F'Derik area	Onion, turnip, beetroot, cabbage, and tomatoes
Upstream of F'Derik dam	Sorghum, barley, wheat, watermelon, and cowpea
Touajil area	Tomato, onion, eggplant, and lettuce
Touajil auberge	Tomato, onion, eggplant, lettuce, and date palm
Toueirgue wadi	None since the 1980s due to severe drought

As part of the El Aouj mining project, an underground pipeline will run from the Touajil, borefield collection tank, to the mine site in El Aouj. This 110 km pipeline is expected to have five pressure relief valves which will provide water to pastoralists and their cattle. This could be an opportunity to foster agriculture in the Mine area.

Figure 10-5: Oasis along the Guelb el Rhein Mine water supply pipeline near Zouerate, March 2023

Data on agricultural potential and production within the Mine area show that a limited number of households and individuals are dependent on this ES. Interaction between the Project and the agricultural potential and production is expected to be limited given the small land area used for agriculture in the Mine area. The Project could even have benefits on agricultural potential if water supply pipelines are planned accordingly. Local populations could be informed about pressure relief valves location and encouraged to use water at pressure relief valve locations so that oases can be created and support the region's agricultural potential as was the case for the Guelb el Rhein Mine water supply pipeline.

Table 10-23 below details the results of the ES prioritisation criteria assessment.

Table 10-23: Assessment of agricultural potential and production against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Medium**: Limited number of households and individual are dependent on this ES.

PRIORITISATION CRITERIA	RESULTS
Interaction with drivers of change on ES or with project operations	**Low**: Interaction between the project and the agricultural potential and production is expected to be limited due to the small area of land used for agriculture in the Mine area.
Replaceability/Management potential	**Low**: Management measures can potentially reduce the impacts and generate benefits for local agriculture.
Priority ecosystem services	**Not a PES**

10.6.3.1.2 Livestock and forage resources

Livestock and breeding activities employ 9.9 % of the population, although it constitutes a small share of Mauritania's GDP, as is the case for agricultural activities. According to the 2013 General Census of Population and Housing (GCPH), only about 21.6 % of the active population of F'Derik moughataa works in livestock breeding while the proportion is about 0.8 % in Zouerate moughataa (ONS, 2017).

There are no official statistics on the number of pastoralists within the Mine area, with numbers being highly dependent on rains and forage availability. According to the Regional Technical Services consulted in 2023, there would be about 700 pastoralists in Zouerate moughataa and 500 in F'Derik moughataa with an estimated total of 100,000 camels and 75,000 small ruminants.

This concurs with data compiled during the 2013 Pastoralist Survey relating to livestock assets completed as part of the ESIA, with goats and camels being identified as the two most common types of livestock owned by pastoralists in the study area (URS, 2015). Given the high cost of camels, ownership of large herds is not common amongst pastoralist households. However, some households herd livestock on behalf of wealthy families based in the main cities of Nouakchott or Nouadhibou. Donkeys and sheeps are also owned by a few households.

Half of the respondents to the 2013 Pastoralist Survey indicate that their livestock assets are not adequate to sustain their pastoral livelihood, mainly due to the small size of herds which do not generate enough revenue from sale of products. Livestock herding is also very dependent on the availability of and access to natural resources such as water sources for livestock watering and the more fertile wadi areas for grazing. While livestock grazing is highly affected by the lack of rain, 75 % of animals slaughtered for meat are still supplied by the region's pastoralists with an average 200 camels, 100 goats and 25 tons of poultry slaughtered monthly.

The 2022 rainy season having been particularly good, there was an increased presence of livestock in the Mine area during 2023 consultation activities. However, drought had been quite severe in the past years resulting in some pastoralists avoiding the El Aouj area, in some instances for a couple years in a row. During the 2025 consultations, herders confirmed that livestock presence in the Mine area remains highly variable and strongly dependent on rainfall conditions.

Figure 10-6 shows grazing areas within the Mine area. Although *Nucularia perrinii* (see Figure 10-7) is found north of El Aouj, near Azouazil guelb and Sebkha Idjil, the mine site is not particularly rich in forage species. Herders and their livestock mostly use this area for water supply at the El Aouj well, its water being used for animal consumption. Species recorded as forage resources in the Mine area in the initial ESIA (URS, 2015), 2023 stakeholder consultations, and in 2023 and 2024 flora inventories are compiled in Table 10-24.

Figure 10-6: Location of grazing Areas in the Mine area

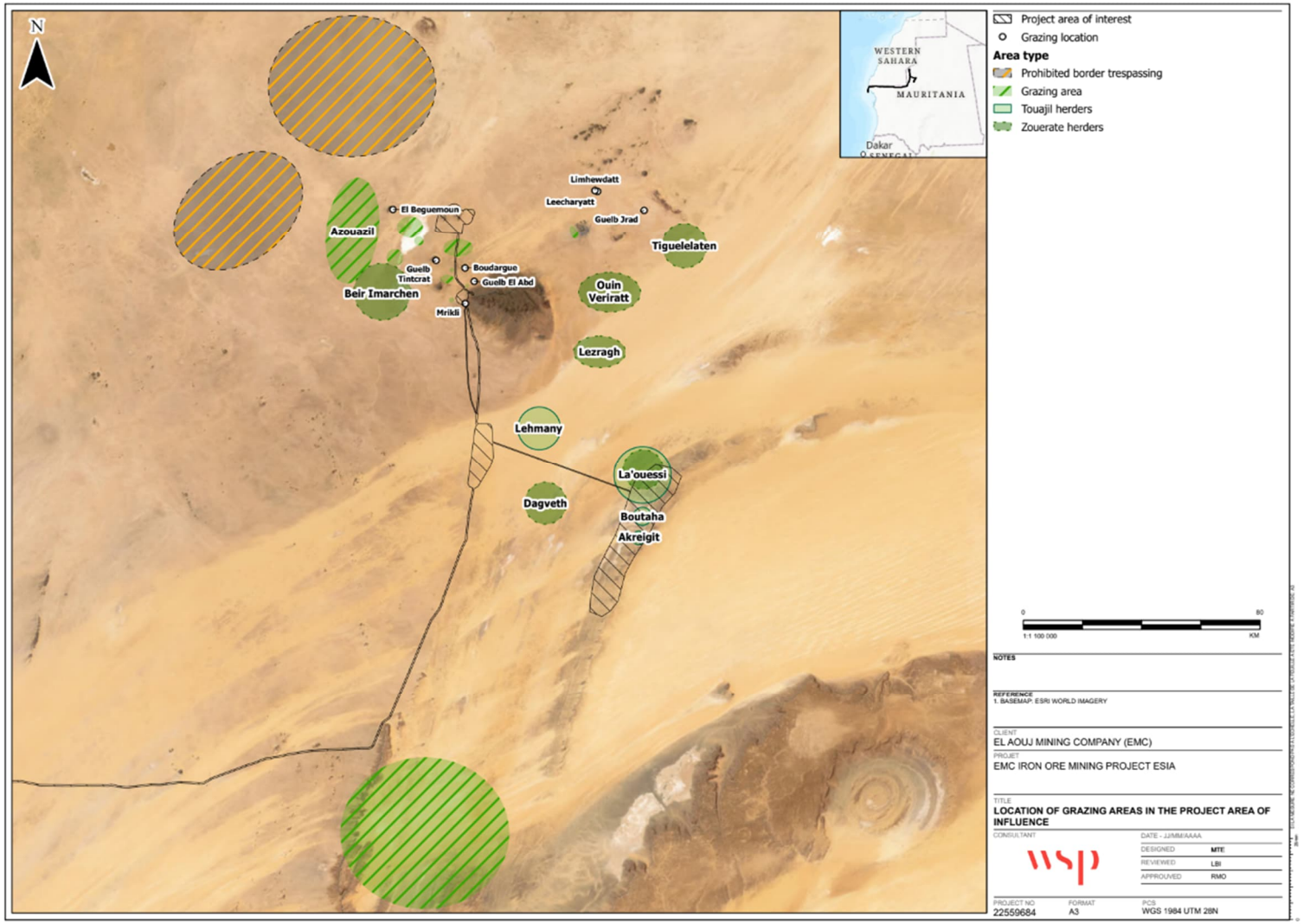


Table 10-24: Forage resources located in the Mine area

FAMILY	SCIENTIFIC NAME	LOCAL NAME	PROTECTION STATUS1	HABITAT	AVAILABILITY	SOURCE
Amaranthaceae	*Cornulaca monacantha*			Unknown	Unknown	URS 2015.
	Nucularia perrinii	Askaf/El Hatbe		Regs	After rainy season	Stakeholder consultation 2023, Field inventories 2023 & 2024.
Apocynaceae	*Calotropis procera*			Unknown	Unknown	URS 2015.
Asteraceae	*Atractylis aristata*	Chidg Ijmel		Regs, guelbs	After rainy season	Stakeholder consultation 2023, Field inventories 2023.
	Brocchia cinerea	El Gartouve		Sandy regs, ravines		Stakeholder consultation 2023, Field inventories 2023.
Boraginaceae	*Heliotropium ramosissimum*	Lihbaliye		Sandy regs, ravines, wadis	During and after rainy season	URS 2015, Stakeholder consultation 2023, Field inventories 2023 & 2024.
Brassicaceae	*Matthiola marocanna*	Chgare		Unknown	Unknown	Stakeholder consultation 2023.
Capparaceae	*Capparis decidua*		LC, Nationally Protected	Unknown	Unknown	URS 2015.
	Maerua crassifolia	Etil	LC, Nationally Protected	Wadis	Year round	Field inventories 2023 & 2024.
Caryophyllaceae	*Gymnocarpos sclerocephalus*	Jjamre		Regs	After rainy season	Stakeholder consultation 2023, Field inventories 2023.
Cyperaceae	*Cyperus laevigatus*	Ssekin	LC	F'Derik Dam	After rainy season	Field inventories 2023.
Fabaceae	*Astragalus vogelii*	Etheyr		Regs	During and after rainy season	Stakeholder consultation 2023, Field inventories 2023.

FAMILY	SCIENTIFIC NAME	LOCAL NAME	PROTECTION STATUS1	HABITAT	AVAILABILITY	SOURCE
	Cullen plicatum	Tatrarit		Guelbs, F'Derik dam, wadis	After rainy season	Stakeholder consultation 2023, Field inventories 2024.
	Vachellia flava	Ttemat	LC, Nationally Protected	Wadis	Year round	Stakeholder consultation 2023, Field inventories 2023 & 2024.
	Vachellia tortilis (Acacia tortilis)	Ttalh	LC, Nationally Protected	Wadis	Year round	URS 2015, Stakeholder consultation 2023, Field inventories 2023 & 2024.
Lamiaceae	*Salvia aegyptiaca*	Tezewkennit		Guelbs, ravines	After rainy season	Field inventories 2023 & 2024.
Malvaceae	*Corchorus depressus*	Taghyit trab		Regs	After rainy season	Field inventories 2023.
	Grewia tenax	Ligleye	LC	Guelbs	After rainy season	Stakeholder consultation 2023.
Menispermaceae	*Cocculus pendulus*	Leelende		Wadis	After rainy season	Stakeholder consultation 2023.
Neuradaceae	*Neurada procumbens*	Saadane		Regs	After rainy season	Stakeholder consultation 2023, Field inventories 2023 & 2024.
Plantaginaceae	*Plantago amplexicaulis*	El Yelme		Regs	Unknown	Stakeholder consultation 2023.
Poaceae	*Panicum turgidum*	M'Rekbe	Nationally Protected	Sandy regs, ravines, wadis	After rainy season	Stakeholder consultation 2023, Field inventories 2023 & 2024.
	Stipagrostis plumosa	Nnsil		Sandy regs, dunes	After rainy season	Stakeholder consultation 2023, Field inventories 2023.
	Stipagrostis pungens	Essbat	Nationally Protected	Dunes	Year round	Stakeholder consultation 2023, Field inventories 2023 & 2024.
Resedaceae	*Caylusea hexagyna*	Dhimban		Sandy regs, wadis	During and after rainy season	Stakeholder consultation 2023, Field inventories 2023 & 2024.

FAMILY	SCIENTIFIC NAME	LOCAL NAME	PROTECTION STATUS1	HABITAT	AVAILABILITY	SOURCE
Urticaceae	*Forsskaolea tenacissima*			Unknown	Unknown	URS 2015, Field inventories 2023 & 2024.
Zygophyllaceae	*Zygophyllum arabicum*	Tejerkenne		Sandy regs, ravines	Unknown	Stakeholder consultation 2023, Field inventories 2023 & 2024.
	Zygophyllum glutinosum	Ddesme		Regs	After rainy season	Stakeholder consultation 2023, Field inventories 2023.

Notes:

[1] Protection status includes international status according to the IUCN Red List and national status (LC: Least Concern), including species listed under Law no. 97-007 of January 20, 1997 amending Order no. 82-171 of December 15, 1982 establishing the Forestry Code and Law no. 2007-055 amending and replacing Law no. 97-007 of January 20, 1997 establishing the Forestry Code.

Figure 10-7: *Nucularia perrinii* (left) and *Cyperus laevigatus* (right), forage resources observed on the field in 2023

Nucularia perrenii, a key forage resource in the Mine area, is found around F'Derik, specifically in Tensekre, Ezweïgue, near Leecharyatt, Boïr Imachi and at the edge of Sebkha Idjil. In the area between F'Derik and Sebkha Idjil, grazing areas consist mostly of herbaceous pasture of *Astragalus vogelli*, *Stipagrostis plumosa*, *Heliotropium ramosissimum*, *Brocchia cinerea*, *Zygophyllum arabicum* and *Zygophyllym gluinosum*. Perennial pasture such as *Panicum turgidum*, *Vachellia flava* and *Vachellia tortilis* are mostly found south of Mrikli.

According to 2013 Pastoralist Survey conducted as part of the 2015 ESIA, pastoralists tend to move seasonally north of F'Derik and west of the El Aouj mine site, into Western Sahara, depending on water and forage resources availability (URS, 2015a). According to 2023 consultation activities with pastoralists from F'Derik, Touajil and Zouerate as well as interviews with pastoralists at nomadic camps and water points throughout the Mine area, the 2013 data and observations remain valid aside from Western Sahara, which is now inaccessible due to the border being closed. This has resulted in the El Aouj site being more frequented by herders although its pasture is of mediocre quality. According to pastoralist consulted in 2023, the El Aouj area could be replaced by Guelb Jrad and Guelb Azouazil area if wells were built in the area, the latter being already used by camel herders because of the availability of forage resources. These two areas are outside the project area of influence. However, the El Aouj Project will develop a new water point each 5km along the water pipeline between the wellfields and the ore treatment facilities at the mine site.

Although there aren't any recent, consolidated statistics regarding the number of pastoralists and herders in the area, it is certainly a widespread economic activity which is highly dependent on climatic conditions and resource availability. Forage resource availability and free movement of pastoralists could be affected by project construction and operations. With the border closure limiting access to some high-quality forage areas and with water sources being sparse in the Mine area, there are limited replaceability potential for forage resources within the Mine area.

Table 10-25 below details the results of the ES prioritisation criteria assessment.

Table 10-25: Assessment of livestock and forage resources against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: Several individuals in the Mine area are involved in pastoral or herding activities, which are highly dependent on climatic conditions and forage resources availability.

PRIORITISATION CRITERIA	RESULTS
Interaction with drivers of change on ES or with project operations	**Medium**: Project anticipated impacts include loss of tree and grass species used as forage resources resulting from permanent land-take and temporary habitat disturbance (URS, 2015b). Additionally, Project infrastructure may impede pastoralist seasonal movement and search for grazing area, especially in and around the El Aouj Mine Site.
Replaceability/Management potential	**Medium**: There are some replacement areas for grazing in the Mine area, which would be enhanced by digging wells in Guelbs Jrad and Azouazil, for instance.
Priority ecosystem services	PES of Type I

10.6.3.1.3 Hunting and bush meat

Discussions with local people underlined that hunting still takes place to supplement local diet. During 2023 stakeholder consultations, it was mentioned that severe drought experienced in the Project AoI in the previous years have reduced the presence of bush meat. However, some species are still hunted to supplement local diet, but are limited to spiny-tail lizards (*Uromastyx dispa flavifasciata*) and cape hare (*Lepus capensis*), both of which are of least concern (LC) according to the IUCN, as well as migratory birds passing through the F'Derik dam. Specific migratory bird species could not be identified with stakeholders.

Amongst the species hunted by local communities, the field surveys conducted in 2013 as part of the ESIA recorded spiny-tail lizard (*Uromastyx dispar flavifasciata*) throughout the study area, except near F'Derik due to human disturbance and hunting (URS, 2015a). Spiny-tail lizards were observed in 23 of the 39 transects during 2023 field inventories, making it the most abundant reptile in the Mine area. Houbara bustard, a species that has been known to be hunted and a vulnerable species according to the International Union for Conservation of Nature (IUCN) Red List, is potentially resident in the Mine area. However, it was not mentioned by stakeholder.

Dependence on hunting and bush meat is limited in the Mine area, wild animals being only consumed seldomly to supplement local diet. Furthermore, the availability of bush meat has already been widely affected by drought. The remaining populations could still be affected by project operations, but management measures could be implemented to mitigate this, such as moving individuals to similar habitats within the Mine area.

Table 10-26 below details the results of the ES prioritisation criteria assessment.

Table 10-26: Assessment of hunting and bush meat against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Low**: Hunting is not widespread in the Mine area, mostly because of a very limited availability of bush meat, so few households hunt to supplement local diet.
Interaction with drivers of change on ES or with project operations	**Medium**: Although the presence of bush meat has declined in recent years due to drought, construction and operation activities could affect the remaining populations of spiny-tail lizards and cape hare which are still hunted by local populations.
Replaceability/Management potential	**High**: Individuals recorded on the El Aouj mine site could be moved to other similar habitats in the Mine area.
Priority ecosystem services	Not a PES

10.6.3.1.4 Wild food products

According to literature, some edible plant species have been recorded in the Mine area. The list of wild food products from the literature review has been enriched during consultations carried out in May 2023. The wild food products used in the study area are listed in Table 10-27. Stakeholders have mentioned that species that used to be gathered for food have been sparser in the Project AoI due to severe drought in the last years.

Of the species listed in Table 10-27, only two were observed in the Mine areaduring the flora inventories conducted in May 2023. *Maerua crassifolia* (LC) was observed in limited abundance in 16 (of 25) transects in El Aouj, 3 (of 12) transects along the Touajil-F'Derik corridor and in Aouchich, mostly in ravines and wadis. *Forsskaolea tenacissima* was observed in 5 (of 25) transects in El Aouj and 1 (of 12) transects along the Touajil-F'Derik corridor, also in very limited abundance.

During 2023 flora surveys, other wild food products were observed, although they were not mentioned by stakeholders as being used for local consumption. These include *Capparis decidua* (LC), *Vachellia tortillis* (LC) and *Neurada procumbens*. It is thus unclear whether they are consumed by communities, but they are considered as wild food species by local botanists.

Table 10-27: List of plants consumed by local communities

FAMILY	SCIENTIFIC NAME	LOCAL NAME	PART CONSUMED					REMARK
			FRUIT	GUM	LEAF	ROOT	SEED	
Capparaceae	*Maerua crassifolia*	Etil	x					Has almost disappeared from the study area due to severe drought. Nationally protection species.
Cynomoriaceae	*Cynemorium coccineum*					x		Has almost disappeared from the study area due to severe drought
Fabaceae	*Vachellia flava (Acacia ehrenbergiana)*	Salam		x				According to desktop study. Nationally protected species.
Fabaceae	*Cassia italica*						x	According to desktop study
Rhamnaceae	*Ziziphus lotus*		x					Has almost disappeared from the study area due to severe drought
Urticaceae	*Forsskaolea tenacissima*	Elleçaïg			x			According to desktop study
Zygophyllaceae	*Balanites aegyptiaca*		x					Has almost disappeared from the study area due to severe drought

Since wild food products are sparse in the Mine area, local communities rarely rely on these species for food and rather use them to supplement their diet when available. Species were recorded in most transects in the El Aouj area, so the Project is bound to have an impact on wild food products. However, transects outside the Project footprint may have shown similar distribution, meaning that there is potential for replaceability.

Table 10-28 below details the results of the ES prioritisation criteria assessment.

Table 10-28: Assessment of wild food products against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Low**: Wild food species being sparse in the Mine area, local communities rarely rely on them for food. These species are merely used to supplement local diet.
Interaction with drivers of change on ES or with project operations	**Medium**: Wild food species have been observed in more than half of the transects in El Aouj, meaning they are quite widespread in the area. Project anticipated impacts include loss tree and grass used as wild food products resulting from permanent land-take and temporary habitat disturbance (URS, 2015b).
Replaceability/Management potential	**Medium**: It is most likely that wild food species are available elsewhere in the Mine area where habitats are similar to those of El Aouj area.
Priority ecosystem services	Not a PES

10.6.3.1.5 Traditional medicine

According to the 2019-2021 Mauritania Survey on Demography and Health, the use of traditional medicine is marginal throughout Mauritania (ONS, MS, ICF, 2021). Indeed, 6.4 % of households consulted a traditional practitioner when children under 5 needed treatments for diarrhea, while the proportion falls to 3.7 % for acute respiratory infections and 2.6 % for fever (ONS, MS, ICF, 2021). These statistics are for Mauritania as a whole and it can be estimated that proportions will be slightly higher in the Mine areasince it is a remote area with reduced access to modern health services. However, no data exist on the use of traditional medicine in the Mine area.

Of the estimated 1,400 flora species in Mauritania, it is estimated that 80 have a widespread medicinal use (Hmeyada O. , 2009). According to the Global Biodiversity Information Facility (GBIF), there are recorded occurrences in Tiris Zemmour wilaya for 19 of these. According to the desk study completed by URS for the initial ESIA in 2015, some species of medicinal value were recorded in the Mine area.

Species listed in Table 5-9 are present or likely to be present in the Mine area. Some species were identified during stakeholder consultations in 2023, where traditional practitioners were met with in Zouerate, F'Derik and Touajil, and others were observed in the Mine area during flora inventories such as *Hyoscyamus muticus* (Figure 10-8). Aside from species growing in the Mine area, traditional medicinal practitioners also import some species from elsewhere in Mauritania, such as *Ziziphus mauritania* and *Ziziphus lotus*, and from Algeria, such as *Nigella sativa* and *Peganum harmala*, but these won't be impacted by the Project and are thus not considered.

Figure 10-8: *Hyoscyamus muticus*, medicinal plants observed on the field in 2023

Plants are collected in the Mine area habitats by practitioners themselves, most species being more broadly available after the rainy season. Herders sometimes help supplying species that are more available in remote areas. Guelb El Abd and Guelb Tintcrat have been mentioned by traditional practitioners in F'Derik as prime supplying areas (Figure 10-6).

Traditional medicine has been facing hardships, medicinal species having been widely affected by climate, especially irregular rains and more intense drought, and over exploitation. Some species being supplied outside the Mine area, it seems as though local populations are not highly reliant on medicinal plants gathered within the Mine area. However, the project could have an impact on the distribution of remaining species.

Table 10-29: List of plants used for traditional medicine within the Mine area

FAMILY	SCIENTIFIC NAME	LOCAL NAME	PROTECTION STATUS[1]	PART USED							EFFICACITY/ILLNESS	SOURCE
				Seed	Ash	Leave	Fruit	Branch	Sap	Root		
Amaranthaceae	*Cornulaca monacantha*										Skin diseases, emetic	URS 2015
Apiaceae	*Ammodaucus leucotricus*	El Kemmoun		x							Diarrhea, stomachache, dysentery, disinfectant	Field inventories 2023
Apocynaceae	*Calotropis procera*								x		Heals camel scabies and wounds	URS 2015
Boraginaceae	*Heliotropium ramosissimum*					x					Burn relief	URS 2015
Brassicaceae	*Anastatica hierochuntica*	El Kemche		x		x		x			Antioxidant, antimicrobial, induces labour, laxative, epilepsy, ophthalmic diseases, fertility	URS 2015, Field inventories 2023
Capparaceae	*Capparis decidua*	Sodada	LC Nationally protected		x			x			Hemostatic, astringent, disinfectant, laxative, asthma, rheumatism	URS 2015
	Cleome brachycarpa	Limpkaïnze				x					Abortion, menstrual cycle regulation	Field inventories 2023
	Maerua crassifolia	Etil	LC Nationally protected			x	x	x			Indigestion, wound	URS 2015, Field inventories 2023
Cucurbitaceae	*Citrullus colocynthis*										Purgative	URS 2015, Field inventories 2023
Cynomoriaceae	*Cynemorium coccineum*	Tterthouth								x	Indigestion	Stakeholder consultation 2023

FAMILY	SCIENTIFIC NAME	LOCAL NAME	PROTECTION STATUS[1]	PART USED							EFFICACITY/ILLNESS	SOURCE
				Seed	Ash	Leave	Fruit	Branch	Sap	Root		
Euphorbiaceae	*Euphorbia granulata*	Oummelbeïne							x		Warts	Field inventories 2023
Fabaceae	*Acacia raddiana*										Vermifuge, skin infections, oedema and allergic dermatoses	URS 2015
	Cullen plicatum	Tatrarit		x			x				Diarrhea, stomach ache, dysentery, ophthalmic diseases	Field inventories 2023
	Lotus roudarei	Kbeidit dhab				x					Stomach ache	Stakeholder consultation 2023
	Senna italica (Cassia italica)	Vellejit				x					Laxative, stomach ache	URS 2015; Field inventories 2023
	Vachellia flava (Acacia ehrenbergiana)	Ttemat	LC			x					Cough, fever, ophthalmologic diseases	URS 2015; Field inventories 2023
	Vachellia tortilis	Ttalh	LC			x	x				Stomach ache, ulcer	Field inventories 2023
Lamiaceae	*Salvia aegyptiaca*	Tezewkennit		x							Ophthalmologic diseases, anti inflammatory, diarrhea	Field inventories 2023
Menispermaceae	*Cocculus pendulus*	Leelende				x					Tension	Stakeholder consultation 2023
Solanaceae	*Hyoscyamus muticus*					x					Analgesic, hallucinogen, asthma	URS, 2015

FAMILY	SCIENTIFIC NAME	LOCAL NAME	PROTECTION STATUS[1]	PART USED							EFFICACITY/ILLNESS	SOURCE
				Seed	Ash	Leave	Fruit	Branch	Sap	Root		
Tiliaceae	*Corchorus depressus*	Taghyit trab				x					Diarrhea, indigestion	Field inventories, 2023
	Grewia tenax	Ligleye					x				Stomach ache	Stakeholder consultation, 2023
Urticaceae	*Forsskaolea tenacissima*										Haemostatic, plaster	URS, 2015
Zygophyllaceae	*Fagonia glutinosa (Zygophyllum glutinosum)*	Ddesme						x			Prostate diseases, syphilis	Field inventories, 2023

Notes:

[1]-Protection status includes international status according to the IUCN Red List and national status (LC: Least Concern), including species listed under Law no. 97-007 of January 20, 1997 amending Order no. 82-171 of December 15, 1982 establishing the Forestry Code and Law no. 2007-055 amending and replacing Law no. 97-007 of January 20, 1997 establishing the Forestry Code.

Table 10-30 below details the results of the ES prioritisation criteria assessment.

Table 10-30: Assessment of traditional medicine against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Medium**: Traditional medicine is widespread in the area, with traditional practitioners in each settlement. However, climate and over exploitation have led practitioners to supply outside the Mine area, which reduces the level of dependence to this ES within the area.
Interaction with drivers of change on ES or with project operations	**Medium**: Project anticipated impacts include loss of tree and grass species used in traditional medicine resulting from permanent land-take and temporary habitat disturbance (URS, 2015b).
Replaceability/Management potential	**Medium**: According to stakeholder consultations, the El Aouj area and water supply corridor would not be specifically rich in medicinal species, so it is likely that species could be found elsewhere in the Mine area, in similar habitats.
Priority ecosystem services	Not a PES

10.6.3.1.6 Building, carpentry and craft materials

There are many craft cooperatives in the study area, making different products such as tents, beads, jewellery, and pot making. According to the literature review conducted for the initial baseline (URS, 2015a), *Acacia raddiana*'s roots are used to create flutes and its charcoal is used as ink. *Cassia italica*'s leaves are used as hair conditioner while the seeds of *Citrullus colocynthis* are used to make soap.

As for building materials, only very few houses in Tiris Zemmour wilaya use wood (3.2 %) or branches and leaves (2.0 %) as a roof material. Walls are also rarely made from wood (3.8 %) or branches and leaves (2.0 %) in the wilaya (ONS, 2015). *Caloptropis procera*, often used as roofing, has been recorded in the area.

Stipagrostis pungens from the Mine area, specifically in Touajil and El Aouj area, was used for mats and sheds but has become rare according to youth groups consulted in 2023 in Touajil. It has become so rare that a crafts cooperative of women from F'Derik have stopped producing mats from local *Stipagrostis pungens*. Argile from the surroundings of Touajil is collected to make adobe bricks for building houses (see Figure 10-9). A gravel sale project was initiated by young people in Touajil, collecting gravel near the village and selling it in Nouadhibou, but it was unsuccessful.

Figure 10-9: Adobe bricks made with clay collected near Touajil, May 2023

The Redewane Cooperative, a cooperative of women set up about ten years ago in Zouerate, have been using several types of stones from all over the Mine area to make jewellery and keychains (see Figure 10-10). Stones used include liblah lehmar, green stones, striped-black stones, red stones and roubi. Supply areas for these

stones, identified during 2023 stakeholder consultation activities, are shown on Figure 10-11. However, according to consultations, the Redewane Cooperative struggles to find customers for their products as only a few wealthy tourists visit the mining area of Zouerate.

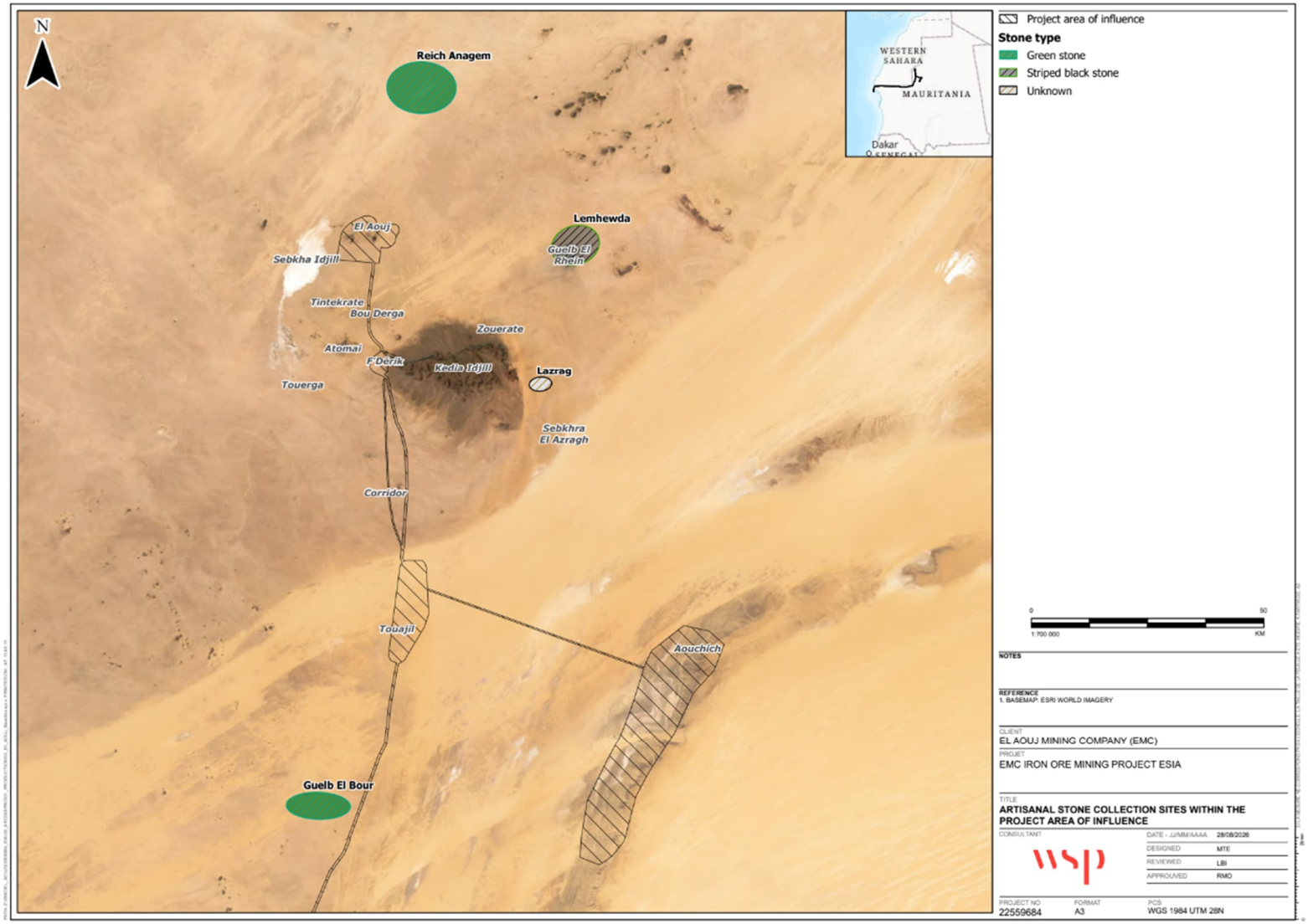
Figure 10-10: Jewellery made by the Redewane Cooperative in Zouerate, May 2023

Table 10-31 below details the results of the ES prioritisation criteria assessment.

Table 10-31: Assessment of building, carpentry and craft materials against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Low**: Local populations are not very dependent on natural resources for building and carpentry (less than 4 % of households use natural resources as building materials) nor crafts, with beads and jewellery making not representing a crucial economic activity.
Interaction with drivers of change on ES or with project operations	**Low**: Stone supply areas are located away from El Aouj and the water supply area. Materials used to build adobe bricks are also widespread in the Mine area. It is unlikely the project would affect the ability of local populations to use natural resources for buildings, carpentry and crafts.
Replaceability/Management potential	**High**: Most resources can be sourced elsewhere in the Mine area or can be imported.
Priority ecosystem services	Not a PES

Figure 10-11: Artisanal stone collection sites in the Mine area used by Redewane Cooperative in Zouerate



10.6.3.1.7 Biofuel

Only few households (4.1 %) in Tiris Zemmour wilaya use wood as cooking fuel, but is the main energy source for nomadic households. *Acacia ehrenbergiana*, *Acacia raddiana*, *Caloptropis procera* and *Maerua crassifolia*, for instance, are species used as firewood (URS, 2015). Of these, three (all except for *Caloptropis procera*) are nationally protected under the Forestry Code (URS, 2015). During stakeholder consultations in 2023, *Nucularia perrenii* has been identified as firewood used by local communities due to its high heat capacity. This species is particularly important to local communities, especially nomadic households, as stakeholders reported that other woody species previously found in the area had become much rarer. Nevertheless, these species are likely to occur in similar habitats outside the Project footprint.. *Nucularia perrenii* has been observed in three locations on the El Aouj Mining site during 2023 flora surveys. Hence, it does not seem widespread in the project footprint, but attention should still be paid to these resources as alternatives are limited.

Table 10-32 below details the results of the ES prioritisation criteria assessment.

Table 10-32: Assessment of biofuels against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Medium**: Although only a limited number of households are known to use wood as cooking fuel in the Mine area, nomadic groups rely on firewood as their main energy source.
Interaction with drivers of change on ES or with project operations	**Medium**: Project anticipated impacts include loss of tree and grass species used as biofuel resulting from permanent land-take and temporary habitat disturbance (URS, 2015b). However, few occurrences have been observed during flora inventories in transects done along the project footprint.
Replaceability/Management potential	**Medium**: Households relying solely on wood for biofuel might be affected by limited availability or limited access to their usual collection zones. However, species are likely to be present in similar habitats in the Mine area outside the project footprint.
Priority ecosystem services	Not a PES

10.6.3.1.8 Water resources

The hydrology of the Mine area is characterised by a wadi system of channels, typical of arid regions. The wadis are ephemeral surface water bodies which are usually dry. Hence, there are no permanent surface water in the vicinity of the project (URS, 2015). Rainfall varies spatially and temporally. 50 % of the annual rainfall can fall within a few hours, creating significant volumes of rainfall runoff which creates large channels in and around the project area. There are four main wadi catchments of relevance in the project footprint, excluding the Aouchich area: Oued Touerga at F'Derik, Oued Mirkili South of F'Derik, Oued Amechchikkel between F'Derik and Touajil, and an unnamed catchment to the north of Oued Touerga where the mine site is located (URS, 2015a).

According to the 2013 GCPH, the main source of drinking water for households in the F'Derik moughataa are taps in yard or on plot (39.1 %), tanker trucks (27.8 %), taps in dwelling (12.6 %) or neighbours' taps (12.4 %). In the Zouerate moughataa, households mainly source their drinking water from tanker trucks (62.9 %), public taps (14.6 %) or taps in dwelling (11.0 %). The water supply system in F'Derik and Zouerate is quite well developed due to the local mining context. To support its local mining operations, workers, and local communities, the SNIM owns and maintains significant physical infrastructure in the region, including water supply networks. Water tanks are also filled along the railway, which are used for personal consumption, small scale market gardening and livestock.

Agriculture activities and livestock rearing are however very affected by the lack of consistent water supply, quality of water, salinity of supply and poor sanitation services. The list of water points visited and analysed for the 2015 ESIA is presented in Table 10-33. Data shows that most wells and boreholes are not suitable for human consumption and are mostly used for cattle watering. Many of the features visited in 2007, 2012 and 2013 as part of the 2015 ESIA process did not show any sign of recent use.

Table 10-33: Overview of water points listed in the 2015 ESIA (URS, 2015a)

LOCATION	NUMBER OF WELLS/BOREHOLES	USE	STATE/LEVEL OF ACTIVITY
F'Derik-Touajil corridor	3	Used by nomads for livestock watering	2 out of 3 showed no sign of recent activity
El Aouj	2	Used by nomads coming from as far as 60 km for livestock watering and washing	Nomads were present on the day of visit in 2007, 2012 and 2013
Touajil	6	Mostly used for irrigation of Auberge gardens	Most were in use although pumps were out of order.
F'Derik	8	About half were used to water F'Derik gardens while the other half was used for livestock watering	Many were inaccessible in 2012 and 2013 due to flooding (wells located in the dam reservoir)
Zouerate	1	Livestock watering	No sign of recent activity in 2012
Aouchich	14	Most are used for livestock watering (10), some for human consumption (4).	While most showed signs of recent activity in 2007 and 2012, many were inaccessible due to flooding in 2013.
Choum	5	Used by nomads for livestock watering and washing as well as farming and human consumption.	About half were in use at the time of visits in 2007, 2012 and 2013.

According to the 2023 baseline, there are 82 boreholes and 11 wells in the Mine area, many not being functional. There would be 14 functional boreholes and 1 well in Touajil, 9 boreholes along the water supply corridor, 18 boreholes and 6 wells in Aouchich as well as 3 boreholes and 2 wells in El Aouj (see Figure 10-12). In the WSP ESIA update report – Volume II – Physical Baseline update – Section 2.2.2 presenting the methodology of the groundwater sampling, Figure 4 Groundwater sampling locations show their location.

During 2023 consultation activities, stakeholders mentioned that replacement water supply areas such as Oumoudhveiratt and Leecharyatt could be used after the El Aouj Mining Project begins as the El Aouj well might be inaccessible. Herders in the F'Derik area also suggested digging wells in Guelb Jrad and Guelb Azouazil (West of El Aouj).

During the Project, access to the El Aouj well will be maintained by EMC for herders and livestock. Where grazing areas are affected by the Project, additional wells/boreholes may be developed by EMC in alternative grazing areas, in consultation with affected herders. Formal stakeholder engagement will be undertaken to identify suitable locations and agree on appropriate mitigation measures.

In Aouchich and along the water supply corridor, water level measurements made between 2007 and 2023 do not show a specific trend with some boreholes showing an increase and other showing a decline. In Touajil, all

boreholes show a decline in groundwater levels and wells located in El Aouj seem to have a stable water level, although only few measurements were made. For a more thorough analysis of water levels and quality in the Mine area borefields, see WSP ESIA update report – Volume II – Physical Baseline update – Section 3.1.2.

As mining operations will also be dependent on water supply, management measures will be required to ensure steady water supply to El Aouj as well as to reduce impact on local populations. Nevertheless, project impacts on water resources will include reduced access to El Aouj wells for local communities and pastoralists, as well as long-term decrease of water availability in Touajil and Aouchich aquifers, which will be abstracted for the Project and will only replenish very slowly (URS, 2015b).

Figure 10-12: Boutaha Well trough used for camel watering (left) and nomad camp in the Aouchich area set up for its proximity to water sources (right), May 2023

Table 10-34 below details the results of the ES prioritisation criteria assessment.

Table 10-34: Assessment of water resources against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: Dependence of water is high, mostly for livestock and agriculture. The Project success is also highly dependent on the availability of water resources.
Interaction with drivers of change on ES or with project operations	**High**: The Project is expected to consume an average 5.08 ML/day for its operation which will be supplied from local borefields, which might enhance water scarcity for local populations. Groundwater levels in Touajil and Aouchich aquifers will replenish very slowly after its abstraction for Project operations (URS, 2015b).
Replaceability/Management potential	**Low**: Replaceability is deemed low given the Mine area is dry and has been experiencing frequent drought over the years.
Priority ecosystem services	PES of Type I and Type II

10.6.3.1.9 Salt extraction

The mineral extraction industry employs 45.5 % of the population in Zouerate moughaata and 12.4 % of the population in F'Derik moughaata (ONS, 2017). Mineral resources include salt at the Sebkha Idjil (west of El Aouj), iron and magnetite (ONS, 2017). Although mineral extraction is not considered an ES, salt extraction, which is made possible by specific ecosystem parameters such as water runoff and aquifer depth that could be impacted by the project, is subject to the ESA.

The salt flat of Sebkha Idjil, located about 25 km from F'Derik (10 km away from El Aouj Guelb), is a low-lying area of about 900 hectares where wadis converge and where groundwater has historically been close to the surface. According to the 2015 ESIA, it is an important form of natural capital for the region, especially for some households in F'Derik (URS, 2015).

Figure 10-13: Sebkha Idjill, May 2023

Consultations in 2023 have confirmed that activities at the Sebkha Idjill remain unchanged and constitute an important economic activity for the F'Derik community (see Figure 10-13). During the group discussion organized with the salt workers in June 2025 (see Figure 10-14), participants indicated that salt extraction in the Sebkha of Idjill is a seasonal activity, generally carried out during the dry season over a period of approximately three months. This activity represents a vital source of livelihood for many families in F'Derik and creates around 300 to 350 jobs per salt extraction campaign. According to the estimates provided during the discussions, between 150,000 and 200,000 tons of salt are extracted annually during a single campaign in the Sebkha of Idjill.

Figure 10-14: Salt extraction in the Sebkha Idjill, June 2025

Table 10-35 below details the results of the ES prioritisation criteria assessment.

Table 10-35: Assessment of salt extraction against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: Salt mining is a central economic activity in the Mine area with many households depending upon it for their livelihood.

PRIORITISATION CRITERIA	RESULTS
Interaction with drivers of change on ES or with project operations	**Medium**: As the edge of Sebkha Idjill is located 10 km away from the El Aouj Mine Site, access to the site is not expected to be affected by the Project. Also, it is not anticipated for Project construction and operation to alter salt extraction in terms of environmental pollution (URS, 2015b).
Replaceability/Management potential	**Low**: The Sebkha Idjill is unique in the Mine area.
Priority ecosystem services	PES of Type I

10.6.3.2 Regulation services

Regulation services were not systematically discussed with community representatives during focus groups and meetings. However, literature and other baseline surveys (air, water quality, etc.) were used to describe their importance within the Mine area.

10.6.3.2.1 Air quality control

Air pollution has negative consequences for human health and is associated with respiratory and cardiovascular diseases, as well as some forms of cancer. Mines, especially open-air pits, tend to reduce air quality. Air quality has also been mentioned by many stakeholders during 2023 consultation as a central issue in the Mine area. Most fear the development of a new mine will further degrade air quality in the region.

Vegetation cover plays an important role in air quality control by capturing airborne pollutants and removing them from the atmosphere through absorption and deposition of pollutants on external surfaces such as leaves and bark (Harris, Reis, Jones, Agarwala , & Nowak, 2019). However, as mentioned previously, the Mine area only has few trees, so air quality control by ecosystems is considered very limited.

The construction of a water pipeline to supply the mine site could increase the number of trees in the project area as it was the case along the Guelb El Rhein water supply pipeline near Zouerate (see Figure 10-5). A similar situation could arise around the pipelines supplying El Aouj, which would increase tree cover, enhancing the ecosystem's ability to control air quality. After 20 years, another pipeline will be developed between Aouchich and El Aouj, providing more opportunity for oases to be developed and vegetation cover to be improved in the Mine area.

However, as air quality is already degraded in the Mine area, it is unlikely that the potential for trees along the water supply pipeline would enhance air quality control to a point where communities would notice an overall improvement of air quality. Similarly, due to the very limited vegetation within the Mine area, it is unlikely that ecosystems currently participate in air quality control or that the project would affect the ecosystem's ability to do so by reducing vegetation cover. Air quality has also been mentioned by many stakeholders during 2023 consultation as a central issue in the Mine area. Most fear the development of a new mine will further degrade air quality in the region.

Table 10-36 below details the results of the ES prioritisation criteria assessment.

Table 10-36: Assessment of air quality control against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Low**: Although air quality is a central issue in the Mine area, the capacity of ecosystem to control air quality is considered limited as vegetation cover is minimal and air quality is already degraded.

PRIORITISATION CRITERIA	RESULTS
Interaction with drivers of change on ES or with project operations	**Low**: Limited negative impacts on air quality are expected during construction and operation. However, the Project will not significantly affect the ecosystem's already limited ability to control air quality.
Replaceability/Management potential	**Medium**: Vegetation can be restored or increased, albeit in a limited manner due to the aridity of the region.
Priority ecosystem services	Not a PES

10.6.3.2.2 Climate regulation

The consequences of increased carbon dioxide and other greenhouse gases in the atmosphere are felt by people around the world through the impacts of climate change on rainfall patterns, storm frequency and severity, temperature, and sea-level rise. By storing carbon in vegetation, ecosystems keep carbon dioxide out of the atmosphere, where it would otherwise contribute to climate change. Given the project area sparse vegetation, the impact on the climate regulation capacity of ecosystems is deemed limited.

As mentioned in the previous section on air quality, an increase in vegetation could be observed around pressure relief valves along the water supply pipelines between Touajil and Aouchich, and El Aouj. However, due to the limited number of trees, it is unlikely that this would enhance the ecosystem's ability to regulate climate. Similarly, it is unlikely that the Project would impact this ES.

Table 10-37 below details the results of the ES prioritisation criteria assessment.

Table 10-37: Assessment of climate regulation against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Low**: The contribution to global climate regulation is considered low due to sparse vegetation in the Mine area.
Interaction with drivers of change on ES or with project operations	**Low**: Interaction is low as the project will not lead to an important loss of vegetation cover and is unlikely to affect climate regulation.
Replaceability/Management potential	**Medium**: Vegetation can be restored or increased, albeit in a limited manner due to the aridity of the region.
Priority ecosystem services	Not a PES

10.6.3.2.3 Water regulation

Ecosystems play a key role in water regulation processes, notably by allowing evapotranspiration (involved in precipitation patterns) and water infiltration (water filtration and groundwater recharge) (MEA, 2005). According to (Xu & Yu, 2020), arid ecosystems represent a crucial, yet poorly understood component of global water cycle. Indeed, sap flow (movement of water in the roots, stems and branches of plants) of shrub species contribute to water regulation.

Of the plants recorded in the Mine area during 2023 flora inventories, many genera, including *Asphodelus, Gymnocarpos*, *Plantago*, and *Zygophyllum*, are known for their water storage capacity (Bidak, Kamal, Halmy,, & Heneidy, 2015). With local populations and project operations being dependent to water resources, water

regulation capacity of local ecosystems is key to ensure long-term availability and quality of water in the Mine area.

Table 10-38 below details the results of the ES prioritisation criteria assessment.

Table 10-38: Assessment of water regulation against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: Water is central to both local livelihoods (small-scale agriculture, herding, human consumption) and project operations. Its availability and quality are highly dependent on ecosystem's ability to regulate water.
Interaction with drivers of change on ES or with project operations	**Medium**: With the Project using water from the Touajil and Aouchich borefields, natural water regulation ability of ecosystems might be altered.
Replaceability/Management potential	**Low**: Replaceability is deemed low as is related to local natural processes that can difficultly be replicated.
Priority ecosystem services	PES of Type I and Type II

10.6.3.2.4 Erosion control

Erosion in arid regions such as Tiris Zemmour wilaya is often caused by wind, negatively affecting ecosystems and infrastructures (Lessani, Wang, & Nikmal, 2022). All vegetation in the Mine area help with erosion control, specifically in wadis, ravines and sandy regs where it prevents erosion due to wind.

Some species recorded in the Mine area during 2023 field inventories, such as *Euphorbia granulata*, *Kickxia aegyptiaca*, *Panicum turgidum*, *Paronychia arabica* and *Salvia aegyptiaca*, have been reported to have sand stabilization and natural windbreak capacities in a 2015 study on ecosytem services provided by plants in desert ecosystems (Bidak, Kamal, Halmy,, & Heneidy, 2015). Several genera recorded including *Atractylis, Gymnocarpos, Fagonia, Pancratium* and *Zygophyllum*, would also be known for their erosion control capacities.

Table 10-39 below details the results of the ES prioritisation criteria assessment.

Table 10-39: Assessment of erosion control against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**High**: Erosion is a central issue in desert ecosystem and vegetation is key to stabilizing soil and acting as natural windbreakers. Although limited, vegetation in the Mine area is necessary because of its erosion control capacity.
Interaction with drivers of change on ES or with project operations	**Low**: With vegetation already being limited in the Mine area, it is unlikely that project operations will impact plants in a way that will impact their capacity to act as sand stabilizer and windbreakers.
Replaceability/Management potential	**Medium**: Management measures such as artificial windbreakers and the preservation of sand stabilizing species can be implemented to limit impacts on erosion control capacity of ecosystems.
Priority ecosystem services	Not a PES

10.6.3.3 Cultural services

10.6.3.3.1 Sacred components

No specific natural features embodying cultural or sacred values were identified in the project area during the baseline (URS, 2015). However, given the arid landscape and the fact that running water, man-made wells and naturel springs are subject to Qur'anic law, all water sources are fundamentally and culturally important.

No specific trees were identified but given their scarcity and tree symbolism in Islamic religious cosmology, trees in the region may be invested with esoteric religious symbolism. Date palm (*Phoenix dactylifera*) groves are highly prized and invested with religious symbolism. Small groves are found near wells and wadis at F'Derik. According to 2023 stakeholder consultation activities, no natural sacred site is recorded in the Mine area, which could be explained by the fact that most inhabitants are not from the region.

Table 10-40 below details the results of the ES prioritisation criteria assessment.

Table 10-40: Assessment of sacred components against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Low**: Although all vegetation is considered sacred by nature, the Mine area does not have any natural sacred sites.
Interaction with drivers of change on ES or with project operations	**Medium**: Expected impacts on sacred and archaeological sites include damage or removal during Project construction and operations as well as reduced access (URS, 2015b). As there were no sacred natural features recorded in the Mine area, it is unlikely that this Project will involve such impacts.
Replaceability/Management potential	**Medium**: Management measures can be put into place if sacred natural features were to be encountered.
Priority ecosystem services	Not a PES

10.6.3.3.2 Tourism and recreation

A dam was constructed in 2010 to safeguard F'Derik and regulate water flows (see Figure 10-15). The water collected behind the dam recharges a well in the local area and is used by local population for leisure activities, particularly in the early evening and over weekends (URS, 2015a). Hence, the area north of F'Derik dam is considered an area of socio-cultural importance for local communities of F'Derik and Zouerate.

Herders and artisanal gold miners use dam water to fill tanks, which caused the water levels to lower. The Hakim has forbidden water collection in order to safeguard the F'Derik dam for local communities' enjoyment.

Figure 10-15: Surface water collected north of the F'Derik dam, March 2023

Table 10-41 below details the results of the ES prioritisation criteria assessment.

Table 10-41: Assessment of tourism and recreation against ES prioritisation criteria

PRIORITISATION CRITERIA	RESULTS
Level of dependence on the ES	**Medium**: The dam is seen by many stakeholders as a central component of local ecosystems. It is a source of water and refreshment for local populations.
Interaction with drivers of change on ES or with project operations	**Low**: Project potential impacts include changes to wadi flow paths and flood risks (URS, 2015b). However, the El Aouj Mine Project is located more than 20 km away from the dam and water will not be directly supplied from F'Derik. It is thus unlikely that Project construction and operations would impact the F'Derik dam.
Replaceability/Management potential	**Medium**: The dam being a unique feature in the Mine area, there are limited replacement options. Management measures can however be implemented to limit project operations impacts.
Priority ecosystem services	Not a PES

10.6.4 Selection of Priority Ecosystem Services

Based on the ES analysis in the whole Project AoI, no PES has been identified in the Port area and in the Rail area, 4 PES have been identified in the Mine area.

The identified PES in the Project AoI are as follows:

- Mine area:
  - Livestock and forage resources (Type I);
  - Water resources (Type I and II);
  - Salt extraction (Type I);
  - Water regulation (Type I and II).

PES identified in the Project AoI are mostly of Type I, with water-related services being associated with Type II PES identified in the Mine area. Type I PES include livestock and forage resources, water resources and salt extraction on which local populations are highly dependent for livelihood. Type II PES are related to the Project being dependent on the water resources.

Following stakeholder consultation, forage resources, water resources and salt extraction were underlined as priority ecosystem services for local communities. These were identified as PES as part of the ES assessment.

11.0 STAKEHOLDER CONSULTATIONS

11.1 Legal framework and international standards

Stakeholder consultation and participation are core elements of the Environmental and Social Impact Assessment (ESIA) process and are required under the regulatory framework in Mauritania, as well as under relevant international good practice applicable to projects aligned with International Finance Corporation (IFC) African Development Bank (AfDB) standards.

The requirements for public consultation in Mauritania are governed by the framework law on the environment (Law No. 2000-045 of July 26, 2000) and its implementing decrees governing environmental impact assessments, in particular Decree No. 2007-105 of April 24, amending and supplementing Decree No. 2004-094. The country recently published Law No. 2025-019 on environmental and social assessment, which was adopted by the National Assembly on May 9, 2025, and published in the Official Journal on July 15, 2025. The purpose of this new law is to define the legal framework applicable to environmental and social assessment.

At the international level, the ESIA is developed in consideration of Equator Principles IV and other international standards and good practices including IFC Performance Standard 1 (PS1) and AfDB Operational Safeguards (OS 10). Equator Principles 5, dedicated to stakeholder engagement, provides specific guidance and requirements for stakeholder engagement and public consultation. IFC's PS1 is dedicated to the assessment and management of environmental and social risks and impacts. It provides specific guidance on stakeholder engagement and public consultation. AfDB's OS10 recognizes the importance of open and transparent collaboration between the client and project stakeholders as an essential element of international best practice. Effective stakeholder participation can improve the environmental and social sustainability of projects, strengthen project acceptance, and contribute significantly to the success of project design and implementation.

A detailed description of the stakeholder consultation and participation process implemented for the El Aouj Project is provided in the following sections.

11.2 Past consultation

Since the initial design phase of the El Aouj Project, a process of stakeholder consultation and engagement has been implemented with the objective of establishing an inclusive and ongoing dialogue between the Project Proponent and stakeholders potentially affected by, or interested in, the Project at the national, regional, and local levels.

Successive consultation activities conducted between 2015 and 2024 have enabled stakeholders to receive information on the Project and its evolution, and to express their concerns, expectations, and recommendations regarding environmental, social, and economic issues associated with mining activities in the area. These consultations have contributed to improving the understanding of the local context and have informed subsequent project studies and assessments.

Three key consultation phases have occurred to date within the El Aouj Project area:

- consultation activities conducted between 2013 and 2016 as part of the preparation, validation, and regulatory approval of the initial Environmental and Social Impact Assessment (ESIA), led by URS;
- consultation activities conducted in May 2023 as part of the ESIA process, including social baseline data collection and stakeholder consultations, led by WSP;
- a project introduction and information meeting conducted in October 2024, organised by El Aouj Mining Company (EMC), bringing together national, regional, and local authorities.

11.2.1 Consultation activities conducted between 2013 and 2016 as part of the 2013 ESIA process by URS

Stakeholder consultation activities were conducted between 2013 and 2016 as part of the preparation, validation, and regulatory approval of the initial Environmental and Social Impact Assessment (ESIA) for the El Aouj Project. These consultations were undertaken during the early design and feasibility phases of the Project and were implemented in accordance with the national regulatory requirements applicable at the time.

The consultation process accompanied the key stages of the ESIA and included project presentation meetings, thematic consultations conducted as part of baseline studies, public meetings, open-house exhibitions, and formal ESIA disclosure and validation procedures led by the competent authorities.

A key public consultation event was held in January 2015 in the city of Zouerate, organized by URS and IBC, with the objective of informing stakeholders about the El Aouj Project and gathering their views and concerns. This consultation was followed by an open-door exhibition day in F'Derik, targeting stakeholders from F'Derik, Zouerate, and Touajil, and complemented by focus group discussions with vulnerable groups.

Stakeholder comments and feedback collected during these consultations were considered in the finalization of the ESIA.

1) URS - consultation meeting in Zouerate

2) URS – consultation meeting in F'Derik

Figure 11-1: Public consultation meeting in Zouerate and F'Derik – January 2015 (URS, 2015)

The ESIA consultation process also included:

- validation of the ESIA Terms of Reference by the competent Ministries;
- a 30-day public inquiry organized by the Ministry of Environment and announced by the Hakem of F'Derik; and
- the issuance of the environmental permit following completion of the regulatory review process.

According to the 2015 ESIA, the principal questions and concerns expressed by communities and stakeholders during the consultations included the following:

- employment opportunities, including access to jobs generated by the Project, priority for local and national labour, and training opportunities, particularly for young people;
- community development and social impacts, notably expectations regarding improvements to health, education, and other basic social services, as well as support to local economic activities;

- health issues, including requests for improved health infrastructure and concerns related to dust emissions, potential impacts associated with workforce in-migration, and the spread of communicable diseases;
- water resources, particularly access to water for domestic use and livestock, potential impacts on existing wells, and the protection of sensitive water bodies;
- environmental protection, including concerns related to dust generation, impacts on vegetation and grazing areas, and the protection of environmentally sensitive zones;
- land use and livelihoods, notably potential impacts on pastoral activities, access to grazing land, and land occupation by Project infrastructure;
- traffic and safety, including road safety concerns and the potential increase in traffic associated with Project activities.

11.2.2 Consultation activities conducted in May 2023 as part of the ESIA process by WSP

Stakeholder consultation activities were conducted in May 2023 as part of the Environmental and Social Impact Assessment (ESIA) process for the El Aouj Project. These activities were led by WSP and formed an integral component of the update of the social baseline and the preparation of stakeholder engagement documentation for ESIA.

The consultations were undertaken in the localities of Zouerate, F'Derik and Touajil, as well as at selected locations along the El Aouj infrastructure corridor, within the Project Area of Influence. The objective was to collect updated socio-economic baseline information and to document stakeholders' knowledge of the Project, perceptions, concerns and expectations related to the proposed mining development.

The consultation program applied a semi-directive participatory approach and included a combination of:

- focus group discussions with homogeneous stakeholder groups, including women, youth and pastoralists;
- key informant interviews with local and regional authorities, heads of administrative services, elected officials and representatives of non-governmental organizations; and
- in situ interviews with community members encountered at key locations within the Project Area of Influence.

In total, eight focus group discussions were organized with women, youth and pastoralists. Individual interviews were also conducted with a range of institutional and community stakeholders; these interviews were qualitative in nature, and the number of participants was not aggregated. A total of approximately 146 individuals from the mining region participated in focus group discussions and individual interviews during the consultation process.

The focus group discussions generally involved 7 to 25 participants per group and followed a semi-directive discussion framework covering socio-economic conditions, livelihoods, access to services, natural resource use and community dynamics, as well as stakeholders' knowledge of and expectations regarding the El Aouj Project.

Key informant interviews focused on institutional mandates and activities, perceptions of the Project, recent socio-economic and environmental changes in the area, and the main challenges faced by institutions in fulfilling their responsibilities. The following figures present the focus group activities and individual interviews conducted with young people, women and pastoralists during the mission carried out in May 2023.

1) Meeting with pastoralist in F'Derik

2) Meeting with pastoralist in Touajil

Figure 11-2: Focus group discussion with pastoralists in F'Derik and Touajil – May 2023 (WSP, 2023)

1) Meeting with youth in F'Derik

2) Meeting with youth in F'Derik pound

Figure 11-3: Focus group discussion with youth in F'Derik – May 2023 (WSP, 2023)

Meeting with women in F'Derik

Meeting with women in Touajil

Figure 11-4: Focus group discussion with women in F'Derik and Touajil – May 2023 (WSP, 2023)

Figure 11-5: Focus group discussion with pastoraslist in Zouerate – May 2023 (WSP, 2023)

Figure 11-6: [Meeting with pastoralist at El Aouj borehole – May 2023 (WSP, 2023)

According to the information collected during the May 2023 consultations, stakeholders raised a range of questions and concerns, notably in relation to:

- employment and livelihoods, including access to job opportunities generated by mining activities, expectations regarding priority for local labour, and limited income-generating opportunities for youth and women;
- pastoralism and natural resources, particularly access to grazing areas and water points, potential disruption of livestock movements, and pressure on vegetation and pastoral resources;
- water resources, including availability and quality of water for domestic use, livestock and market gardening, and reliance on wells and boreholes;
- environmental impacts, especially dust emissions associated with mining and transport activities, land disturbance and effects on vegetation;
- health and safety, including respiratory health concerns linked to dust, road and rail safety, and access to healthcare services;
- community development and infrastructure, with expectations regarding improvements to basic services, local infrastructure and socio-economic development initiatives; and

- vulnerable groups, including constraints faced by women in accessing land, financing and markets, and high unemployment and limited training opportunities for youth.

These issues informed the social baseline analysis and contributed to the identification and assessment of potential environmental and social impacts within the ESIA.

Detailed records of the consultation activities conducted in May 2023, including minutes of meetings, attendance lists and photographic documentation, are provided in APPENDIX U.

11.2.3 Project introduction and information meeting conducted in October 2024 by EMC

A project introduction meeting was held in October 2024, organized by the El Aouj Mining Company (EMC). The purpose of the meeting was to present the key features of the El Aouj Project and to discuss the methodological approach of the ESIA.

The meeting brought together national authorities in Nouakchott, as well as regional and local administrative authorities from Zouerate and F'Derik, including the Hakem and the Mayor.

11.3 Stakeholder consultation activities conducted in June 2025

11.3.1 Methodology for stakeholder consultation

Stakeholder consultations were conducted in June 2025 as part of the Environmental and Social Impact Assessment (ESIA) process for the El Aouj Project. These consultations were implemented with project stakeholders within the Project Area of Influence. The consultation program combined a public plenary consultation meeting with targeted focus group discussions and key informant interviews, in order to ensure inclusive participation and to enable both collective dialogue and group-specific exchanges.

The public consultation meeting was held on 17 June 2025 at the Maison des Jeunes in F'Derik and organized as a plenary session. The meeting was facilitated by EMC, GSE, and WSP. Hassaniya was the main language used throughout the meeting. WSP delivered its presentation in French, with sequential interpretation into Hassaniya. During the discussion, consultation exchanges, and Q&A session, sequential interpretation was provided in both languages, allowing French-speaking participants to follow the meeting and intervene in French when needed. It aimed to achieve the following objectives:

- Present the El Aouj Project, the ongoing ESIA and its scope and perimeter;
- Provide an overview of stakeholder consultations previously conducted in 2015 and 2023;
- Present the environmental and social effects identified as part of the 2023–2024 ESIA studies, together with examples of mitigation measures considered;
- Engage with participants on issues considered important for their communities;
- Provide an opportunity for participants to express their views; to respond to questions raised by stakeholders; and to collect stakeholder feedback.

The following means of communication were used to inform communities and stakeholders of the public consultation meeting:

- initial contact with local administrative and traditional leaders
- dispatch of official invitations to administrative, regional and local authorities
- invitations conveyed through community representatives and recognised local leaders; and
- open participation for all interested persons

To support this communication effort and ensure transparency, the materials used for the meeting were also made available to stakeholders.

The invitation letter, public posters, agenda as well as the PowerPoint presentation in French used during the plenary session are provided in APPENDIX V. The materials used were translated into Arabic and explained in Hassaniya to stakeholders.

In addition to the plenary session, focus group discussions, key informant interviews and targeted site visits were conducted on 18 and 19 June 2025 with specific stakeholder groups, including salt producers, pastoralists, women in vulnerable situations, and youth and small local economic actors. These activities supported the update of the social and land-use baseline and informed the ESIA analysis.

The focus group discussions and key informant interviews enabled in-depth and participatory exchanges on livelihood activities, vulnerabilities and socio-economic conditions, and supported a better understanding of issues considered important by local communities. They aimed to document stakeholders' perceptions of the Project, to collect questions, comments and concerns, and to gather complementary social baseline information, including socio-economic profiles, labour dynamics and seasonal aspects relevant to the ESIA.

Discussions with pastoralists focused on local and regional pastoral practices, including activity calendars, transhumance routes and access to grazing and water resources. Further information on livestock herding and grazing in the El Aouj area, including the location of grazing areas in relation to the Project footprint, is provided in Section 10.6.3.1 and Figure 10-6. Engagements with women in vulnerable situations and with youth and small local economic actors documented specific constraints, vulnerabilities and expectations related to livelihoods, access to resources, employment and local economic activities.

Key informant interviews with administrative and municipal authorities and other institutional stakeholders collected institutional perspectives on local socio-economic dynamics, land-use context and development priorities, supporting the understanding of territorial and organizational aspects relevant to the ESIA. Targeted site visits, including the Idjill Sebkha salt exploitation area, the proposed worker accommodation site and selected economic assets, supported direct observation of land use, activities, infrastructure and access conditions, and informed the social and land analysis.

The results of these stakeholder consultations are presented in Section 11.3.2.

11.3.2 Results of the 2025 ESIA Consultation

11.3.2.1 Participants in the Public Consultation Meeting

More than 139 people attended the public consultation meeting. Table 11-1 provides details on the number of participants at the meeting. Out of the total participants, more than 20% were women.

Table 11-1: Public Consultation Participants

Date	Location	Type of Meeting	Male	Female	Total
17/06/2025	F'Derik	Public consultation	112	27	139

The attendees included a wide variety of stakeholders. Participants notably comprised administrative and regional authorities, including the Wali (Governor) of the Tiris Zemmour Wilaya, the Commander of the Military Region, the Director of Cabinet of the Wali, and the Vice-President of the Tiris Zemmour Region. The meeting was also attended by local authorities, including the Hakem and the Mayor of F'Derik, as well as representatives of the security forces, including the armed forces, gendarmerie, national guard and police.

In addition, political representatives, including Members of Parliament representing F'Derik, participated in the consultation, alongside representatives of civil society organizations, women, youth, pastoralists, salt producers, small local economic actors, and other community members from F'Derik, Touajil and Zouerate, as well as surrounding localities within the Project Area of Influence.

Participants were invited to express their views on the Project and the ongoing ESIA, including the potential environmental and social effects identified through the ESIA studies, as well as their questions, concerns and expectations.

The identification and discussion of potential impacts were further supported through six (6) focus group discussions conducted in F'Derik in June 2025, involving a total of 82 participants, including 43 men and 39 women. These focus group discussions complemented the plenary consultation meeting by enabling more detailed and structured exchanges with specific stakeholder groups.

Table 11-2: Focus Group Discussions Conducted in June 2025

Focus group	Date	Male	Female	Total
Salt producers (Sebkha Idjill)	18 June 2025	15	0	15
Pastoralists and farmers	18 June 2025	8	0	8
Institutional actors and pastoral associations	18 June 2025	6	0	6
Women in vulnerable situations	19 June 2025	0	31	31
Small local economic actors and vulnerable youth	19 June 2025	14	8	22
Total (6 focus groups)		43	39	82

The consultation activities were documented in a detailed report, including the "procès-verbal" and attendance list of the plenary public consultation meeting, as well as attendance lists and summaries of discussions for all focus group discussions. These documents are provided in APPENDIX W and APPENDIX XThe following figures present the public consultation, focus group activities and individual interviews conducted during the mission carried out June 2025.

Figure 11-7: Public consultation meeting in F'Derik on 17 June 2025

1) Meeting with salt producer in F'Derik

2) Meeting with pastoralist in F'Derik

Figure 11-8: Focus group with salt producers and pastoralist, F'Derik – June 2025

1) Meeting with women in vulnerable situations in F'Derik

2) Meeting with youth and small economic actors in F'Derik

Figure 11-9: Focus group with women in vulnerable situations and youth and small economic actors, F'Derik – June 2025

11.3.2.2 Project Potential Impacts Identified by Participants

While the summary tables presented below highlight the main issues raised during the consultations, the detailed consultation report provided in APPENDIX W and APPENDIX X contains the full records of discussions, including participants' statements and supporting documentation.

During the public consultation meeting and the focus group discussions held in June 2025, participants highlighted various potential environmental and social impacts they are concerned about in their daily lives, the environment, and their economic activities. These potential impacts are presented in Table 11-3, without order of priority. The sections of the ESIA report where those potential impacts are addressed, and mitigation measures are proposed are indicated in Table 11-3.

Table 11-3: Potential Environmental and Social Impacts Expressed During Consultations

N°	Potential Impacts	Section of the ESIA Report where the Issues are Addressed
1	Air quality degradation due to dust emissions from mining activities	Chapter 12.0 Impact Assessment: 12.2.1.3 Air quality (Mine Area)
2	Public health risks, including respiratory diseases linked to dust exposure	Chapter 12.0 Impact Assessment: 12.2.1.3 Air quality (Mine Area)
3	Noise and vibration impacts related to blasting and rail transport	Chapter 12.0 Impact Assessment: 12.2.1.5 Noise and vibration (Mine Area) 12.2.4.2 Noise and vibration (Rail Area)
4	Cumulative environmental impacts in an area already affected by mining activities	13.0 Cumulative Impact Assessment
5	Pressure on water resources and long-term water availability	Chapter 12.0 Impact Assessment: 12.2.1.1 Groundwater (Mine Area)
6	Reduced access to water for livestock and pastoral uses	Chapter 12.0 Impact Assessment: 12.2.1.14 Ecosystem services (Mine Area)
7	Restriction of access to grazing areas and transhumance routes	Chapter 12.0 Impact Assessment: 12.2.1.14 Ecosystem services (Mine Area

N°	Potential Impacts	Section of the ESIA Report where the Issues are Addressed
8	Disturbance to pastoral activities and livestock movements	Chapter 12.0 Impact Assessment: 12.2.1.14 Ecosystem services (Mine Area
9	Risks to the traditional salt exploitation at the Idjill Sebkha	Chapter 12.0 Impact Assessment: 12.2.1.9.5 Natural Resource-based Livelihood Impacts 12.2.1.14.4 Degradation of salt extraction activities at Sebkha Idjill
10	Potential contamination of salt produced at the Sebkha	Chapter 12.0 Impact Assessment: 12.2.1.2.3 Pollution of Sebkha Idjill and the Salt Works
11	Environmental degradation affecting local ecosystems	Chapter 12.0 Impact Assessment: 12.2.1.8.1 Natural habitat loss, degradation and
12	Increased pressure on local infrastructure and services	Chapter 12.0 Impact Assessment: 12.2.1.11.2 Increased pressure on communal facilities and services
13	Socio-economic inequalities between local communities and project workers	Chapter 12.0 Impact Assessment: 12.2.1.11.4. Women and Vulnerable groups
14	Limited local access to employment opportunities	Chapter 12.0 Impact Assessment: 12.2.1.9.4 Employment and Training
15	Impacts related to population influx	Chapter 12.0 Impact Assessment: 12.2.1.10.1 Unplanned Project-induced In-Migration Impacts
16	Impacts on living conditions in F'Derik	Chapter 12.0 Impact Assessment: 12.2.1.9.5 Natural Resource-based Livelihood Impacts 12.2.1.10.1 Unplanned Project-induced In-Migration Impacts 12.2.1.11.2 Increased pressure on communal facilities and services 12.2.1.12.1 Community health, safety and security
17	Risks related to worker accommodation near residential areas	Chapter 12.0 Impact Assessment: 12.2.1.10.1 Unplanned Project-induced In-Migration Impacts
18	Insufficient transparency and communication with communities	Stakeholder Management Plan
19	Limited participation of civil society in environmental monitoring	Chapter 14.0 - ESMP and Stakeholder Management Plan
20	Long-term impacts on local livelihoods	Chapter 12.0 Impact Assessment: 12.2.1.9.5 Natural Resource-based Livelihood Impacts

N°	Potential Impacts	Section of the ESIA Report where the Issues are Addressed
		12.2.1.14.1 Degradation of livestock and forage resources 12.2.1.14.4 Degradation of salt extraction activities at Sebkha Idjill
21	Territorial imbalance between F'Derik, Touajil and surrounding localities	Chapter 12.0 Impact Assessment: 12.2.1.10.1 Unplanned Project-induced In-Migration 12.2.1.9.5 Natural Resource-based Livelihood Impacts 12.2.1.11.2 Increased pressure on communal facilities and services

11.3.2.3 Concerns Regarding the Project

During the consultation activities, participants expressed several concerns regarding the El Aouj Project. These concerns are presented in Table 11-4, not in order of priority, and largely reflect those already identified in relation to the Project's potential impacts (Chapter12.0). The ESIA sections where these concerns are addressed, along with the corresponding mitigation measures, are indicated in Table 11-4.

Table 11-4: Concerns Expressed During Consultations

N°	Concerns	Section of the ESIA Report where the Issues are Addressed
1	Health risks associated with prolonged exposure to dust	Chapter 12.0 Impact Assessment: 12.2.1.3 Air quality (Mine Area) 12.2.1.12.2 Workers health, safety and security
2	Insufficient capacity of local health facilities	Chapter 12.0 Impact Assessment: 12.2.1.11.2 Increased pressure on communal facilities and services
3	Availability and sustainable management of water resources	Chapter 12.0 Impact Assessment: 12.2.1.1.3 Impact of Declining Groundwater Level in the P2 and P4 Aquifers on Groundwater Users 12.2.1.14.3 Increased access to water resources through pressure relief valves along the water pipelines 12.2.1.14.5 Degradation of ecosystems' water regulation capacity
4	Access to water for livestock watering	Chapter 12.0 Impact Assessment: 12.2.1.14.2 Alteration of water resources for groundwater users in water abstraction areas
5	Preservation of grazing areas	Chapter 12.0 Impact Assessment: 12.2.1.14.1 Degradation of livestock and forage resources
6	Impacts on pastoral mobility and transhumance	Chapter 12.0 Impact Assessment: 12.2.1.9.5 Natural Resource-based Livelihood Impacts
7	Protection of the Idjill Sebkha salt exploitation site	Chapter 12.0 Impact Assessment:

N°	Concerns	Section of the ESIA Report where the Issues are Addressed
		12.2.1.2.3 Pollution of Sebkha Idjill and the Salt Works 12.2.1.9.5 Natural Resource-based Livelihood Impacts 12.2.1.14.4 Degradation of salt extraction activities at Sebkha Idjill
8	Risks of environmental pollution	Chapter 12.0 Impact Assessment: 12.2.1.1.2 Declining Groundwater Quality in the P2 and P4 Aquifers through Long Term Pumping 12.2.1.2.2 Changes of Surface Water Quality and Pollution of Wadis 12.2.1.2.3 Pollution of Sebkha Idjill and the Salt Works 12.2.1.3.1 Emissions on Receptors at F'Derik, Zouerate, El Aouj Wells, Sebkha Idjill Salt Works 12.2.1.3.2 Operational emissions on the Mine Accommodation 12.2.1.4.2 Emissions from Use of Vehicles, Mobile Plant and Transport of Goods 12.2.1.6.1 Impacts on Land Quality
9	Noise and vibrations affecting daily life	Chapter 12.0 Impact Assessment: Noise and vibration
10	Lack of local employment opportunities	Chapter 12.0 Impact Assessment: 12.2.1.9.4 Employment and Training
11	Use of external labour and subcontractors	Chapter 12.0 Impact Assessment: 12.2.1.9.4 Employment and Training
12	Social impacts linked to worker accommodation	Chapter 12.0 Impact Assessment: 12.2.1.10.1 Unplanned Project-induced In-Migration Impacts
13	Lack of feedback following previous consultations	Stakeholder Management Plan
14	Limited transparency on project evolution	Stakeholder Management Plan
15	Weak involvement of local civil society	Stakeholder Management Plan
16	Living conditions and lack of basic infrastructure	Chapter 12.0 Impact Assessment: 12.2.1.11.2 Increased pressure on communal facilities and services
17	Territorial isolation of Touajil	Chapter 12.0 Impact Assessment: 12.2.1.10.1 Unplanned Project-induced In-Migration 12.2.1.9.5 Natural Resource-based Livelihood Impacts 12.2.1.11.2 Increased pressure on communal facilities and services
18	Cumulative impacts of mining activities	13.0 Cumulative Impact Assessment

11.3.2.4 Requests expressed at consultation meetings

During the consultation activities, participants made a number of requests and suggestions. These are listed in Table 11-5, not in order of priority. Many of the requests reflect points already raised regarding the Project's potential impacts and stakeholder concerns Table 11-4.

The ESIA sections where these requests are addressed, when applicable, are indicated in Table 11-5.

One general trend observed during the public consultation meetings was the request for support to local communities by the Project proponent. These requests were noted; however, broad community support initiatives fall outside the scope of the ESIA.

Table 11-5: Requests Expressed During Consultations

N°	Requests	Section of the ESIA Report where the Issues are Addressed
1	Strengthen measures to control dust emissions	Chapter 12.0 Impact Assessment: 12.2.1.3 Air quality (Mine Area) Chapter 14 ESMP
2	Improve local health infrastructure and equipment	Chapter 12.0 Impact Assessment: 12.2.1.11.3 Community development potential Chapter 14 ESMP
3	Ensure priority access to employment for local residents	Chapter 12.0 Impact Assessment: 12.2.1.9.4 Employment and Training Chapter 14 ESMP
4	Strengthen training opportunities for youth	Chapter 12.0 Impact Assessment: 12.2.1.9.4 Employment and Training Chapter 14 ESMP
5	Support income-generating activities for women	Chapter 12.0 Impact Assessment: 12.2.1.11.4 Women and Vulnerable groups Chapter 14 ESMP
6	Preserve access to grazing areas	Chapter 12.0 Impact Assessment: 12.2.1.14.1 Impact ES01 & mitigation: Degradation of livestock and forage resources Chapter 14 ESMP
7	Develop water points for livestock	Chapter 12.0 Impact Assessment: 12.2.1.14.3 Increased access to water resources through pressure relief valves along the water pipelines Chapter 14 ESMP
8	Protect the Idjill Sebkha salt exploitation	Chapter 12.0 Impact Assessment: 12.2.1.9.5 Natural Resource-based Livelihood Impacts 12.2.1.2.3 Pollution of Sebkha Idjill and the Salt Works Chapter 14 ESMP 12.2.1.14.4 Degradation of salt extraction activities at Sebkha Idjill
9	Ensure transparent and regular communication	Stakeholder Management Plan
10	Organise feedback sessions on ESIA findings	Stakeholder Management Plan

N°	Requests	Section of the ESIA Report where the Issues are Addressed
11	Improve public lighting	Stakeholder Management Plan
12	Improve local infrastructure and services	Chapter 12.0 Impact Assessment: 12.2.1.11.3 Community development potential Chapter 14 ESMP
13	Support local economic initiatives	Chapter 12.0 Impact Assessment: 12.2.1.11.3 Community development potential Chapter 14 ESMP
14	Involve civil society in monitoring activities	Stakeholder Management Plan
15	Promote equitable territorial development	xx Chapter 12.0 Impact Assessment: 12.2.1.10.1 Unplanned Project-induced In-Migration 12.2.1.9.5 Natural Resource-based Livelihood Impacts 12.2.1.11.2 Increased pressure on communal facilities and services

11.3.2.5 Thematic summary of concerns and requests

The potential impacts identified by the communities concern economic, social and environmental impacts. They are summarized below by subject matter.

Health and quality of life

Participants raised concerns about potential health effects associated with mining activities, particularly dust exposure and, in some cases, vibrations linked to blasting. Several stakeholders noted the limited capacity of existing health services in F'Derik and stressed the need for strengthened local health infrastructure and equipment to respond to potential health needs. Safety issues were also raised, including risks linked to transport movements (road and rail) and the broader context of an area already hosting industrial and security-related activities.

Environmental issues

Concerns were expressed regarding potential environmental impacts, in particular air quality (dust) and risks of pollution. Noise and vibration were also mentioned, including the existing effects of rail operations on daily life. Participants emphasised the importance of implementing appropriate environmental management measures to identify, control and reduce potential impacts, and referred to the need to consider cumulative effects in a mining-affected area.

Water resources and pastoral issues

Access to water was identified as a key concern, notably in relation to the sustainability of water resources and their availability for communities and livestock. Pastoral stakeholders raised concerns about potential constraints on access to watering points and increased pressure on water resources. Participants also highlighted the importance of preserving grazing areas and maintaining transhumance routes, given the dependence of local livelihoods on pastoral activities.

Livelihoods and economic activities

Stakeholders emphasised the need to protect existing livelihood activities. Particular attention was drawn to the Idjill Sebkha salt exploitation area, described as a long-standing activity supporting many households and forming part of local heritage. Concerns were expressed regarding potential disturbance to salt production

conditions (including dust deposition and potential contamination risks). Other livelihood activities and small-scale economic practices were also referred to, including small trade, agriculture and informal income-generating activities.

Employment and local economic inclusion

Employment expectations were frequently raised. Participants expressed the wish that job opportunities generated by the Project be accessible to local residents, with priority given to communities within the Project Area of Influence. Concerns were raised about reliance on subcontractors and external labour, and about selection criteria that could limit access for local youth. Requests also referred to skills development and training opportunities, particularly for youth and women.

Community development and basic infrastructure

Participants referred to the lack of basic infrastructure and services in the area and expressed expectations for improvements linked to project development. Issues raised included access to healthcare, potable water, roads, public lighting and public spaces. Stakeholders also mentioned the need for broader local development benefits in order to address persistent poverty and limited economic activity.

Stakeholder engagement and governance

Participants raised concerns about transparency and the need for sustained dialogue with communities. Some noted limited feedback from previous consultations and expressed the expectation of clearer communication on project developments and ESIA outcomes. Requests were also made for regular consultation mechanisms and for involvement of civil society actors in follow-up and monitoring processes.

Equity between localities

Concerns were raised about disparities between localities within the Project Area of Influence, including Touajil and surrounding communities. Stakeholders referred to isolation, limited access to services and the need to ensure that engagement and potential benefits are not concentrated in a single locality.

11.4 Conclusion

Consultations conducted with local communities in the mining area from 17 to 21 June 2025 identified their main concerns and expectations regarding the El Aouj mining project. Overall, local communities are showing strong interest in the implementation of the project, which they see as a major opportunity for socio-economic development. The expectations expressed relate in particular to:

- Job creation, especially for young people;
- Improved living conditions through access to stable incomes and basic services;
- Local economic development through the direct and indirect benefits of the project.

12.0 IMPACT ASSESSMENT

The impact assessment presented in Section 12.2 integrates the evaluations undertaken by URS (2015) and WSP. Where the findings of the URS assessment were determined to remain valid and consistent with current Project conditions, WSP did not repeat the analysis. Instead, WSP synthesized the principal information, methodologies, and conclusions. In these cases, the chapter includes the explicit introductory statement: ***"Summary of the impact assessment conducted by URS in 2015."***

Conversely, where new data had become available, where regulatory or project context changes required an updated analysis, or where the URS documentation was incomplete or no longer adequate to support current decision-making, WSP performed a new impact assessment. These updated assessments were completed either as part of the 2023 review or within the present report.

12.1 Methodology

For consistency purposes, the impact assessment methodology adopted in this report was similar as that used in the previous ESIA (URS, 2015) and (WSP, 2023), and is described below.

The impact assessment process was based on a standard methodology, widely used nationally and internationally. The term *"impact"* was used to describe a change to the receiving physical, biological, or social environment resulting from the Project's realization, which may have required mitigation or management to be considered. The methodology was grounded in the premise that projects could generate both negative and positive impacts, with significance assessed by considering several attributes of the project activities and of the receiving environment.

The impact assessment process comprised the following main steps:

- General description of the impact, in terms of associated Project phase (construction, operation or decommissioning, the nature of the impact (neutral, positive or negative) and type of impact (direct or indirect) (refer to chapter 12.1.1);
- Determination of impact significance based on the combined evaluation of impact magnitude and receptor sensitivity (refer to chapter 12.1.1.4);
- Development of mitigation measures: actions adopted to avoid, minimize, restore, or offset negative impacts, or to improve the effects of positive impacts on the environmental and social component (refer to chapter 12.1.2);
- Where applicable, the significance of residual impacts is determined following evaluation of mitigation measure effectiveness (refer to chapter 12.1.3)

12.1.1 Overview of the Impact Assessment Approach

The impact assessment followed a standard, internationally recognised methodology consistent with Mauritanian requirements, IFC Performance Standards, AfDB Operational Safeguards and good practice in ESIA. The assessment described how Project activities could generate changes in the physical, biological and social environment, and evaluated the significance of such changes using a structured set of criteria.

The methodology applied in this ESIA remained aligned with previous assessments ((URS, El Aouj Iron Ore Project - Hydrogeology Feasibility study, 2015); (WSP, 2023)), while integrating updated project information, supplementary baseline data and new requirements (e.g., climate change, cumulative impacts).

12.1.1.1 Project phase

The potential impacts, both positive and negative, were assessed over the lifetime of the Project; divided into the following three time periods:

- **Construction (4–5 years)**: delivery of infrastructure, site preparation, installation activities.
- **Operation (41 years)**: mining, processing, transport, accommodation and support systems.
- **Decommissioning (4 years)**: dismantling of installations, removal of equipment and rehabilitation of disturbed areas.

12.1.1.2 Nature of impact

Each impact was classified as:

- **Negative**: adverse change to the environment or affected communities.
- **Positive**: beneficial change or improvement.
- **Neutral**: no discernible change.

12.1.1.3 Type of impact

The types of impacts considered in the ESIA include:

- Direct: Environmental and/or social impact that arises directly from activities that form an integral part of the Project (e.g., new infrastructure) and that can be directly controlled to some degree. This definition assumes Project 'control' over its primary supply chains. For example, through the application of design specifications, mitigation measures and/or operational management control.
- Indirect: Environmental and/or social impact that arises from activities not explicitly forming part of the Project but as a "knock on effect" of it (e.g., changes to water availability due to increased influx of people) and that cannot be directly controlled to any degree, but which might reasonably be expected to exert some influence. In contrast to direct impacts, they are not caused directly by the Project action but rather arise as a result of the direct impacts. This definition assumes a variable degree of Project influence over secondary supply chains and other third parties.

12.1.1.4 Determination of the significance of the impact

Impact significance resulted from combining impact magnitude and receptor sensitivity, using a matrix approach consistent with international practice. Professional judgement was applied where necessary to ensure consistency with definitions

- Impact magnitude: The direct or indirect interferences produced by the project actions on the environment, able to influence the state or quality of one or more environmental and social receptors.
- Receptor sensitivity: The sum of the conditions that characterize the present value and/or trends of a specific environmental or social component and/or of its resources or receptors.

12.1.1.5 Impact magnitude

Impact magnitude reflected the scale of change caused by the Project. It was determined using three sub-criteria:

- Intensity
- Geographical extent
- Duration

Based on these criteria, magnitude was classified into four categories (Table 12-1):

Table 12-1: Magnitude scale

Magnitude	Definition
High	Consequences for the physical, biological and socio-economic environment are very strong and are difficult to mitigate or could require complex, costly measures.
Moderate	Consequences for the physical, biological and socio-economic environment are important, but could be mitigated by specific measures.
Low	Consequences for the physical, biological and socio-economic environment are reduced and could require mitigation measures.
Negligible	Consequences for the physical, biological, and socio-economic environment are negligible and do not require mitigation measures.

The impact magnitude is defined by the combination of 3 main criteria: intensity, geographic extent and duration, which are explained further below. Table 12-2 presents the magnitude assessment matrix based on those three assessment criteria.

Table 12-2: Magnitude assessment matrix

Intensity	Geographical extent	Duration	Impact Magnitude
High	Regional	Long-term / Permanent	**High**
		Short-term	**Moderate**
	Local	Long-term / Permanent	**High**
		Short-term	**Moderate**
	Project site	Long-term / Permanent	**High to Moderate**
		Short-term	**Moderate**
Moderate	Regional	Long-term / Permanent	**High to Moderate**
		Short-term	**Moderate**
	Local	Long-term / Permanent	**Moderate**
		Short-term	**Low**
	Project site	Long-term / Permanent	**Moderate**
		Short-term	**Low**
Low	Regional	Long-term / Permanent	**Moderate**
		Short-term	**Low**
	Local	Long-term / Permanent	**Moderate to Low**
		Short-term	**Low**
	Project site	Long-term / Permanent	**Low to Negligible**

Intensity	Geographical extent	Duration	Impact Magnitude
		Short-term	**Negligible**

12.1.1.5.1 Intensity

Impact intensity is determined by the scale of changes to the affected environmental or social component or the resulting disturbance from a project's activity, as follows (Table 12-3):

Table 12-3: Intensity scale

Intensity	Definition
High	Consequences of the impact factor reach or exceed the limit of legal standards or accepted practices and/or whose effects are likely to cause serious impairment or catastrophic damage in the different components. (i.e. for the biological component, a high intensity corresponds to impacts whose magnitude contributes to a substantial change in the ecological integrity or function of a population or ecosystem).
Moderate	Consequences of the impact factor are detected or perceived and their effects are likely to cause tangible changes in the different components.
Low	Consequences of the impact factor might be detected or perceived, but whose effects are unlikely to cause tangible changes in the different components.

12.1.1.5.2 Geographic extent

This criterion corresponds to the spatial extent of the change in the receptor concerned. Three levels of measures are considered, as follows (Table 12-4):

Table 12-4: Geographic extent scale

Geographical extent	Definition
Regional	The impact on a component is felt over a large area, beyond the Area of Influence of the Project.
Local	Impact is felt within the Area of Influence of the Project.
Project site	Impact is felt within the Project footprint.

Note that biological significance refers to the Ecological Appropriate Area of Assessment (EAAA), as defined in the biological baseline report (WSP, 2023).

12.1.1.5.3 Duration

In terms of duration, an impact can be classified as follows (Table 12-5):

Table 12-5: Duration scale

Duration	Definition
Long-term / Permanent	An impact that persists during the operation phase, and maybe during the decommissioning phase or even beyond the decommissioning of the Project.

Duration	Definition
Short-term / Temporary	An impact that persists during the construction phase only.

12.1.1.6 Receptor sensitivity

The term 'receptor' is used to describe features of the environment such as water resources, habitats and species which are valued by society for their intrinsic worth and/or their social or economic contribution; and social groups or Project affected People (PAP) such as individuals and communities that may be impacted by the Project.

The sensitivity of a receptor is determined by the consideration of a range of criteria depending on the topic under consideration, including: the economic, social and cultural value of the receptor, locally, nationally and internationally; any local, national or international designations; the rarity of the receiving environment; and the benefits or services provided.

Each receptor of a site has a different sensitivity to the impact magnitude generated by the project or can pose a different level of risk to the project. The sensitivity is a site-specific criterion, typically evaluated based on the presence/absence of some features which define:

- The value of the receptor (rarity, uniqueness, diversity, quality of life, etc.) and its resilience to potential change;
- The location or distribution of the receptor relative to the proposed project footprint;
- The extent to which the receptor has been influenced by past and current cumulative effects, and projections of its future state in the absence of the project.

Receptor sensitivity is determined by considering the receptors' ability to resist or adapt to changes and its resilience to change. The category of the sensitivity of a receptor is determined based on professional judgement of technical topic leads and is presented in each technical sub-section of the impact assessment chapter.

Sensitivity was assigned as follows (Table 12-6):

Table 12-6: Sensitivity scale

Receptor sensitivity	Definition
High	An attribute with a high value on a national, regional or local scale with little or no potential for substitution. Sensitive receiving environment or receptor with no or very limited resilience or adaptability to imposed stresses.
Moderate	An attribute with a moderate value on a local scale with limited potential for substitution, or an attribute of low value on an international, regional or national scale. Receiving environment or receptor with moderate resilience or adaptability to imposed stresses.
Low	An attribute of low value on a local scale with potential for substitution locally. Receiving environment or receptor with high resilience or adaptability to imposed stresses.
Negligible	An attribute of very low importance or rarity on a local scale, with high potential for substitution. The receiving environment or receptor has very high resilience or adaptability to imposed stresses, such that impacts would cause no discernible change.

12.1.1.7 Impact significance (impact magnitude x receptor sensitivity)

For negative impacts only, the impact significance levels were assessed by considering both the impact magnitude and the receptor sensitivity. The impact significance was categorized as major, minor, moderate or negligible according to the following definitions (Table 12-7):

Table 12-7: Significance scale

Impact Significance	Definition
High	An impact that can cause sufficient change to the biophysical and/or social environment that it fundamentally affects the status, potential productivity or usage of the environment.
Moderate	An impact that can cause change to the biophysical and/or social environment, but does not fundamentally affect the status, potential productivity or usage of the environment.
Low	An impact which is either too small to be measured or, even if quantifiable, does not give rise to any material change in the biophysical and/or social environment.
Negligible	An impact of which effect is unlikely to be felt or measured, lead to no measurable effect.

The combination of the magnitude of a negative impact and the sensitivity of the receptor(s) experiencing the impact determines the significance rating according to the impact significance matrix presented in Table 12-8:

Table 12-8: Significance Matrix

Significance matrix	Potential Impact Magnitude			
Receptor sensitivity	**High**	**Moderate**	**Low**	**Negligible**
High	**High**	**High/Moderate**	**Moderate**	**Moderate/Low**
Moderate	**High/Moderate**	**Moderate**	**Moderate/Low**	**Low**
Low	**Moderate**	**Moderate/Low**	**Low**	**Low/Negligible**
Negligible	**Moderate/Low**	**Low**	**Low/Negligible**	**Negligible**

This matrix provided the general basis for attributing impact significance; however, there was flexibility in assigning impact significance. Professional judgement was applied to ensure that impact significance corresponded to the definitions provided.

12.1.2 Mitigation measures

Mitigation measures were identified and prioritized in accordance with the mitigation hierarchy, consistent with good international practice and the requirements of the IFC Performance Standards (PS) and AfDB Operational Safeguards (OS). The measures are presented in a logical sequence, reflecting the progressive application of avoidance, minimization, mitigation/restoration, and compensation for residual impacts (Table 12-9).

Table 12-9: Mitigation hierarchy

Mitigation measures	Definition
Avoid	Change the Project's design, technology, location, or timing to prevent adverse effects on an environmental feature or adverse social impacts.

Mitigation measures	Definition
Minimise	Reduce the intensity, extent, duration or likelihood of adverse impacts through different Project design, actions or management processes during construction and operation to reduce adverse impacts.
Restore	Measures taken during or after impact to repair damages, restore functions, or rehabilitate affected environments or livelihood, and return conditions as close as possible to pre-impact status.
Compensate/offset	Where important residual effects remain after options for avoidance, minimization and restoration efforts have been exhausted, it may be appropriate to provide compensatory/offsetting measures, where technically and financially feasible. Compensatory measures do not eliminate the original adverse effect; they merely seek to offset it with a comparable positive one.

Mitigation measures typically addressed one or more of the key features of the impact magnitude identified, for example by reducing the duration, the geographic extent, and the intensity, or by increasing the resilience of the valued component.

Mitigation measures were numbered as follows:

- Component (P=Physical, B=Biological, S= Social);
- Project phase (C=Construction, O=Operation, D=Decommissioning);
- Sub-component (AQ=Air Quality, GW=Groundwater, SW=Surface Water, etc);
- Number of impact;
- Letter for each impact related mitigation.

For example, impact on Loss and degradation of nationally protected trees is numbered EB01 and its related mitigations are numbered B_C_EB01a.

12.1.3 Residual impacts

Residual negative impacts are those that remain following the implementation of the proposed mitigation. These were identified for each of the components by reviewing the predicted impacts against the effectiveness of the mitigation measure proposed to reduce or eliminate each negative impact and then identifying any residual impacts. Residual impact values were re-assessed according to the same methodology, but after the application of mitigation measures.

Residual impacts “after mitigation” are presented at the end of each impact description.

12.1.4 Enhancement measures

When possible, enhancement measures were proposed for the identified positive impacts. Enhancement measures are proactive actions designed to increase positive environmental and social outcomes or development benefits of a project, beyond merely avoiding or mitigating adverse impacts. They aim to strengthen positive impacts, improve local development outcomes, enhance environmental or social performance and create additional benefits for affected communities. Enhancement measures are not substitutes for mitigation and cannot offset unmitigated adverse impacts.

12.2 Impact assessment over the Project Area of Influence

Table 12-10 summarized the main Project activities during the construction, operation, and closure phases, as well as the associated impact factors, defined as the direct or indirect pressures or interferences generated by Project activities that could influence the state or quality of environmental or social components.

Based on this assessment, and taking into account the concerns raised during stakeholder consultations (chapter 11.0), potential environmental and social impacts were identified for all mine phases, and including El Aouj activities in the port and rail areas. These impacts were assessed in the following chapters.

Table 12-10: Project activities, impact factors and potential environmental and social impacts

Project Activities	Impact Factors	Potential Environmental & Social Impacts (associated impact assessment chapters) in the mine area	Potential Environmental & Social Impacts (associated chapters) in the port and rail areas
Construction activities (4-5 years) ▪ Access road creation ▪ Construction of mine and process plant infrastructures ▪ Bore wells development (Touajil and Aouchich areas) ▪ Road extension (from F'Derick area to the mine) ▪ Thermal and solar power plant construction ▪ Construction and operation of temporary workers' accommodation	▪ Soil preparation / Vegetation removal / / Topsoil removal / Earthworks, surface grading and excavations. ▪ Workforce demand/presence (2500 people) ▪ Dust and gas emissions ▪ GHG emissions ▪ Noise & vibration emissions ▪ Energy needs and consumption ▪ Topsoil storage ▪ Chemical and explosives transport, storage and use	▪ **Soil pollution (12.2.1.6 Land quality and land use)** ▪ **Contribution to climate change (12.2.1.4 GHG Emissions (contribution to Climate Change)** ▪ **Changes in local geomorphology on the mine open-pit (12.2.1.7 Landscape and visual** ▪ **Change in topography and landscape of the mine site (Kedja Idjill) (12.2.1.7 Landscape and visual** ▪ **Air quality degradation (12.2.1.3 Air quality)** ▪ **Declining Groundwater levels (12.2.1.1 Groundwater)** ▪ **Groundwater quality decrease (12.2.1.1 Groundwater)** ▪ **Surface waterflow and food risk (12.2.1.2 Surface water)** ▪ **Surface water quality degradation (12.2.1.2 Surface water)** ▪ **Pollution of Sebkha Idjill and the Salt Works (12.2.1.2 Surface water)** ▪ **Hydrological modification on wadis in the Mine site (12.2.1.2 Surface water)** ▪ **Noise levels and vibration increase (12.2.1.5 Noise and vibration)** ▪ **Habitat loss, degradation and fragmentation (12.2.1.8 Ecology and biodiversity)** ▪ **Loss and degradation of nationally protected flora (12.2.1.8 Ecology and biodiversity)** ▪ **Globally threatened bird species loss (disturbance) (12.2.1.8 Ecology and biodiversity)** ▪ **Workers influx (12.2.1.10In-migration** ▪ **Inflationary Pressures and Shortages (12.2.1.9 National and local economy)** ▪ **Enhancement of the Local Economy 12.2.1.9 National and local economy)**	**Rail area** ▪ Soil pollution (12.2.2.1 Land quality) ▪ Surface water pollution (12.2.2.2 Surface water) ▪ Groundwater pollution (12.2.2.3 Groundwater) ▪ Air quality degradation (12.2.2.4 Air quality) ▪ Noise levels and vibration increase (12.2.2.5 Noise and vibration) ▪ Contribution to climate change (12.2.1.4 GHG Emissions (contribution to Climate Change)) ▪ Habitat degradation, fauna disruption and collision risk (12.2.2.6 Ecology and biodiversity)

Project Activities	Impact Factors	Potential Environmental & Social Impacts (associated impact assessment chapters) in the mine area	Potential Environmental & Social Impacts (associated chapters) in the port and rail areas
▪ Construction of workers' accommodation (El Aouj City and on site permanent camp) ▪ Extraction of borrow materials ▪ Movement of construction plant and vehicles		▪ **Natural Resource-based Livelihood Impacts (12.2.1.9 National and local economy)** ▪ **Employment and Training (12.2.1.9 National and local economy)** ▪ **Damage or degradation of cultural heritage resources (12.2.1.14**Cultural Heritage**)** ▪ **Ecosystem services perturbation (water use and pastoralism) (12.2.1.15 Ecosystem Services)** ▪ **Landuse restriction (12.2.1.6 Land quality and land use)** ▪ **Impacts on the road traffic (12.2.1.13** Traffic and transportation**)**	▪ Impacts on community health and safety (12.2.1.12.1Impact SOC10 & mitigation: Impacts) ▪ Impacts on pastoral livelihood (12.2.1.15Ecosystem Services) ▪ Damage or degradation of cultural heritage resources, changes to local access and setting (12.2.2.9 Cultural Heritage)
Operation activities (41 years) ▪ Ore extraction (open-pit drill and blast) ▪ Mine waste and tailings deposition ▪ Industrial waste production	▪ Workforce demand (1025 peoples) ▪ Dust emission ▪ GHG emissions ▪ Mineral wastes production ▪ Hazard wastes production ▪ Noise and vibration emission		**Port area** ▪ Soil and surface water Pollution (12.2.3.1 Land quality678) ▪ Air quality degradation (12.2.3.3Air quality ▪ Noise emissions (12.2.3.4Noise) ▪ Marine water pollution

Project Activities	Impact Factors	Potential Environmental & Social Impacts (associated impact assessment chapters) in the mine area	Potential Environmental & Social Impacts (associated chapters) in the port and rail areas
▪ Use of mine access roads ▪ Ore processing (crushing, screening, high pressure grinding and DM separation) ▪ Thermal and solar power plant operation ▪ Water abstraction, treatment, transport and use from Touajil and Aouchich wellfields ▪ Operation of workers' accommodation (El Aouj City and on-site permanent camp) ▪ Ore transportation (by train and boat)	▪ Liquid and solid waste production ▪ Energy consumption ▪ Water consumption ▪ Rail traffic increase ▪ Road traffic increase ▪ Chemical and explosives transport, storage and use		(12.2.3.5Marine physical environment ▪ Marine noise emissions 12.2.3.5Marine physical environment) ▪ Degradation of protected areas (12.2.3.6Ecology and biodiversity) ▪ Degradation of bird species habitat and disturbances (12.2.3.6Ecology and biodiversity) ▪ Degradation of aquatic species habitat and disturbances (12.2.3.6 Ecology and biodiversity) ▪ Increased government revenues (12.2.3.8 Community) ▪ Impacts on community health and safety (12.2.3.8 Community)

Project Activities	Impact Factors	Potential Environmental & Social Impacts (associated impact assessment chapters) in the mine area	Potential Environmental & Social Impacts (associated chapters) in the port and rail areas
Closure activities (4 years)	▪ Demolishment of hard-standing areas, subsurface structures and ancillary buildings ▪ Demolishment of on-site mine roads ▪ Recycling and disposal of inert and non-hazardous materials ▪ Disposal of hazardous wastes ▪ Remediation of contaminated land ▪ Decommissioning of mine accommodation ▪ Selling of F'Derick workforce accommodation (or passing on to the community)		▪ Impact on fisheries (12.2.3.8 Community) ▪ Damage or degradation of cultural heritage resources, changes to local access and setting (12.2.3.9 Cultural Heritage)

12.2.1 Mine area

12.2.1.1 Groundwater

The El Aouj Project requires a total water supply of 5.08 ML/d, which is essential for its mining operations. As there are no permanent surface water sources nearby, water will be sourced from aquifers within the EMC groundwater exploitation permit areas at Touajil and Aouchich in the Taoudeni Basin. The feasibility study for the El Aouj Project included a comprehensive evaluation of the groundwater resource, utilising a numerical groundwater flow model to simulate historical, current, and future conditions, and to assess the potential impacts of groundwater abstraction (URS, El Aouj Iron Ore Project - Hydrogeology Feasibility study, 2015) (full hydrogeology feasibility study in APPENDIX Y).

Existing water sources in the area include shallow wells relying on rainfall, boreholes in the Kedia Idjill mountain range, and deep boreholes in the sedimentary rocks of the Taoudeni Basin. Not all water is suitable for drinking, but some is fit for livestock.

The groundwater impact assessment for the El Aouj Project considers both the quantity and quality of water resources, as well as the needs of existing groundwater users in the region. The project area is characterized by two distinct hydrogeological areas, each presenting unique considerations and potential impacts:

- The Reguibat Shield: Non-Aquifer area: The Reguibat Shield, composed primarily of regional crystalline basement rocks such as granite and gneiss, is classified as a non-aquifer. Within this area are the mine site, access roads, rail spur, the new city of El Aouj and a portion of the water supply pipeline. Key activities in this area include pit dewatering to enable mining operations, the use of water for dust suppression on roads and at the mine site, and the management of potential pollution risks associated with chemical, fuel usage, used water and waste deposition. These activities are assessed for their potential to affect local groundwater conditions, despite the limited aquifer potential of the underlying geology.
- The Taoudeni Basin: Sedimentary aquifer: The sedimentary Taoudeni Basin underlies the area extending from Touajil to Aouchich and serves as the primary source of groundwater for the project. This basin contains the P2 and P4 stratigraphic units, which are designated as productive aquifers. Groundwater abstraction from these units is a central component of the project's water supply strategy. The assessment in this area focuses on the sustainability of groundwater withdrawal, the protection of water quality, and the safeguarding of current groundwater users who rely on these aquifers for their needs.

Aquifer status and groundwater sensitivity is summarised in Table 12-11 below:

Table 12-11: Aquifer Status and Groundwater Sensitivity in the El Aouj Project Area

Area	Aquifer status	Groundwater sensitivity
Mine site	Non aquifer area	Low
Touajil wellfield	Aquifer area	High (quantity) Moderate (quality)
Aouchich wellfield	Aquifer area	High (quantity) Low (quality)
Mine access road / rail spur	Non aquifer	Low
Water pipe	Aquifer / Non aquifer	Low

Source: (PRISM, 2006); (Golder Associates, 2007) (Golder Associates, 2008) ; (Scott Wilson, 2007)

12.2.1.1.1 Impact GW01 & mitigation: Declining Groundwater Levels in the P2 and P4 Aquifers

Impact description

To meet the water requirements of the Project, raw water will initially be sourced by extracting groundwater from production boreholes located in the Touajil wellfield. As groundwater levels decrease to a threshold where resource sustainability and pump efficiency may be compromised, extraction operations will shift to the Aouchich area towards the eastern part of the Taoudeni Basin.

The numerical groundwater flow model developed for evaluating the groundwater resources within the EMC water exploitation permit area has been utilised to simulate the drawdown of regional groundwater levels resulting from long-term abstraction in the P2 and P4 aquifers. The model begins with steady-state groundwater conditions from 1978, which serve as the baseline for future predictive simulations (URS, El Aouj Iron Ore Project - Hydrogeology Feasibility study, 2015).

Construction

During the initial construction phase, groundwater abstraction will start at the Touajil wellfield only, taking water from the P2 aquifer via 2 to 3 boreholes at a rate of 1–2 ML/d, which is approximately 40% of the maximum extraction rate expected during the operational phase.

The model developed by URS in 2015 directly simulates the maximum extraction rate, which will only be reached during the operational phase. The exact impact on drawdowns at the Touajil wellfield is therefore not specified for the construction phase, which is expected to last two years. An empirical estimate, which considers the drawdown anticipated at the maximum abstraction rate, shows that drawdown can vary greatly but may exceed 20 meters at some boreholes during the first two years. The drawdown generated by extracting 2 ML/d, or 40% of the maximum rate on which this hypothesis is based, is expected to be significantly lower.

Operation

During the operation phase, the groundwater abstraction will increase to a maximum of 5.08 ML/d during full production. After approximately 20 years, as Touajil's supply declines, the Aouchich wellfield will be developed at a rate of 4.27ML/d to access the P4 aquifer, extending water supply up to year 42, the end of the mine's operational life. It is anticipated that Touajil will continue to provide a sustainable quantity of about 0.8 ML/d, with actual figures to be confirmed following long-term monitoring. The following diagram represents the predicted drawdowns over the whole groundwater abstraction cycle for the project at both wellfields.

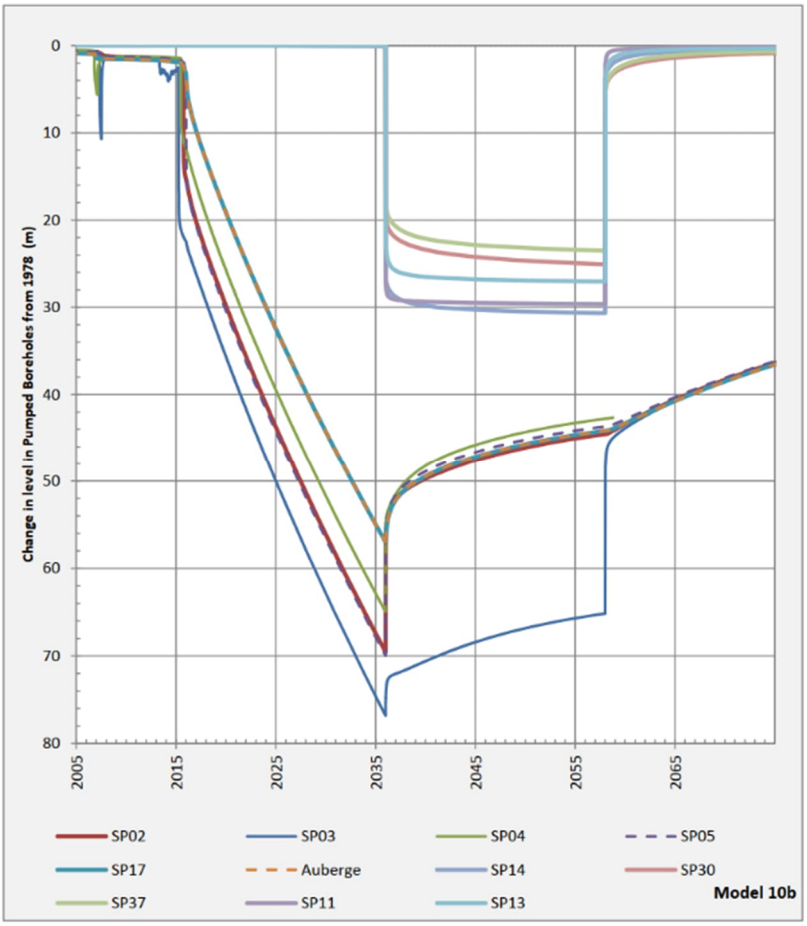


Figure 12-1: Predicted Drawdown in the Touajil and Aouchich wellfields over the whole Project's life (URS, El Aouj Iron Ore Project - Hydrogeology Feasibility study, 2015) (Touajil Pumping wells : SP02-03-04-05-17; pumping well at Aouchich: SP11-13-14-30)

Impact of Abstraction at Touajil

Figure 12-2 illustrate the predicted drawdown contours following 42 years of Project groundwater abstraction. According to the modelling results, groundwater levels in the Touajil region are expected to decline between 55 metres (at the Touajil Auberge: the nearest receptor) and 80 metres over a 10 to 20-year period. The exact timing for the transfer of abstraction from Touajil to Aouchich will be determined once pumping commences and water levels, as well as abstraction rates, are regularly monitored.

Impact of Abstraction at Aouchich

Once groundwater abstraction begins in Aouchich, a decline in groundwater levels within the P4 aquifer is anticipated. Assuming a 22-year abstraction period in Aouchich, the model predicts a regional groundwater level decrease of about 1 to 5 metres, with a local drawdown locally falling between approximately 20 and 30 metres at the production wells. The drawdown in the Aouchich area is expected to be less severe due to the aquifer's fewer boundary constraints and its role as a natural discharge area. As with Touajil, the conceptual model for Aouchich will be validated through long-term monitoring of the aquifer's response to sustained pumping.

Uncertainty remains regarding when drawdowns become excessive and when abstraction should shift from Touajil to Aouchich (URS, El Aouj Iron Ore Project - Hydrogeology Feasibility study, 2015). Monitoring and possible adjustments in wellfield management will address this uncertainty.

Consequently, abstraction during the operational phase is regarded as an impact of high magnitude due to its high intensity (major drawdown expected) of a regional extent and a long-term duration.

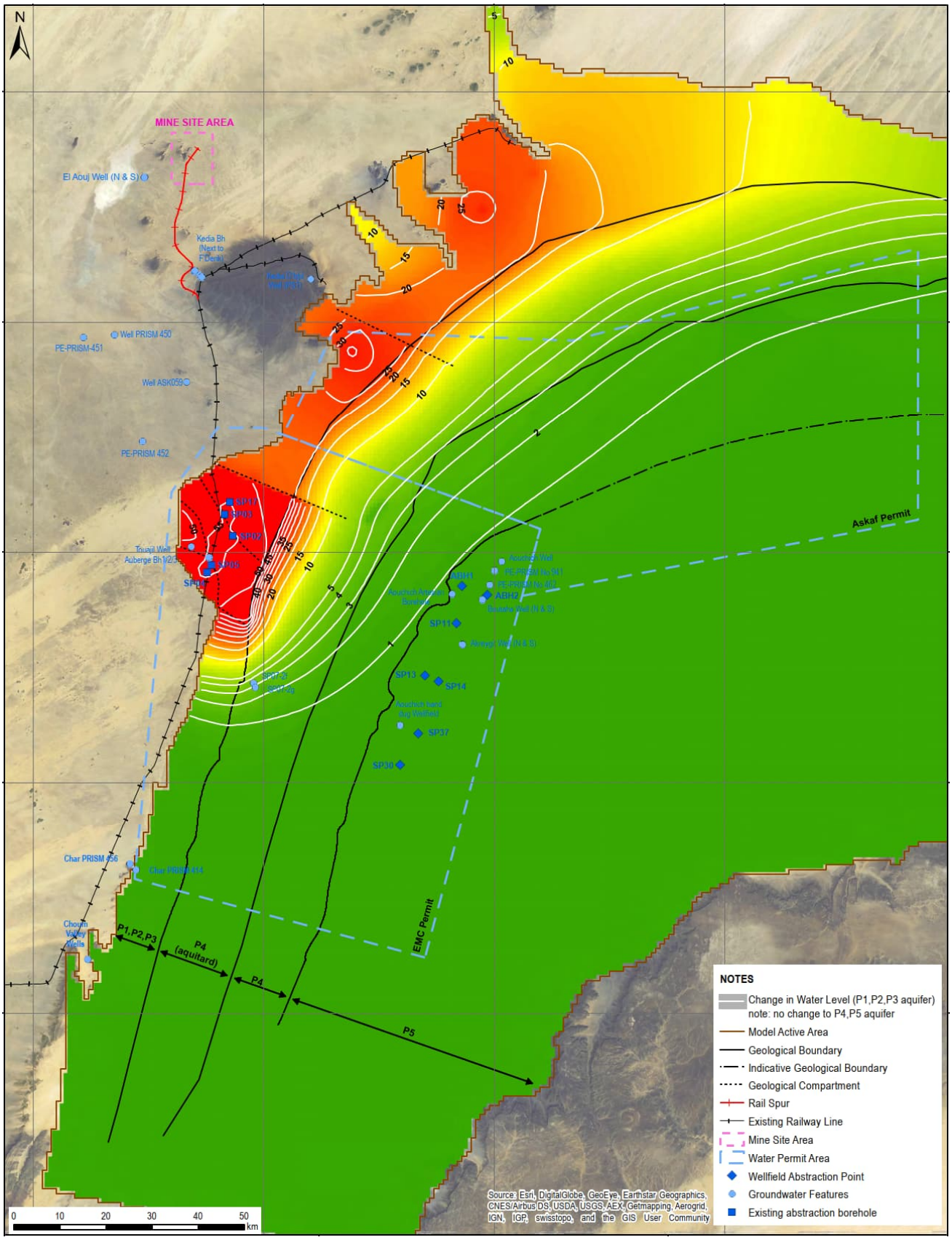


Figure 12-2: Simulated change in water levels from the start to 20 years of GW abstraction (URS, El Aouj Iron Ore Project - Hydrogeology Feasibility study, 2015) (see APPENDIX Y for full hydrogeological study)

Decommissioning

Impact of the GW abstraction on aquifers recovery

The cessation or significant reduction of pumping will allow the aquifers to recover. However, the arid climate of Mauritania results in minimal groundwater recharge from rainfall, meaning that aquifer recovery occurs very slowly. The groundwater model projects that, following a reduction in abstraction at Touajil, groundwater levels could recover by approximately 50% after a 60-year period.

Consequently, this limited and gradual recharge of aquifers renders groundwater resources particularly vulnerable and highly sensitive.

The resulting **significance** of the impact on declining groundwater levels is considered as **High**.

Mitigation measures

Embedded Mitigation Measures

Protecting groundwater resources and users has been a key consideration in project design. Key mitigation incorporated into the Project design for minimising potential groundwater impacts include:

- Use of Dense Media Separation (DMS) for Mineral Processing: Mineral processing will employ DMS, a technique which significantly reduces the demand for raw water compared to alternative processing methods.
- Water Recycling and Reuse: Water will be recycled wherever possible throughout the mining operation. Waste brine generated from the reverse osmosis (RO) treatment plant, as well as treated mine waste water, will be repurposed for dust suppression along the mine access roads. Additionally, when available, wadi runoff collected by the dam located upstream of the tailings storage area will be utilised. Treated effluent will also be used for the irrigation of the palm grove, thereby further reducing the demand for fresh water.
- Reuse of incidental water from pit dewatering for dust suppression.
- Support the needs of local communities and pastoralists, water pipeline outlet taps will be installed. These outlets will provide access to raw water for pastoralists and local communities, specifically for the watering of livestock.
- Preventing pollution.

The project aims for zero water discharges during normal operations.

Additional Mitigation Measures

In addition to the mitigation measures incorporated into the Project design, several further actions will be implemented to safeguard groundwater resources and users.

- Groundwater Abstraction Management Plan: A dedicated Groundwater Abstraction Management Plan will be developed to oversee the abstraction of groundwater from Touajil, with subsequent abstraction from Aouchich. This phased approach is intended to limit the impact on groundwater users in Touajil. The Plan will establish detailed parameters for monitoring both water levels and quality during abstraction activities. These parameters will be assessed against the groundwater model referenced in URS, 2015b (see APPENDIX Y) and the model updated as necessary, thereby ensuring that abstraction is managed responsibly and sustainably.

- Water Management Plan: The Project will also include the preparation of a comprehensive Water Management Plan. The primary aim of this Plan is to promote efficient water use, encourage water reuse and recycling, ensure responsible disposal of wastewater, and prevent pollution. Furthermore, the Plan will address the management of storm water throughout the Project lifecycle. It will identify specific water management targets and indicators and will incorporate a water balance tool to facilitate regular reporting and tracking of water usage.
- Cleaning of the photovoltaic power plant panels with dry process: consider implementing a dry photovoltaic panel cleaning system, such as dry robotic cleaning (no need of treated water, cost-effective, enables the restoration of at least 95% of optical transmittance with daily or weekly cleaning, but requires integration from the plant's design phase) at the mine's photovoltaic plant.

Even after implementation of mitigation measures, the residual impact on the aquifers will remain of **High significance**.

Summary of impact assessment

Table 12-12: Impact GW01 - Declining Groundwater Levels in the P2 and P4 Aquifers

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C-Op-D	Negative	Direct	High	Regional	Long-term	High	High	High
After mitigation	C-Op-D	Negative	Direct	High	Regional	Long-term	High	High	High
Mitigation measures	▪ Design and Implement the Groundwater Abstraction Management Plan including: ▪ Monitor abstraction in Touajil to determine timing for development of the wellfield at Aouchich ▪ Update the groundwater model with updated data recorded during the groundwater monitoring ▪ Designe and Implement the Water Management Plan ▪ Use photovoltaic panels dry cleaning method for the solar plant at the mine site								
Notes	1 Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.1.1.2 Impact GW02 & mitigation: Declining Groundwater Quality in the P2 and P4 Aquifers through Long Term Pumping

Impact description

Although measurements taken since 2013, and more frequently since 2023, show no notable change in conductivity (see section 6.6.4.3 of the baseline : hydrogeology – Touajil area) , pumping tests conducted in 2007 (Golder Associates, 2007) (Golder Associates, 2014), which involved abstraction from the P2 aquifer, demonstrated that groundwater quality changed over time. Specifically, there was an increase in the concentrations of both major and minor ions, resulting in higher salinity levels. This trend is likely attributable to the abstraction of older groundwater with longer residence times in the aquifer.

It is possible that the **construction** and **operation phases** of the Project could lead to a progressive decline in groundwater quality. Such deterioration may cause lower quality water to be drawn into the aquifer, which could impact its suitability for future uses. As a consequence, additional water treatment may be required to ensure the water meets the necessary standards for its intended uses.

The P4 aquifer at Aouchich is known to have poorer quality water, with higher salinity, compared to the P2 aquifer at Touajil. Consequently, beginning development at Touajil offers an advantage: less brine will be produced during treatment and a greater proportion of the raw water will be utilised.

The reverse osmosis (RO) plant will be designed to handle a range of groundwater quality conditions. Therefore, variations in groundwater quality are not expected to significantly affect the Project's water supply or the provision of potable water.

The anticipated magnitude of this change in groundwater quality is considered moderate. This estimation is precautionary and will be reassessed once pumping commences and long-term water quality monitoring data are available. The duration of the impact is expected to be long term, as changes in groundwater quality are generally irreversible, even after **decommissioning**.

Mitigation measures

- Groundwater Abstraction Management Plan: The implementation of the Groundwater Abstraction Management Plan is a key measure to mitigate declining groundwater quality in the P2 aquifer. This plan will help determine the appropriate duration of pumping at Touajil and manage the transfer of abstraction to Aouchich. By monitoring water quality and adjusting the abstraction regime as needed, the potential impact of declining quality can be reduced from moderate to low if significant changes are detected.
- Pollution Prevention through Good Practice: The Project will adhere to good practice in both design and site management to prevent pollution. These measures are detailed under Impact P_O_LQU01c and are integral to maintaining the quality and safety of groundwater resources.

Summary of impact assessment

Table 12-13: Impact GW02 - Declining Groundwater Quality in the P2 and P4 Aquifers through Long Term Pumping

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C-Op-D	Negative	Direct	Moderate	Local	Long-term	Moderate	Moderate (Touajil) Low (Aouchich)	Moderate
After mitigation	C-Op-D	Negative	Direct	Low	Local	Long-term	Low	Moderate (Touajil) Low (Aouchich)	Low
Mitigation measures	▪ Implement the Groundwater Abstraction Management Plan, including : ▪ Monitor abstraction in Touajil to determine timing for development of the wellfield at Aouchich ▪ Implement good international practices for preventing groundwater contamination (refer to impact LQU01)								
Notes	1 Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.1.1.3 Impact GW03 & mitigation : Impact of Declining Groundwater Level in the P2 and P4 Aquifers on Groundwater Users

Impact description

Projected Drawdown at the Touajil Wellfield (P2 Aquifer)

Significant drawdown is anticipated as a result of Project abstraction activities at the Touajil wellfield, specifically affecting boreholes utilized by the Touajil Auberge. The Auberge, a guest house with associated gardens, also

abstracts groundwater from the P2 aquifer. It operates up to 3 boreholes equipped with electric submersible pumps. Water extracted from these boreholes is stored in an on-site tank, providing both the guest house's water supply and irrigation for the gardens.

Model simulations predict that, over a period of 20 years, groundwater levels at the Auberge boreholes will decline by approximately 55 meters (Figure 12-3). Should Project-related water abstraction cause groundwater levels to fall below either the pump intakes or the base of the boreholes, the Auberge's water supply would be interrupted. However, the specific depths of the boreholes and pumps are currently unknown, introducing uncertainty regarding the timing of this potential impact. Importantly, the lowering of groundwater levels is expected to be gradual, allowing for ongoing monitoring and the implementation of mitigation measures as needed. Additionally, long-term pumping may affect groundwater quality, identified as Impact GW02.

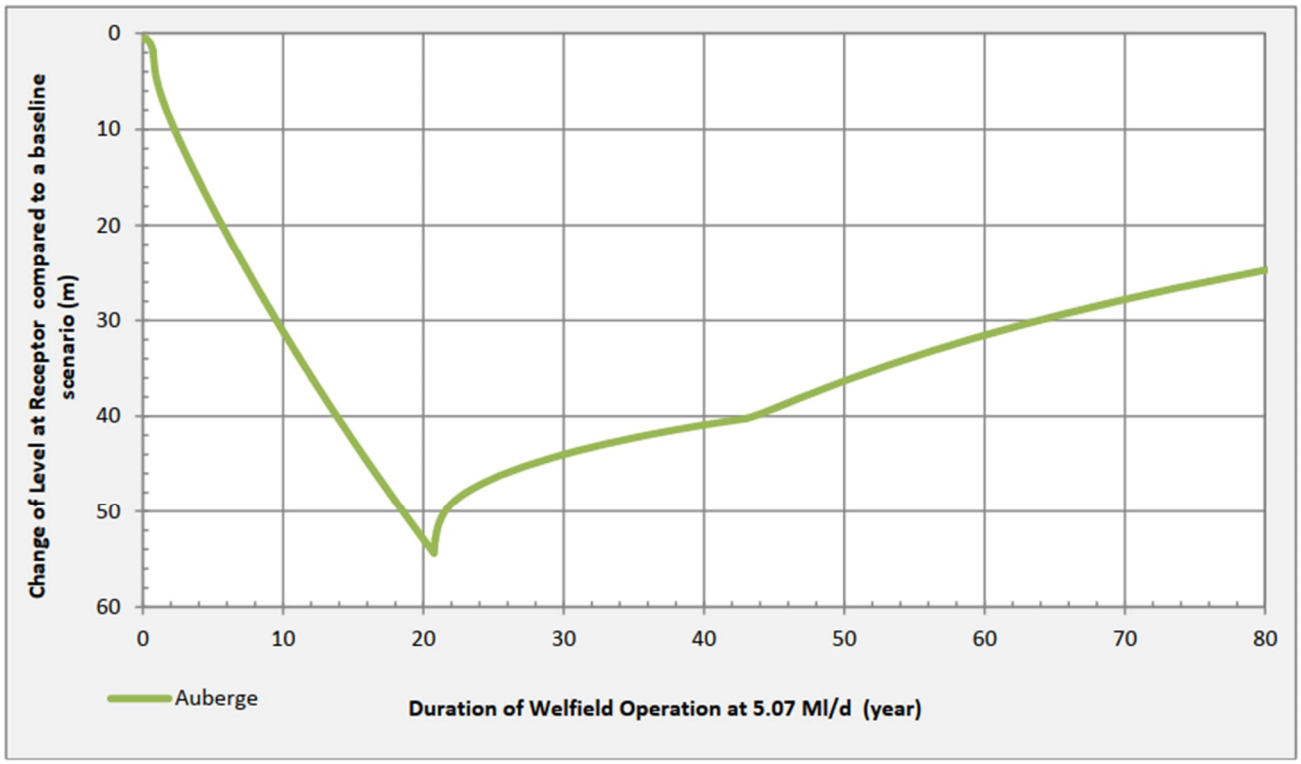


Figure 12-3: impact of abstractions upon the Touajil area receptors (URS, 2015). Partial recovery of the aquifer after 21 years due to reduction in pumping at Touajil wellfield and start-up of the Aouchich wellfield.

Projected Drawdown at Aouchich (P4 Aquifer)

Following the transfer of groundwater abstraction activities to Aouchich, water will be drawn from the P4 aquifer. This transition presents the potential to impact additional groundwater users and natural features in the region. While Aouchich does not have permanent settlements dependent on groundwater for drinking water, pastoralists do rely on the resource, using hand dug wells and artesian boreholes for livestock watering and irrigation.

With a projected abstraction period of 22 years at Aouchich, regional groundwater levels in the P4 aquifer are expected to decline by approximately one to three meters. This anticipated reduction could affect five hand dug wells: Aouchich well, Boutaha Wells (north and south) (Figure 12-4), and Akreygit wells (north and south). Furthermore, three artesian boreholes—SP11, SP14c, and the Aouchich Artesian borehole (Loulecisse) (Figure 12-4) —may be impacted, as reduced groundwater levels could cause some boreholes to cease

artesian flow. Based on measured well depths, there is a possibility that some hand dug wells could dry up as a result of pumping from the Aouchich wellfield.

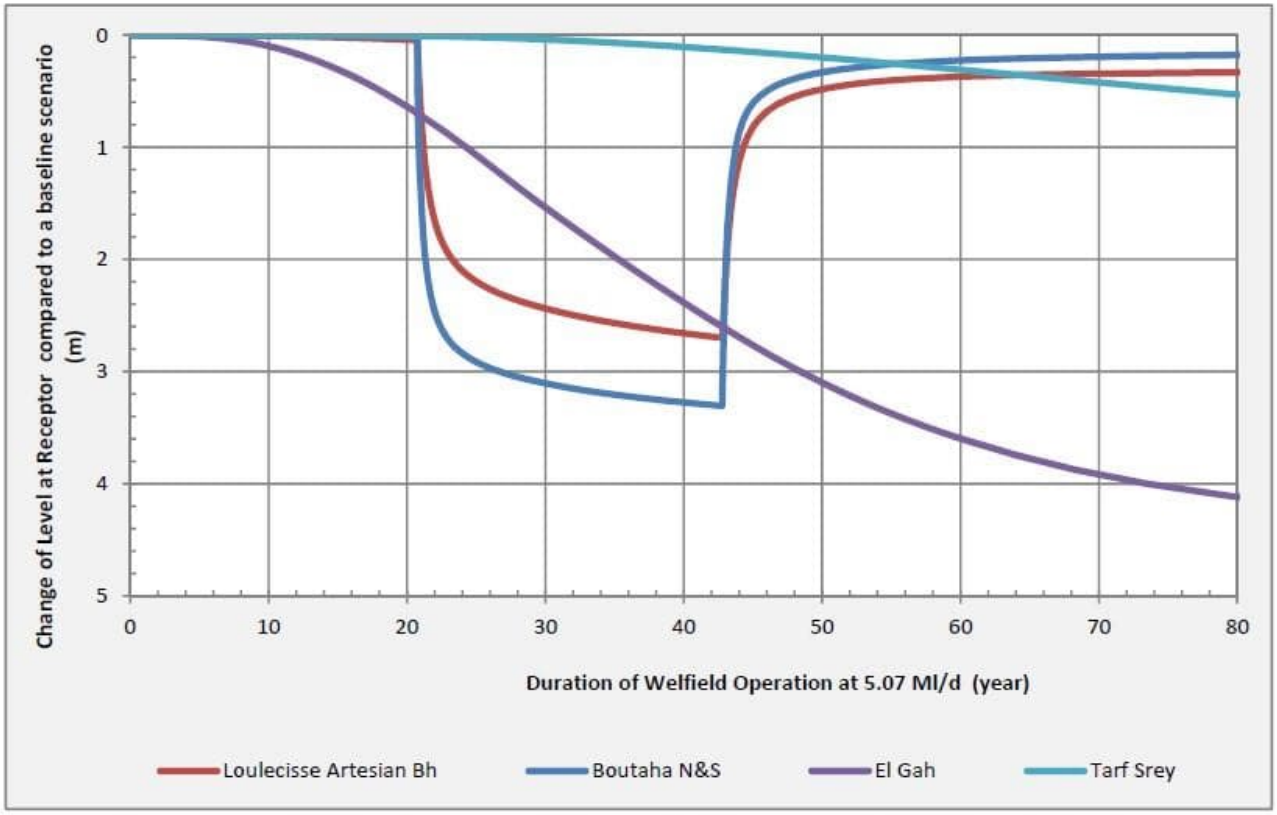


Figure 12-4: Expected drawdown at the Loulecisse and Boutaha wells (El Gah and Tarf Srey are SNIM wellfields receptors east of Kedja Idjill) (URS , 2015)

Mitigation measures

- Alternative Water Supply: To further protect existing groundwater users, an alternative water supply will be provided from the EMC wellfields:
  - At Touajil: when the Auberge's existing pumps or boreholes can no longer access water due to declining levels.
  - At Aouchich: when artesian boreholes cease to flow or hand dug wells dry out.

  This supply will be delivered either directly via pipeline or through the use of tanks, thereby ensuring continued access to water for those affected by Project activities.
- Local access to raw water (embedded mitigation): During project operation, mitigation will include ensuring access to raw water for communities and pastoralists via outlet taps along the pipeline;
- Provision of potable water to F'Derick (embedded mitigation): The project includes the installation of a potable water pipeline from the mine's RO plant to supply additional drinking water needs for the town of F'Derick.
- Engagement with stakeholders: Stakeholder engagement will be established at 2 stages:

- before the commencement of groundwater abstraction: to identify all water users in the area of interest. A grievance management mechanism must be implemented to collect all requests from the local population regarding access to potable water and water for livestock watering.
- during the closure phase of the project.

- Mine Closure Plan. Procedures will be developed for the transfer of water supply infrastructure ownership, supporting ongoing community access to water resources. These procedures will be integrated into the detailed Mine Closure Plan to facilitate a smooth transition and maintain water access for local users after project completion.

The impacts on groundwater users and local communities are assessed to be of high intensity due to serious impairment brought to the users if usual water points runs out, of long-term due to duration of the groundwater abstraction period (over 42 years) and the slow recharge rates of the aquifers after the end or decrease of the wellfields exploitation. The **magnitude** of these impacts is therefore considered as **high**.

The sensitivity is considered as high due to absence of potential for substitution and very limited adaptability for the users to access to water if no mitigation measures are put in place. The **impact significance** is therefore considered as **high** before the implementation of appropriate mitigation measures.

The impacts are regarded as being of **moderate significance** even after all mitigation measures have been implemented, given the substantial importance of water resources for various stakeholders and the enduring challenges associated with consistently supplying water of adequate quality.

Summary of impact assessment

Table 12-14: Impact GW03 - Impact of Declining Groundwater Level in the P2 and P4 Aquifers on Groundwater Users

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C-Op-D	Negative	Direct	High	Local	Long-term	High	High	High
After mitigation	C-Op-D	Negative	Direct	Low	Local	Long-term	Low	High	Moderate
Mitigation measures	▪ Alternative water supply for groundwater users from EMC wellfields ▪ Access to raw water of suitable quality for livestock watering and local communities ▪ Provision of potable water supply to F'Derick ▪ Implement the Stakeholder Engagement Plan ▪ Implement the detailed Mine Closure Plan, with the objective of ownership transfer of wellfields, pipelines and RO plant to enable continued use (at a reduced level) post-closure								
Notes	1 Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.1.1.1 Impact GW04 & mitigation : Open-pit dewatering

Impact description

Hydrogeological testing, including packer testing carried out by (Golder Associates, 2014), has determined that the open pit site's permeability is low, with measured values between 10^{e-9} and 10^{e-10} m/s. While there are some water-bearing fractures present, there have been no significant water inflows observed at the mine site.

Construction

Even though stripping operations are carried out during the construction phase, the excavated areas will not have reached the saturated zone. Therefore, this impact does not exist during this phase.

Operation

Groundwater Modeling Approach

A groundwater model was developed by URS (URS, El Aouj Iron Ore Project - Hydrogeology Feasibility study, 2015). The model simulated groundwater inflows to the open-pit during dewatering operations and after mine closure, as well as evaluating the impacts on surrounding water levels. The model consisted of a single layer with its base set at -250 mRL, and it covers a grid of 200-meter by 200-meter cells.

Estimated Open-Pit Inflows and Water Level Behavior

Predicted inflows of groundwater into the open-pit are expected to be less than 300 m3/d, with a decreasing trend over time. After ten years, the model estimates a maximum inflow of about 200 m3/d (URS , 2015).

The combination of groundwater inflows and rainfall runoff within the open-pit's catchment area is expected to result in the formation of a pond at the base of the pit.

Any minor groundwater inflows will be controlled using local sumps. These sumps will also serve to collect rainfall, with the stored water being utilized for dust control purposes.

Estimated Dewatering Influence and Drawdown

As the pit deepens, the effects of dewatering will extend outward. Model simulations covering up to 42 years of operation, including sensitivity analysis of hydraulic parameters, predicted that groundwater levels will experience a drawdown of about one meter at distances between 1.4 km and 3.5 km from the pit (URS , 2015). Notably, the El Aouj wells are located beyond the reach of the dewatering influence (8 km west from the future open pit).

The **intensity** of the impact on groundwater at the mine site is considered as **low** because of its location within an area predominantly characterised by non-aquifer formations and a very little inflow of groundwater expected into the pit. The geographical extend of the dewatering is expected to remain local over a long period (up to after the mine closure). As a result, the impact magnitude is considered as minor.

The **sensitivity** is considered as **low** because there are no identified groundwater users or features within the calculated range of influence associated with pit dewatering.

As a consequence, the **impact significance** of the open pit dewatering is considered as **minor**.

Decommissioning

Inflow rates into the open pit are projected to further decline after its closure. The pond will increase in size, reaching its maximum approximately 20 years after mine closure. At that time, the surface water elevation of the pond will be around -160 mRL to -140 mRL, with a water depth between 30 and 50 meters. Assuming the ground surface is at 350 mRL, the resulting water level will be about 500 meters below ground level. The pond will occupy an area of roughly 0.05 km2 (5 ha) after closure. At this stage, the rate of inflow to the pit will be balanced by evaporation. The pond's water level will remain approximately 500 meters below ground surface and will fluctuate seasonally according to patterns of evaporation and rainfall (URS , 2015). Over time, windblown sand is expected to gradually fill the pit.

The principal potential impact following mine closure will be the accumulation of water at the base of the pit. This may attract animals and local inhabitants seeking access to the water, potentially leading to attempts to enter the pit area. Such ingress could present a drowning hazard for those individuals.

Mitigation measures

- Implementation of the Mine Closure Plan: a number of safety measures described in the conceptual Mine Closure Plan will be implemented to prevent accidental ingress and safeguard both animals and people. These measures include:
  - the installation of warning signage to alert people to the danger
  - the construction of a rock safety bund around the perimeter of the open pit.
  - Installation of appropriate stormwater drainage around the open-pit;
  - Installation of warning signs following open-pit closure.

With the proposed mitigation measures in place, the residual impact is expected to remain long-term but of **negligible significance**.

Table 12-15: Impact GW04 - Impact of Open-pit dewatering

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Op-D	Negative	Direct	Low	Local	Long-term	Low	Low	Low
After mitigation	Op-D	Negative	Direct	Low	Local	Long-term	Low	Low	Negligible
Mitigation measures	▪ Implement the detailed Mine Closure Plan								
Notes	1 Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.1.2 Surface water

The Project is located in northwest Mauritania, a region characterized by a hot and arid climate. The area experiences high rates of evaporation and infrequent rainfall, with precipitation occurring in short, intense bursts. Rainfall intensity can vary significantly across time and location, and half of the annual rainfall can occur within a few hours at any location. Such intense rainfall events can generate substantial volumes of runoff and lead to high flows within local wadi systems.

Environmental impacts on surface water are generally linked to changes in watercourse abstraction, discharges, ecological resources dependent on the hydrological regime, flood risk, and potential pollution infiltration into groundwater. Most of these impacts have been scoped out for the following reasons:

- No abstraction occurs from surface water due to the intermittent nature of wadi flows.
- No discharges are made to surface water for the same reason.
- Ecological baseline surveys found no significant habitats associated with the wadis, although evidence of grazing damage indicates local importance for grazing. These wadis may also serve as temporary watering sites for livestock after rainfall. Potential impacts can be excluded if there are no substantial changes to flow paths or regimes in grazing areas.
- There is minimal connection between surface water and groundwater. Low annual rainfall and high evaporation mean groundwater recharge from surface water is negligible, with most surface water evaporating.

- Preliminary assessment of waste rock from the ore body does not indicate a risk of acid rock drainage (ARD), so no specific water pollution mitigation measures for ARD are proposed.

Remaining potential impacts relate to changes in wadi flow paths and flood risk (SW01), changes in surface water runoff quality (SW02), and effects on downstream receptors such as Sebkha Idjill (SW03).

12.2.1.2.1 Impact SW01 & mitigation : Change in Surface Water Flow and Flood Risk

Impact description

The construction and operation of the mine, along with associated infrastructure, have the potential to alter surface water flows. These changes may lead to reduced water availability for downstream users, including grazing animals.

Mine area

In the southern watershed (Catchment C), the total area occupied by the mine infrastructures is distributed as follows:

- Interceptor dam: 6 km², representing 3% of the total watershed area.
- Mining infrastructure (processing plant, solar power facility, worker camp, haul roads, ...): 3 km², accounting for 1.5% of total runoff in the watershed.
- Tailings storage area: 3 km², or 1.5% of the total watershed area.
- Explosive depot: 1 km², representing 0.5% of the total watershed area.
- Rail spur: 2 km², or 1% of the total watershed area.
- Waste dump: 10 km², representing 5% of the total watershed area. Runoff downstream will continue from this area, resulting in a negligible impact on surface water flows.

The estimated change in runoff due to the project is estimated to 21 km², or 10% of the total runoff from Catchment C.

In the northern watershed (Catchment D), only the open pit will affect the runoff area, covering approximately 4 km², which is just over 2% of its total area.

Between these two catchments, only the areas covered by the open pit, the tailings disposal and the interceptor dam (Water captured by the dam after rainfall events will be reused for dust suppression at the mine) can be effectively considered as lost for runoff, totalling 13 km² out of 378 km² (less than 4%).

The biggest impact on surface runoff will occur at the end of the mine operation phase, when the open pit and the tailings disposal facility will reach their maximum extent.

Following decommissioning, all areas previously occupied by mine infrastructure will be restored to natural runoff conditions, except for the tailing disposal facility and the open pit.

El Aouj city – rail spur - Touajil & Aouchich wellfields, road accesses and water pipeline

El Aouj city is located in catchment A in an area with very limited elevation change. The area of the future city (1.5 km²) represents 0.02% of the total watershed area.

In the catchments A and B, the corridor occupied by the access road, rail spur, Touajil wellfield and water pipeline covers a total area of 5 km², less than 0.1% of the total area of these catchments.

As for Touajil and the Aouchich wellfield, the areas covered by the pumping infrastructure will be very limited and can be considered negligible.

Mitigation measures

Embedded Mitigation within the Project Design

Key mitigation incorporated into the Project design which minimises potential surface water impacts includes (URS , 2015):

- Prevention of changes in surface runoff or implementation of measures for separation and diversion of water flows:
  - Installation, management and maintenance of a surface water interceptor dam above the tailing disposal area to limit surface water runoff into the tailing disposal area and runoff from the tailing disposal area into the surrounding environment. This also has a positive impact by storing water for future re-use for dust suppression and reducing the quantity of groundwater that has to be abstracted;
  - Construction and maintenance of bridges, culverts or diversion channels where infrastructure crosses wadis in order to accommodate intermittent storm water runoff;
  - Buried water pipeline from the wellfields to the mine, and from the mine to the El Aouj city.

Additional Mitigation Measures

Implementation of the Water Management Plan: Additional mitigation measures, beyond those incorporated into the Project design, have been formulated in accordance with national legislation, IFC Performance Standards 3 and 6, and other relevant standards. These surface water mitigation measures will be included in the management plans proposed for the Project and include (URS , 2015):

- Guideline values, for example IFC EHS Effluent Guidelines (IFC, 2007a), and reuse for dust control or irrigation of locally grown vegetable, in the case of treated sanitary wastewater.
- Minimising erosion and conveyance of soils and sediment which could block or be transported in wadi channels. Additional mitigation measures to prevent soil erosion rehabilitation of disturbed areas and training in environmental awareness and driving.

These measures will be in place during construction, operation and closure phases.

Implementation of the Mine Closure Plan : The detailed Mine Closure Plan will include measures to ensure that runoff and storm flows can continue unimpeded after post-closure.

The proportional change in surface water flow is characterized by low intensity and could extent outside the project site over an extended period (the duration of mine operations), leading to a moderate impact magnitude. Sensitivity is assessed as low due to the presence of low-sensitivity receptors. Prior to mitigation measures, the overall impact **significance** is considered **moderate**. With the implementation of mitigation measures, the likelihood of flow path blockages and flooding will be reduced. Consequently, the magnitude of impact on flow and flood risk will remain low, and **residual impacts** will be of **low significance** during all phases of the Project.

At the wellfields, the **impact significance** on surface water flow is considered as **negligible**.

Summary of impact assessment

Table 12-16: Impact SW01 – Change in Surface Water Flow and Flood Risk

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Low	Local	Long term	Moderate	Low	Moderate
After mitigation	C, O, D	Negative	Direct	Low	Project site	Long term	Low	Low	Low
Embedded Mitigation measures	▪ Prevention of changes in surface runoff or implementation of measures for separation and diversion of water flows								
Additional mitigation measures	▪ Implement Water Management plan, including ▪ Minimise erosion and soil conveyance ▪ Implement the detailed Mine Closure Plan								
Notes	1 Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure								

12.2.1.2.2 Impact SW02 & mitigation : Changes of Surface Water Quality and Pollution of Wadis

Impact description

Construction and operation phases

Surface contamination by chemicals in the mine area

Runoff occurring over polluted areas presents a risk to the quality of water in wadis following rainfall events within the identified catchment areas (see Section 6.6.3). During both the construction and operation phases of the mine, there is a possibility of accidental discharges or spillages involving fuel, stored chemicals, additives, and lubricants from vehicles. These incidents may take place around the mine site, along the mine access road, the waste rock dump, tailings disposal area, the waste disposal facility. Pollutants tend to accumulate on exposed surfaces and can be mobilized by rainfall runoff, which may then spread contamination toward and along the wadi channels. The lowest hydraulic point corresponds to the Sebkha Idjill, whose closest eastern boundary lies more than 10 km from the railway spur, considered as the nearest infrastructure potentially capable of generating accidental or chronic contamination (e.g., hydrocarbon spills). Given the climatic context (extremely rare rainfall), the significant distance between the Sebkha and this potential source of chemical contamination, and the embedded mitigation measures already integrated into the Project design, the likelihood that chemical contamination could reach the Sebkha Idjill through surface water flow is considered low. Likewise, the sensitivity of the hydrological environment is considered low due to the near-permanent absence of watercourses and surface runoff.

Contamination risks from other infrastructures

Other locations—such as the the wellfields (drilling activities, refuelling and maintenance) and the city of El Aouj and the proposed palm grove (which will use treated sanitary effluent) may also produce polluted runoff if the design and management of waste facilities and surface runoff management systems are not sufficiently effective.

Dust Suppression and Associated Risks

Dust suppression activities at the waste dump area, tailings disposal area, and access roads will utilize brine from the reverse osmosis plant, groundwater from the Touajil/Aouchich wellfield, and water from the interceptor dam when available. The use of brine carries the potential for salt accumulation, which could result in brackish runoff.

Decommissioning

During the mine closure phase, dismantling activities may lead to surface contamination or leave behind infrastructure that contains polluting substances—either partially or not fully removed—which could later be released into the environment.

Mitigation measures

To address these risks, the implementation of mitigation strategies and adherence to good site practices are essential. Key measures include the separation of clean and dirty runoff, containment systems to prevent spills, and the execution of an Emergency Preparedness and Response Plan. These actions collectively are expected to reduce the magnitude of potential impacts to negligible levels.

Embedded Mitigation within the Project Design

Key mitigation incorporated into the Project design which minimises potential surface water impacts includes (URS , 2015):

- Separation or diversion of clean runoff from potentially contaminated runoff on the mine site.
- Control and prevention of silt laden or polluted runoff from the waste dump area, tailings disposal area and other mine site facilities to off-site receptors.
- The waste rock is not expected to have ARD potential, so only inert mine waste material will be disposed of in the waste dump area.
- At the mine site, non-mining waste will be systematically sorted to optimise recycling efforts. Non-recyclable materials will be incinerated, with a dedicated incinerator constructed on-site for this purpose.
- The detailed Mine Closure Plan will include measures to ensure that any potentially contaminating material is rendered harmless to the water environment by removal, treatment or reinstatement.

Additional Mitigation Measures

Additional mitigation measures, beyond those incorporated into the Project design, have been formulated in accordance with national legislation, IFC Performance Standards 3 and 6, and other relevant standards. These surface water mitigation measures will be included in the management plans proposed for the Project and include (URS , 2015):

- Good practice including prevention, identification, control and monitoring of accidental discharges/ spills and provision of spill containment and clean-up equipment during all Project phases.
    - Control of spillage through routine preventative maintenance on construction plant and vehicles, and use of drip trays under temporary plant.
    - Secondary containment by bunding around chemical/ fuel/ lubricant/ hydraulic fluid storage tanks and facilities.
    - Dedicated refuelling areas with impervious surfacing and available spill containment and clean-up kits.
- Preparation of a specific management plan for emergency preparedness and response.

- Management and treatment of effluent streams (including wash water that may contain cement from concreting operations during construction) to meet applicable discharge.
- Control of waste including sewage effluents, hazardous and non-hazardous waste and contaminated soils which could leach into water. Waste will be managed and disposed of in accordance with good site practices, applicable international standards and the Non-Mining Waste Management Plan. These mitigation measures are detailed in Section 12.2.1.6.1

These measures will be in place during construction, operation and closure phases and are included in Section 12.2.1.6.1.

In the mine area, the overall magnitude of impact from these occurrences is considered low, primarily because rainfall runoff in the area is infrequent and flows within wadis are intermittent, and there is no surface water point or hand dug well used by herders close to any mine infrastructure. Consequently, the sensitivity of surface water is also deemed low. Despite this, there remains a potential for the accumulation of pollutants over time.

In the Aouchich area, sensitivity is rated as high due to several hand-dug wells used by herders—such as Aouchich well, Akregit north and south, Boutaha north and south, and Loulecisse well—being located within the footprint of the Aouchich wellfield. Before any mitigation measures are put in place, the resulting impact significance is assessed as Moderate.

Summary of impact assessment

Table 12-17: Impact SW02: Changes of Surface Water Quality and Pollution of Wadis

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Mine Area									
Before mitigation	C, O, D	Negative	Direct	Moderate	Local	Long term	Moderate	Low	Low
After mitigation	C, O, D	Negative	Direct	Low	Project site	Long term	Low	Low	Low to Negligible
Aouchich Area									
Before mitigation	C, O, D	Negative	Direct	Moderate	Project site	Long term	Moderate	high	Moderate
After mitigation	C, O, D	Negative	Direct	Low	Project site	Long term	Negligible	high	Low to Negligible
Embedded Mitigation measures	▪ Separation of clean and dirty runoff ▪ Control of polluted runoff ▪ Only inert mine waste material to be disposed of in waste dump area ▪ Design, construction and maintenance of a proper incinerator								
Additional mitigation measures	▪ Good practice including prevention, identification, control and monitoring of accidental discharges/ spills (refer to impact LQU01) ▪ Implement the Emergency Preparedness and Response Plan ▪ Implement the Non-Mining Waste Management Plan ▪ Implement the detailed Mine Closure Plan								
Notes	1 Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure								

12.2.1.2.3 Impact SW03 & mitigation : Pollution of Sebkha Idjill and the Salt Works

Impact description

Sebkha Idjill and the associated salt works face potential risks of contamination during the construction, operation, and closure phases of the mine. Polluted wadi flows have the possibility of impacting these areas, which may compromise the commercial value of the extracted salt if deposits become contaminated. The sensitivity of Sebkha Idjill to such impacts is considered moderate.

The Sebkha Idjill serves as the ultimate natural discharge area for all wadis from catchment C where most of all the mine infrastructures take place—including the waste dump area, treatment facilities, power plant, loading bay, workers camp, most of the haul roads, explosive depot, the tailings disposal area and a large section of the rail spur. The distance from the mine site to the sebkha is approximately 10 km. Consequently, the frequency and intensity of rainfall will influence the time it takes for any pollutants in the runoff to reach Sebkha Idjill, which could span several years.

Runoff from the mine site may carry contaminants such as sediments and fines originating from tailings, as well as dissolved salts resulting from the use of brackish water for dust suppression. Most fines are expected to settle before reaching Sebkha Idjill or may require a significant amount of time to travel that distance. Most of those sediments are derived from the natural ground of the Requibat Shield and are similar to the surficial soils found within the Sebkha Idjill catchment basin. Salts carried by the runoff will undergo significant dilution, minimizing their impact on the overall water quality entering the Sebkha.

The mine site and its associated facilities contribute approximately 10% of the total flow to Sebkha Idjill from the east (catchment C), as referenced in Section 12.2.1.2.1. Should a pollution event occur, dilution will lessen its effects and provide sufficient time for remedial actions to be implemented if necessary.

Mitigation measures

Measures for protecting Sebkha Idjill from pollution align with those established for preventing changes in surface water quality (Impact SW02, section 12.2.1.2.2). With these mitigation strategies in place, the magnitude of potential impacts is low, and residual impacts are minimal throughout all phases of the project.

Summary of impact assessment

Table 12-18: Impact SW03: Pollution of Sebkha Idjill and the Salt Works

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Moderate	Local	Long term	Moderate	Moderate	Moderate
After mitigation	C, O, D	Negative	Direct	Low	Project site	Long term	Low	Moderate	Low
Embedded Mitigation measures	▪ Separation of clean and dirty runoff ▪ Control of polluted runoff ▪ Only inert mine waste material to be disposed of in waste dump area								
Additional mitigation measures	▪ Good practice including prevention, identification, control and monitoring of accidental discharges/ spills (refer to impact LQU01) ▪ Implement the Emergency Preparedness and Response Plan ▪ Implement the Non-Mining Waste Management Plan ▪ Implement the detailed Mine Closure Plan								

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Notes	1 Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure								

12.2.1.3 Air quality

Airborne pollutants will be released as a result of various activities associated with the mine (mining, blasting, material handling, ore processing), including emissions from the power plant as well as vehicle and equipment exhausts. These sources contribute to the overall levels of air pollution within the project area.

Throughout the construction, operation, and closure phases of the project, several pollutants are anticipated to be emitted to the air. The air quality assessment has specifically considered dust emissions such as airborn particles (PM_{10}, $PM_{2.5}$). Additionally, strong winds acting upon disturbed ground can further exacerbate dust generation. These particulates are of particular concern due to their potential impacts on air quality and human health. Exhaust gas, such as oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), and sulphur dioxide (SO_2) are also monitored and assessed to evaluate their environmental and health impacts.

The assessment of greenhouse gases associated with the project is addressed separately in Section 12.2.1.4.

At the Touajil and Aouchich wellfields, the construction and installation of the Aouchich wellfields will potentially generate dust and increase the concentrations of airborne particulates.

The majority of particulates generated by construction activities are larger than ten micrometres in diameter and, therefore, are not usually associated with a significant increase in concentrations of PM_{10} and $PM_{2.5}$ (IAQM, 2014). The expected distance of dust and particulates deposition is therefore expected to be limited to few hundreds meters. Impacts on pastoralists will be infrequent and limited to the time period within which they are within less than one kilometre from construction works. The construction activities are therefore highly unlikely to have an effect on any existing receptors.

The wellfields operation is not expected to generate any dust. Gas emission will be limited to the use of one generator in case of solar energy supply failure.

The wellfields are expected to stay operational after the mine closure with a notable reduced groundwater abstraction rate sufficient to provide water to the local communities and pastoralists. The decommissioning of installations will therefore be limited to the removal of few containers and solar panels at decommissioned boreholes.

As such, the impact significance of the wellfields at any phase of the Project is considered **negligible** on identified receptors.

12.2.1.3.1 Impact AQ01 & mitigation: Operations Emissions on Receptors at F'Derick, Zouérate, El Aouj Wells, Sebkha Idjill Salt Works

Impact description

Natural airborne pollutant concentration

Given the remote location of the Project, there are very few existing sources of airborne pollutants in the area. Measurements of key air pollutants—namely nitrogen dioxide (NO^2), ozone (O3), and sulphur dioxide (SO^2)—indicate that their concentrations are significantly below internationally recognized limit values. The ambient concentration of ozone (O_3) remains near the World Health Organization (WHO) threshold (see section 6.6.5.3).

Natural Dust levels

The area is characterized by extremely high levels of particulates and dust. Sand and dust storms are common occurrences, and these events can re-suspend large amounts of unconsolidated particulate matter into the atmosphere. This contributes to the elevated background concentrations of dust and particulates in the region. A particular concern in such arid desert environments is the presence of respirable crystalline silica. Natural background levels of respirable crystalline silica in the Project area are known to exceed the guidelines established by the WHO (see section 6.6.5.3). These elevated levels pose potential health risks, particularly due to the fine nature of the particulates that can be inhaled.

Emissions from the Project are expected to result primarily from the mine's power plant, as well as from vehicle and equipment exhausts. In addition to these sources, fugitive dust emissions and fine particulate matter will be produced by several mining-related activities. These include mining, blasting, material handling, ore processing, and vehicle movements. Strong winds acting on disturbed ground will further contribute to the release of particulates into the air.

Throughout the construction, operation, and closure phases of the Project, several pollutants are anticipated to be released into the atmosphere. These pollutants include dust, PM_{10}, $PM_{2.5}$, oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), and sulphur dioxide (SO_2). These emissions have been evaluated as part of the air quality assessment for the Project.

The presence of these pollutants in the air may lead to a range of impacts. Deposition of dust on surfaces can affect local amenity, while particulate matter and gaseous pollutants may pose risks to human health and ecological sites. The assessment has considered the effects on air quality sensitive receptors that are located within proximity to the mine site and associated infrastructure, such as the mine access road and rail spur.

The following groups have been identified as sensitive receptors for air quality impacts, based on their potential exposure to emissions from the Project:

- Inhabitants of F'Derick;
- Inhabitants of Zouérate (impacts considered only during the operation phase);
- Nomadic pastoralists who occasionally utilize the El Aouj wells;
- Seasonal workers at the salt works located at Sebkha Idjill;
- Workers residing in the mine site accommodation.

The exposure of mine staff to air pollutants during their working hours is discussed in chapter 12.2.1.12.2 12.2.1.12.2Impact SOC11 & mitigation: Impacts on Worker's Health, Safety And Security.

Construction

Construction activities associated with the Project present the potential to generate dust and increase concentrations of airborne particulates within a radius of less than 1 km from the emission sources (Qiming Luo et al., 2021). The majority of airborne particles produced during construction are likely to settle and deposit within this distance, thereby limiting their spatial impact.

Given this limited range, it is highly unlikely that construction activities will affect existing receptors located in F'Derick and Zouérate, which are situated approximately 30 km to the south and 40 km to the southeast of the mine site, respectively. Similarly, the potential for dust impacts on nomadic receptors at El Aouj wells—located within 10km of the mine site—is considered very low. Any impacts on nomadic populations are expected to be infrequent and restricted to periods when these populations are situated within 1 km of active construction works.

Furthermore, most particulates generated by construction activities are greater than 10µ in diameter. Particles of this size are not typically associated with significant increases in concentrations of PM_{10} and $PM_{2.5}$ (IAQM, 2014).

During the 5-year construction phase—particularly in the first year when the rail spur is being built—bulk goods will be transported to the site via a new access road extending from the north of F'Derick to the mine site. This access road will remain unpaved during construction, serving as an additional source of dust emissions. There is a potential for construction traffic to increase concentrations of NO_2, PM_{10}, and $PM_{2.5}$ at possible receptor locations in F'Derick, especially those adjacent to the access road and the N1 Highway. However, due to the relatively low frequency of construction-related vehicle movements and existing traffic conditions, any increase in nitrogen dioxide, PM_{10}, or $PM_{2.5}$ concentrations is expected to represent only a negligible change from baseline conditions.

In summary, potential air quality impacts during the construction phase of the Project are anticipated to be of negligible significance and, as such, are not considered further in this assessment.

Operation

During the operational phase, a range of on-site activities and processes, together with vehicle movements, have the potential to emit dust and fine particulate matter (PM_{10} and $PM_{2.5}$) into the atmosphere. On the mine site itself, fugitive emissions of dust and PM_{10} are expected from blasting operations, haul trucks traveling on unpaved roads, other vehicles moving on unpaved site roads, uncovered conveyors and stockpiles, the waste dump area, and the tailings disposal area.

Controlled emissions of dust and PM_{10} will originate from bag-houses, the waste incinerator, the on-site mine power plant, and the exhaust from haul trucks and other vehicles. The mine power plant, haul trucks, and other vehicle exhausts will also emit NO_x, while SO_2 emissions will be limited to the exhaust from the mine power plant. These emissions may impact the identified air quality sensitive receptors. As such, an atmospheric dispersion model has been employed to predict the potential impacts of mining operations on local air quality.

Air dispersion model main outcomes

At the El Aouj mine site, the maximum calculated concentrations for each pollutant, except for CO, are higher than existing air regulation limits, but located inside the mine area, near the emission sources. The magnitude of the impacts decreases rapidly with the distance, so that impact magnitude on the air quality at the towns of F'Derick and Zouérate as well as El Aouj wells for all pollutants are predicted to have a negligible concentration. The updated model confirms that the operation of the mine will have a negligible impact on air quality at F'Derick and Zouérate.

Additional details regarding the modelling approach and results are provided in APPENDIX D.

Based on the results of the air dispersion modelling representative of conditions with the implementation of Project's embedded mitigation measures (already part of the Mine design), the impact magnitude is estimated as **low**, the geographical extend local and the duration permanent (over the mine operation). The sensitivity is considered as **high** because of potential temporary presence of herders in the vicinity of the mine. However, the average daily dust concentrations exiting the mine site does not exceed the limit value set by the IFC for PM_{10} (50 µg/m^3) and $PM_{2.5}$ (15µg/m^3) outside the mine footprint. No impact on receptors is therefore expected. The impact significance is therefore considered as **low to negligible**.

Decommissioning

The closure of the mine site presents certain environmental challenges, particularly regarding the potential increase in dust deposition and airborne concentrations of particulate matter, specifically PM_{10}, over the four-

year closure period. To address these challenges, mitigation measures that have been integrated into the mine's operational design will continue to be implemented throughout the closure works. These measures are intended to minimise emissions to air, and their continued application will ensure that the benefits realised during the operational phase are maintained during closure.

At the end of the mine's operation, the mine closure plan will be implemented. The waste dump and tailings disposal areas on the mine site will be designed and developed to remain stable, negating the need for additional work or profiling at closure, except for necessary geotechnical reasons. Plant and ancillary facilities will be dismantled and removed, with ownership of the mine power plant transferred to SNIM or MEE SA. The landfill will be compacted and capped, site roads not required for post-closure activities will be ripped and regraded, and mine site accommodation will be decommissioned unless a local community organization assumes responsibility for the facility.

After the successful implementation of the detailed Mine Closure Plan, there will be no sources of emissions to air from the mine site likely to cause significant impacts at any off-site receptor. Outside the mine site, decommissioning and deconstruction activities will not introduce any significant new sources of air emissions. Accordingly, air quality effects related to the closure phase have been evaluated solely for activities occurring within the mine site. Based on the implemented measures, no discernible alteration to baseline air quality levels at any receptor site is expected during the closure phase of the Project.

Mitigation measures

Embedded mitigation measures

Appropriate good practice air quality mitigation measures have been integrated into the project design for both the construction and closure phases. These measures include:

- use of water to dampen down materials and dust generating activities.
- the minimisation of drop heights during material handling.
- inspections and maintenance of the mine haul roads.
- Implementation of the detailed Mine Closure Plan.
- Installation of solar power for water abstraction from designated water supply boreholes, which substitutes conventional energy sources with renewable energy

During the operation and closure phase, the embedded mitigation measures to reduce the gas and dust emission will consist in using raw water from the wellfields to control dust emissions from mining activities (blasting, road traffic, stockpiles, tailings) and minimising dust generation using dry ore treatment processes, materials handling designs and dust collectors at the ore treatment facilities and train loading (see sections 4.2.1.2.3 & 4.2.1.2.6) . Dust collectors (bag-houses) will be installed at key processing points, including the primary and secondary crushing stations, primary screening, High Pressure Grinding Rolls (HPGR), Dense Media Separation (DMS), and train loading facilities, to capture and control particulate emissions. Maintenance of equipment and power plants will be conducted to reduce gas emissions.

Additional mitigation measures

Polymer Addition Trials for Dust Suppression : trials involving the addition of polymers to raw water should be undertaken at the outset of mining activities. The primary aim of these tests is to evaluate the effectiveness of polymer-enhanced water in reducing dust emissions generated by mining processes, such as blasting, road traffic, handling of materials, and ore treatment. These trials are also intended to assess the potential for optimising water consumption. By incorporating polymers, it is anticipated that the dust suppression capabilities

of the water will be improved, which may result in a reduced volume of water required for effective dust control. The outcomes of these tests will inform the ongoing development and refinement of dust mitigation strategies, supporting the project's broader environmental objectives.

Stacks height to reduce impacts associated with power generating facility : It is recommended that the power generating facility at the mine site be constructed with tall exhaust stacks (minimum of 30m height). The increased height of these stacks will promote more effective dispersion of exhaust gases, thereby reducing the concentration of air pollutants at ground level and minimising the impacts on air quality within the mine infrastructures. By elevating the release point of emissions, the stacks will help prevent the accumulation of harmful substances such as nitrogen oxides, sulphur dioxide, and particulate matter within sensitive receptor areas within the mine working environment. This approach complements the embedded air quality mitigation measures already integrated into the project, ensuring that the overall environmental footprint of the mine's operations remains as low as possible.

Summary of impact assessment

Table 12-19: Impact AQ01 - Operational Emissions on Receptors at F'Derick, Zouérate, El Aouj Wells, Sebkha Idjill Salt Works

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Op-C	Negative	Direct	Low	Regional	Permanent	Moderate	High	Moderate
After mitigation	Op -C	Negative	Direct	Low	Local	Permanent	Low	High	Low
Embedded Mitigation measures	▪ Dust capture by enclosure of equipment, wherever possible, or high-pressure dust suppression through fogging / misting; ▪ Bag houses on crushing, screening, stockpile and train loading with maintenance programs and bag replacement schedules ▪ Vacuum ports whenever dust emissions >1 kg/h within a 10 m radius ▪ Dust suppression on roads and stockpiles with raw water and brine from RO plant; ▪ Surface wetting supplemented by fogging during blasting ▪ Generators and vehicles maintenance. ▪ Power the wellfields with solar energy ▪ Implement the detailed Mine Closure Plan								
Additional mitigation measures	▪ Carry out tests adding polymers to raw water to reduce dust more effectively and reduce groundwater consumption. ▪ Stacks height to reduce impacts associated with power generating facility								
Notes	[1] Project Phase: Op = Operation								

12.2.1.3.2 Impact AQ02 & mitigation: Operational emissions on the Mine accommodation

Impact description

Even with the updated meteorological conditions recorded directly at El Aouj weather station, the most frequent wind direction will still blow emissions from the open-pit, haul routes, processing plant, stockpiles, and tailings disposal area away from the mine accommodation camp.

Concentrations calculated by the air dispersion model at the accommodation camp with the implementation of the embedded mitigation measures show very low values, significantly below the limits. In some cases, however, according to the UK Environmental Agency (that reports that the impact on air quality determined by each individual pollutant is to be considered negligible if it is less than 1% of the corresponding long-term limit value or less than 10% of the short-term limit value), air impact due to the Project cannot be considered negligible compared to existing air quality conditions.

The following table presents the expected PM and gas concentrations produced by the project at the accommodation camp with the implementation of the Project's embedded mitigation measures.

Table 12-20: Expected annual average added PM and gas concentrations at the accommodation camp

Air contaminant s of concern	PM_{10}	$PM_{2.5}$	So_2	NO_2	CO
Annual average concentration (µg/m^3)	0.06	0.03	0.26	0.26	0.0028
Maximum incremental contribution (%)	0.4	0.6	1.3	2.6	
UK Environmental Agency recommended threshold not to exceed (%)	1	1	1	1	
Predicted daily average concentration (µg/m^3)	1.03	0.58			
2021 WHO ambient air quality Guidelines (µg/m^3/day)			40	10	4
Maximum incremental contribution (%)	2.60	3.87			
Impact of the incremental contribution	negligible	negligible	minor	minor	minor

Additional details regarding the modelling approach and results are provided in APPENDIX D.

Based on the results of the air dispersion modelling representative of conditions with the implementation of Project's embedded mitigation measures (already part of the Mine design), the impact magnitude is estimated as **low**, the geographical extend project site and the duration permanent (over the mine operation). The sensitivity is considered as **high** with the proximity of the accommodation camp. The impact significance is considered as **low to negligible**.

Mitigation measures

The mitigation measures to implement for reducing air contamination at the accommodation camp are similar to the ones for reducing the emissions on receptors located outside the mine footprint. In addition, the impact of gas emissions from the mine power plant could be reduced with the construction of stacks high enough to reduce or even eliminate gas concentrations towards the accommodation camp.

Summary of impact assessment

Table 12-21: Impact AQ02 - Operational Emissions on the Mine Accommodation

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Op	Negative	Direct	High	Local	Permanent	High	High	High
After mitigation	Op	Negative	Direct	Low	Project site	Permanent	Low	High	Low to negligible

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Embedded Mitigation measures	▪ Dust capture by enclosure of equipment, wherever possible, or high-pressure dust suppression through fogging / misting; ▪ Bag houses on crushing, screening, stockpile and train loading with maintenance programs and bag replacement schedules ▪ Vacuum ports whenever dust emissions >1 kg/h within a 10 m radius ▪ Dust suppression on roads and stockpiles with raw water and brine from RO plant; ▪ Surface wetting supplemented by fogging during blasting ▪ Generators and vehicles maintenance. ▪ Power the wellfields with solar energy ▪ Implement the detailed Mine Closure Plan								
Additional mitigation measures	▪ Carry out tests adding polymers to raw water to reduce dust more effectively and reduce groundwater consumption. ▪ Stacks height to reduce impacts associated with power generating facility								
Notes	1 Project Phase: Op = Operation								

12.2.1.4 GHG Emissions (contribution to Climate Change)

"The assessment of greenhouse gas (GHG) emissions associated with the Project draws on the analysis undertaken as part of the Environmental and Social Impact Assessment prepared by URS in 2015 (see Appendix AA).

The methodology applied by URS is primarily based on the February 2014 version of the International Finance Corporation's (IFC) Carbon Emissions Estimator Tool (CEET). Depending on the emission sources considered, the emission factors provided by this tool were supplemented with the GHG conversion factors published in 2015 by the United Kingdom's Department for Environment, Food and Rural Affairs (Defra), together with activity-specific emission factors."

General and national context of GHG emissions

Global warming and climate change remain central concerns in sustainable development. There is a widely recognized need to mitigate global greenhouse gas (GHG) emissions in order to offset projected increases or to reduce emissions below current levels. The Kyoto Protocol, an international agreement connected to the United Nations Framework Convention on Climate Change, commits participating countries to internationally binding emission reduction targets. Mauritania ratified the Kyoto Protocol in 2005.

As of 2012, Mauritania's GHG emissions were reported at 10.64 million metric tons of carbon dioxide equivalent ($MtCO_2e$), accounting for approximately 0.02% of total global emissions ((WRI / CAIT, 2012)).

The Project's total estimated annual emissions account for roughly 4.7% of Mauritania's reported GHG emissions in 2012, which were recorded at 10.64 million tonnes of CO2 equivalent (MtCO2e) according to CAIT Climate Data Explorer ((WRI / CAIT, 2012)). Additionally, based on 2012 data from USGS, the Project is projected to be responsible for about 48% of Mauritania's iron ore production. Assuming similar emissions rates per tonne of iron ore produced across existing mines, it can be inferred that El Aouj may contribute approximately 48% of the GHG emissions associated with total iron ore production in the country. Therefore, in the national context, the Project's GHG emissions are considered 'significant'.

Estimated Annual Greenhouse Gas (GHG) Emissions

The available emission source information indicates that the Project is expected to generate approximately 497,825 tonnes of carbon dioxide equivalent (tCO2e) annually, which represents a production of 0.048 tCO2e per tonne of ore mined, as referenced in the GHG calculation report (URS , 2015)). This figure falls within the range observed in other mines developing the same activity, where anticipated emissions vary between 0.0078 and 0.083 tCO2e per tonne of ore produced (URS , 2015))

The primary contributors to these emissions are the mine site power plant, fuel consumption by vehicles and mobile equipment on-site, and the transportation of goods. Among these, the mine site power plant is identified as the most significant source of GHG emissions.

All sources of GHG emissions associated with the Project are considered adverse. Importantly, GHG emissions are not location-specific; their impacts are global rather than confined to Mauritania or the local area, and as such, receptors are not assessed within the GHG emissions calculation. The increase in GHG emissions from human activities, including those from the Project, contributes to climate change on a global scale. While the Project's direct GHG emissions represent a relatively minor addition to total global man-made GHG emissions (reported as 49.0 GtCO2e in 2004 by (IPCC, 2007), emissions of this magnitude are considered 'significant' when viewed against the backdrop of global mitigation efforts to offset the projected growth in GHG emissions or to reduce them below current levels (IPCC, 2007).

Assessment Scope

The assessment scope is focused on the activities and operations under the Project during its operational phase. The following sources, which generate direct emissions from facilities owned or controlled by the Project, are assessed in detail:

- Mine site power plant (48 MW);
- Fuel consumed by plant and vehicles used on-site and for workforce transportation;
- Transport of goods to and from the site via road and the rail spur (excluding segments using the existing railway line, which are outside the study's scope).

Annual GHG emissions are presented for the operational life of the mine. Where average annual operational emissions data was unavailable, peak annual operation figures were used to represent a worst-case scenario. This conservative approach is designed to likely overestimate GHG emissions from these sources. Where possible, emissions are reported as carbon dioxide equivalent (CO_2e), accounting for the six Kyoto Protocol GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6). Where reporting as CO_2e was not possible, results are based solely on carbon dioxide (CO_2) and are clearly noted in the impact evaluation. Emissions factors are sourced from the CEET (February 2014), with supplementary industry-recognized factors referenced as needed.

Exclusions from Assessment

Consistent with IFC guidance, GHG emission sources related to construction, closure, and land use change have been excluded from the assessment. Additionally, emission sources estimated to contribute less than one percent of total reported emissions have been scoped out as negligible. These sources are outlined below. Detailed estimates, calculations, and assumptions for all emission sources are available in the GHG Management Plan.

- Detonation of Explosives: GHG emissions from explosives detonation are considered negligible, based on maximum use at a peak capacity of 57 tons per day. This method is intentionally conservative, likely leading to an overestimate of emissions from this source.

- Groundwater Abstraction: The use of small power plants to abstract and pump groundwater from the Touajil and Aouchich wellfields, even when assuming diesel oil fuel as a worst-case scenario, results in negligible emissions.
- Disposal of Non-Mining Waste: Emissions from non-mining waste disposal are estimated as negligible. Calculations are based on waste volumes per person from a comparable mining project and site-specific data for healthcare waste incineration.
- Worker Residences in F'Derick: Emissions associated with worker residences are minimal and excluded. These residences will use power from the existing grid, while on-site operational accommodation will be powered by the mine power station.
- Air Travel for International Workers: Air travel emissions are estimated to be negligible, based on the equivalent of two return short-haul international flights per week for employees traveling six times per year.

12.2.1.4.1 Impact GHG01 & mitigation: Greenhouse Gases Emission from the Mine Power Plant

Impact description

The principal contributor to greenhouse gas (GHG) emissions from on-site operational activities is the heavy fuel oil (HFO) power plant. This facility is designed to operate on a continuous basis, generating 48 megawatts (MW) of electricity to supply the mine site's energy requirements.

The total consumption of HFO by the power plant is projected to reach approximately 106,236 tonnes per annum. On average, this equates to around 8,853 tonnes of HFO consumed each month, based on the assumption that the plant operates every day of the year (365 days). Correspondingly, the total GHG emissions from the power plant are estimated to be 332,211 tonnes of carbon dioxide equivalent (tCO2e) annually. Details of the emissions calculation methods, the data sources utilised, and the assumptions underpinning these figures are provided in (URS, El Aouj Iron Ore Project - Hydrogeology Feasibility study, 2015) Appendix 6C GHG emissions calculation report.

The GHG emissions arising from the combustion of HFO within the power plant are expected to have a moderate level of significance during the operational phase of the Project. This assessment is based on the fact that emissions from the power plant represent 67% of the total GHG footprint of the mine, and slightly more than 3% of Mauritania's total annual emissions. For the purpose of this assessment, any emission source that accounts for over 50% of the Project's total emissions is categorised as having moderate significance.

Mitigation measures

Embbeded Mitigation Measures

The following measures are aimed at improving efficiency and reducing the GHG emission from the power plant:

- Adoption of good practices:
  - Regular plant maintenance to ensure optimal equipment performance and efficiency;
  - Measurement and reporting of fuel consumption at the mine site power station to facilitate monitoring and improvement;
  - Measure and monitoring of fuel use and emissions;
  - Where options exist, specify use of lower carbon fuels;

- Reducing idling time for electrically powered equipment, which minimizes unnecessary energy consumption and emissions;
- Installation of solar power for water abstraction from designated water supply boreholes, which substitutes conventional energy sources with renewable energy.

Regular maintenance and monitoring of the power plant, along with the implementation of additional mitigation measures will contribute to the reduction of GHG emissions from the plant. However, it is anticipated that these mitigation efforts, while beneficial, are unlikely to substantially alter the overall significance of the impact. As a result, the magnitude of the effect is expected to remain moderate, and the mine site power plant will continue to be the most significant single source of GHG emissions for the Project.

GHG Emission Offsetting

An additional option for mitigating GHG emissions involves offsetting. This approach was developed under the Kyoto Protocol's Clean Development Mechanism (CDM), which is recognized as the largest offsetting mechanism worldwide ((United Nations, 2012)). The CDM enables governments and private entities to financially support emission reduction projects in developing countries and receive credits known as "certified emission reductions" (CERs) that can be applied toward their reduction targets. Eligible projects include renewable energy installations, forestry initiatives, and activities such as the combustion of landfill methane or destruction of industrial pollutants.

Summary of impact assessment

Table 12-22: Impact GHG01 - Emissions from the Mine Power Plant

Impact Assessment	General description of the impact			Determination of Magnitude		Determination of significance			
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Op	Negative	Indirect	Moderate	Global	Long term	Moderate	N/A	Moderate
After mitigation	Op	Negative	Indirect	Moderate	Global	Long term	Moderate	N/A	Moderate
Mitigation measures	▪ Regular plant maintenance. ▪ Measurement and reporting of fuel consumption at the mine site power station. ▪ Measure and monitoring of fuel use and emissions ▪ Where options exist, specify use of lower carbon fuels ▪ Reducing idling time for electrically powered equipment. ▪ Power the wellfields with solar energy								
Notes	1 Project Phase: Op = Operation								

12.2.1.4.2 Impact GHG02 & mitigation: Emissions from Use of Vehicles, Mobile Plant and Transport of Goods

Impact description

Emissions resulting from the consumption of diesel by production vehicles, mobile plant, and equipment are factored into the Project's overall greenhouse gas (GHG) footprint. This assessment also accounts for the transport of ore by both rail and road.

On-Site Diesel Consumption

Detailed data is available regarding the predicted use of all vehicle and plant types that will be utilized on-site throughout the full operational lifetime of the mine. Diesel is the assumed fuel for these operations. The average annual diesel consumption on-site is projected to be 55 million liters (ML) per year, as referenced in (BBA, 2015). Based on this consumption, annual GHG emissions are estimated at 151,235 tonnes of carbon dioxide equivalent (tCO2e). The calculations supporting these estimates are provided in the GHG calculation report.

Rail Transport of Ore Concentrate

The transportation of ore concentrate by rail is expected to require two trains per day, each carrying a load of 9,000 tonnes. The journey is assumed to be limited to the 37-kilometer rail spur. During operational periods, consumables such as fuel will be transported by back-loading onto the iron ore trains, traveling from the port to the mine site. For the purpose of calculating GHG emissions, a worst-case scenario has been considered, assuming full tonnage in both directions. Under these conditions, GHG emissions from rail transport are estimated to be 14,283 tCO2e per annum, as detailed in the GHG calculation report. The calculation methodology employs DEFRA CO2e factors (DEFRA, DECC, 2015) for freight rail. *emissions.*

Road Transport of Materials

During operations, some materials will be transported by road, specifically involving approximately two truck trips per week from Nouakchott to the mine site. The GHG emissions resulting from this road transport are estimated at 96 tCO2 per year, as outlined in the GHG calculation report. DEFRA CO2e factors (DEFRA, DECC, 2015) for articulated vehicle freight transport have been used in these calculations.

Combined Impact and Significance

The cumulative effect of GHG emissions from fuel combustion by on-site vehicles, mobile plant, and ore transportation is anticipated to be of low significance, confined to the operational phase of the mine. The total annual emissions from vehicles, mobile plant, and transport activities are estimated at *165,614 tCO2e, representing 33% of the Project's annual emissions and over 1.5% of Mauritania's yearly emissions.*

Mitigation measures

Embedded Mitigation Measures

The Project incorporates several mitigation measures into its design to reduce greenhouse gas (GHG) emissions. These measures are aimed at improving efficiency and minimizing environmental impact:

- Specification of fuel-efficient vehicles and energy generating equipment and careful consideration of GHG emissions when selecting fuel types, to lower overall emissions.
- Adoption of good practices:
  - Regular vehicles and engines maintenance to ensure optimal equipment performance and efficiency.
  - Measurement and reporting of fuel consumption by vehicles and engines for plant operations, to facilitate monitoring and improvement.
- Training workers on efficient use of equipment and vehicles to minimize fuel wastage, thereby reducing GHG emissions.
- Informing the on-site workforce about EMC's commitment to monitoring and reducing GHG emissions, supplemented by environmental awareness training.

- Use of rail transport (as opposed to road transport) where possible: back-loading trains traveling from the port to the mine site with consumables. This approach enhances the GHG efficiency of transport by ensuring trains do not return empty, thereby optimizing fuel use.
- Installation of solar power for water abstraction from designated water supply boreholes, which substitutes conventional energy sources with renewable energy.
- Consideration by EMC and the housing developer of green energy sources for El Aouj homes and accommodations. Options include solar hot water systems and solar power installations to further decrease reliance on fossil fuels.

At present, it is unlikely that mitigation measures will have a substantive effect on the impact's significance. It is not practicable to accurately specify the fuel-saving potential or GHG reductions associated with the adoption of mitigation strategies such as the use of fuel-efficient vehicles, driver training, or minimizing journeys, as referenced as reference above. As a result, it is anticipated that the magnitude of the impact will remain low, and this will continue to be a source of low significance GHG emissions for the Project.

Summary of impact assessment

Table 12-23: Impact GHG02 - Emissions from Use of Vehicles, Mobile Plant and Transport of Goods

Impact Assessment	General description of the impact			Determination of Magnitude		Determination of significance			
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Op	Negative	indirect	Low	Global	Medium term	Low	N/A	Low
After mitigation	Op	Negative	indirect	Low	Global	Medium term	Low	N/A	Low
Embedded Mitigation measures	▪ Specify fuel efficient vehicles and minimise travel ▪ Specify efficient generator equipment and consider GHG emissions of fuel ▪ Implementation of regular maintenance and servicing ▪ Provision of driver training and awareness to improve fuel use efficiency ▪ Use of rail transport (as opposed to road transport) where possible ▪ Power the wellfields with solar energy ▪ Develop green energy sources for El Aouj homes and accommodations								
Notes	1 Project Phase: Op = Operation								

12.2.1.5 Noise and vibration

The prevailing noise climate in the Project area is primarily influenced by wind noise. Additional sources of man-made noise include vehicular traffic on the N1 Highway, train movements along the existing SNIM railway line, and activities associated with the residents of F'Derick and their livestock. With regard to vibration, there are no significant sources in the vicinity of the Project, except for those generated by the SNIM railway line and road vehicles.

This noise and vibration assessment focuses on the impacts to human receptors and their livestock. Special attention is given to sensitive off-site receptors near the mine site, which comprise temporary dwellings of pastoralists and the El Aouj wells. These off-site receptors may be affected by noise generated during both construction and operational phases of the mine.

Infrastructure-Related Impacts

Construction and operation of the mine access road and the rail spur have the potential to cause noise impacts to any sensitive receptors located nearby, including the town of F'Derick. Furthermore, the development of water pipelines and the Touajil wellfield may result in noise impacts affecting sensitive receptors in proximity to these infrastructures, including the town of Touajil to the south.

On-Site Accommodation and Worker Impacts

Throughout the construction, operation, and closure phases of the Project, on-site accommodation will be provided for mine workers. With 24-hour activity at the mine site and shift work schedules, there is potential for both noise and ground-borne vibration—such as from blasting—to affect personnel who are off-shift and resting. Therefore, the accommodation facilities are identified as potential sensitive receptors.

Exclusion of Distant Settlements

The closest permanent settlement to the mine site is F'Derick, situated approximately 30 km to the south. Given this substantial distance, it is determined that F'Derick will not experience significant noise or vibration impacts from activities at the mine site, and thus is excluded from further assessment.

Vibration Impacts at the Mine Site Boundary

The distance between non-blasting mining activities—during both the construction and operational phases—and the primary vibration receptors identified (pastoral activities surrounding the Project area) outside the Project footprint ensures that vibration impacts from these activities on nearby receptors will remain negligible.

However, the potential impact of blasting activities on sensitive receptors has been taken into consideration in the assessment.

Construction at the Touajil and Aouchich wellfields may cause noise and vibration during borehole drilling and equipment installation.

Impacts on pastoralists will be infrequent and limited to the time period within which they are within less than 200 metres from construction works. The construction activities are therefore highly unlikely to have an effect on any existing receptors.

The wellfields operation is not expected to generate any noise or vibration, except in case of use of one generator in case of solar energy supply failure. The noise generated will be limited to few meters since the generator will be placed within a container.

The wellfields are expected to stay operational after the mine closure with a notable reduced groundwater abstraction rate sufficient to provide water to the local communities and pastoralists. The decommissioning of installations will therefore be limited to the removal of few containers and solar panels at decommissioned boreholes.

As such, the impact significance of noise and vibration at the wellfields at any phase of the Project is considered negligible on identified receptors.

12.2.1.5.1 Impact NV01 & mitigation: Noise Impacts generated by Project Activities and Equipment

Impact description

Construction

Noise levels have been estimated at various distances for typical construction activities related to the Project. The following are the assumed activities during construction:

- Site clearance
- Excavations and foundations
- Slab construction
- Steelwork construction
- Finishing and fitting
- Rail spur construction
- Road construction
- Pipeline trenching and backfilling
- Wellfields construction (drilling, construction of tanks and power supply infrastructures, borehole equipment, hydraulic testing)

Machinery usage and Noise Source Data

The types of machinery expected to be used for each construction activity, including their operational 'on-times' (the percentage of time each item of plant is active in an hour), are detailed in the noise and vibration impact assessment Reference Material ((URS , 2015). Sound power levels for each item of plant have been derived from BS 5228-1: 2009+A1: 2014 (British Standard, 2014), ensuring the assessment is based on recognised industry standards (URS , 2015).

Noise Levels at On-Site Mine Accommodation

The mine accommodation, located approximately 300 metres from the main area of construction works, is anticipated to experience noise levels during construction generally below 63 dB L_{Aeq}. If standard temporary accommodation unit with closed windows and air conditioning is used, a noise reduction of roughly 30 dB(A) is expected (URS , 2015). This results in internal noise levels of 33 dB L_{Aeq} or less, which should be suitable for resting and sleeping. The impact of construction noise on the mine accommodation is therefore assessed as low in significance.

Noise Impacts from Rail Spur Construction near F'Derick

The construction of the rail spur in proximity to F'Derick will bring works to within around 100 metres of the nearest section of some settlements. During these activities, noise levels may reach between 65 and 70 dB L_{Aeq} for brief periods, which is notably above the daytime IFC criterion level, but remains below the commonly adopted limit of 75 dB L_{Aeq} for short-term construction works. Due to the short duration of these works, with construction activities approaching and then moving away from any particular location, the significance of noise effects on the nearest parts of F'Derick is considered low (URS , 2015).

Noise Impacts to Touajil from Water Supply Infrastructure Works

During the construction of water supply infrastructure—including pipelines and boreholes—noise levels in Touajil may at times exceed the daytime IFC criterion level for short-term construction works, depending on how close the works are to receptors. However, due to the linear and continuous nature of pipeline construction, elevated noise levels will only be experienced for relatively short periods. Implementing good site practices, such as ensuring machinery equipment noise control features are properly maintained, will help minimise noise emissions. Consequently, the significance of construction noise effects on Touajil town is assessed as low.

Overall Construction Phase Noise Characteristics

Throughout the majority of the construction phase, noise levels will occur through limited time and considerably lower than the peak values described above, with higher noise levels occurring only for brief intervals.

Operation

The evaluation is based on the information provided by the noise and vibration impact assessment Reference Material (URS , 2015) and the list of infrastructures to be built and equipment planned to be used (see section 4.2). Sound power level data for each plant item have been obtained from URS data relating to similar projects (URS , 2015) and from the British Standard BS 5228 BS 5228-1: 2009+A1: 2014 (British Standard, 2014). The fixed plant roster also accounts for the on-site power plant. These data sources have been used to estimate operational noise levels at various locations both within the site and in the surrounding area (URS , 2015).

General Noise Emissions

During standard operations, excavation and processing activities are expected to generate relatively continuous noise across the mine site. However, certain receptors will experience intermittent noise events, primarily caused by trucks passing by. This pattern results in a consistent background noise with occasional peaks at specific locations.

Noise Levels at Off-Site Locations

At a distance of approximately 4.5 to 5 kilometres from the centre of the mine site, the increase in ambient noise levels (average noise level measured during the baseline survey = 43.3dBA in the area of the mine) is not expected to exceed 3 dB(A), in line with guidance from the International Finance Corporation (IFC). Therefore, the significance of operational noise effects beyond the mine site boundary is considered negligible.

Noise Impacts at On-Site Accommodation

Operational noise levels at the on-site accommodation facilities are anticipated to range between 60 and 65 dB L_{Aeq} (URS , 2015). Assuming that temporary accommodation units are equipped with closed windows and air conditioning—measures that typically provide a noise reduction of around 30 dB(A) (URS , 2015), the resulting internal noise levels should be between 30 and 35 dB L_{Aeq}. These internal levels are considered suitable for resting and sleeping, and thus, the significance of construction noise effects on accommodation is assessed as low.

Noise from Boreholes and Pipelines

The operation of boreholes and associated pipelines is not expected to result in significant noise impacts at Touajil. Any fixed infrastructure /equipment required at borehole sites, such as power supplies, will be sourced, positioned, and, if necessary, provided with mitigation to ensure resultant noise levels remain within acceptable limits for resting and sleeping in the community of Touajil.

Decommissioning

Potential noise impacts associated with the decommissioning phase may affect the on-site accommodation facilities. The on-site accommodation is situated approximately 300 metres from the main decommissioning works. During decommissioning activities, noise levels at the location of the accommodation are anticipated to generally remain below 63 dB L_{Aeq} (URS , 2015). This estimation accounts for the distance from the main works and typical operational conditions. As for during the construction phase, if standard accommodation unit with closed windows and air conditioning is used, a noise reduction of roughly 30 dB(A) is expected (URS , 2015). This results in internal noise levels of 33 dB L_{Aeq} or less, which is suitable for resting and sleeping. The impact of construction noise on the mine accommodation is therefore assessed as low in significance.

Based on the predicted internal noise levels and the effective mitigation provided by the accommodation design, the significance of noise effects from decommissioning on the on-site accommodation is assessed as low.

Mitigation measures

Mitigation measures incorporated into the final design are primarily focused on controlling occupational noise on-site. This approach aims to ensure that workplace conditions remain acceptable throughout the various project phases, including construction, operation, and closure. These embedded mitigation strategies are also informed by the necessity to maintain suitable noise levels within the mine accommodation camp.

- Compliance with international noise emissions limits:
  - All major construction machinery and equipment will comply with international noise emission limits (for example European Commission Directive 2000/14/EC, modified by Directive 2024/2749) (European Parliament and Council of the European Union., 2025).
  - Noise levels at the nearest off-site receptor locations identified from the noise source remain within the reference limits established by the IFC EHS guidelines (ICF-WB, 2007)
- Good practice design and site management:
  - Implement best practice principles in both design and site management to minimise noise emissions. This includes the correct usage of machines and equipment, alongside the implementation of a regular inspections and maintenance to ensure continued efficiency and compliance.
  - Machines in intermittent use will be shut down in the intervening periods between work or throttled down to a minimum.
  - Materials will be handled with care, being placed rather than dropped. Where practicable, materials will be delivered during normal working hours to minimise disruption.

Summary of impact assessment

Table 12-24: Impact NV01 & mitigation: Noise Impacts generated by Project Activities and Equipment

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Low	Local	Short term	Negligible	High	Moderate
After mitigation	C, O, D	Negative	Direct	Low	Local	Short term	Negligible	High	Low
Embedded Mitigation measures	▪ Compliance with international noise emissions limits ▪ Good practices design and management: – Proper use of vehicles and machines with respect to minimizing noise emissions – Shut down of machines in intermittent use in the intervening periods between work – Materials will be handled with care								
Notes	1 Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure								

12.2.1.5.2 Impact NV02 & mitigation: Vibration Impacts generated by Project Activities and Equipment

Impact description

Construction

During the construction works, ground borne vibration has been assessed in relation to its potential effects on both on-site and off-site receptors. The on-site accommodation, located approximately 300 metres from the main construction activities, is expected to experience minimal vibration levels. This distance is considered sufficient to ensure that significant vibration is unlikely to be detected by occupants during the construction period.

Similarly, vibration levels at F'Derick, particularly during the construction of the rail spur, are anticipated to remain insignificant. The overall assessment indicates that the significance of vibration effects arising from construction activities is low.

Operation

Ground borne vibration (excluding that associated with blasting) is not expected to be significant for on-site sensitive receptors. This conclusion is subject to the condition that office buildings are located at a suitable distance from excavation and processing areas, and that vibration sources such as crushers are constructed with foundations designed to minimise vibration transmission. Through these precautionary measures, potential vibration impacts on sensitive locations are expected to be effectively managed.

No specific predictions have been made about vibration levels at sensitive receptors resulting from blasting activities. This is due to the fact that ground borne vibration propagation is highly influenced by local geological conditions, which can be complex and variable. Without site-specific measurement data, it is not possible to accurately predict vibration levels from blasting. However, considering the substantial separation between the mine and off-site receptors, approximately 30 kilometres to F'Derick, the only groups potentially at risk of significant effects are nomads and pastoralists who may come into close proximity to the mine site.

Accurate prediction of air overpressure is also challenging, largely due to the variable influence of prevailing weather conditions and the extensive distances involved. Nonetheless, efforts will be made to minimise air overpressure at its source through the implementation of carefully considered blast design. The mine operator will adopt appropriate blasting strategies to reduce the effects of blasting on both on-site and off-site sensitive receptors. On-site, the primary sensitive locations include office accommodation (classified as medium sensitivity) and mine accommodation facilities.

The closest off-site sensitive receptors are likely to be nomads and pastoralists, along with their livestock, who may occasionally move near to the mine site. Addressing the potential effects of blasting on these groups will be achieved through proactive community engagement and educational initiatives, which are planned as part of the Stakeholder Engagement Plan.

Decommissioning

During the decommissioning phase, ground borne vibration has also been considered. It is concluded that the on-site accommodation, which is situated approximately 300 metres from the main decommissioning activities, should not experience significant vibration levels during site closure operations.

Mitigation measures

Embedded mitigation measures

Mitigation measures incorporated into the final design include the implementation of a proper design of foundations to crushers and other potential sources of ground borne vibration.

Additional mitigation measures

The IFC Environmental, Health, and Safety (EHS) Guidelines for Mining (IFC, 2007b) outline a series of additional mitigation measures for vibration control, supplementing those already incorporated into the project design. These guidelines provide comprehensive management practices aimed at minimising emissions associated with blasting, including both ground-borne vibration and air overpressure. The following sections detail these recommended practices, all of which are applicable to activities at the mine site:

- Minimising Explosive Use: Wherever feasible, mechanical ripping should be employed in place of explosives. This approach helps to avoid or significantly reduce the reliance on explosive methods;
- Blasting Management Practices: The guidelines recommend the development and implementation of specific blasting plans, including the use of correct charging procedures and appropriate blasting ratios. Employing delayed, micro-delayed, or electronic detonators, as well as conducting specific in-situ blasting tests, can improve fragmentation and reduce ground vibrations. Notably, utilising down-hole initiation with short delay detonators has been shown to enhance fragmentation and further decrease ground vibration levels;
- Blast Design and Surveying: conduct a blasting-surfaces survey to prevent the use of over-confined charges, which can exacerbate vibration effects. Additionally, performing a drill hole survey helps to identify any deviations, allowing for blasting recalculations to ensure optimal results and minimise environmental impacts.
- Control Measures: the designing and use of a controlled and regular blast-hole layout is recommended to better manage how explosive energy is released, thereby reducing ground vibration and air overpressure impacts on nearby receptors.
- Stakeholder engagement: The implementation of a Stakeholder Engagement Plan is advised, with particular attention given to engaging with local pastoralists if necessary. Through education and dialogue, stakeholders can be made aware of blasting activities and informed about the potential effects, fostering transparency and community support.

Summary of impact assessment

Table 12-25: Impact NV02 & mitigation: Vibration Impacts generated by Project Activities and Equipment

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Low	Regional (blasting)	Short-term	Low	High	Moderate
After mitigation	C, O, D	Negative	Direct	Low	Local	Short-term	Low	High	Low*
Embedded Mitigation measures	▪ Proper design of foundations to crushers and other potential sources of ground borne vibration ▪ Shut down of machines in intermittent use in the intervening periods between work								
Additional mitigation measures	▪ Appropriate blast design ▪ Implement the Stakeholder Engagement Plan								
Notes	1 Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure *The impact significance has been modified based on expert's judgement								

12.2.1.6 Land quality and land use

The Project is situated within an active mining region, with evidence of historic mining operations located near the cities of F'Derick and Zouérate. The El Aouj deposit lies within a 50 km radius of the current SNIM iron ore mines. Although the broader area is characterised by mining activities, the immediate Project footprint remains largely undisturbed, except for some local exploration works.

Soil resources within the Project footprint are notably limited. The area is mostly comprised of aeolian sand deposits, rock outcrops, gravel, and minor pockets of sediment located in wadi channels (see section 6.6.7 – baseline).

For the successful implementation of the Project, a land area of up to 190 km² is required. This allocation is detailed in Table 4-8, section 4.2.7 (Project Description) of the document.

Land use in the Project area is primarily shaped by temporary nomadic pastoralist activities, including camel herding, seasonal grazing, and the establishment of associated camps. Pastoralists rely on the sparse vegetation and are known to graze predominantly camels around the mine site and southwards towards F'Derick. To the west of the mine site, pastoralists regularly visit the El Aouj wells (north and south) to water livestock. Additionally, salt is seasonally extracted from the Sebkha Idjill in the vicinity. Land situated around F'Derick, Touajil, and the N1 Highway experiences regular disturbance due to traffic movements, grazing, and other activities linked to these cities and infrastructures. The SNIM railway line runs close to both F'Derick and Touajil.

The Aouchich wellfield is located in a remote area with limited soil resource. Land use patterns within the wellfield footprint are dominated by temporary nomadic pastoralist activities (camel herding, seasonal grazing, and associated camps). Pastoralists are dependent on the sparse vegetation and are known to graze, predominantly camels, in the area around the wellfield. Land in and around the wellfield is known as a good grazing area for livestock and pastoralists water livestock at the hand dug wells of Aouchich, Boutaha North, Loulecisse and Akreygit located within the wellfield area.

Key Receptors identified

The land quality and land use impact assessment has focused on several primary receptors that may be affected by Project activities:

- Soil Resources: the PAoI includes soil that may be disturbed during the implementation of the Project.
- Permanent Settlements: Communities in the vicinity of the Project footprint, specifically F'Derick, Zouérate, and Touajil, have been considered due to their proximity and potential exposure to Project-related changes.
- Temporary and Nomadic Pastoralist Activities: Semi-nomadic and nomadic pastoralist activities and dwellings within the PAoi represent another key receptor group.
- Salt Extraction Works: Ongoing salt extraction operations at Sebkha Idjill have also been considered in the assessment.

12.2.1.6.1 Impact LQU01 & mitigation: Impacts on Land Quality

Potential impacts on land quality can result from the **construction**, **operation** and **closure** phases of the mining operation, including related wellfield power and pumping facilities, and project-wide construction activities.

Impact description

Erosion and Loss of soil

Activities such as site clearance, excavations, earthworks, material stockpiling, vehicle movements, drilling of boreholes and maintenance works (including access road maintenance) have the potential to disturb the ground, leading to erosion and the loss or movement of soil. This can occur due to wind or periodic surface water runoff. The issue is further exacerbated where vegetation such as trees, shrubs and grasses is cleared, which otherwise provides limited ground stability, especially in wadis.

Ground Compaction

Off-road vehicle movements across the site can result in the compaction of the ground. This compaction can affect the structure and permeability of the soil, potentially influencing drainage and vegetation regrowth.

Flow disruption and increase of erosion

The rail spur, mine access road, water supply pipeline and some mine site infrastructure (such as the tailings disposal area) will cross existing wadis and smaller channels. Such crossings have the potential to disrupt flows and increase erosion.

Land Contamination

The accidental discharge or spillage of pollutants, improper disposal of non-mining waste during all phases of the mine life, and activities associated with the decommissioning and removal of infrastructure (particularly in areas such as the power plant and fuel/oil/chemical storage facilities) can lead to land contamination.

The extent of land contamination will depend on factors such as the type of pollutant released, the quantity and timing of the release, and the sensitivity of the receiving environment. The most significant impacts are expected from large-scale releases of pollutants with high environmental toxicity or resistance to degradation, such as heavy fuel oil.

Without mitigation, large-scale pollutant releases and land erosion/loss could result in long-term effects of moderate significance.

Domestic waste generated at the mine site, as well as in the city of El Aouj, will be collected and managed by the entity overseeing the landfill at F'Derick. Inadequate handling of this waste may result in substantial, long-term soil contamination.

Generally, the site environment is of low sensitivity due to the lack of soils, vegetation and groundwater. Wadi channels, however, are considered more sensitive, as accumulated soil can enhance vegetation growth and pollutants may be carried by intermittent rainfall down the channels or seep into groundwater. Despite their heightened sensitivity, the overall risk remains low due to the infrequent flow events in wadis.

Mitigation measures

Embedded mitigation measures to prevent soil disturbance and erosion

- Mine infrastructures footprint: the project has been designed to minimise the operational footprint as far as practicable, thereby reducing ground disturbance and vegetation clearance.
- Construction and Formalisation of Access Road: the access road leading to the mine site will be formalised and paved after construction. This strategy promotes the use of a single roadway from F'Derick to the mine site, effectively discouraging traffic from creating and using multiple desert tracks, thereby protecting

surrounding land from further disturbance. The access roads will be clearly marked including the display of defined speed limits for construction and operational vehicles, and graded appropriately to minimise erosion.

- runoff & erosion management: to mitigate impacts of infrastructures crossing sensitive areas, culverts and/or drains will be installed to capture and divert infrequent stormwater runoff. Ongoing monitoring and maintenance of these culverts and drains will further reduce the risk of erosion.

Embedded measures to prevent land contamination

- Wastewater Treatment and Reuse: A wastewater treatment plant (WWTP) will be constructed to treat all sewage effluents from the mine site and the El Aouj city at F'Derick. Treated solid waste will be disposed of in the landfill, while treated liquid waste will be used to irrigate the proposed palm grove. Management of the WWTP and disposal processes will follow good site practices and adhere to international standards, such as the IFC EHS Effluent Guidelines (ICF-WB, 2007).

Additional mitigation measures proposed to prevent erosion and land contamination

- Pollution Prevention and Control: robust procedures will be established for the prevention, identification, control, and monitoring of pollutants, as well as the management of accidental discharges and spills. Spill containment and clean-up equipment will be available and maintained during all phases of the Project;
- Emergency Preparedness and Response: the Project will include the development and implementation of an Emergency Preparedness and Response Management Plan, together with associated procedures. This will ensure a coordinated and effective response in the event of environmental incidents. All employees will receive training in emergency and spill response procedures, environmental awareness, and safe driving practices. This will help to ensure that all mitigation measures are effectively implemented and maintained
- Monitoring and Remediation of Contaminated land: regular monitoring of areas used for fuel and chemical storage will be carried out. If soil contamination is suspected as a result of Project activities, a visual inspection will be performed, followed by chemical testing if necessary. Any contaminated ground material will be remediated, recorded and monitored (see EPRP).
- Non-Mineral Waste Management: all waste generated during the Project, including both hazardous and non-hazardous materials, will be stored, handled, and disposed of in accordance with the Non-mining Waste Management Plan. Waste management facilities will be designed and operated following good site practices and international standards. EMC will ensure that any entity overseeing the waste collection and disposal has the necessary authorizations and technical capabilities (controlled access, covering, protection against contamination), including domestic waste management. At Project closure, all hazardous waste will be removed from the site.
- Mine Closure Management Plan: The mine closure plan details every step needed to ensure that mining-affected areas are properly graded and free of chemical contamination. Land rehabilitation will generally be minimal; in most cases, disturbed ground will not be restored, especially in major landforms like the open-pit, waste dump, and tailings disposal area, which will remain as they are. After decommissioning, some infrastructure such as mine site roads that aren't needed post-closure will undergo rehabilitation—these will be loosened, regraded to blend with the local landscape, and topped with sand sourced from the site, in line with the specific guidelines outlined in the detailed Conceptual Mine Closure Plan.

Even with effective implementation of mitigation measures, some potential for erosion, loss of soil and land contamination remains within the project footprint. However, these residual impacts are not expected to be significant. The magnitude of potential impacts will be reduced, resulting in residual land quality impacts that are long term and of low significance throughout all phases of the project.

Summary of impact assessment

Table 12-26: Impact LQU01 & mitigation: Impacts on Land Quality

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Negative	Moderate	Local	Long term	Moderate	Low	Moderate
After mitigation	C, O, D	Negative	Negative	Low	Project site	Long term	Low	Low	Low
Embedded Mitigation measures	▪ Minimisation of the Project footprint and soil disturbance ▪ Mine access road construction / traffic management ▪ Installation / maintenance of culverts/ drainage ▪ Wastewater treatment								
Additional Mitigation measures	▪ Good practice prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment ▪ Implement the Emergency Preparedness and Response Plan, including training ▪ Implement the Non-Mining Waste Management Plan ▪ Implement the detailed Mine Closure Plan, ▪ Environmental awareness and driver training								
Notes	1 Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure								

12.2.1.6.2 Impact LQU02 & mitigation: Impacts on Land Use

Potential impacts on land use can result from the **construction**, **operation** and **closure** phases of the mining operation, including project-wide construction activities.

Impact description

Construction and operation phases

- Concentration of traffic zones: A new road will be constructed between the mine site and F'Derick, which will facilitate the movement of vehicles along a single corridor, replacing the multiple tracks currently in use. This represents a permanent change in land use, but it is anticipated to yield a positive outcome: by concentrating vehicle movements to one road, vegetation will be able to passively re-colonise previously tracked land, potentially increasing the grazing area available to nomadic pastoralists. This benefit will persist even after the closure of the mine.

- Effects of In-Migration and Settlement Expansion: The construction of residences in F'Derick to house mine workers, as well as the possible in-migration of opportunity seekers, is expected to lead to both planned and unplanned expansion of the F'Derick town. This expansion will likely result in increased pressure on local natural resources, particularly grazing land near F'Derick. It is anticipated that this may also lead to the establishment of permanent or temporary nomadic pastoralist camps in the Project area, especially near outlet taps installed on the raw water pipeline for livestock watering. The assessment of the mentioned potential impact is further detailed in sections 12.2.1.9.5 (SOC05) - 12.2.1.10 (SOC06) and 12.2.1.11 (SOC07 & SOC08).

- Burying Water Pipelines: both raw and potable water pipelines will be located beneath the ground. Excavated materials during installation will be reused as backfill, minimising waste. By burying the pipelines, the movement of vehicles, pastoralists, and animals remains unhindered, ensuring continued access and mobility in the area. This impact is considered as negligible and is not further assessed.

- Solar plants at the wellfields: the surface of solar panels to be built at each wellfield is estimated to 360m² per borehole. At Touajil; none of the well are located within a grazing area. At Aouchich, 6 out of 7 boreholes are located in a rocky ground without grazing land. Only one borehole (SP30: Figure below) is currently located within a wadi near a grazing area.

Figure 12-5: Borehole SP30 in Aouchich wellfield

Decommissioning

At the closure stage, some infrastructure at the mine site will be decommissioned, dismantled, and removed in accordance with the detailed Mine Closure Plan. Contaminated soils will be remediated, foundations will be broken up and covered, and land will be re-graded as necessary. Once closure activities are complete, vegetation is expected to passively re-colonise the area over several years, restoring land for livestock grazing. Additional mitigations measures are proposed to optimize the vegetation recolonisation (see section 12.2.1.8.2 - EB01) Nevertheless, certain areas—including the open-pit, waste dump, tailings disposal sites, wellfields installation at Touajil and Aouchich)—will remain in place, resulting in permanent changes to land use in these parts of the Project area.

Mitigation measures

Embedded mitigation measures to prevent land use disruption

- Mine infrastructures footprint: the project has been designed to minimise the operational footprint as far as practicable, thereby reducing ground disturbance and vegetation clearance.
- Construction and Formalisation of Access Roads: the access road leading to the mine site will be formalised and paved after construction. This strategy promotes the use of a single roadway from F'Derick to the mine site, effectively discouraging traffic from creating and using multiple desert tracks, thereby protecting surrounding land from further disturbance. The access roads (mine site and wellfields) will be clearly marked, including the display of defined speed limits for construction and operational vehicles.

Additional mitigation measures to prevent land use disruption

- Stakeholder Engagement: Stakeholder engagement will be an ongoing process, carried out in accordance with the Stakeholder Engagement Plan. This will ensure that local communities and other stakeholders are kept informed and their concerns are addressed throughout the Project.
- Mine Closure Management Plan: The mine closure plan will outline all necessary actions to ensure that areas affected by mining activities are properly graded and let in a position prone to support revegetation or restoring initial land use.

Summary of impact assessment

Table 12-27: Impact LQU02 & mitigation: Impacts on Land Use

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Negative	Moderate	Local	Long term	Moderate	Low	Moderate
After mitigation	C, O, D	Negative	Negative	Low	Local	Short term	Low	Low	Low
Embedded Mitigation measures	▪ Minimisation of the Project footprint and soil disturbance ▪ Mine access road construction / traffic management								
Additional mitigation measures	▪ Implement the Stakeholder Engagement Plan ▪ Implement the detailed Mine Closure Plan, including the revegetation Plan (EB01a)								
Notes	1 Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure								

12.2.1.7 Landscape and visual

“Summary of the impact assessment conducted by URS in 2015.”

The landscape and visual assessment aims to provide a thorough understanding of both the landscape and visual context within the Project Area of Influence (PAI). This involves examining the constituent elements, character, spatial variations, geographic extent, and condition of the landscape, as well as how it is experienced and valued. The visual assessment seeks to establish the potential visibility of the Project, identify affected groups (receptors), determine impacted locations, and evaluate the nature of existing views and visual amenity at these points.

Definitions for the Assessment

- Landscape effects: These are effects on the landscape itself, treated as a resource or receptor in its own right.
- Visual effects: These refer to changes in specific views and the general visual amenity experienced by people.

Study Area Definition

The study area for this assessment is defined by the Project footprint and includes the mine site area, water pipelines, Touajil and Aouchich wellfields, rail spur, mine access road, worker residences in F’Derick, and areas determined by professional judgement regarding potential visibility of the Project components and anticipated changes to the baseline landscape and visual context.

Landscape Character Areas (LCAs)

Within the study area, 14 landscape character areas (LCAs) have been identified, primarily based on landform, land use, geological, and ecological characteristics. The sensitivity of each LCA to the Project has been determined by assessing both its susceptibility to Project impacts and its inherent value, as detailed in Table below. Sensitivity reflects the landscape's inherent characteristics compared to the proposed development, independent of human receptors or users.

Table 12-28: Landscape character Areas (URS, 2015: modified)

Ref.	LCA	Susceptibility / value	Sensitivity
LCA 01	Tiris Zemmour Sandy Plains/ Regs	Low susceptibility/ low value	Low
LCA 02	Kedia Idjill Plateau	Low susceptibility/ low value	Low
LCA 03	F'Derick Town	Moderate susceptibility/ moderate value	Moderate
LCA 04	Tiris Zemmour Guelbs	Moderate susceptibility/ moderate value	High
LCA 05	Azefal Dunes	Low susceptibility/ moderate value	Low
LCA 06	Desert Wadis	Low susceptibility/ high value	Moderate
LCA 07	Sebkha Idjill	Low susceptibility/ moderate value	Low
LCA 08	El Hammami Stable Dunes	Low susceptibility/ moderate value	Low
LCA 09	El Hammami Sandy Plains	Low susceptibility/ low value	Low
LCA 10	Zouérate Stable Dunes	Low susceptibility/ moderate value	Low
LCA 11	Zouérate Town	Low susceptibility/ moderate value	Low
LCA 12	El Atgâne / Rgouga Dunes	Low susceptibility/ moderate value	Low
LCA 13	Sbaa Akrejit / Tatrar / El Hereichat cliffs	Low susceptibility/ high value	Moderate
LCA 14	Sebkha Bou Talha	Low susceptibility/ moderate value	Low

LCAs of low sensitivity are formed from landscape character types abundant throughout Mauritania, and are neither scarce locally, regionally, nor nationally. Many of these LCAs are also distant from the site. The Project will directly and indirectly affect only a minimal fraction of these LCAs; therefore, further assessment of Project effects on landscape character is omitted from this Landscape and Visual Impact Assessment (LVIA).

There will be no significant visibility of the mine site from F'Derick, so it will not impact the character of F'Derick. Similarly, the expansion of F'Derick town, if managed with appropriate mitigation measures—such as Mauritanian-style housing and community consultation in accordance with the Stakeholder Engagement Plan—is unlikely to have a significant adverse effect on the character of **LCA 03** F'Derick Town. Instead, this expansion is considered potentially beneficial, due to the development of worker residences and the resultant rejuvenation of F'Derick. It is recommended that this beneficial effect be enhanced by EMC support of regional and local authorities in urban planning.

LCA 06, Desert Wadis, is judged to have moderate sensitivity to the Project. However, embedded mitigation measures, particularly buried water pipelines for water management, are expected to prevent significant indirect effects on landscape character resulting from changes to water supply in the wadis near the mine site, F'Derick worker residences, the mine access road, rail spur, and water pipelines. Accordingly, further assessment is not included in this assessment.

The Aouchich wellfield is situated in a flat area at an altitude of 250 metres above sea level, within a plain bordered by the Sbaa Akrejit / Tatrar / El Hereichat cliffs (**LCA 13**), which mark the edge of a vast elevated rocky plateau covered by dunes, reaching an altitude of 450 metres above sea level. The rarity of these cliffs within the region enhances their prominence and significance as key features of the landscape. The wellfield will be developed 200 m below the plateau at a minimum of 3km from the cliffs and will therefore not significantly affect the landscape character due to its small and scattered infrastructure. As a result, this LCA will not undergo any additional evaluation.

The Aouchich wellfield is situated in a flat area at an altitude of 250 metres above sea level, approximately 3 kilometres from the Sbaa Akrejit / Tatrar / El Hereichat cliffs (**LCA 13**), which mark the edge of a vast elevated dune plateau reaching an altitude of 450 metres above sea level. These cliffs serve as significant features within the landscape due to their scarcity in the region, contributing to their notable value. The configuration of the wellfield located 200 m below this plateau will prevent significant indirect effects on landscape character resulting from the wellfield installations composed of scares and largely spread infrastructures of small dimension. Further assessment is therefore not considered for this LCA.

As a result, the landscape assessment is focused on effects on **LCA 04** Tiris Zemmour Guelbs from the mine site. LCA 04 Tiris Zemmour Guelbs is assessed as having moderate sensitivity to the Project.

Visual Assessment

For the visual assessment, nine representative viewpoints have been selected to illustrate the range of views of various Project components from surrounding locations or to demonstrate the absence of a view (URS , 2015). In the open landscape, primary visual receptors include isolated temporary nomadic settlements, routes used by nomads, users of the El Aouj wells at Hassie El Aouj, and the Sebkha Idjill salt works. Visibility of the mine site from larger settlements, such as Zouérate, is limited to very distant, long views from upper storeys or roofs.

For each viewpoint, the sensitivity of the receptor has been identified by URS (URS , 2015). Details of receptor locations, their susceptibility to the Project, the value of existing views, and their sensitivity are provided in the following Table.

Table 12-29: Viewpoints of the Project (URS,2015)(

Ref.	LCA	Susceptibility / value	Sensitivity
VP01	Adjacent to SNIM railway	Low susceptibility/ moderate value	Low
VP02	North of F'Derick	Low susceptibility/ moderate value	Low
VP03	Hassie El Aouj	Moderate susceptibility/ moderate value	Moderate
VP04	Sebkha Idjill salt works	Low susceptibility/ moderate value	Low
VP05	East of Guelb el Aouj	Low susceptibility/ moderate value	Low
VP06	South of F'Derick	Moderate susceptibility/ moderate value	Moderate
VP07	Northeast edge of Zouérate	Low susceptibility/ low value	Low
VP08	Road between Zouérate and F'Derick	Low susceptibility/ moderate value	Low
VP09	Zouérate Town	Low susceptibility/ low value	Low

For viewpoints with low sensitivity—VP 01, VP 02, VP 07, VP 08, and VP 09—the extent and type of changes in the view are not expected to have a significant impact on visual amenity (URS , 2015). As a result, no further evaluation of Project effects at these locations is included. Likewise, assessments indicate that the mine access

road, rail spur, and buried water pipelines are unlikely to significantly affect visual amenity, so additional review of these elements is not provided.

The visual assessment mainly examines potential impacts at viewpoints VP 03 (Hassie El Aouj) and VP 04 (Sebkha Idjill Salt Works). Additional effects have been evaluated at VP 05, located east of Guelb El Aouj near the mine, and VP 06, south of F'Derick, related to new worker housing and expansion in F'Derick. While the impact at VP 05 is significant, it will affect only a small group of people. The effects at VP 06 are considered negative but not substantial due to the existing conditions and context. 04 (Sebkha Idjill Salt Works). Effects at VP 05, east of Guelb El Aouj from the mine site, and VP 06, south of F'Derick from the establishment of worker residences and expansion of F'Derick, have been assessed. It is considered that effects at VP 05, while significant, will only be experienced by a very small number of people. Effects at VP 06 are assessed to be adverse but not significant (URS , 2015).

12.2.1.7.1 Impact LV01 & mitigation: Effects on Landscape Character of LCA 04 Tiris Zemmour Guelbs

The Project is anticipated to affect the landscape character of Tiris Zemmour Guelbs (LCA 04) primarily through the partial removal of the Guelb El Aouj East and the establishment of waste dumps. These changes are expected to alter the existing physical and aesthetic qualities of the area.

Impact description

Direct Impacts of Mine Development

The planned mine site development and operation will directly affect Guelb el Aouj East through the partial removal of the guelb and the placement of a mine waste dump adjacent to it during both construction and operational phases. This modification is illustrated in Figure 6.6.

Landscape Characteristics and Value

The mine site is located at the easternmost of four guelbs, which together form the distinctive landform of Guelb el Aouj. These guelbs are steep-sided hills, generally darker in colour compared to the surrounding flat sandy plains, and rise to become prominent landmarks within the landscape. The side slopes of the guelbs typically range from 1:2 to 1:4, but can be even steeper in certain areas (URS , 2015).

Guelb El Aouj serves as a notable landmark and viewpoint, aiding navigation through the open desert. It is usually observed alongside other landforms such as Kedia Idjill and additional guelbs. From an aesthetic perspective, the guelbs provide visual interest to otherwise broad, featureless panoramas. These landforms are regarded as characteristic natural features, valued for their topographical and aesthetic qualities on a local scale. Overall, LCA 04 is considered to have local value (URS , 2015).

Magnitude and Nature of Landscape Change

Mining activities will result in a direct adverse alteration to the character of LCA 04, including substantial modification and partial removal of Guelb el Aouj East. The magnitude of this change is assessed as moderate at the local scale of Guelb el Aouj East, but low overall for LCA 04, taking into account the scale of the project relative to the region's unmodified natural landforms. Guelb el Aouj Centre and Guelb el Aouj West, along with other guelbs in Tiris Zemmour, will remain intact. Therefore, the partial loss of Guelb el Aouj East and the introduction of the engineered waste dump landform are somewhat offset by the retention of similar landform features throughout the broader LCA 04 Tiris Zemmour Guelbs area (URS , 2015).

Navigation by nomads in the desert will not be significantly impacted by these landform changes, although the new landforms will be lower than the existing peaks of the guelbs (URS , 2015).

Impacts during the construction phase will be short term, whereas effects following construction will be long term and persist post-closure.

The change in landscape character will be locally significant, but it will not be significant at the regional level.

Mitigation measures

Embedded Mitigation Measures

Several embedded mitigation strategies have been identified to reduce, though not fully mitigate, impacts on the landscape character of LCA 04. These include:

- Minimising the project footprint and disturbance through careful design, retaining elements of the existing El Aouj East landform within the final site profile, albeit in a much modified state.
- Designing the waste dump area, plant, ancillary facilities, and tailings disposal area to facilitate natural re-vegetation.
- Ripping, re-grading, and covering all site roads not required for post-closure activities with site-sourced sand to blend with the local topography.
- Transport of the product will use the existing railway line with a rail spur and sidings to the Mine site minimising the need for additional infrastructure impacting landscape character.
- EMC will seek the assistance from the Authorities in relation to the allocation of land adjacent to F'Derick so that the planned development of worker residences is integrated into the town. Housing for workers at F'Derick will be of a Mauritanian style which incorporates local vernacular features.
- Buried raw and potable water pipelines minimize change in landscape character over approximately 110 km length.

Summary of impact assessment

Table 12-30: Impact LV01 & mitigation: Effects on Landscape Character of LCA 04 Tiris Zemmour Guelbs

Impact Assessment	General description of the impact			Determination of Magnitude		Determination of significance			
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Moderate	Local	Long term	Moderate	Moderate	Moderate
After mitigation	C, O, D	Negative	Direct	Low	Local	Long term	Low	Moderate	Low
Embedded Mitigation measures	■ Minimisation of project footprint ■ Encouragement of natural re-vegetation ■ Controlled vehicle access through the landscape effects on character/ vegetation ■ All site roads, including access roads, service required for post closure activities, will be ripped, re-graded to local topography and covered with a layer of site								
Additional mitigation measures	Implement the detailed Mine Closure Plan								
Notes	1 Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure								

12.2.1.7.2 Impact LV02 & mitigation: Effects on Views at VP 03 Hassie el Aouj and VP 04 Sebkha Idjill Salt Works

The development of the mine will impact visual amenity at specific viewpoints, notably Hassie el Aouj (Viewpoint 03) and Sebkha Idjill Salt Works (Viewpoint 04). These impacts are associated with changes in the views and scenic value experienced from these locations as a result of the mining activities.

Impact description

Alterations to the Landscape

The mine site will notably alter the nature of the views from El Aouj and the Sebkha Idjill salt works. Key changes are primarily due to the visibility of the waste dump area and the mining activities within Guelb El Aouj East, which will become part of the background landscape as seen from these viewpoints. Additionally, at the salt works (VP 04), the tailings disposal area and the access road or rail spur may also be visible. However, at the El Aouj wells, these project elements will be hidden by intervening local topography (URS , 2015).

Visibility of Project Components

The main visual changes will involve a major modification of the topography to the east of Guelb el Aouj, along with the creation of new significant landform features in the waste dump area, which will be visible to the south and southeast of the Guelb el Aouj center. Furthermore, the open-pit will be located at the heart of Guelb el Aouj East, beneath the surrounding landform, so it will not be visible from any observation point.

It is anticipated that the processing plant and mine accommodation will not be visible from either of these viewpoints. This is due to their positioning behind the eastern arm of Guelb El Aouj East. Furthermore, the access road and rail spur are unlikely to be visible because of their distance from the viewpoints and their relatively low height (URS , 2015).

Mitigation measures

Embedded Mitigation Measures

Several embedded mitigation strategies have been identified to reduce, though not fully mitigate, impacts on the landscape character of LCA 04. These include:

- Minimising the project footprint and disturbance through careful design, retaining elements of the existing El Aouj East landform within the final site profile, albeit in a much modified state.
- Designing the waste dump area, plant, ancillary facilities, and tailings disposal area to facilitate natural re-vegetation.
- use of water to dampen down materials and dust generating activities
- Ripping, re-grading, and covering all site roads not required for post-closure activities with site-sourced sand to blend with the local topography.

Additional Mitigation Measures

- Implement the detailed mine closure Plan

Summary of impact assessment

Table 12-31: Impact LV02 & mitigation: Effects on Views at VP 03 Hassie El Aouj and VP 04 Sebkha Idjill Salt Works

Impact Assessment	General description of the impact			Determination of Magnitude		Determination of significance			
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Low	Local	Long term	Low	Moderate	Low
After mitigation	C, O, D	Negative	Direct	Low	Local	Long term	Low	Moderate	Low
Embedded Mitigation measures	▪ Minimisation of Project footprint ▪ Encouragement of natural re-vegetation, wherever practicable ▪ Dust suppression on roads by water trucks and on stockpiles ▪ Controlled vehicle access through the landscape will reduce detrimental effects on character/ vegetation ▪ All site roads, including access roads, service roads and haul roads, not required for post closure activities, will be ripped, re-graded to local topography and covered with a layer of site sourced sand								
Additional Mitigation measures	▪ Implement the detailed Mine Closure Plan								
Notes	1 Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure								

12.2.1.8 Ecology and biodiversity

Project components include the development of an open pit mine, access roads, storage and/or disposal areas for ore, waste rock, tailings, and explosives, ore processing facilities, power generating facilities and associated power line, a rail spur, water wells, water pipelines, water treatment facilities, a dam, waste disposal facilities, accommodations for workers, and the construction of El Aouj city. Project activities will include site clearing (removal of vegetation), earthworks (excavating, backfilling, grading, and levelling), the presence and movement of heavy machinery, vehicles, and trains, the presence of workers, the construction of long-term buildings and infrastructure, and ore extraction, processing, and transportation. Project activities are likely to result in:

- Loss, degradation, and fragmentation of natural habitats, including vegetated and non-vegetated natural habitats, due to site clearing, earthworks, facility construction, and dust deposition.
- Removal of protected trees and grasses (i.e., loss of individual plants) before the start of the levelling and construction works, degradation of tree habitats due to the dust deposition, and tree habitat fragmentation resulting from the construction of infrastructure and land occupation.
- Degradation of habitats and sensory disturbance of threatened bird species as a result of noise, vibration, lights, and dust.

Most receptors considered are the same as those assessed in the 2015 ESIA (URS 2015). This impact assessment is based on the biological baseline drawn from a literature review and two field missions conducted by WSP in May 2023 (dry season) and October 2024 (wet season) to update biological field data collected in 2012 and 2013 as part of the 2015 ESIA.

The 2015 ESIA assessed 3 main impacts:

- EB01: Loss of legally protected trees
- EB02: Loss of legally protected grass

- EB03: Potential impacts on African Houbara (*Chlamydotis undulata*)

Based on the updated field surveys, the assessment of impacts was updated to include:

- EB04: Natural habitat loss, degradation and fragmentation
- EB01: Loss and degradation of legally protected flora (this impact includes trees and grass).
- EB03: Impacts on bird species of conservation concern

These impacts are described and assessed in the sections below.

12.2.1.8.1 Impact EB04 & mitigation: Natural Habitat Loss, Degradation and Fragmentation

Based on the habitat assessment, almost 90% of the habitats recorded within the Project area qualify as natural habitats according to IFC criteria and local expert judgement. Given their overwhelming predominance, the habitats surrounding the Project are considered natural for the purposes of the impact assessment. In the following chapters, the term modified habitats will be used exclusively to designate habitats that have been significantly altered by anthropogenic activities. Six natural habitat types were identified in the Mine area: dhayas, dunes, ravines, regs, and wadis.

Table 7-11 summarizes the extent of natural and modified habitat types in the Project footprint and within the surrounding AoI.

Table 12-32: Area summary of habitats overlapping the project footprint and the project area of influence

Habitat types	Project footprint overlapping natural habitats (ha)	Project AoI overlapping natural habitats (ha)
Dunes	12	9,260
Guelbs	219.5	575.6
Ravines	1,187.5	3,595.5
Regs	460.2	43,336.6
Wadis	80.43	50,885
Sebkhra	1.5	4,662.25
Total	1,961.13	112,315

The Project footprint overlaps 1,961.13 ha of natural habitats, resulting in the permanent loss of this area. Losses will mainly constitute in ravines and regs. The Project AoI overlaps an additional 110,354 ha of natural habitats, which are expected to be degraded to varying extents from dust deposition and increased sensory disturbance. These changes will negatively impact habitat quantity and quality for wildlife. The changes could also impact potential habitat corridors if animal movement across the Mine area is constrained. The loss of vegetated areas will reduce the habitat function for wildlife like shading, ambient humidity, food resources and nesting/breading/feeding areas. Further, the loss of vegetated natural habitats can exacerbate the existing pressures on vegetation, including grazing pressure and climate change. The types of natural habitats present in the Mine area are broadly distributed across the region, and none are identified as holding special conservation value at the regional or national scales. Natural habitats are considered ecologically important at

the local scale and there are anticipated challenges involved in restoring vegetation in desert ecosystems. Natural habitats are therefore considered as a **moderate sensitivity receptor**.

Impact description

Construction

During construction, the main impacts on habitats will be:

- Loss, degradation and fragmentation of natural habitats. During the construction phase, vegetation will be cleared, and ground will be levelled in areas where infrastructure and facilities will be installed in the Mine area (including power plant, explosive depot, solar plant, El Aouj city, and the wellfields of Touajil). The total direct loss of habitats from Project construction is estimated at 1,961.13 ha (Figure 12-7, Figure 12-8, Figure 12-9, Figure 12-10). This estimate includes areas with a wide range of vegetation ground cover. On average, across all habitat types, the proportion of vegetation coverage is approximately 33%.

  During the construction phase, heavy machinery, and construction vehicle traffic as well as site preparation activities in the Project footprint will cause indirect physical degradation of natural habitats. In particular, the production of dust will result in an increase in dust deposition and will decrease habitat quality in areas close to construction sites. As described in Section 12.2.1.3.1 (Air Quality), the majority of airborne particles produced during construction are likely to settle and deposit within 1 km of emission sources. Furthermore, habitat degradation caused by increased noise, light, vibrations and human presence could reduce the ecological functions of these habitats, notably their capacity to support local fauna. Approximately 110,354 ha of natural habitats are expected to be degraded outside the Project footprint.

  The risk of habitat degradation from the introduction of non-native invasive plant species is considered negligible. No invasive species were observed during field surveys, and none were identified as part of the baseline literature review. Few non-native species have the specialized adaptions required to establish and survive in the arid habitats of the mine AoI.

  Project activities will increase the risk of soil contamination, both from the storage of material or heavy equipment and the potential for accidental hydrocarbon spills. The presence of fuel-powered machinery and vehicles also introduces additional sources of pollution from exhaust emissions. Together, these pollutants may adversely affect habitats if they contaminate the soil or infiltrate groundwater.

  The construction of infrastructure like roads and railways will result in habitat fragmentation and a reduction of connectivity for fauna. Fragmentation impacts from the water pipeline are predicted during the active construction period only. Fragmentation effects are expected to be negligible afterwards because the pipeline will be buried and the habitats are already open and sparely vegetated at baseline.

  Unplanned population influx may also indirectly influence the quantity and quality of natural habitats, if informal settlements are established. These could increase natural habitat conversion (habitat loss) and increase demand for grazing of livestock in vegetated areas (habitat degradation).

  These changes will result in negative direct and indirect effects for habitat loss and fragmentation, and degradation, respectively. Impact on habitats will have a moderate intensity, a regional extent and a long-term duration leading to a **moderate impact magnitude**.

  As the sensitivity was defined to be moderate and the magnitude to be moderate, the impact is of **moderate negative significance.**

Operation

During operation of the mining site, the main impacts on habitats will be:

- Loss, degradation and fragmentation of natural habitats. The habitat loss amounts to 1,961.13 ha. This includes the mine pit, waste dump, tailings area and wellfields of Aouchich.

  Habitat degradation during the operational phase will be a continuation of the degradation that occurred during the construction phase. Degradation impacts will increase relative to the construction phase. There will be an increase in dust emissions resulting from ore extraction, processing, and load out. This will increase the dust deposition in the nearby habitats. Sensory disturbance (noise and vibration) from blasting and ore extraction is also expected to increase, which may reduce the suitability of nearby habitats for fauna. The risk of accidental hydrocarbon spills and emission of pollutants will persist during operation, attributable to the movement refueling and maintenance of vehicles and heavy equipment and the operation of the ore processing facility and the thermal power plant. The area of natural habitat degradation is estimated to be 110,354 ha.

  Habitats will remain fragmented during the operational phase as the infrastructure will be present and will carry increased traffic levels, relative to baseline conditions. Fragmentation effects will increase incrementally during operation as the open pit mine is developed, creating a local movement barrier for some less mobile fauna species.

  The risk of unplanned population influx will continue during operation, which could lead to further habitat conversion and/or habitat degradation.

  These effects will result in negative direct and indirect impacts on habitats with a moderate intensity, a local geographical extent and a long-term duration leading to a **moderate impact magnitude**.

  As the sensitivity was defined to be moderate and the magnitude to be moderate, the impact is of **moderate negative significance.**

- Habitat creation: The water pipeline will be equipped with release valves every 5 km (i.e., 34 locations) along the entire length of the pipeline. This will result in the release of an important amount of water, likely to generate small oases at some of those release valves stations. The effect could be similar to what is already observed along the water pipeline feeding the Guelb El Rhein from the Tarf Srey wellfield, where water inputs resulted in new habitat creation (Figure 12-6). These pressure release valves along the water pipeline will redistribute water resources in the Project area and allow for vegetation, including trees, to establish. The composition of this newly established vegetation remains uncertain, in particular it is uncertain if nationally protected tree species will grow in these areas. The regular availability of water could increase the chance that non-native invasive species could establish around the release valves; however, the potential for these species to spread beyond the watered areas would be very limited.

This will result in a positive and indirect impact on habitats with a low intensity, a project-site extent even if the benefits for fauna could be local scale as this would attract animals to the site and a long-term duration leading to a **low impact magnitude**.

Figure 12-6: Example of Small-Scale Oasis in the Project Region, Established Around the Water Pipeline for the Guelb El Rhein Mine.

Decommissioning

During decommissioning of the mining site, the main impacts on habitats will be:

- Habitat recolonisation and improved habitat connectivity. After the decommissioning phase, the removal of facilities and infrastructure will enable vegetation to progressively recolonize the available areas. The likelihood of natural revegetation success following decommissioning is highly uncertain and would involve important time lags for the re-establishment of woody vegetation associated with some natural habitats. Without targeted revegetation efforts, the natural re-establishment of vegetation is highly uncertain; therefore, the Project will implement rehabilitation measures as defined in the Revegetation Plan during the decommissioning phase. As described for the construction phase, the risk of introducing or spreading invasive plant species is considered negligible.

  The removal of some infrastructure will improve connectivity of natural habitat, resulting in a minor impact magnitude.

  The decommissioning phase will result in a positive direct impact on the habitat with a low intensity as the land will be available again in the Project site and with a permanent duration, leading to a **low impact magnitude**.

Figure 12-7: Habitat loss – Mine area

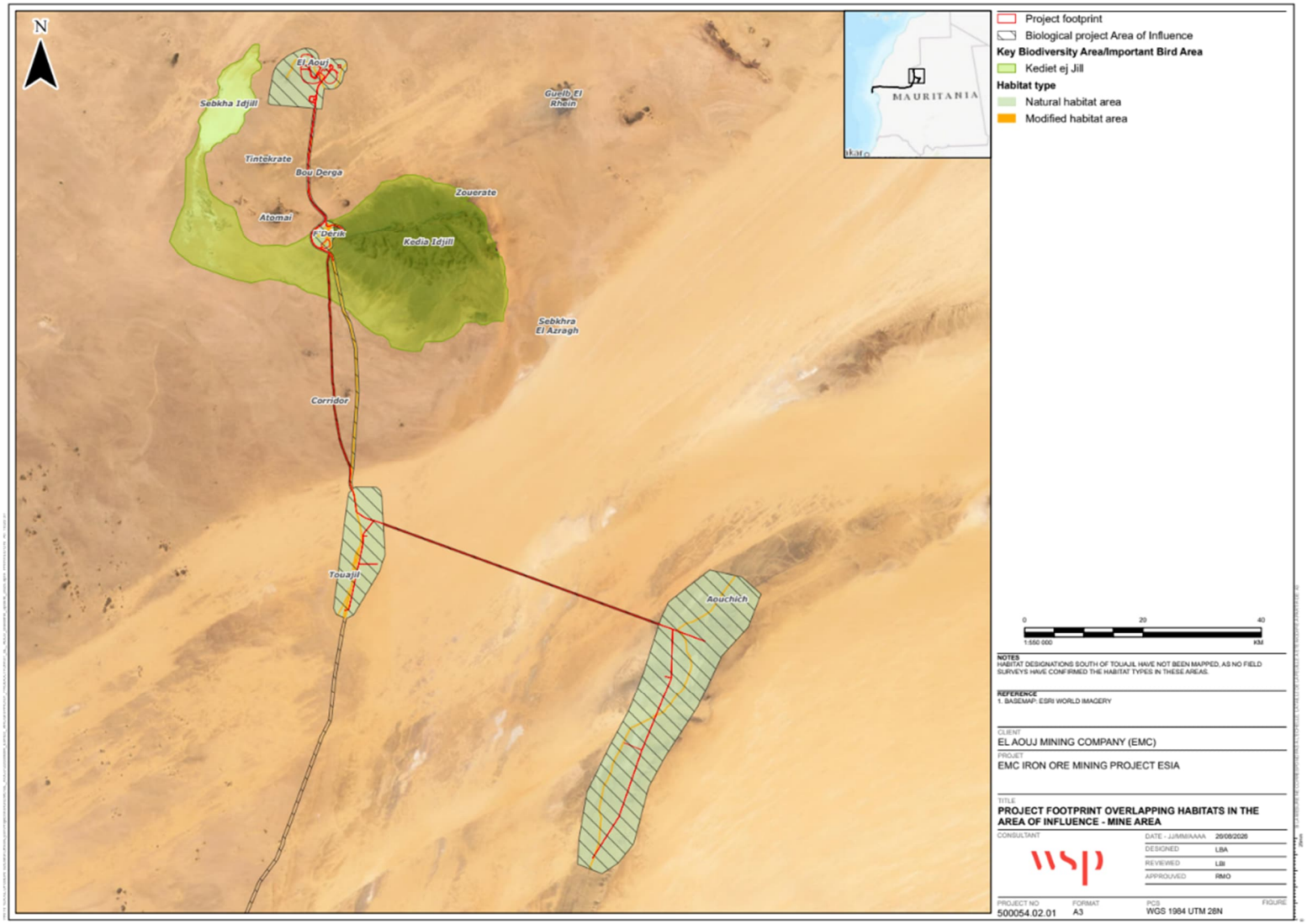


Figure 12-8: Habitat loss – El Aouj

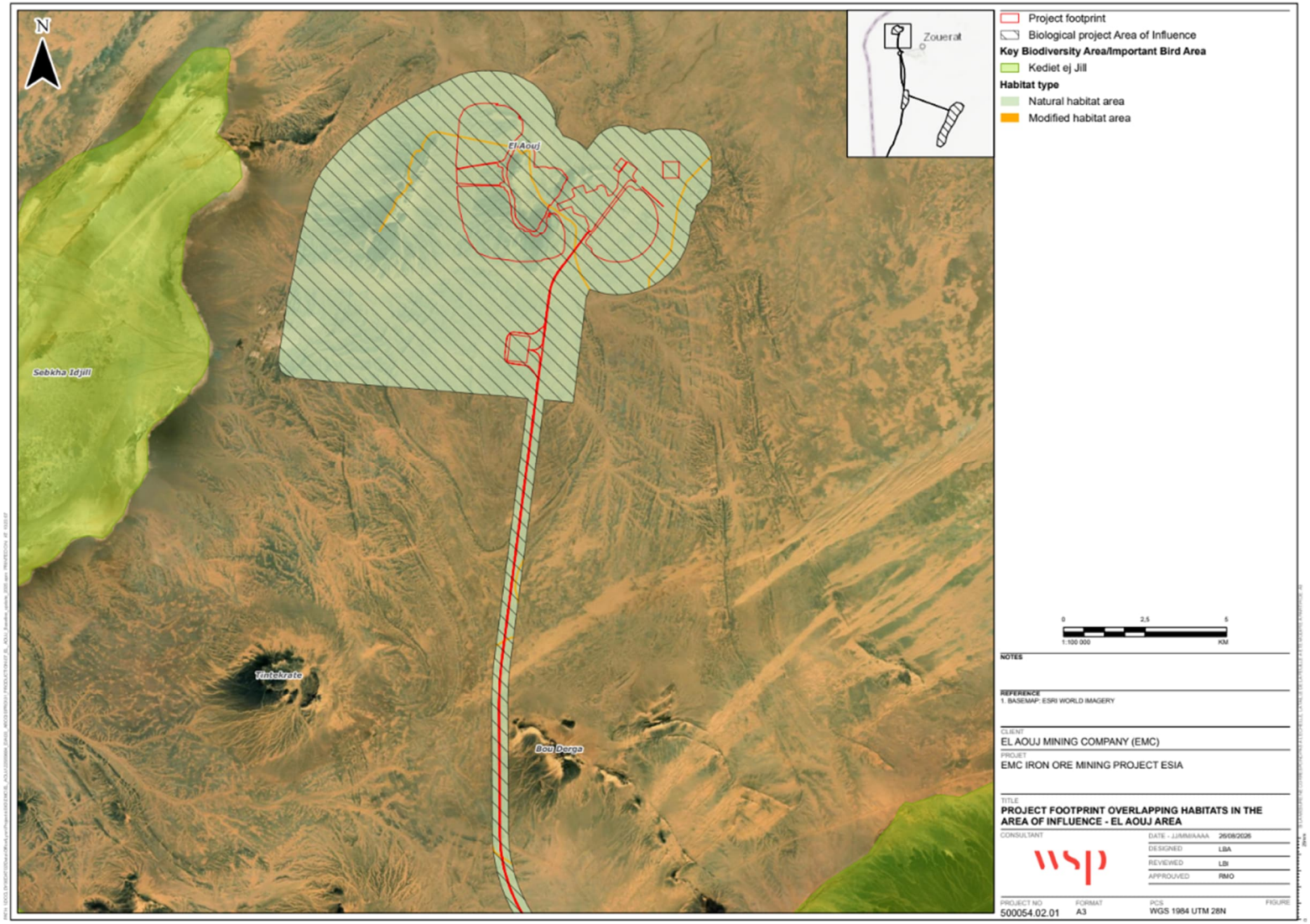


Figure 12-9: Habitat loss – F'Derik, El Aouj City, Water Corridor and Touajil

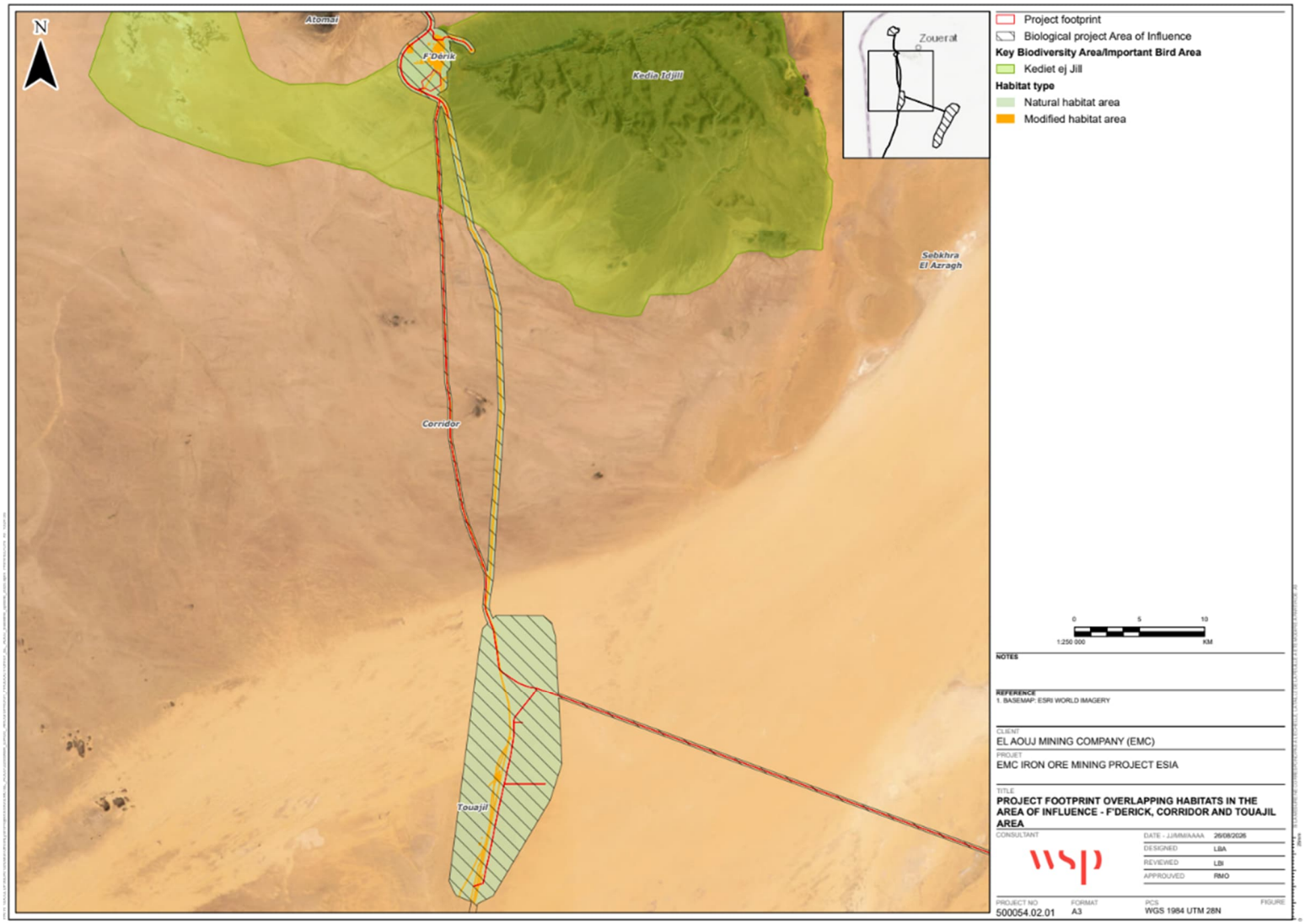
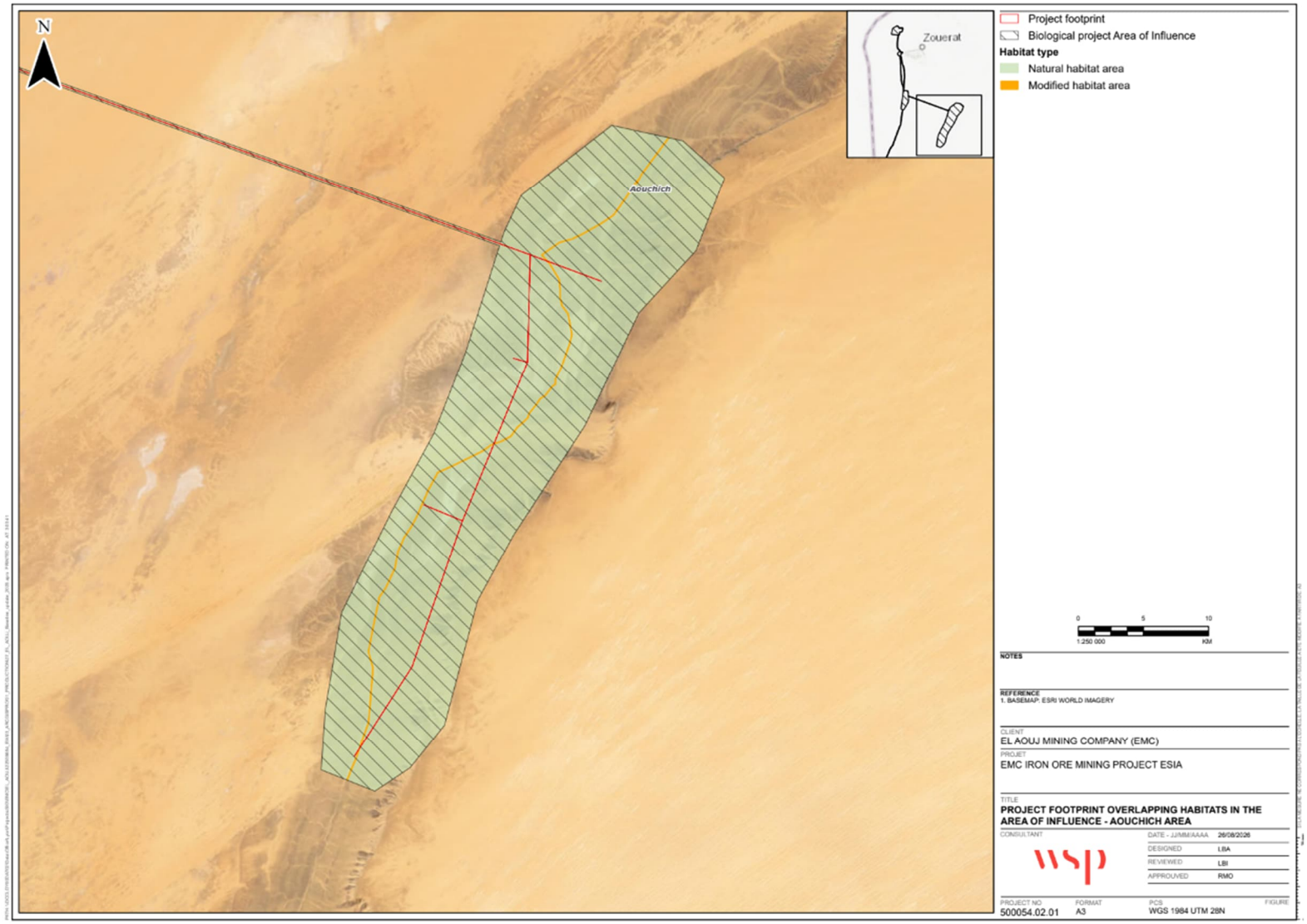


Figure 12-10: Habitat loss – Aouchich area



Mitigation measures

In addition to physical mitigation measures the following additional about natural habitat loss, degradation, and fragmentation are listed below:

Construction

- Develop and implement a Vegetation Clearing Plan procedures that includes provision for tree salvage.
- Develop and implement a Biodiversity Action Plan. The Biodiversity Action Plan (BAP) describes the Project's strategy to achieve no net loss of natural habitats, as prescribed in IFC PS6. The BAP:
  - Defines verification and monitoring requirements to demonstrate the effective implementation of mitigation measures related to tree retention, protection of natural habitats from unintentional clearing, and vegetation salvage.
  - Establishes targets for achieving no net loss of natural habitat.
  - Is integrated with the Vegetation Clearing Plan and Revegetation Plan.
- Develop and implement a Revegetation Plan, including:
  - Establishes objectives for returning natural habitats.
  - Incorporates the principles of adaptive management.
  - Maximizes opportunities to use available water from the water pipeline's release valves to establish natural vegetation assemblages along the water pipeline.
  - Establishes procedures to salvage cleared vegetation (trees, shrubs, grasses) and identify areas where they can be replanted. Replanting sites should correspond to areas where natural vegetation is currently growing (i.e., to increase the density of vegetation). Replanted sites should be isolated with fences to exclude grazers and improve vegetation quality.
  - Establishes procedures to collect seeds and cuttings, conduct germination trials, and grow seedlings in a nursery setting, with a focus on building the necessary stocks to revegetate the Project site following decommissioning. These actions require prioritization during early operation to allow sufficient time to develop and test procedures and build up sufficient plant stock to support Project's decommissioning and mine closure needs.
  - Defines monitoring requirements.
  - Establishes timelines for actions, including timelines to address any identified information gaps.

Operation

- Continue implementing the Revegetation Plan, as described above for the construction phase. As part of the adaptive management approach, vegetation seeding and/or planting efforts should be initiated as soon as possible during operations because there are long time-lags required to establish woody vegetation and a high degree of uncertainty around the success rate of re-establishing natural habitats.
- Continue implementing the BAP, as described above for the construction phase. Over the operation phase, periodically review the BAP and make revisions as needed as part of an adaptive management approach.

Decommissioning

- Continue implementing the Revegetation Plan and monitoring the re-establishment of natural habitats in alignment with the objectives of the BAP and the Mine Closure Plan.

Summary of impact assessment

Table 12-33: Impact EB04 – Natural habitat loss, degradation and fragmentation

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Magnitude	Receptor Sensitivity	Impact Significance
Loss, degradation, and fragmentation of habitats									
Before mitigation	C	Negative	Direct Indirect	Moderate	Regional	Long-term	Moderate	Moderate	Moderate
After mitigation	C	Negative	Direct Indirect	Moderate	Regional	Long-term	Moderate	Moderate	Moderate
Loss, degradation and fragmentation of habitats									
Before mitigation	O	Negative	Direct Indirect	Moderate	Local	Long-term	Moderate	Moderate	Moderate
After mitigation	O	Negative	Direct Indirect	Moderate	Local	Long-term	Moderate	Moderate	Moderate
Habitat creation									
Assessment	O	Positive	Indirect	Low	Project site	Long-term	Low	Moderate	N/A
Habitat recolonization and improved habitat connectivity									
Assessment	D	Positive	Direct	Low	Project site	Permanent	Low	Moderate	N/A
Mitigation measures	▪ Develop and implement a Vegetation Clearing Plan procedures that includes provision for tree salvage. ▪ Develop and implement a Biodiversity Action Plan (BAP). The BAP describes the Project's strategy to achieve no net loss of natural habitats, as prescribed in IFC PS6 and defines verification and monitoring requirements to demonstrate the effective implementation of mitigation measures related to tree retention, protection of natural habitats from unintentional clearing, and vegetation salvage. ▪ Develop and implement a Revegetation Plan								
Notes	[1] Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure								

12.2.1.8.2 Impact EB01 & mitigation: Loss and Degradation of Legally Protected Flora

In total, 74 flora species were observed during field surveys (2015, 2023, 2024) and another 3 flora species were identified from the literature.

As described in the baseline, the number and composition of species detected across years and seasons varied. The variation observed likely reflects natural seasonal variability in plant emergence and detectability, driven by differences in rainfall patterns, phenological stages, and germination timing between survey periods.

Flora species of conservation concern include 3 that are listed on Appendix II of CITES, 4 species that are protected in Mauritania, and 3 species that are protected in Tiris Zemmour (Table 12-34). None of these species are globally threatened or have a restricted distribution range.

Table 12-34: Flora species of conservation concern in the Mine area

Flora species	Protection status & CITES	Field observations		
		URS 2015	Dry season 2023	Wet season 2024
Balanites aegyptiaca	Protected in Tiris Zemmour			X
Capparis decidua	Protected in Tiris Zemmour	X	X	X
Euphorbia calyptrata	CITES Appendix II	X	X	X
Euphorbia granulata	CITES Appendix II	X	X	X
Euphorbia inaequilatera	CITES Appendix II	X		
Maerua crassifolia	Protected in Tiris Zemmour	X	X	X
Stipagrostis pungens (synonym Aristida pungens)	Protected in Mauritania	X	X	X
Vachellia flava (synonyms Acacia flava and Acacia ehrenbergiana)	Protected in Mauritania	X	X	X
Vachellia tortilis raddiana (synonym Acacia raddiana)	Protected in Mauritania	X	X	X
Ziziphus lotus	Protected in Mauritania			X

Protected species in Mauritania under law (n°2007-055, 2007).

Protected species in Tiris Zemmour and Dakhlett Nouadhibou under law (n°2007-055, 2007).

Location of these flora species occurrences is illustrated below (Figure 12-11 and Figure 12-12). All the flora species of conservation concern are trees or shrubs, except *Stipagrostis pungens*, which is an herbaceous plant. *Maerua crassifolia* and *Vachellia tortillis* are widely represented across the inventories from different years.

Flora species of conservation concerned in the Mine area are considered to be of **moderate sensitivity**.

Figure 12-11: Flora species of conservation concern north of Mine area – Dry (2023) and wet (2024) seasons

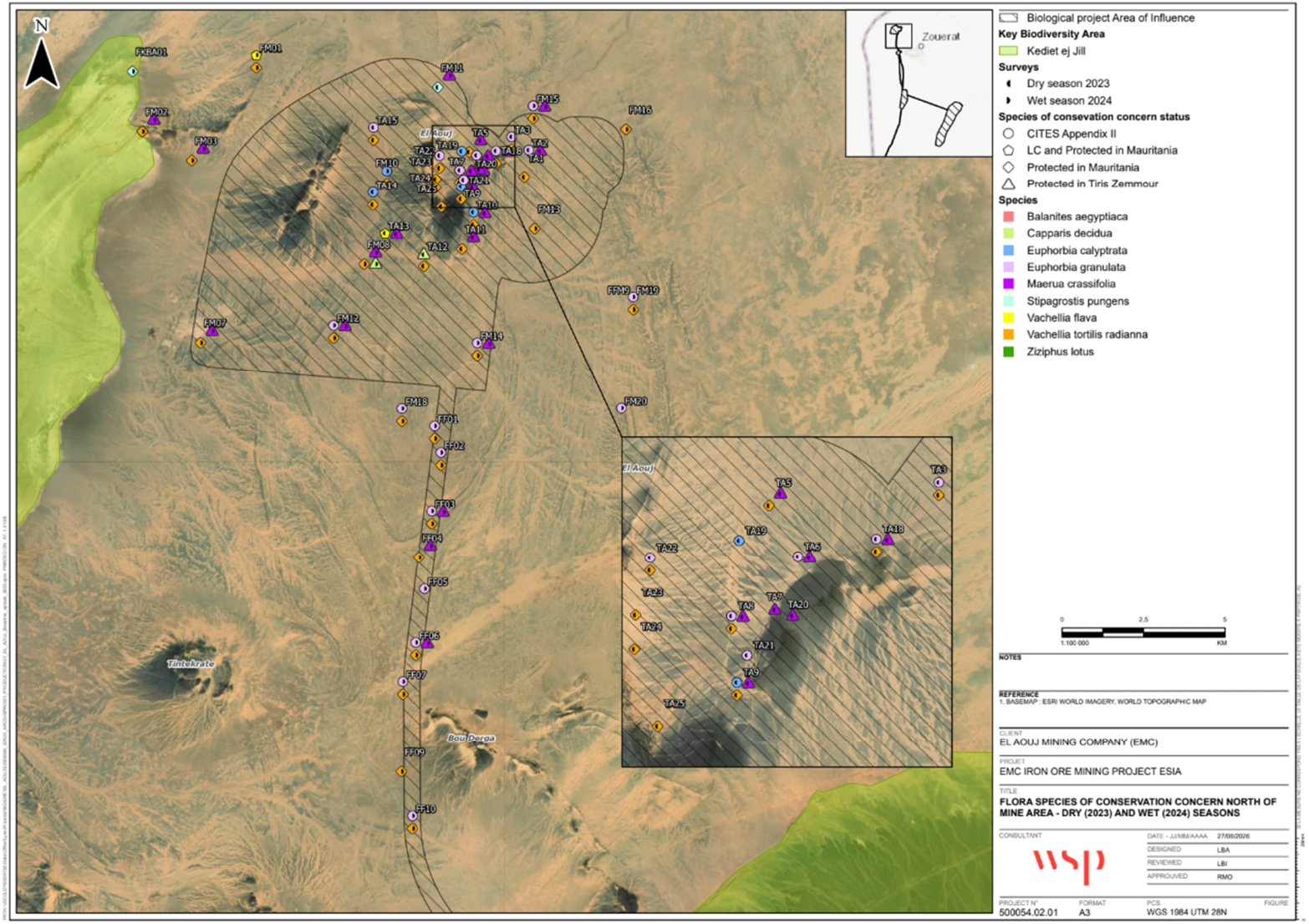
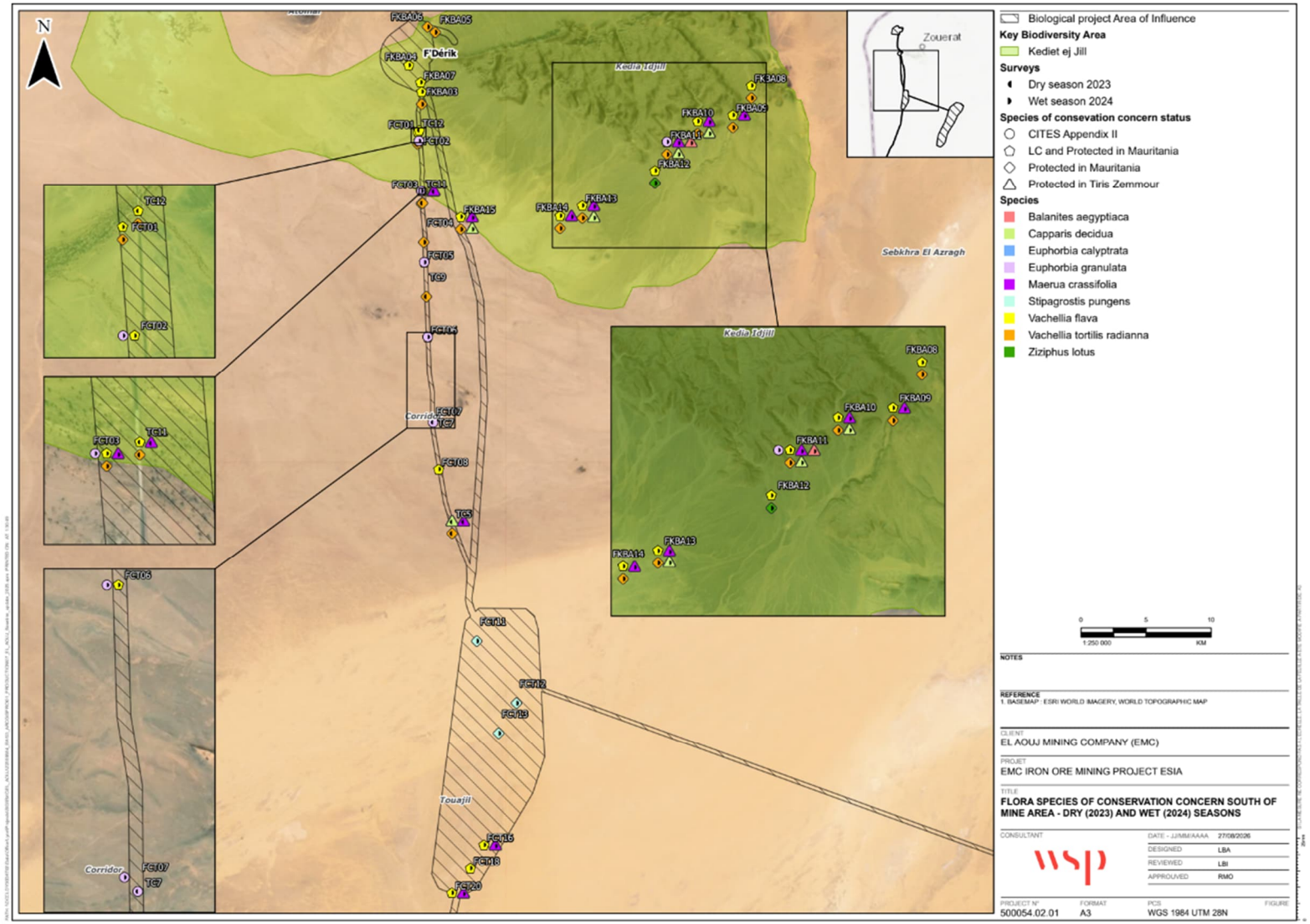


Figure 12-12: Flora species of conservation concern south of Mine area – Dry (2023) and wet (2024) seasons



Impact description

Construction

During construction of the mining site, the main impacts on flora species will be:

- Loss of protected flora species and degradation and fragmentation of flora habitat. During construction, there will be vegetation clearing in the areas where infrastructure will be constructed (including power plant, explosive depot, solar plant, El Aouj city, and the wellfields of Touajil and Aouchich). The trees will be removed before the beginning of earthworks and levelling.

  Construction activities and the associated movement of heavy vehicles are expected to release significant amounts of dust into the atmosphere. This dust will likely settle on the foliage of nearby trees, potentially degrading the quality of tree habitats in the vicinity of the construction site. Given the observed abundance of individuals, the area surrounding the mining site currently provides suitable habitat conditions especially for *Vachellia tortilis raddiana*. Dust deposition may impair photosynthetic activity and overall plant health, with effects expected within 1 km of emission sources

  As described for natural habitats, Project activities will increase the risk of soil or groundwater contamination, which could adversely affect the quality of flora habitats. Further, unplanned influx of people induced by the Project could result in loss of species of conservation concern in areas of natural habitat conversion. The risk of introducing non-native invasive plants is considered negligible because none were observed in the AoI during baseline surveys, and the arid ecosystem is no conducive for the establishment of non-natives that are not adapted to desert environments.

  Although the Project includes plans to establish landscaped gardens and palm groves within the mine site boundary, these plantings do not provide like-for-like ecological compensation for the native species that will be removed during construction.

  Construction activities will fragment some flora communities and reduce their ecological connectivity. These effects will be localized and the species involved are likely resilient to such changes considering the low density of flora, their widespread distribution, and that tree seeds may be dispersed over long distances.

  Construction will result in a direct and indirect negative impact over the protected flora species with a moderate intensity, the extent will be limited to the Regional where activities are located, and the duration will be long-term duration. This leads to a **moderate impact magnitude**.

  As the sensitivity was defined to be moderate and the magnitude to be moderate, the impact is of **moderate negative significance** because it will cause measurable change but is not expected to fundamentally affect the conservation status or population viability of nationally protected flora species.

Operation

Impacts involving the loss of flora species and fragmentation of their associated habitats will continue into the operation phase, as described and assessed for the construction phase. Degradation of protected species habitats will also continue into the operation phase but with different activities contributing to this main impact:

- Degradation of protected flora habitat and loss of individuals. Ore extraction (including the use of explosives), ore processing (crushing, and sifting), loading and unloading ore and waste rock, and truck traffic for ore transportation will produce dust emissions. These activities will increase the amount of dust deposition around the mine site. Risks of plant loss from land conversion associated with unplanned population influx will also continue during operation, as will the risk of accidental pollution from incidents related to hydrocarbons, vehicles, or machinery.

Development of the mine pit and waste dumps can lead to additional loss of individual plants.

Effects during operation will result in a direct and indirect negative impact on the protected species with a low intensity, local geographical extent where activities are located, and the duration will be of long-term duration covering operation activities. This leads to a **low impact magnitude**.

As the sensitivity was defined to be moderate and the magnitude to be low, the impact is of **low negative significance**.

- Habitat creation: As described for natural habitats, the water pipeline will be equipped with release valves every 5 km (i.e., 34 location) along the entire length of the pipeline. This will likely generate oases at some of those release valves stations, thereby increasing the extent of vegetated areas. The extent to which the species assemblages will include nationally, or regionally protected species is uncertain.

  This will result in a positive and indirect impact on flora with a low intensity, a project-site extent and a long-term duration leading to a **low impact magnitude**.

Decommissioning

During decommissioning of the mining site, the main impacts on flora species of conservation concern will be:

- Recolonisation and improved habitat connectivity. During the decommissioning phase Project activities will stop and some infrastructure will be removed, which will result in a positive direct impact on the vegetation that could slowly return to the area. Considering the Project is occurring in a desert area where plants are rare, the recolonisation will be considered as very important for the protected species. However, in such a difficult habitat, recolonisation may occur over a long-time scale and the natural re-establishment of nationally and regionally protected species is highly uncertain. Rehabilitation measures defined in the Revegetation Plan will be implemented during the decommissioning phase to increase the likelihood of plant re-establishment.

  The decommissioning and removal of mining facilities will improve connectivity between vegetation areas, resulting in small positive effects for flora species.

  The decommissioning phase will result in a positive direct impact on flora species of conservation concern with a low intensity as the land will be available again in the Project site. There is potential for long-term positive effects from natural recolonization, which would lead to a **low impact magnitude**. However, there is a high degree of uncertainty about the positive outcome for species of conservation concern as current desertification trends linked to climate patterns suggest that natural recolonization may not occur.

Mitigation measures

In addition to physical mitigation measures the following additional about legally protected flora species are listed below:

Construction

- Paved mine access road will reduce dust emission from the traffic, and process plant fence will exclude grazers from the area; both reducing the vegetation degradation. This will compensate for some of the loss to the Project over the long-term.
- The removal of trees should be avoided when possible, specifically the removal of *Balanites aegyptiaca*, *Capparis decidua, Maerua crassifolia, Vachellia flava*, and *Vachellia tortilis radianna*. As possible, all trees

recorded in the Water Corridor should be avoided through micro-siting. All trees recorded in the Water Corridor should be avoided with micro-siting as their numbers are very low.

- Integrate trees in the design and infrastructure / facilities layout to avoid their removal as much as possible.
- Develop and implement a Vegetation Clearing Plan that includes provision for plant salvage.
- During the removal, the exact number of legally protected species plants will be tracked, following the Vegetation Clearing Plan procedures.
- Tree removal should follow the national legislation regarding the restrictions on *Balanites aegyptiaca, Capparis decidua, Maerua crassifolia, Vachellia flava*, and *Vachellia tortilis raddiana* (refer to Figure 12-12 known locations of these species). Authorization from the Ministry of Environment is required prior to protected tree clearing.
- Develop and implement a Revegetation Plan. The Revegetation Plan:
  - Establishes objectives for returning flora species of conservation concern.
  - Incorporates the principles of adaptive management.
  - Maximizes opportunities to use available water from the water pipeline's release valves to establish flora species of conservation concern.
  - Establishes procedures to salvage cleared vegetation and identify areas where they can be replanted. Replanting sites should correspond to areas where vegetation is currently growing (e.g., to increase the density of trees). Replanted sites should be isolated with fences to exclude grazers and improve vegetation quality.
  - Establishes procedures to collect seeds or cuttings, conduct germination trials, and grow seedlings in a nursery setting, with a focus on species of conservation concern. These actions require prioritization during early operation to allow sufficient time to develop and test procedures and build up sufficient plant stock to support Project's decommissioning and mine closure needs.
  - Defines preliminary monitoring requirements.
  - Identifies next steps and establishes timelines for actions, including timelines to address any identified information gaps. planting trials early
- If an area of high relative abundance of protected grasses (*Stipagrostis pungens*) is encountered, salvage and transplant them before the start of construction works, following to the Vegetation Clearing Plan and Revegetation Plan procedures. Areas of high relative abundance are defined as those where 50% or more of the plants present are *Stipagrostis pungens.*
- Develop and implement a BAP. The BAP should describe the Project's strategy to achieve no net loss of natural habitats, as prescribed in IFC PS6. The BAP:
  - Defines verification and monitoring requirements to demonstrate the effective implementation of mitigation measures related to tree retention, protection of natural habitats from unintentional clearing, and vegetation salvage.
  - Establishes targets for achieving no net loss of natural habitat.
  - Is integrated with the Vegetation Clearing Plan and Revegetation Plan.

Operation

- Paved mine access road will reduce dust emission from the traffic, and process plant fence will exclude grazers from the area; both reducing the tree degradation. This will compensate for some of the tree loss to the Project over the long-term. (URS 2015)

  Refer to measure P_O_AQU01/02e. Dust suppression on roads and stockpiles with raw water and brine from RO plant supplemented by polymers and inorganic salts, if necessary.

- Continue implementing the Revegetation Plan and monitoring as defined above for the construction phase. As part of the adaptive management approach, tree seeding and/or planting efforts should be initiated as soon as possible during operations given the long time-lags required to establish mature trees, and the high risk of seedling mortality.

- Maintain vegetation under and between solar panel rows to preserve habitat structure.

- Continue implementing the BAP, as described above for the construction phase. Over the operation phase, periodically review the BAP and make revisions as needed as part of an adaptive management approach.

Decommissioning

- Continue implementing the Revegetation Plan and monitoring the re-establishment of species of conservation concern in alignment with the objectives of the BAP and the Mine Closure Plan.

Summary of impact assessment

Table 12-35: Impact EB01 – Loss and degradation of legally protected trees

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Magnitude	Receptor Sensitivity	Impact Significance
Loss of protected flora species and degradation and fragmentation of flora habitat									
Before mitigation	C	Negative	Direct Indirect	Moderate	Regional	Long-term	Moderate	Moderate	Moderate
After mitigation	C	Negative	Direct Indirect	Low	Regional	Long-term	Moderate	Moderate	Moderate
Degradation of protected flora habitat									
Before mitigation	O	Negative	Direct Indirect	Low	Local	Long-term	Low	Moderate	Low
After mitigation	O	Negative	Direct Indirect	Low	Local	Long-term	Low	Moderate	Low
Habitat creation									
Assessment	O	Positive	Indirect	Low	Project site	Long-term	Low	Moderate	N/A
Recolonization and improved habitat connectivity									
Assessment	D	Positive	Direct	Low	Project site	Permanent	Low	Moderate	N/A
Mitigation measures	▪ Paved mine access road will reduce dust emission from the traffic, and process plant fence will exclude grazers from the area; both reducing the vegetation degradation. This will compensate for some of the loss to the Project over the long-term. ▪ The removal of trees should be avoided when possible, specifically the removal of *Balanites aegyptiaca, Capparis decidua, Maerua crassifolia, Vachellia flava*, and *Vachellia tortilis raddiana*. As possible, all trees recorded in the Water Corridor should be avoided through micro-siting. All trees recorded in the Water Corridor should be avoided with micro-siting as their numbers are very low. ▪ Integrate trees in the design and infrastructure / facilities layout to avoid their removal as much as possible. ▪ Develop and implement a Vegetation Clearing Plan that includes provision for plant salvage.								

	▪ During the removal, the exact number of legally protected species plants will be tracked, following the Vegetation Clearing Plan procedures. ▪ Tree removal should follow the national legislation regarding the restrictions on *Balanites aegyptiaca, Capparis decidua, Maerua crassifolia, Vachellia flava*, and *Vachellia tortilis raddiana* (refer to Figure 12-12, Figure 12-13, Figure 12-14 of the Impact Assessment Chapter for known locations of these species). Authorization from the Ministry of Environment is required prior to protected tree clearing. ▪ Develop and implement a Revegetation Plan. ▪ If an area of high relative abundance of protected grasses (*Stipagrostis pungens*) is encountered, salvage and transplant them before the start of construction works, following the Vegetation Clearing Plan and Revegetation Plan procedures. Areas of high relative abundance are defined as those where 50% or more of the plants present are *Stipagrostis pungens.* ▪ Develop and implement a Biodiversity Action Plan (BAP). The BAP describes the Project's strategy to achieve no net loss of natural habitats, as prescribed in IFC PS6 and defines verification and monitoring requirements to demonstrate the effective implementation of mitigation measures related to tree retention, protection of natural habitats from unintentional clearing, and vegetation salvage. ▪ Maintain vegetation under and between solar panel rows to preserve habitat structure.
Notes	[1] Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure

12.2.1.8.3 Impact EB03 & mitigation: Impacts on Bird Species of Conservation Concern

Among the 77 bird species confirmed or potentially present in the mine AoI, 16 species are of conservation concern. These include 3 species that are globally threatened (African houbara (VU), Iberian grey shrike (VU), and white-backed vulture (CR)), 6 species that are listed on CITES appendices, and 8 species that trigger an IBA/KBA criterion in Kediet ej Jill (see **Table 12-36** below). None of the bird species in the mine AoI trigger critical habitat, as detailed in Chapter 7 Section 7.6 (Critical Habitat Assessment). Birds of conservation concern are a receptor with a **high sensitivity**.

Table 12-36: Bird species conservation of concerned in the Mine Area of Influence

Scientific name	Common name	IUCN status[a]	Triggering KBA CITES[b]	Field observations		
				2012-2013 (URS)	Dry season 2023	Wet season 2024
Alaemon alaudipes	Greater hoopoe-lark	LC	Triggering KBA - Kediet ej Jill	X	X	X
Ammomanes cinctura	Bar-tailed lark	LC	Triggering KBA - Kediet ej Jill	X	X	
Ammomanes deserti	Desert lark	LC	Triggering KBA - Kediet ej Jill	X		
Argya fulva	Fulvous babble	LC	Triggering KBA - Kediet ej Jill	X		X
Bucanetes githagineus	Trumpeter finch	LC	Triggering KBA - Kediet ej Jill	X		
Chlamydotis undulata	African houbara	VU	CITES App.I	X		
Falco biarmicus	Lanner falcon	LC	CITES App.II	X		X
Falco naumanni	Lesser kestrel	LC	CITES App.II	X	X	
Falco pelegrinoides	Peregrine falcon	LC	CITES App.II	X		
Falco tinnunculus	Common kestrel	LC	CITES App.II	X		
Gyps africanus	White-backed vulture	CR	CR		X	
Lanius meridionalis	Great grey shrike	VU	VU		X	X

Oenanthe leucopyga	White-crowned wheatear	LC	Triggering KBA - Kediet ej Jill	X	X	X
Passer simplex	Desert sparrow	LC	Triggering KBA - Kediet ej Jill	X		X
Platalea leucorodia	Eurasian spoonbill	LC	CITES App.II			X
Ptyonoprogne obsoleta	Pale rock martin	LC	Triggering KBA - Kediet ej Jill	X		

Impact description

Construction

During construction of the mining site, the main impacts on bird species of conservation concern will be:

- Loss and degradation of bird habitat and disturbance of birds: The construction phase is expected to generate localized loss and degradation of habitats within the Mine area including power plant, explosive depot, solar plant, El Aouj city, and the wellfields of Touajil and Aouchich) due to land clearing, vegetation removal, soil compaction and dust deposition. There is also the risk of soil and groundwater contamination as previously described for natural habitats and flora. These pressures may reduce both the availability and the quality of key resources, while modifications to vegetation structure and ground cover can alter habitat suitability for bird species, potentially leading to a decline in their local abundance and richness. Habitat degradation effects are anticipated to be relatively widespread across and around the Project footprint.

  Construction activities will also generate disturbances likely to affect bird behaviour. Noise, vehicle movements, dust emissions and human presence may cause avoidance behaviour, increase stress, and could disrupt essential activities such as foraging, resting or breeding. Given the Project's location in an open desert environment with minimal natural vegetation or topographic features to buffer disturbance, noise and visual stimuli may propagate over long distances, potentially amplifying behavioural impacts for sensitive species. This is particularly relevant in relation to the nearby Kediet Ej Jill KBA, recognized for supporting regionally important bird populations, where disturbance-related displacement could affect key bird populations.

  As previously described for natural habitats (Section 12.2.8.1), total habitat loss during construction is estimated at 1,961.13 ha. The loss of habitat inside the KBA Kediet ej Jill is limited to162 ha, which corresponds to a portion of the rail spur, El Aouj City and pipeline. The pipeline will be buried; therefore, its disturbance should be temporary during the construction period. The Project will also use existing infrastructure in the KBA boundary, including the main road and the existing rail line. The Project will tie into the main rail line south of the proposed El Aouj City, within the KBA boundaries. It should be noted that the proposed infrastructure and activities are outside of the core area of the KBA, which is the rocky guelb formation east of F'Derick.

  Based on field observations, most occurrences of bird species of conservation were recorded in the El Aouj mining area, so most direct and indirect impacts would be expected in this sector. Otherwise, several occurrences, including those of white-backed vultures, fulvous babbler, and Eurasian spoonbill, were recorded around the F'Derick dam and in areas of the KBA near the dam. Project activities are not anticipated around the F'Derick dam. Birds using areas of the KBA that are within the Project AoI are likely somewhat tolerant of disturbance as the habitats in this sector of the AoI comprise a mix of natural habitats (mainly regs and smaller extents of wadis) and modified habitats (F'Derick dam, village of F'Derick, road, rail, and other disturbances). The Project would incrementally increase the amount of existing sensory disturbance by increasing the volume of traffic and the amount of people present.

Finally, population influx could negatively affect bird habitat (from unplanned land conversion) and could increase the risk of bird mortality from hunting, poaching or poisoning (scavenging raptors and birds of prey are frequently targeted for poisoning).

In combination, the above effects will result in negative and direct and indirect impacts on birds of conservation concern with a moderate intensity, a local geographical extent and a long-term duration leading to a **moderate impact magnitude**.

As the sensitivity was defined to be high and the magnitude to be moderate, the impact is of **moderate negative significance.**

Operation

During operation of the mining site, the main impacts on birds will be:

- Loss and degradation of bird habitat, mortality and disturbance of birds: During the operation phase there is an increased risk of mortality from collision with power lines, solar panels, of other mine infrastructure. there could also be a risk of poisoning if animals get access to the explosives materials and ingest them.

  During the operation phase, ongoing mining activities (ore extraction, processing, and transportation), combined with continuous human presence, will continue to disturb birds within and around the Project area. Progressive expansion of mining infrastructure, including the mine pit, waste rock dumps, processing facilities, roads, and other operational components, will result in further habitat loss or alteration, reducing the availability and suitability of natural habitats for several species that occasionally use the El Aouj mining area. Also, El Aouj City will continue expanding as construction of Phase 2 (220 homes) and Phase 3 (440 homes) are planned to begin in year 3 and 4 of operation, respectively. As described for natural habitats, the area of habitat loss during operation totals 1,961.13 ha. The risk of unplanned population influx will persist during operation, which could increase the extent of bird habitat loss and degradation, and increase the risk of mortality.

  Blasting operations generate sudden and intense noise, which can trigger a panic reaction in birds present nearby. This rapid flight response may lead to accidental collisions with infrastructure, vehicles, or natural features, particularly for low-flying species. The shock waves associated with the explosion can, within close range of the blast point, can disturb or damage nests, especially during the breeding season, resulting in the loss of eggs or chicks, or temporary or permanent nest abandonment by adults. At greater distances, vibrations and noise mainly cause behavioural disturbance (displacement, interruption of feeding or resting). In a desert environment such as El Aouj, where bird densities are low and few species nest in the immediate vicinity of blasting areas, these impacts generally remain limited and mainly manifest as temporary disturbance rather than direct mortality. The landscape topography will naturally mitigate some noise propagation. Blasting will occur within the mine pit; therefore, the pit walls are expected to limit the extent of noise propagation. There remains a possibility that noise will propagate and disturb habitats in the Kediet ej Jill KBA, but again the landscape and the distances involved will limit effects. Sebkha Idjill, which forms part of the KBA, is closest to the mine pit (to the west); however, there is a rocky guelb (inselberg) between El Aouj and the KBA. Otherwise, the mine is at least 10 km from the southern portion of the KBA and even further from the core area of the KBA, which is the rocky formation east of F'Dérik.

  Noise associated with ore processing, conveyors, and heavy vehicle traffic can lead to the avoidance of otherwise suitable habitats and reduced use of the area by sensitive species. Constant human presence may cause stress and interfere with foraging or nesting activities.

  Artificial lighting is of particular concern given the remote location of the Project site, which currently experiences very low baseline light pollution. Night-time lighting may disrupt circadian rhythms, attract or

disorient nocturnal and migratory birds, and increase the risk of collisions with structures. Because the Project area in a desert landscape with little vegetation or topographic barriers, noise and light disturbances are likely to propagate over long distances, likely affecting species beyond the immediate footprint of the Project.

The presence and operation of a photovoltaic solar panels for power generation at the mine site (25 ha), Touajil wellfield (~0.9 ha), and Aouchich wellfield (~0.9 ha) could affect bird communities in several ways. The reflective surface of solar panels, especially at the mine site where the size of the area will be more important, can create glare or a 'lake effect'. This phenomenon refers to the visual confusion between photovoltaic panels, which are highly reflective and polarizing, and a water surface. The solar plant may increase disturbance, and can lead to disorientation during migration, especially during migration over a desert area where water points are rare. This misleading information during migratory flights could lead to a significant expenditure of energy to descend and ascend again, without providing any access to water. Some of the species of conservation concern observed in the AoI are migratory species, including the lesser kestrel, peregrine falcon, Eurasian spoonbill. Other migratory birds (e.g., grey heron and little egret) were observed near the F'Derick dam and around the temporary water points of the Mine area and the Kediet ej Jill KBA. This demonstrates that migratory species do descend and stop in this region during migration when water is present.

The introduction of new artificial elements into the landscape may also create additional risks for birds. Overhead powerlines, conveyors, and vehicle movements can lead to collision events, particularly for large raptors and nocturnal species that may be attracted to illuminated areas or that hunt at low altitude. The Project includes a 35 km 33 kV overhead power line, of which 1 km crosses the Kediet ej Jill KBA. Although the area affected within the KBA is near/within F'Dérik and other existing disturbance, part of the alignment is less than 200 m from the F'Dérik dam. Avifauna tends to concentrate around the dam seasonally, when water is present. The use of a bird friendly design will minimize the risk of electrocution; however, the risk of mortality from collisions will remain. Species such as the Nubian bustard (NT), which is one of the KBA trigger criteria, are particularly vulnerable to collisions with power lines due to their larger size, field of vision, and flight patterns. Nonetheless, habitats traversed by the power line are open and sparsely vegetated, which makes the line more visible. No regional bird carcass monitoring data are available to inform avian mortality estimates.

There is also a risk of accidental pollution or any incident related to hydrocarbons, vehicles, or machinery. If not properly managed, accidental spills of hydrocarbons, process chemicals could contaminate soil or water resources, potentially affecting birds using these water points.

The degradation of habitat in Kediet ej Jill KBA will be limited to the Project AoI, mainly attributable to increased vehicle and rail traffic. As El Aouj City continues to expand, human presence will also increase. The area affected directly and indirectly in the KBA totals about 162 ha and 2240 ha, respectively.

In combination, Project effects will result in negative direct and indirect impacts on birds of conservation concern. Impacts would have a moderate intensity, a local geographical extent and a long-term duration leading to a **moderate impact magnitude.**

As the sensitivity was defined to be high and the magnitude to be moderate, the impact is of **moderate negative significance.**

- Habitat creation: As previously described, small oases are expected to develop around water release valves along the water pipeline. This will provide water resource points all along the pipeline, with vegetation patches that may attract birds. Moreover, these oases may also host some prey, likely to attract birds of prey.

This will result in a positive and indirect impact on birds with a low intensity, a project-site geographical extent and a long-term duration leading to a **negligible impact magnitude**.

Decommissioning

During decommissioning of the mining site, the main impacts on birds will be:

- Degradation of bird habitat and disturbance of birds. The dismantling and removal of the facilities at the end of the exploitation period will continue some impacts identifies during the operation phase like noise, dust, heavy vehicle traffic and accidental pollution risk.

  Habitat degradation in Kediet ej Jill KBA will decrease, relative to operation, as rail and road traffic are expected to decline.

  These effects will result in negative and direct and indirect impacts on birds with a low intensity, a Project site geographical extent and a short-term duration leading to a **negligible impact magnitude**.

  As the sensitivity was defined to be high and the magnitude to be negligible, the impact is of **low negative significance.**

- Restoration of bird habitat. During the decommissioning phase, the removal of facilities, cessation of sensory disturbances, and recolonisation of vegetation will progressively result in an improvement of bird habitat. This will be a long-term positive impact, assuming the site is not re-disturbed and that vegetation can re-establish naturally.

  The decommissioning phase will result in a positive direct impact on habitats with a low intensity as the land will be available again in the Project site and with a permanent duration, leading to a **low impact magnitude**. The likelihood that positive effects from revegetation will materialize is uncertain because natural recolonization of vegetation may be limited by the site's biophysical and climate conditions.

  As the sensitivity was defined to be high and the magnitude to be low, the impact is positive.

Mitigation measures

In addition to physical mitigation measures the following additional about bird species of conservation concern are listed below:

Construction

- Minimize light dispersion with the use of high efficiency and directional lighting (i.e., lights fitted with shields to direct lighting towards the ground and minimize sky glow)
- Lighting should be kept to the minimum required, specifically targeting work areas in use. Consider the use of mobile, temporary lighting if the location of work areas shifts over time.
- For areas not requiring full-time illumination, install motion sensor lights so that lights can turn on and off automatically based on need. These should be installed around administrative buildings and other facilities that do not typically require regular use during night-time hours.
- Develop and implement a Vegetation Clearing Plan
- Develop and implement a Revegetation Plan
- Implement the Biodiversity Action Plan. The BAP defines measures to avoid and minimize impacts to natural habitats and to work towards no net loss of natural habitats, as prescribed in IFC PS6. The BAP defines the

verification and monitoring requirements to demonstrate the effective implementation of mitigation measures for the transmission line, solar power generating areas, blasting activities, and lighting. The BAP also confirms requirements for additional conservation actions to benefit the Kediet ej Jill KBA..

- Implementation of awareness training: Train employees about environmental concern: wastes, fauna and flora.
- Solar panels with an anti-reflective coating to prevent glare.
- Verify solar panel glare measurements and implement corrective measures if acceptability thresholds are exceeded.

Operation

- Verify solar panel glare measurements and implement corrective measures if acceptability thresholds are exceeded (refer to BAP).
- Minimize light dispersion
- Lighting should be kept to the minimum required
- Motion sensor lights
- Continue implementing the Revegetation Plan and BAP, as described above for the construction phase. Over the operation phase, periodically review the BAP and make revisions as needed as part of an adaptive management approach.
- Update training and awareness of employees
- Pre-blast inspection: inspection of the blast area by an ecologist prior to explosive use (to confirm absence of active nests).
- Use of explosives outside sensitive daily periods: early morning / late afternoon only.
- Progressive warning system: siren with gradually increasing sound levels from blasting zone.
- Systematic incident reporting: documentation of interactions or incidents between blasting activities and birds.
- Deterrence measures (acoustic or chemo-sensory) around the solar plant area.
- Maintain vegetation under and between solar panel rows to preserve habitat structure
- Systematic incident reporting: documentation of any interaction between solar panels and birds. Apply additional mitigation or corrective measures as needed, based on monitoring results.
- Apply a bird friendly design to the power line to prevent electrocution risk for birds along the power line, in alignment with good international industry practice (IFC and EBRD, 2026).
- Install bird flight diverters along sensitive areas of the overhead power line (i.e., along 1 km where the line overlaps the Kediet ej Jill KBA).
- Monitor avian mortality along the overhead power line for two years post-construction. Adjust mitigation measures as needed, based on monitoring results.

Decommissioning

- Continue implementing the Revegetation Plan and monitoring.

Summary of impact assessment

Table 12-37: Impact EB03 – Impacts on bird species of conservation concern

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Magnitude	Receptor Sensitivity	Impact Significance
Loss and degradation of bird habitat and disturbance of birds									
Before mitigation	C	Negative	Direct Indirect	Moderate	Local	Long-term	Moderate	High	Moderate
After mitigation	C	Negative	Direct Indirect	Low	Local	Long-term	Moderate	High	Moderate
Loss and degradation of bird habitat, mortality and disturbance of birds									
Before mitigation	O	Negative	Direct Indirect	Moderate	Local	Long-term	Moderate	High	Moderate
After mitigation	O	Negative	Direct Indirect	Low	Local	Long-term	Moderate	High	Low*
Habitat creation									
Assessment	O	Positive	Indirect	Low	Project site	Long-term	Negligible	High	N/A
Degradation of bird habitat and disturbance of birds									
Before mitigation	D	Negative	Direct Indirect	Low	Project site	Short-term	Negligible	High	Low
After mitigation	D	Negative	Direct Indirect	Low	Project site	Short-term	Negligible	High	Low
Restoration of bird habitat									
Assessment	D	Positive	Direct	Low	Project site	Permanent	Low	High	N/A
Mitigation measures	▪ Minimize light dispersion with the use of high efficiency and directional lighting (i.e., lights fitted with shields to direct lighting towards the ground and minimize sky glow) ▪ Lighting should be kept to the minimum required, specifically targeting work areas in use. Consider the use of mobile, temporary lighting if the location of work areas shifts over time. ▪ For areas not requiring full-time illumination, install motion sensor lights so that lights can turn on and off automatically based on need. These should be installed around administrative buildings and other facilities that do not typically require regular use during night-time hours. ▪ Develop and implement a Vegetation Clearing Plan ▪ Develop and implement a Revegetation Plan ▪ Implement the Biodiversity Action Plan to avoid and minimize impacts to natural habitats and work towards no net loss of natural habitats, as prescribed in IFC PS6. The BAP defines the verification and monitoring requirements to demonstrate the effective implementation of mitigation measures for the transmission line, solar power generating areas, blasting activities, and lighting. The BAP also confirms requirements for additional conservation actions to benefit the Kediet ej Jill KBA. ▪ Implementation of awareness training: Train employees about environmental concerns: wastes, fauna and flora. ▪ Solar panels with an anti-reflective coating to prevent glare. ▪ Verify solar panel glare measurements and implement corrective measures if acceptability thresholds are exceeded. ▪ Verify solar panel glare measurements and implement corrective measures if acceptability thresholds are exceeded. ▪ Minimize light dispersion ▪ Lighting should be kept to the minimum required ▪ Motion sensor lights ▪ Update training and awareness of employees ▪ Pre-blast inspection: inspection of the blast area by an ecologist prior to explosive use (to confirm absence of active nests). ▪ Use of explosives outside sensitive daily periods: early morning / late afternoon only. ▪ Progressive warning system: siren with gradually increasing sound levels from blasting zone.								

	▪ Systematic incident reporting: documentation of interactions or incidents between blasting activities and birds. ▪ Deterrence measures (acoustic or chemo-sensory) around the solar plant area. ▪ Maintain vegetation under and between solar panel rows to preserve habitat structure ▪ Systematic incident reporting: documentation of any interaction between solar panels and birds. Apply additional mitigation or corrective measures as needed, based on monitoring results. ▪ Apply a bird friendly design to the power line to prevent electrocution risk for birds along the power line, in alignment with good international industry practice (IFC and EBRD, 2026). ▪ Install bird flight diverters along sensitive areas of the overhead power line (1 km inside the Kediet ej Jill KBA). ▪ Monitor avian mortality along the power line for two years post-construction. Adjust mitigation measures as needed, based on monitoring results.
Notes	[1] Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure *The impact rating deviates from the significance matrix (Table 12-8), based on expert judgement

12.2.1.9 National and local economy

National and local economies remain largely dependent on revenues from mining activities, which are one of the main drivers of economic growth in Mauritania. Iron ore mining is a key part of economic development in the Tiris Zemmour region. This section assesses impacts in relation to the baseline conditions described under Section 8.4.7 (Economic Activities and Livelihoods).

12.2.1.9.1 Impact SOC01: Increased Government Revenue

“Summary of the impact assessment conducted by URS in 2015.”

The receptor's sensitivity about increased public revenue is high, as the supplementary income generated by the El Aouj mine.

Impact description

Construction

During construction, the Project focuses on delivering mine infrastructure and no production occurs. No impact on government revenue is anticipated during this phase

Operation

During the operational phase, the El Aouj mine is expected to produce around 931 Mt of run-of-mine ore generating some 421 Mt of final product over an anticipated 41 years of the mine life or an average of around 11,3 Mt per year. The annual production of iron ore represents a major lever for increasing public revenues at the national level. The project will contribute significantly to public revenues throughout the operating period, notably through the payment of mining royalties, direct taxes (corporate income tax, personal income tax) and indirect taxes. Royalties will be paid in full to the State throughout the operating period, and all tax obligations will be paid to the Mauritanian Treasury in accordance with the national legislation. Public revenues from royalties and taxes will give Mauritania new budgetary leeway, likely generating multiple positive spin-offs effects. Investment in the mining sector and related industries is a key pillar of the Mauritanian government's economic development strategy. The planned increase in production at the El Aouj mine, and therefore in exports, should contribute to sustainable economic growth. Iron ore is one of Mauritania's strategic resources, and every ton exported improves the trade balance, enabling the government to stabilize its budget and finance essential public services at the national level. The production of 11,3 M/t per year creates a stable and predictable tax flow throughout the project's lifetime, improving the state's ability to plan long-term investments. The impact is positive and direct due to the payment of taxes and royalties by EMC.

Decommissioning

In the decommissioning phase of the project, the cessation of royalty and tax payments will result in reduced government revenues derived from El Aouj mining activities. Consequently, no positive impact on government revenue is anticipated during this phase.

Enhancement measures

EMC will make tax and royalty payments in a transparent, accurate and timely manner throughout the operational phase, consistent with national legislation and good international industry practice. The company will ensure that sound financial principles and rigorous accounting processes are in place. It will also publish an annual report on taxes and royalties paid, in accordance with the best practices established by the Extractive Industries Transparency Initiative (EITI), to which Mauritania is a signatory.

The implementation of these management measures should generate significant positive impacts for the Mauritanian economy in the medium term, thanks to increased public revenues.

Summary of impact assessment

The following table provides a summary of the project's impact on increase government revenues.

Table 12-38: Impact SOC01 – Increased Government Revenues

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase 1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Assessment	Op	Positive	Direct	Moderate	Regional and local	Long-term	Moderate	High	N/A
Enhancement-measures	▪ Payments of taxes and royalties in a transparent, accurate and timely manner; ▪ Implementation of sound financial principles and accounting processes for the Project; ▪ Annual publishing of taxes and royalties paid, in line with EITI good practice guidelines.								
Notes	1 Project Phase: Op = Operation; N/A = Not applicable								

12.2.1.9.2 Impact SOC02: Enhancement of the Local Economy

"Summary of the impact assessment conducted by URS in 2015."

The sensitivity of the receptor associated with enhancement of the local economy is considered low.

Impact description

Construction

During the construction phase, the project will mobilise approximately 2,600 workers for various activities related to the development of the mine infrastructures. The presence of this workforce will lead to a significant increase in demand for goods and services, particularly industrial equipment, food products, transport services, telecommunications and everyday consumer goods. Some of this equipment, goods and services will have to be imported from the international market, while a substantial proportion will be purchased on the domestic market (Nouakchott and Nouadhibou). In addition, local sourcing will also be possible, particularly from suppliers based in Zouérate and, to a lesser extent, in F'Derick.

This dynamic is anticipated to generate opportunities for businesses at the local, regional, and national levels, resulting in positive impacts on profitability and employment within the supply chain.

The construction phase generally marks a period of accelerated and highly visible economic expansion at the local area. During this time, with an influx of workers, F'Derick is expected to serve as a significant, though temporary, center of economic activity. Local economic operators will see their revenues increase, while other residents may set up new small businesses (shops, restaurants) to meet the needs of project workers. The presence of many workers also leads to an increase in monetary circulation in the city, creating an economic multiplier effect that benefits residents.

The impact is positive and direct due to the stimulation of the local economy.

Operation

During the operational phase, the project will continue to purchase certain equipment and goods, while worker spending in the area will help maintain growth and diversification of the local economy. It, lasting nearly four decades, represents the longest and most decisive period of economic stability for the region. With 1,000 permanent jobs, a significant proportion of which can be occupied by workers from the mining area, this phase generates regular income for many households, helping to improve living standards and reduce unemployment.

The long-term presence of the mine helps to structure the local economy around complementary services such as transportation, restaurant services, diversified trade, and agricultural and pastoral activities supported by constant demand. Through its taxes and contributions, the mine increases local tax revenues, which can enable local and administrative authorities to finance public infrastructure in the city (schools, health centers). The stability of jobs in the mine also encourages private investment in the city of F'Derick, particularly in housing, commerce, and services.

The impact is positive and direct due to the stimulation of the local economy.

Decommissioning

During the project closure, activities will be limited to mine decommissioning. This phase will not generate any significant improvement in the local economy. Consequently, no impact is anticipated during this phase.

Enhancement measures

As part of its procurement strategy, EMC will identify local opportunities and, where possible, give preference to purchasing goods and services from Mauritanian suppliers, provided that they meet the project's requirements in terms of deadlines, quality, and health, safety, and environmental (HSE) standards. EMC will also support local economic development by participating, where relevant, in local public procurement (see Impact SOC03). Local suppliers will have the opportunity to register their interest before work begins.

In addition, the stakeholder database, which is part of the stakeholder engagement plan, will be expanded to better identify local suppliers.

The implementation of these measures will enhance economic benefits.

Summary of impact assessment

Table 12-39 provides a summary of the project's impact on enhancement of the local economy.

Table 12-39: Impact SOC02 - Enhancement of the Local Economy

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Assessment	Co	Positive	Direct	Moderate	Regional and local	Short-term	Low	Low	N/A
Assessment	Op	Positive	Direct	Moderate	Local	Long-term	Moderate	Low	N/A
Enhancement measures	▪ Implement the Procurement Strategy; ▪ Register interest of local suppliers prior to construction; ▪ Stakeholder database (in the Stakeholder Engagement Plan) to identify local partners/ suppliers.								
Notes	1 Project Phase: Co = Construction; Op = Operation; N/A = Not applicable								

12.2.1.9.3 Impact SOC03 & mitigation: Increase inflationary Pressures and Shortages

"Summary of the impact assessment conducted by URS in 2015."

The sensitivity of receptors associated with inflationary pressures and shortages in the mining area is high, due to their exposure to rapid changes in the prices and availability of essential goods and products.

Impact description

Construction

During the project construction phase, approximately 2,600 workers will be mobilized for the work, along with the arrival of people seeking employment and economic opportunities in the area. The rapid increase in demand for local goods and services, both direct and indirect, could exacerbate inflationary pressures and lead to shortages of food and other essential goods. Although the project may stimulate the local economy through the purchase of goods and services, it will be necessary to ensure that the potential negative effects, particularly inflation, do not outweigh the expected benefits. Regular monitoring of the availability and prices of key goods and services in local markets will be ensured.

This risk is particularly high in contexts where markets are highly rigid, for example due to shortages of raw materials or finished products, a lack of key skills in the labour market, and low capacity for local supply adjustment. Vulnerable groups are likely to be the most severely affected, particularly due to possible increases in the prices of basic commodities, which could affect their financial ability to maintain sufficient caloric intake and adequate nutrition.

The impact is negative and direct due to the pressures and lead to shortages of food and other essential goods, with a moderate intensity. The extent is local, and short-term due to the project's construction period (5 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance**.

Operation

During the operational phase, approximately 1,000 workers will be mobilized on site, in addition to others attracted by the job opportunities. The project involves setting up a temporary camp on site that will operate for ten years and can house 2,000 to 3,000 people. Additionally, a permanent camp is planned, which will provide accommodation for about 960 people in the area.

This situation could lead to increased demand for local products and higher food prices in the markets of F'Derick and Zouérate. While this increased demand represents an income opportunity for local producers and traders, it could also generate inflationary effects, exacerbating the economic vulnerability of low-income households. However, the proposed mitigation measures should reduce the extent of these inflationary pressures and limit the risk of shortages.

The impact is negative and direct due to the pressures and lead to shortages of food and other essential goods, with a high intensity. The extent is local, and long-term due to the project's operational period (41 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance**.

Decommissioning

During the project closure, activities will be limited to mine decommissioning. This phase will not generate the pressures and lead to shortages of food and other essential goods in the project area.

Mitigation measures

A local purchasing policy will be implemented as part of the procurement strategy in order to reduce these impacts. Monitoring local markets will enable this strategy to be adjusted regularly to mitigate the effects of price increases and potential shortages of essential goods related to project demand. Procurement from national and local suppliers, particularly for foodstuffs, will also help prevent shortages and limit the resulting inflationary pressures.

Even with these measures in place, some residual impacts will remain. These are likely to be negative and long-lasting. They will remain minor for the wealthiest households but will be much more significant for the poorest households during the construction and operational phases.

Summary of impact assessment

Table 12-40 provides a summary of the project's impact on inflationary pressures and shortages.

Table 12-40: Impact SOC03 - Increase inflationary Pressures and Shortages

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Co	Negative	Direct	Moderate	Local	Short-term	High	High	High
After mitigation	Co	Negative	Direct	Low	Local	Short-term	Low	High	Moderate
Before mitigation	Op	Negative	Direct	High	Local	Long-term	High	High	High
After mitigation	Op	Negative	Direct	Low	Local	Long-term	Low	High	Moderate
Mitigation measures	▪ Monitoring of availability and prices of key goods and services in local markets to inform periodic review of the Procurement Strategy								
Notes	1 Project Phase: Co = Construction; Op = Operation								

12.2.1.9.4 Impact SOC04: Increased Employment and Training

“Summary of the impact assessment conducted by URS in 2015.”

The sensitivity of receptors relating of the employment and training is high, due to access to employment and improved household income.

Impact description

Construction

During the construction phase, approximately 2,600 workers will be employed for an estimated period of three years. More than 95% of the workforce will be Mauritanian workers and 5% will be expatriate personnel. However, during the early stages of the project, a higher proportion of expatriates will be required to carry out specialised work. The job opportunities will be for unskilled, semi-skilled and skilled positions, with a predominance of physically demanding jobs, which will further encourage the participation of men during this phase. Consultations with stakeholders have highlighted strong expectations among local communities that they will be given priority in the recruitment process for the El Aouj mine activities.

In line with its human resources management policy, EMC plans to prioritise the recruitment of local labour during the construction phase in order to promote access to employment for the populations of the mining area (F’Derick, Zouérate and Touajil). This approach will enable many households to benefit from stable incomes, thereby contributing to improving their living conditions. The project will also contribute to a significant reduction in unemployment in the region. However, local communities' access to employment opportunities will depend on several factors, such as level of education, suitability of skills for the project's needs, availability of candidates and their ability to access the application process set up by EMC.

The impact associated with employment and training in construction phase is positive and direct, due to the job creation, reduced unemployment, and access to training for local workers.

Operation

During the operational phase, the project will employ approximately 1,000 workers. As with the construction phase, more than 95% of the workforce will be Mauritanian nationals, while approximately 5% will be expatriates. However, a higher proportion of expatriates will be present at the start of operations to ensure skills transfer and support initial technical operations.

Most operational positions will be filled by Mauritanian workers, primarily from the mining area comprising F’Derick, Zouérate and Touajil, as well as other localities in the Tiris-Zemmour region and the rest of the country. However, demographic analysis shows that local communities generally have relatively low levels of education and skills, while unemployment remains high among working-age people aged 14 to 64. In addition, many households depend exclusively on agricultural and pastoral activities due to a lack of access to salaried jobs.

Women and persons with disabilities are among the groups facing the greatest difficulties in accessing employment and economic opportunities in the area. In the absence of specific measures to promote female employment, their prospects may remain limited due to cultural norms related to gender. Furthermore, the contribution of pastoral households to the labour market could also be limited due to the seasonality and demands of their traditional livelihoods.

In order to strengthen national skills, EMC will implement a progressive training programme aimed at enabling Mauritanian workers to access positions requiring higher qualifications in the medium and long term. Over the years, this dynamic has contributed to the long-term professionalization of the local workforce, while promoting knowledge transfer between international experts and national workers. It also improves national employability, as the skills developed are sought after in other mining and industrial sectors in the country.

The impact on the operational phase is positive and direct, due to job creation, reduced unemployment, and access to training for local workers. ***Decommissioning***

During the decommissioning phase, the project plans to maintain a small team of workers on site to carry out decommissioning and rehabilitation operations. These activities will take place over a period of approximately four years. Most of this work will be performed by Mauritanian workers.

The impact associated with this phase is considered positive and direct.

Enhancement measures

The Project will optimise the utilisation of existing skills available within the local labour market. In alignment with the Recruitment and Training Strategy, EMC will implement employee training programmes based on a gap analysis between required position competencies and current employee capabilities. Enhancing skill levels and promoting safe working practices will collectively support the continued development of the local workforce's expertise.

The primary measures to enhance the positive Project impact of providing job opportunities include implementing the Recruitment and Training Strategy and setting up a shop-front in F'Derick where applicants can obtain assistance to complete job applications and apply for advertised positions. EMC will also seek to enhance access to job opportunities for women and pastoralists through proactive engagement and recruitment for suitably qualified positions.

Implementation of a Human Resources and Employment Plan (including Mauritanisation Plan) which will include guidelines and standards for sourcing, selection, recruitment of the workforce, together with the implementation of the Stakeholder Engagement Plan will further enhance the benefits arising from Project-related employment.

Summary of impact assessment

Table 12-41 provides a summary of the project's impact on employment and training.

Table 12-41: Impact SOC04 - Increased Employment and Training

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Assessment	Co	Positive	Direct	High	Local and Regional	Short-term	Low	High	N/A
Assessment	Op	Positive	Direct	High	Local and Regional	Long-term	Low	High	N/A
Assessment	De	Positive	Direct	Low	Local	Project site	Low	Moderate	N/A
Enhancement measures	■ Implement the Recruitment and Training Strategy; ■ Implement Human Resources and Employment Policy (including the Mauritanisation Plan); ■ Implement the Stakeholder Engagement Plan, including proactive engagement with women and pastoralists on employment opportunities; ■ Opening of shop front in F'Derick.								
Notes	1 Project Phase: Co = Construction; Op = Operation; De = Decommissioning; ; N/A = Non applicable								

12.2.1.9.5 Impact SOC12 & mitigation: Unemployment at Mine Closure (retrenchment & transition)

The sensitivity of receptors related to employment at mine closure is considered moderate, due to limited alternative job opportunities in the mining area and partial transferability of mining-related skills.

Impact description

Construction

No employment-related closure impacts are anticipated during the construction phase, as this phase does not involve workforce reduction.

Operation

No job-loss impacts are anticipated during the operational phase. However, workforce transition and retrenchment planning will be required in late operations to minimise the impacts associated with mine closure.

Decommissioning

At the end of the operational phase, the Project will enter a decommissioning period of approximately four years. During this period, the workforce will be significantly reduced, with only a small team retained to carry out dismantling, rehabilitation, and closure activities. This reduction will generate a direct negative impact on EMC employees and contractor staff due to job losses, and an indirect negative impact on local suppliers and businesses whose revenues depend on mining activities in F'Derick and Zouérate.

As emphasised in the Social Baseline, local communities have limited alternative job opportunities, relatively low levels of formal education, and high dependence on mining employment and mine-linked supply chains. As a result, the receptor sensitivity is considered Moderate.

The impact is Local, Short-term, and of Moderate magnitude, resulting in a Moderate impact significance before mitigation.

Mitigation measures

EMC will implement the following measures to reduce the negative impacts associated with workforce reduction and to support a responsible transition at mine closure:

- Develop a Retrenchment and Transition Plan during the late operational phase, in line with IFC PS2, and implement it in alignment with the Mine Closure Plan and related social management plans;
- Facilitate access to short, targeted re-skilling or up-skilling sessions, delivered by public authorities or recognised training providers, where feasible, to support workers in their transition to the regional labour market;
- Share information on external job opportunities and refer workers to public employment services, without guaranteeing placement;
- Communicate EMC's principles and expectations to major contractors regarding fair and transparent retrenchment practices, in alignment with applicable national legislation;
- Inform local suppliers and SMEs of upcoming reductions in purchase orders, allowing them to anticipate closure and adjust their business activities accordingly;
- Provide information and guidance to women and vulnerable workers, including adapted training schedules and basic support for exploring micro-enterprise opportunities, where feasible;

- Maintain regular communication with local authorities and affected communities about closure timelines and expected reductions in workforce numbers;
- Maintain an accessible grievance mechanism throughout the closure phase to allow workers to report concerns or issues related to the transition;
- Ensure alignment with the Mine Closure Plan, including communication about any opportunities for infrastructure transfer or post-closure community support.

Summary of impact assessment

Table 12-42 provides a summary of the project's impact on employment at mine closure (retrenchment & transition).

Table 12-42: Impact SOC12-Employment at Mine Closure (retrenchment & transition)

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase 1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Assessment	D	Negative	Direct Indirect	Moderate	Local	Short-Term	Moderate	Moderate	N/A
Assessment	D	Negative	Direct Indirect	Low	Local	Short-Term	Low	Moderate	N/A
Enhancement measures	▪ Develop a Retrenchment and Transition Plan during the late operational phase, in line with IFC PS2, and implement it in alignment with the Mine Closure Plan and related social management plans; ▪ Facilitate access to short, targeted re-skilling or up-skilling sessions, delivered by public authorities or recognised training providers, where feasible, to support workers in their transition to the regional labour market; ▪ Share information on external job opportunities and refer workers to public employment services, without guaranteeing placement; ▪ Communicate EMC's principles and expectations to major contractors regarding fair and transparent retrenchment practices, in alignment with applicable national legislation; ▪ Inform local suppliers and SMEs of upcoming reductions in purchase orders, allowing them to anticipate closure and adjust their business activities accordingly; ▪ Provide information and guidance to women and vulnerable workers, including adapted training schedules and basic support for exploring micro-enterprise opportunities, where feasible; ▪ Maintain regular communication with local authorities and affected communities about closure timelines and expected reductions in workforce numbers; ▪ Maintain an accessible grievance mechanism throughout the closure phase to allow workers to report concerns or issues related to the transition; ▪ Ensure alignment with the Mine Closure Plan, including communication about any opportunities for infrastructure transfer or post-closure community support.								
Notes	Project Phase: D = Decommissioning								

12.2.1.9.6 Impact SOC05 & mitigation: Natural Resource-based Livelihood Impacts

"Summary of the impact assessment conducted by URS in 2015."

Artisanal salt extraction in the Idjill sebkha and pastoral activities are the main sources of income for livestock farmers and several families living in the mining area (F'Derick, Touajil, Aouchich, Touaergha). These activities constitute essential means of livelihood, cultural and economic, for local communities.

As screened in the Environmental and Social Impact Assessment (ESIA) - Human Rights Risk Screening Report, general vulnerabilities related to resource access and livelihoods may be amplified by project activities. These cross-cutting vulnerabilities are addressed indirectly in this section through the receptor-based assessment of natural-resource-based livelihoods (pastoralism and artisanal salt extraction). Pastoralism in the area may significantly evolve in the coming decades, e.g: area usage increases due to cumulative impacts on other pastureland in the region or usage decrease because of a general livestock decrease, because of drought or difficult economic conditions. A specific assessment of pastoralism in the locality of Aouchich is being carried out, as this will become a second wellfield for the project's water provisioning in 20 years after the beginning of mining operation. In any case, a new social baseline will have to be conducted about two years before the start of the development of the wellfield project in Aouchich.

The sensitivity of receptors associated with livelihoods based on pastoralism and salt extraction is considered high. The sections below describe the anticipated impact of the project on pastoralist livelihood at different stages of the project. Nevertheless, the project is scheduled for development in +20 years, which means that the social baseline will be outdated at that time.

Impact description

Construction

During the construction phase, the project involves several operations for the development of the mine infrastructure. These activities will involve the removal of vegetation cover and a significant increase in traffic in the mining area.

- Pastoralism / Livelihood

Mine area: Pastoralism is the main source of income and food security for many households in the region and is a production system that is heavily dependent on seasonal livestock mobility, access to pastoral resources, and strategic water points. The Wilaya of Tiris Zemmour is one of the country's principal grazing areas. It hosts a diversity of pastoral systems:

- Nomadic systems, characterised by high livestock mobility, primarily involving camels and goats. These herders move according to the availability of natural resources.
- Transhumant systems, in which herds migrate for seven to eight months, generally from the north to the south of the country, and sometimes beyond national borders, in search of more abundant pastures.
- Agropastoral systems with sedentary livestock, practised mainly in urban settings, are based on the rearing of cattle and small ruminants. These systems are less mobile and often integrated with agricultural activities.

The project's construction activities, including excavation work and road traffic for supplying the site with equipment and materials, generate several impacts that could directly affect the livelihoods of livestock farmers and many families. Pastoralism depends on the seasonal mobility of livestock and free access to grazing land.

The establishment of the mine and its infrastructure (roads, railway link between F'Derick and the El Aouj mine, storage areas, buildings, pits, auxiliary facilities) and its security zones around the mine may lead to a reduction in grazing areas traditionally used by herders, the fragmentation of transhumance corridors, and access

restrictions related to security measures around the mining site. These changes may disrupt usual pastoral routes and increase pressure on remaining grazing areas, reducing the availability of resources for livestock.

The increased traffic of machinery, heavy vehicles, and vehicles transporting project workers during the construction phase significantly increases the risk of accidents involving herds and herders, particularly during seasonal transhumance movement. Animals crossing roads in F'Derick, often unpredictably, can cause collisions, including with herders and cause livestock losses, which directly undermines household incomes. The establishment of mining infrastructure and related activities leads to a reduction in vegetation available within the project area and in some adjacent areas. This loss of vegetation cover limits the availability of natural pastureland, increasing pressure on surrounding areas. This situation may affect the pastoralists who may need to modify their traditional itinerary near the mining site. Disruption of traditional pastoral corridors may cause delays in seasonal livestock movements and affect access to water sources and grazing land.

According to the Chapter 12.2.1.2 – Surface water, construction-phase land clearance and vehicle movement may temporarily alter runoff in local wadi channels, which are used by pastoralists as grazing corridors after rainfall. Disturbance of soils can mobilise sediments and affect the short-term productivity of wadi vegetation, although embedded measures (culverts, drainage) maintain flow continuity and limit residual impacts to low levels.

In addition, conflicts may arise over the use of space, access to resources (water, grazing land) or damage to livestock in the event of an accident involving a project vehicle. These tensions can affect social cohesion between project workers and local populations.

According to the Chapter 12.2.1.6 – Land Quality and Land Use, construction activities will disturb soils, cause local erosion, and reduce vegetation cover within the mine footprint and along access routes. These temporary losses of vegetation may reduce nearby forage availability and can push herds toward adjacent grazing areas. The formalisation of the access road is expected to reduce uncontrolled off-track vehicle movement and, in the long term, will allow passive recovery of areas previously affected by multiple informal tracks.

In addition, the Touajil Auberge and its oasis depend on groundwater from the P2 aquifer. According to Chapter 12.2.1.1.3 - Impact GW03: Impact of Declining Groundwater Level in the P2 and P4 Aquifers on Groundwater Users, this livelihood is sensitive to long-term variations in groundwater levels. While no effect is expected during the construction phase, the Auberge relies on boreholes that could be impacted by groundwater drawdown associated with the future Touajil wellfield catchment.

Aouchich locality:

The construction of the wellfield infrastructure will not impact the pastoralists livelihood. Indeed, the construction will mainly consist of the installation of pumping wells, solar panels, and underground pipes. The limited footprint of the construction site, given the size of the pasture area and the availability of several wells, will allow the pastoralists to continue their activities during the construction phase. These wells are used periodically throughout the year, particularly during dry seasons, and represent important fallback water points for pastoralist herds. A pastoralist camp is also located near the Loulecisse well, confirming active seasonal use of the Aouchich area during construction periods.

According to Chapter 12.4.2 – Physical risks, the CCRA identifies extreme heat and heat waves as the only high-risk hazards for the Project. All other climate-related events (extreme precipitation, severe storms, strong winds, hail, flooding) are assessed as low-risk. Although these low-risk events do not threaten project infrastructure, shallow hand-dug wells and rainfall-dependent wadi pastures used by pastoralists may still be sensitive to hot, dry periods.

- Artisanal Salt Mining

Artisanal salt extraction in the Sebkha d'Idjil constitutes a significant socio-economic activity within the mining region. Conducted annually over a two- to three-month period during the dry season, it generates temporary employment for local residents of F'Derick, with stakeholder consultations indicating that approximately 300 to 350 individuals participate in each salt extraction campaign. This activity provides income for households, workers and the municipality of F'Derick, while also being of significant cultural importance to the traditional community of Sebkha d'Idjill.

Feedback gathered during consultations in the mining area revealed that F'Derick residents are particularly concerned about the actual or perceived impacts that the development of the El Aouj project and associated population influx may have on artisanal salt mining activities. Furthermore, the El Aouj mine and its associated infrastructure, including the access road, railway line and water pipelines, will not hinder access to the Sebkha d'Idjil extraction area, nor to the various transport routes traditionally used by families to convey salt to national or neighbouring markets. Consequently, the project's activities are not expected to have any direct impact on livelihoods related to artisanal salt production.

According to the Chapter 12.2.1.2 – Surface water, Sebkha Idjill is located downstream of the mine catchment and receives runoff from wadis originating in the project area. During construction, land clearing and soil disturbance may mobilise sediments during rare but intense rainfall events. Although embedded erosion and drainage controls reduce this risk to low levels, episodic sediment-laden runoff could temporarily influence water quality entering the Sebkha, which is relevant for salt crystallisation processes. This potential effect is short-term and of low magnitude but remains a point of concern for communities engaged in artisanal salt extraction.

The impact on natural resource-based livelihood is negative and direct, due to the potential disruption of pastoral itineraries and increased traffic, with a low intensity. The extent is local, and short-term due to the project's construction period (3 years). The magnitude is **Low**.

As the sensitivity was defined to be high and the magnitude to be low, the impact is of **moderate negative significance**.

Operation

- Pastoralists / Livelihood

Mine area: During the project's operational phase, a significant increase in traffic is expected, linked in particular to mining production activities, ore transport by train, and workers transport between the site and the city of F'Dérick. This intensification of movement is likely to increase the risk of accidents involving livestock, with potential consequences for the livelihoods of some families. Consultations with livestock farmers during field visits indicate that transhumance corridors in the region generally follow a west-east axis. These itineraries include stops at available water points for watering livestock. The El Aouj well, located in the immediate vicinity of the mine, is one such water point where herders gather with their livestock when passing through the area.

The project plans to install a fence around part of the mining site, including the processing plant, workers' accommodation and the explosives storage area, to prevent livestock from entering and thus reduce the risk of accidents in the area. Although the remainder of the site will not be enclosed by fencing, it will still be off-limits to grazing.

Due to the distance between the mine and the El Aouj well, mining activities will not affect livestock farmers' access to the El Aouj well or the transhumance corridor.

According to Chapter 12.2.1.6 – Land Quality and Land Use, continuous operational traffic and the long-term occupation of disturbed land (haul roads, pits, waste dump) may limit vegetation recovery and reduce pasture quality close to infrastructure. This may increase pressure on surrounding grazing areas during the operational period.

The Touajil Auberge and its oasis, which rely on groundwater from the P2 aquifer, are expected to be affected during the operational abstraction period at the Touajil wellfield. According to Chapter 12.2.1.1.3 - Impact GW03: Impact of Declining Groundwater Level in the P2 and P4 Aquifers on Groundwater Users), groundwater levels at the Auberge boreholes may decline significantly during long-term pumping, making this livelihood sensitive to groundwater-level reductions.

Aouchich locality: The only human activity in the Aouchich area is pastoralism. Pastoralists from Zouérate and Touajil quoted Aouchich as an area of good pastureland, with water points available at four wells called: Aouchich, Loulecisse, Boutaha and Akreigit (Figure 12-13). They declared that Aouchich was a spot of particular importance during drought. A pastoral camp is located close to the Loulecisse well. According to the Regional Delegate of the Agricultural and Pastoralism Ministry, a transhumant corridor exists between Amessaga, Touajil and Aouchich. The Site visit during the ESIA baseline update confirmed pastoralism activities in the area.

Figure 12-13: Location of the hand dug wells and boreholes to be developed in the Aouchich area

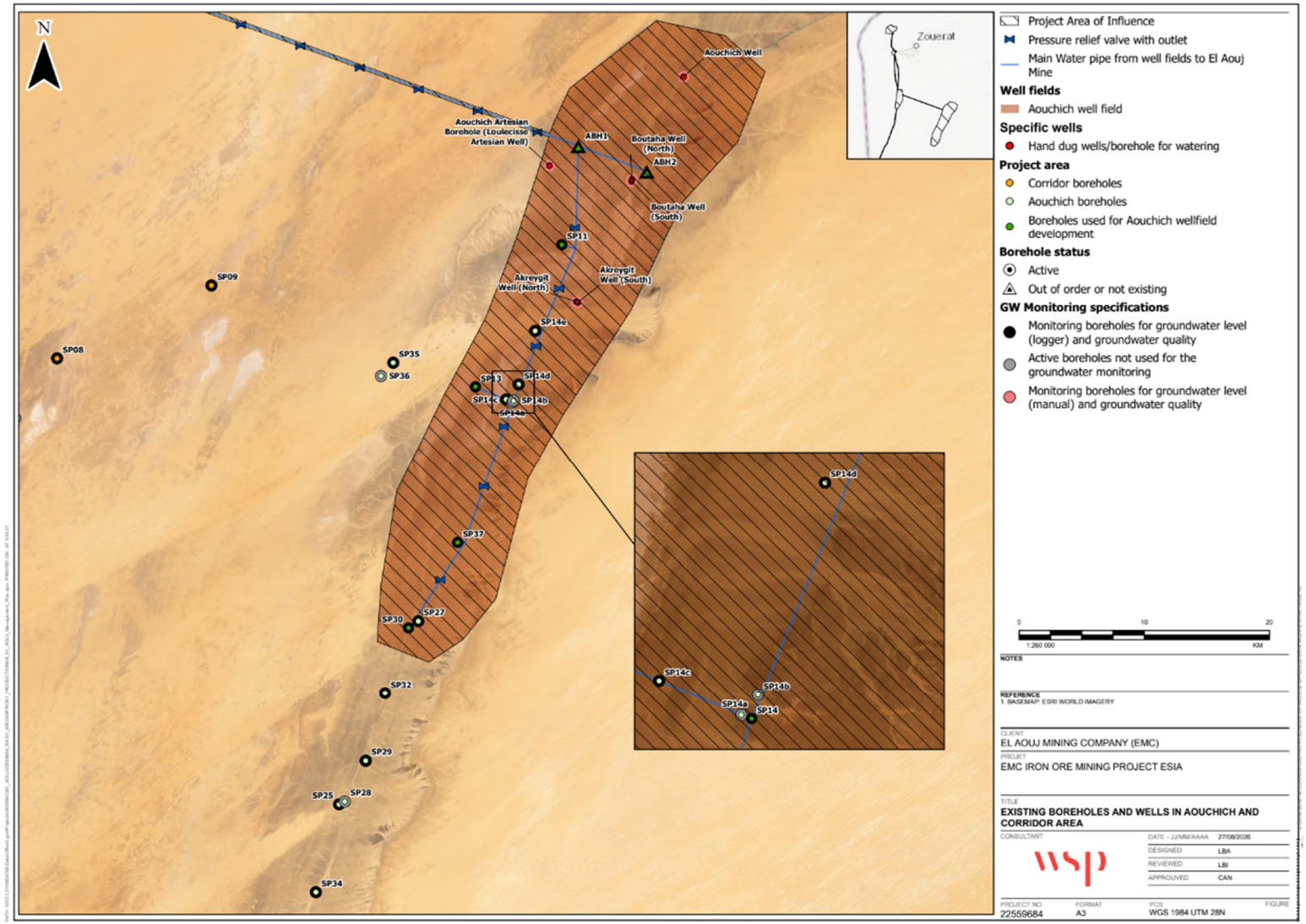


Figure 12-14: Loulecisse artesian well, March 2023

Figure 12-15: Aouchich well, March 2023

Figure 12-16: Boutaha north well, March 2023

Figure 12-17: Pastoralist nomadic camp in Aouchich area, May 2023

During operation, the project infrastructure (underground water pipeline) will not directly impact the pastoralists' activities. However, according to Chapter 12.2.1.1 – Groundwater, the water abstraction modelling (see Figure 12-2, section 12.2.1.1.3) predicts a regional drawdown of the P4 aquifer between 1 and 3 meters (URS , 2015), with localised drawdown up to 20–30 meters near pumping wells. Several pastoralist water points (Aouchich, Loulecisse, Boutaha North/South, Akreygit) fall within this drawdown zone and may experience reduced yields or complete drying during the operational period. This drawdown could lead to the permanent dry-off of these shallow wells, which would significantly and adversely affect pastoralist livelihoods, livestock mobility and drought-season resilience.

According to Chapter 12.4.2 – Physical risks, temperature-related hazards (heat stress, heat waves) are projected to intensify toward 2070. While "drought" and "water scarcity" are not hazards for the project infrastructure (deep groundwater), shallow pastoralist wells and rainfall-dependent wadi pastures remain sensitive to hot, dry periods and to storm-driven sediment flows. These climatic conditions may amplify vegetation stress in Aouchich and increase pressure on remaining functional wells during the operational phase.

Artisanal Salt Mining

The project's mining activities should not affect traditional salt extraction operations in the Sebkha Idjill. However, due to the proximity between the mine and the sebkha, and the occasional presence of salt miners, certain potential impacts may occur. These mainly concern dust emissions from the mine, noise pollution, vibrations and wastewater discharge.

The impacts related to dust, noise and vibrations, as well as mine effluents, are analysed in detail in section 12.2.1.3, 12.2.1.5 and 12.2.1.2 of this report.

The impact on natural resource-based livelihood is negative and direct, because it is ongoing and changes territorial and pastoral dynamics over several decades, with a high intensity due to the risk of drying the hand dug wells. The extent is regional, covering at least all the Aouchich area and impacts pastoralists coming from Zouérate and is long-term due to the project's operational period (41 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **High negative significance**.

Decommissioning

During the mine closure phase, all infrastructure on the site will be decommissioned, dismantled and removed. At this stage, access restrictions, including fences installed around sensitive areas, may be lifted. Vegetation is expected to gradually and naturally recolonise the rehabilitated areas, a process that will take several years at the mining site. Once this regeneration is complete, the restored areas can once again be used for grazing. However, some facilities, including the open pit, the backfill area and the tailings storage area, will remain in place.

Mine area: Given the limited and localised nature of these changes, the overall impact of the project closure on pastoralism and salt extraction activity is considered negligible.

Aouchich locality: Decommissioning will not have any additional impact on pastoralist livelihood as the adverse impact on the water level of wells generated during operations is definitive. At the end of the mining activities, the wellfield is planned to be handed over to local communities or authorities. According to the hydrogeological model (Chapter 12.2.1.1 – Groundwater), aquifer recovery in this arid environment is gradual and partial over long timeframes. For example, model projections at Touajil indicate only around 50% recovery after several decades, with Aouchich expected to recover more readily but still slowly. Considering the groundwater levels currently observed, the refilling of these hand-dug wells may therefore take extended periods after the cessation of the wellfield. A water shortage could then be expected if a minimum maintenance of the pumping installations is not planned until the hand dug wells groundwater levels are recovered enough.

Mitigation measures

Mitigation measures implemented to avoid and reduce potential negative effects on pastoralist livestock herding should include the following:

- Access roads to be clearly marked with a defined speed limit to be used by Project construction and operational vehicles in order to reduce the risk of collisions with people and animals;
- Training of workers in safe driving and avoidance of hazards;
- Implementation of the Stakeholder Engagement Plan including the grievance mechanism.

From the beginning of the El Aouj project construction, water level at the Aouchich area wells will be regularly monitored. This will allow fine-tuning of the assessment of the foreseen impact of a 3.3 m drawdown at the Aouchich wells.

An update to the social baseline will be conducted two years before the development of the project to assess any changes in the number of pastoralists and their usage of the area. From the data available in this present Aouchich social baseline: the confirmed usage of the wells by pastoralists, the importance of the area for pastoralists of Touajil and Zouérate and the groundwater level modelling, the construction of drinking troughs in new grazing areas will be required before the start of the well field development. In any case, the Groundwater

& Surface Water Management Plan shall describe all the measures to be implemented to ensure the water supply of herders and communities throughout the wellfield operation and after the mine closure, until the recovery of groundwater levels allowing the reuse of all existing hand-dug wells.

Additional mitigation measures

- Undertake targeted identification and socio-economic assessment of pastoralist users potentially affected by Project activities, including seasonal users of grazing areas, transhumance routes and water points, to inform livelihood restoration planning
- Targeted engagement with pastoralists and artisanal salt workers at the Sebkha d'Idjill to confirm transhumance routes, seasonal salt extraction periods, and any access or safety concerns associated with Project activities;
- Development and implementation of livelihood restoration measures, where impacts are verified, in consultation with affected pastoralists and artisanal salt workers.

Prepare targeted livelihood support measures for salt-extraction workers and pastoralist households, aligned with IFC Performance Standards and consistent with national pastoral regulations on mobility and access to water.The implementation of the above-mentioned mitigation measures for pastoral livestock farming and the effective implementation of the stakeholder engagement plan, including the grievance mechanism, will reduce the sensitivity of potential impacts on livelihoods.

Summary of impact assessment

Table 12-43 provides a summary of the project's impact on natural resource-based livelihood impacts.

Table 12-43: Impact SOC05 - Natural Resource-based Livelihood Impacts

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Co	Negative	Direct	Low	Local	Short-term	Low	High	Moderate
After mitigation	Co	Negative	Direct	Low	Local	Short-term	Low	Low	Low
Before mitigation	Op	Negative	Direct	High	Regional	Long-term	High	High	High
After mitigation	Op	Negative	Direct	Moderate	Regional	Long-term	Moderate	High	Moderate
Mitigation measures	▪ Undertake targeted identification and socio-economic assessment of pastoralist users potentially affected by Project activities, including seasonal users of grazing areas, transhumance routes and water points, to inform livelihood restoration planning Mine area: ▪ Access road to be clearly marked with defined speed limits; ▪ Driver training, including safe practice and avoidance of hazards; ▪ Implement Stakeholder Engagement Plan, including the grievance mechanism; ▪ Targeted engagement with pastoralists and artisanal salt workers at the Sebkha d'Idjill to confirm transhumance routes, seasonal salt extraction periods, and any access or safety concerns associated with Project activities; ▪ Development and implementation of livelihood restoration measures, where impacts are verified, in consultation with affected pastoralists and artisanal salt workers; ▪ Prepare targeted livelihood support measures for salt-extraction workers and pastoralist households, aligned with IFC Performance Standards and consistent with national pastoral regulations on mobility and access to water. Aouchich locality:								

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
	▪ Implement Groundwater & Surface Water Management Plan: monitor wells water levels during mining activities to re-assess the impact of water abstraction before developing the well field project in 20 years-time; ▪ Update social baseline two years before the development of the well field project; ▪ Construction of drinking troughs in new grazing areas; ▪ Update and implement the Stakeholder Engagement Plan, including the community grievance mechanism: allow access to raw water with acceptable conductivity for local communities and livestock.								
Notes	1 Project Phase: Co = Construction; Op = Operation								

12.2.1.10 In-migration

This section assesses impacts in relation to the baseline conditions described under Section 8.4.3 (Population and Social Organisation), with consideration of pressures on social infrastructure and services (Section 8.4.8).

12.2.1.10.1 Impact SOC06 & mitigation: Unplanned Project-induced In-Migration Impacts

“Summary of the impact assessment conducted by URS in 2015.”

Vulnerable groups identified in the mining area also include seasonal workers and migrants, whose living and working conditions are often precarious. The sensitivity of receptors associated with migration is high, due to the economic and social vulnerability of these populations.

As screened in the Environmental and Social Impact Assessment (ESIA) - Human Rights Risk Screening Report project-induced in-migration can amplify underlying social vulnerabilities. These cross-cutting vulnerabilities are addressed indirectly in this section through the analysis of in-migration pressures on housing, services, social cohesion and exposure to risk.Impact description

Construction

During the construction phase, the activities planned in the mining area are likely to lead to increased migration to the city of F’Derick, due to the direct and indirect employment opportunities created. Mauritania occupies a unique position in regional migration dynamics, serving as a point of departure, a destination, and a transit point for many migrants. Internal migration related to the project could have negative effects, including:

- The possibility of spontaneous settlements forming in F’Derick and potentially Zouérate, as well as migration from other localities (such as Nouadhibou), which may lead to associated health, safety, law and order, land use conflict, and environmental challenges;
- Enhanced demand for infrastructure, including access to electricity, heating, water, transportation, medical services, and education;
- Increased pressure on existing communal resources such as water supplies and pastureland;
- Elevated risks related to worker and community health and safety, including potential conflicts between local residents and migrants, increased crime and illicit activities (e.g., prostitution), and the possible introduction of communicable diseases (including STIs and HIV/AIDS).

Drivers of unplanned in-migration within the Project area include high rates of unemployment and underemployment in Mauritania and neighbouring countries, coupled with a long-standing cultural tradition of labour mobility in the region. Conversely, limiting factors include:

- The remote location of the Project;
- Low population density in the region;
- The presence of other mining developments in the area.

The most significant migration effects are expected during the construction phase, when the project's labour requirements will be at their highest. To estimate the potential scale of migration induced by the project, the methodological recommendations of the IFC were applied. Deliberately conservative multipliers were used to take into account factors likely to limit unplanned immigration, such as conditions of access to the area, availability of local services and environmental constraints.

Two scenarios were used, one with a high multiplier of 5 and the other with a low multiplier of 1, implying that each formal job created by the project could generate between one and five additional job opportunities within the mining area. Most of the expected migration is estimated at 80% or more and will come from within Mauritania, although some arrivals may also come from neighbouring countries.

Unplanned immigration is expected to be concentrated mainly in F'Derick, which will be the main recruitment center, although an increased influx of migrants to Zouérate also remains likely.

The impact is negative and indirect, with a high intensity. The extent is regional, and short-term due to the project's construction period (3 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance**.

Operation

During the operational phase, continued in-migration is also expected in the mining area. This trend will be driven mainly by sustained demand for labor and growing needs for goods and services related to mining activities. This in-migration will generate a series of socioeconomic impacts, affecting both the city of F'Derick and its surrounding communities. These impacts stem mainly from unplanned population growth, increased demand for essential services, and significant pressure on local infrastructure and basic social services, particularly in the areas of housing, access to water, health, and sanitation. As with the construction phase, the majority of expected migrants will come from Mauritania, particularly young people looking for employment opportunities and improved economic conditions. A small proportion of workers may also arrive from neighbouring countries, attracted by direct employment and indirect economic opportunities generated by the project. This unplanned immigration is expected to be concentrated mainly in the town of F'Derick, which will be the main recruitment center and hub for socio-economic activities related to the project.

The impact is negative and indirect, with a high intensity. The extent is regional, and long-term due to the project's operational period (41 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance**

Decommissioning

During the mine decommissioning phase, all infrastructure on site will be decommissioned, dismantled and removed. At this stage, there will be no economic or operational activity likely to attract migrants to the project area. Consequently, the effects of internal migration during the closure phase are considered negligible.

Mitigation measures

In-migration presents a complex and sensitive challenge. EMC will address the risks associated with population in-migration based on the Mauritanian labor code and by collaborating with local and regional authorities and implementing basic management measures as outlined in the Influx Management Strategy, which will be developed in line with international best practices. This approach will be supported by the Stakeholder Engagement Plan, Human Resources and Employment Plan, Procurement Strategy, and Health and Safety Management System. Furthermore, contractors and subcontractors are required to adhere to EMC's general human resources policies regarding staff recruitment, including the standard policy of not hiring personnel directly at the mine site.

In addition, EMC will coordinate with local and regional authorities to monitor and manage secondary risks associated with in-migration, including informal settlement, pressure on communal services, and potential community tensions. Monitoring of in-migration trends and related grievances will be undertaken to enable adaptive management measures where required.

Summary of impact assessment

Table 12-44 provides a summary of the project's impact on unplanned project-induced in-migration.

Table 12-44: Impact SOC06 - Unplanned Project-induced In-migration Impacts

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Co	Negative	Indirect	High	Regional	Short-term	High	High	High
After mitigation	Co	Negative	Indirect	High	Regional	Short-term	Moderate	Moderate	Moderate
Before mitigation	Op	Negative	Indirect	High	Regional	Long-term	High	High	High
After mitigation	Op	Negative	Indirect	Low	Regional	Long-term	Moderate	Moderate	Moderate
Mitigation measures	▪ Work with local and regional authorities to mitigate impacts associated with in migration; ▪ Implement the Influx Management Strategy; ▪ Implement EMC's Health and Safety Management System; ▪ Implement the Human Resources and Employment Plan; ▪ Implement the Stakeholder Engagement Plan, to include clear communication of all available employment positions at Project shop front in F'Derick; ▪ Implement the Procurement Strategy; ▪ Coordinate with local and regional authorities to monitor and manage secondary risks associated with in-migration.								
Notes	1 Project Phase: Co = Construction; Op = Operation								

12.2.1.11 Community

This section assesses impacts in relation to the baseline conditions described under Section 8.4.3 (Population and Social Organisation), with consideration of pressures on social infrastructure and services (Section 8.4.8).

12.2.1.11.1 Impact SOC07 & mitigation: Groundwater users and future community access to groundwater resources

“Summary of the impact assessment conducted by URS in 2015.”

The sensitivity of receptors associated with Touajil groundwater users, as well as the community's future access to these resources, is considered high.

As screened in the Environmental and Social Impact Assessment (ESIA) - Human Rights Risk Screening Report vulnerabilities linked to access to essential resources may be amplified by project activities. These cross-cutting vulnerabilities are addressed indirectly here through the assessment of groundwater users, community dependence on the P2/P4 aquifers and future access considerations.

.Impact description

Construction

The project's construction phase focuses on developing the mine's infrastructure and associated facilities, and no production activities will occur at the site during this period. The impacts of groundwater extraction related to the project on groundwater are addressed in the section 12.2.1.1.

Operation

The Touajil community currently obtains its drinking water from a borehole drilled by SNIM and water for livestock from a well near the Touajil inn. the Touajil Auberge, a guest house and gardens, also obtain water from the same P2 aquifer as the Project water supply. The Touajil borehole field will be developed to supply water to the project. Therefore, Project water abstraction will not impact directly upon the principal water supply for the Touajil community, although it will:

- Adversely impact groundwater production from boreholes that currently supply the Touajil Auberge;
- Reduce the potential for future development of the groundwater resource by the Touajil community;
- Provide infrastructure for community water abstraction post closure.

Extreme water scarcity in the region means that existing groundwater resources have importance as an ecosystem provisioning service for local communities, even if they are not currently being exploited. The abstraction of water from the P2 aquifer at the Touajil wellfield could have a long-term adverse impact, of high significance for local communities, increasing the likelihood that the communities will be dependent in the long term on water supplied from outside the region. EMC plans to manage the Touajil wellfield in such a way as to maintain a sufficient storage level to ensure a sustainable longterm yield. This future yield will be significantly lower than the volume extracted during the mining operational phase. -term yield. This future yield will be significantly lower than the volume extracted during the mining operational phase.

The impacts of groundwater are addressed in the section 12.2.1.1.

Decommissioning

During the mine closure phase, no activities will require a high-volume water supply. After the mine has closed, EMC will hand over all hydraulic installations to the local community, including the Touajil wellfield and the reverse osmosis treatment unit, so that they can continue to operate the well autonomously and sustainably.

Mitigation measures

To reduce these effects, EMC plans to oversee the Touajil wellfield in a way that ensures enough water remains for sustainable use over the long term. Although this sustained productivity will be substantially lower than the

wellfield's output during mining operations, EMC intends to transfer ownership of both the wellfield and the RO treatment plant to the local community once the project concludes, allowing continued access and use.

In addition, targeted consultation with pastoral households and other groundwater-dependent users to confirm the impacts of pumping, seasonal water requirements, and appropriate mitigation or supply measures.

Summary of impact assessment

The summary of the project's impact on groundwater is presented in the section 12.2.1.1.

12.2.1.11.2 Impact SOC08 & mitigation: Increased pressure on communal facilities and services

"Summary of the impact assessment conducted by URS in 2015."

The city of F'Derick has several basic infrastructure facilities, but their capacity remains insufficient to meet the needs of the local population. The sensitivity of the receptors associated with the increasing pressure on municipal infrastructure and services is high.

As screened in the Environmental and Social Impact Assessment (ESIA) - Human Rights Risk Screening Report, access to basic services is an area of vulnerability that may be amplified by project-related demographic changes. These cross-cutting vulnerabilities are addressed indirectly in this section through the assessment of pressures on communal facilities and services in F'Derick.

Impact description

Construction

During the construction phase, approximately 2,600 workers will be employed for an estimated period of 3 years. There is the potential for increased demand for, and pressure on, key services and infrastructure as a result of Project activities and workforce requirements, particularly in F'Derick during the Project operations where the operational workforce residence will be located. Demand will be increased and impacts exacerbated by potential Project-induced in-migration. The additional burden on these services risks possible deterioration in the quality and regularity of availability to the local community:

Pressure on health services: The influx of workers will significantly increase the number of visits to the municipal health center, which could quickly become saturated. The risk of accidents related to construction activities will require increased medical response capacity. In addition, the concentration of workers in temporary camps could promote the spread of infectious diseases, which would increase the demand for care.

Increased generation of waste: The production of wastewater and solid waste will increase significantly in the city of F'Derick. The city does not have a waste collection and treatment facility. This could lead to overflows, odour nuisance and local pollution. The increase in waste production poses an increased risk of health problems for local populations.

Increased demand for water: Water consumption will increase significantly, putting pressure on an already limited network. This additional demand may cause occasional shortages for local households if autonomous solutions are not implemented by the project.

Road infrastructure and traffic: The transport of materials, equipment and project personnel will generate heavy traffic from lorries and light vehicles. Local roads, which are not designed to cope with such high volumes of traffic, are likely to deteriorate rapidly. This situation will also increase the frequency of accidents and congestion at strategic points in the city of F'Derick.

Increase demand of housing: The arrival of thousands of workers will create high demand for housing, restaurants, shops and services. This pressure may lead to higher rents and reduced availability of housing for local residents.

EMC plans to develop several essential services and infrastructure in F'Derick to support the project's implementation and the workers who will be housed there. These investments will include improvements to the water supply, enhanced waste management systems, and support for local providers in the education and health sectors, in order to mitigate the potential pressures resulting from the arrival of project personnel.

The impact is negative and direct, with a high intensity. The extent is local, and short-term due to the project's construction period (3 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance.**

Operation

During the operational phase of the project, approximately 1,000 workers will be employed at the mining site. The arrival of workers, as well as the potential settlement of some of their families in the city of F'Derick, will lead to significant local population growth. This demographic dynamic is a major factor that is likely to increase pressure on existing social services and community infrastructure.

Pressure on health services: The arrival of new residents will lead to an increase in demand for healthcare. This pressure is reflected in overcrowding in consultation and emergency services, and increased demand for medical staff, medicines and equipment.

Pressure on educational infrastructures: The installation of workers' families from the project in the city of F'Derick will lead to a significant increase in demand for educational infrastructure. The arrival of new households will be accompanied by the enrolment of a large number of children in local public schools, which will put direct pressure on the capacity of these establishments. This situation will result in particular in an increase in the number of pupils per classroom, leading to an overload of existing infrastructure and a risk of deterioration in the quality of education. Schools could quickly reach or even exceed their functional limits, making it difficult to manage classes and provide adequate supervision for pupils.

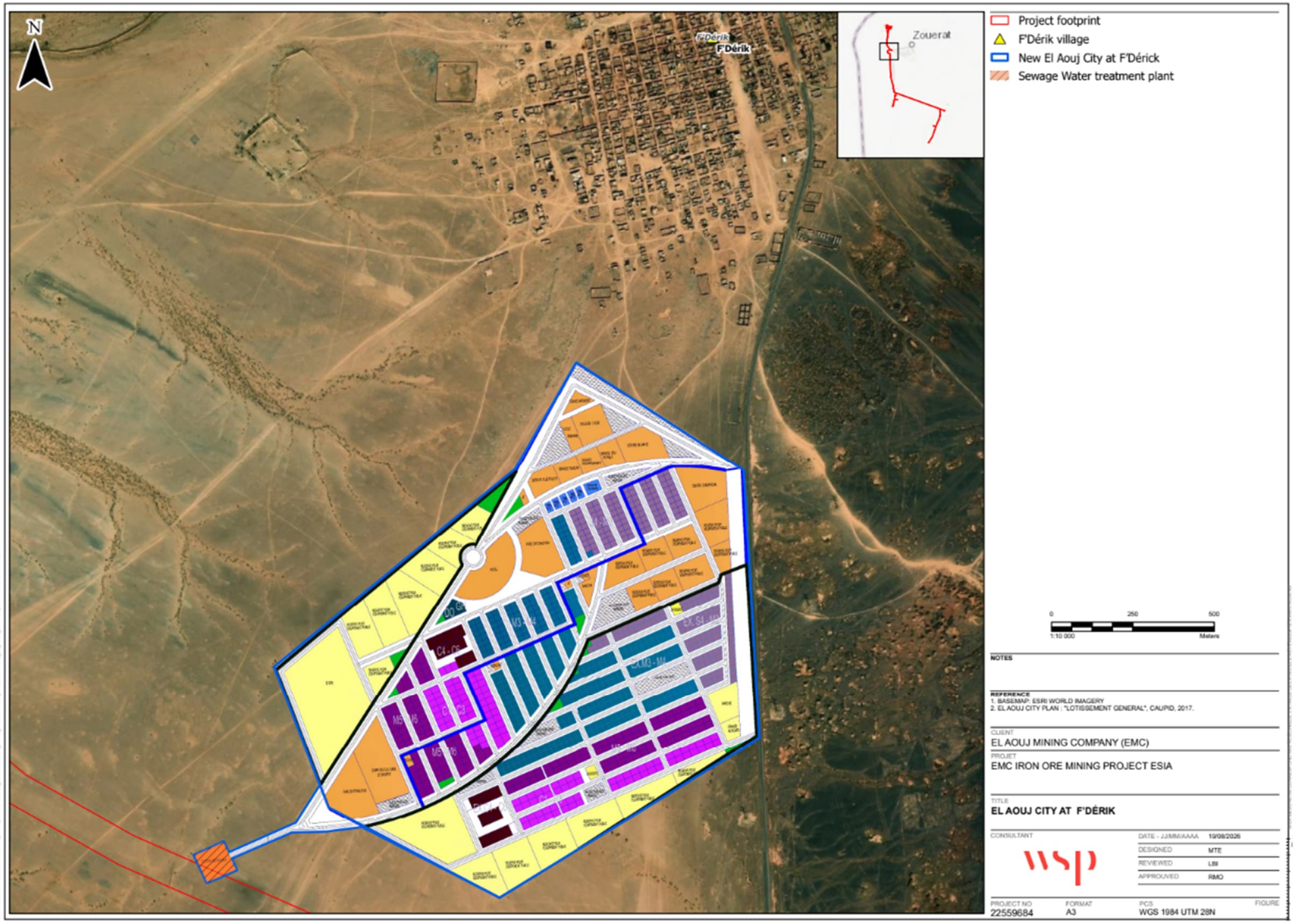
Road infrastructure and traffic: During the project's operational phase, the number of workers in the city will decrease significantly compared to the construction phase, but traffic will remain heavy and more regular, mainly due to staff rotations between the mining site and the city of El Aouj and the transport of inputs and products.

Increased generation of waste: The production of wastewater and solid waste will increase significantly in the city of F'Derick. The city does not have a waste collection and treatment facility. This could lead to overflows, odour nuisance and local pollution. The increase in waste production poses an increased risk of health problems for local populations.

EMC provides for the implementation of several measures designed to support and strengthen local infrastructure and services in the city of F'Derick in order to facilitate access to quality services for the population, including project workers and their families, while avoiding saturation of existing facilities.

El Aouj City at F'Derick: EMC involves the construction of housing (Cité El Aouj) in F'Derick to accommodate of workers during the operational phase (Figure 12-18). The housing will be located south of the city of F'Derick and will comprise 440 residences as well as various public facilities and services, including a sanitation facility. The implementation of this infrastructure is scheduled for four years after the start of mining operations. A detailed description of the complex is provided in the project description (section 4.1.6.7.3).

Figure 12-18: El Aouj City at F'Derik



The impact is negative and direct, with a high intensity. The extent is regional, and long-term due to the project's operational period (41 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance.**

Decommissioning

During the mine closure phase, all infrastructure present on the site will be decommissioned, dismantled, and removed. At this stage, a large proportion of the workers will gradually leave the area, resulting in a significant decrease in the population associated with the project. In this context, the pressure exerted on local infrastructure and community services is considered negligible.

The El Aouj City built by EMC in F'Derick, will remain in place and will not be demolished. It represents a structural investment for the city. Once the project is closed, this residential complex will become an important infrastructure for urban expansion and development in F'Derick. The El Aouj City may be used by local authorities to provide accommodation for various needs in the city. This high-quality infrastructure may be put to good use for the benefit of local communities.

Mitigation measures

Specific measures will be implemented to reduce pressures on communal facilities in F'Derick. These measures include the construction of camps dedicated to project workers, to mitigate the risk of overloading existing accommodations. At the same time, EMC could contribute to strengthening basic social infrastructure in F'Derick. These actions aim to prevent pressures on public services and to promote sustainable local development in line with the anticipated population growth associated with the project.

- Integration of workers residences into F'Derick township;
- Development of infrastructure in F'Derick for worker residences.

Additional mitigation measures:

- In coordination with relevant local authorities and service providers, EMC will monitor demand on key communal services (including water, waste management, health and education) in order to adapt support measures as necessary during construction and early operations.
- EMC to establish health services dedicated to project workers and their families;
- EMC will provide technical and material support to the basic social services of the city of F'Derick (health, education).

Summary of impact assessment

Table 12-45 provides a summary of the project's impact on increased pressure on communal facilities and services.

Table 12-45: Impact SOC08 – Increased Pressure on Communal Facilities and Services

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Co	Negative	Direct	High	Local	Short-term	High	High	High
After mitigation	Co	Negative	Direct	Low	Local	Short-term	Moderate	Moderate	Moderate

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Op	Negative	Direct	High	Local	Long-term	High	High	High
After mitigation	Op	Negative	Direct	Low	Local	Long-term	Moderate	Moderate	Moderate
Mitigation measures	▪ Integration of workers residences into F'Derick municipality; ▪ Development of infrastructure in F'Derick for worker residences; ▪ In coordination with relevant local authorities and service providers, EMC will monitor demand on key communal services (including water, waste management, health and education) in order to adapt support measures as necessary during construction and early operations; ▪ EMC to establish health services dedicated to project workers and their families; ▪ EMC will provide technical and material support to the basic social services of the city of F'Derick (health, education).								
Notes	1 Project Phase: Co = Construction; Op = Operational; De = Decommissioning								

12.2.1.11.3 Impact SOC09: Impact on Community development potential

"Summary of the impact assessment conducted by URS in 2015."

The sensitivity of receptors associated with community development is high.

Impact description

Construction

The project's construction phase focuses on developing the mine's infrastructure and associated facilities, and no production activities will occur at the site during this period. Consequently, no impact is anticipated during this phase.

Operation

The project is located in a region characterised by significant needs in terms of basic social infrastructure (hospitals, schools, water, etc.). The city of F'Derick faces structural challenges such as access to basic services and the vulnerability of households in terms of access to credit or financing, as well as a marked dependence on a limited number of income-generating activities. In this context, the Project's long-term presence creates opportunities for structured community development, which will be guided by a dedicated framework developed with stakeholders to prioritise and coordinate community support initiative.

- Improve basic infrastructure: Through this structured community development framework, the Project can support gradual and targeted improvements to basic infrastructure by identifying priority deficits with stakeholders and directing investment towards essential services such as hospitals, schools, access to drinking water and sanitation. These efforts aim to improve the accessibility and quality of social services and contribute to an environment conducive to human development.
- Community development opportunity linked to El Aouj city: El Aouj city, built by EMC in F'Derick, will include quality housing as well as various public facilities and services. After the mine closure, this infrastructure can be transferred to the municipality of F'Derick, offering several opportunities for local development. This

transfer will improve access to housing for residents, support urban expansion through the integration of new infrastructure, and strengthen local public services.

- Improve livelihoods of communities: The Project's contribution to local development creates opportunities to strengthen the livelihoods of communities by improving access to vocational training, supporting the acquisition of skills suited to the labour market, and promoting the development of sustainable income-generating activities. The project will also contribute to improving living conditions through better access to basic social services. Taken together, these efforts have the potential to gradually and sustainably foster an environment more conducive to the economic empowerment of households, while supporting greater inclusion of vulnerable social groups, particularly young people, women and low-income households.Water discharge from the pipeline (purging and maintenance) – Opportunity for agricultural development: Water discharge from pipeline purging or maintenance operations can have occasional but significant impacts on the local environment. Temporary spills can lead to the formation of muddy areas or small runoff. These water inputs can also create localized areas of soil that are temporarily favourable for oasis farming or market gardening, thus constituting a potential opportunity for agricultural development (oases, market gardening), if these discharges are controlled and directed appropriately.

The project has the potential to become a real lever for sustainable socio-economic transformation in the mine area, given the scale and duration of operations and the associated opportunities for local development. This long-term potential will be supported by a structured community-development framework, developed with stakeholders, ensuring that EMC's contributions to local development are coherent, inclusive and aligned with local priorities. The impact is positive and direct.

Decommissioning

During the mine decommissioning phase, the potential transfer of existing facilities and infrastructure will be assessed by EMC and confirmed following a consultation process with the relevant stakeholders. The conclusions of these discussions, as well as the transfer arrangements selected by EMC, will be presented in the detailed closure plan for the El Aouj mine, in order to ensure a transparent transition in line with stakeholder expectations.

The impact is positive and direct.

Enhancement measures

Specific measures will be implemented to maximize the positive impacts of the project on community development. These measures may include support for basic social services, the provision of infrastructure that can benefit local communities, and the promotion of sustainable economic activities to support the autonomy and socio-economic resilience of the area after the closure of the mining site.

Summary of impact assessment

Table 12-46 provides a summary of the project's impact on community development potential.

Table 12-46: Impact SOC09 – Impact on Community Development Potential

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Assessment	Op	Positive	Direct	Moderate	Local	Long-term	Low	High	N/A
Assessment	De	Positive	Direct	Moderate	Local	Long-term	Low	High	N/A

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Enhancement measures	■ Develop a Community Development Plan prior to any community support/ investment initiatives being implemented; ■ Implement a Stakeholder Engagement Plan (SEP); ■ Maintain a commitment register; ■ Maintain a request for support register; ■ Implement the detailed Mine Closure Plan.								
Notes	1 Project Phase: Op = Operation; De = Decommissioning; N/A = Not Applicable								

12.2.1.11.4 Impact SOC13 & mitigation: Impact on Women and Vulnerable Groups

This assessment draws on the Chapter 08 Social Baseline for the Mine Area (Sections 8.4.3, 8.4.4 and 8.4.5), which identifies women and vulnerable groups as highly sensitive receptors due to structural socio-economic conditions, limited access to services, and exposure to GBV risk.

The mining area has a significant number of vulnerable people. Identified vulnerable groups include women (particularly female heads of households), households without income, unemployed young people, elderly people without family support, and people with disabilities. These categories are more exposed to the socioeconomic risks associated with mining activities and therefore require specific attention in the planning of interventions. The sensitivity of the receptors associated with vulnerable groups is high.

As screened in the Environmental and Social Impact Assessment (ESIA) - Human Rights Risk Screening Report socially disadvantaged or marginalised groups may face heightened vulnerabilities in the context of project development. These cross-cutting vulnerabilities are addressed indirectly in this section through the assessment of social vulnerability affecting women and other vulnerable groups.

Impact description

Construction

During the construction phase of the project, approximately 2,600 workers will be mobilized on site, the majority of whom will be men. In addition, the arrival of additional people, mainly men looking for jobs or business opportunities, may generate social impacts. This influx will create a demographic imbalance, leading to:

- an increase in the cost of living (food, housing, transportation);
- a significant change in the male/female ratio in the mining area.

These dynamics may have a disproportionate impact on some vulnerable groups, including women, poor households, unemployed youth, the older population, and people with disabilities.

Women (including female heads of households): The mining area has a large number of women who actively contribute to socio-economic dynamics and local development initiatives. Despite their commitment, these women continue to face structural challenges that hinder their economic autonomy and access to sustainable opportunities. In particular, they encounter numerous difficulties in improving their production capacity in the areas of market gardening and handicrafts, as well as in accessing regional markets.

On a social level, the massive influx of external labor can increase the risk of harassment, exploitation, and gender-based violence (GBV), particularly in public spaces, at water points, and in markets. Women may be

exposed to inappropriate behaviour from project workers (as well as people seeking employment or business opportunities), including domestic violence, early pregnancy, or forced marriage of young girls. Interactions between project workers and women may also increase the incidence of communicable diseases. Women and adolescent girls may also face forms of stigmatization or social tensions if transactional dynamics develop (such as gifts, promises of employment, etc.).

Households without income: They are particularly affected by rising market prices for food and transportation due to the influx of workers and other people into the area. Competition for small job opportunities, as well as pressure on natural resources, can push them into debt and into precarious and dangerous forms of work. These households often have limited access to employment due to their low qualifications and the administrative costs associated with obtaining documents.

Older people without family support: Older people are severely affected by rising food prices, which can directly impact their ability to eat properly, especially since they rarely have a stable income.

Unemployed youth: The construction phase of the project is scheduled to last three years and will generate high demand for workforce (2,600 people), which may provide temporary jobs for young people in the mining area, particularly those in F'Derick. However, if most jobs are given to external workers, local young people may feel excluded and treated unfairly. This could lead to frustration, tension, and potentially social unrest.

People living with disabilities: People with disabilities are at greater risk of exclusion from the labour market, particularly when jobs require high mobility, stamina, or specific technical skills. Their access to professional opportunities therefore remains limited, which reinforces their socioeconomic vulnerability.

In addition, project activities could also have a direct impact on vulnerable groups, due to potential tensions related to cultural differences and the presence of workers or job seekers in the mining area.

The impact is negative and direct, with a high intensity. The extent is local, and short-term due to the project's construction period (3 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance.**

Operation

During the project's operational phase, approximately 1,000 people will be present on site. Direct impacts related to their presence are expected:

- an increase in the cost of living (food, housing, transportation);
- a significant change in the male/female ratio in the mining area.

In addition, as required by the AfDB, some vulnerable households may continue to face increased economic pressure affecting their livelihoods, particularly those relying on informal or small-scale income-generating activities that are sensitive to market fluctuations.

Women (including female heads of household): Employment opportunities will stabilize around a reduced workforce (approximately 1,000 workers). Despite this decline, some cases of gender-based violence (GBV) or sexual harassment could occur in the area due to the continued presence of project workers. Women living in the town of F'Derick will remain exposed to inappropriate behaviour by some workers around the El Aouj city or where workers will be housed during the operational phase.

Interactions between workers and women may also increase the incidence of communicable diseases. Without specific measures, women may also be excluded from skilled jobs and confined to informal service activities (catering, small businesses), which are often precarious and sensitive to economic shocks.

Youth in the mine area: During the operational phase, the number of jobs will decrease, and the technical requirements of certain occupations will increase. Without adequate training, some of the young people recruited during the construction phase may lose their jobs, thereby exacerbating structural unemployment in the area.

People living with disabilities: Workforce stabilization during the operational phase can benefit some people with disabilities, if suitable positions exist. However, in the absence of a robust policy on accessibility, job accommodation, and non-discrimination, their marginalization is likely to continue.

The impact is negative and direct, with a high intensity. The extent is local, and long-term due to the project's operational period (41 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance.**

Decommissioning

During the mine decommissioning phase, all infrastructure present on the site will be decommissioned, dismantled, and removed. At this stage, a large proportion of the workers will gradually leave the area, resulting in a significant decrease in the population associated with the project. At the local level, mining-related income for certain vulnerable groups will gradually decline due to job and income losses. This loss of livelihoods risks further weakening vulnerable groups and exacerbating food insecurity in the mining area.

Mitigation measures

The following measures are proposed in EMC to reduce the project's impact on vulnerable groups:

- Implement the HR policy that explicitly includes provisions on equal opportunities, non-discrimination, and the protection of vulnerable groups;
- Implement a recruitment strategy that includes a minimum proportion of women, both in technical and non-technical positions, with suitable working hours and conditions that allow for a work-life balance;
- Develop a professional inclusion policy that ensures that positions are accessible to people with disabilities, including reasonable accommodations where necessary;
- Raise awareness among all project workers about compliance with the code of ethics and conduct, including standards relating to the prevention of harassment, gender-based violence, and discriminatory behaviour;
- Support women's cooperatives in the mining area, in particular through training, capacity building, access to financing, or equipment, in order to improve their livelihoods in a sustainable manner;
- Train individuals or groups who lack the necessary skills to access job opportunities related to the project, with a particular focus on vulnerable or disadvantaged groups;
- Implement the Stakeholder Engagement Plan (SEP) to ensure ongoing, transparent, and inclusive communication with all affected communities;
- Implement the grievance management mechanism (GMM), including appropriate channels (telephone, community relays, focal points, complaint boxes), confidentiality guarantees, clear processing times, and specific procedures for the secure handling of GBV-related complaints.

Summary of impact assessment

Table 12-47 provides a summary of the project's impact on vulnerable group.

Table 12-47: Impact SOC13 & mitigation: Impact on Women and Vulnerable groups

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Op	Negative	Direct	High	Local	Long-term	High	High	High
After mitigation	Op	Negative	Direct	Moderate	Local	Long-term	Moderate	High	Moderate
Before mitigation	De	Negative	Direct	High	Local	Long-term	High	High	High
After mitigation	De	Negative	Direct	Moderate	Local	Long-term	Moderate	High	Moderate
Mitigation measures	■ Implement the HR policy that explicitly includes provisions on equal opportunities, non-discrimination, and the protection of vulnerable groups; ■ Implement a recruitment strategy that includes a minimum proportion of women, both in technical and non-technical positions, with suitable working hours and conditions that allow for a work-life balance; ■ Develop a professional inclusion policy that ensures that positions are accessible to people with disabilities, including reasonable accommodations where necessary; ■ Raise awareness among all project workers about compliance with the code of ethics and conduct, including standards relating to the prevention of harassment, gender-based violence, and discriminatory behaviour; ■ Support women's cooperatives in the mining area, in particular through training, capacity building, access to financing, or equipment, in order to improve their livelihoods in a sustainable manner; ■ Train individuals or groups who lack the necessary skills to access job opportunities related to the project, with a particular focus on vulnerable or disadvantaged groups; ■ Implement the Stakeholder Engagement Plan (SEP) to ensure ongoing, transparent, and inclusive communication with all affected communities; ■ Implement the grievance management mechanism (GMM), including appropriate channels (telephone, community relays, focal points, complaint boxes), confidentiality guarantees, clear processing times, and specific procedures for the secure handling of GBV-related complaints.								
Notes	1 Project Phase: Op = Operation; De = Decommissioning								

12.2.1.12 Health and safety

This section assesses impacts in relation to the baseline conditions described under Sections 8.4.8 (Health and Social Infrastructure) and 8.4.9 (Security).

12.2.1.12.1 Impact SOC10 & mitigation: Impacts On Community Health, Safety And Security

"Summary of the impact assessment conducted by URS in 2015."

The health, safety, and security of communities are considered a high sensitivity receptor in the mining area, due to their importance for the protection of the local population.

As screened in the Environmental and Social Impact Assessment (ESIA) - Human Rights Risk Screening Report underlying vulnerabilities related to community safety and protection may be amplified by project activities.

These cross-cutting vulnerabilities are addressed indirectly in this section through the assessment of accident risks, communicable diseases, social tensions and security-related concerns.

Impact description

Construction

During the mine construction phase, the main impact factors identified are as follows:

- Earthworks/Excavation work;
- The presence of workers on site (approximately 2,600 people);
- Use of machinery, heavy equipment, transport vehicles, and workers' private vehicles;
- Electrification work and installation of electrical facilities on site;
- Pipeline and development of the water supply network.

There are several potential risks to public health, safety and security as associated with Project development, operation and workforce, including:

- Risks and impacts arising from equipment accidents, structural failures, or releases of hazardous materials will be managed through appropriate Project design and the effective implementation of the Health and Safety Management System. This will include procedures for preventing public access to construction areas and the use of applicable warning signage. Some operational facilities will also be fenced and have applicable security measures;
- Risks of accidents involving both local residents and livestock (including a risk that some accidents may involve serious injuries and fatalities) from increased traffic volumes due to Project activities (refer to Section 6.11 for the assessment of this risk);
- Potential health impacts (e.g. the spread of HIV/ AIDS, STIs and other communicable diseases such as tuberculosis) from increased population due to in-migration, social contact and poor health standards – the construction workforce will be housed at the mine site and EMC will implement employee health screening as part of its recruitment process for operational staff only;
- Potential social tensions leading to conflicts between Project workforce, security personnel and the local community and increased risk of crime and violent or anti-social behaviour – the local gendarmerie in F'Derick is responsible for providing security in the community and will extend this assistance to the Project workforce residence.

Potential air quality impacts on sensitive off-site receptors and local communities are presented in Section 12.2.1.3 and are not repeated here.

The impact is negative and direct, with a high intensity. The extent is local, and short-term, due to the construction period (3 years). The magnitude is **Moderate**.

As the sensitivity was defined to be moderate and the magnitude to be moderate, the impact is of **moderate negative significance.**

Operation

During the project's operational phase, the main impact factors identified are as follows:

- Blasting operations;

- Extraction and production of raw iron ore;
- Presence of workers (1,000 people) on site;
- Production of solid waste, mainly consisting of tailings from mining operations;
- Discharge of water from the pipeline, particularly during purging and maintenance operations;
- Discharge of mine drainage water;
- Increased rail traffic related to ore transport;
- Use of machinery, heavy equipment, transport vehicles, and workers' private vehicles;
- Increased water and electricity consumption for operational needs and site facilities.

During the operational phase of the project, several potential risks to the health and safety of the communities of F'Derick may arise. These risks mainly result from the intensification of mining activities, and the population increase linked to the presence of project workers.

Blasting operations: In operational phase, blasting is one of the most sensitive factors for the health and safety of communities. Blasting generates vibrations and shock waves that can cause significant discomfort, fear, and recurring complaints, especially if blasting is frequent. They can also produce dust and blast gas emissions, which can be carried by strong winds in the area and temporarily affect air quality in communities near the mine (F'Derick, Touergha, and Sebkha d'Idjill). In addition, blasting can disrupt pastoral movements, especially at the El Aouj well, which is a strategic water source for transhumance in the region. The permanent residences in the area are located in F'Derick, approximately 30 km from the future mine. Even though these dwellings are remote, blasting operations pose a high risk to pastoral communities and temporary pastoralist camps, particularly around the El Aouj well. In addition, the noise and vibrations generated by blasting operations, which may affect the comfort, health, and well-being of salt workers in the Sebkha of Idjill during the salt extraction period.

Extraction and production of raw iron ore: Extraction and production result in continuous dust emissions (loading, crushing, internal transport) and regular industrial noise. These nuisances can result in increased respiratory discomfort and dust accumulation in the area, particularly at the salt mining site in Sebkha and the El Aouj water points.

Increase in rail traffic (ore transport): The project provides for a connection between the El Aouj mine and the existing railway via a 37 km railway branch line, which will pass west of the town of F'Derick. The increase in rail traffic is changing safety conditions around the tracks. The main risks involve collisions with animals, particularly between F'Derick and the mine, where the tracks cross grazing areas or wildlife corridors. Without appropriate measures (safe crossings, signage, awareness campaigns), the potential severity of rail accidents could be high.

Increased road traffic: the movement of vehicles transporting project workers between F'Derick and the mine may increase communities' exposure to the risk of traffic accidents. This impact is addressed in section 12.2.1.3.

Mine drainage water discharge: Mine drainage water is a major issue because it can carry suspended solids and undesirable elements from the mine. If this water flows into areas accessible to communities (Sebkha d'Idjill), it can degrade soil quality. The risks are particularly high in the event of uncontrolled runoff during periods of rain. This impact is addressed in section 12.2.1.6.

Risk of disease transmission: The presence of approximately 1,000 workers during the operational phase maintains a permanent risk of infectious disease transmission, including HIV/AIDS, sexually transmitted

infections (STIs), and other communicable diseases such as tuberculosis, due to increased social interactions. The regular movement of workers between the city of El Aouj, the public spaces of F'Derick, and other regions of the country may also facilitate the transmission of seasonal diseases.

In addition, the settlement of a significant number of workers in F'Derick could create a risk of social tensions, particularly if coexistence between project personnel and local communities is not adequately managed. In certain circumstances, these tensions could escalate into localized conflicts, especially in cases of cultural misunderstandings, inappropriate behaviour, or perceived inequalities in access to economic opportunities.

The impact is negative and direct, with a high intensity. The extent is local, and long-term, due to the operational period (41 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance.**

Decommissioning

During the closure phase, site activities will be limited to the dismantling of infrastructure, removal of equipment, and securing of residual areas. These operations will remain occasional and controlled and are not expected to cause major disturbances likely to generate significant risks for local communities. The gradual reduction of mining operations will also be accompanied by a substantial decrease in the number of personnel present on site, with a team estimated at between 60 and 70 workers. This decline in activity will considerably limit interactions between workers and surrounding populations, as well as potential sources of accidents or disturbances (traffic, noise, dust, etc.). In this context, the risks to community health and safety during the decommissioning phase are assessed as moderate, given the limited intensity of residual activities, the significant reduction in traffic, and the small number of workers still mobilized on site.

The impact is negative and direct, with a moderate intensity. The extent is local, and short-term, due to the decommissioning period (4 years). The magnitude is **Moderate**.

As the sensitivity was defined to be moderate and the magnitude to be moderate, the impact is of **moderate negative significance.**

Mitigation measures

The development and implementation of a Community Health and Safety Management Plan will be a key component in reducing the potential risks that the project may pose to the local population. This plan will define the procedures, preventive measures, and response protocols necessary to protect communities from hazards associated with project activities, particularly during the construction and operational phases. At the same time, EMC will develop and implement a Security Management Plan aimed at regulating the practices and conduct of security personnel. Specialized training will be provided to all security staff to ensure compliance with international standards regarding professional conduct, the proportional use of force, and the management of sensitive situations.

Risk assessments for community health and safety will be periodically updated during construction and operation phases to ensure adaptive management of emerging risks, including traffic, communicable diseases, and security-related concerns.

Additionally, EMC plans to hold health and safety awareness sessions for every employee and contractor. These training sessions will specifically address the following topics:

- the prevention and management of occupational risks;
- the reduction of risks related to HIV/AIDS and sexually transmitted infections (STIs);

- information on responsible behaviour and good health practices.

The project's grievance mechanism will be shared with local communities before work begins and throughout its implementation. This process is included in the Stakeholder Engagement Plan to allow community members to easily and transparently report any incidents, concerns, or impacts.

Summary of impact assessment

The following table provides a summary of the project's impact on community health, safety and security.

Table 12-48: Impact SOC10 - Community Health, Safety and Security Impacts

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Co	Negative	Direct	High	Local	Short-term	Moderate	Moderate	Moderate
After mitigation	Co	Negative	Direct	Low	Local	Short-term	Low	Low	Low
Before mitigation	Op	Negative	Direct	High	Local	Long-term	High	High	High
After mitigation	Op	Negative	Direct	Low	Local	Long-term	Moderate	Moderate	Moderate
Before mitigation	De	Negative	Direct	Moderate	Local	Short-term	Moderate	Moderate	Moderate
After mitigation	De	Negative	Direct	Low	Local	Short-term	Low	Low	Low
Mitigation measures	■ Implement the Community Health and Safety Management Plan; ■ Implement the Stakeholder Engagement Plan, including grievance mechanism; ■ Implement a Security Management Plan; ■ Develop the Emergency Preparedness Response Plan in coordination with the local authorities; ■ Work with local and regional authorities to assist them in mitigating potential impacts and risks in F'Derick; ■ Prevention and management of occupational risks; ■ Reduction of risks related to HIV/AIDS and sexually transmitted infections (STIs); ■ Information on responsible behaviour and good health practices.								
Notes	1 Project Phase: Co= Construction; Op= Operation; De= Decommissioning								

12.2.1.12.2 Impact SOC11 & mitigation: Impacts on Worker's Health, Safety And Security

"Summary of the impact assessment conducted by URS in 2015."

As screened in the Environmental and Social Impact Assessment (ESIA) - Human Rights Risk Screening Report underlying vulnerabilities related to worker protection and working conditions may be amplified by project activities. These cross-cutting vulnerabilities are addressed indirectly in this section through the assessment of occupational hazards and workplace safety conditions. Impact description

Construction

During the mine construction phase, the main impact factors identified are as follows:

- Earthworks/Excavation work;
- The presence of workers on site (approximately 2,600 people);

- Use of machinery, heavy equipment, transport vehicles, and workers' private vehicles;
- Electrification work and installation of electrical facilities on site;
- Pipeline and development of the water supply network.

During the construction phase, approximately 2,600 workers will be mobilized on mining site. This phase, which is particularly intensive in technical and logistical activities, exposes workers to various occupational risks inherent to a large-scale construction site. The main identified risks include:

- Working at height, which may result in falls or serious injuries in the event of protective equipment failure or human error;
- Working in pits and excavations, involving risks of collapse, burial, or accidents related to the movement of heavy machinery;
- Injuries associated with the use of hand tools and mechanical equipment, including cuts, impacts, bruises, or crushing injuries;
- Traffic accidents, due to the increased movement of vehicles and heavy equipment on site, which may affect both drivers and workers on foot.

The impact is negative and direct, with a high intensity. The extent is project site, and short-term, due to the construction period (3 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance.**

Operation

During the operational phase of the project, approximately 1,000 workers will be employed to carry out mining operations. This phase involves several occupational risks inherent associated industrial activities. The main risks to which workers will be exposed include:

- Explosions related to blasting activities, which may result in flying debris, shock waves, or accidents in the event of non-compliance with safety protocols;
- Vibrations generated by blasting and heavy equipment, which may affect workers' comfort and safety, particularly those operating near blasting areas;
- The risk of falls into pits and excavated areas, especially when moving near unstable slopes, working faces, or active extraction zones;
- Injuries and mechanical accidents associated with the operation of heavy machinery, production equipment, and industrial tools;
- Traffic accidents resulting from the coexistence of mining equipment, light vehicles, and pedestrians within active operational areas;
- Working at height, with risks of falls during interventions on infrastructure, equipment, or elevated areas;
- Risks associated with remote fieldwork, site access constraints, and security conditions ;
- Dust and gas emissions, which may cause respiratory impacts (see further below).

Risk of silicosis

Risk of exposure to air pollution of workers at mine accommodations are presented in Section 12.2.1.3 and is considered low. However, workers will also be exposed during their daily activities. At the mine site, the maximum calculated concentrations using an air dispersion modelling for several pollutants (PM_{10}, $PM_{2,5}$, SO_2 and NO_2) inside the mine area, near the emission sources, are higher than existing air regulation limits (APPENDIX D). The main concern is the risk of silicosis, which is caused by inhalation of crystalline silica dust (WHO, 2000). Workers at greatest risk include those who blast, cut, crush or handle rock, typical tasks in iron ore extraction and processing. For this reason, miners are explicitly listed among the occupations with highest exposure to silica dust.

The impact is negative and direct, with a high intensity. The extent is project site, and long-term, due to the operational period (41 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance.**

Decommissioning

During the mine closure phase, between 60 and 70 workers will remain on site to carry out the dismantling of facilities and the removal of equipment. Although activities are significantly reduced compared to previous phases, certain occupational hazards still exist. Workers will, in particular, be exposed to the risk of falls into pits and excavated areas due to the presence of unstable slopes or zones requiring safety measures. The movement of vehicles and machinery used for dismantling and removing equipment may also lead to traffic-related accidents.

Additionally, some tasks will require work at height, especially during the dismantling of structures or technical infrastructure, which increases the risk of falls for workers.

Therefore, even though the scale of activities is limited, the closure phase requires the rigorous implementation of prevention, training, and supervision measures to ensure an adequate level of safety for all workers involved.

The impact is negative and direct, with a high intensity. The extent is project site, and short-term, due to decommissioning period (4 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance.**

Mitigation measures

A number of potential issues have been identified that broadly fall within the accepted definition of “labour issues” (as defined by good international practice in IFC PS 2) of relevance to the Project – these include the following:

- The Human Resources and Employment Policy will address concerns related to child labour and forced labour, including any form of involuntary or compulsory work such as indentured or bonded labour, or similar contractual arrangements. The policy will also ensure the fair treatment, non-discrimination, and equal opportunity for all employees through appropriate employment terms;
- The advancement of safe working conditions, along with the promotion and protection of workforce health, will be achieved through the implementation of the Occupational Health and Safety Management Plan. This plan includes proactive measures to prevent accidents, injuries, and occupational diseases (including silicosis) by minimising sources of workplace hazards. In addition to the already described measures to avoid and reduce dust emissions, proper control measures should include respiratory protective equipment and air and worker surveillance programs.

- Explosives management will be addressed through EMC's internal Standard Operating Procedure, which covers blast design, charging procedures, exclusion zones, misfire management, post-blast clearance, and the monitoring of vibration, air overpressure, and emergency response
- Appropriate worker accommodation facilities and services will be developed, ensuring that their design adheres to relevant international standards, including those outlined by IFC ;
- Good worker-management relationships will be established and maintained at all stages of the Project through the implementation of a Grievance Mechanism for workers and their organizations. This mechanism will enable workers to raise reasonable workplace concerns in an appropriate manner;
- EMC's Human Resources and Employment Policy requirements extend to all individuals working for the company, including both direct employees and "non-employee workers" such as contracted and subcontracted personnel. This also covers organisations involved in the supply chain when their work is directly related to the company's core functions.

EMC will only engage contractors and subcontractors that can demonstrate compliance with the Mauritanian Labour Code. All contracted organisations will be required to comply with the mine site rules and conform to the requirements of EMC's Health and Safety Management System. This will include having an Environmental Health and Safety (EHS) Management Plan that adequately identifies the health and safety hazards and control measures applicable to their scope of work, identifies competent Health and Safety staff and roles/ responsibilities, outlines staff Health and Safety training, safety meetings, Health and Safety inspections and reporting.

EMC will conduct inspections to ensure the contractors are managing safety arrangements and performance, including of their subcontractors. The Security Plan will be implemented and include work in off-site locations.

Summary of impact assessment

The following table provides a summary of the project's impact on worker health, safety and security.

Table 12-49: Impact SOC11 – Worker Health, Safety and Security Impacts

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase 1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Co, De	Negative	Direct	High	Project site	Short-term	High	High	High
After mitigation	Co, De	Negative	Direct	High	Project site	Short-term	Low	Moderate	Low
Before mitigation	Op	Negative	Direct	Moderate	Project site	Long-term	High	High	High
After mitigation	Op	Negative	Direct	Moderate	Project site	Long-term	Low	Moderate	Low
Before mitigation	De	Negative	Direct	High	Project site	Short-term	High	High	High
After mitigation	De	Negative	Direct	Moderate	Project site	Short-term	Low	Moderate	Low
Mitigation measures	▪ Implement Human Resources and Employment Policy; ▪ Implement the Occupational Health and Safety Management Plan;								

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase 1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
	▪ Develop Standard Operating Procedures to address explosives management and work on remote areas ▪ Consideration of IFC PS 2 guidelines as appropriate in regard to worker accommodation; ▪ Implement the Grievance Mechanism for workers; ▪ Regular inspections of Contractor's performance including health and safety; ▪ Implement the Security Management Plan.								
Notes	1 Project Phase: Co = Construction; Op = Operation								

12.2.1.13 Traffic and transportation

12.2.1.13.1 Impact TT01 & mitigation: Construction of the Mine Access Road on Junction

Impact description

Construction

There is the potential for localised impact on traffic and transportation during the construction of the mine access road. The access road will form a junction with the existing road to the north of F'Derick at the position where it turns towards Zouérate. The mine access road will run parallel and to the west of the new rail spur and is planned to be paved (bitumen coated) after construction.

Impacts on the local traffic and transportation network could result from:

- Disruption to traffic travelling on the existing F'Derick road due to junction works.
- Increased risk of accidents due to the construction works.
- Inappropriate or unmanaged construction works.

The greatest potential impacts will arise should the construction works for the junction encroach on the operation of the existing F'Derick-Zouérate road. However, given the limited traffic recorded on the existing road, the receptor is of low sensitivity. It is also noted that the construction of the junction will take place over a short period of time within the wider construction programme; therefore, the works have the potential to generate short term effects of potential low significance.

The impact avoidance measures such as the use of the existing SNIM railway and development of a site-specific rail spur and sidings, and the effective implementation of the mitigation measures and good practice, such as the implementation of thorough road traffic management at the junction works will reduce the likelihood of impacts on traffic and transportation. The implementation of such measures will reduce the magnitude of potential impacts, such that residual impacts will be of low significance during the construction phases (Table 12-50).

Mitigation measures

Summary of impact assessment

Table 12-50: Impact TT01 – Construction of the Mine Access Road Junction

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Co	Negative	Direct	Low	Local	Short-term	Low	Low	Low
After mitigation	Co	Negative	Direct	Low	Local	Short-term	Low	Low	Low
Mitigation measures	■ Driver training ■ Develop and Implement the Traffic and Transportation Management Plan ■ Implement appropriate traffic management at the mine access road junction during construction works								
Notes	1 Project Phase: Co = Construction								

12.2.1.13.2 Impact TT02 & mitigation: Increased Traffic Flow during Construction

Impact description

Construction and Operation

There is the potential for increased traffic flow both locally and on the N1 Highway during the construction of the Project. Increased traffic flow during construction could result from:

- Movement of employees to the mine site.
- Movement of materials, equipment and goods by road.

The movement of employees has been scoped out of this assessment as set out in Section 6.11.2.

The transportation of materials, equipment and goods will be mostly achieved using the SNIM railway from Nouadhibou to the mine site (Section 3.12). However, as goods cannot be delivered directly to the mine site until the rail spur and siding is constructed, there will be a period during which goods will need to be offloaded at the existing F'Derick siding offloading yard (Figure 3.1) and transported to the site by road. It is anticipated that the movement of goods by road from F'Derick will be required for approximately seven months, during which there will be approximately seven return truck movements per day. The trucks will travel from the F'Derick sidings to the mine site via the mine site access road.

Following the construction of the rail spur, the requirement to transport materials and equipment by road from F'Derick will be removed and only those goods which require transport from Nouakchott will be transported by road. It is anticipated that during the construction period there will be approximately four return truck movements per week, which is less than one truck per day. During the initial seven-month period when the rail spur is not yet constructed, this will result in a total of 11 truck movements per week on the final section of the N1 Highway from F'Derick (seven from F'Derick and four from Nouakchott).

As there are currently low volumes of traffic recorded on the existing road network in F'Derick and towards the mine site, the receptor is of low sensitivity. In addition to this, as the maximum number of truck movements (11

movements) required to transport materials will only occur for a period of seven months the impact of increased traffic during construction will have the potential to generate short term effects of potential low significance.

Following the initial seven-month period, the four return trucks per weeks are considered negligible in relation to the existing level of traffic on the N1 Highway. Therefore, the impact of the impacts associated with the transport of materials, equipment and produce for the remainder of the construction period will be negligible.

The impact avoidance measures such as the use of the existing SNIM railway line and site-specific rail spur and sidings and the effective implementation of the mitigation measures and good site practice such as the implementation of a Traffic and Transportation Management Plan will reduce the likelihood of impacts on traffic and transportation occurring. The implementation of such measures will reduce the magnitude of potential impacts, such that residual impacts will be of low significance during the construction phase.

Mitigation measures

Summary of impact assessment

Table 12-51: Impact TT02 – Increased Traffic Flow

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Co, Op	Negative	Direct	Low	Local	Short-term	Low	Low	Low
After mitigation	Co, Op	Negative	Direct	Low	Local	Short-term	Low	Low	Low
Mitigation measures	■ Embedded mitigation: − Driver training − Development of rail spur and sidings to connect mine site with existing railway line − Movement of product, material and consumables by rail − Construction of the mine access road (paved after construction) − Workforce accommodation located at the mine site − Transport of employees to/ from the mine site in organised buses ■ Develop and Implement the Traffic and Transportation Management Plan ■ Installation of road markings and signage (including speed limits) on the mine access road								
Notes	1 Project Phase: Co = Construction, Op = Operation								

12.2.1.14 Cultural Heritage

The cultural heritage assessment is carried out in accordance with the requirements of IFC Performance Standard (PS8 - Cultural Heritage), which aims to identify, preserve, and protect tangible and intangible cultural resources that may be affected by project activities. Based on the cultural heritage baseline, a four-point qualitative system was developed and used to assign a cultural heritage significance value (importance) and to each identified cultural heritage resource, as described in below, this value was used to define the sensitivity of the resource to changes generated from the Project:

- High

Archaeological, historical and cultural sites considered to be of the highest importance with the greatest potential for further, significant associated discoveries to be made. This also includes rare and previously unstudied

features with a high potential for further research, which may be permanently lost as a result of Project activities - due to their non-renewable nature and inability to 'adapt' to any physical changes generated by a Project. Includes highly significant cultural sites which have been frequented by the local community for longstanding cultural purposes and those which attract visitors from further afield. Including both 'critical' and 'non-replicable' cultural heritage sites.

- Moderate

Archaeological and historical and cultural resources considered to be of moderate importance with some potential for further, discoveries to be made. Cultural / sacred resources considered to be of moderate value to the community that may be able to adapt to change generated by the Project e.g., via substitution (under the right conditions). Cultural sites which have been frequented by the local community for longstanding cultural purposes. Sites associated with oral history, and /or which may be representative of a number which no longer exist. Including both 'replicable' and 'non-replicable' cultural heritage sites.

- Low

Archaeological and historic sites considered to be of some limited importance with a low potential for further discoveries and/or are in a state of poor condition. Cultural sites which may be no longer in use but are known to the community and associated with settlement history/oral history. Including 'replicable' cultural heritage sites.

- Negligible

Archaeological and historical features considered to be of limited importance including features which are very common and well understood, or those which are very poorly preserved and / or badly disturbed, offering very limited potential for further research. Cultural sites which are very common and 'replicable' - in the sense that new buildings or mosques can be readily established and / or cultural sites which are not in current use, with no enduring local importance or historical value.

Types of cultural heritage impact

Direct impacts

Cultural heritage sites have the potential to be impacted by Project-related interactions that cause direct physical disturbance or compaction e.g., through surface clearance or groundbreaking activity. Project activities and physical works with the potential to interact with cultural heritage resources would occur primarily during the construction (including pre-construction) and operational phase. The decommissioning/closure phases are unlikely to involve additional significant ground disturbance activities (beyond rehabilitation and landscaping works).

Indirect impacts

Indirect impacts include secondary effects in relation to Project activities, commonly through changes in the environmental setting of a community resource e.g., through increased dust levels, , vibration generated during groundworks / vehicle movements etc, or through restricted local access to places of local cultural / spiritual importance.

The sections below describe the anticipated impact of the Mine Area activities on cultural heritage receptors during each Project phase.

12.2.1.14.1 Impact CH01 & mitigation: Damage and Disturbance of Tangible Archaeological Cultural Heritage

The cultural heritage of the Mine Area presents a diverse and important collection of archaeological remains that attest to old human occupation, dating back at least to the Paleolithic period. These resources consist of

scattered Paleolithic and Neolithic stone tools and pottery, petroglyphs depicting hunting scenes, tumuli interpreted as Neolithic or pre-Islamic tombs and protohistoric burials (illustrative of funerary practice between the 8th millennium BC and the 8th century AD). The baseline includes resources categorised as considered "critical" and "non-replicable" representative of 'recognised heritage of communities who use, or have used within living memory, the cultural heritage for long standing cultural purposes' (IFC PS 8, 2012a) and with a high potential for further research. Several modern period resources were also identified, including Islamic burials and colonial era camps / military remains. The distribution of heritage resources within the Mine Project Area is shown on the figures 1 to 5 in APPENDIX R.

The 2023 targeted baseline reconnaissance phase yielded 72 new resources across the entirety of the Project area (including the mine site), spanning from Palaeolithic to modern times. Predominant additions were Neolithic tumuli and Islamic-period tombs, alongside flint scatters and pottery sherds. In the Aouchich Wellfield area, twenty-five new sites were identified through targeted visual reconnaissance, dated to the Neolithic and historic periods (the distribution is shown on Figure 7 in APPENDIX R). These resources were concentrated in the northern half of the area. In summary, the cultural heritage resources within the footprint of the Aouchich Wellfield include:

- Fifteen Neolithic tombs:
  - five containing multiple tumuli;
  - one large tumulus accompanied by four smaller ones;
  - a large mound with scattered elements;
  - two simple burial mounds encircled by upstanding plates linked to a historic-period Islamic tomb, a large, conical tumulus;
- Seven sites from the historic period, each containing tomb evidence;
- A single military camp, dated to the colonial era.

Any surface or below ground disturbance associated with Project activities may result the permanent degradation, dispersion or destruction of highly sensitive receptors, including ancient human remains. To recognise the enduring nature of archaeological cultural heritage, the assessment to follow integrates a summary of the impact assessment conducted by URS in 2015 and the 2023 update completed by WSP.

Impact description

Construction

During the construction phase, the activities with the potential to impact tangible archaeological cultural heritage are:

- Ground disturbance: preparation works and vegetation removal, excavations / groundworks ;
- Presence of workers and population influx;
- Land acquisition;
- Heavy plant and vehicle movements; and
- Vibration emissions.

Construction is the period during which the risk of damage or destruction of physical, tangible cultural heritage receptors is greatest, due to the scale of the preparatory activities and groundworks associated with the development of the Mine and supporting infrastructure, including ancillary facilities.

Ground disturbance: surface and sub-surface disturbance are essential for the installation of Mine Area infrastructure. These activities represent the direct impact pathway on archaeological and historical receptors. The Mine Area has a high potential for (previously unknown) buried archaeology, and groundworks may irreversibly damage or destroy surface and/or subsurface artefacts, funerary structures, discrete tombs, and/or traces of prehistoric occupation. Tangible resources are non-renewable in nature, and direct physical damage may permanently impact highly sensitive assets, including human remains. The excavation works necessary for the creation of the pipeline / water network intersect areas of high archaeological potential (Touajil and Aouchich) and present a higher risk of intersecting with, as yet unidentified, underground resources.

Presence of workers and population influx: the presence of additional population (including construction workers and predicted local influx) within the Mining Area will lead to an increased likelihood for accidental cultural heritage disturbance / damage, purposeful looting, and/or removal of materials from in-situ context.

Heavy plant and vehicle movement: the movement of heavy vehicles can cause surface and shallow sub-surface remains to be directly compacted or removed from their original context. In mining areas, where Paleolithic and Neolithic tools have been found in high concentrations, the movement of machinery can scatter artifacts or displace them from their archaeological context.

Land Acquisition: Public access to tangible archaeological cultural heritage is an important factor in promoting, understanding, and preserving local history. In the mining area, particularly near the right-of-way, there are currently no tourist activities or local visitation related to archaeological sites. In this context, any changes to public access resulting from the project must be assessed primarily from a conservation perspective (rather than from the perspective of public / tourist access). An assessment of land acquisition in relation to living cultural heritage (active cemeteries / open air mosques) is provided in Section 12.2.1.14.3.

Vibration emissions: movement of heavy plants and/or construction vehicles can give rise to indirect impacts through vibration which may be compounded by other activities generating vibration emissions such as excavation works for pipeline trenching, borehole drilling, surface grading activities etc. Vibration can cause significant damage to the integrity of physical heritage assets, resulting in partial or complete loss. Shallow, fragile resources such as tombs and/or other monumental features (e.g., petroglyphs, tombs) may be particularly vulnerable to vibration emissions.

Potential impacts are negative and direct and/or indirect, depending on the related activity. These impacts are of high intensity due to the density and distribution of tangible heritage receptors in the Mine footprint. The extent is within the Project site, and permanent, due to the irreversible nature of the impact (to non-renewable resources). The magnitude is **High**.

As the sensitivity was defined as high (on a worst-case basis) and the magnitude is high, the impact is of **high negative significance.**

Operation

During the Project's operational phase, the main impact factors with the potential to impact tangible archaeological cultural heritage resources are:

- Blasting operations;
- Extraction and production of raw iron ore;
- Presence of workers and population influx;

- Increased rail traffic in the mining area related to ore transport;
- Land acquisition; and
- Heavy plant and vehicle movement.

Although invasive groundworks are less extensive than during the construction phase, several operational activities constitute significant cumulative direct and indirect impacts in terms of the destruction of archaeological cultural heritage resources within the site's footprint, presuming their in-situ survival throughout construction.

Blasting operations: indirect vibration emissions resulting from blasting can destabilise the walls of rock art sites located on rock outcrops within the Mine Area, causing cracks and fragments to break off. It can also compromise the stability of funerary structures located on the lower inclines of the mine.

Ore extraction: Ore extraction (open pit) activities may extend into areas with concentrations of cultural heritage remains. The gradual expansion of mining areas may also impact discrete sites which have not yet been discovered (e.g., isolated tombs, artefactual surface scatters) within the mining footprint.

Presence of workers and population influx: the presence of additional populations (including operations staff and local economic migration) within the Mining Area will lead to an increased likelihood for accidental cultural heritage disturbance / damage, purposeful looting, and/or removal from in-situ context.

Heavy plant and vehicle movement: the movement of heavy vehicles during mining operations can cause surface and shallow sub-surface remains to be directly compacted or removed from their original context. Secondary, indirect, impacts from vehicle movements affecting tangible resources includes vibration emissions. Vibration can cause significant damage to the integrity of physical heritage assets, resulting in partial or complete loss. Shallow, fragile resources such as tombs and/or other monumental features (e.g., petroglyphs, tombs) may be particularly vulnerable to vibration emissions.

These impacts are negative and direct and/or indirect, depending on the related activity. These impacts are of high intensity due to the density and distribution of tangible archaeological heritage receptors in the Mine footprint. The extent is within the Project site, and permanent, due to the irreversible nature of the impact (to non-renewable resources). The magnitude is **High**.

As the sensitivity was defined to be high (on a worst-case basis) and the magnitude to be high, the impact is of **high negative significance.**

Decommissioning

During the mine decommissioning phase, all infrastructure on site will be decommissioned, dismantled and removed, within the confines of the Mine Area footprint. Consequently, no additional or new impacts, beyond those assessed for the operational phase are envisaged. These impacts may include: the presence of workers and the movement of heavy plant and vehicles resulting in secondary vibration emissions (presuming the in-situ preservation of cultural heritage resources during the preceding phases). These impacts are envisaged to be reduced in intensity during decommissioning. Consequently, during decommissioning, these impacts are negative and both direct and/or indirect, depending on the related activity. These impacts are of low intensity due to the less invasive nature of the predicted decommissioning activities. The extent is within the Project site, and permanent, due to the irreversible nature of impact (upon non-renewable resources). The magnitude is **Low**.

As the sensitivity was defined to be high (on a worst-case basis) and the magnitude to be Low, the impact is of **moderate negative significance.**

Mitigation measures

The implementation of mitigation measures is expected to reduce adverse impacts through the avoidance of direct and indirect interactions wherever possible and through the development of supporting contractor training. Mitigation should must include the following commitments, consolidated and delivered through a bespoke Management Plan:

Implement the Cultural Heritage Management Plan (CHMP), to consolidate all Cultural Heritage mitigation commitments:

- Constraints Mapping (avoidance areas) to inform detailed design and construction planning;
- A Project specific Chance Find Procedure;
- The physical demarcation of defined sensitive areas (installation of barriers and signage incorporating buffer zones);
- Preconstruction survey (for any locations not previously inspected – depending on revisions to the final Project design);
- Site-specific mitigation as needed (e.g., vibration monitoring, targeted archaeological evaluation / excavation and recording etc); and
- Cultural heritage awareness training to support effective implementation of the CHMP.

Avoidance and Preservation In-situ

Archaeological and historical resources are non-renewable, and the primary objective of cultural resource management should be their physical preservation in-situ, in accordance with IFC guidance (IFC, 2012) . This means avoiding direct impacts, irrespective of the protected status of the potential receptor. Therefore, the preferred mitigation strategy for all sites potentially directly impacted by Project activities is avoidance.

Constraints Mapping:

To enable the avoidance of sensitive, potentially non-replicable resources within the proposed footprint, including all associated/supporting infrastructure, known site locations will be designated as areas for avoidance on cultural heritage sensitivity mapping and marked with physical demarcation (using barriers) during all ground preparation and construction works.

These locations will be safeguarded by a 15-meter "exclusion zone" to account for the potential extent of sub-surface resources. These avoidance plans will be integrated into the CHMP and include specific receptors, as determined by the finalised Project Description, and any pre-construction survey requirements. As a minimum, these avoidance plans should include the 15 Neolithic tombs within the Aouchich wellfield; the colonial era camp and the six historical period tombs (these are depicted on Figure 7 in APPENDIX R):

- Neolithic tombs (**WSP-05, WSP-50, WSP-51, WSP-52, WSP-53, WSP-56, WSP-57, WSP-59, WSP-60, WSP-61, WSP-64, WSP-67, WSP-68, WSP-70, WSP-71**);
- Colonial era camp (**WSP-63**); and
- Historical tombs (**WSP-73, WSP-69, WSP-50, WSP-55, WSP-58, WSP-59**).

Chance Find Procedure:

To avoid potential impacts to previously unknown resources a Chance Find Procedure (CFP) is required by best practice guidelines (PS 8 and ISS 8). The CFP will provide a mechanism to address archaeological discoveries during Project activities when a Cultural Heritage Expert is not present. The CFP will apply for the

lifetime of the Project, throughout the entirety of the footprint and during any / all ground works, including preparatory clearance.

The CFP clarifies the exact steps to be taken by the Client (and Contractors) in the event of any accidental archaeological discovery. Through the effective implementation of the CFP the Project cultural heritage team would decide on the appropriate next steps. The CFP will be implemented through the Project's ESMP and will be incorporated (as a sub-section) within a bespoke Cultural Heritage Management Plan CHMP.

Minimisation

Archaeological Evaluation Programme:

In accordance with PS-8 and AfDB ISS-8, non-replicable and significant cultural heritage resources will not be removed unless all of the following conditions are met:

- There are no technically or financially feasible alternatives to removal at that location;
- The overall benefits of the project conclusively outweigh the anticipated cultural heritage loss from removal; and
- Any removal of cultural heritage is carried out using the best available technique.

In the event that the avoidance of the known receptors within the Project footprint, particularly the Aouchich area, is not practical, then a phase of archaeological evaluation is required to fully investigate their form, condition and subsurface potential and to inform a plan for their potential excavation and removal ('preservation' via record). This may apply to all or a select number of resources that cannot be avoided by the Project.

This archaeological evaluation stage should occur prior to any preparatory works or construction activities commencing, to determine the likelihood for interred human remains, the sub-surface extent and the research value of those receptors thus far identified by purely visual means.

Typically, archaeological evaluation comprises a scheme of preliminary, shallow and targeted hand-dug test pits (e.g., 1 m x 1 m in size) through which the archaeological potential could be firmly established, and any further analysis undertaken. This scheme will seek to eliminate the risk of archaeological induced delays during the construction phase and the loss of sensitive, non-renewable resources.

Once the evaluation stage is complete, further measures to minimise impacts to archaeological resources will be determined. For example, if the targeted sites yield archaeological material, it may be necessary to implement a programme of "preservation by record" through systematic recording (e.g., archaeological excavation and/or exhumation of human remains). Such work, where required, will be described in appropriate detailed work programmes and specifications to be prepared by the Project's Cultural Heritage Team.

Summary of impact assessment

The following table provides a summary of the project's impact damage to or removal of tangible archaeological cultural heritage remains.

Table 12-52: Impact CH01 – Damage and Disturbance of Tangible Archaeological Cultural Heritage

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Co	Negative	Direct / Indirect	High	Project site	Permanent	High	High	High

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
After mitigation	Co	Negative	Direct / Indirect	High	Project site	Permanent	Moderate	High	Moderate
Before mitigation	Op	Negative	Direct / Indirect	High	Project site	Permanent	High	High	High
After mitigation	Op	Negative	Direct / Indirect	High	Project site	Permanent	Moderate	High	Moderate
Before mitigation	De	Negative	Direct / Indirect	Low	Project site		Low	High	Moderate
After mitigation	De	Negative	Direct/ Indirect	Moderate	Project site		Negligible	High	Negligible
Mitigation measures	■ Implement the Cultural Heritage Management Plan (CHMP), to include: – Constraints Mapping (avoidance areas) to inform detailed design; – A Project specific Chance Find Procedure; – The demarcation of sensitive areas (installation of barriers and signage); – Site-specific mitigation as needed (e.g., vibration monitoring, or evaluation where direct avoidance is unassured); – Preconstruction survey (for any locations not previously inspected – depending on revisions to the final Project design); and – Cultural heritage awareness training to support effective implementation of the CHMP. ■								
Notes	1 Project Phase: Co = Construction; Op = Operation; De = Decommissioning All impacts are assessed on a conservative (worst-case) basis and will vary depending on the sensitivity / value of the individual receptor within the component group.								

12.2.1.14.2 Impact CH02 & mitigation: Disturbance of Intangible Cultural Heritage

The assessment of intangible cultural heritage aims to identify, understand, and document the practices, expressions, knowledge, and living traditions that form the identity of local communities. In accordance with PS8, this assessment is conducted separately from that of tangible heritage in order to recognize the specificity, dynamics, and mobility of intangible elements, as well as their direct link to community lifestyles.

The intangible heritage records unique belief systems and people's relationships and understanding of their physical and spiritual environment. Within the Project area this is represented by a wide range of cultural and social norms experienced by the local communities.

Key features for the mine Project area include:

- Generational employment in the salt extraction and mining industries;
- Traditional ways of life (pastoral and nomadic);
- Local beliefs in a demon / spirits, supported by stories and legends;
- Traditional gendered activities (including crafts associated with nomadic groups);
- Religious singing (Medh), and;
- The use of, and he passing of knowledge regarding, medicinal plants and herbs.

Active cemeteries and mosques are also considered in this section of the assessment since they are entwined with local belief systems and current cultural practice and behaviours.

Impact description

Construction

During the construction phase of the Project, approximately 2,600 workers will be mobilized on site. The temporary influx of labour accompanied by opportunistic influx, and the simultaneous implementation acquisition of land, may generate indirect impacts upon intangible cultural heritage.

- Cultural and social norms experiences by the local communities

Artisanal salt extraction in the Sebkha d'Idjil: Artisanal salt extraction is one of the region's most emblematic cultural elements. In the Sebkha d'Idjil, families have been harvesting salt for centuries using manual methods, passed down orally and through daily practice. This activity is considered a strong marker of identity, symbolizing the deep connection between the inhabitants of F'Derick and their natural environment. Youth continue to learn these techniques from their parents, thus perpetuating a skill that contributes to social cohesion. Increased traffic may make it more difficult for families and young farmers to access the Sebkha d'Idjil, particularly the usual road crossing the Project's road between F'Derick and El Aouj mining site. This pressure may be exacerbated if some youth prioritize employment opportunities afforded by the Project at the expense of learning traditional skills. This impact may be compounded by increases in wage / demographic changes, which make traditional employment a less attractive career prospect.

Pastoral lifestyles (nomadism, transhumance, sedentarization): Families living in the area of influence have historically practiced pastoralism, an activity based on seasonal movements, camel and goat herding, and control of vast natural territories. These lifestyles have gradually evolved towards partial sedentarization, but pastoral practices remain central to family organization. The associated knowledge (choice of routes, water management, meteorological knowledge) is passed down from generation to generation within families. The arrival of a large construction workforce, and opportunistic in-migration / influx together with the development of project infrastructure / land acquisition could alter the dynamics of pastoral movement and reduce the frequency of traditional practices.

Women's artisanal weaving, textiles, and jewellery: Women in the mining area maintain recognized forms of craftsmanship, such as weaving, traditional textile manufacturing, and jewellery making from local materials. These practices are important not only from a cultural perspective, but also from a social perspective, as they strengthen solidarity among women and provide a source of additional income. Knowledge is passed on in the home, where young girls learn by observation and imitation. The socio-economic changes brought about by the mining project could affect the amount of time available, women interest in these activities, and the sustainability of these practices. This pressure may be exacerbated if female youth prioritize employment opportunities afforded by the Project at the expense of learning traditional skills. This impact may be compounded by increases in wage / demographic changes, which make traditional employment a less attractive career prospect.

Knowledge of medicinal plants: The region's inhabitants have unique knowledge about the use of medicinal plants, including tree bark, leaves, and certain desert herbs. This knowledge is typically passed on by elder healers during gathering trips or when providing care within the family. The Project's land acquisition, vehicular traffic, and anticipated population influx could alter access to areas where medicinal plants are traditionally gathered and reduce the availability of species. The transmission of this knowledge may decline if gathering trips become less frequent.

Religious chanting (Medh): Religious chanting, known as Medh is used during religious ceremonies and family or community events. It reinforces the spiritual dimension of social relations and the transmission of religious values. The potential impacts are mainly related to social changes and cohabitation with Project workers, or opportunistic / economic migrants from outside the community.

- Living cultural and sacred resources:

Local beliefs related to spirits and mystical places: During consultations in 2023 and 2025, several residents mentioned the existence of beliefs related to spirits or “demons” associated with certain places in the region. Two sites are particularly often cited, including Guelb Imechken Lazrag, but their exact location remains deliberately secret and could not be mapped. These beliefs play a strong symbolic role in the local collective imagination. Although none of these places have been identified in the immediate vicinity of the mining area, the risk of cultural misunderstandings (infringements of local taboo) or direct / indirect disturbances could occur if an unidentified site were to be affected during construction.

Islamic tombs, modern cemeteries, mosques and open-air places of worship: On the road leading to the mine are the modern / active cemeteries of F’Derick city. These cemeteries are highly sensitive areas from a social and religious point of view. Open-air places of worship places are sometimes very simple in their materiality (and not obvious to those from outside the local community). These places are well-respected locally and any damage, intrusion, or modification would be morally unacceptable. They area are considered an essential part of the local communities' heritage. Islamic tombs and cemeteries located along the road, and open-air places of worship are particularly sensitive during construction, as increased traffic and numbers of people raise the risk of accidental intrusion, unintentional disrespect, or nuisances (noise, dust) perceived as an affront to the sanctity of these places. Increases in population may also place general pressure on the availability of resources (to continue to support the existing community).

Such incidents could generate social tensions and damage the relationship between the Project / Client and local communities. Furthermore, through the land acquisition process during construction, earthworks, the installation of base camps, access tracks, and storage areas will create an industrial landscape that alters the usual access to active cultural heritage sites. Sensitive places located near the Project right-of-way may become more difficult to safely access due to temporary security fencing and the presence of heavy machinery act.

Festivals and regional culture: No traditional ceremonies specific to the project area were identified during the consultations. Nevertheless, a regional cultural week is held every three years in Tiris Zemmour, in a location that varies between the main cities. Local populations have indicated that interest in this event is limited.

The impact is negative and both direct and indirect, with a low – moderate intensity (depending on the specific receptor), because although no locally sacred places have been identified within Project area, aspects of intangible practice occur within the local communities affected by the Project’s construction. The extent is local, and short-term, due to the duration of the construction period (3 years). The magnitude is **Low**.

As the sensitivity was defined to be high and the magnitude to be Low, the impact is of **moderate negative significance.**

Operation

During the operational phase, the Project mobilises around 1,000 workers. The number of workers is decreasing (compared to the construction phase), but their presence remains constant. The impacts tend to be minor but more permanent, although there is less ‘shock’ associated with the changes induced by the Project which may promoting gradual adaptation in local cultural norms and behaviours.

Artisanal salt extraction may be affected in the longer term if infrastructure and land acquisition permanently alters access, or if the attraction of formal employment contributes to a progressive decline in the number of youths working in this sector.

Pastoral practices may undergo a reduction in frequency if certain routes remain disrupted by the presence of facilities or persistent traffic. In the long term, this may accentuate sedentarization and lead to a gradual loss of traditional knowledge related to mobility and the natural landmarks used by pastoral families.

Beliefs associated with mystical sites, as well as active places of worship, remain sensitive due to the regular movement of workers and vehicles. Although the risk is lower than during construction, it becomes long-term, potentially generating accidental disturbance or infringements of taboos which could have negative consequences, effecting local community-client relations, particularly given the sacred nature and sensitivity of these places. Additionally, during operation of the mine, the permanent presence of industrial infrastructure may restrict safe public access to some areas where cultural resources are located. Sites located within the production area or in the immediate vicinity of the mining perimeter may become inaccessible.

These impacts may be exacerbated in combination, and when occurring concurrently with, local environmental changes induced by the Project. For example, operational blasting will generate vibration that may cause significant discomfort and fear, while also producing dust and gas emissions which may restrict safe local access to places of cultural importance (e.g., cemeteries and mosques), resulting in the intermittent disruption of cultural norms. As no active sacred and intangible cultural heritage aspects have as yet been identified by local communities in the immediate proximity of the Project site, the intensity of this impact is predicted to be moderate.

These impacts are negative and direct and indirect, with a low to moderate intensity. The extent is low, and long-term, due to the operational period (41 years). The magnitude is **Moderate**.

As the sensitivity was defined to be high and the magnitude to be moderate, the impact is of **moderate negative significance.**

Decommissioning

During the mine decommissioning phase, all infrastructure on site will be decommissioned, dismantled and removed. The impact on intangible cultural heritage is negligible.

Mitigation measures

The mitigation measures include:

- Implement the Project Grievance Mechanism.
- Implement the Cultural Heritage Management Plan to include specific additional measures on intangible cultural heritage and associated places:
  - A strategy for ongoing consultation, linked to the Project SEP, with religious leaders (Imams) and traditional cultural leaders on intangible heritage (to identify unanticipated impacts);
  - A calendar of local cultural events, to support the respect for periods of religious and community ceremonies, adapting activities where possible; and Cultural heritage awareness training for contractors (including no-go areas, taboos etc).

Summary of impact assessment

Table 12-53 provides a summary of the Project's impact to intangible cultural heritage resources.

Table 12-53: Impact CH02 –Disturbance of Intangible Cultural Heritage

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Co	Negative	Direct/ Indirect	Low - Moderate	Local	Short-term	Low	High	Moderate

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
After mitigation	Co	Negative	Direct/ Indirect	Negligeable	Local	Short-term	Negligeable	High	Low
Before mitigation	Op	Negative	Direct/ Indirect	Low - Moderate	Local	Long-term	Moderate	High	Moderate
After mitigation	Op	Negative	Direct/ Indirect	Negligeable	Local	Long-term	Negligeable	High	Low
Mitigation measures	Implement Grievance Mechanism Implement the Cultural Heritage Management Plan, to include additional measures; ■ Implement programme for ongoing local consultation with regard to intangible cultural heritage (aligned with SEP) ■ A calendar of local cultural events, to support the respect for periods of religious and community ceremonies, adapting activities where possible; and ■ Cultural heritage awareness training for contractors (including no-go areas, taboos etc). ■								
Notes	1 Project Phase: Co = Construction; Op = Operation All impacts are assessed on a conservative (worst-case) basis and will vary depending on the sensitivity / value of the individual receptor within the component group.								

12.2.1.14.3 Impact CH03 & mitigation: Changes to the Setting of Cultural Heritage

The Project will result in a change in land use and access, through the land acquisition process, transforming a landscape currently characterized by open desert, traditionally used for nomadic transport and pastoral grazing, into an industrial mining complex comprising an open pit, waste dumps, tailings storage areas, and various associated infrastructure (worker accommodation, railway, etc.).

The creation of artificial topography, marked by the elevation of high spoil heaps and the appearance of a deep pit, could alter the intervisibility between the archaeological sites and natural landmarks that allowed for a clear understanding of the funerary landscape. The sensitivity of receptors associated with changes to setting of archaeological and cultural heritage is moderate due to the resulting visual changes generated by the Project (See Chapter 12.2.1.7Landscape and visual).

“Summary of the impact assessment conducted by URS in 2015.”

Impact description

Construction

The construction phase generates the first visible changes, immediately affecting the environment of heritage sites. Earthworks, excavation, levelling, and installation of industrial infrastructure alter the structure of the natural landscape. The introduction of mining equipment, heavy machinery and vehicles, as well as the development of installation areas, creates a new and sudden visual intrusion that alters the open and natural character of the desert in the area.

This phase marks the beginning of a structural change in the future mine, during which traditional topographical landmarks begin to lose their coherence in the landscape. The historical interpretation of the territory then becomes more complex for local communities, particularly for pastoralists, as the relationship between heritage sites and natural landforms is disrupted – during the construction period this change may be heightened as an initial ‘shock’ and deviation from the local ‘norm’.

The impact is negative and direct, with a high intensity, due to the sudden change in the natural topography. The extent is Local, and short-term, due to the construction duration (3 years). The magnitude is **High**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance.**

Operation

The operational phase corresponds to the period when the impacts are most continuous, although these changes will occur more gradually (compared to during construction). The gradual deepening of the open pit, the accumulation of tailings, and the creation of slag heaps are creating a new topography that is partially replacing the natural relief of the El Aouj East Guelb.

This new morphology, dominated by industrial structures, causes a lasting and sometimes irreversible change to the environment of the archaeological sites. Traditional sightlines are broken, the reliefs that once served as landmarks for nomadic activities become less visible, and the visual identity (and inter-visibility) of the historical landscape is transformed. Although some relief features in the region, notably the El Aouj Center, El Aouj West, and other guelbs in the Tiris Zemmour region near the site, remain intact, their presence is unlikely to be sufficient to compensate for the gradual of the natural relief of the area directly affected by the project (guelb El Aouj Est). The cultural landscape, as a medium for understanding archaeology and heritage, is thus undergoing a significant impact that remains partially mitigable but irreversible.

The impact is negative and direct, with a moderate intensity, due to the more gradual changes in the natural topographic in the area afforded by the operational phase. The extent is local, and long-term, due to the operational period (41 years). The magnitude is **Moderate**.

As the sensitivity was defined to be high and the magnitude to be moderate, the impact is of **moderate negative significance.**

Decommissioning

During the mine decommissioning phase, all infrastructure on site will be decommissioned, dismantled and removed in accordance with the Mine Closure Plan. The impact on changes to setting of archaeological and cultural heritage site is negligible, potentially positive.

Mitigation measures

The mitigation measures include:

- Development of the CHMP to inform site-specific mitigation and ongoing community consultation, supported by Cultural Heritage Awareness Training.
- Minimisation of project footprint and sensitive Project design to avoid, where appropriate, impacts on cultural heritage sites.
- Implement the detailed Mine Closure Plan including encouragement of natural re-vegetation and rehabilitation of mine site roads, wherever practicable.

Summary of impact assessment

A summary of the assessment of changes to the setting of tangible cultural heritage resources is provided in Table 12-54.

Table 12-54: Impact CH04 – Changes to the Setting of Archaeological and Cultural Heritage Sites

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Co	Negative	Indirect	High	Local	Short-term	High	High	High
After mitigation	Co	Negative	Indirect	Moderate	Local	Short-term	Moderate	High	Moderate
Before mitigation	Op	Negative	Indirect	Moderate	Local	Long-term	Moderate	High	Moderate
After mitigation	Op	Negative	Indirect	Low	Local	Long-term	Moderate	High	Low
Mitigation measures	▪ Implement the Cultural Heritage Management Plan ▪ Minimisation of project footprint and sensitive Project design to avoid, where appropriate, impacts on cultural heritage sites; ▪ Implement the detailed Mine Closure Plan including encouragement of natural re-vegetation and rehabilitation of mine site roads, wherever practicable; ▪ Dust suppression on roads and stockpiles.								
Notes	1 Project Phase: Co = Construction; Op = Operation								

Limitations for cultural heritage

- Some limitations should be mentioned regarding the assessment of the impacts on cultural heritage. The cultural heritage area of study for the baseline update was determined based on the initial Project footprint, and any subsequent design changes or extensions may necessitate new surveys.
- Field surveys were conducted exclusively through visual and surface surveys, health and safety considerations, and inaccessibility. These constraints are typical for baseline data collection but did not hinder the survey's objectives.
- Below-ground investigations were not part of the baseline inspection, with limited vegetation clearance carried out only to clarify specific sites.
- While the baseline study provided valuable information on visible cultural heritage resources, it does not rule out the possibility of undiscovered remains in below-ground deposits or inaccessible areas.

12.2.1.15 Ecosystem Services

The Ecosystem Services Assessment (ESA) performed in the baseline allowed the identification of the Priority Ecosystem Services (PES) based on the following prioritization criteria:

- Level of dependence on the Ecosystem Service (ES) - for affected communities and their well-being (Type I) or for Project performance (Type II);
- Interaction with drivers of change on ES (Type I) or with Project operations (Type II);
- Replaceability / Management potential - accessibility and efficiency of a possible alternative to the affected ES.

Based on this analysis, the PES identified in the ES baseline for the Mine area are the following:

- Livestock and forage resources (Type I);

- Water resources (Type I and II);
- Salt extraction (Type I);
- Water regulation (Type I and II)

Based on PES identified in the ES baseline, the following impacts on ecosystem services during construction, operation and decommissioning phases have been identified in the Mine area and are assessed in the following sections:

- Degradation of livestock and forage resources (Impact ES01);
- Alteration of water resources for groundwater users in water abstraction areas (Impact ES02);
- Increased access to water resources through pressure relief valves along the water pipelines (Impact ES03);
- Degradation of salt extraction activities at Sebkha Idjll (Impact ES04);
- Degradation of ecosystems' water regulation capacity (Impact ES05).

12.2.1.15.1 Impact ES01 & mitigation: Degradation of Livestock and Forage Resources

As stated in the Ecosystem Services Assessment (ESA), livestock breeding is an important economic activity within the Project AoI, representing 21.6% of the active population of F'Derick moughataa[10] (Office National de la Statistique (ONS), 2017). There are no official statistics on the number of pastoralists within the Project AoI, with numbers being highly dependent on rains and forage resources availability. According to the Regional Technical Services consulted in 2023, there would be about 700 pastoralists in Zouérate moughataa and 500 in F'Derick moughataa with an estimated total of 100,000 camels and 75,000 small ruminants.

Forage resources in the Project AoI include *Nucularia perrenii*, *Astragalus vogelli*, *Stipagrostis plumosa*, *Heliotropium ramosissimum*, *Brocchia cinerea*, *Zygophyllum arabicum* and *Zygophyllum glutinosum*. Perennial pasture such as *Panicum turgidum*, *Vachellia flava* and *Vachellia tortilis* are mostly found south of Mrikli. Though the El Aouj Mining Site has not been largely used for pasture historically, herders mentioned that the site has been more frequented since the closure of the border with Western Sahara, although forage resources are of mediocre quality (as described in the baseline inside the Livestock and forage resources section for the Mine area).

Only 1 grazing area was identified within the Project's AoI, along the Infrastructure Corridor. Located between the explosives storage facility and the town of F'Dérick, it covers approximately 200 ha, extending over a length of 8 km and 250m (width of the corridor). However, only the right-of-way for the future rail spur and the access road to the mine will result in a permanent loss of grazing land; the areas occupied by the underground water pipeline and the overhead power line will remain available once their construction is complete.

The other areas identified are locations where herds temporarily congregate near permanent water points within the Aouchich wellfield. These areas do not, however, constitute grazing areas (Figure 10-6).

Livestock and forage resources having been identified as a PES in the ESA, this component is considered as a receptor with a **high sensitivity value**.

[10] Moughataas are administrative divisions in Mauritania equivalent to departments. The Tiris Zemmour wilaya (region) is divided into three moughataas: F'Derik, Zouerate and Bir Mogrein. The Project AoI is located in F'Derik and Zouerate moughataas.

Impact description

Forage resource availability and free movement of pastoralists could be affected by project construction and operations. With the border closure with Western Sahara limiting access to some high-quality forage areas and with water resources being sparse in the Project AoI, the replaceability of forage resources is limited within the Project AoI.

Moreover, several flora species of forage resources were recorded on the El Aouj Mining Site during 2023 and 2024 flora inventories. Project activities such as site clearing, earthworks, the presence and movement of heavy machinery, vehicles, and trains, the presence of workers and the construction of buildings and infrastructures will result in grass vegetation removal, potential degradation of habitats suitable for forage resources, restriction of free movement of pastoralists resulting from the construction of infrastructure, and disruption of livestock, including the risk of accidents involving Project machinery and trains, and livestock.

Construction

During construction of the mining site, the main impacts on livestock and forage resources will be:

- Loss of forage resources and their habitat. Due to vegetation clearing on the mine site where infrastructure will be built and where the mining pit will be dug, forage resources will be lost. However, as forage resources at the El Aouj Mining Site are of mediocre quality according to stakeholders, and because it does not represent a prime pasture location, this will be of **low intensity** on livestock and forage resources ES.
- Degradation of forage resource habitats adjacent to the mine, mainly due to dust deposition, as in the case of protected grasses. Considering the Project is located in a desert area where dust levels are already high, the degradation of forage resources due to dust emission will be of **low intensity**.
- Restriction of livestock movement across the Project AoI. The construction of buildings and infrastructure, the presence of machinery, vehicles, and trains, as well as the presence of workers are likely to restrict herders' movement. As livestock movement across the Project AoI is already highly dependent on water and forage resources availability, additional restrictions may have a **moderate intensity**.
- Disruption of livestock. Dust deposition, noise, and vibrations associated with construction activities may increase stress upon livestock. The impact is expected to be of **low intensity**.
- Risk of accidents involving livestock. Increased circulation of trains and machinery in the Project AoI may result in accidents involving livestock. The impact is expected to be of **moderate intensity**.

Construction activities will thus result in a direct negative impact on ES provided by livestock and forage resources, with an overall moderate intensity. The impact is expected to be of project-site geographical extent and the duration will be short-term during construction activities. This leads to a **low impact magnitude**.

As the sensitivity was defined to be high and the magnitude to be low, the impact is of **moderate negative significance**.

Operation

During operation of the mining site, the main impacts on livestock and forage resources will be:

- Degradation of forage resource habitats adjacent to the mine, which will mainly be due to dust deposition or trampling. Mining activities, like extraction of ore, trucks hauling ore, and ore processing, but also increase in road and railway traffic will produce dust emissions and increase the amount of dust deposition around the construction sites. Considering the Project is located in a desert area where dust levels are already high, the degradation of forage resources due to dust emission will be of **low intensity**.

- Restriction of livestock movement across the Project AoI. The presence of buildings and infrastructure, machinery, vehicles, and trains, as well as workers are likely to restrict herders' movement. As livestock movement across the Project AoI is already highly dependent on water and forage resources availability, additional restrictions may have an impact of **moderate intensity**.
- Disruption of livestock. Dust deposition, noise, and vibrations associated with operation of the mining site, including increased traffic in the Project AoI, may increase stress upon livestock. The impact is expected to be of **low intensity**.
- Risk of accidents involving livestock. Increased train circulation within the Project AoI may result in a higher risk of accidents involving livestock. The impact is expected to be of **low intensity**.

The operation phase will result in a direct negative impact on ecosystem services provided by livestock and forage resources, with an overall low intensity. The impact is expected to be of local geographical extent and a long-term duration, throughout the operation phase. This leads to a **low impact magnitude**.

As the sensitivity was defined to be high and the magnitude to be low, the impact is of **moderate negative significance**.

Decommissioning

During the decommissioning phase, the main impact on livestock and forage resources will be:

- Restoration of some forage resource habitats in the mine area. The removal of some facilities and infrastructure at the end of mining activities will allow for forage resources to recolonise the decommissioned areas. Considering the Project AoI is a desert area where grasses and shrubs are rare, the recolonisation will likely increase forage resources availability, resulting in an impact of **low intensity**.
- Restoration of access for herders and their livestock. The decommissioned area will be accessible to pastoralists and their livestock, and Project infrastructures will no longer affect their seasonal movement. This is likely to result in an impact of **low intensity**.

The decommissioning phase will result in direct positive impact on livestock and forage resources on the Project site, with an overall low intensity. Access to the mine site during the decommissioning phase is expected to be permanent. This leads to a **negligible impact magnitude**.

As the sensitivity was defined to be high and the magnitude to be low, the impact is of **low positive significance**.

Mitigation measures

The measures to mitigate the impact on livestock and forage resources are listed below.

Construction

- In areas where forage resources are present and need to be removed, they will be cute and distributed to communities and/or pastoralists that use the area for grazing (as described in EB01). Forage resources to consider are those listed in Table 7 of the Ecosystem Services Assessment.
- Integrate forage resources to the Revegetation Plan (as described in EB01).
- Access roads to be clearly marked with a defined speed limit (as described in LQU01).
- Driver training, including safe practice and avoidance of hazards (as described in LQU01).
- Implement Stakeholder Engagement Plan, including the grievance mechanism (as described in SOC05).

- Embedded mitigation:
  - Burying of the water pipe from the wellfields to the mine site (as described in SW01).

Operation

- Access roads to be clearly marked with a defined speed limit (as described in LQU01).
- Driver training, including safe practice and avoidance of hazards (as described in LQU01).
- Implement Stakeholder Engagement Plan, including the grievance mechanism (as described in SOC05).
- Implement the Revegetation Plan (as described in EB01).

Decommissioning

- Reseed the Project site with native forage species seeds as described in the Revegetation Plan (as described in EB01 and EB04).

Mitigation measures allow to reduce the impact magnitude from low to negligible during the operation phases, resulting in a residual impact of **low significance**. During the construction and decommissioning phases, impacts' magnitude and significance remain unchanged.

Summary of impact assessment

Table 12-55: Impact ES01 – Degradation of livestock and forage resources

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C	Negative	Direct	Moderate	Project site	Short-term	Low	High	Moderate
After mitigation	C	Negative	Direct	Moderate	Project site	Short-term	Low	High	Moderate
Before mitigation	Op	Negative	Direct	Low	Local	Long-term	Low	High	Moderate
After mitigation	Op	Negative	Direct	Low	Project site	Long-term	Negligible	High	Low
Assessment	D	Positive	Direct	Low	Project site	Permanent	Negligible	High	N/A
Embedded mitigation measures	■ Burying of the water pipe from the wellfields to the mine site.								
Mitigation measures	■ In areas where forage resources are present and need to be removed, they will be cut and distributed to communities or pastoralists that use the area for grazing. Forage resources to consider are those listed in Table 7 of the Ecosystem Services Assessment. ■ Integrate forage resources to the Revegetation Plan. ■ Access roads to be clearly marked with a defined speed limits. ■ Driver training, including safe practice and avoidance of hazards. ■ Implement Stakeholder Engagement Plan, including the grievance mechanism. ■ Implement the Revegetation Plan. ■ Reseed the Project site with native forage species seeds.								
Notes	[1] Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.1.15.2 Impact ES02 & mitigation: Alteration of Water Resources for Groundwater Users in Water Abstraction Areas

Water resources were identified as a PES in the ESA (report WSP n° 22559684_R02_ESIA_VOL3_d_ESA_V0.1, 21-07-2023), mainly due to local agriculture and herding activities being highly affected by the lack of consistent water supply and quality in the Project AoI. Mining operations will also be dependent on water supply, requiring an average 5,57 m^3/day (Section 3.2 of the report WSP n°

22559684_R02_ESIA_VOL1_V0 Project Description, 29-06-2023). Water resources having been identified as a PES (Type I and II) in the ESA, water resources are considered a receptor of **high sensitivity**.

The Project will supply water in Touajil wellfield (P2 aquifer) for a period of 20 years, followed by the abstraction of water from the Aouchich wellfield (P4 aquifer) during an additional 20 years (Figure3: Mine site Infrastructures general layout, in section 2.3 of the report WSP n° 22559684_R02_ESIA_VOL1_V0 Project Description, 29-06-2023). Both water abstraction areas have deep aquifers distinct from shallow aquifers used by local populations throughout the Project AoI.

However, the Touajil Auberge, a guest house and gardens located 7 km south of Touajil, pumps water from the deep aquifer of Touajil wellfield for agricultural activities. Abstracted water is stored in a tank on-site and provides guests with water supply as well as irrigation for the gardens (URS, 2015). Some wells and boreholes in the Aouchich area are also likely to be affected by a reduction in water levels in P4 aquifers. There are no permanent settlements in the area, but those wells are used by pastoralists for livestock and irrigation.

Impact description

It is expected that water abstraction for Project activities will cause a reduction of water availability for agricultural activities at the Touajil Auberge. Additionally, based on groundwater level decline predictions, some wells in Aouchich may become dry because of water abstraction for mining activities and some boreholes will no longer be artesian. These impacts are likely to occur during the operation phase and to continue beyond the decommissioning phase as aquifers only replenish very slowly due to limited recharge from rainfall (URS, 2015).

Project impacts on aquifers and water users in groundwater abstraction areas (P2 and P4 aquifers) are covered in sections 6.3.5, 6.4.5 and 6.4.6 of the initial ESIA (URS, 2015).

Construction

No impact is expected on water resources for groundwater users in Touajil and Aouchich during construction activities.

Operation

Throughout the operation phase, it is expected that water levels will lower in Touajil wellfield, affecting the Touajil Auberge's water supply. Model simulations predict that after 20 years of water abstraction from P2 aquifer by the El Aouj Mine, groundwater levels at the Auberge boreholes will decline of approximately 55 m (URS, 2015). Moreover, a decline in groundwater levels has already been observed in the P2 aquifer due to water supply for SNIM operated Guelb El Rhein Mine, north-east of Zouérate.

The timing of the impact is unknown as the depth of the Auberge's current boreholes and pumps is not known. However, as soon as the groundwater levels are lower than the boreholes and pumps, water supply at the Touajil Auberge will cease.

In the Aouchich water abstraction area, URS (2015) identified five hand dug wells that will potentially be affected by a decline in groundwater levels (estimated between 1 and 3 m in the P4 aquifer). Additionally, three artesian boreholes in the area, namely SP11, SP14c and Aouchich Artesian borehole, from which groundwater from the P4 aquifer flow, may be affected.

Water quality may also be affected by long-term pumping in the P2 and P4 aquifers (see Impact GW02, Section 6.4.5.2, URS 2015).

The operation will result in a direct negative impact on water resources for groundwater users in water abstraction areas (Touajil Auberge and Aouchich) with a high intensity and a geographical extent limited to the local area. The impact is expected to be of long-term duration. This impact will be of **high magnitude**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance**.

Decommissioning

Reduction in water availability at the Touajil Auberge and Aouchich is expected to continue during the decommissioning phase as aquifers take a very long time to recharge. Indeed, it is estimated that groundwater levels in the Touajil wellfield will recover by around 50% after 60 years (URS, 2015).

The decommissioning phase is expected to result in a direct negative impact on water resources for groundwater users in water abstraction areas (Touajil Auberge and Aouchich) with an extent limited to the local area. The impact is expected to be of long-term duration. This impact will be of **high magnitude**.

As the sensitivity was defined to be high and the magnitude to be high, the impact is of **high negative significance**.

Mitigation measures

From the beginning of the El Aouj Project construction activities, water levels at the Touajil Auberge and Aouchich area wells and boreholes will be monitored. A Water & Groundwater Management Plan will describe all the measures to be implemented to ensure proper water supply of herders and communities throughout the operation phase and after the mine closure, until the recovery of groundwater levels allowing the reuse of all existing hand dug wells. The measures to mitigate the impact on water resources for groundwater users in water abstraction areas are listed below.

Operation

- Implement the Water & Groundwater Management Plan (as described in SW01).
- Monitor groundwater abstraction in Touajil to determine timing for development of the wellfield at Aouchich (as described in GW01).
- Update the Groundwater model.
- Provide alternative water supply for groundwater users at Touajil Auberge and Aouchich from EMC wellfields (direct pipeline, tanks or pumps) (as described in GW03).
- Implement the Stakeholder Engagement Plan, including the Grievance Mechanism (as described in SOC05).

Decommissioning

- Implement the detailed Mine Closure Plan, with the objective of ownership transfer of wellfield, pipelines and reverse osmosis plant to enable continued use (at a reduced level) post-closure (as described in GW03).

Mitigation measures allow to reduce the impact magnitude from high to moderate, resulting in a residual impact of **moderate negative significance**.

Summary of impact assessment

Table 12-56: Impact ES02 – Reduction of availability of water resources for agricultural activities at the Touajil Auberge

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Op, D	Negative	Direct	High	Local	Long-term	High	High	High
After mitigation	Op, D	Negative	Direct	Moderate	Local	Long-term	Moderate	High	Moderate
Mitigation measures	■ Implement the Water & Groundwater Management Plan. ■ Monitor abstraction in Touajil to determine timing for development of the wellfield at Aouchich. ■ Update the Groundwater model. ■ Provide alternative water supply for groundwater users at Touajil Auberge and Aouchich (direct pipeline, tanks or pumps). ■ Implement the Stakeholder Engagement Plan, including the Grievance Mechanism. ■ Implement the detailed Mine Closure Plan, with the objective of ownership transfer of wellfield, pipelines and reverse osmosis plant to enable continued use (at a reduced level) post-closure.								
Notes	[1] Project Phase: Op = Operation, D = Decommissioning								

12.2.1.15.3 Impact ES03 & mitigation: Increased Access to Water Resources Through Pressure Relief Valves Along the Water Pipelines

As mentioned in the previous section, water resources were identified as a PES, mainly due to local agriculture and herding activities being highly affected by the lack of consistent water supply and quality in the Project AoI. Water resources having been identified as a PES in the ESA, it is considered as a receptor with a **high sensitivity value**.

Project infrastructure include water supply pipelines linking water abstraction areas (Touajil wellfield during the first 20 years and Aouchich wellfield for an additional 20 years). These pipelines require pressure relief valves to prevent hammering when the wellfield pumps are restarted. These valves will be located every 5 km between the mine and wellfield (Section 3.2.1 of the report WSP n° 22559684_R02_ESIA_VOL1_V0 Project Description, 29-06-2023). These will create an estimated 34 water point for water users throughout the Project AoI. During field observations in March 2023, Guelb El Rhein Mine water supply pipeline pressure relief valves' location were visited. Water reservoirs were installed to collect overflowing water and make it available to local populations.

Impact description

There should be an overall increase in access to water resources throughout the Project AoI given the addition of water points at pressure relief valves' location along the water supply pipelines. These can potentially develop into water supply or livestock watering areas. Water in the P4 aquifer (Aouchich) is highly saline, so potential for cultivation, water supply and livestock watering are limited, but P2 aquifer has good quality water. This means that 18 of the 34 pressure relief valves have sufficient water quality to develop into oases, some being located close to F'Derick and Touajil. Water made available to local communities comes from deep aquifers that were previously not accessible to most water users (aside from water users identified in Section 1.1.3). Project impacts on water resources were covered in sections 6.4.5 and 6.4.6 of the initial ESIA (URS, 2015).

Construction

No impact is expected on access to water resources during construction activities.

Operation

During mining operations, water will be release through pressure relief valves along the water supply pipelines. This can result in a direct positive impact in terms of access to water resources throughout the Project AoI, with a moderate intensity. This impact is expected to be of local geographical extent and long-term duration. This impact will be of **moderate magnitude**.

As the sensitivity was defined to be high and the magnitude to be moderate, the impact is of **moderate positive significance**.

Decommissioning

After the closure of the mine, the water pipelines will be handed over to a community organisation for long-term usage and supply of water (URS, 2015). Although groundwater levels will have decreased significantly during Project operations, local communities will still be able to supply water resources through these infrastructures.

This can result in a direct positive impact in terms of access to water resources throughout the Project AoI. This impact is expected to be of local geographical extent and long-term duration. This impact will be of **moderate magnitude**.

As the sensitivity was defined to be high and the magnitude to be moderate, the impact is of **moderate positive significance**.

Mitigation measures

The measures to mitigate the impact on access to water resources are listed below.

Construction

- Embedded mitigation:
  - Installation of outlet taps in raw water pipeline (as described in GW03).
  - Installation of water trough to collect water at pressure relief valves.

Operation

- Implement the Water & Groundwater Management Plan (as described GW01).
- Implement the Community Development Management Plan.

Decommissioning

- Implement the detailed Mine Closure Plan, with the objective of ownership transfer of wellfield, pipelines and reverse osmosis plant to enable continued use (at a reduced level) post-closure (as described in GW03).

Mitigation measures allow to increase the impact magnitude from moderate to high, resulting in a residual impact of **high significance**.

Summary of impact assessment

Table 12-57: Impact ES03 – Increased access to water resources through pressure relief valves along the water pipelines

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Assessment	Op, D	Positive	Direct	Moderate	Local	Long-term	Moderate	High	N/A
Embedded mitigation measures	■ Installation of outlet taps in raw water pipeline. ■ Installation of water trough to collect water at pressure relief valves.								
Mitigation measures	■ Implement the Water & Groundwater Management Plan. ■ Implement the detailed Mine Closure Plan, with the objective of ownership transfer of wellfield, pipelines and reverse osmosis plant to enable continued use (at a reduced level) post-closure.								
Notes	[1] Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.1.15.4 Impact ES04 & mitigation: Degradation of Salt Extraction Activities at Sebkha Idjill

The salt flat of Sebkha Idjil, located about 25 km from F'Derick (10 km away from El Aouj Guelb), is a low-lying area of about 900 hectares where wadis converge and where groundwater has historically been close to the surface. According to the 2015 ESIA, salt extraction at Sebkha Idjil is an important form of natural capital for the region, especially for some households in F'Derick (URS, 2015). Indeed, it provides seasonal employment to about 120 individuals from April to June, generating sufficient income to sustain households throughout the year (URS, 2015). Consultations in 2023 have confirmed that activities at the Sebkha Idjil remain unchanged and constitute and important economic activity for the F'Derick community.

The ESA (report WSP n° 22559684_R02_ESIA_VOL3_d_ESA_V0.1, 21-07-2023) has identified salt extraction as a priority ecosystem service in the Project AoI, meaning that local populations are dependent on Sebkha Idjil as a mean of livelihood. The Sebkha Idjil is thus considered as a receptor with **high sensitivity value**.

Impact description

The impacts of the project on the Sebkha Idjil and the salt works were described in the initial 2015 ESIA completed by URS (see impacts SOC05 and SW03). As assessed by URS (2015), there is a possibility for the Sebkha Idjill to be impacted by polluted wadi flows during construction, operation, and decommissioning (closure) phases.

As the Sebkha Idjil is the natural discharge area for all wadis in the mine site area (sub-catchments ID 1 to ID 8, see Figure 6.5 of URS, 2015), runoff water from the waste dump area, tailings disposal area and other facilities at the mine site will eventually reach it. Depending on the frequency and intensity of rainfall in the area, it could take years for the pollution carried in runoff waters to reach the Sebkha Idjil, 10 km away from the mine site. As stated in section 6.5.5.3 of URS, 2015, contaminants that could reach Sebkha Idjil through runoff waters include sediments/fines from tailings and dissolved salts from the use of brackish water as dust suppressants. Impacts are expected to be limited as sediments/fines will have time to settle before reaching the Sebkha Ijdil and salts will be significantly diluted. Moreover, the Project infrastructure, access roads, railway, and pipeline are not expected to impede access to the salt extraction area, or the various routes used for transporting salt to markets.

However, as stated in the ESA (Section 5.1.1.9 of the report WSP n° 22559684_R02_ESIA_VOL3_d_ESA_V0.1, 21-07-2023), local populations in F'Derick are highly dependent on

salt extraction, with 120 individuals generating sufficient income between April and June to sustain their household throughout the year. If contaminants were to reach Sebkha Idjill and compromise the salt extraction process, impacts on local livelihoods could occur, though URS (2015) assessed that this would not be the case. However, given the economic and cultural significance of Sebkha Idjill, local populations are highly sensitive to potential perceived impacts on salt extraction. Project impacts on ES provided by the Sebkha Idjill were partially covered in sections 6.3.5 and 6.5.5 of the initial ESIA (URS, 2015).

Construction

During construction of the mining site, the main impacts on salt extraction will be:

- Contamination of salt flats through runoff water. During construction, impacts related to contamination through runoff water are expected to be of **low intensity** as contaminants will either have had time to settle (sediments) or will be significantly diluted (salts) before reaching Sebkha Idjill.

  Construction activities will thus result in a direct negative impact on ecosystem services provided by the Sebkha Idjill. The impact is expected to be local and long-term. This leads to a **low impact magnitude**.

  As the sensitivity was defined to be high and the magnitude to be low, degradation of ecosystem services provided by the Sebkha Idjill is thus considered to be an impact of **moderate significance**.

It should be noted that given the economic and cultural importance of salt extraction, negative impacts perceived by local populations could lead to lower social acceptability of Project.

Operation

During operation of the mining site, the main impacts on salt extraction will be:

- Contamination of salt flats through runoff water. During operations, impacts related to contamination through runoff water are expected to be of **low intensity** as contaminants will either have had time to settle (sediments) or will be significantly diluted (salts) before reaching Sebkha Idjill.

  Operations are expected to result in a direct negative impact on ecosystem services provided by the Sebkha Idjill, with a low intensity. The impact is expected to be local and long-term. This leads to a **low impact magnitude**.

  As the sensitivity was defined to be high and the magnitude to be low, degradation of ecosystem services provided by the Sebkha Idjill is thus considered to be an impact of **moderate significance**.

Again, it should be underlined that given the economic and cultural importance of salt extraction, negative impacts perceived by local populations could lead to lower social acceptability of Project.

Decommissioning

During decommissioning, the main impacts on salt extraction will be:

- Contamination of salt flats through runoff water. As it can take many years for contaminants to reach the Sebkha Idjill through runoff water depending on frequency and intensity of rainfall, this impact could still occur during decommissioning phase. Impacts related to contamination through runoff water are expected to be of **low intensity** as contaminants will either have had time to settle (sediments) or will be significantly diluted (salts) before reaching Sebkha Idjill.

  A direct negative impact could occur during the decommissioning phase, with a low intensity. The impact is expected to be local and long-term. This leads to a **low impact magnitude**.

As the sensitivity was defined to be high and the magnitude to be low, degradation of ecosystem services provided by the Sebkha Idjill is thus considered to be an impact of **moderate significance**.

Mitigation measures

Mitigation measures identified for impacts SOC05 and SW03 which are also applicable to ES04 are the following:

Construction and operation

- Embedded mitigation:
  - Separation or diversion of clean and dirty runoff (as described in SW02/03).
  - Control of polluted runoff (as described in SW02/03).
  - Only inert mine waste material to be disposed of in waste dump area (in operation) (as described in SW02/03).
  - Landfill to be located away from the wadis and other surface water channels (in construction) (as described in SW02/03).
- Good practice including prevention, identification, control and monitoring of accidental discharges/spills (as described in SW02/03).
- Control of wash water that may contain cement from concreting operations (as described in SW02/03).
- Implement the Emergency Preparedness and Response Plan (as described in SW02/03).
- Implement the Non-Mineral Waste Management Plan (as described in SW02/03).
- Implement the Stakeholder Engagement Plan, including the Grievance Mechanism (as described in SOC05).
- Develop and implement a Livelihood Restoration Plan if ecosystem services provided by Sebkha Idjill are impacted by Project activities.

Decommissioning

- Implement the detailed Mine Closure Plan (as described in SW01).

Mitigation measures allow to reduce the impact magnitude from low to **negligible**, resulting in a residual impact of **low significance**.

Summary of impact assessment

Table 12-58: Impact ES04 – Degradation of salt extraction activities at Sebkha Idjill

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, Op, D	Negative	Direct	Low	Local	Long-term	Low	High	Moderate
After mitigation	C, Op, D	Negative	Direct	Low	Project site	Long-term	Negligible	High	Low
Embedded mitigation measures	▪ Separation of clean and dirty runoff. ▪ Control of polluted runoff.								

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
	▪ Only inert mine waste material to be disposed of in waste dump area. ▪ Landfill to be located away from the wadis and other surface water channels.								
Mitigation measures	▪ Good practice including prevention, identification, control and monitoring of accidental discharges/spills. ▪ Control of wash water that may contain cement from concreting operations. ▪ Implement the Emergency Preparedness and Response Plan. ▪ Implement the Non-Mineral Waste Management Plan. ▪ Implement the detailed Mine Closure Plan. ▪ Implement Stakeholder Engagement Plan, including the grievance mechanism. ▪ Develop and implement a Livelihood Restoration Plan if ecosystem services provided by Sebkha Idjil are impacted by Project activities.								
Notes	[1] Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.1.15.5 Impact ES05 & mitigation: Degradation of Ecosystems' Water Regulation Capacity

As stated in the ESA (Section 5.1.2.3 of the report WSP n° 22559684_R02_ESIA_VOL3_d_ESA_V0.1, 21-07-2023), ecosystems play a key role in water regulation processes, notably by allowing evapotranspiration (involved in precipitation patterns) and water infiltration (water filtration and groundwater recharge) (MEA, 2005). According to Xu and Yu (2020), arid ecosystems represent a crucial, yet poorly understood component of global water cycle. Indeed, sap flow (movement of water in the roots, stems and branches of plants) of shrub species contribute to water regulation.

Of the plants recorded in the Project AoI during 2023 flora inventories, many genera, including *Asphodelus, Gymnocarpos*, *Plantago*, and *Zygophyllum*, are known for their water storage capacity (Bidak and al., 2015). With local populations and project operations being dependent to water resources, water regulation capacity of local ecosystems is key to ensure long-term availability and quality of water in the Project AoI. Water regulation has thus been identified as a PES, making it a **receptor of high sensitivity**.

Impact description

Asphodelus, Gymnocarpos, and *Zygophyllum* have been recorded in the El Aouj Mining Site during 2023 flora inventories. Plants with water storage capacity are thus present on the Project site and are likely to be impacted at all phases of the Project, degrading ecosystems' water regulation capacity. Project impacts on water regulation were not covered in the initial ESIA, but impact on air quality (dust) was addressed in section 6.6.6 (URS, 2015).

Construction

During construction, the main impacts on water regulation ES are:

- Loss of grasses and shrubs with water storage capacities. Construction will lead to vegetation clearing on the areas where infrastructure will be constructed or where the mining pit will be dug. As vegetation is sparse in the Project area, loss of grasses and shrubs with water storage capacities will be of **moderate intensity** on water regulation ES.
- Degradation of flora habitats adjacent to the mine, mostly due to dust deposition, affecting grasses and shrubs with water storage capacities. Earthwork and heavy vehicle traffic will produce dust emissions and

increase the amount of dust deposition around the construction sites and mainly under the wind. Considering the Project is occurring in a desert area where dust levels are already high, the degradation due to dust emission will be of **low intensity**.

- Fragmentation of flora habitats. Construction sites will cause a reduction in the connectivity of grass and shrub habitats in the local area. However, as vegetation is already rather sparse, the fragmentation is expected to be of **low intensity**.

The construction will result in a direct negative impact, with a low intensity. The impact is expected to be limited to the Project site where construction activities are located and of short-term duration. This impact will be of **negligible magnitude**.

As the sensitivity was defined to be high and the magnitude to be negligible, the impact is of **low negative significance**.

Operation

During the operation of the mining site, the main impacts on water regulation ES are:

- Degradation of flora habitats adjacent to the mine, mostly due to dust deposition, affecting grasses and shrubs with water storage capacities. Mining activities and heavy vehicle traffic will produce dust emissions and increase the amount of dust deposition around the mining site, mainly when winds are important. Considering the Project is occurring in a desert area where dust levels are already high, the degradation due to dust emission will be of **low intensity**.
- Fragmentation of flora habitats. The presence of buildings and infrastructure will cause a reduction in the connectivity of grass and shrub habitats in the local area. However, as vegetation is already rather sparse, the fragmentation is expected to be of **low intensity**.
- Reduction of groundwater levels in Touajil and Aouchich wellfields. As stated in the ESA (Section 5.1.2.3 of the report WSP n° 22559684_R02_ESIA_VOL3_d_ESA_V0.1, 21-07-2023), groundwater levels are expected to lower significantly due to water abstraction for Project operations. With groundwater being an important component of the hydrological cycle, a reduction in groundwater levels may affect natural water regulation in the Project AoI with a **low intensity**.

Operations will result in a direct negative impact, with a low intensity. The impact will be of local geographical extent and a long-term duration during this phase. This impact will be of **low magnitude**.

As the sensitivity was defined to be high and the magnitude to be low, the impact is of **moderate negative significance**.

Decommissioning

During the decommissioning phase, the main impact on water regulation ES will be:

- Restoration of grasses and shrubs with water storage capacities in the mine area. The removal of some facilities and infrastructure at the end of mining activities will allow for grasses and shrubs with water storage capacities recolonise the decommissioned areas. Considering the Project AoI is a desert area where grasses and shrubs are rare, the recolonisation will likely increase forage resources availability, resulting in an impact of **low intensity**.

The decommissioning phase will result in a direct positive impact at the Project site, with a low intensity. Restoration of grasses on the mine site during the decommissioning phase is expected to be permanent. This leads to a **negligible magnitude**.

As the sensitivity was defined to be high and the magnitude to be negligible, the impact is of **low positive significance**.

Mitigation measures

The measures to mitigate the impact of degradation of ecosystems' water regulation capacity are listed below.

Construction

- Integrate grass species with water storage capacity, including genera *Asphodelus*, *Gymnocarpos*, *Plantago*, and *Zygophyllum*, to the Revegetation Plan (as described in EB01).

Mitigation is expected to reduce the impact magnitude to **negligible** during the construction phase as key grasses with water retention capacities will be replanted elsewhere. This will result in an impact of **negligible negative significance**.

Operation

- Embedded mitigation related to air quality and dust control (as described in AQ01 and AQ02, URS 2015):
  - Dust capture by enclosure of equipment, wherever possible, or dust suppression through fogging/misting.
  - Bag houses on crushing, screening, stockpile and train loading with maintenance programmes and bag replacement schedules.
  - Vacuum ports whenever dust emissions >1 kg/h within a 10 m radius.
  - Dust suppression on roads and stockpiles with raw water and brine from RO plant supplemented by polymers and inorganic salts, if necessary.
  - Surface wetting supplemented by fogging during blasting.
  - Stack height to reduce impacts associated with power generating facility.
- Implement the Water & Groundwater Management Plan (as described in GW01).
- Implement the Revegetation Plan (as described in EB01).

Dust control and water management will limit impacts on ecosystems' capacity to regulate water in the regional area and reduce the impact significance to **low** during the operation phase. This will result in an impact of **low negative significance**.

Decommissioning

- Reseed the Project site with native species with water storage capacity seeds, following the Revegetation plan procedures (as described in EB01 and EB04).
- Fertilize the planted seeds with manure from local livestock (as described in EB02).
- Fence the area during 3 years in order to avoid traffic, trampling and grazing, but to allow the circulation of reptiles and small mammals (as described in EB02).

During decommissioning, impact magnitude will remain **low** resulting in a residual impact of **low positive significance**.

Summary of impact assessment

Table 12-59: Impact ES05 – Degradation of ecosystems' water regulation capacity

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C	Negative	Direct	Low	Project site	Short-term	Negligible	High	Low
After mitigation	C	Negative	Direct	Low	Project site	Short-term	Negligible	High	Negligible*
Before mitigation	Op	Negative	Direct	Low	Local	Long-term	Low	High	Moderate
After mitigation	Op	Negative	Direct	Low	Local	Long-term	Low	High	Low*
Assessment	D	Positive	Direct	Low	Project site	Permanent	Negligible	High	N/A
Embedded mitigation measures	■ Dust capture by enclosure of equipment, wherever possible, or dust suppression through fogging/misting. ■ Bag houses on crushing, screening, stockpile and train loading with maintenance programmes and bag replacement schedules. ■ Vacuum ports whenever dust emissions >1 kg/h within a 10 m radius. ■ Dust suppression on roads and stockpiles with raw water and brine from RO plant supplemented by polymers and inorganic salts, if necessary. ■ Surface wetting supplemented by fogging during blasting. ■ Stack height to reduce impacts associated with power generating facility.								
Mitigation measures	■ Integrate grass species with water storage capacity, including genera *Asphodelus*, *Gymnocarpos*, *Plantago*, and *Zygophyllum*, to the Revegetation Plan. ■ Implement the Water & Groundwater Management Plan. ■ Implement the Revegetation Plan. ■ Reseed the Project site with native species with water storage capacity seeds. ■ Fertilize the planted seeds with manure from local livestock. ■ Fence the area during 3 years in order to avoid traffic, trampling and grazing, but to allow the circulation of reptiles and small mammals.								
Notes	[1] Project Phase: C = Construction, Op = Operation, D = Decommissioning *The impact rate has been modified based on expert's judgement: the mitigation planned is considered sufficient to reduce the impact overall significance on ecosystems' water regulation capacity.								

12.2.2 Rail area

The El Aouj Project requires the transport of iron ore extracted from the El Aouj mine to the mineral port at Nouadhibou, using the existing railway infrastructure operated by SNIM. To ensure a connection between the El Aouj mine and the main railway network, a 37 km rail spur will be constructed, bypassing the city of F'Derick to the west (included in the Project's infrastructures). Both the construction and operation of this spur will also be under SNIM's responsibility.

The involvement of railway infrastructure and SNIM's operations in the El Aouj Project will be strictly confined to utilising the rolling stock and the existing rail network. This includes mainly the transportation of ore from the El Aouj mine.

The transportation of iron ore by SNIM between the Tiris Zemour mines and the mineral port of Nouadhibou is currently handled by 4 pairs of trains per day (1 outbound + 1 return trip = 1 pair), ensuring a transport capacity

of 14 Mt/y. The transportation of 11 M/t/y of ore from the El Aouj mine will require the operation of 2 additional pairs of trains per day. This increase will represent an increase of 50% of the overall train traffic. To enhance logistics capacity, the Project encompasses the procurement of 18 locomotives and 870 wagons, each capable of carrying 120 tonnes, all designated to optimise ore transportation from the mining site.

No additional infrastructure is required to allow for increased rail traffic needed to handle the transportation of ore from El Aouj.

The increase in rail traffic will begin during the construction phase of the El Aouj mine infrastructure, as some construction materials and equipment will be transported from the port of Nouadhibou to the construction sites. The frequency of trains used for construction is uncertain, but it is not expected to significantly increase traffic compared to the current mineral transport operated by SNIM for its own needs.

The railway network is entirely owned by SNIM, and the transport of ore will be carried out exclusively by SNIM and under its responsibility, from the ore loading area at the mine to the mineral port of Nouadhibou. For this reason, the responsibility for implementing most of the mitigation measures recommended in this document will be assigned to SNIM. In most of cases, EMC can only provide assistance and advice to SNIM to ensure the proper implementation of the recommended measures.

The potential impacts identified concern all phases of the Project (construction, operation, and closure), as long as the railway infrastructure is used for EMC needs. However, the identified measures do not differ between phases, since they relate solely to the use of the railway and trains for transporting equipment (construction /dismantling) or ore (operation). The increase in rail transport will only result in an increase in existing potential impacts already identified by SNIM (SNIM, 2024).

12.2.2.1 Land quality

12.2.2.1.1 Impact Rail-LQU01 & mitigation: Increase of Impacts on Land Quality

Impact description

The increase in impacts on soil quality may stem from various sources:

- An increase in the transportation of hazardous materials, primarily hydrocarbons, to supply the construction site but especially the fuel-fired power plant during the operational phase: the risk of accidental spills of hazardous materials during their transport will be heightened along the railway line.
- The risk of chronic soil contamination along the railway line, due to spills of hazardous products related to leaks from rolling stock (mainly mineral oils and fuel oil).
- An increase in waste generated from locomotive maintenance: soil contamination at maintenance workshops may worsen if unproper hazardous materials management processes and waste management already constitute a source of contamination.

The extent of land contamination will depend on factors such as the type of pollutant released, the quantity and timing of the release, and the sensitivity of the receiving environment. The most significant impacts are expected from large-scale releases of pollutants with high environmental toxicity or resistance to degradation, such as heavy fuel oil.

Without mitigation, large-scale pollutant releases and land erosion/loss could result in long-term effects of moderate significance.

Generally, the site environment is of high sensitivity due to the variety of land crossed by the railway line, including wadis, inhabited areas.

Mitigation measures

Mitigation measures already proposed in the SNIM ESIN (SNIM, 2024)

- Organise awareness campaigns, display materials, and training sessions for project staff regarding increased risks associated with pollution, the importance of sorting, collecting, storing, and recycling waste, as well as the prohibitions and penalties outlined in the regulations concerning the irregular disposal of solid and liquid waste in natural environments.
- Set up storage areas for oils and fuels.
- Equip fuel tanks with automatic shut-off pumps to prevent the risk of fuel spillage during refuelling.
- Implement a system for collecting and recovering/recycling grey water from maintenance workshops, and for storing black water, water contaminated by accidental pollution, and other liquid waste (such as tanks or sealed, drainable pits).
- Provide labelled waste containers and removable skips for sorting and collecting solid waste, and establish procedures for the proper collection, sorting, storage, and transport of solid and liquid waste.
- Sign contracts for the recovery and treatment of various types of solid waste, including household waste, hazardous waste (such as contaminated drums, hydrocarbons, filters, batteries), plastics, and other polluting waste, with companies holding appropriate environmental permits.
- Pollution Prevention and Control: procedures to establish for the prevention, identification, control, and monitoring of pollutants, as well as the management of accidental discharges and spills;
- Emergency Preparedness and Response: development and implementation of an Emergency Preparedness and Response Management Plan, together with associated procedures;
- Hazardous Materials Management Plan: development and implementation of a Hazardous Materials Management Plan including storage, transportation, disposal, recovery, and control and decontamination measures.

Even with effective implementation of mitigation measures, some land contamination remains possible, but these residual impacts are not expected to be significant. The magnitude of potential impacts will be reduced, resulting in residual land quality impacts that are short term and of low significance.

Summary of impact assessment

Table 12-60: Impact Rail-LQU01 & mitigation: Increase on impacts on Land Quality

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Moderate	Regional	Long term	Moderate	High	Moderate
After mitigation	C, O, D	Negative	Direct	Low	Project site	Short term	Negligible	High	Low
Mitigation measures	▪ Environmental awareness ▪ Storage area for oil and fuels								

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
proposed in the ESIN (SNIM, 2024)	▪ Equip fuel tanks with automatic shut-off pumps ▪ Implement a system for collecting and recovering/recycling wastewater ▪ Solid Waste management: provide equipment, establish procedures and select accredited companies for waste disposal ▪ Prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment ▪ Implement the Emergency Preparedness and Response Plan ▪ Implement the Hazardous Material Management Plan								
Notes	[1] Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.2.2 Surface water

12.2.2.2.1 Impact Rail-SWU01 & mitigation: Increase of Impacts on Surface water

The surface waters located along the railway are mostly wadis, with only a few temporary bodies of water during the rainy season.

Impact description

Impacts on surface water quality may originate from sources similar to those identified for soil contamination. Pollution can spread to water points if the sources of contamination are located near wadis or intermittent water points. Wadi channels, are considered sensitive, as accumulated soil can enhance vegetation growth and pollutants may be carried by intermittent rainfall down the channels. Despite their heightened sensitivity, the overall risk remains low due to the infrequent flow events in wadis.

Mitigation measures

The recommended mitigation measures for protecting surface water quality are aligned with those established for preventing land contamination. These measures aim to minimise the risk of pollutants carried by intermittent rainfall down the wadis, particularly in areas where contamination sources are located near wadis or intermittent water points. By implementing strategies that address soil contamination, the potential for pollutants to be carried by intermittent rainfall into surface water channels is reduced. For specific details regarding these mitigation strategies, refer to section 12.2.2.1.1).

Summary of impact assessment

Table 12-61: Impact Rail-SWU01 & mitigation: Increase of impacts on Surface water

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Moderate	Regional	Long term	Moderate	High	Moderate
After mitigation	C, O, D	Negative	Direct	Low	Project site	Short term	Negligible	High	Low
Mitigation measures proposed in the ESIN (SNIM, 2024)	▪ Environmental awareness ▪ Storage area for oil and fuels ▪ Equip fuel tanks with automatic shut-off pumps								

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
	▪ Implement a system for collecting and recovering/recycling wastewater ▪ Solid Waste management: provide equipment, establish procedures and select accredited companies for waste disposal ▪ Prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment ▪ Implement the Emergency Preparedness and Response Plan ▪ Implement the Hazardous Material Management Plan								
Notes	[1] Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.2.3 Groundwater

12.2.2.3.1 Impact Rail-GWU01 & mitigation: Increase of Impacts on Groundwater

Impact description

Impacts on groundwater quality may originate from sources similar to those identified for soil contamination. Pollutants may be carried by intermittent rainfall down the channels or seep into groundwater. Despite their heightened sensitivity, the overall risk remains low due to the infrequent flow events in wadis.

Mitigation measures

The recommended mitigation measures for protecting groundwater quality are aligned with those established for preventing land contamination. These measures aim to minimise the risk of pollutants seeping into groundwater, particularly in areas where contamination sources are located near wadis or intermittent water points. By implementing strategies that address soil contamination, the potential for pollutants to be carried by intermittent rainfall into groundwater is reduced. For specific details regarding these mitigation strategies, refer to section 12.2.2.1.1).

Summary of impact assessment

Table 12-62: Impact Rail-GWU01 & mitigation: Increase of impacts on groundwater

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Moderate	Regional	Long term	Moderate	High	Moderate
After mitigation	C, O, D	Negative	Direct	Low	Project site	Short term	Negligible	High	Low
Mitigation measures proposed in the ESIN (SNIM, 2024)	▪ Environmental awareness ▪ Storage area for oil and fuels ▪ Equip fuel tanks with automatic shut-off pumps ▪ Implement a system for collecting and recovering/recycling wastewater ▪ Solid Waste management: provide equipment, establish procedures and select accredited companies for waste disposal ▪ Prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment ▪ Implement the Emergency Preparedness and Response Plan ▪ Implement the Hazardous Material Management Plan								

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Notes	[1] Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.2.4 Air quality

12.2.2.4.1 Impact Rail-AQ01 & mitigation: Increase of Emissions on Receptors along the Railway

Impact description

Air pollution from dust and gas emissions is mainly associated with the movement of rolling stock (locomotives), the handling of ore during loading and unloading, and the dispersion of ore particles during transport.

The expected atmospheric pollutants include fine particles ($PM_{2.5}$, PM_{10}) from the smoke generated by locomotive engine combustion and from the ore during transport, as well as exhaust gases such as carbon dioxide (CO_2), carbon monoxide (CO), nitrogen oxides (NO_X), and polycyclic aromatic hydrocarbons (PAHs).

Gas and particle Emissions increase with the additional number of trains in operation, their age, the quality of fuel used, and the length of the ore trains (number of wagons transporting the ore). The effects of this pollution depend on the distance between the source and the receptors, as well as the direction of the wind.

The levels of gas and particulate matter from current rail transportation activities are not reported by SNIM. Taking into account a projected 50% rise in existing rail operations, the adverse impacts on air quality resulting from increased rail traffic are classified as moderate in intensity.

Given that dust emissions will occur throughout the duration of the project, the impact duration is considered long. In terms of extent, the impact is judged to be local, as disturbance of air quality will be felt only within the direct influence area of the railway or by a limited portion of the population living near the rail. In this context, populations in localities along the railway network would be the most exposed (high sensitivity).

Mitigation measures

EMC El Aouj Project's embedded mitigation measures

The dispersion of ore particles during loading and transport will be limited by specific EMC El Aouj Project's embedded mitigation measures designed to reduce the emission of fine ore dust:

- During ore loading: the concentrate is surface-wetted on the stockpile to increase its moisture content above the Dust Extinction Moisture (DEM) threshold, ensuring that dust generation is minimised during handling and loading (see section 4.1.6.2: Process Plant facilities in the Project description).
- After ore loading and before start of the transport: a fine water spray is applied as a mist onto the top of the loaded wagons to suppress any residual dust during transport along the railway.

Mitigation measures already proposed in the SNIM ESIN (SNIM, 2024)

- Purchase and/or use of equipment in compliance with national and international standards.
- Perform regular maintenance on vehicles, machinery, and motorised equipment, including scheduled filter replacements as recommended by manufacturers.
- Periodic monitoring of gaseous emissions and fine particle emissions ($PM_{2.5}$, PM_{10}) from locomotives.

Summary of impact assessment

Table 12-63: Impact Rail-AQU01 & mitigation: Increase of emissions on receptors along the railway

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Moderate	local	Long term	Moderate	High	Moderate
After mitigation	C, O, D	Negative	Direct	Low	local	long term	Low	High	Low
Embedded mitigation in the El Aouj Project	▪ During ore loading: Maintain constant humidification of the stockpile surface above the DEM threshold. ▪ After ore loading : water spraying on the top of the loaded wagons								
Mitigation measures proposed in the ESIN (SNIM, 2024)	▪ Purchase and/or use of equipment in compliance with national and international standards ▪ Perform regular maintenance on vehicles, machinery, and motorised equipment								
Notes	[1] Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.2.5 Noise and vibration

12.2.2.5.1 Impact Rail-NV01 & mitigation: Increase of Noise and Vibrations Impact Generated by Increased Train Traffic

Impact description

The railway crosses vast desert areas along most of its route. However, human receptors are located either within the towns traversed by the railway—specifically, the cities of Choum, Inal, and Boulenouar—or in small hamlets or seasonal nomadic camps set up along the railway line. The sources of noise and vibrations will come solely from the passage of mining convoys. Consequently, the frequency of impacts caused by noise and vibrations affecting receptors during the passage of mining trains will be increased by 50% compared to the current situation.

Taking into account a projected 50% rise in existing rail operations, the adverse impacts on noise and vibrations resulting from increased rail traffic are classified as moderate in intensity.

Given that noise and vibrations emissions will occur throughout the duration of the project, the impact duration is considered long.

According to recent measures conducted by WSP during the transit of one ore train, noise levels fall below 55dBA—the threshold recommended by the IFC for residential receptors—at distances ranging from 200 to 250 meters. The impact is therefore considered to remain local, as noise and vibration disturbance will only be felt within the direct area of influence of the railway or by a limited portion of the population living close to the rail. However, some dwellings are situated less than 200 metres from the railway track. In this context, populations in localities along the railway network would be the most exposed (high sensitivity).

Mitigation measures

Given the current situation, there are few measures available to reduce the impacts of noise and vibrations resulting from increased rail traffic. The only feasible measures relate to the purchase of equipment in compliance with national and international standards and the regular maintenance of rolling stock.

Summary of impact assessment

Table 12-64: Impact Rail-NV01 – Increase of noise and vibrations impact generated by increased train traffic

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Moderate	local	Long term	Moderate	High	Moderate
After mitigation	C, O, D	Negative	Direct	Moderate	local	long term	Moderate	High	Moderate
Mitigation measures proposed in the ESIN (SNIM, 2024)	▪ Purchase and/or use of equipment in compliance with national and international standards ▪ Perform regular maintenance on vehicles, machinery, and motorised equipment								
Notes	[1] Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.2.6 Ecology and biodiversity

The existing railway line between Zouérate and Nouadhibou does not intersect any legally protected areas (reserves or national parks), KBA, IBA, or RAMSAR wetlands.

Faunal density in this region is generally low, with potential occurrence of species such as the fennec fox, African wolf, sand cat, gerbil, and African ground squirrel. The habitats within the rail AoI are estimated to support between 1 and 9 mammal species, including one VU species, the Dorcas gazelle. Although *Gazella dorcas* (VU) is known to occur regionally and may occasionally use habitat within the Rail AoI, the species does not meet IFC PS6 thresholds for Critical Habitat designation. None of the biodiversity features identified as occurring or potentially occurring in the Rail AoI met the Criteria for inclusion in the critical habitat screening; therefore, no critical habitat was identified.

The impacts of increased rail activity on terrestrial fauna are assessed below. Potential effects on natural habitats, flora and avifauna were screened out of the assessment as the proposed activities in the Rail area do not have a strong linkage with these receptors.

12.2.2.6.1 Impact EB05 & mitigation: Fauna Habitat Degradation, Disturbance and Collision risk

The increase in material transport (construction phase) and in mineral transport (operation phase) along the 872 km Zouérate–Nouadhibou railway, are expected to intensify disturbance to terrestrial fauna through increased frequency of disturbance from noise, vibration, and dust emissions. During the operations phase, mineral transport is carried out by three trains, each transporting 18,000 tons of iron ore, making one round trip per day.

Terrestrial fauna is considered as a receptor with a **low sensitivity**.

Impact description

Construction

As the El Aouj Project does not include any construction activities within the railway corridor, no construction phase impacts are anticipated. However, the construction phase of the mine will require increased use of the railway to transport construction materials, particularly for the construction of the spur line between F'Derick and

the mine site. As a result, impacts are expected. The Project will only rely on the existing railway infrastructure for construction materials transport.

During the construction phase, rail activities impact on terrestrial fauna are:

- Fauna disturbance: More frequent train passages or longer wagon sets will reduce habitat quality, disrupt wildlife movements, and trigger avoidance behaviour among sensitive species, especially with noise and vibration.

  This will result in a negative and direct impact on habitats with a low intensity, a project-site geographical extent and a short-term duration leading to a **negligible impact magnitude**.

  As the sensitivity was defined to be low and the magnitude to be negligible, the impact is of **negligible negative significance**.

- Collision risk: More frequent train passages or longer wagon sets increase collision risk particularly affecting species such as the fennec fox, African wolf, sand cat, and Dorcas gazelle, or domestical fauna such as camels or goats, which may occur along the route. As trains occupy the corridor more frequently, animals attempting to cross may face greater mortality risk.

  This will result in a negative and direct impact on habitats with a low intensity, a project-site geographical extent and a short-term duration leading to a **negligible impact magnitude**.

  As the sensitivity was defined to be low and the magnitude to be negligible, the impact is of **negligible negative significance**.

- Habitat fragmentation: More frequent train passages or longer wagon sets may temporarily fragment habitats situated along the railway right-long-way. Although the railway is already an established linear infrastructure in Mauritania's landscape, higher train frequency can amplify the barrier effect for wildlife, especially for species with limited movement capacity. As trains occupy and move through the corridor for longer periods, fauna may experience temporary restrictions when attempting to cross the tracks, leading to delays in movement, altered daily activity patterns and short-term displacement, creating interruptions in wildlife movement and contributing to localized stress and avoidance behaviours.

  This will result in a negative and direct impact on habitats with a low intensity, a project-site geographical extent and a short-term duration leading to a **negligible impact magnitude**.

  As the sensitivity was defined to be low and the magnitude to be negligible, the impact is of **negligible negative significance**.

Operation

The transportation of iron ore by SNIM between the Tiris Zemour mines and the mineral port of Nouadhibou is currently handled by 4 pairs of trains per day (1 outbound + 1 return trip = 1 pair).

During the operation phase, rail activities impact on terrestrial fauna are:

- Habitat degradation and fauna disturbance: More frequent train passages or longer wagon sets will reduce habitat quality, disrupt wildlife movements, and trigger avoidance behaviour among sensitive species. In addition, dust emissions generated during ore transport can further degrade air quality and lead to dust deposition on vegetation, altering food availability and the sensory environment of species living near the corridor. These effects are consistent with disturbance patterns commonly observed in mining and transport contexts.

This will result in a negative and direct impact on habitats with a moderate intensity, a project-site geographical extent and a long-term duration leading to a **moderate impact magnitude**.

As the sensitivity was defined to be low and the magnitude to be moderate, the impact is of **low negative significance**.

- Collision risk: More frequent train passages or longer wagon sets increase collision risk particularly affecting species such as the fennec fox, African wolf, sand cat, and Dorcas gazelle, which may occur along the route. As trains occupy the corridor more frequently, animals attempting to cross may face greater mortality risk due to reduced visibility (dust, heat haze) and longer train lengths.

  This will result in a negative and direct impact on habitats with a moderate intensity, a project-site geographical extent and a long-term duration leading to a **moderate impact magnitude**.

  As the sensitivity was defined to be low and the magnitude to be moderate, the impact is of **low negative significance**.

- Habitat fragmentation: More frequent train passages or longer wagon sets may temporarily fragment habitats situated along the railway right-long-way. Although the railway is already an established linear infrastructure in Mauritania's landscape, higher train frequency can amplify the barrier effect for wildlife, especially for species with limited movement capacity or that sensitive disturbance. As trains occupy and move through the corridor for longer periods, fauna may experience temporary restrictions when attempting to cross the tracks, leading to delays in movement, altered daily activity patterns and short-term displacement, creating interruptions in wildlife movement and contributing to localized stress and avoidance behaviours.

  This will result in a negative and direct impact on habitats with a moderate intensity, a project-site geographical extent and a long-term duration leading to a **moderate impact magnitude**.

  As the sensitivity was defined to be low and the magnitude to be moderate, the impact is of **low negative significance**.

Decommissioning

During the decommissioning phase, no adverse impacts are anticipated within the Rail area. As the project will cease using the existing railway infrastructure, train frequency will decrease compared to the operational phase. This reduction in rail traffic is expected to generate positive outcomes for biodiversity, including lower levels of noise, vibration, and dust emissions, as well as a reduced risk of wildlife disturbance and collisions. Overall, the decommissioning phase is expected to have a net beneficial effect (in comparison of the operation phase) on fauna along the Zouérate–Nouadhibou railway corridor.

Mitigation measures

In addition to physical mitigation measures the following additional about habitat degradation, fauna disruption and collision risk are listed below.

Construction & Operation

- Implement a monitoring and track fauna collision incident

Summary of impact assessment

Table 12-65: Impact EB05 – Habitat degradation, Fauna disruption and collision risk

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase[1]	Nature	Type	Intensity	Geographical extent	Duration	Magnitude	Receptor Sensitivity	Impact Significance

Fauna disruption									
Before mitigation	C	Negative	Direct	Low	Project site	Short-term	Negligible	Low	Negligible
After mitigation	C	Negative	Direct	Negligible	Project site	Short-term	Negligible	Low	Negligible
Collision risk									
Before mitigation	C	Negative	Direct	Low	Project site	Short-term	Negligible	Low	Negligible
After mitigation	C	Negative	Direct	Negligible	Project site	Short-term	Negligible	Low	Negligible
Habitat fragmentation									
Before mitigation	C	Negative	Direct	Low	Project site	Short-term	Negligible	Low	Negligible
After mitigation	C	Negative	Direct	Low	Project site	Short-term	Negligible	Low	Negligible
Habitat degradation and fauna disruption									
Before mitigation	O	Negative	Direct	Moderate	Project site	Long-term	Moderate	Low	Low
After mitigation	O	Negative	Direct	Low	Project site	Long-term	Low	Low	Low
Collision risk									
Before mitigation	O	Negative	Direct	Moderate	Project site	Long-term	Moderate	Low	Low
After mitigation	O	Negative	Direct	Low	Project site	Long-term	Low	Low	Low
Habitat fragmentation									
Before mitigation	O	Negative	Direct	Moderate	Project site	Long-term	Moderate	Low	Low
After mitigation	O	Negative	Direct	Moderate	Project site	Long-term	Moderate	Low	Low
Mitigation measures	▪ Implement a monitoring and track fauna collision incident								
Notes	[1] Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure								

12.2.2.7 Ecosystems services

No Priority Ecosystem Services (PES) were identified in the ES baseline for the Rail area. Therefore, no impact assessment is deemed necessary for this area.

12.2.2.8 Community

12.2.2.8.1 Impact Rail-SOC-R01 & mitigation – Impact on Community Health & Safety between F'Derick and Nouadhibou

The environmental and social impact assessment evaluates the incremental effects of the El Aouj project on the existing railway infrastructure. Sensitivity is considered moderate, reflecting the considerable diversity of lifestyles, including urban and rural communities as well as temporary pastoral camps, located along the railway corridor.

Impact description

Construction

During this phase, no substantial effects on the community, health, or safety are anticipated in the rail area, since the extension works on the rail spur will take place within the mining area.

Operation

During the project's operational phase, an increase in rail traffic is expected in the railway area. This increase in traffic is likely to generate risks to the health, safety, and security of communities, particularly for pedestrians, vehicles, and livestock crossing the railway line. It is also expected to lead to increased noise levels, vibrations, and dust emissions.

Increase rail traffic: The project will lead to an increase in the number of trains (2 additional pairs per day) between F'Derick and Nouadhibou. This increase in traffic will increase the risk of collisions involving people or vehicles, particularly at uncontrolled crossings or road crossings on the RN1, notably at Choum and then F'Derick, as well as at the many informal crossings that are very common in rural areas. The daily movements of communities, particularly to access water or pasture, will be interrupted more frequently when trains pass, if they have to cross the railway line.

Long trains (averaging 150 to 200 wagons) can create a barrier effect that impacts mobility: local people must wait for the train to pass before crossing and sometimes attempt to do so hastily when the end seems near. Children, herders, and pedestrians using informal crossings are particularly vulnerable. This barrier effect on mobility will become more pronounced, particularly in Choum and F'Derick, where people will have to wait longer to cross the railroad tracks when a train is passing, which may disrupt their daily travel.

The project will lead to an increase in the number of trains (2 additional pairs per day) between F'Derick and Nouadhibou. This increase in traffic will increase the risk of collisions involving people or vehicles, particularly at uncontrolled crossings or road crossings on the RN1, notably at Choum and then F'Derick, as well as at the many informal crossings that are very common in rural areas. The daily movements of communities, particularly to access water or pasture, will be interrupted more frequently when trains pass, if they have to cross the railway line. Long trains (averaging 150 to 200 cars) can create a barrier effect that impacts mobility: local people must wait for the train to pass before crossing and sometimes attempt to do so hastily when the end appears to be near. Children, herders, and pedestrians using informal crossings are particularly vulnerable. This barrier effect on mobility will be accentuated, particularly in Choum and F'Derick, where people will have to wait longer to cross the railway line when a train is passing, which may disrupt their daily movements.

In addition, there is a risk of derailment, which is a high-impact scenario for communities located near the railway tracks. A derailment near an urban or rural area, a nomadic camp, or a busy crossing point can have serious consequences, including:

- Risk of injury or death to people in the immediate vicinity of the railroad at the time of the accident;
- Cattle or other animals being crushed, causing significant economic losses for households;
- Destruction or damage to nearby homes, businesses, or community infrastructure.

This increase in traffic exposes livestock farmers to a greater risk of accidents involving their animals, particularly during periods of transhumance.

Dust emissions: Due to heavy train traffic, there will be an increase in dust emissions along the railway line. When trains pass, dust from the sand will be blown up by the wind. Furthermore, the wagons transporting iron ore will be open, and even though the iron ore is generally wet when it leaves the mine, fine particles may be blown away during transport, especially in strong winds, which are very common in the region. This dust and fine particles are likely to degrade air quality and cause respiratory and eye irritation or aggravate pre-existing conditions in vulnerable people. They may also deposit on homes, nomadic camps and small businesses located along the railway line, adversely affecting quality of life.

Noise: The growth in the number of trains will generate higher noise levels for households living near the railway. The noise comes mainly from passing trains, braking, coupling and the use of warning horns at level crossings. Social receptors less than 100 m from the railway are particularly exposed, which may disrupt the well-being of communities. This area includes a group of vulnerable people who will be more exposed to these risks, including women, herders, elderly people without family support, people with disabilities and sick people who require special attention.

The impacts related to air quality and noise are analysed in detail in section 12.2.2.4 and 12.2.2.5 of this report.

The impact is negative and indirect, with a moderate intensity. The extent is regional due to the railway crossing through several localities, and long-term due to the project's operational period (41 years). The magnitude is **moderate**.

As the sensitivity was defined to be moderate and the magnitude to be moderate, the impact is of **moderate negative significance.**

Decommissioning

During the decommissioning phase of the El Aouj project, the existing railway will continue to be used by SNIM. No significant impact on community, health and safety is expected during this phase.

Mitigation measures

EMC will recommend that SNIM implement the following additional measures (some of them already included in SNIM ESIN (SNIM, 2024) :

Reduction

- Install enhanced and visible safety signs at crossing points (signs, audible warning devices if possible);
- Restricting train speeds in urban and rural areas, in line with international best practices for preventing rail collisions;
- Harmonize the use of a sound signal by introducing a standardized klaxon procedure when approaching inhabited areas or community crossings, in order to ensure rapid and consistent information for people living near the railway;
- A coordinated emergency response plan between EMC and SNIM to ensure a rapid response in the event of accidents affecting communities in the area;
- Develop an HSE plan compliant in compliance with the IFC HSE guidelines for railway operations;
- Maintain an accessible and appropriate complaints management mechanism for the communities concerned;
- Organise periodic information meetings in the localities crossed by trains on the risks associated with train passage and promote appropriate safety procedure.

Summary of impact assessment

The following table provides a summary of the project's impact on community health and safety between F'Derick and Nouadhibou.

Table 12-66: Impact Rail-SOC-R01 & mitigation – Impact on Community Health & Safety between F'Derick and Nouadhibou (Incremental Traffic Risk)

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Op	Negative	Indirect	Moderate	Regional	Long-term	Moderate	Moderate	Moderate
After mitigation	Op	Negative	Indirect	Low	Regional	Long-term	Low	Low	Low

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Mitigation measures	▪ Install enhanced and visible safety signs at crossing points (signs, audible warning devices if possible); ▪ Restricting train speeds in urban and rural areas, in line with international best practices for preventing rail collisions; ▪ Harmonize the use of a sound signal by introducing a standardized klaxon procedure when approaching inhabited areas or community crossings, in order to ensure rapid and consistent information for people living near the railway; ▪ A coordinated emergency response plan between EMC and SNIM to ensure a rapid response in the event of accidents affecting communities in the area; ▪ Develop an HSE plan compliant in compliance with the IFC HSE guidelines for railway operations; ▪ Maintain an accessible and appropriate complaints management mechanism for the communities concerned; ▪ Organize periodic information meetings in the localities crossed by trains on the risks associated with train passage and promote appropriate safety procedure.								
Notes	1 Project Phase: Op = Operational								

12.2.2.8.2 Impact Rail-SOC-R02 & mitigation – Pastoral Livelihood Interface (Barrier & Livestock Risk)

The environmental and social impact assessment therefore, focuses on the additional effects of the El Aouj project on this existing infrastructure. The sensitivity is assessed as moderate due to the wide diversity of lifestyles, ranging from urban and rural areas, and to temporary pastoral camps along the railway line.

Impact description

Construction

No significant impact on community, health and safety is expected during this phase in the railway area, as the rail branch extension works will be carried out in the mining area.

Operation

The operational phase is the period during which risks and disruptions related to railway activities are most likely to affect pastoral communities, particularly due to increased rail traffic. This factor is likely to affect livestock and the livelihoods of herders and pastoral communities dependent on pastoralism.

Along the railway line, livestock farming systems are based on transhumant pastoralism and sedentary or semi-sedentary forms of livestock farming, and livestock feed varies according to the season, fodder availability and access to water. The income of farmers or pastoralists and their families comes mainly from the sale of animals and dairy products and, to a lesser extent, from commercial opportunities around train crossing points or transit points.

The main impact of the project on the rail area is collisions between trains and animals during crossings, with potentially high economic losses for farmers or pastoralists and households depending on livestock farming. Secondary impacts include extent transhumance movements and conflicts of use in the event of uncompensated or poorly managed animal losses when a train passes, as well as noise that can cause herds to scatter.

Risk of collisions between trains and animals: The increase in the number of trains on the F'Derick–Nouadhibou corridor increases the likelihood of collisions between trains and herds. These animals regularly cross the railway line to access grazing areas or water points. The high speed of trains and their limited braking capacity make avoidance difficult, which can result in significant animal losses for livestock farmers. These losses pose a direct threat to livelihoods, particularly in households that are heavily dependent on livestock farming.

Disturbance of livestock by noise: Increased noise levels from passing trains, braking, coupling and the use of warning horns can frighten animals. Some herds may scatter when surprised by the noise, leading to temporary losses or collisions in the area. Temporary camps located near the track are also likely to experience these noise disturbances, affecting the organization of pastoral activities.

Risks of social conflict: Animal losses or damage to herds can lead to tensions between livestock farmers and SNIM train maintenance crews. In the absence of complaint management or compensation mechanisms, herders often have no recourse to compensate for the loss of their livestock. This situation can increase their economic vulnerability and create conflict between farming or pastoralists and train maintenance teams.

The impact is negative and indirect, with a moderate intensity. The extent is regional due to the railway crossing through several localities, and long-term due to the project's operational period (41 years). The magnitude is **moderate**.

As the sensitivity was defined to be moderate and the magnitude to be moderate, the impact is of **moderate negative significance.**

Decommissioning

During the decommissioning phase of the El Aouj project, the existing railway will continue to be used by SNIM. No impact of the project on pastoral livelihoods is expected during this phase.

Mitigation measures

EMC will recommend that SNIM implement the following additional measures:

Reduction

- Install enhanced and visible safety signs at crossing points (signs, audible warning devices if possible);
- Restricting train speeds in urban and rural areas, in line with international best practices for preventing rail collisions;
- Harmonize the use of a sound signal by introducing a standardized klaxon procedure when approaching inhabited areas or community crossings, in order to ensure rapid and consistent information for people living near the railway;
- A coordinated emergency response plan between EMC and SNIM to ensure a rapid response in the event of accidents affecting communities in the area;
- Develop an HSE plan compliant in compliance with the IFC HSE guidelines for railway operations;
- Maintain an accessible and appropriate complaints management mechanism for the communities concerned;
- Organise periodic information meetings in the localities crossed by trains on the risks associated with train passage and promote appropriate safety procedure.

Summary of impact assessment

Table 12-67 provides a summary of the project's impact on pastoral livelihood interface between F'Derick and Nouadhibou.

Table 12-67: Impact Rail-SOC-R02 – Pastoral Livelihood Interface (Barrier & Livestock Risk)

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Op	Negative	Indirect	Moderate	Regional	Long-term	Moderate	Moderate	Moderate
After mitigation	Op	Negative	Indirect	Low	Regional	Long-term	Low	Moderate	Low
Mitigation measures	▪ Install enhanced and visible safety signs at crossing points (signs, audible warning devices if possible); ▪ Restricting train speeds in urban and rural areas, in line with international best practices for preventing rail collisions; ▪ Harmonize the use of a sound signal by introducing a standardized klaxon procedure when approaching inhabited areas or community crossings, in order to ensure rapid and consistent information for people living near the railway; ▪ A coordinated emergency response plan between EMC and SNIM to ensure a rapid response in the event of accidents affecting communities in the area; ▪ Develop an HSE plan compliant in compliance with the IFC HSE guidelines for railway operations; ▪ Maintain an accessible and appropriate complaints management mechanism for the communities concerned; ▪ Organise periodic information meetings in the localities crossed by trains on the risks associated with train passage and promote appropriate safety procedure.								
Notes	1 Project Phase: Op = Operational								

12.2.2.9 Cultural Heritage

The Project plans to use SNIM's existing railway line to transport iron ore between F'Derick and the mineral port of Nouadhibou. The main potential source of impact associated with this use is increased rail traffic, which is unlikely to affect cultural heritage resources within the existing rail corridor. The sections below describe the anticipated impact of the Project on tangible and intangible cultural heritage resources during each Project stage.

12.2.2.9.1 Impact Rail-CH-R01: Damage and Disturbance of Tangible and Intangible Cultural Heritage

Impact description

Construction

During the construction phase, all activities will be strictly limited to the mining area. No installations or interventions are planned in the railway area. Therefore, no impact on cultural heritage (tangible nor intangible) is expected during this phase.

Operation

During the operations stage of the Project, no ground disturbance activities are predicted to occur, hence no direct, physical impacts on tangible receptors are predicted

Intermittent increases in rail traffic may indirectly impact (as yet unknown) cultural heritage receptors within close proximity to the operational railway. These indirect impacts may result from changes to local environmental setting via sporadic increases in dust, noise etc. Some limited changes to current local access (e.g., to cultural resources that may be present throughout the wider landscape) are anticipated. The potential impact of any such access restrictions is currently unknown, however, no additional land (beyond the existing the rail corridor) is required for the Project. Mitigation measures have been identified to manage any unforeseen impacts resulting from safety improvements along the rail corridor, should they occur.

Decommissioning

During the Project's decommissioning phase, there will be no more ore transport between F'Derick and Nouadhibou. Consequently, no impact on cultural heritage is expected during this phase.

Mitigation measures

Avoidance

To avoid potential impacts to previously unknown resources, a CFP will provide a mechanism to address archaeological discoveries during Project activities when a Cultural Heritage Expert is not present.

Minimisation

The Project Grievance Mechanism and the SEP will include measures to identify and manage any unforeseen impacts to cultural heritage resulting from the operational railway, as indicated in the CHMP.

12.2.3 Port area

All of the ore extracted from the El Aouj mine and transported by train will be temporarily stored at the Nouadhibou mineral port.

Currently, the mineral port is exclusively dedicated to exporting concentrated iron ore extracted from SNIM mines located in the Tiris Zemour region. In 2024, the tonnage of ore loaded onto bulk carriers from this port reached 14.2 Mt/y.

The ore production from the El Aouj mine will amount to 11 million tons per year and will be routed entirely through the mineral port. The management of this ore will therefore represent an increase of approximately 78% in port activities compared to current unloading, temporary storage, and ship loading operations.

This increase in ore volume will result in a 55% rise in maritime traffic: the mineral port received 99 vessels of 150,000 tons in 2025, and the El Aouj Project will introduce 55 additional vessels per year, each with a tonnage between 205,000 and 208,000 tons.

The infrastructure at the Nouadhibou mineral port is currently sized to handle ore from the El Aouj mine without the need for additional construction.

As part of the El Aouj Project, activities at the Nouadhibou mineral port will be limited to the operational phase of the Project, specifically including the unloading, temporary storage, and loading of El Aouj ore onto bulk carriers.

The mineral port of Nouadhibou is the exclusive property of SNIM, which also operates it. For this reason, most of the mitigation measures recommended in this document will be directed to SNIM; in most cases, EMC can only provide support and advice to SNIM to ensure the proper implementation of the recommended measures.

12.2.3.1 Land quality

12.2.3.1.1 Impact Port-LQU01 & mitigation: Increase of Impacts on Land Quality

Impact description

Additional ore management at the mineral port could affect land quality in two ways:

- An increase in the areas used for temporary ore storage within zones already designated for this purpose. As previously mentioned, the ore presents no risk of leaching or acid drainage. Ore management does not require any chemical additives. Potential impacts on land quality from leachate in low sensitivity areas will be negligible and are scoped out.
- An increase in the use of existing ore management equipment, such as stackers, loaders, conveyors, and bucket wheel reclaimers, may present additional risks of hydraulic leaks or hydrocarbon spills onto the soil. However, this increased risk appears to be limited as long as the equipment is subject to routine inspections and regular maintenance.

The environment of the mineral port is considered to be of low sensitivity, as it is located in a desert area without vegetation and with no activities other than industrial ones. The potential risk of increase of soil contamination impact due to the greater use of existing facilities is considered low.

Mitigation measures

- Organise awareness campaigns, display materials, and training sessions for project staff regarding increased risks associated with pollution, the importance of sorting, collecting, storing, and recycling waste, as well as the prohibitions and penalties outlined in the regulations concerning the irregular disposal of solid and liquid waste in natural environments.
- Set up storage areas for oils and fuels.
- Pollution Prevention and Control: procedures to establish for the prevention, identification, control, and monitoring of pollutants, as well as the management of accidental discharges and spills;
- Emergency Preparedness and Response: development and implementation of an Emergency Preparedness and Response Management Plan, together with associated procedures;
- Hazardous Materials Management Plan: development and implementation of a Hazardous Materials Management Plan including storage, transportation, disposal, recovery, and control and decontamination measures.

Even with effective implementation of mitigation measures, some land contamination remains possible, but these residual impacts are not expected to be significant. The magnitude of potential impacts will be reduced, resulting in residual land quality impacts that are short term and of low significance.

Summary of impact assessment

Table 12-68: Impact Port-LQ01 - Increase of impacts on Land Quality

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Low	Project site	Long term	Low	Low	Low

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
After mitigation	C, O, D	Negative	Direct	Low	Project site	Short term	Negligible	Low	Low
Mitigation measures	▪ Environmental awareness ▪ Storage area for oil and fuels ▪ Prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment ▪ Implement the Emergency Preparedness and Response Plan ▪ Implement the Hazardous Material Management Plan								
Notes	[1] Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.3.2 Surface and ground water quality

There is no surface water or wadis in the mineral port area or Cap Blanc zone in general. Groundwater consists of seawater infiltration from the surrounding sea, located about 10 meters below the surface. There is no available and exploitable water resource at Cap Blanc. Due to the absence of watercourses and aquifer, and the low risk of soil contamination (see previous section), the risk of increased pollution of surface and groundwater due to the greater activities at the mineral port is considered negligible, and further impact assessment has been scoped out.

12.2.3.3 Air quality

12.2.3.3.1 Impact Port-AQ01 & mitigation: Increase of Dust Emissions on Receptors

Impact description

An increase in the unloading, temporary storage, and loading of ore onto bulk carriers is expected to result in elevated levels of gas and dust emissions in all locations where ore handling occurs at the port.

The impact magnitude resulting from these emissions is influenced by climatic and meteorological variables, with factors such as humidity, wind direction and speed, emission rates of gases and particulate matter, and the distribution and proximity of receptors playing critical roles.

Climatic conditions: The climatic conditions of the Cap Blanc area are presented in section 6.4.1.2. The wind rose is dominated by directions from North-Northeast to North-Northwest with wind speeds ranging from 6 to 10 m/s. Winds over 20 km/h resuspend desert dust in most cases, raising fine particulate levels. At sea, the semi-diurnal tide and North–South currents channelled through the inlet, combined with a well-mixed water column, promote advection and dilution of plumes toward the south and over the water, limiting the impact toward Cansado/Nouadhibou when winds remain from the north.

Gas emissions: The gas emissions from the mineral port are primarily generated by the thermal power plant located on the site. The current thermal power plant is capable of producing up to 16 MW. Considering a 78% increase in ore management activity with the integration of the El Aouj Project, the intensity of emissions resulting from this additional activity is regarded as high.

Dust emissions: Five fugitive sources structure particulate emissions at the port (TECSULT, 2009) ore stockpiling, transfer to conveyors, processing plant, ship loading, and wind erosion of stockpiles. The source related to ore processing does not concern ore from El Aouj, since it arrives already processed and ready for

export. Modelling conducted in 2009 at the mineral port demonstrates that fine particulate concentrations resulting from ore handling activities significantly exceed the recommended thresholds set by the WHO (WHO, 2021), with concentrations reaching up to 1,801 µg/m3/year (8,943 µg/m3/24h) for PM10 and 225 µg/m3/year (1,118 µg/m3/24h) for PM2.5 at the site boundary (TECSULT, 2009).

The prevailing wind direction significantly influences the dispersion of particulate (and gas) plumes, carrying them predominantly offshore to the south. To the north of the site, exceedances for $PM_{2.5}$ (both 24-hour and annual averages) cease between the mineral port and Cansado, while for PM_{10} (24-hour), they cease between Cansado and the city of Nouadhibou. Annual PM_{10} concentrations return to compliant levels starting at Cansado (TECSULT, 2009).

It is important to highlight that the modeling conducted in 2009 utilised an export volume of 12 Mt recorded in 2007. The integration of additional ore from El Aouj to the mineral port will result in an increase of 11 Mt/y, representing an increase of 108% compared to the 2007 baseline used for the dispersion model. This increase is anticipated to intensify dust emissions over the long term within and with a local extent. Accordingly, the impact magnitude is assessed as high.

Receptors: For both gases and fine particles, the main plume is directed southward, with maximum concentrations developing over the sea (TECSULT, 2009). Cap Blanc is considered a sensitive receptor located beneath the plume, while Cansado and Nouadhibou are generally minimally affected (winds rarely blow northward), with modeled levels significantly lower than those observed at the property boundary. The entire area south of the mineral port, extending to the tip of Cap Blanc—the primary zone for the dispersion of dust and gas plumes—is completely uninhabited and contains no anthropogenic activities. However, the increase in gas and dust concentrations at the port site may result in heightened health impacts for personnel working onsite. Therefore, the sensitivity of the mineral port area is considered high with respect to the deterioration of air quality at the site.

Mitigation measures

Verify that SNIM implement the following mitigation measures:

- Create a health and safety management plan featuring targeted actions to enhance and regulate air quality. This document should detail, for each identified source, all actions to be implemented in order to minimise dust and gas emissions as much as possible.
- Implement the health and safety management plan and carry out regular inspections and maintenance of dust suppression systems.
- Conduct routine air quality monitoring ($PM_{10/2.5}$, NOx, SOx)
- Systematically verify the Statutory and compliance documents of ore vessels.

Summary of impact assessment

Table 12-69: Impact Port-AQ01 - Increase of dust emissions on receptors

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	High	Local	Long term	High	High	High
After mitigation	C, O, D	Negative	Direct	Moderate	Local	Long Term	Moderate	High	Moderate

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Mitigation measures	■ Develop a health and safety management plan that includes specific measures for air quality control. Storage area for oil and fuels ■ Implement the health and safety management plan and carry out regular inspections and maintenance of dust suppression systems. ■ Conduct systematic periodic inspections of ore carrier vessels,								
Notes	[1] Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.3.4 Noise

12.2.3.4.1 Impact NV01 & mitigation: Increase of noise and vibrations

The potential effects of noise and vibrations are primarily linked to increased unloading, storage, and loading of ore onto bulk carrier vessels, which may expose nearby receptors to higher noise levels. In 2009, an ESIA for building a new loading dock at the mineral port included a detailed analysis of local noise sources, such as the thermal power plant, ship loading operations, crushers, screens, hoppers, and ore transport (TECSULT, 2009). The highest sound emission was estimated at the new ship loading dock, reaching 88.6 dBA. Subsequent noise measurements took place at the edge of the port's industrial zone and at the boundary of Casando's residential area, which is the nearest receptor. Results showed noise levels varied from 37 dBA at Casando's residential border to 44–46 dBA at the port boundaries, mainly due to wind and road traffic (TECSULT, 2009).

Noise level estimations at the closest receptors were also performed to assess the impact of the new loading dock on the existing sound environment. These calculations show a background noise increase of about 0.8 dBA at the three evaluated boundaries, including the residential area of Casando (TECSULT, 2009). These values remain well below the IFC recommended thresholds (45 dBA at night and 55 dBA during the day).

Port activity related to ore management from the El Aouj mine will result in increased ore handling time on the site, including at the loading dock, but not in an increase in equipment likely to generate more noise. Consequently, activities related to El Aouj ore management are not expected to generate additional noise at the mineral port. This adverse impact is therefore considered negligible and is scoped out.

12.2.3.5 Marine physical environment

12.2.3.5.1 Impact Port-ME01 & mitigation: Increase of the degradation of sediment and sea water quality

Impact description

The activities related to the El Aouj Project at the Nouadhibou mineral port are limited to loading iron ore onto vessels. Since there are no processing operations or direct industrial discharges associated with El Aouj ore management at the port, the potential for additional sediment or water pollution from land-based activities is primarily related to ship-loading activities only.

Increase of bulk carrier ships may also introduce certain impacts to the marine environment, such as:

- Increased water turbidity caused by the disturbance of sediments in shallow areas;
- Pollution of sediments and water resulting from accidental spills, operational errors, chronic leaks, or intentional discharge of waste. As noted in sections 6.4.2.4 and 6.4.2.5, traces of contamination have been found in both sediment and seawater, linked to marine traffic (Antea Group, 2017). This type of contamination can accumulate over time, particularly in sediments, leading to long-term effects.

The rise in the volume of ore to be transported will lead to increased maritime traffic, which is likely to intensify these types of disturbances and impacts on the physical marine environment. The magnitude of this impact is considered moderate and is expected to remain local, leading to a moderate impact magnitude.

The sensitivity of the marine environment is considered high due to its potential effect on aquatic habitat and legally protected areas (see section 12.2.3.6.3).

As the sensitivity was defined to be high and the magnitude to be moderate, the impact is of high significance.

Mitigation measures

Verify that SNIM implement the following mitigation measures:

- Routine inspection of fuel and lubricant lines on cranes, ship loaders, and quay infrastructure.
- Regular maintenance of vessels engines and equipment.
- Adopt a strict “zero discharge overboard” policy for all vessels operating in or approaching the port.
- Implement the Emergency Preparedness and Response Plan:
  - Emergency spill response plan with on-site /onboard equipment and trained personnel
  - Engage monitoring of water and sediment quality after any accidental spill into the sea.

Summary of impact assessment

Table 12-70: Impact Port-ME01 - Increase of the degradation of sediment and sea water quality

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Moderate	Local	Long term	Moderate	High	High
After mitigation	C, O, D	Negative	Direct	Moderate	Local	Long Term	Moderate	High	Moderate
Mitigation measures	▪ Routine inspection of fuel and lubricant lines on cranes, ship loaders, and quay infrastructure. ▪ Regular maintenance of vessels engines and equipment. ▪ Adopt a strict “zero discharge overboard” policy for all vessels operating in or approaching the port. ▪ Implement the Emergency Preparedness and Response Plan								
Notes	[1] Project Phase: C = Construction, Op = Operation, D = Decommissioning								

12.2.3.5.2 Impact Port-ME02 & mitigation : Increase of Marine Noise Emissions

Impact description

Bulk carriers, characterized by their high tonnage (exceeding 100,000 DWT, and up to 250,000 DWT at the mineral port), powerful propulsion, and large-diameter propellers, are among the merchant vessels generating the highest levels of continuous underwater noise. Their acoustic signature is dominated by low-frequency emissions, mainly between 10 and 200 Hz, which are mostly the result of propeller cavitation and the operation of main engines. The noise levels measured at the source for this type of vessel commonly reach values of

about 180 to 190 dB re 1 µPa @ 1 m in the low-frequency bands, with a particularly pronounced contribution around 50–100 Hz (Cruz, et al., 2021). Due to the low attenuation of low frequencies in the marine environment, these emissions can propagate over several tens of kilometers, significantly contributing to the elevation of regional ambient noise (Possenti, et al., 2024). The repeated passage of bulk carriers is therefore likely to cause chronic acoustic masking of biological signals used by large marine mammals, sometimes reducing the functional communication range in areas of intense traffic (see section 12.2.3.6.3).

Because of their frequency of passage, transit speed, and high acoustic power, bulk carriers play a major role in the cumulative effects of anthropogenic underwater noise, especially in navigation corridors connecting mineral ports and ecologically sensitive coastal areas.

The increase in traffic related to the commercialization of ore from the El Aouj mine will significantly increase the number of bulk carriers coming to load the ore. The increase of marine noise emission is considered of moderate intensity over a long period of time with a local geographical extent (mainly across marine protected areas along the coast, leading to a moderate impact magnitude.

Mitigation measures

- Reduction of navigation speed ("slow steaming"): Lowering ship speeds is recognized as the most effective and immediately applicable measure to reduce underwater noise, as it limits propeller cavitation. Speed reductions in the range of 10 to 30% can lead to a decrease in radiated noise by several decibels, while simultaneously reducing greenhouse gas emissions.
- Optimization and maintenance of propellers: Regular maintenance of propellers (reducing fouling, repairing defects) helps to limit cavitation, which is the main source of underwater noise from merchant vessels.
- Application of international guidelines from the International Maritime Organization (IMO): Voluntary adoption of the revised IMO Guidelines ((IMO), 2023) currently provides the international reference framework for reducing underwater radiated noise, in the absence of binding regulatory thresholds.

Summary of impact assessment

Table 12-71: Impact Port-ME02 - Increase of marine noise emissions

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	C, O, D	Negative	Direct	Moderate	Local	Long term	Moderate	High	High
After mitigation	C, O, D	Negative	Direct	Moderate	Local	Long Term	Moderate	High	Moderate
Mitigation measures	▪ Reduction of navigation speed ▪ Regular maintenance of vessels engines and equipment. ▪ Application of international guidelines from IMO								
Notes	-								

12.2.3.6 Ecology and biodiversity

As described in Section 12.2.3, the Project will increase the volume of ore handled, stored, and shipped at the existing mineral port. This increase in ore volume will result in an increase in maritime traffic, increasing the annual number of vessels from 99 to 154 vessels (i.e., an increase of 55 vessels annually). Assuming a

continuous supply of ore from the mine, the Project would increase ocean going vessel traffic in Baie du Lévrier by about one vessel every six to seven days.

As described in the biodiversity baseline, the Port AoI contains sensitive biodiversity features, including:

- Legally protected areas and internationally recognized areas:
  - Cap Blanc Integral Reserve IBA/KBA, which covers much of the Baie du Lévrier and some extents of the peninsula's coastline.
  - Cap Blanc Satellite Reserve, a small legally protected area at the tip of the Cap Blanc peninsula (annexed to Banc d'Arguin National Park).
  - Dakhla KBA/IBA and proposed national park, located mainly in the waters at the tip of and along the western side of the Ras Nouadhibou Peninsula.
- Critical habitat qualifying features:
  - Under criterion 1, critical habitat is identified for Mediterranean monk seal and blackspotted smoothhound, with confirmed presence and suitable habitats in the Port AoI.
  - Under criterion 3, critical habitat is identified for curlew sandpiper, grey plover, and Sandwich tern, with suitable intertidal habitats present in the AoI.
  - Critical habitats identified within the Port AoI include coastal and intertidal marine habitats, notably sandy beaches, mudflats, sandbanks, and subtidal sandy-mud substrates.
- Presence or potential occasional presence of other globally threatened marine species that do not trigger critical habitat, and presence of non-critical habitat qualifying migratory birds.

Other notable sensitive biodiversity features are present in region of Baie du Lévrier, but outside the boundaries of the AoI region:

- Critical habitat qualifying features:
  - Under criterion 1, critical habitat is triggered by green turtles and Atlantic humpback dolphins in the in the Marine EAAA, with critical habitat present in Banc d'Arguin National Park. Banc d'Arguin is approximately 100 km southeast of the port.
  - Under criterion 4, critical habitat is triggered by seagrass beds, which are present in Baie de l'Étoile and Banc d'Arguin National Park.
- Canary current shelf-break north KBA/IBA, which is located about 30 km west of the port.

Considering the sensitive features present in the Port AoI and the proposed Project activities, the assessment evaluates the following impacts:

- EB06: Degradation of legally protected areas and internationally recognized areas
- EB07: Degradation of bird habitat and bird disturbance
- EB08: Degradation of aquatic species habitat and disturbance

The risk of a major oil spill incident resulting from a vessel collision or grounding is not assessed in this section, they are addressed in Section 12.3.1 (Accidental risks).

12.2.3.6.1 Impact EB06 & mitigation: Degradation of legally protected areas and internationally recognized areas

Legally protected areas and internationally recognized areas are receptors with a **high sensitivity.** Those considered in the assessment of impacts are briefly described below, with additional details provided in the biological baseline (Section 7.0).

Cap Blanc Integral Reserve KBA and IBA

Cap Blanc Integral Reserve is designated as an IBA and KBA. The IBA and KBA overlap each other; however, the spatial extents of these sites differ slightly. These sites predominantly include the marine habitats of Baie du Lévrier but also extend inland to include some onshore and shoreline areas of the Ras Nouadhibou peninsula. The sites are designated as IBA and KBA because they support important concentrations of coastal migratory birds.

The Cap Blanc Integral Reserve is within and adjacent to the Port AoI and include both marine and terrestrial ecosystems. Approximately 83.2 ha of the integral reserve overlaps with the Port AoI.

Cap Blanc Satellite Reserve

Cap Blanc Satellite Reserve is a satellite reserve of Banc d'Arguin National Park. It covers a 4.2 km coastal strip at the tip of the Ras Nouadhibou Peninsula and extends 100 m inland and 400 m out to sea. The area was designated to protect Mediterranean monk seal habitat, although available data suggest that monk seals are concentrated outside the reserve, further north along the western side of the peninsula in Western Sahara (refer to Section 7.3.3.5 for details). The satellite reserve slightly overlaps with the Port AoI. The mineral port is located within 5 km of the satellite reserve and the port's loading dock is less than 3 km from the satellite reserve.

Dakhla Area KBA and IBA

Dakhla Area KBA and IBA is a proposed national park, subdivided into three spatially distinct sectors. The smallest and southernmost sector intersects the boundary of the Port AoI at the tip of the Ras Nouadhibou peninsula (26.2 ha). The site is designated because it supports important concentrations of migratory birds and is noted as being an important migratory staging post for waders and seabirds moving in and out of Banc d'Arguin National Park.

Baie de l'Étoile

Baie de l'Étoile is a proposed Marine Protected Area (Merceron, 2024) located outside the Port AoI, almost 22 km north of the mineral port. It is considered critical habitat under criterion 4b due to the presence of seagrass beds and also contains sandy/pebble beaches, rocky coasts, and salt marshes (Merceron, 2024). The site is ecologically important because it supports a rich diversity of marine fauna and functions as a fish nursery and spawning ground.

Canary Current Shelf Break North KBA and IBA

Canary Current Shelf Break North is a marine KBA and IBA, located approximately 30 km from the Port AoI. It is designated as a KBA and IBA to recognize the ecological importance of the Canary Current system's upwelling in providing essential foraging grounds for marine fauna, especially seabirds. Varying in depth between 50 and 1,000 m, the Canary Current Shelf Break is a highly productive, nutrient rich zone.

Banc d'Arguin National Park

Banc d'Arguin National Park is almost 100 km from the Port AoI. It is also designated as a KBA/IBA, a UNESCO World Heritage Site, and a Ramsar wetland. The park includes shallow seabeds (less than 5 meters water depth), marine seagrass beds, intertidal mudflats, intertidal sandbanks, mangrove forests, channels, and creeks, as well as coastal desert habitats. An estimated 2,250,000 migratory birds overwinter at this site, representing over 30% of the total estimated wader population along the East Atlantic migration route. In addition to bird biodiversity**,** the park supports a diversity of marine fauna with several taxa of high conservation priority. Banc d'Arguin National Park constitutes critical habitat, triggered by the presence of globally important concentrations of green turtles, several species of migratory birds, and seagrass beds.

Impact description

Construction

As the Project does not involve construction activities within the Port area, no construction-phase impacts are anticipated at the mineral port of Nouadhibou or within the Port AoI.

Operation

During the operation phase, the main impacts from increased volume of ore handling and increased shipping traffic will be:

- Degradation of Cap Blanc Integral Reserve, Cap Blanc Satellite Reserve, and Dakhla Area KBA and IBA: Port activities will generate an incremental increase of dust emissions. Dust generated from ore handling operations may settle on the water surface, forming iron-rich particulate films that reduce water clarity, and quality thereby increasing local turbidity during repeated vessel transits. The Cap Blanc Satellite Reserve is the nearest legally protected area, located 4.2 km to the southwest along the coast, which also corresponds to the prevailing wind direction. Deposition of dust on coastal habitats, including the highly sensitive Cap Blanc and Dakhla Area, may further degrade shoreline vegetation, resting sites, and feeding grounds used by both resident and migratory bird species. Over time, these changes can alter habitat structure and reduce the ecological quality of these important biodiversity hotspots.

  Increased vessel traffic also raises the risk of waste being discharged at sea, of introducing non-native invasive species, or accidental pollution events (e.g., oil spill), which could further degrade marine and coastal habitats and associated species. Potential impacts on terrestrial and marine wildlife are addressed in sections EB07 and EB08, respectively. The most important risk is the risk of introducing marine invasive species from ballast waters, which are recognized as a key mechanism for invasive species dispersal around the globe (Bailey, 2015). Invasive species can imbalance ecosystems and their establishment in the reserves could degrade their marine habitats.

  Maritime traffic will pass through the Cap Blanc Integral Reserve, and it may pass through the Dakhla Area. The increase in vessel traffic of approximately one vessel return trip every six to seven days, is unlikely to cause a disturbance that is important enough to alter the integrity of the KBA/IBA listing criteria, which are mainly migratory birds (refer to Section 12.2.3.6.2). The Project's maritime traffic will also pass close to the Cap Blanc Satellite Reserve, contributing to a small incremental increase in the level of sensory disturbance within the satellite reserve.

  The above effects will result in negative direct and indirect impacts on habitats of the Cap Blanc/ Dakhla Area. Impacts could have a low or moderate intensity, depending on if alien invasive species are introduced and the extent of their infestation. Impacts will have a local geographical extent and a long-term duration leading to a **low to moderate impact magnitude**.

As the sensitivity was defined to be high and the magnitude to be low to moderate, the impact is of **moderate to high significance**.

- Degradation of Baie de l'Étoile, Canary Current Shelf Break North KBA and IBA and Banc d'Arguin National Park: The increase in port activities is not expected to generate significant impacts, as the port is located more than 20 km away. Vessel traffic may pass through the Canary Current Shelf Break North; however, vessel routes will not pass near Baie de l'Étoile or Banc D'Arguin National Park. The increase in shipping traffic volume could cause localized disturbances in the Canary Current Shelf Break KBA/IBA, but the frequency of vessel transit is not expected to threaten the viability or continued use by species triggering the KBA/IBA listing criteria (i.e., marine birds).

  Increased vessel traffic may increase the risk of introducing non-native invasive species. Reduced habitat quality caused by invasive species is likely the most important potential impact as a reduction in habitat quality and ecosystem functioning in a globally important area such Banc d'Arguin National Park could have important consequences. The likelihood that invasive species introduced near the port could spread 100 km across Baie du Lévrier to reach Banc d'Arguin National Park is uncertain, but possible.

  The distance between the port facilities and these sensitive areas makes dust impacts negligible.

  The above effects will result in negative direct (Canary Current Shelf Break North only) and indirect (Baie de l'Étoile and Banc D'Arguin National Park) impacts on habitats with a low intensity, a project site geographical extent and a long-term duration leading to a **negligible impact magnitude**.

  As the sensitivity was defined to be high and the magnitude to be low, the impact is of **low significance**.

Decommissioning

During the decommissioning phase, no adverse impacts are anticipated within the Port AoI. As Project-related export activities will cease, the use of the existing port infrastructure—including ship loading operations and associated ore-handling activities—will decrease compared to the operational phase. Overall, the decommissioning phase is expected to have a net beneficial effect (in comparison with the operation phase) within the Nouadhibou mineral port area.

Mitigation measures

In addition to physical mitigation measures the following additional about degradation of legally protected areas and internationally recognized areas are listed below.

- As part of contractual obligations, require vessel operators to comply with the requirements of adhere to the Ballast Water Management Convention (International Maritime Organization (IMO), 2024). Perform periodic inspections to confirm compliance. As needed, implement training or penalties for non-compliances.
- Ensure that SNIM maintains an operational Emergency Preparedness and Response Plan, with clear communication channels for informing authorities and mandatory reporting timelines. The plan assigns responsibilities for spill/accident cleanup and the materials/equipment that must be on hand to ensure a timely response by SNIM.

Summary of impact assessment

Table 12-72: Impact EB06 – Degradation of legally protected areas and internationally recognized areas

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase[1]	Nature	Type	Intensity	Geographical extent	Duration	Magnitude	Receptor Sensitivity	Impact Significance
Degradation of Cap Blanc Integral Reserve, Cap Blanc Satellite Reserve, and Dakhla Area KBA and IBA									
Before mitigation	O	Negative	Direct Indirect	Low to moderate	Local	Long-term	Low to moderate	High	Moderate to High
After mitigation	O	Negative	Direct Indirect	Low	Local	Long-term	Low	High	Moderate
Degradation of Baie de l'Étoile, Canary Current Shelf Break North KBA and IBA and Banc d'Arguin National Park									
Before mitigation	O	Negative	Direct Indirect	Low	Project site	Long-term	Negligible	High	Low
After mitigation	O	Negative	Direct Indirect	Low	Project site	Long-term	Negligible	High	Low
Mitigation measures	■ Require vessel operators to comply with the requirements of adhere to the Ballast Water Management Convention ■ Ensure that SNIM maintains an operational Emergency Preparedness and Response Plan, with clear communication channels for informing authorities and mandatory reporting timelines. The plan assigns responsibilities for spill/accident cleanup and the materials/equipment that must be on hand to ensure a timely response by SNIM.								
Notes	[1] Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure								

12.2.3.6.2 Impact EB07 & mitigation: Degradation of bird habitat and bird disturbance

The Ras Nouadhibou Peninsula mainly supports migratory seabirds and shorebirds, which are known to occupy the Cap Blanc IBA (which overlaps the Port AoI) and Banc d'Arguin National Park (located approximately 100 km from the Port AoI). Bird richness and abundance vary by season, with more species present during the overwintering and migratory periods are moderately high around the Port AoI. Five globally threatened species and one species that meets the IBA listing criteria for Cap Blanc IBA were documented in the region and could occur in the Port AoI. These include Curlew sandpiper (*Calidris ferruginea*; VU), Audouin's gull (*Larus audouinii*; VU), Grey plover (*Pluvialis squatarola*; VU), Egyptian vulture (*Neophron percnopterus;* EN), Rüppell's vulture (*Gyps rueppelli*; CR) and Sandwich tern (*Thalasseus sandvicensis, LC).*

Grey plover and Sandwich tern trigger critical habitat under the 3a threshold. The species are associated with marine coastal/supratidal habitats, and Cap Blanc is partially composed of these kinds of habitat.

Birds of conservation concerned are a receptor with **high sensitivity.**

Impact description

Construction

As the Project does not involve construction activities within the Port area, or any other activities during the construction phase, no impacts are anticipated at the mineral port of Nouadhibou or within the Port AoI.

Operation

During the operation phase, the main impacts of the port activities (arrival of ore, storage, export, etc.) will be:

Degradation of bird habitats: Port activities will generate an increase of dust emissions. Dust generated from ore handling operations may settle on the water surface (Wollenweber, 2025), forming particulate films that reduce water clarity, modify light penetration, and disrupt primary productivity and affect the foraging efficiency of piscivorous birds, particularly those that rely on visual detection of prey, thereby increasing local turbidity during repeated vessel transits. This can affect prey availability for diving birds and other species sensitive to substrate quality. Fine particles may lead to large-scale changes in community structure and migration patterns are among its effects, as are respiratory and reproductive impairments. Air pollution's impact on reproduction is one of the most critical and underappreciated factors contributing to bird population declines. It not only reduces individual fitness but threatens species viability over time. Air pollution, both directly and indirectly, compromises the acoustic and visual signals birds depend on. This

leads to disrupted mating, reduced fitness, and ecological imbalance. Birds exposed to high gas and particulate matter concentrations show histopathological damage to their respiratory tissues. Fine particles can overload the respiratory systems of birds, resulting in respiratory stress and inflammation especially PM2,5 (Saha, 2025).

Increased vessel traffic also raises the risk of waste being discharged at sea or accidental pollution events (e.g., hydrocarbons), which could further degrade marine and coastal habitats relied upon by avifauna.

Increased vessel traffic — including manoeuvring cargo ships, tugboats, and supply vessels — can elevate the likelihood of collisions with birds flying at low altitude over the port basin, especially in conditions of reduced visibility (fog, dust, early morning or dusk) but the larger size of the vessels used by the Project will not have an impact on the birds. Additionally, the increased frequency in the use of existing vertical structures such as cranes, masts, loading arms, and conveyors may also incrementally increase the risk of collisions for large gulls, terns, and migratory seabirds that use the Cap Blanc area as a flyway or resting site. This risk may be heightened during migratory peaks when bird density is higher, and individuals are more fatigued or more sensitive to disorientation.

These effects will result in a negative and direct and indirect impact on habitats with a low intensity, a local geographical extent and a long-term duration leading to a **moderate impact magnitude**.

As the sensitivity was defined to be high and the magnitude to be moderate, the impact is of **moderate significance**.

- Bird disturbance: The increase in traffic — including a higher frequency of train arrivals, more frequent operation of the tipper, and intensified loading and vessel movements — may cause birds to avoid the area, particularly during migration periods when disturbance sensitivity is heightened.

  Dust may also accumulate on plumage, reducing insulation and waterproofing capacities, which can compromise thermoregulation and flight performance. In addition, the reduction of quiet resting areas traditionally used by Laridae, Ardeidae, and migratory species may further limit the suitability of the port and adjacent coastal zones for birds. The tippler, conveyors and motors are major sources of loud noise and vibration, which can interfere with bird communication, resting and feeding behaviours, and may ultimately trigger avoidance responses.

  This will result in a negative and direct and indirect impact on habitats with a low intensity, a local geographical extent and a long-term duration leading to a **moderate impact magnitude**.

  As the sensitivity was defined to be high and the magnitude to be moderate, the impact is of **moderate significance**.

Decommissioning

During the decommissioning phase, no adverse impacts are anticipated within the Port AoI. As Project-related export activities will cease, the use of the existing port infrastructure—including ship loading operations and associated ore-handling activities—will decrease compared to the operational phase. This reduction in port activity is expected to generate positive outcomes for the local environment, including lower noise levels, fewer emissions of dust from ore handling, and reduced disturbance to coastal and marine fauna. Overall, the decommissioning phase is expected to have a net beneficial effect (in comparison with the operation phase) within the Nouadhibou mineral port area.

Mitigation measures

In addition to physical mitigation measures the following additional about the degradation of bird species habitat and disturbance are listed below.

- As part of contractual obligations, require vessel operators to comply with the requirements of adhere to the Ballast Water Management Convention (International Maritime Organization (IMO), 2024). Perform periodic inspections to confirm compliance. As needed, implement training or penalties for non-compliances.
- Ensure that SNIM maintains an operational Emergency Preparedness and Response Plan, with clear communication channels for informing authorities and mandatory reporting timelines. The plan assigns responsibilities for spill/accident cleanup and the materials/equipment that must be on hand to ensure a timely response by SNIM.

Summary of impact assessment

Table 12-73: Impact EB07 – Degradation of bird species habitat and bird disturbance

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase[1]	Nature	Type	Intensity	Geographical extent	Duration	Magnitude	Receptor Sensitivity	Impact Significance
Degradation of bird habitat									
Before mitigation	O	Negative	Direct Indirect	Low	Local	Long-term	Moderate	High	Moderate
After mitigation	O	Negative	Direct Indirect	Low	Local	Long-term	Low	High	Moderate
Bird disturbance									
Before mitigation	O	Negative	Direct Indirect	Low	Local	Long-term	Moderate	High	Moderate
After mitigation	O	Negative	Direct Indirect	Low	Local	Long-term	Low	High	Moderate
Mitigation measures	■ Require vessel operators to comply with the requirements of adhere to the Ballast Water Management Convention ■ Ensure that SNIM maintains an operational Emergency Preparedness and Response Plan, with clear communication channels for informing authorities and mandatory reporting timelines. The plan assigns responsibilities for spill/accident cleanup and the materials/equipment that must be on hand to ensure a timely response by SNIM.								
Notes	[1] Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure								

12.2.3.6.3 Impact EB08 & mitigation: Degradation of aquatic species habitat and disturbance

There are 26 fish species of conservation concern that could potentially occur in the Port AoI, based on occurrence records from the broader region. These include 7 CR species, 7 EN species, and 12 VU species according to IUCN red list of threatened species. One fish species, the Blackspotted smoothhound (*Mustelus punctulatus*, VU), triggers critical habitat under criterion 1. Its critical habitat in the AoI includes sandy bottom subtidal habitats.

Four species of globally threatened sea turtles are known from the Mauritanian coast; however, no nesting sites are identified in the Port AoI. Green turtles (EN) are the most likely species to be encountered in the Port AoI. Observations of sea turtles in the AoI would be seasonal and periodic, and likely to include individuals in transit to and from Banc d'Arguin National Park, where individuals are known to feed on seagrass beds. Green turtles are a critical habitat qualifying species; however, critical habitat is not present in the AoI.

The Port AoI overlaps with the distribution range of a local population of Mediterranean monk seal (VU). There is a high concentration of monk seal locations northwest of the town of Nouadhibou. The Satellite reserve constitutes the habitat of the monk seal colony. An important marine mammal area (IMMAs) was also defined around the Cap Blanc, indicating that monk seals are at times present within the Port AoI. Monk seals trigger critical habitat under criterion 1, and core areas of occupancy are coastline, caves, and nearshore areas on the

western side of Ras Nouadhibou Peninsula (on Western Sahara side). Epipelagic habitats of the AoI are likely used for movement and feeding.

The waters of Mauritania, specifically around the shelf and shelf break areas, support 26 cetacean species including four globally threatened species. Atlantic humpback dolphins may occur in the Port AoI, with rare occurrences likely attributable to transient individuals travelling between known areas of occupancy. Other globally threatened cetaceans are unlikely to occur in the Port AoI.

Aquatic fauna is a receptor with **high sensitivity**.

Impact description

Construction

As the Project does not involve construction activities within the Port area, or any other activities during the construction phase, no impacts are anticipated at the mineral port of Nouadhibou or within the Port AoI.

Operation

During the operation phase, the main impacts of the port activities (arrival of ore, storage, export, etc.) will be:

- Degradation of the aquatic habitat: The increase of 55 vessels a year at the mineral port is expected to lightly intensify pressures on the aquatic environment. Vessel manoeuvres may periodically elevate local turbidity through propeller wash and sediment resuspension, altering the physical characteristics of the water column and seabed. In parallel, dust generated from ore handling operations may settle on the water surface, forming iron-rich particulate films that reduce water clarity, modify light penetration, and disrupt primary productivity of phytoplankton. These dust deposits can also accumulate in nearshore substrates, affecting benthic organisms and degrading feeding habitats relied upon by demersal fish and other marine fauna. These combined processes additionally exert pressure on benthic micro-fauna, fauna and flora.

  As described for legally protected areas and internationally recognized areas, the potential introduction of non-native species could result in marine habitat degradation if invasive species establish and spread.

  Collectively, these processes may reduce the suitability of critical coastal and shallow-water habitats around Cap Blanc, an area of high biodiversity value, thereby incrementally diminishing the quality of foraging grounds for marine mammals, diving birds, and demersal fish species.

  This will result in a negative and direct and indirect impact on habitats with a low intensity, a local geographical extent and a long-term duration leading to a **low impact magnitude**.

  As the sensitivity was defined to be high and the magnitude to be low, the impact is of **moderate significance**.

- Disturbance of aquatic fauna: The increase of 55 vessels a year will lightly elevate underwater noise levels, as vessels generate continuous low-frequency sounds that propagate over long distances and interfere with key ecological functions for marine species. Higher vessel frequency of 1 per 6 or 7 days and more frequent manoeuvres will intensify acoustic disturbance, disrupting essential behaviours such as navigation, foraging, communication, and echolocation in cetaceans, as well as haul-out and resting behaviours in the Mediterranean monk seal. Species that are particularly sensitive to acoustic disturbance may increasingly avoid the area, leading to stress, altered movement patterns, and possible displacement from important habitats around Cap Blanc. These disturbances reduce habitat suitability for marine species and may contribute to long-term degradation of the ecological functions of the coastal and near-shore environment.

This will result in a negative and direct impact on habitats with a low intensity, a local geographical extent and a long-term duration leading to a **low impact magnitude**.

As the sensitivity was defined to be high and the magnitude to be low, the impact is of **moderate significance**.

- Collision risk: The increase in vessel traffic will incrementally increase the risk of boat strikes, which can cause severe injury or mortality to marine mammals and other large marine fauna. Of particular concern are potential impacts to Mediterranean monk seal, which occur in the AoI year-round. Although collisions pose a risk to monk seals, major threats to monk seals in the AoI include fisheries bycatch/entanglement in fishing gear and disturbance or loss of breeding cave habitat. Collision rates between marine mammal and vessels in the region are unknown, likely due to under-reporting. The assemblage of marine species in and near the AoI indicates a high sensitivity to potential impacts; however, the likelihood of impacts is highly uncertain given the available information. Nonetheless, a single mortality event for a marine mammal could have negative effects for the local population given their population sizes and life history traits (low fecundity).

  The above effects will result in a negative and direct impact on marine fauna with a moderate intensity, a local geographical extent and a long-term duration leading to a **moderate impact magnitude**.

  As the sensitivity was defined to be high and the magnitude to be moderate, the impact is of **high significance**.

Decommissioning

During the decommissioning phase, no adverse impacts are anticipated within the Port AoI. As project-related export activities will cease, the use of the existing port infrastructure—including ship loading operations and associated ore-handling activities—will decrease compared to the operational phase. This reduction in port activity is expected to generate positive outcomes for the local environment, including lower noise levels, fewer emissions of dust from ore handling, and reduced disturbance to coastal and marine fauna. Overall, the decommissioning phase is expected to have a net beneficial effect (in comparison with the operation phase) within the Nouadhibou mineral port area.

Mitigation measures

In addition to physical mitigation measures and those listed for EB06, the following additional about the degradation of aquatic species habitat and disturbance are listed below.

- Implement a “Stop-Work / Slow-down” protocol if monk seals, dolphins or sea turtles are observed within a defined exclusion radius around manoeuvring vessels
- Implement a wildlife incident reporting system (collisions, disturbance events) with regular reviews to adjust mitigation measures.
- Lighting management plan (amber/long-wavelength spectrum, shielding, switch-off during migration corridors/sensitive time windows), visibility testing on vertical structures (masts, cranes, conveyors).

Summary of impact assessment

Table 12-74: Impact EB08: Degradation of aquatic species habitat and disturbance

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase[1]	Nature	Type	Intensity	Geographical extent	Duration	Magnitude	Receptor Sensitivity	Impact Significance

Degradation of aquatic habitat									
Before mitigation	O	Negative	Direct Indirect	Low	Local	Long-term	Low	High	Moderate
After mitigation	O	Negative	Direct Indirect	Low	Local	Long-term	Low	High	Low*
Disturbance of aquatic fauna									
Before mitigation	O	Negative	Direct Indirect	Low	Local	Long-term	Low	High	Moderate
After mitigation	O	Negative	Direct Indirect	Low	Local	Long-term	Low	High	Low*
Collision risk									
Before mitigation	O	Negative	Direct	Moderate	Local	Long-term	Moderate	High	High
After mitigation	O	Negative	Direct	Moderate	Local	Long-term	Moderate	High	Moderate
Mitigation measures	■ Measures listed for EB06 (Degradation of legally protected areas and internationally recognized areas) ■ Implement a “Stop Work / Slow down” protocol if monk seals, dolphins or sea turtles are observed within a defined exclusion radius around manoeuvring vessels ■ Implement a wildlife incident reporting system (collisions, sightings, disturbance events) with regular reviews to adjust mitigation measures. ■ Lighting management plan (amber/long wavelength spectrum, shielding, switch off during migration corridors/sensitive time windows), visibility testing on vertical structures (masts, cranes, conveyors).								
Notes	[1] Project Phase: C = Construction, O = Operation, D = Decommissioning/ closure *The impact rating deviates from the significance matrix (Table 12-8), based on expert judgement								

12.2.3.7 Ecosystems services

No Priority Ecosystem Services (PES) has been identified in the ES baseline for the Port area. Therefore, no impact assessment is deemed necessary for this area.

12.2.3.8 Community

12.2.3.8.1 Impact Port-SOC-P01: Increased Government Revenues-iron ore export

Impact description

Construction

The Project does not involve any construction activities within the port area. Therefore, no construction-phase impacts are expected at the Nouadhibou mineral port.

Operation

During the operational phase, approximately 11,3Mt per year of iron ore from the El Aouj mine will be stored at the Nouadhibou mineral port and then exported to the international market. The logistics chain for this operation will be entirely managed by SNIM, which has the necessary infrastructure in place at the mineral port.

In 2024, nearly 14.2 million tons of iron ore, sourced exclusively from SNIM, were exported by the mineral port of Nouadhibou. With the addition of production from El Aouj, the total volume of iron ore exported from the port will therefore increase significantly. This substantial increase in exports represents a major economic lever for Mauritania, particularly through increased revenue from port taxes, handling fees, and export royalties.

Indeed, the El Aouj project represents an increase of nearly 78% in port activities related to iron ore. By applying its mining taxes and fees related to exports, the government will benefit from a proportional increase in revenue collected on these additional iron ore exports.

However, it should be noted that exports of goods and products from the Nouadhibou Free Zone are not subject to any customs duties or taxes. The Free Zone is a separate customs territory with its own tax and customs

regime, distinct from the national customs territory. Consequently, an increase in export flows within this zone will not automatically translate into higher customs revenues, but rather into indirect economic benefits.

The impact is positive and indirect due to the increase in iron ore exports at the national level.

Decommissioning

During the decommissioning phase, no activities related to the storage and export of ore from the project will take place in the mineral port. SNIM's port activities will continue as normal. Therefore, no impact is expected during this phase in the port area.

Enhancement measures

EMC will recommend that SNIM establish an annual reporting system on the volumes and values of iron ore production and exports and the royalties paid to the State.

Summary of impact assessment

Table 12-75 provides a summary of the project's impact on increase government revenues.

Table 12-75: Impact Port-SOC-P01 – Increased Government Revenues-iron or export

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase 1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Assessment	Op	Positive	Indirect	Low	Regional and local	Long-term	Moderate	Low	N/A
Enhancement measures	▪ Establish an annual reporting system on the volumes and values of iron ore production and exports and the royalties paid to the State								
Notes	1 Project Phase: Op = Operation; N/A = Not applicable								

12.2.3.8.2 Impact Port SOC-P02 & Mitigation: Impacts on community (including fishers) health and safety

The coastal area of Nouadhibou is characterized by a large number of artisanal fishers, who constitute one of the most vulnerable socio-economic groups in the region. Their activity relies mainly on the use of traditional canoes, which are often poorly equipped with safety equipment (life jackets, navigation lights), increasing their vulnerability to maritime risks. This makes artisanal fishers a receptor of moderate sensitivity for community health and safety.

In addition, artisanal fishers generally operate near commercial shipping channels and regularly use the access corridors near the mineral port to enter or leave fishing areas. This coexistence makes artisanal fishers moderate-sensitivity receptors.

Impact description

Construction

During the construction phase, no project activities will be carried out in the port. Therefore, this phase does not present any community health and safety risk.

Operation

The operational phase is the period during which community health and safety risks may occur. These relate primarily to:

- Collision risks associated with increased bulk-carrier movements
- Hydrodynamic wake that can destabilize canoes
- Human exposure to accidental discharges during loading or bunkering operations
- Limited visibility and safety equipment of artisanal vessels

This phase includes ore storage activities, loading ore onto ore carriers, and exporting ore to the international market. These activities increase the frequency of interactions between large vessels and artisanal canoes and therefore elevate community safety risks.

Increase in maritime traffic: The project plans to transport approximately 11.3 M/t of iron ore per year, adding approximately 55 additional cargo boat to current traffic (around one additional vessel every 6–7 days). In 2025, the mineral port recorded 99 cargo boat departures transporting SNIM ore. The addition of the project's vessels will therefore bring the yearly total to 154 ships. While this increase does not create congestion, it raises the frequency of interactions between bulk carriers and artisanal canoes.

This, in turn, increases the collision risk for artisanal canoes operating near the access channel. Industrial fishing and commercial cargo boats also use the channels near the mineral port access channel, which increases traffic density in the area. Canoes, which often have low radar visibility and rudimentary signaling equipment, are particularly vulnerable, especially during nighttime activities or in cloudy conditions, which are common in Nouadhibou Bay. According to the ESIA baseline report (Chapter 08), several navigation incidents involving industrial ships and artisanal fishing boats have been reported in the Nouadhibou port area in recent years. The coexistence of artisanal fishing activities and industrial maritime traffic poses risks to the community health and safety of fishermen. Although the project's area of influence in the zone (mineral port) is subject to regulatory restrictions, there is frequent proximity between the navigation channel for ore-carrying cargo ships and the routes used by fishermen. Therefore, the additional vessel movements introduced by the Project may increase the likelihood of maritime accidents involving artisanal boat users.

Hydrodynamic effects and instability of canoes: The passage of deep-draught vessels generates wake waves that can destabilize small boats. These waves can cause loss of balance, falls into the sea or, in extreme cases, the capsizing of poorly oriented or overloaded artisanal fishing canoes at sea.Accidental discharges of hydrocarbons or oil and iron ore into the sea: In addition to the risk of collision, the prolonged presence of ore carriers alongside during loading and bunkering increases the likelihood of small accidental releases of hydrocarbons, oils, or iron ore. Such events may lead to short-term human exposure (skin contact or inhalation of fumes) for nearby artisanal fishers operating in or transiting adjacent waters. Although the port area is regulated and controlled by the Nouadhibou coast guard and SNIM security agents, the sea remains an open environment, and artisanal canoes may be present close to navigation channels and berths; clear alerts and rapid containment are therefore essential to protect users' health and safety. . Ecological and livelihood effects of accidental releases (e.g., on fishing grounds or product quality) are assessed in SOC03 (Fisheries). Given the frequency of traffic, the vulnerability of canoes, and the density of fishing activities in the area, the impact is negative and indirect, with a moderate intensity. The extent is local, and long-term due to the project's operational period (41 years). The magnitude is **moderate**.

As the sensitivity was defined to be moderate and the magnitude to be moderate, the impact is of **moderate negative significance.**

Decommissioning

During the decommissioning phase, no project activities will be carried out at the port of Nouadhibou. Demobilization operations do not concern the port area, and no additional ship movements are planned. As a result, no impact on the community health and safety is anticipated during this phase.

Mitigation measures

The proposed mitigation measures aim to reduce community health and safety risks identified for the project's operational phase. EMC will recommend and monitor that SNIM and the Port Authority:

- Collaborate with the Port Authority to strengthen ship traffic management, maintaining and, where feasible, improving existing traffic-monitoring and user-notification procedures for large-vessel approaches and departures at the mineral port.
- Organize awareness campaigns for artisanal fishermen on the arrival and departure times of ore-carrying cargo ships as well as on the risk areas to be avoided near the mineral port and its access channel (including night/fog navigation and visibility/lighting good practices;
- Strengthen maritime signage and visual navigation aids near the mineral port and along the access channel to improve small-craft visibility and situational awareness;
- Implement and maintain Emergency Preparedness and Response (ERP)plan, including:
  - A rescue system operational 24/7, with trained personnel and adequate equipment;
  - A joint coordination protocol between SNIM, the Port Management Authority/Harbour Master, the Coast Guard, and fishing cooperatives for rapid alerts and response to collision or spill events;
- Ensure that safe loading and bunkering procedures are applied to minimise the likelihood of small hydrocarbon releases, and ensure rapid containment and clear communication to artisanal boat users if an incident occurs, in order to reduce risks of human exposure and unsafe navigation conditions;
- Record and review incidents and near-misses involving artisanal canoes and industrial vessels; share lessons learned with cooperatives and update measures accordingly;
- Maintain an accessible grievance mechanism for safety-related incidents in the port area, with systematic registration, investigation, feedback and closure.

Summary of impact assessment

Table 12-76: Impact Port SOC-P02 – Community health and safety

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
Before mitigation	Op	Negative	Indirect	Moderate	Local	Long-term	Moderate	Moderate	Moderate
After mitigation	Op	Negative	Indirect	Low	Local	Long-term	Low	Low	Low
Mitigation measures	▪ Collaborate with the Port Authority to strengthen ship traffic management, maintaining and, where feasible, improving existing traffic-monitoring and user-notification procedures for large-vessel approaches and departures at the mineral port;								

Impact Assessment	General description of the impact			Determination of Magnitude				Determination of significance	
	Project phase1	Nature	Type	Intensity	Geographical extent	Duration	Impact Magnitude	Receptor Sensitivity	Impact Significance
	▪ Organize awareness campaigns for artisanal fishermen on the arrival and departure times of ore-carrying cargo ships as well as on the risk areas to be avoided near the mineral port and its access channel (including night/fog navigation and visibility/lighting good practices; ▪ Strengthen maritime signage and visual navigation aids near the mineral port and along the access channel to improve small-craft visibility and situational awareness; ▪ Implement and maintain Emergency Preparedness and Response (ERP) plan, including: o A rescue system operational 24/7, with trained personnel and adequate equipment; o A joint coordination protocol between SNIM, the Port Management Authority/Harbour Master, the Coast Guard, and fishing cooperatives for rapid alerts and response to collision or spill events; ▪ Ensure that safe loading and bunkering procedures are applied to minimise the likelihood of small hydrocarbon releases, and ensure rapid containment and clear communication to artisanal boat users if an incident occurs, in order to reduce risks of human exposure and unsafe navigation conditions; ▪ Record and review incidents and near-misses involving artisanal canoes and industrial vessels; share lessons learned with cooperatives and update measures accordingly; ▪ Maintain an accessible grievance mechanism for safety-related incidents in the port area, with systematic registration, investigation, feedback and closure.								
Notes	1 Project Phase: Op = Operational								

12.2.3.8.3 Impact SOC-P03 & Mitigation: Impacts on Fisheries

Impact description

Construction

No construction activities related to the El Aouj Project will take place within the Nouadhibou mineral port. All operations rely entirely on SNIM's existing port infrastructure, and fishing is legally prohibited within port security zones and access channels.

As a result, no construction-phase impact on fisheries is expected, and this phase is scoped out.

Operation

Project activities at the port consist exclusively of the unloading, temporary storage, and loading of ore onto bulk carriers. The addition of 11 Mt/year of ore will represent an increase of approximately 78% in existing port activity. Although the percentage increase in port traffic appears significant (+55 vessels/year), this corresponds in practice to approximately one additional vessel every 6–7 days, which does not generate congestion nor materially change navigational conditions for artisanal fishers operating outside the port security perimeter. As described in the physical and biodiversity assessments, the Project does not introduce new processes at the port; rather, it increases impacts already associated with SNIM's long-standing operations. As presented in the Chapter 08 Social Baseline (Section 8.2.3.2), artisanal fishing is prohibited within the mineral port and its access channel. However, the wider Baie du Lévrier immediately adjacent to the port is Mauritania's main artisanal fishing zone and hosts the largest concentration of artisanal pirogues. The baseline also documents recent navigation incidents in this broader area involving artisanal and industrial vessels, indicating that artisanal craft frequently operate in close proximity to commercial maritime traffic. In this context, the increase in ore-related vessel movements may indirectly affect fishing operations and related livelihoods for artisanal fishers who operate near the port approaches. Additional bulk-carrier traffic may require pirogues to adjust their routes to

avoid high-traffic zones, potentially leading to longer travel distances, increased fuel costs, reduced effective fishing time, and a greater perception of insecurity that affects how and when fishers choose to operate. . These operational effects occur outside the restricted port area, but they may nonetheless influence the efficiency, cost and continuity of artisanal fishing activities.

The rise in ore-handling activities may also reinforce accidental pollution risks, such as small hydrocarbon leaks or spills associated with port operations. While SNIM maintains established spill-prevention systems, any increase in port activity raises the potential for accidental releases. For fishing communities and local value chains, even minor discharges can lead to temporary avoidance of near-shore fishing grounds and concerns regarding product quality, and short-term disruption of processing, drying and marketing, particularly among women engaged in these value-added activities along the Nouadhibou coastline.

Overall, during operation, the Project will increase existing port-related pressures on fisheries as an economic activity and livelihood source. The impact is assessed as Negative, Indirect, of Low–Moderate intensity, with a Local extent and Long-term duration, resulting in a Low–Moderate impact magnitude. Fisheries (economic activities and livelihoods) are considered a receptor of Moderate sensitivity (Table 8-12, Chapter 08 Social Baseline, Section 8.5). Therefore, the significance of the impact before mitigation is Moderate.

Decommissioning

No decommissioning activities are planned at the mineral port. When ore-export operations cease, vessel traffic will decrease accordingly. No adverse impacts on fisheries are anticipated. The decommissioning phase is therefore scoped out.

Mitigation measures

Verify that SNIM implements the following measures to limit incremental pressures on fishing activities and local value chains:

- Provide navigation information to maritime users, including artisanal fishing cooperatives, regarding periods of increased vessel movements near the port approaches.
- Promote maritime safety awareness for artisanal fishers, in coordination with the Port Authority and fishing associations.
- Maintain incident-reporting systems, ensuring that navigation incidents and near misses involving artisanal craft are logged and shared with the Project to inform fisheries-related monitoring.
- Verify that SNIM maintains pollution-prevention procedures (routine inspection and maintenance of fuel, lubricant and hydraulic systems on port equipment) to reduce the likelihood of minor releases that can trigger temporary avoidance of fishing grounds.
- Ensure that SNIM maintains an operational Emergency Preparedness and Response Plan, with clear communication channels for informing authorities and fishing cooperatives so that artisanal fishers can plan around short-term restrictions or avoidance zones following minor releases.
- Maintain an accessible grievance mechanism for fishing stakeholders, with systematic recording, follow-up, and feedback.
- Promote continued stakeholder engagement, including regular communication with fishing cooperatives to address navigation or pollution-related concerns affecting fishing operations and value chains.

Summary of impact assessment

Table 12-77 : Impact SOC-P03 – Fisheries (traffic and pollution)

Impact assessment	Project phase [1]	Nature	Type	Geographical extent	Duration	Magnitude	Receptor sensitivity	Significance
Before mitigation	Op	Negative	Indirect	Local	Long-term	Low-moderate	Moderate	Moderate
After mitigation	Op	Negative	Indirect	Local	Long-Term	Low	Moderate	Low-Moderate
Mitigation measures	Verify that SNIM implements the following measures to limit incremental pressures on fishing activities and local value chains: ▪ Provide navigation information to maritime users, including artisanal fishing cooperatives, regarding periods of increased vessel movements near the port approaches; ▪ Promote maritime safety awareness for artisanal fishers, in coordination with the Port Authority and fishing associations; ▪ Maintain incident-reporting systems, ensuring that navigation incidents and near misses involving artisanal craft are logged and shared with the Project to inform fisheries related monitoring; ▪ Verify that SNIM maintains pollution-prevention procedures (routine inspection and maintenance of fuel, lubricant and hydraulic systems on port equipment) to reduce the likelihood of minor releases that can trigger temporary avoidance of fishing grounds; ▪ Ensure that SNIM maintains an operational Emergency Preparedness and Response Plan, with clear communication channels for informing authorities and fishing cooperatives so that artisanal fishers can plan around short-term restrictions or avoidance zones following minor releases; ▪ Maintain an accessible grievance mechanism for fishing stakeholders, with systematic recording, follow-up, and feedback; ▪ Promote continued stakeholder engagement, including regular communication with fishing cooperatives to address navigation or pollution-related concerns affecting fishing operations and value chains.							
Notes	[1] Project Phase: Op = Operation (Construction and Decommissioning phases scoped out in the Port Area)							

12.2.3.9 Cultural Heritage

The activities planned as part of the project at the Nouadhibou mineral port mainly concern the storage and loading of iron ore aboard ships heading for international markets (see ESIA Chapter 4 - Project description). The main impact factors associated with these operations include:

- increased maritime traffic;
- risk of accidental oil discharges at sea.

These factors are not expected to influence cultural heritage aspects within the port area. This prediction is further characterised below.

12.2.3.9.1 Impact Port-CH-P01 & Mitigation: Damage and Disturbance of Tangible and Intangible Cultural Heritage

Impact description

Construction

During the construction phase, the scope of the work will be limited to the mining area. No activity, installation or intervention is planned at the mineral port during this period. Consequently, no impact on tangible archaeological remains and / or historical sites, or intangible activities are expected during this phase.

Operation

The operational phase activities planned as part of the Project at the Nouadhibou Port mainly involve the landside storage and off-loading of iron ore for marine export. There will therefore be no direct disturbance activities or modification of the land surface. The Project does not include any dredging work during the operational phase. The absence of dredging work avoids significant disturbance to the marine seabed and greatly reduces the risk of damage to underwater cultural heritage.

There is a potential for archaeological remains within the port of Nouadhibou. This risk concerns the remains of the 19th-century French colonial fort (landside), as well as shipwrecks located in Baie du Lévrier (marine side), approximately 6.5 km from the mineral port location associated with the Project. It is also possible that undocumented cultural heritage resources, may be present in the mineral port / storage area – albeit this area is already industrial / previously disturbed and this potential is considered to be very low.

In the port area, intangible heritage mainly consists of traditional lifestyles, beliefs, and practices (particularly those related to the sea, economic activities, and community interactions). In the context of Nouadhibou, where local practices and identities are predicted to be linked to the maritime environment (and related employment), the potential impact of the Project on intangible cultural heritage would mainly be associated with the arrival of new workers and, potentially, increased social interactions in the Port area.

As the logistics and operational management of the mineral port are managed by SNIM, the Project does intend employ an additional workforce. Furthermore, the project does not plan to restrict community access to fishing grounds. The use of port areas by local populations will not be changed, and no social or cultural pressure induced by the project is expected to arise. Furthermore, indirect and induced changes from increases in vessel movements (and noise etc) in the port area are expected to be minimal – given the port is already operational. The risk of disruption to local setting, practices and beliefs is therefore, predicted to be negligible. Consequently, no impact on intangible cultural heritage is expected during this phase. However, mitigation measures will be implemented throughout the project's life cycle.

Given the limited nature of the activities and impact factors identified for cultural heritage in the port area, no impact on tangible resources are predicted. To further assure this assumption, cultural heritage mitigation measures will be implemented regardless – to manage any unexpected impacts should they occur.

Decommissioning

During the Project's decommissioning phase, ore storage and off-loading activities will cease. No further work is planned in the port area. Consequently, no impact on cultural heritage is expected.

Mitigation measures

Avoidance

To avoid potential impacts to previously unknown resources, a CFP will provide a mechanism to address archaeological discoveries during Project activities when a Cultural Heritage Expert is not present.

Minimisation

The Project Grievance Mechanism and the SEP will include measures to identify and manage any unforeseen impacts to cultural heritage resulting from the operational port, particularly intangible cultural heritage, as indicated in the CHMP.

12.3 Summary of residual impacts

12.3.1 Mine area

In the Mine area, 72 impacts have been identified, for which residual impacts have been assessed after implementation of the mitigation measures. Over the 72 residual impacts: 1 residual impact is assessed as High, 26 are assessed as Moderate, 35 are assessed as Low, 2 are assessed as Negligible and 11 are assessed as Positive.

The only **residual high impact** is the decline of groundwater levels in the P2 (Touajil wellfield) and P4 (Aouchich wellfield) aquifers due to the quantity of water pumped for the mining activities and the duration of the pumping.

The **residual moderate impacts** are summarized below:

- Impacts on the physical environment through the decline of groundwater level in the P2 and P4 aquifers for groundwater users due to water pumping activities for the mining treatment, and GHG emissions from the Mine power plant;
- Impacts on the biological environment through the loss, degradation and fragmentation of natural habitats and legally protected trees, but also through the loss and degradation of birds of conservation concern's habitats and birds of conservation concern disturbance, generated by the mine facilities and infrastructure implantation, and by the mining related activities resulting in noise, dust, light, road and train traffic, and habitat occupation.
- Impacts on the social environment through the unplanned project-induced in-migration and the increase inflationary pressures and shortages during both construction and operation phases, the natural resource-based livelihood impacts and the community health, safety and security impacts during operation, the degradation of livestock and forage resources, the reduction of availability of water resources for agricultural activities at the Touajil Auberge, the impact on women and vulnerable groups, and the retrenchments and employment transition for the mine closure.
- Impacts on the cultural heritage environment are related to potential damage or removal of tangible cultural heritage, and to changes to the setting of archaeological and cultural heritage sites, during both construction and operation phases.

12.3.2 Rail area

In the Rail area, 13 impacts have been identified related to the increase in rail traffic due to the El Aouj Project, for which residual impacts have been assessed after implementation of the mitigation measures. Over the 13 residual impacts: 1 residual impact is assessed as Moderate, 9 are assessed as Low and 3 are assessed as Negligible.

The only **residual moderate impact** is linked to the increase of noise and vibrations impacts generated by the increased train traffic over the railway between the El Aouj Mine and Nouadhibou mineral port.

12.3.3 Port area

In the Port area, 14 impacts have been identified related to the increase in port activities due to the El Aouj Project, for which residual impacts have been assessed after implementation of the mitigation measures. Over the 14 residual impacts: 8 residual impacts are assessed as Moderate, 5 are assessed as Low and 1 is assessed as Positive.

The **residual moderate impacts**, mainly due to the ore loading at the mineral port and the increase in bulk carrier traffic, are summarized below:

- Impacts on the physical environment through the increase of dust emissions on nearby receptors generated by the ore handling activities at the mineral port (unloading from train, temporary storage and loading on the ships).
- Impacts on the physical marine environment through the increased degradation of sediment and sea water quality due to the increase water turbidity and pollution, and the increase of marine noise emissions, both due to the traffic increase of bulk carriers, characterized by their high tonnage.
- Impacts on the biological environment through the degradation of designated areas of Cap Blanc (integral and satellite reserves) and Dakhla Area, the degradation of bird habitats, and bird disturbance, due to onshore and underwater noise, dust emissions and disruptions from the increased marine traffic.
- Impacts on the marine biological environment through the collision risk for marine mammals with the ships (including Monk Seals) due to the traffic increase.
- Impacts on economic activities linked to marine resources like fisheries, likely to be altered by the increase of marine traffic and accidental marine pollution.

12.4 Risks to the Project

12.4.1 Accidental risks

In accordance with the World Bank Group – IFC General Environmental, Health and Safety (EHS) Guidelines, the World Bank Group – IFC EHS Guidelines for Mining, and the African Development Bank (AfDB) Integrated Safeguards System (ISS), potential emergency situations associated not only with mining activities at the El Aouj Mine Site, but also with ore transport by rail from the mine to the port site and ore handling and loading operations at the port site have been identified.

This assessment supports compliance with:

- IFC PS 1 and AfDB OS1, through systematic identification of emergency risks;
- IFC PS 4 and AfDB OS4, through consideration of risks to community health, safety, and security;
- IFC PS 2 and AfDB OS2, through identification of risks to workers and contractors across all project components.

Mine Site

- Fire and Explosion Emergencies

At the mine site, fire and explosion risks are associated with the use, storage, and handling of fuels, explosives, and combustible materials, as well as with mobile and fixed mining equipment. Potential emergency scenarios include fires involving haul trucks, loaders, drilling rigs, generators, fuel storage facilities, and workshops, as well as electrical fires affecting substations and site infrastructure. Accidental ignition of explosives or

uncontrolled blasting events may also occur during drilling and blasting activities. Such incidents may result in injuries or fatalities, damage to critical infrastructure, interruption of mining operations, and, in certain circumstances, off site impacts. These risks require protection of both workers and surrounding communities from industrial hazards, the prevention and control of fire and explosion hazards, the establishment of adequate emergency response capacity and Standard Operating Procedures to address explosives management.

- Medical Emergencies

Mining operations at the El Aouj site present a range of occupational health and safety risks that may result in medical emergencies. These include traumatic injuries arising from equipment operation, falls, or contact with moving machinery; heat stress and dehydration due to climatic conditions; exposure to dust, noise, or hazardous substances; and acute medical conditions requiring urgent care. Given the remote location of the mine, delays in access to external medical facilities may exacerbate the severity of outcomes if on site response capabilities are insufficient. Adequate on site medical facilities, trained personnel, and emergency medical evacuation arrangements are required to address such risks.

- Traffic and Transport Emergencies at the Mine site

The intensive use of heavy mobile equipment and light vehicles within the mine site creates a significant risk of traffic related incidents. Emergency scenarios include collisions between haul trucks, light vehicles, and ancillary equipment, as well as incidents involving pedestrians and mobile machinery. Loss of control of vehicles on haul roads, particularly on slopes or under adverse weather conditions, may result in rollovers or run off road events. Such incidents can cause serious injuries or fatalities and may also trigger secondary emergencies, such as fires or hazardous material releases. These risks require traffic safety management to protect workers and, where relevant, nearby communities.

- Rescue and High-Risk Operational Emergencies at the Mine

High risk operational and rescue emergencies may arise across all project components, as a result of the use of heavy equipment, complex mechanical systems, and hazardous working environments. Such emergencies are typically characterized by a high potential for serious injury or fatality and often require rapid, coordinated, and specialized response actions to protect affected workers and contractors.

At the mine site, emergency scenarios may include incidents involving heavy mobile equipment, such as collisions, rollovers, or mechanical failures, as well as geotechnical events including slope instability, rockfalls, or localized ground collapse. These situations may result in workers being trapped, injured, or buried and may also pose secondary risks due to equipment damage, fire, or hazardous material release. These high-risk rescue scenarios must be anticipated through adequate emergency preparedness planning.

- Tailings Dam Failure

Failure of tailings storage facilities represents a low probability but high consequence emergency scenario at the mine site. Potential failure modes may include structural instability, overtopping during extreme rainfall events, erosion, or foundation failure, which could result in the sudden release of tailings and process water. Such an event may pose significant risks to worker safety, downstream communities, and the environment, including loss of life, contamination of soil and water resources, and long term environmental damage.

Tailings related emergency risks must be anticipated through appropriate design, monitoring, and emergency preparedness measures, including clearly defined response procedures, early warning systems where applicable, and coordination with relevant authorities.

- Evacuation Emergencies

Situations may arise requiring partial or full evacuation at the mine site (including remote areas such as in the wellfield), along the rail corridor, or at the port facilities as a result of operational incidents, security alerts, environmental events, or other emergency conditions. Evacuation related emergencies may include delays, communication failures, congestion along evacuation routes, or injuries occurring during the evacuation process.

A clear and site specific evacuation procedures must be established for all facilities, supported by effective communication systems, clearly marked evacuation routes and assembly points, and regular drills to ensure personnel are adequately prepared to respond safely and efficiently under emergency conditions.

- Natural Hazard–Related Emergencies Affecting Mining Operations

Natural hazards such as extreme heat, intense rainfall, flooding, strong winds, lightning, and sandstorms may affect mining operations and trigger emergency situations at the mine site. These events may compromise worker safety, disrupt power supply and communications, reduce visibility, destabilize slopes or infrastructure, and hinder emergency response. Climate related risks must therefore be integrated into emergency preparedness and response planning.

- Hazardous Materials and Environmental Emergencies

The mine site involves the storage and use of hazardous substances, including fuels, lubricants, reagents, and explosives. Emergency scenarios may include spills or releases resulting from equipment failure, improper handling, or traffic incidents. In addition, failures of mine infrastructure such as tailings containment systems or process water ponds may result in significant environmental impacts and risks to workers and potentially downstream communities. These risks require preparedness for accidental releases and infrastructure failures, including coordination with authorities and implementation of mitigation and response measures.

- Civil and Security Emergencies

Civil and security related emergency situations may arise as a result of external threats or social disturbances. Identified scenarios include labor unrest or civil disturbances, and unauthorized external intrusion into project facilities. While such events may be low probability, they have the potential to pose serious risks to worker safety, public safety, and the continuity of operations if not adequately anticipated and managed.

Security alerts may require the immediate suspension of activities, evacuation of personnel, and coordination with competent authorities to assess and manage potential risks. Labor or civil disturbances, including strikes, protests, or community unrest, may escalate into emergency situations if they involve violence, property damage, or obstruction of critical infrastructure. Unauthorized intrusion into project sites may expose intruders to hazardous operating environments and increase the risk of accidents, sabotage, or confrontation with security personnel.

Civil and security emergencies must be managed in a manner that protects workers, contractors, and surrounding communities, while respecting applicable legal and human rights obligations. Emergency preparedness for such events requires clearly defined communication and response protocols, coordination with public security forces and local authorities, and integration of security related scenarios into site specific Emergency Preparedness and Response Plans.

Mine-Port rail corridor

Emergency situations associated with ore transport by rail primarily relate to train operations along the rail corridor and at interfaces with public or shared infrastructure. Credible scenarios include train derailments, collisions with other trains or vehicles at crossings, mechanical failures of locomotives or railcars, and emergency evacuation of train crews following incidents. Such events may result in injuries or fatalities, damage to rail infrastructure, temporary disruption of services, and, in certain circumstances, impacts on nearby

communities and biodiversity or the environment through ore spillage. These risks require coordinated emergency preparedness and response arrangements, including communication protocols with rail authorities (SNIM) and external emergency services.

Port site

Emergency situations related to ore handling and loading at the port site are associated with cargo transfer activities, operation of conveyors and ship loaders, fuel and energy systems, and the ship–shore interface. Potential scenarios include equipment failure during loading operations, spillage of ore, fires or explosions involving handling equipment or fuel storage, ship–shore interface incidents (including the risk of fuel oil spill), and occupational accidents resulting in injuries or fatalities. These risks may affect workers, port users, and, where applicable, surrounding communities and the marine environment. These risks must be addressed through appropriate emergency preparedness and response measures.

Conclusion

This ESAI incorporates emergency scenarios associated with mining operations, ore transport by rail, and ore loading at the port site, in alignment with the World Bank Group General EHS Guidelines, the IFC EHS Guidelines for Mining, and the African Development Bank Integrated Safeguards System.

The identified emergency situations provide a sound and comprehensive basis for the preparation of Emergency Preparedness and Response Plans applicable to all facilities within the Project Area of Influence (AoI), in line with Good International Industry Practice (GIIP), IFC Performance Standards PS1, PS2, and PS4, and the African Development Bank Operational Safeguards OS1, OS2, and OS4. The Emergency Preparedness and Response Plan should have cross links to the Traffic Management Plan, Hazardous Materials Management Plan, Non mining waste management plan, Community Health, Safety and Security Management Plan, Occupational Health and Safety Management Plan and Stakeholder Engagement Plan.

In accordance with their respective operational responsibilities, SNIM, as the operator of the port and rail facilities, is responsible for the development of emergency preparedness and response plans for those components, while EMC is responsible for the preparation and implementation of emergency preparedness and response plans for the mine site.

12.4.2 Climate Change Risks

12.4.2.1 Physical risks

The Climate Change Physical Risk Assessment helped identifying the most critical climate-related risks, at present or in the future, according to different emission scenarios and during the lifetime of the Project as a consequence of Climate Change. The temporal scope has been precautionary chosen to extend up to 2070, which corresponds to a Project life of almost 60 years. Climate risks increase over time and have a peak at the end of the period, which implies that a shorter temporal scope would reduce the overall risk level.

CCRA is based on existing methodologies for the assessment of climate change risks and vulnerability as part of adaptation strategies. Guidelines and methodologies from the **ISO 14091** as well as the **Intergovernmental Panel on Climate Change (IPCC)**[11] and the **World Bank Group**[12] were used as a guidance for defining factors that contribute to determine the risks. These methodologies consider a variety of risk components whose definitions are as follows:

[11] The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.

[12] The World Bank Group (WBG) is a family of five international organizations that make leveraged loans to developing countries.

- Climate-related Hazard: natural or human induced climate-related hazard, such as flood, wildfire, extreme heat, that can occur at the Project Site. The changes in intensity of hazard related events and of their probability over-time are influenced by climate change.
- Exposure: the possibility for a Project in a specific site to be adversely affected by a certain hazard because of the presence of certain Project services, resources, infrastructures, people and other Project's intrinsic elements that are prone to be affected. A Project, depending on its intrinsic nature and characteristics, may or may not be exposed to a certain hazard that occur at the Project Site. Exposure is therefore an indicator of the fact that the Project "can or cannot be affected" by a certain hazard.
- Sensitivity: propensity or predisposition of elements of the Project to be affected by a certain hazard. Sensitivity is a measure of "how much" a Project exposed to a certain hazard can be affected.
- Adaptive capacity: the ability of the Project to adjust to climate hazard-related events, to mitigate potential damages, to take advantage of opportunities, or to respond to the consequences.
- Vulnerability: expresses the magnitude of potential effects and consequences of climate hazard-related events on elements of the Project. Vulnerability results from the combination of Sensitivity and Adaptive capacity.
- Risk: the result of the combination of Hazard probability or intensity at a certain time and the Vulnerability.

This methodology assesses different climate-related hazards independently, at present and in the future, over a time consistent with the temporal scope of the assessment, and according to some future carbon emission scenarios. For each specific hazard, the risk components are assigned a qualitative class ("i.e., "high", "medium", "low") and then combined using qualitative matrices, as explained in **Figure 12-19**. The result is a class of Risk ("low", "medium", "high" or "extreme") for each climate-related hazard considered in the analysis. The following figure shows risk assessment process for a specific hazard "h" the Project is exposed to.

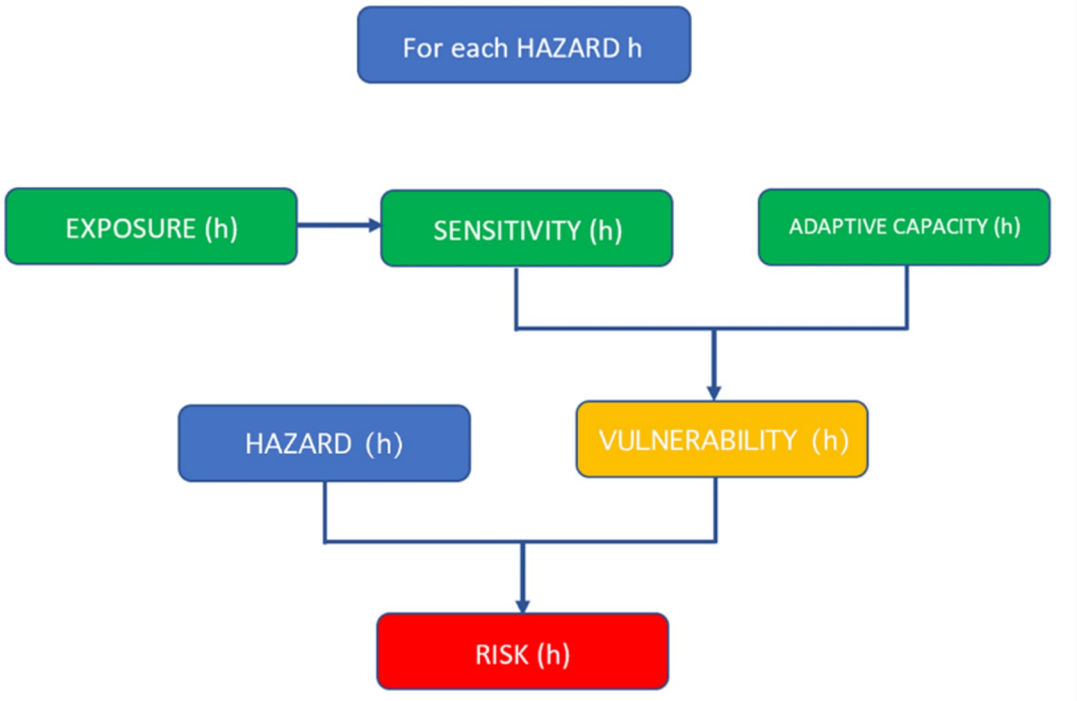


Figure 12-19: Workflow of the risk assessment for a specific hazard "h" the Project is exposed to, showing how different risk factors are combined across the analysis.

The climate-related hazards that have been selected for this Project are listed and identified as either chronic or acute.

Table 12-78: Climate-related hazards selection

Hazard type	Hazard
Chronic	Heat stress
Chronic	Water scarcity
Acute	Heat wave
Acute	River flooding
Acute	Extreme precipitations

The exposure evaluation considered the intrinsic characteristics and features of the Project.

Table 12-79: Exposure assessment

Hazard	Exposure	Justification
Heat stress	Yes	People working outdoor and indoor might be impacted. Machinery could be damaged. Railway may be affected.
Water scarcity	No	The mining activity will provide water access to people and project through the well fields targeting deep GW resource not linked to rainfall and superficial recharge.
Heat wave	Yes	People working outdoor and indoor might be impacted. Machinery could be damaged. Railway may be affected.
River flooding	No	No rivers presence in the study area.
Extreme precipitations	Yes	People working outdoor might be impacted. Infrastructures could be damaged.
Severe storms	Yes	People working outdoor might be impacted. Infrastructures could be damaged.
Hail	Yes	People working outdoor might be impacted. Infrastructures could be damaged.
Drought	No	The mining activity will provide water access to people and project through the well fields targeting deep GW resource not linked to rainfall and superficial recharge.
Strong wind	Yes	People working outdoor might be impacted. Infrastructures could be damaged.
Wildfires	No	The Project is located in a desert area with very sparse vegetation.

The Project was considered exposed to all relevant climate-related hazards potentially affecting the Project site, except for Water scarcity, Heat stress and Wildfires. Therefore, all of them were scoped in for further assessment.

Climate Score Global 2.7, implemented by Jupiter Intelligence, was used as the data source for assigning a class of either probability or intensity to each scoped-in climate-related hazard. Jupiter's Hazard input data were obtained for the Project location, identified through the coordinates of a representative point.

Among all possible metrics available, the most representative were selected for each hazard. They are shown in The following table.

Table 12-80: Most representative metrics selected to characterize each hazard.

Heat stress	Days per year with temperature exceeding the local historical 99th percentile temperature.
Heat wave	Annual count of 3-day periods with high temp >35C and low temp >24C.
Extreme precipitations	Maximum daily total water equivalent precipitation (in mm) experienced at the 100-year return period.
Severe storms	Number of days per year where environmental conditions are conducive to severe thunderstorm formation.
Hail	Number of days per year where large hail (>2 in / 5 cm in diameter) is possible.
Strong wind	Maximum 1-minute sustained wind speed (in km/hr) experienced at the 100-year return period.

For each hazard, the Sensitivity was qualitatively characterized based on a set of indicators, selected according to the characteristics of the Project potentially exposed to that hazard. The final step was to assign a class of Sensitivity ("High", "Medium" or "Low"), using the information collected through the assessment process, also considering their relative importance, reliability and completeness. Similarly to Sensitivity, the Adaptive Capacity was qualitatively assessed as "High", "Medium" or "Low". The magnitude of potential effects and consequences (Vulnerability) were assessed for each hazard, combining the Sensitivity and the Adaptive Capacity. As details and justifications are found in the APPENDIX C. Table 12-81 shows the details of Vulnerability assessment for all hazards.

Table 12-81: Vulnerability assessment

Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Heat stress	HIGH	MEDIUM	HIGH
Heat wave	HIGH	MEDIUM	HIGH
Extreme precipitations	HIGH	MEDIUM	HIGH
Severe storms	HIGH	MEDIUM	HIGH
Hail	MEDIUM	LOW	HIGH
Strong wind	HIGH	MEDIUM	HIGH

The Climate Change Risk has been assessed combining Vulnerability and Hazard levels, according to qualitative considerations based on the following matrix:

RISK					
	VULNERABILITY				
HAZARDS	Lowest	Low	Medium	High	Highest
Lowest	Lowest	Lowest	Low	Low	Medium
Low	Low	Low	Low	Medium	Medium
Medium	Low	Medium	Medium	High	High
High	Low	Medium	High	High	Highest
Highest	Medium	High	High	Highest	Highest

Figure 12-20 Risk matrix

Risk related to five of seven hazards is assessed as “LOW”, for all the scenarios and the timeframes, including the present days. These hazards are ‘Severe Storm’, ‘Strong Wind’, ‘Heavy Precipitations (Rain)’, ‘Heavy Precipitations (Hail) and ‘Flooding’. For all these hazards the Vulnerability is assessed as ‘HIGH’, except for ‘Flooding’ which Vulnerability is assessed as ‘MEDIUM’. At the same time, the hazard class has been assessed as ‘LOWEST’ for all the metrics, except for ‘Flooding’ which has been assessed as ‘LOW’.

Risk associated to temperature-related hazards, namely ‘Heat Wave’ and ‘Heat Stress‘, are assessed with more severe classes.

Risk mitigations

A few measures are proposed in the following to reduce the climate risks for the hazards considered in the assessment.

The list of measures identified here has not to be considered binding or exhaustive. However, they should be taken in consideration to reduce the Vulnerability of the El Aouj Mine Project towards climate-related hazards. These measures could also represent a solid basis for the preparation of a more comprehensive Climate Change Adaptation Plan.

All Risks

- The existing Project Emergency Preparedness & Response Plan should be expanded to include procedures and measures to deal with climate hazards. The Plan should be regularly updated.
- Implement an early warning system and make provision for a direct connection with any existing early warning systems at local or regional level to guarantee information on potential extreme events are monitored and shared on a daily basis.
- Maintain an efficient network connectivity within the Project site, making sure mobile communication and alternative communication systems would be available in case of an emergency due to climate-related extreme events.
- Ensure that roads connecting to the Mining facilities are maintained on a regular basis. This would increase the Adaptive Capacity in all hazards, particularly those related to potential flooding.

Risk of Extreme Heat (heat wave and heat stress)

- Provide adequate and regular maintenance of cooling systems verifying that the adequacy is guaranteed in the face of the expected increase in temperatures and the frequency of conditions of thermal stress and number and duration of heat waves.
- Provide for additional shades in public spaces, such as adding shades in parking lots or outdoor staff transit areas.
- Consider using construction materials for buildings and other infrastructures with a lower capacity to absorb heat and higher capacity to maintain their main properties in case of extremely high temperatures.
- Provide proper and regular maintenance to buildings, infrastructures and equipment to avoid increasing their sensitivity to hot temperatures.
- Rescheduling working hours during extremely hot periods to ensure the safety and efficiency of staff working in outdoor areas.

12.4.2.2 Transition risks

The Task Force on Climate-related Financial Disclosures (TCFD) defines climate transition risk as the risk associated with the transition to a low-carbon and resilient economy. It refers to the potential financial impacts and disruptions that businesses and financial institutions may face as a result of policy, legal, technological, and market changes aimed at addressing climate change.

Transition risks arise from efforts to mitigate greenhouse gas emissions and transition to a more sustainable and low-carbon economy. These risks can include regulatory changes, shifts in market preferences and demand, changes in technology and innovation, and evolving societal expectations. They can lead to significant financial implications, such as asset write-downs, stranded assets, reduced market share, increased operating costs, or disrupted supply chains.

A transition risk assessment was conducted for the El Aouj Project and the reports in presented in the APPENDIX C. The assessment was conducted considering the “Net Zero 2050” scenario, which represent the lowest emissions pathway and the “Current Policies” scenario, which currently represent the highest emissions pathway. Considering the Project perspective, they represent, respectively, the most unfavorable and the most favorable outcome.

Based on the analysis of potential risks and financial impacts related to transition trends, the project shows relatively low risks under the "Current policies" scenario. It should be highlighted that to transition to a low carbon economy, Mauritania will require international support. However, in a low emissions scenario like the Net Zero 2050, certain risks can materialize, particularly those associated with political changes and new carbon restrictions, leading to potential financial implications.

Under the "Current policies" scenario, the project appears to be able to operate without significant risks or financial impacts. However, as the transition towards a low emissions economy gains momentum, there is a need to address potential risks that may arise under the Net Zero 2050 scenario. Proactive measures and mitigation strategies should be considered to moderate these risks. One of the key recommendations is to monitor policy developments at both the national and international levels, ensuring alignment with long-term sustainability goals. Additionally, it is important to enhance disclosure around non-financial information, considering the increasing investor demand for transparency regarding environmental performance. It should be noted that the assessment lacks an analysis of reputational risk due to data limitations. However, studies

indicate that higher levels of disclosure are associated with lower credit risk, underscoring the significance of transparency in today's business landscape[13].

In conclusion, it is recommended to actively monitoring policy developments, setting ambitious emissions reduction targets, and enhancing disclosure practices.

12.4.2.3 Risks to the availability of natural resources

In the Tiris Zemmour region, annual precipitations show pronounced interannual variability, with minima approaching 0 mm/year and maxima reaching approximately 200 mm/year. Over the 1950–2023 period, no statistically significant long-term trends are detected. Accordingly, the CCRA does not identify any material increase in drought frequency or intensity that could exacerbate the potential desiccation of nomadic wells episodically recharged by rainfall events. Moreover, irrespective of future climate trajectories, the project will not exert influence on the availability of surface-water resources.

Hydrogeologically, the aquifer systems exploited in the Tiris Zemmour region of the Taoudeni Basin contain fossil groundwater, with residence times ranging from several tens of thousands to several hundreds of thousands of years. Modern recharge from surface-water processes is considered extremely limited due to the prevailing hyper-arid climatic conditions and the low permeability of overlying formations. The aquifer units targeted by the El Aouj project occur consistently at significant depths and can only be accessed through deep boreholes specifically developed for mining water supply purposes.

The projected increase in the frequency and magnitude of heat waves and extreme heat events identified in the CCRA is not expected to affect groundwater resources, given the negligible contribution of contemporary climatic processes to aquifer recharge. Consequently, the overall impact of climate change on groundwater availability is assessed as negligible and is therefore not further analysed.

[13] Bannier, C. E., Bofinger, Y., & Rock, B. (2022). Corporate social responsibility and credit risk. Finance Research Letters, 44, 102052.

13.0 CUMULATIVE IMPACT ASSESSMENT

This Chapter describes the potential cumulative impacts that the El Aouj Project, in combination with other existing or planned developments, could potentially have on identified Valued Environmental and Social Components (VECs) in the Project area of influence.

Cumulative impacts are contextual and encompass a broad spectrum of impacts at different spatial and temporal scales (IFC, 2013). They may arise because a series of projects of the same type are being developed in close proximity (e.g., water extraction from other wellfield in the Taoudeni basin), or as a result of combined effects of a mix of different types of projects (e.g., house developments, industries).

> *"Cumulative impacts are impacts that result from the successive, incremental, and/or combined effects of a project when added to the effects of other past, present, and reasonably foreseeable future activities, as well as natural environmental and social drivers, affecting the same valued environmental and social components over time".* (IFC, 2013)

Multiple and successive environmental and social impacts from existing developments, combined with the potential incremental impacts resulting from proposed and/or anticipated future developments, may result in significant cumulative impacts that would not be expected in the case of a stand-alone development (IFC, 2013). Cumulative impacts may result in either:

- An additive impact: where it adds to the impact which is caused by other similar impacts; or
- An interactive impact: where a cumulative impact is caused by different impacts that combine to form a new kind of impact. Interactive impacts may be either countervailing (the net adverse cumulative impact is less than the sum of the individual impacts) or synergistic (the net adverse cumulative impact is greater than the sum of the individual impacts).

This Cumulative Impact Assessment has also been prepared in alignment with the African Development Bank (AfDB) Operational Safeguards, in particular OS1, OS3, OS4 and OS5. In line with OS1, the CIA identifies VECs, defines spatial and temporal boundaries relevant to regional cumulative effects, and evaluates combined pressures resulting from mining, transport, water abstraction, urban growth, and other development activities. Consistent with OS3, the assessment examines cumulative impacts on natural habitats, terrestrial and marine biodiversity, critical habitat areas, and species of conservation concern within the mine, rail and port environments. Elements relevant to OS4 are incorporated through the analysis of cumulative pollution and environmental quality stressors, including dust, noise, water abstraction, groundwater salinisation and risks linked to increased industrial and transport operations. In accordance with OS5, the assessment considers cumulative consequences for pastoral livelihoods, mobility and transhumance routes, access to water resources, community health and safety, and the capacity of basic social services in the region. This chapter therefore provides a cumulative impact analysis and a set of management recommendations that are consistent with AfDB requirements for coordinated, regional-scale mitigation, monitoring and stakeholder engagement.

13.1 Methodology

The Cumulative Impact Assessment (CIA) process involves (a) the analysis of the potential impacts and risks of the Project in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen VECs over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible (IFC, 2013).

The *Good Practice Handbook – Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets* (IFC, 2013) was used as a guideline and direct reference in the completion of this CIA study. Figure 13-1 outlines the steps used in the determination, assessment, and management of cumulative impacts.

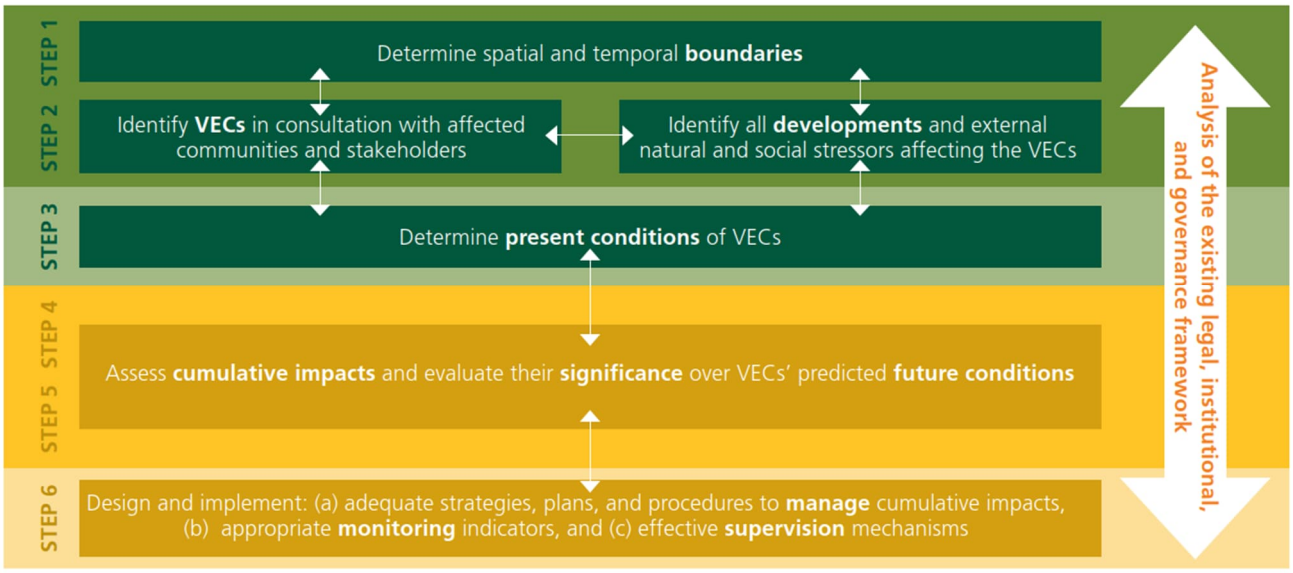


Figure 13-1: Steps in the CIA Process (IFC, 2013)

In accordance with the African Development Bank (AfDB) Operational Safeguards (AfBD, 2024) , cumulative impact assessment must evaluate how the Project's residual impacts interact with those of other past, ongoing and reasonably foreseeable developments within a wider regional context. AfDB requires that cumulative impacts be assessed across environmental, social and biodiversity dimensions, with particular attention to pressures on natural resources (OS1), effects on critical habitats and species of conservation concern (OS3), pollution-related stressors and infrastructure-driven risks (OS4), and combined consequences for pastoral livelihoods, mobility routes, access to water, community health and safety, and basic social services (OS5). The CIA must therefore adopt a regional, multi-project perspective, integrate natural and anthropogenic drivers of change, and provide coordinated management recommendations that support long-term sustainability and shared governance among operators and authorities.

13.1.1 Step 1 Spatial and temporal boundaries of the CIA and Identification of VECs

As required by Performance Standard 1 (IFC, 2012) the CIA Study Area encompasses the following components:

- The primary Project site and related facilities that the Project will develop;
- Areas potentially impacted by cumulative impacts from further planned development of the Project, any existing project or condition, and other project-related developments that are realistically defined at the time the ESIA is undertaken; and
- Areas potentially affected by impacts from unplanned but predictable developments caused by the Project that may occur later or at a different location.

Temporary boundaries for a CIA normally include the complete life cycle of the Project plus the expected time frame of the potential effects of proposed Project which can extend beyond its life cycle.

VECs to include are those that could be affected by the Project but also identified as being of concern by stakeholders.

AfDB OS1 requires CIA spatial and temporal boundaries to be VEC-specific, region-wide, inclusive of all relevant past, present and foreseeable developments, and extended across the full project lifecycle and post-closure period to capture long-term ecological, hydrological and social processes.

13.1.2 Step 2: Identification of other Projects, Activities and Environmental and Social Drivers

Existing, planned, and/or reasonably anticipated future projects and activities ('developments') that have the potential to influence the current environmental baseline within the Project AoI were identified via a review of online searches for information on other proposed major infrastructure and/or development plans for the region available in the public domain, as well as review of freely available aerial imagery, and EMC knowledge on the region. Those known existing/planned projects/activities, and their potential interactions with VECs, were mapped and described.

Environmental and social drivers of change, primarily climate change and population influx, were contextualised for the CIA Study Area based on a literature review of available information.

13.1.3 Step 3: Present Conditions of VECs

Available information on the current condition and trends of each VEC was compiled and reviewed from existing studies, official data sources, scientific literature, stakeholder inputs, and local knowledge. This approach establishes a baseline that reflects the combined effects of past and ongoing developments, rather than a pre-project reference condition.

13.1.4 Step 4 and 5: Assessment of Cumulative Impacts

CIA is future-oriented. Therefore, as recommended by IFC (IFC, 2013), cumulative impacts were assessed as the difference between the estimated future baseline condition of VECs in the context of the stresses imposed by all other sources (existing/proposed developments/activities within the CIA Study Area and natural environmental drivers); and the estimated VEC condition in the context of that future baseline condition plus the Project.

For this assessment, the expected potential environmental and social impacts and risks identified in Step 2 are discussed in the context of the predicted future baseline condition of the VECs. The residual impacts of the Project on VECs were then re-evaluated in the light of the impacts generated by the existing and proposed projects and activities in the Study Area, to produce a qualitative determination as to whether the contribution from the Project would result in a significant cumulative impact.

Similarly, AfDB requires the CIA to identify all relevant interacting projects and drivers at regional scale, to include foreseeable developments even if not yet approved, and to integrate both anthropogenic and natural drivers that could cumulatively affect environmental, social, cultural heritage and biodiversity VECs.

13.1.5 Step 6: Recommendations for Management of Cumulative Impacts

For significant cumulative impacts on VECs, management strategies to address these, consisting of collaborative/coordinated or adaptive management programmes, must be proposed.

Therefore, the focus of this CIA was on mitigation actions that the Project can take to avoid contributing to the overall cumulative impacts on the future baseline of the identified VECs, building on those mitigation measures already implemented via the Project ESIA's mitigation hierarchy.

AfDB requires cumulative impacts to be managed through regional, multi-stakeholder coordination, with measures that promote joint monitoring, shared data, and harmonised environmental and social practices,

ensuring long-term protection of natural resources, biodiversity, community well-being and essential services across all interacting developments.

13.1.6 Assumptions and Limitations

The cumulative impact assessment is largely based on the outcomes of this ESIA, supplemented by a high-level review of the potential impacts that may be contributed by other projects, activities, and drivers of change in the study area. In the absence of specific information on the residual impacts associated with these other projects and activities, the estimated overall cumulative impacts on VECs in the CIA should be considered qualitative. Stakeholder consultations were not carried out specifically for the CIA

13.2 Assessment Results

13.2.1 Spatial and Temporal Boundaries

The spatial boundary of the CIA includes a polygon delimited by the following limits:

Spatial boundary for the mine area

- West to East: The area extends across the Tiris Zemour region, from the western edge of Sebkha Idjill to the boundary of the Makteir plateau, which is situated in the north-western part of the Taoudeni sedimentary basin.
- North to South: It covers the mining zones of Tizerghaf and M'Haoudat, located on the craton approximately 60 km north-east of Zouérate, reaching southwards to the southern part of the Tiris Zemour region, north of Choum within the Taoudeni basin.

Spatial boundary for the rail corridor

The spatial boundary for the railway sector remains almost identical to the current footprint. Increased railway activity is not expected to require significant additional land beyond what is already in use.

Spatial boundary for the port area

- Terrestrial environment: the special boundary is defined by the eastern edge of the Cap Blanc peninsula. This area corresponds to the existing port footprint, as the anticipated increase in port activity will not necessitate further land acquisition on the terrestrial area.
- Marine environment: the boundary includes the Baie du Lévrier and extends south to El Mamghar, encompassing most of the aquatic environment of Banc d'Arguin National Park (PNBA). The northern limit includes the southern sector of the Dhakla Key Biodiversity Area (KBA). The boundary coincides with the marine ecologically appropriate area of analysis of the critical habitat assessment for the El Aouj Project.

Temporal Boundaries

The temporal boundaries are estimated from the duration of the project's activities, which, for example, span 41 years in the case of the El Aouj Project. However, these temporal boundaries may be considered effectively permanent from a human perspective for certain resources, such as groundwater, since hydraulic models consistently indicate that aquifer recovery can require over 150 years to return to their original levels.

The temporal extent of impacts from other past, present, and predictable future developments is considered within the same timeframe.

13.2.2 Valued Environmental Components (VECs)

The identified resources and receptors (VECs) that may be exposed to cumulative impacts as a result of the Project, in combination with other existing, planned, and/or reasonably anticipated future projects and activities, are presented in Table 13-1 together with their associated indicators :

Table 13-1: Valued Environmental Components (VECs) for the CIA and associated indicator

VEC Category	VEC Sub-Component	Associated Indicators
Environmental VECs	Water resources in Tiris Zemmour	▪ Changes in available groundwater resources Drawdown extent and long-term aquifer behaviour
	Groundwater quality	▪ Salinity trends ▪ Potability
	Sebkha Idjill	▪ Surface water or soil contamination
Social VECs	Pastoralism & livelihoods	▪ Access to grazing land and water points Integrity of livestock corridors and transhumance routes
	Basic social infrastructure & services	▪ Availability and capacity of water supply, housing, healthcare, education and sanitation
	Community health	▪ Exposure to environmental stressors (dust, noise, water quality) Capacity of local health services
	Community safety – road	▪ Frequency vehicle traffic Accident rates along key road corridors
	Community safety – rail	▪ Frequency of rail traffic Safety conditions at crossings and community interface zones
	Social acceptability & community perception	▪ Community concerns and expectations Perceived distribution of project benefits and impacts
Cultural Heritage VECs	Tangible cultural heritage	▪ Presence, condition and vulnerability of archaeological or historical sites
	Intangible cultural heritage	▪ Continuity of land-use practices, traditions and social customs
	Cultural landscape & setting	▪ Continuity of visual and cultural character of key landscapes
Biological VECs	Flora and natural habitats	▪ Habitat condition and species presence Loss, fragmentation or degradation of key habitat types
	Terrestrial fauna (mine area)	▪ Habitat availability and quality Disturbance and displacement of fauna
	Kediet ej Jill KBA	▪ Habitat availability and quality Disturbance and displacement of fauna
	Avifauna – mine area	▪ Distribution and abundance of resident bird species Collision rates

VEC Category	VEC Sub-Component	Associated Indicators
	Avifauna – port area	▪ Distribution and abundance coastal and marine birds Habitat quality in mudflats, sandflats and coastal wetlands
	Marine mammals	▪ Vessel collision rates
	Marine critical habitats	▪ Ecological condition in Cap Blanc, Satellite Reserve and Dakhla KBA/IBA Presence of sensitive species (e.g., monk seal, smoothhound)

13.2.3 Other Identified Projects, Activities and Environmental Drivers

Other Projects and Activities

A summary of the existing, planned, and/or reasonably anticipated future projects and activities that have the potential to influence the future environmental baseline within the Study Area, and result in cumulative impacts on identified VECs, are set out Table 13-2.

13.2.3.1 Existing and Planned Mining Projects in the Tiris Zemmour Region

The following overview details the major operating mines and development-stage projects in the Tiris Zemmour Region of northern Mauritania. All currently operating SNIM mines in the Zouerate area — including Tazadit, Rouessa, F'Dérick, TO-14, Guelb El Rhein (Guelbs I & II), and M'Haoudat — are connected to and export iron ore via the SNIM railway and the SNIM mineral port of Nouadhibou. These operations collectively generate regular heavy rail traffic, port handling activities, and associated support services along the corridor.

In addition, several advanced or planned iron ore projects in the region have been explicitly designed to rely on the same logistics corridor. Notably, the Askaf Iron Ore Project is located adjacent to the SNIM railway and was developed on the basis of rail transport to Nouadhibou for export. Similarly, the Atomai Project explicitly plans to use SNIM's existing rail and port facilities, and recent EIB and AfDB-financed railway modernisation programmes include the construction of new rail extensions to connect Atomai and El Aouj to the main line, confirming its foreseeable future use of the corridor.

These sites are considered significant contributors to cumulative regional environmental and social impacts, and their inclusion is pertinent for cumulative impact assessment (CIA) under IFC Performance Standard 1.

Operating Mines

- F'Dérick Mine: The F'Dérick Mine, located at the western end of Kediet ej Jill in the Tiris Zemmour region of Mauritania, is the country's first iron ore mine, brought into operation in the early 1960s by MIFERMA before being taken over by SNIM in 1983. The deposit, averaging around 60% iron content, has historically employed several thousand workers and continues to serve as a major hub for the national extractive industry. Available data indicate that production reached approximately 11 Mt/y in 2011, with reserves estimated between 30 and 40 Mt in 2018 and particularly competitive operating costs. The ore is mined by open-pit methods, crushed, and then transported, as is the case for neighboring mines (Rouessa, Tazadit), via the SNIM mineral railway. In 2023, SNIM launched a new development project targeting an increased capacity of about 2 Mt per year, including new processing, conveying, and rail loading facilities, confirming F'Dérick's pivotal role in the national mining strategy.

- Tazadit Mine: Managed by SNIM and located near F'Dérick within the Zouérat mining district, the Tazadit Mine is an established open-pit iron ore operation extracting hematite and magnetite from banded iron formations in the Reguibat Shield since the early 60's. The mine is connected to the port of Nouadhibou via the Mauritania Railway and is situated in a cluster of active and historical iron ore mines, making it a significant regional development.
- Rouessa Mine: The Rouessa Mine, operated by SNIM near F'Dérick, exploits hematite, magnetite, and martite deposits hosted in banded iron formations of the Reguibat Shield. It forms part of the Zouérat–F'Dérick iron ore mining cluster. The mine is an integral part of the historic mining basin initially developed by MIFERMA, whose deposits at F'Dérick, Rouessa, and Tazadit were among the first operations to supply the mining railway inaugurated in 1963, making a significant contribution to the national economy from the very beginnings of Mauritania's iron ore industry.
- The TO-14 mine, located in the Zouérate mining zone in the Tiris Zemmour region of Mauritania, is an open-pit iron operation that has been active since 1991 and is operated by SNIM. The site forms part of the historic mining basin of the Kediet ej Jilll and benefits from shared infrastructure, including the mineral railway linking Zouérate to the port of Nouadhibou. In 2020, the mine was equipped with new processing facilities intended to increase production capacity by approximately 2 Mt per year, funded by SNIM and integrated into the strategic programme to enhance industrial performance. Available data indicate a production of around 4.2 Mt in 2024, confirming its importance in national iron ore supply.
- Guelb El Rhein (Guelbs I & II): The Guelb El Rhein mining complex (Guelbs I & II), located about 25 km northeast of Zouérate in the Tiris Zemmour region of Mauritania, is one of the largest iron ore extraction and processing centers operated by SNIM. This is a large-scale open-pit operation, primarily exploiting magnetite deposits, and is composed of a concentration and processing complex since 1984. Guelb II, commissioned in 2015, expanded production and beneficiation capacity up to 17 Mt per year. The site is fully integrated into SNIM's logistics network, using the mineral railway to transport concentrate to the port of Nouadhibou, placing it at the heart of the Zouérate mining cluster. Available data confirm its strategic importance and its role in the ongoing increase of national production capacity.
- M'Haoudat Mine: The M'Haoudat Mine is an iron ore operation managed by SNIM since 1994. The deposit extends along a ridge approximately 14 km in length and consists of four subvertical mineralized lenses rich in hematite. This mine is an integral part of the Kediet ej Jill mining basin and is fully incorporated into SNIM's logistics system, which is based on transporting ore via the mineral railway to the port of Nouadhibou. Available data confirm a verified annual production of 1,2Mt in 2024.

Planned Mine Projects (in addition to El Aouj)

- Askaf Iron Ore Project (Askaf North / South): The Askaf iron ore project is a large group of magnetite-quartzite deposits located very close to the SNIM railway corridor, which would allow for direct transport of concentrate to the port of Nouadhibou. Originally developed by Sphere Minerals, the project was taken over by Glencore in 2012, with plans for a capacity of 7.5 Mt per year of iron ore concentrate. An EPC contract was awarded to Essar Projects in 2014 for the construction of a beneficiation plant. Work was suspended at the end of 2014 and subsequently abandoned in 2015. Currently, the project is considered paused or inactive, but it remains listed as a reasonably foreseeable mining development due to the size of its resources and its strategic location along national mining infrastructure. In 2023, Essar Capital (Mauritius) Ltd was granted an exploration license for the Guelb Askaf deposit, raising the possibility of the project being revived with the same theoretical capacity of 7.5 Mt per year, integrated into the national rail and port network.

- Tizerghaf (Tiezerghaf) Project: Promoted by SNIM, the Tizerghaf Project is a planned mining and processing development located about 24 km from Guelb El Rhein. It targets magnetite-bearing quartzite deposits and includes an open-pit mine, beneficiation plant, and associated infrastructure such as power supply, water abstraction, and upgrades to rail and port systems.
- Atomai Project: The Atomai Project, near F'Dérick within the Zouérate mining basin, is a large-scale planned iron ore mining, beneficiation, and pelletising development promoted by SNIM and Mauritania Saudi Mining and Steel Company (Takamul). The project features an open-pit mine, beneficiation facilities, two pelletising plants in Nouadhibou, and supporting infrastructure, targeting production of about 10 Mt per year of high-grade iron ore pellets.

In addition to the operating SNIM mines and the El Aouj, Atomai, Tizerghaf and Askaf projects already considered in this assessment, SNIM's regional CIA identifies several additional mining initiatives in the Tiris Zemmour region. These include, in particular, the Tazadit underground project, the NIMM project, the Guelb Lehdej project, as well as several exploration permits or applications for mining permits located mainly south of F'Dérick and close to the SNIM railway corridor. Although these projects were excluded from the main scope of the SNIM CIA due to a level of definition considered insufficient against IFC criteria, they reflect growing interest in the development of new mineral resources in the region. Their possible implementation could, in the long term, increase cumulative pressure on railway and port infrastructure, groundwater resources, energy needs, as well as workforce movements and urbanisation dynamics around Zouérate and F'Dérick. These initiatives should therefore be regularly monitored as part of future updates to the cumulative impact assessment.

Figure 13-2 presents the location of ongoing or planned mining Projects within the Tiris Zemour area around Zouérate.

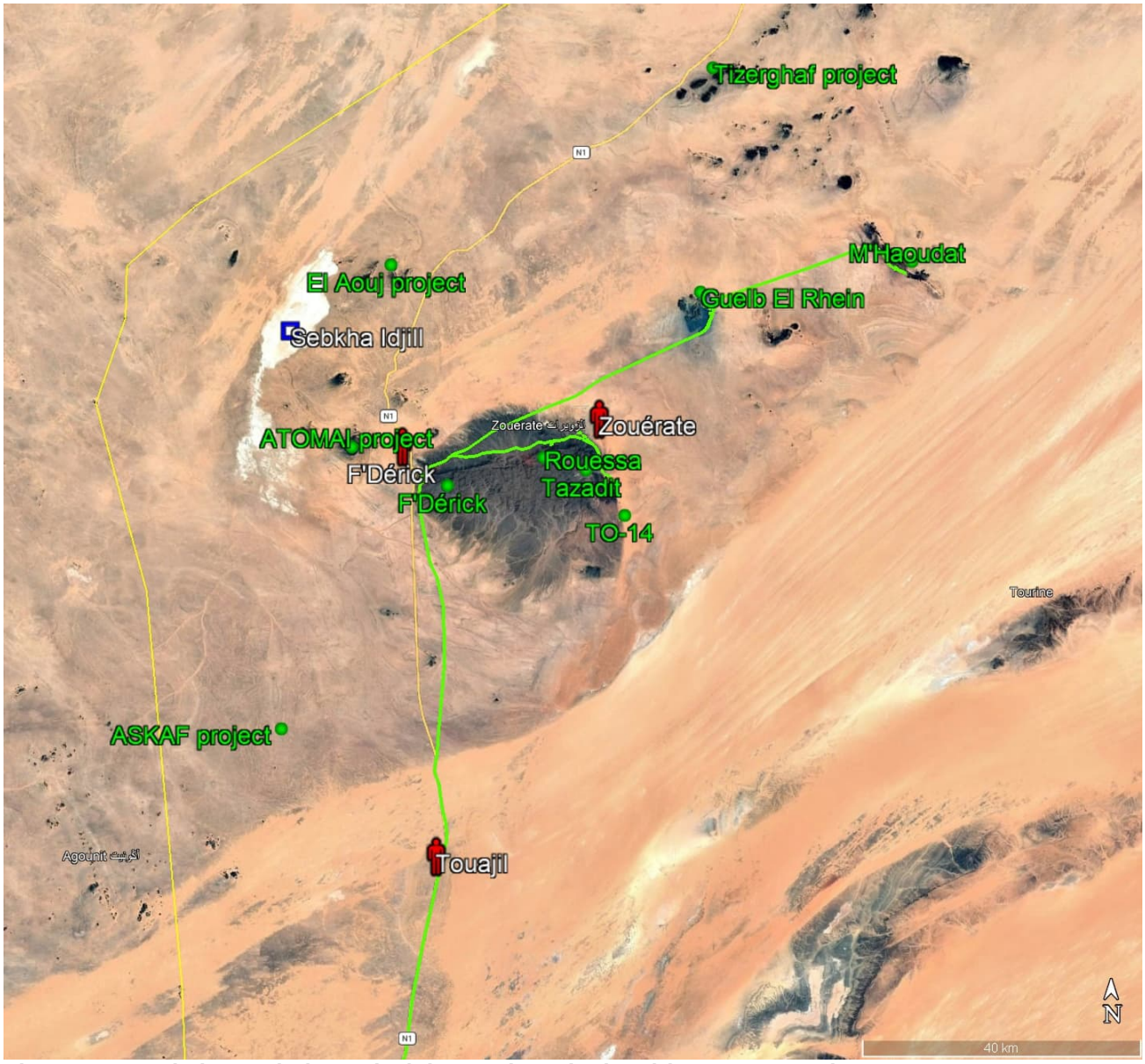


Figure 13-2: Existing and Planned Mining Projects in the Tiris Zemour Region

13.2.3.2 Existing and Planned Projects in the Tiris Zemmour Region

- SNIM Power Plants – Zouérate: Electricity supply in the Zouérate mining area is largely provided through SNIM-owned and operated power generation facilities, which supply both SNIM's mining operations and the surrounding urban centres, including Zouérate and F'Dérick. In recent years, SNIM has expanded this energy infrastructure through the commissioning of new thermal and solar power plants in Zouérate, notably a 30 MW thermal plant and a 12 MW solar photovoltaic plant, with the objective of meeting rising demand driven by mining activities while improving reliability and increasing the share of renewable energy (approaching 29% today) in the local energy mix (SNIM, 2025). The power plant is supplied with fuel via the SNIM railway network.

Figure 13-3: Zouérate HFO Power Plant (photo: (Africa Power Services, 2025)

- Oued El Gah Desalination Plant: Water supply for mining operations and urban centres in the Zouérate area is partly supported by the Oued El Gah desalination plant, which is owned and operated by SNIM and forms part of the company's integrated water and utilities infrastructure. The facility has been developed and expanded to address chronic water scarcity in the region and to meet increasing industrial and domestic demand associated with mining activities and population growth in Zouérate and F'Dérick. In November 2023, the Mauritanian President inaugurated an extension project that increased water production by 1,000 m³ and included the acquisition of a desalination unit, the addition of five storage tanks, the installation of two pumping stations (each with a capacity of 340 m³/h), and the construction of a pipeline with a diameter of 400 mm and approximately 23 km in length for transport to the city, carried out by the SNIM Foundation (AMI, 2023). In December 2025, the President also presided over the laying of the foundation stone for the second extension of the facility, which involves adding a new desalination unit with a capacity of 1,000 m³ per day, financed by SNIM's charitable foundation (SNIM, 2025).

- PRAPS-2 (Pastoralism Support Programme): The Regional Sahel Pastoralism Support Project – Phase II (PRAPS-2) is a World Bank–supported regional programme implemented in Mauritania and five other Sahelian countries between 2022 and 2027, with the objective of strengthening the resilience of pastoral and agro-pastoral communities through improved animal health services, sustainable management of pastoral resources, livestock market infrastructure, and conflict prevention related to access to land and water (World Bank, 2021). In Mauritania, PRAPS-2 supports activities such as restoration of degraded rangelands, development of pastoral infrastructure (including vaccination parks and livestock markets), and measures to secure livestock mobility corridors, which are directly relevant in regions affected by large-scale mining development.

- Tiris Uranium Project – transport corridor (Aura Energy / Tiris Resources): The regional CIA conducted by SNIM also identified the transport corridor associated with the Tiris uranium project, developed by Tiris Resources (Aura Energy), as a relevant third-party development. Although the mining facilities are located outside the cumulative study area, the logistics flows associated with the project would use the road network linking Zouérate to the north-eastern areas of Tiris Zemmour. Due to this spatial overlap with the areas of influence of the El Aouj and Atomai projects and existing SNIM operations, this transport corridor may be considered a potential source of cumulative pressure on road infrastructure, road-user safety and regional logistics activities.

13.2.3.3 SNIM Railway Modernisation & Expansion

The SNIM railway links the Zouérate mining basin to the SNIM mineral port at Nouadhibou. The modernisation and expansion programme includes the following upgrades:

- The addition of two new passing tracks—at PK 20 (Nouadhibou) and near PK 618 (F'Dérick sector)—increasing the total from 17 to 19, as well as the installation of station tracks (approximately 26 km) and access tracks (approximately 42 km);
- The expansion of maintenance workshops at the central point in Nouadhibou and the strengthening of the concrete sleeper plant;
- The creation of two locomotive depots and two new base camps (PK 255 and PK 606) for track teams;
- The acquisition of rolling stock (notably locomotives, about 1,743 100-ton wagons, tankers, and flatcars) to increase the number of pairs of ore trains to eight;
- The commissioning of a modern train regulation system (real-time tracking and optimization of crossings).

All upgrade work is planned to be carried out without the construction of a new line and within the existing track corridor and SNIM's land concessions.

Table 13-2: Existing, planned, and/or reasonably anticipated future projects in the CIA study Area

Project / Mine	Type	Status	Cumulative relevance (ESIA screening)	Official / authoritative reference
Tazadit Mine	Iron ore mine (magnetite & hematite), open pit	Operating	Core contributor to cumulative dust, noise, workforce exposure and rail traffic within the Zouerate mining basin.	SNIM
Rouessa Mine	Iron ore mine (hematite & magnetite), open pit	Operating	Part of the Kédia d'Idjil mining cluster; overlapping air, noise and logistics impacts.	SNIM
F'Dérick Mine	Iron ore mine (hematite), open pit	Under development / early operation	Increases cumulative pressures on workforce, air quality and rail capacity.	SNIM
TO-14 Mine	Iron ore fines and processing facilities	Operating	Adds processing-related dust, water use and tailings management impacts.	SNIM
Guelb El Rhein (Guelbs I & II)	Magnetite iron ore mine and beneficiation plant	Operating	Major driver of cumulative water abstraction, tailings, energy demand and rail traffic.	SNIM
M'Haoudat Mine	Iron ore mine (hematite, DSO)	Operating (mature)	Contributes to aggregate mining footprint and shared rail traffic.	SNIM
Askaf Iron Ore Project (Askaf North / South)	Magnetite iron ore project with planned beneficiation	On hold / inactive (reasonably foreseeable)	Large undeveloped iron ore deposit adjacent to the SNIM railway; relevant as a reasonably foreseeable development that could reactivate and add cumulative mining, water, energy and logistics pressures.	ESSAR
Tizerghaf (Tiezerghaf) Project	Planned magnetite mine and beneficiation plant	Planned / development stage	Reasonably foreseeable cumulative impact driver (water, tailings, energy, logistics).	SNIM
Atomai Project	Magnetite iron ore mine and beneficiation / pellet feed	Planned / under development	Future cumulative contributor via additional processing, water abstraction, energy demand and rail/port throughput.	TAKAMUL
SNIM Railway Modernisation & Expansion	Railway rehabilitation and new lines (incl. El Aouj & Atomai spurs)	Financed / implementation ongoing	Enables production growth; increases cumulative noise, vibration, dust and safety risks along the corridor.	SNIM

Project / Mine	Type	Status	Cumulative relevance (ESIA screening)	Official / authoritative reference
SNIM Power Plants – Zouerate	12 MW solar + 30 MW thermal power plants	Operating (since 2025)	Modify baseline air emissions and energy availability, enabling mining intensification and urban growth.	SNIM
Oued El Gah Desalination Plant – Zouerate	Industrial / urban water desalination (expansion)	Under expansion	Affects cumulative water abstraction and brine management in an arid mining environment.	SNIM
El Aouj Mining Area	Future large-scale iron ore mining zone	Planned / reasonably foreseeable	Introduces additional future mining footprint, water and energy demand enabled by rail expansion.	EMC
Urban Expansion – Zouerate & F'Dérick	Induced residential and service development	Ongoing	Increases cumulative pressure on water, waste, health services and community exposure.	Tiris Zemour Authorities
PRAPS-2 (Pastoralism Support Programme)	Regional pastoral resilience and land-use programme	Ongoing (2022–2027)	Contextual cumulative programme affecting land use, water points and mobility around mining areas.	CILSS – Comité permanent inter-États de Lutte contre la Sécheresse dans le Sahel Ministère de l'Élevage

13.2.3.4 Other identified Projects out of the Tiris Zemour region

SNIM's regional CIA identified several projects located outside the Tiris Zemmour mining basin that could, in the long term, constitute additional sources of cumulative pressure, but which were ultimately screened out of the main analysis due to a lack of detailed technical information or because they were not considered sufficiently defined or reasonably foreseeable under IFC criteria. In the Nouadhibou region, these projects include, in particular, the expansion of the Nouadhibou deep-water port, SNIM's direct reduced iron and hot briquetted iron production project (DRI/HBI), the gas pipeline project linking offshore gas fields to Nouadhibou, as well as several major green hydrogen and green ammonia projects, namely the Nour, AMAN and NAYRAH projects. The CIA also mentions the renewable-energy-powered desalination plant, the Nouadhibou industrial wastewater treatment plant project and the urban road network expansion programme. These projects were identified as potentially relevant to cumulative issues related to port infrastructure, water resources, energy, land use or maritime traffic, but were excluded from the analytical scope due to the absence of publicly available detailed studies, sufficient engineering data, or a level of maturity allowing them to be considered reasonably defined developments.

Outside Nouadhibou, the CIA also identified the Tindouf–Zouérate road project linking Algeria to Mauritania, as well as the battery energy storage system (BESS) component of the Desert to Power programme in Boulenoir. These initiatives could theoretically interact cumulatively with regional transport infrastructure and energy networks. However, they were also excluded from the main cumulative assessment due to a lack of precise data on their final configuration, schedule or technical characteristics, which did not allow them to be classified as reasonably foreseeable projects under the IFC methodology adopted by the CIA.

13.2.3.5 Other Environmental and Social Drivers

- Climate Change

Beyond the projects and activities, climate change acts as an independent driver of cumulative impacts in the Tiris Zemmour region: the projected increase in heat waves and thermal stress heightens risks to worker health, causes equipment shutdowns due to insufficient cooling, and leads to thermal deformation of rail tracks (expansion), all of which have cascading effects on rail and port logistics. These systems are already under considerable strain, with an additional 2 pairs of trains per day (about +50%) and approximately 55 extra vessels per year associated with the Project. These effects may increase the likelihood of simultaneous transport and operational interruptions throughout the mining corridor.

Furthermore, although rare, more intense extreme rainfall events can cause erosion, blockages, and localized damage to access roads, the rail spur, and industrial infrastructures, even in the presence of a retention basin and dry stack tailings. Lightning and windy episodes, while generally posing a low to moderate overall risk, can add spikes of disruption.

While water shortages are not a structuring factor for the Project's supply (due to reliance on deep aquifers disconnected from surface recharge), rising extreme temperatures increase operational water demand (for cooling and dust suppression). This compound effect, together with intensified regional mining and logistics activities, amplifies pressures on VECs such as water resources, community health and safety and ecosystem services.

SNIM's regional CIA also highlights that climate change may result, in the coastal region of Nouadhibou, in a gradual rise in sea level that could interact with the impacts associated with increased port and maritime activities. Although these effects are not considered a structuring factor for the mining infrastructure located in Tiris Zemmour, they potentially represent a regional environmental driver that may influence coastal and marine habitats in the long term, as well as the port infrastructure used by mining projects in the region.

13.2.4 Present Conditions of VECs

The present conditions of VECs were collated from the baseline data for this ESIA (Chapters 6.0 to 10.0). New baseline data was not specifically collected for the CIA.

13.2.5 Overall Assessment of Cumulative Impact on VECs

Table 13-3 presents a qualitative screening of the cumulative interactions between existing, planned, and reasonably foreseeable regional developments and all environmental, social, cultural heritage, and biological VEC sub-components, indicating where cumulative effects are likely to occur based on spatial and temporal overlap, impact pathways, and available baseline information. Those interactions are discussed in the following subsections

Table 13-3: Comprehensive Screening of Cumulative Interactions Between Projects, Activities, Environmental/Social Drivers and VEC Sub-Components

Driver / Project / Activity	Water resources	Groundwater quality	Sebkha Idjill	Pastoralism & grazing land	Basic services & infrastructure	Community health risks	Community safety	Social acceptability / perception	Tangible heritage	Intangible heritage	Setting and perception of cultural heritage	Natural habitat and flora (mine)	Avifauna (mine)	Kediet ej Jill KBA	Terrestrial habitat and fauna (port)	Marine mammals	Critical habitat (port)
Tazadit Mine	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rouessa Mine	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
F'Derick Mine	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TO-14 Mine	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Guelbs I & II	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
M'Haoudat Mine	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
El Aouj Project	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Askaf Project	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
Tizerghaf Project	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	✓

Driver / Project / Activity	Water resources	Groundwater quality	Sebkha Idjill	Pastoralism & grazing land	Basic services & infrastructure	Community health risks	Community safety	Social acceptability / perception	Tangible heritage	Intangible heritage	Setting and perception of cultural heritage	Natural habitat and flora (mine)	Avifauna (mine)	Kediet ej Jill KBA	Terrestrial habitat and fauna (port)	Marine mammals	Critical habitat (port)
Atomai Project	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SNIM Power Plants	-	-	-	-	✓	✓	-	✓	-	-	✓	-	✓	-	-	-	-
Oued El Gah Desalination	✓	✓	-	✓	✓	✓	-	✓	-	-	✓	-	-	-	-	-	-
PRAPS-2	-	-	-	✓	-	-	-	-	-	✓	-	-	-	-	-	-	-
Railway Modernisation	-	-	-	-	✓	✓	✓	✓	-	-	✓	-	-	-	✓	-	-
Climate Change	✓	✓	-	✓	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓

Note : ✓ Cumulative interaction likely ; ; - No meaningful cumulative interaction expected

13.2.5.1 Cumulative impacts on Environmental VECs

13.2.5.1.1 Increased pressure on water resources

Five mining projects are currently operated by SNIM in the Tiris Zemmour region, either within the Kediet ej Jill Mountain or within a maximum radius of 50 km from Zouérate. Four other projects, including the El Aouj project, are under development (see figure below).

SNIM currently operates seven wellfields. Two of these wellfields are located within Kediet ej Jill, composed of conglomerates belonging to the Paleoproterozoic-age Seyala Formation. The five other wellfields are located within the first three sedimentary units of the Taoudeni Basin (P1 to P3), which constitute the main regional aquifer formations. These sedimentary units are crossed by a network of faults mainly oriented NW–SE, with local N–S orientations. These faults are generally subvertical and cut through the entire sedimentary column down to the bedrock. They form hydraulic barriers with heterogeneous behaviours that can locally influence groundwater flow by creating zones of hydraulic discontinuity or preferential flow corridors.

The Touajil and Aouchich wellfields (El Aouj Project) constitute two additional wellfields that are not yet exploited. The ATOMAI Project, currently under development, will likely also require the use of an additional wellfield. The Touajil wellfield, intended to supply water for the El Aouj project during its first 20 years, is located within the first three aquifer units similar to those exploited by SNIM, at a distance of approximately 20km from the nearest El Erguiya wellfield currently operated by SNIM.

In contrast, the Aouchich wellfield, intended to supply the project for the following 20 years, is located within a different aquifer unit, in upper sedimentary formations (P4–P5), which are more recent and not yet directly exploited by ongoing or planned projects. The effect of drawdown in the lower aquifers (P1–P3) on the upper aquifer (P4–P5) remains unknown.

The exploitation of the existing wellfields, initiated in the 1970s for some of them, ensures the water supply for both mining and social needs in the region (water supply to the towns of Zouérate and F'Dérick). Since their commissioning, population growth and the expansion of industrial activities have progressively increased water demand. To meet this demand, pumping volumes per well have increased and new wells have been installed. Projections indicate a potential increase in demand reaching nearly 300% over the 2025–2045 period.

All of these wellfields have been the subject of various hydrogeological studies and modelling exercises confirming groundwater availability for each project individually. However, to date, the cumulative impact of these abstractions across all wellfields, as well as the effects associated with SNIM's projected future water needs, has not been fully quantitatively assessed at the regional scale through hydrogeological modelling integrating all exploited wellfields.

The hydrogeological model developed by URS (2015) represents an initial effort to simulate the cumulative drawdowns within the P1–P3 aquifer units. This was achieved by modelling a constant abstraction rate at the El Gah, Tarf Srei, and M'Haoudat wellfields, carried out simultaneously with abstraction activities at the Touajil and Aouchich wellfields.

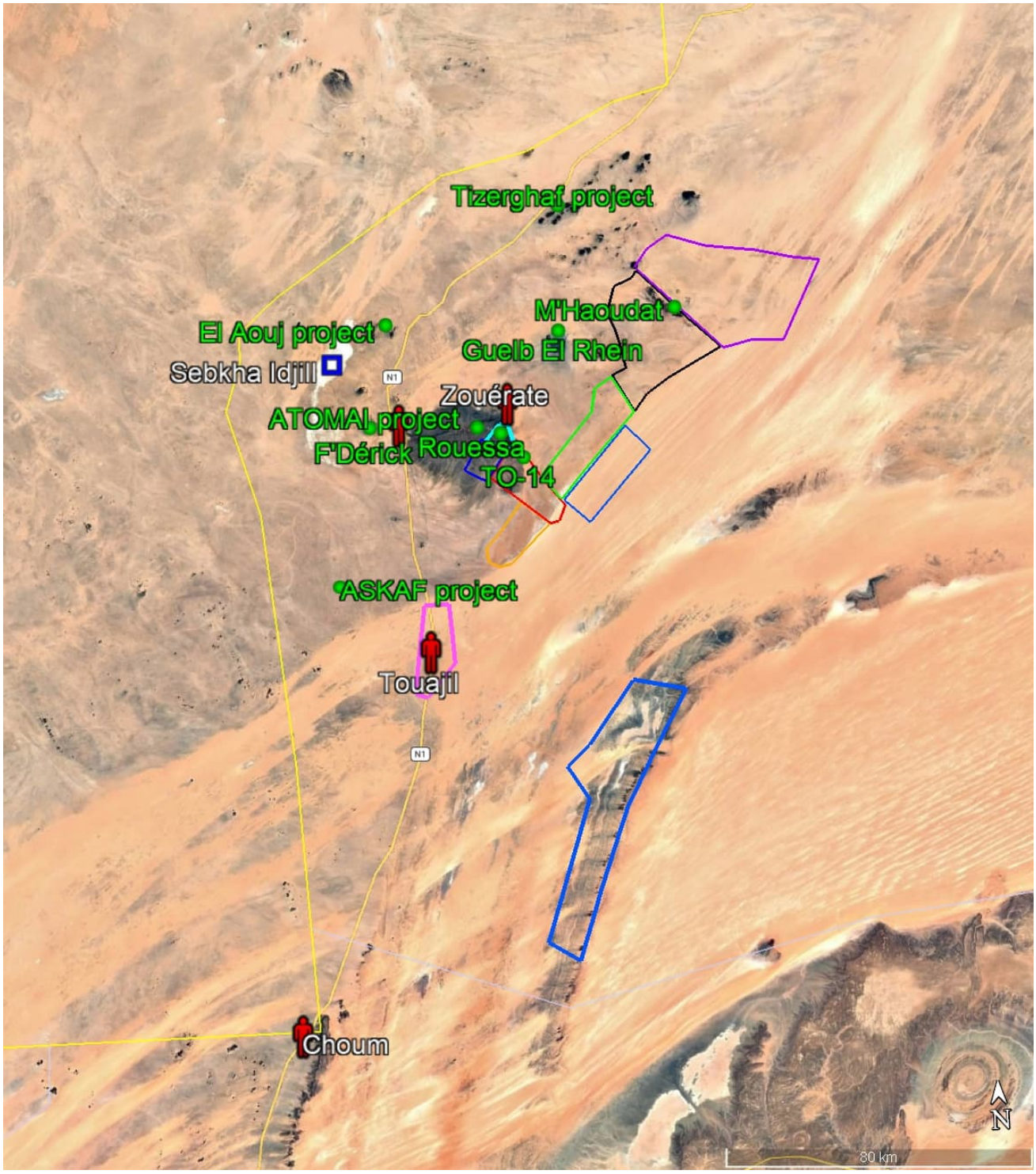


Figure 13-4: **Existing and Future wellfields in the study area of the CIA**

Analyses of pumping tests and the accompanying modelling have identified a barrier to groundwater flow situated just north of the Touajil wellfield. This barrier serves to hydraulically isolate the Touajil wellfield from the abstractions occurring at the SNIM wellfields, ensuring that groundwater levels and flows in this area remain largely distinct. The internal barrier, characterised by its low permeability, prevents the drawdown from extending further to the north.

However, the model also demonstrates that groundwater levels to the north of this barrier are primarily influenced by abstraction from the wellfields located further north, such as El Gah and other wellfields further

north. As a result, there is a general and notable drawdown observed across the entire aquifer units along the boundary of the Taoudeni Basin (Figure below). The implementation of additional projects, including Askaf and ATOMAI, is expected to elevate water demand and may intensify the cumulative effects on groundwater resources within the Taoudeni Basin.

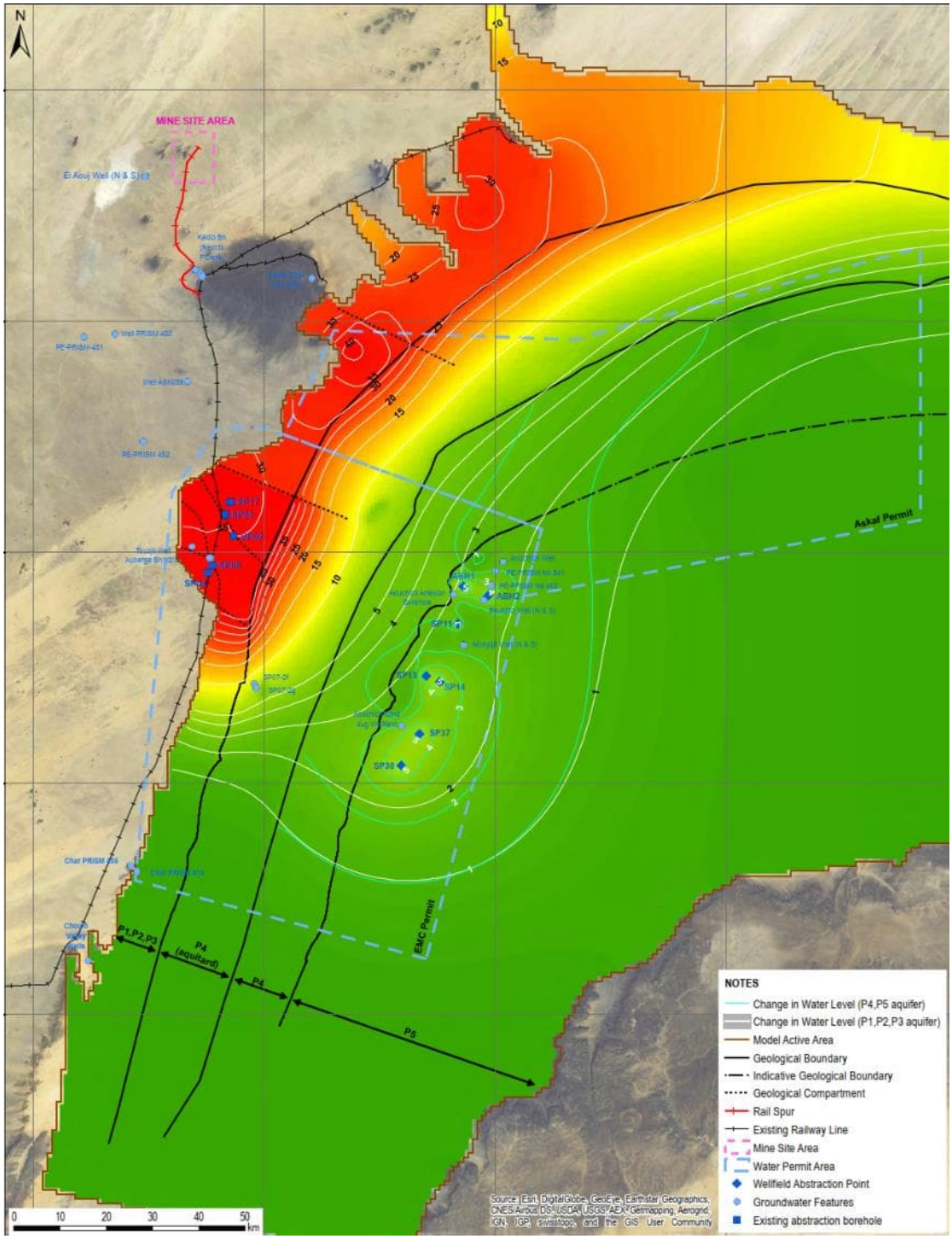


Figure 13-5: Simulated change in water levels from the start of the GW abstraction to the end of the El Aouj mine operation (URS, El Aouj Iron Ore Project - Hydrogeology Feasibility study, 2015) (see Appendix B for full hydrogeological study)

The recent SNIM's regional CIA (SNIM, 2026) provides a more comprehensive assessment of cumulative impacts on groundwater resources, based on an integrated hydrogeological study of the Tiris Zemmour region. The study consolidates information from previous investigations, existing ESIAs and operational datasets, establishes a regional inventory of water points, characterises the main hydrogeological units, and develops a transient numerical model to evaluate the combined effects of current and future groundwater abstractions. However, it also highlights a key limitation: the lack of continuous piezometric monitoring between 2018 and 2025 considerably constrains the understanding of how the aquifer system has evolved under existing abstraction pressures. Without reliable time-series data on groundwater-level variations, the numerical model cannot be robustly calibrated under transient conditions, thereby limiting its capacity to predict cumulative drawdowns and hydraulic interactions between abstraction points. As a result, the model's predictive outputs depend on statistical reconstructions whose uncertainty cannot be quantified with sufficient confidence.

This analysis nevertheless confirms that the regional aquifer system is already experiencing measurable hydraulic stress. Historical records indicate sector-specific declining piezometric trends, with substantial cumulative drawdowns observed in several exploited wellfields. In 2024, existing groundwater abstractions across the region were estimated at approximately 155 L/s. When the projected water demands of the Atomai and El Aouj projects are included, total regional demand would increase to approximately 335.58 L/s. The Atomai project alone would require around 105.9 L/s from the Azragh sector, while the El Aouj project would generate a maximum demand of approximately 74.4 L/s, initially relying on the Touajil wellfields during the first years of operation before shifting to Aouchich for the remainder of the mine life.

According to SNIM's CIA, the acceptability threshold for groundwater availability is defined by two key conditions: first, that the rate of piezometric decline does not increase beyond the baseline trends already documented in active abstraction areas; and second, that groundwater levels remain above the minimum operational thresholds required to secure the existing water supply for the populations of Zouérate and F'Dérick.

The modelling results suggest that cumulative groundwater effects would vary spatially across the region. While some drawdown cones are expected to remain relatively localised, notably around Touajil and Aouchich, broader regional interactions cannot be excluded due to the partial hydraulic connectivity between aquifer compartments and the long duration of abstraction. The Azragh and Oued El Gah sectors appear particularly vulnerable to increasing cumulative hydraulic stress, and the wellfield sectors supporting the supply of Zouérate may struggle to maintain the groundwater levels needed to meet existing supply commitments.

On this basis, SNIM's CIA (SNIM, 2026) confirms that groundwater availability in the study region is subject to a significant cumulative impact. This issue should therefore not be considered only at the scale of the El Aouj project or its associated wellfields, but rather at the broader regional scale, accounting for existing SNIM operations, planned mining developments, social water requirements, and potential effects on groundwater-dependent ecosystems. Effective management of this impact will require coordinated action between operators, public authorities and resource users, supported by continuous monitoring of groundwater levels and abstraction flows, periodic updates of the regional hydrogeological model, and the establishment of sector-specific adaptive management thresholds.

13.2.5.1.2 Increased pressure on groundwater quality

As described in Section 12.2, the pumping tests carried out in 2007 (Golder Associates, 2007) (Golder Associates, 2014),which involved abstraction from the P2 aquifer, demonstrated a progressive deterioration of groundwater quality over time, characterised by increasing salinity levels. Additional studies further indicate that groundwater salinity varies both between hydrostratigraphic units and across geographic zones. This spatial variability reflects the structural compartmentalisation of the aquifer system induced by fault networks (TECSULT / AECOM, 2009).

Long-term and sustained groundwater abstraction from the wellfields of the Tiris Zemmour region, located within the Taoudeni Basin, may enhance the mobilisation and lateral or vertical circulation of older groundwater masses with longer residence times. Such waters can potentially show higher mineralisation, and their displacement toward production zones represents a potential risk for gradual salinity increase within actively exploited aquifers.

Certain wellfields, currently yield groundwater of sufficiently low salinity to allow its use for potable-water production with minimal treatment supplying the nearby communities (I.e. Zouérate). However, a progressive increase in salinity caused by the migration of more mineralised groundwater originating from adjacent wellfields potentially triggered by excessive or unbalanced abstraction regimes, may adversely affect the capacity of these wellfields to provide acceptable water quality to produce potable water. Such an evolution could have direct implications for the reliability of drinking-water supply.

SNIM's CIA (SNIM, 2026) confirms that the aquifers are characterised by limited recharge and that long-term changes in groundwater flow patterns may affect the quality of the water abstracted. These findings are supported by nearly two decades of hydrogeological data, together with the PRISM, Golder, URS, SRK and WSP studies, and supplemented by SNIM's operational records. The assessment includes a regional inventory of water points, a review of hydrochemical characteristics, the development of a regional conceptual model, and an evaluation of hydraulic interactions between the Azragh, Touajil and Aouchich sectors and the wellfields currently operated by SNIM.

The CIA concludes that cumulative increases in drawdown could modify groundwater flow conditions and facilitate the mobilisation of more mineralised water from specific hydrogeological units. It therefore identifies a potential risk of gradual water quality deterioration in the most intensively abstracted sectors, compounded by significant uncertainty due to the absence of a quantitative regional hydrochemical model. The assessment also notes that variations in piezometric levels could affect groundwater-dependent ecosystems and, where applicable, alter exchanges between aquifers and desert wetlands such as sebkhas.

13.2.5.1.3 Increased pressure on surface water and soil quality of the Sebkha Idjill

As mentioned in the baseline study (see section 6.6.3: catchment A) and the impact assessment (see section 12.2.2.2.2), the Sebkha Idjill forms the lowest point of a vast hydrographic basin within which several mining projects are being developed (El Aouj and ATOMAI are the closest, and Askaf on the southern edge of the watershed).

Although the climatic conditions are extremely arid (very low rainfall), the topographic configuration (very gentle slopes except in the guelbs) and the relatively significant distances between these projects and the edges of Sebkha Idjill (10 km for the El Aouj project, 5 km for ATOMAI, and over 30 km for ASKAF), Sebkha Idjill could potentially serve as a receptacle for any accidental or chronic contamination generated by these projects.

However, the risk of cumulative contamination in this sensitive area will remain low if all mining projects incorporate basic hazardous material and waste management rules and procedures into the design of their respective projects. The risk will become negligible if hazardous materials and waste are managed according to international best practices by all stakeholders, as this is the case for the El Aouj project.

SNIM's regional CIA (SNIM, 2026) identified the region's sebkhas as receptors potentially sensitive to cumulative groundwater drawdown. Beyond the contamination risks already considered in this study, the results of the regional hydrogeological modelling indicate that cumulative abstractions associated with SNIM operations, the Atomai project and the El Aouj project may modify regional hydraulic gradients, locally reduce recharge to certain sebkhas and alter interactions between groundwater and surface water. The CIA therefore

considers that cumulative impacts on certain groundwater-dependent sebkhas may be significant at the regional scale and recommends coordinated monitoring of water levels, flows and the ecological functioning of these environments.

13.2.5.1.4 Degradation of air quality

SNIM's regional CIA (SNIM, 2026) evaluates cumulative air quality impacts using regional dispersion modelling that integrates emissions from existing SNIM operations, the El Aouj and Atomai projects, and their associated infrastructure. The assessment considers concentrations of PM_{10}, $PM_{2.5}$, NO_2 and SO_2 and compares the predicted results against World Health Organization air quality guideline values. Overall, the modelling indicates that cumulative concentrations of particulate matter and NO_2 are expected to remain broadly aligned with the applicable guideline thresholds, although the regional baseline is strongly influenced by naturally elevated desert dust levels. By contrast, occasional exceedances of WHO guideline values for SO_2 may occur in scenarios involving the use of high-sulphur fuels. On this basis, the CIA concludes that air quality is unlikely to constitute a major regional cumulative impact, provided that the planned emission control measures are effectively implemented and that lower-sulphur fuels are used where required.

13.2.5.1.5 Increase of GHG emissions

Greenhouse gas (GHG) emissions represent an inherently cumulative impact, as their contribution to climate change is global and independent of the location in which they are generated. SNIM's regional CIA (SNIM, 2026) assesses Scope 1 and Scope 2 emissions from existing SNIM operations, the Atomai project and the El Aouj project on a combined basis. Current emissions from SNIM operations are estimated at 540,731 tCO_2e/year, while projected emissions from the Atomai project are estimated at 1,126,652 tCO_2e/year. Based on the El Aouj ESIA, annual emissions from the El Aouj project are estimated at 497,825 tCO_2e/year, primarily linked to the site power plant, fuel use by mining equipment and freight transport. Taken together, the three operations would generate approximately 2,165,208 tCO_2e/year, equivalent to around 11.2% of Mauritania's national emissions in 2024. Within this cumulative total, the Atomai project would represent approximately 52.0% of emissions, existing SNIM operations 25.0%, and the El Aouj project 23.0%. According to the reference framework used in the CIA Emissions from the El Aouj project account for approximately 2.6% of Mauritania's national emissions.

This cumulative contribution is potentially significant, particularly in light of Mauritania's Nationally Determined Contribution (NDC), which commits the country to reducing GHG emissions by 11% by 2030 compared with the business-as-usual scenario. Decarbonisation efforts by existing SNIM operations and by the Atomai and El Aouj projects will therefore be important to supporting the achievement of this national target.

Table 13-4: Breakdown of annual GHG emissions from SNIM activities and the ATOMAI and El Aouj projects (from CIA 2026 and calculated GHG for El Aouj Project (see section 12.2.1.4)

Source	Annual emissions (tCO2e/year)	Share of national emissions
Existing SNIM operations	540 731	2,8 %
Atomai	1 126 652	5,8 %
El Aouj	497 825	2,6 %
Cumulative total	2 162 383	11,2 %

13.2.5.1.6 Recommendations to address cumulative impact to environmental VECs

- **Increased pressure on water resources**: It is recommended to develop a numerically robust and fully parameterized hydrogeological model integrating *all* available datasets for both currently exploited wellfields and planned wellfields. This model should incorporate the complete geological, hydrostratigraphic, hydrodynamic, and piezometric information, as well as the time series of historical abstractions and monitoring data (water levels, flow rates, and, where available, water quality parameters).

  Once calibrated—using standard procedures such as steady-state and transient calibration, sensitivity analysis, and uncertainty quantification—the model should be used to integrate all projected groundwater abstraction scenarios. This will allow the assessment of the cumulative impacts of concurrent withdrawals on groundwater levels and aquifer behaviour, the identification of potential drawdown interference zones, and the verification of whether the available groundwater resource is adequate to meet the demands of all ongoing and future projects.

  The model should simulate the evolution of aquifer systems under multiple pumping scenarios reflecting projected future water demands. Such simulations must also evaluate alternative groundwater-allocation strategies aimed at achieving long-term sustainable groundwater management, including optimising spatial distribution of pumping, limiting critical drawdowns, reducing hydraulic impacts on neighbouring wellfields, and preserving strategic aquifer reserves.

- **Increase pressured on groundwater quality**: it is recommended to implement a continuous groundwater-monitoring programme covering all wellfields. This should rely on automatic pressure transducers and flow meters installed in strategically selected production and observation wells, in order to ensure uninterrupted high-frequency measurements and facilitate robust long-term trend analysis. The systematic integration of these monitoring data into a centralized and quality-controlled hydrogeological database would significantly improve operational water-resource management, enhance early-warning capabilities, and support periodic updating and recalibration of the hydrogeological model.

- **Increased pressured on surface water and soil quality of the Sebkha Idjill**: it is recommended that:

  - hazardous materials and waste management plans as well as emergency and response plans of Atomai and El Aouj are developed and fully implemented according to national regulations and international standards;

  - coordinated monitoring of water levels, flows and the ecological functioning of the Sebkha Idjill are developed before the start of the construction activities and until the end of the mining activities.

- **Degradation of air quality**: to effectively manage potential cumulative impacts on regional air quality, the project should implement a combination of preventive and monitoring measures. These should include strict control of fuel quality, with particular attention to the use of lower-sulphur fuels where required, in order to limit SO_2 emissions. In parallel, a regional air quality monitoring programme should be implemented to verify actual concentrations of key pollutants, including particulate matter and nitrogen dioxide, assess the effectiveness of emission control measures, and support adaptive management where monitoring results indicate emerging risks or exceedances.

- **Increase of GHG emissions**: GHG emissions should be managed through coordinated action between operators, with a focus on improving energy efficiency, reducing reliance on fossil fuels, monitoring emissions, progressively integrating lower-carbon energy sources, and aligning project-level mitigation measures with Mauritania's national emissions reduction pathway.

13.2.5.2 Cumulative Impacts on Social VECs

Residual social impacts with moderate or high significance were carried forward in the assessment of cumulative impacts. These included:

- The reduction of access to water resources and grazing land affecting pastoralism and natural resource-based livelihoods.
- The increase in demand for basic social infrastructure and services (water supply, healthcare, housing) driven by population growth and project-induced in-migration.
- The increase in risks to community health associated with environmental exposure and pressure on healthcare systems.
- The increase in risks to community safety associated with transport activities (rail and road) and interaction with industrial infrastructure.
- The potential deterioration of social acceptability and community perception linked to resource competition and perceived inequities in benefit sharing.

13.2.5.2.1 Reduction of access to water resources and grazing land affecting pastoralism and livelihoods

There are currently multiple operating mines in the Tiris Zemmour Region, and several additional mining projects including El Aouj are planned for development. Although the exact spatial extent of all planned developments is not fully defined, it can be reasonably assumed that future open-pit mining operations and associated infrastructure will result in land take and groundwater abstraction of a similar nature and scale to the El Aouj Project.

Cumulative impacts on groundwater resources, as described in Section 13.2.5.1.1, are expected to result in regional drawdown of aquifer units and potential changes in water availability. Given that groundwater constitutes a critical resource for livestock watering and pastoral survival in this arid environment, any reduction in availability may directly affect pastoral systems. Reduced access to water points may increase travel distances for herders and livestock, leading to increased pressure on remaining accessible resources.

In addition, the expansion of mining areas, rail infrastructure, and associated facilities may contribute to the fragmentation of grazing lands and disruption of traditional transhumance routes. These impacts are likely to be compounded by existing pressures, including desertification, climatic variability, and increasing competition for land use.

As one of several planned mining developments in the region, the El Aouj Project would contribute incrementally to these cumulative pressures on pastoralism and livelihoods.

The recent SNIM's regional CIA (SNIM, 2026) provides additional regional information on land-based livelihoods and cumulative pressures affecting pastoralism in the Tiris Zemmour region. It records approximately 700 individuals engaged in pastoralist activities in Zouerate and 500 in F'Derik, with livestock numbers of approximately 100,000 camels and 75,000 small ruminants. It also notes that numbers of livestock keepers fluctuate widely depending on rainfall and the subsequent availability of grazing resources.

13.2.5.2.2 Increase in demand for basic social infrastructure and services

The development of multiple mining projects in the Tiris Zemmour region is expected to result in a sustained increase in population levels, driven by workforce requirements and associated economic opportunities. This population growth will generate additional demand for essential services, including water supply, healthcare, housing, sanitation, and education.

The recent SNIM's regional CIA (SNIM, 2026) provides a more detailed assessment of cumulative project-induced in-migration and resulting pressure on social infrastructure. Population trends show that Zouerate increased by almost 40% between 2013 and 2023 (approximately 3.1% growth per year), while the population of F'Derik more than doubled over the same period. Both El Aouj and Atomai are expected to employ up to around 2,000 workers, most of whom would be accommodated in dedicated camps with on-site medical facilities and welfare services, thereby limiting their direct reliance on municipal education and health systems.

The main pathway for cumulative pressure is the expected influx of job seekers, informal workers and dependants attracted by project-related economic opportunities. For El Aouj, multiplier effects are estimated at between one and five additional economic migrants per job. Additional pressure may arise from the approximately 880 new dwellings planned at F'Derik as part of "El Aouj City"; while associated social infrastructure is planned, population growth beyond planned housing capacity and the arrival of non-project-affiliated migrants may increase demand on existing municipal schools and public health facilities.

Cumulative impacts on groundwater resources, particularly those affecting water quantity and quality, may further constrain the capacity of existing water supply systems serving urban centres such as Zouerate and F'Derick. Progressive drawdown of aquifers and potential increases in salinity may reduce the reliability of potable water supply, particularly where treatment capacity is limited.

Existing infrastructure in the region is already constrained, and cumulative increases in demand from multiple projects may lead to overloading of services, reduced service quality, and unequal access to basic infrastructure. Informal or unplanned settlement growth associated with in-migration may further exacerbate these pressures.

The regional CIA further notes that water supply and sanitation systems in Zouerate and F'Derik already operate under strain, with limited production capacity, ageing infrastructure and variable household access to safe water and sanitation. Secondary population growth associated with multiplier economic effects and the arrival of non-project-affiliated job seekers and dependants is identified as the primary pathway for cumulative pressure on municipal education and health services.

While individual mining projects may contribute to infrastructure development through targeted investments, these contributions may not fully offset cumulative demand at the regional level. The El Aouj Project contributes incrementally to these pressures as part of broader regional development.

13.2.5.2.3 Increase in risks to community health

Cumulative impacts on community health are associated with both environmental changes and demographic pressures resulting from multiple mining developments in the region.

Changes in groundwater quality, including potential increases in salinity as described in Section 13.2.5.1.2, may affect the suitability of water for potable use. In areas where groundwater is the primary source of drinking water, this may have implications for public health, particularly if alternative water sources or treatment options are limited.

In addition, population growth associated with multiple projects may increase the demand for healthcare services and contribute to the spread of communicable diseases, particularly in areas experiencing rapid or

unplanned expansion. Increased interaction between communities and incoming workers may also introduce new health risks.

The recent SNIM's regional CIA (SNIM, 2026) provides further information on the existing sensitivity of health services. Health facilities face chronic staff and medicine shortages, particularly outside Zouerate, which is the only town with specialist services such as dentistry and ultrasounds. In F'Derik, reported constraints include difficulties attracting and retaining qualified healthcare workers, medicine supplies reportedly covering only 5–10% of requirements, non-operational laboratory equipment and inadequate capacity to treat serious polytraumatic injuries.

Exposure to environmental stressors, including dust and noise generated by multiple operations, may further contribute to cumulative health impacts, particularly for sensitive population groups.

The Project's contribution to these cumulative effects is incremental, but it forms part of a broader regional trend of increasing pressures on community health systems.

13.2.5.2.4 Increase in risks to community safety

The addition of multiple mining projects and associated infrastructure will result in increased transport activity across the region, including both rail and road traffic associated with the movement of materials, equipment, and personnel.

Together, these activities are expected to increase the risk of traffic accidents involving community members and livestock. The expansion of rail infrastructure may also introduce new safety risks, particularly at crossing points and in areas where traditional movement patterns intersect with transport corridors.

The recent SNIM's regional CIA (SNIM, 2026) also identifies noise, traffic and railway safety risks among the community health, safety and wellbeing concerns raised by regional and local stakeholders.

In remote areas where infrastructure is limited, increased interaction between communities and industrial operations may further elevate safety risks. These may include accidental encounters with heavy machinery, restricted access areas, or operational hazards.

The cumulative nature of these impacts arises from the combined effect of multiple projects contributing to increased traffic volumes and expanded infrastructure networks. As one of several planned developments, the El Aouj Project contributes incrementally to these cumulative risks.

In addition, cumulative increases in transport activity associated with the Project and other regional developments further contribute to community safety risks. Although the Project will result in an increased traffic of machines, trucks and vehicles and workforce transport during the construction phase, the impact on traffic during the operation phase is expected to be limited. Nevertheless, high numbers of pedestrians/cyclists/motorbike on the roads combined with limited road traffic awareness, increased cumulative levels of heavy machinery from surrounding developments, and poor road conditions will increase the risk of traffic accidents on transportation networks, and an additive cumulative impact on social VECs in the CIA study area is likely.

From a cumulative perspective, while the upgraded railway enables higher levels of mining activity and associated rail traffic, it also functions as a regional mitigation measure by reducing capacity constraints, limiting unplanned modal shifts to road transport, and strengthening safety and environmental controls along the corridor.

13.2.5.2.5 Changes in social acceptability and community perception

Cumulative impacts on natural resources, livelihoods, and access to services are expected to influence community perceptions of mining developments across the region.

In particular, competition for water resources, especially where groundwater availability or quality declines, may increase community concerns. Perceived inequities in the distribution of economic benefits, employment opportunities, and infrastructure investments across multiple projects may also contribute to dissatisfaction or tension within affected communities.

Stakeholder consultation reported in SNIM's regional CIA (SNIM, 2026) identified pressure on social infrastructure linked to population influx and "perceived territorial inequities in benefit distribution along the mining corridor". Concerns raised by project-affected communities also included impacts on pastoralism and grazing areas, persistent unemployment, limited tangible economic benefits for communities and requests for local prioritisation in employment opportunities.

The regional assessment also identifies unmet employment expectations and cost-of-living pressures as potential sources of community concern. It notes that a lack of clear communication regarding recruitment and employment timing may lead to grievances, while workforce presence and PIIM may increase demand for housing, water, food and other essential goods and services, contributing to upward pressure on prices where demand increases more rapidly than local supply.

At the same time, mining developments may generate positive perceptions where tangible benefits are realised, including employment, improved infrastructure, and increased economic activity. The balance between positive and negative perceptions is likely to vary across communities depending on local conditions and levels of impact.

The cumulative outcome will depend on how impacts are managed collectively by operators, and how effectively stakeholders are engaged. As one of several projects in the region, the El Aouj Project contributes incrementally to these evolving social dynamics.

13.2.5.2.6 Recommendations to address cumulative impact on social VECs

Effective management of cumulative social impacts requires a regional approach, and collaboration among different actors. Coordinated and complementary efforts by project proponents, SNIM, local authorities, and government institutions will be required.

The following are measures proposed to address key cumulative impacts on social VECs:

- **Reduction of access to water resources and grazing land affecting pastoralism and livelihoods:** EMC and other mining companies operating in the Tiris Zemmour region should establish a framework for working collaboratively on the management of cumulative impacts on pastoralism and natural resource-based livelihoods. This framework should focus on maintaining access to key grazing areas and water resources, and on preserving transhumance routes that may be affected by mining activities and associated infrastructure. Initiatives may include coordinated planning of land use, identification and protection of priority livestock corridors, and development of shared water access points for pastoral communities. Engagement with local stakeholders should be undertaken to ensure that traditional land use practices are adequately considered. Such coordinated efforts would contribute to maintaining livelihood resilience under increasing cumulative pressure.
- **Increase in demand for basic social infrastructure and services:** Project proponents should coordinate with regional and national authorities to support the planning and development of basic social infrastructure and services in line with cumulative demand. This includes water supply systems, healthcare facilities, housing, sanitation, and education infrastructure. A coordinated approach would help ensure that investments are aligned with projected population growth associated with multiple developments. Collaboration among operators may also improve efficiency and reduce the risk of service gaps or

duplication of efforts. Supporting integrated regional planning would help manage cumulative pressures on infrastructure and improve access to essential services for affected communities.

- **Increase in risks to community health:** EMC and other project proponents should support the establishment of a regional programme to monitor and manage cumulative impacts on community health. This programme should focus on tracking key indicators related to water quality, environmental exposure (e.g., dust), and population dynamics. Particular attention should be given to potential impacts linked to changes in groundwater quality and availability. Coordination with public health authorities will be essential to strengthen healthcare capacity and ensure adequate service provision. A collaborative approach across operators would improve the understanding of cumulative health trends and support targeted mitigation measures, enhancing the effectiveness of health management at regional scale**.**
- **Increase in risks to community safety:** SNIM should coordinate the development of a regional approach to manage cumulative risks to community safety associated with increased transport activity and industrial presence. This may include coordinated traffic management measures, improvements to safety infrastructure along key transport corridors, and awareness programmes for local communities. Particular attention should be given to rail crossings and areas where transport infrastructure intersects with community movement routes. Collaboration among project proponents would ensure consistency in safety measures and improve their effectiveness in addressing cumulative risks arising from multiple developments**.**
- **Changes in social acceptability and community perception:** Project proponents should establish a coordinated stakeholder engagement framework at the regional level to address cumulative impacts on social acceptability and community perception. This framework should facilitate information sharing, improve transparency, and support consistent communication with affected communities. It may also include alignment of grievance mechanisms and monitoring of community concerns across projects. Particular attention should be given to issues related to resource competition, access to services, and distribution of project benefits. A coordinated approach would help build trust and reduce the risk of cumulative social tensions associated with multiple developments.

13.2.5.3 Cumulative Impacts on Cultural Heritage VECs

Residual cultural heritage impacts with moderate or low significance identified in Chapter 12.0 were carried forward in the assessment of cumulative impacts. These included:

- The potential disturbance or loss of tangible cultural heritage (archaeological remains);
- The potential disturbance of intangible cultural heritage linked to land use and traditional practices;
- Changes to the setting and perception of cultural heritage within the landscape

13.2.5.3.1 Disturbance or loss of tangible cultural heritage

There are currently multiple operating and planned mining projects in the Tiris Zemmour Region, which together will result in increased land disturbance associated with open-pit mining, infrastructure development, and transport corridors. Although known cultural heritage sites are limited within the Project Area of Influence, the cumulative expansion of mining activities may increase the likelihood of encountering previously unidentified archaeological remains.

The progressive disturbance of land across multiple projects may elevate the risk of accidental damage to cultural heritage resources, particularly in areas that have not been comprehensively surveyed. Increased accessibility due to roads and infrastructure may also contribute to indirect impacts, such as unauthorized collection or disturbance of artefacts.

However, the implementation of project-level mitigation measures, including pre-construction surveys and chance find procedures, reduces the likelihood of significant residual impacts. As one of several planned developments in the region, the El Aouj Project would contribute incrementally to cumulative impacts on tangible cultural heritage.

13.2.5.3.2 Disturbance of intangible cultural heritage

Cumulative development in the region may influence traditional practices linked to land use, pastoral mobility, and the use of natural resources. Changes in access to land and water resources, as described for social VECs, may indirectly affect the continuity of certain cultural practices associated with pastoralism and local ways of life.

The recent SNIM's regional CIA (SNIM, 2026) provides additional regional context on pastoral land use and associated pressures. It records approximately 700 individuals engaged in pastoralist activities in Zouerate and 500 in F'Derik, with livestock numbers of approximately 100,000 camels and 75,000 small ruminants, and notes that livestock numbers fluctuate widely depending on rainfall and the subsequent availability of grazing resources. Stakeholder engagement undertaken for the regional CIA also identified concerns regarding impacts on pastoralism and grazing areas.

Increased industrial activity and the presence of a larger workforce may also alter the social environment in which cultural practices are maintained. These changes may influence how cultural traditions are practiced or transmitted, particularly where access to traditional lands becomes more constrained.

However, given the relatively low population density and the nature of cultural practices in the region, cumulative impacts on intangible cultural heritage are expected to remain limited. The Project contributes incrementally to these broader regional changes.

13.2.5.3.3 Changes to the setting and perception of cultural heritage

The development of multiple mining projects and associated infrastructure may progressively alter the visual and cultural landscape of the Tiris Zemmour region. These changes may affect the setting in which cultural heritage is experienced, particularly in areas of cultural or historical significance.

The expansion of mine sites, transport infrastructure, and associated facilities may introduce new visual elements into the landscape, potentially affecting the perception of remoteness or cultural value in certain areas. These effects are cumulative in nature, as each additional project contributes incrementally to landscape transformation.

However, given the limited number of identified cultural heritage receptors and their distribution within the region, these changes are not expected to result in significant cumulative impacts. The El Aouj Project contributes incrementally to these changes in landscape character.

13.2.5.3.4 Recommendations to address cumulative impacts on Cultural Heritage VECs

Effective management of cumulative impacts on cultural heritage requires a coordinated approach among project proponents and relevant authorities. The following measures are proposed to address key cumulative impacts:

- **Disturbance or loss of tangible cultural heritage** : EMC and other mining companies operating in the Tiris Zemmour region should coordinate the implementation of Cultural Heritage Management Plan across projects. This should include alignment of chance find procedure and sharing of information on identified archaeological resources. Establishing a regional approach to cultural heritage management would improve the identification and protection of previously undocumented sites and reduce the risk of cumulative impacts associated with multiple developments.

- **Disturbance of intangible cultural heritage**: Project proponents should engage with local communities to better understand cultural practices linked to land use, mobility, and resource access. This engagement should inform project planning and cumulative impact management to ensure that intangible cultural heritage is appropriately considered. A coordinated approach across projects would help maintain continuity of cultural practices under changing regional conditions.
- **Changes to the setting and perception of cultural heritage**: Project proponents should consider cumulative landscape changes in project design and planning, particularly in areas of potential cultural significance. Coordination among operators may help manage visual impacts at a regional scale and reduce cumulative effects on the perception of cultural landscapes.

13.2.5.4 Cumulative Impacts on Biological VECs

Residual biological impacts with moderate or high significance were carried forward in the assessment of cumulative impacts. These included:

- The loss, degradation and fragmentation of natural habitats and flora at the mine site.
- The loss of fauna habitat and disturbance of fauna at the mine (birds), the degradation of fauna habitat and disturbance of fauna at the port (birds), and the increase in vessel-fauna collision risk at the port (marine mammals).
- The degradation of marine critical habitats in Cap Blanc Integral Reserve (KBA/IBA), Cap Blanc Satellite Reserve (legally protected area), and Dakhla Area (KBA/IBA and proposed legally protected area) at the port.

Notable Potential Cumulative Impacts Not Assessed for Biological VECs

It is acknowledged that existing projects and reasonably foreseeable developments could combine to generate important effects in legally protected areas or internationally recognized areas that are not listed above, namely in Baie de l'Étoile, Banc d'Arguin National Park, and Canary Current Shelf Break North KBA/IBA. In these areas, the impact assessment for the El Aouj Project (Chapter 12) determined that Project activities would result in residual impacts of low significance and uncertain likelihood. Accordingly, the Project's contribution to cumulative impacts within these sites would be incrementally small, and unlikely to be represent material risks. In Baie de l'Étoile and Banc d'Arguin National Park, the Project would contribute indirect potential effects from the risk of introducing invasive species and the risk of accidental pollution incidents. In Canary Current Shelf Break North KBA/IBA, the Project would contribute about one vessel return transit per week, and possibly fewer depending on individual navigation routes (i.e., whether the vessel approaches and leaves to/from the north or south of Baie du Lévrier).

Similarly, existing projects and reasonably foreseeable developments could combine to generate important underwater noise effects, with potentially important impacts for marine mammals. In particular, noise from regular vessel traffic, periodic dredging activities, and temporary construction noise (notably from pile driving) can disrupt marine fauna habitat use, movement and activity patterns. The Project's contribution to these cumulative effects is incrementally small, corresponding to approximately one ocean going vessel transit to and from the port each week.

13.2.5.4.1 Loss, degradation and fragmentation of natural habitats and flora at the mine site

There are currently six operating mines in the Tiris Zemmour Region, and four additional mines (including El Aouj) are planned for development in the region. The exact footprints for these planned developments are not known; however, it can be assumed that their open pit mining operations would result in natural habitat conversion of similar spatial scale to the El Aouj Mine Project. Given the types and distribution of natural habitats

in the region, land conversion is expected to mainly include the loss and fragmentation of regs, guelbs (where ore bodies are typically concentrated) and wadis. Although these habitat types are widely distributed throughout the region and more broadly across North Africa, the potential effects of losing vegetated natural habitats are of greatest concern. Flora resources are already under threat from livestock grazing pressure and desertification effects linked to climate change and increased frequency and intensity of droughts. Habitat loss from future developments would add to these existing pressures.

Planned development will also add new point source air emissions, mainly by generating particulate matter that can degrade the quality of surrounding habitat from increased dust deposition. Increased dust deposition may have limited effects on the region's vegetation because most native desert plants are adapted to such conditions, providing them with a natural resilience to dust impacts.

New linear infrastructure, including transmission lines, rail spurs, pipelines, and access roads will contribute to landscape fragmentation; however, the magnitude of these effects on vegetation and flora may be limited as the habitats affected are open and sparsely vegetated. In addition, pipelines proposed as part of the El Aouj Project will be buried, which will limit long-term fragmentation impacts. Given the landscape context and the types of linear features proposed, limited edge effects are expected.

The long-term cumulative effects of current and planned developments will depend, in part, on the extent and success of natural habitat restoration following the decommissioning of large-scale mining. The return of natural vegetation remains highly uncertain, even with active restoration measures, as local conditions are challenging for the re-establishment of vegetation. The loss of trees, including legally protected species, could represent permanent losses if restoration efforts are unable to re-establish self-sustaining trees on the arid landscape. These losses could have disproportionate effects on local biodiversity as trees help stabilize the soil and protect against erosion, they provide microclimate conditions (e.g., shade, soil fertility) that allows smaller plants to establish around them, and they provide valuable habitat and resources for desert fauna.

As one of four proposed mining projects in the region, the El Aouj Mining Project would contribute about a quarter of future cumulative impacts on natural habitats in the region.

13.2.5.4.2 Loss of fauna habitat and disturbance of avifauna at the mine

Despite limited vegetation cover and water availability, baseline surveys confirmed the presence of a diverse assemblage of avifauna in the mine region. The conversion of natural habitat, as described above, will reduce the amount of suitable habitats available for birds in the region. The conversion, attributable mainly to mining projects, will reduce the availability of resources for foraging, nesting, and resting. As a result, the planned developments would cause localized changes in the distribution and abundance of birds across the region, though known hotpots, such as the area around the F'Derik dam, are likely to remain unchanged.

The expansion of supporting mine infrastructure, including power generation and transmission, increases the risk of avian mortality from collisions with transmission lines, solar panels, buildings, and other physical structures. Impacts would primarily affect resident bird populations as the region is not known to support important concentrations of migratory species. Larger species, such as vultures and other birds of prey, would be most vulnerable to collision with transmission lines. Avian mortality monitoring data are not available in the region, precluding estimates of potential avifauna mortality rates. This constitutes a key uncertainty in the understanding of cumulative effects on the region's avifauna.

Lastly, the planned developments will each require large construction and operation workforces. Given the remote location of the mining area and the relatively low density of human settlements, the foreseeable developments are expected to result in a large increase in the number of workers present, and potentially an important unplanned influx of people. According to SNIM's cumulative effects assessment (RSK, 2026),

approximately 4,000 workers are expected during the construction of the El Aouj and Atomai mines. In addition, the 2015 ESIA (URS, 2025) predicted that for each new job created, one to five additional people could migrate to the area (i.e., economic migrants). This could add considerably to the in-migration estimates. The risk natural habitat loss from land conversion is possible if vegetated areas are targeted by newcomers. The influx of people is more likely to result in habitat degradation, especially if domestic waste is not managed in an environmentally responsible way (see Figure 13-8). As described in Chapter 8 (Section 8.4.6), occasional hunting is practised in the mine area, but it does not constitute a primary livelihood in this zone due to the harsh climate and low vegetation cover. As summarized in Chapter 7 (Section 7.5.9), the mine area has few mammal and reptile species and those that do occur in the region are present in low densities. Avifauna is the most abundant and diverse taxonomic group in the Mine area. Population influx could increase mortality risk for birds if they are hunted, poached, or persecuted. Given the regional context, hunting or poaching are more likely to constitute opportunistic occurrences rather than targeted harvest efforts.

As one of four proposed mining projects in the region, the El Aouj Mining Project would contribute about a quarter of future cumulative impacts on birds in the region.

13.2.5.4.3 Loss and degradation of habitat and disturbance and displacement of fauna in Kediet ej Jill KBA/IBA

Kediet ej Jill KBA/IBA can be separated into two distinct ecological sectors, the core sector which is made up of rocky guelb habitat and the lowland sector, which includes Sebkha Idjill and other lowland habitats typical of the region (primarily regs). As described in the biological baseline (Chapter 7, Section 7.5.1), none of the fauna species triggering the IBA criteria met the criteria for critical habitat screening – all are resident species with global conservation status of LC or NT.

Habitat availability and quality within the core area of the KBA is currently affected by four operational mines, including Tazadit, Rouessa, F'Dérick, and TO-14 mines (Figure 13-6). Habitat conversion and dust deposition are the main impact factors affecting the guelb, although the impacts of conversion and dust deposition on vegetation assemblages are assumed to be limited owing the limited vegetation cover in the core area of the KBA (Figure 13-7). Mineral extraction and transport activities associated with these mines would also cause sensory disturbance to nearby fauna that use the rocky guelb. Human activity around the periphery of the guelb may also contribute to sensory disturbance in the core area, including from train traffic and vehicle traffic. Future disturbance in the core area of the KBA is anticipated to be from expansion of ongoing mining. The risk of increased hunting and poaching activity in the core area of the KBA from increased population/workforce in the region is considered low as the rocky guelb is largely inaccessible. Although access is possible on foot, it is associated with considerable health and safety risks owing to the steep terrain and exposure to extreme heat, which is exacerbated by the presence of dark coloured rock formations (absorbs heat) and absence of features that provide shade. The El Aouj Project is not expected to contribute to direct or indirect effects to habitats or fauna within the core area of the KBA.

The lowland sector of the KBA includes the town of F'Dérik, the national roadway (N1), and the existing SNIM railway. These are the main sources of habitat conversion, habitat degradation and sources of fragmentation within the KBA. However, the stark topographical contrast between the guelb and lowland habitats within the KBA contributes some natural fragmentation for non-avian fauna. Sebkha Idjill, located in the western portion of the KBA is affected by ongoing salt extraction activities as detailed in Chapter 8 (Section 8.4.7.7). These are expected to continue in the future, but with limited effects on the KBA's fauna and flora given they are largely absent from the Sebhka. Future development in the region is likely to increase the amount of sensory disturbance associated with the existing infrastructure in the lowland areas of the KBA. In particular, F'Derik will become more densely populated, the local roadways will have more vehicle traffic, and the existing SNIM rail line will see an increase in rail traffic.

Mining developments will add linear infrastructure, including localized transmission lines, access roads, pipelines, and rail spurs. These may fragment fauna habitat, but the open and sparely vegetated nature of habitats affected should considerably limit edge effects. Transmission lines can pose collision and electrocution risks for avifauna; however, most of this infrastructure is expected to be outside the KBA and the lines are expected to be highly visible in open habitats. Nonetheless, avifauna that trigger the KBA criteria could be at higher risk of mortality, notably the Nubian bustard (Neotis nuba; NT) because it is a large-bodied bird, has limited frontal vision and frequently flies at the height of transmission conductors.

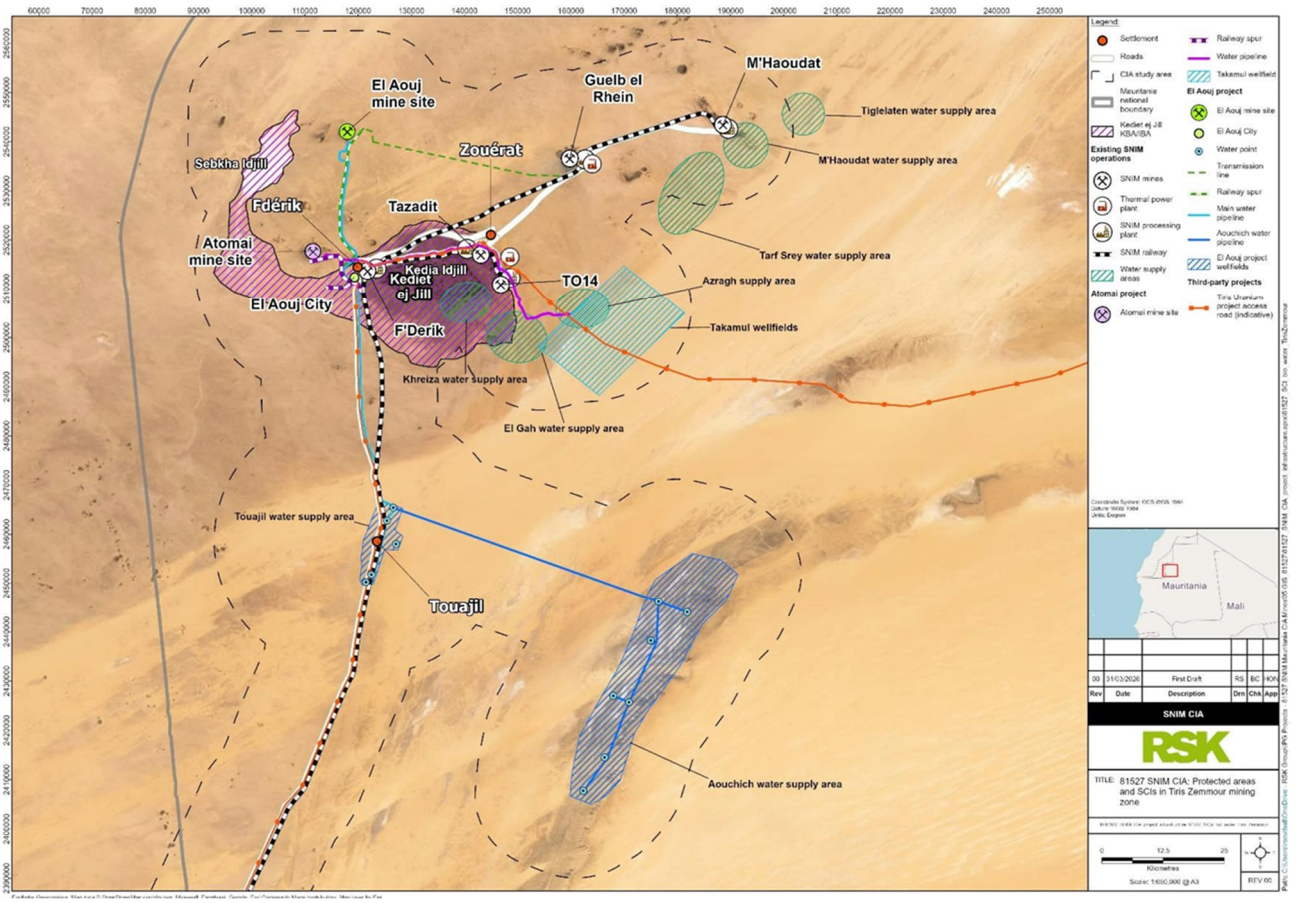


Figure 13-6: Sources of cumulative impacts in Proximity to the Kediet ej Jill KBA (Source: RSK, 2026). Note that the alignment of the green transmission line illustrated in the map is no longer proposed as a revised alignment now follows the road between the El Aouj Mine and the town of F'Dérik.

Figure 13-7: Kediet ej Jill KBA/IBA with sparsely vegetated lowland area in the foreground and core guelb area in the background.

Figure 13-8: Example of Poorly Managed Household Waste Around Inhabited Areas.

13.2.5.4.4 Degradation of terrestrial fauna habitat and disturbance of fauna at the port

The addition of multiple new mines serviced by the mineral port will increase the level of onshore activities, namely the number of trains arriving and departing and the volume of ore handled, processed, and loaded onto vessels. Together these activities are expected to further increase dust emissions and deposition, and noise levels. These activities may reduce the quality of bird habitat in proximity to the port and may elicit avoidance behaviour in more sensitive species. The extent to which these activities will affect critical habitat qualifying species (grey plover and Sandwich tern) is uncertain as their presence near the mineral port is uncertain but

suitable habitats exist along the coastline of Ras Nouadhibou (i.e., mudflats, saltmarshes, sandflats, beaches, bays and estuaries).

The potential change in marine habitat quality (see description in Section 13.2.5.8.5) may also alter the availability and/or distribution of marine food resources for birds that feed on marine organisms. This includes potential effects on the critical habitat qualifying species. Grey plover feeds on marine polychaete worms, molluscs and crustaceans and Sandwich tern feeds on surface-dwelling marine fish, small shrimps, and marine worms.

13.2.5.4.5 Increase in vessel-fauna collision risk at the port

The Project will increase the number of vessels entering Baie du Lévrier by 55 vessels per year. In 2025, the mineral port operated by SNIM received 99 vessels. Commercial and fishing vessels also transit through Baie du Lévrier to access the Port of Nouadhibou, which is a commercial and fishing hub. The number of vessels accessing the Port of Nouadhibou is uncertain, but much higher than that of the smaller, more specialized mineral port. Additional vessel traffic in Baie du Lévrier is expected from the Askaf Iron Ore Project, Tizerghaf Project, and Atomai Project. The number of vessels needed to ship the expected volume of ore from these three additional projects is uncertain but is likely fewer vessels for each individual project (relative to El Aouj), based on the projected annual production of ore.

Together, the four proposed mines will increase large vessel traffic in Baie du Lévrier. The area is already busy with commercial vessels, fishing fleets, and artisanal fishing boats (“pirogues”), though the latter do not pose a substantial risk for marine mammals due to their smaller size. Movement of marine mammals across the navigation channel will become riskier as marine traffic increases. Juvenile seals may be at higher risk of collisions as they tend to make more movements from the western side of Ras Nouadhibou (in Western Sahara) to the east side of the peninsula to reach Baie de l’Etoile.

The Project’s contribution to marine traffic is relatively small (55 vessels/year), nonetheless it contributes to a regional trend of increased vessel traffic. Cumulatively, vessel traffic in Baie du Lévrier poses an important risk to marine mammals because each mortality event represents an important loss for local populations.

13.2.5.4.6 Degradation of marine critical habitats in Cap Blanc Integral Reserve, Cap Blanc Satellite Reserve, and Dakhla Area

In combination, activities from existing and proposed developments at the mineral port (SNIM) and at the commercial Port of Nouadhibou will increase the risk of marine habitat degradation in the Cap Blanc reserves and Dahkla Area. In particular, the introduction of alien invasive species could cause substantial ecosystem degradation within these designated areas, with detrimental effects on a suite of sensitive species, including species with critical habitat.

Increased vessel traffic also increases the risk of accidental or intentional pollution events, with negative effects on water and sediment quality. Although a single localized incident is unlikely to cause long-term measurable change, the continuous presence of multiple vessels moving through the navigation channel and anchored in mooring areas has the potential to cause more important changes in habitat quality. These changes could include altered water quality, altered sediment quality, and reduced habitat suitability for sensitive species due to increased sensory disturbance (i.e., more underwater noise and lights).

Lastly, periodic dredging of the navigation channel is required to ensure port access for larger vessels. Each dredging event contributes to short-term increases in turbidity and physical disturbance of the benthic habitat. These activities would periodically disturb demersal fish and alter the distribution of benthic organisms.

In combination, the above changes would result in degraded conditions in the Cap Blanc Integral Reserve, Cap Blanc Satellite Reserve, and Dakhla Area KBA/IBA. The changes could alter the distribution and abundance of

marine fauna, and change the availability of prey, including for critical habitat qualifying species such as monk seal and blackspotted smoothhound.

13.2.5.4.7 Recommendations to address cumulative impact to biological VECs

Effective management of cumulative effects on biodiversity requires a regional approach, and collaboration among different actors. Coordinated and complementary efforts by project proponents, SNIM, the Port Authority for the Nouadhibou Autonomous Port, and government agencies and institutions will be required. The following are measures proposed to address key cumulative impacts on biodiversity:

- **Natural Habitat Loss in Tiris Zemour**. EMC and other mining companies operating in Tiris Zemmour should establish a framework for working collaboratively on habitat restoration initiatives so that learnings can be shared across the region. The ultimate objective would be to increase the success of restoration and mine closure across the region. Other initiatives may be considered under this framework, such as coordinated restoration efforts to deliver joint natural habitat gains.
- **Loss of fauna habitat and disturbance of fauna at the mine and in Kediet ej Jill KBA/IBA.** SNIM should coordinate the establishment of a regional program to monitor avifauna populations across Tiris Zemmour. Biomonitoring efforts should be conducted by an independent, suitably qualified organization with support from developers/project proponents in the region. Focal areas should include monitoring of raptor populations and monitoring in understudied Important Bird Areas across the region (i.e., Kediet ej Jill and El Ghallâouîya).
- **Disturbance of terrestrial fauna (critical habitat qualifying species).** SNIM should coordinate the establishment of an avifauna monitoring program near the mineral port. Consider if the program could be an extension of an ongoing bird monitoring program led by the Institut Mauritanien de Recherche Océanographique et des Pêches (IMROP) on Ras Nouadhibou (focused mainly in the Cap Blanc Satellite Reserve). EMC and other users of the mineral port would support biomonitoring efforts in exchange for access to data. Surveys should aim to establish existing conditions around the mineral port, prior to the increase in production/export of ore. Monitoring should continue during the El Aouj Project operation as the mineral port activities continue to increase. Surveys should target critical habitat qualifying species, including grey plover and Sandwich tern to understand if the increase in mineral port activity coincides with any changes in the species' distribution and abundance patterns on Ras Nouadhibou.
- **Degradation of critical marine habitat.** Support the establishment and implementation of a research and monitoring program targeting blackspotted smoothhound in Baie du Lévrier. Little is known about the species in the region, so improved understanding of the species distribution, abundance and reproduction sites could help inform targeted measures for cumulative impact management. Efforts should be coordinated by SNIM, with participation from IMROP, and support from EMC, other mining companies using the mineral port, and possibly other key role players at the Autonomous Port of Nouadhibou.
- **Degradation of critical marine habitat.** Support the reinforcement and expansion of programs focused on detecting, monitoring, controlling and eradicating the presence of marine alien invasive species in Baie du Lévrier. Marine invasive species can spread rapidly over large areas as species can easily spread with the movement of currents and tides. Supporting coordinated, early detection efforts for alien invasive species is more effective than localized, proponent led initiatives. This measure would align with the conservation objectives of maintaining ecological integrity in designated areas that overlap the project AoI, namely Cap Blanc Integral Reserve KBA/IBA, Cap Blanc Satellite Reserve, and Dakhla Area KBA/IBA. Coordinated efforts focused on early detection around the ports would have the added benefit of also reducing risks for Banc d'Arguin National Park.

- **Cumulative impacts on Mediterranean monk seals.** EMC could support regional conservation initiatives for monk seals, such as threat reduction programs. Past/ongoing programs led by international researchers from CBD Habitat have successfully established protection zones for monk seals, including zones with fishing net prohibitions and access restrictions in resting and breeding grounds. These programs include close collaboration with communities and strategically target key mortality sources; however, they require ongoing financial support for continued success. Another possibility would be to support of efforts to expand monk seal colonies as CBD Habitat are currently seeking funding support to actively expand colonies on Ras Nouadhibou (https://cbd-habitat.com/en/mediterranean-monk-seal/). Researchers from CBD Habitat are currently implementing an international action plan for the Mediterranean monk seal across Mauritania, Morocco, Spain, and Portugal. The plan includes the creation of a new network on monk seal colonies , including in Banc d'Arguin National Park (refer to Appendix B of ESIA Chapter 7 for information gathered during a key informant interview with an international monk seal specialist). Initial efforts are underway, including the construction of an enclosure to house translocated individuals from the Cap Blanc population in Banc d'Arguin National Park. Such initiatives align with conservation and management objectives of the Cap Blanc Satellite Reserve, which aims to protect monk seals and their habitat.
- **Vessel collisions with marine mammals**. SNIM should establish a regional working group on marine mammal collision in Baie du Lévrier, with collaboration and participation from major port users and authorities. As highlighted in the ESIA, data on marine mammal collisions in the region are limited, likely due to under-reporting and lack of incentives for reporting incidents if they do occur. The gap in availability of information precludes the ability to develop strategic measures to address potentially important cumulative impacts. SNIM should coordinate a regional program to gather and track marine mammal mortality events and analyse data to identify trends. If mortality hotspots or concerning collision trends are identified, the working group would collaborate to identify and implement measures across the region.

13.3 RECOMMENDED MANAGEMENT OF CUMULATIVE IMPACTS

The management of cumulative impacts in the Tiris Zemmour region requires coordinated action between EMC, SNIM, other mining operators, government authorities, and relevant institutions. While the Project will mitigate its own impacts through its ESMPs, several regional pressures—particularly on water, biodiversity, community services, and transport safety—can only be effectively addressed through joint planning, monitoring and governance. The key recommendations are summarised below.

Regional Water Resource Coordination:

- Establish and maintain a shared hydrogeological model integrating all wellfields (existing and planned) to assess cumulative drawdown and long-term groundwater sustainability.
- Create a joint groundwater monitoring programme with harmonised parameters and shared datasets.
- Implement regional abstraction planning to optimise pumping distribution, limit depletion hotspots, and manage salinity risks.

Regional air quality monitoring program:

- Develop and implement a regional air quality monitoring program to verify actual concentrations of key pollutants, including particulate matter and nitrogen dioxide;
- Assess the effectiveness of emission control measures put in place at the respective facilities and support adaptive management where monitoring results indicate emerging risks or exceedances.

GHG emissions management: coordinate efforts among all operators to reduce greenhouse gas emissions as much as possible:

- Reduce dependence on fossil fuels;
- Monitor emissions on a regular basis (annual report);
- Integrate lower-carbon energy sources wherever feasible;
- Share GHG emissions data to track progress and identify opportunities for improvement;
- Seek to align project-level mitigation measures with Mauritania's national emissions reduction pathway.

Coordinated Social Infrastructure and Livelihood Management:

- Support authorities in planning for regional population growth, including water supply, housing, health services, and basic infrastructure.
- Develop a collaborative pastoralism and land-use framework to maintain access to grazing areas, protect transhumance routes, and reduce fragmentation of rangelands.
- Enhance community health resilience through shared data, coordinated environmental monitoring, and support to local health systems.

Transport and Community Safety:

- Implement a regional transport safety strategy across mining operators, focusing on road safety measures, rail crossing improvements, and awareness campaigns for local communities.
- Work with SNIM to strengthen rail safety management, including community communication and risk prevention in rural areas.

Regional Stakeholder Engagement:

- Establish a multi-operator engagement framework to ensure consistent messaging, prevent misinformation, and address cross-project community concerns.
- Promote coordination of grievance mechanisms, allowing concerns related to cumulative impacts to be managed coherently.

Cultural Heritage Coordination:

- Harmonise chance-find procedures and cultural heritage management approaches across projects.
- Share information from archaeological surveys and coordinate with authorities to manage heritage risks proactively.

Biodiversity and Critical Habitat Protection

- Create a regional habitat restoration and monitoring initiative for desert flora, fauna, and avifauna.
- At the port, collaborate with SNIM and IMROP to establish joint monitoring of seabirds, marine mammals, and habitat quality.
- Support regional efforts on marine invasive species management and Mediterranean monk seal conservation, aligned with existing protected area objectives.

Regional Environmental and Social Governance:

- Promote the establishment of a regional environmental and social coordination forum involving operators, authorities, and key institutions.
- Align construction and operational ESMPs across the region to ensure consistent environmental and social performance.
- Support development of a regional climate resilience strategy, integrating heat-stress management, extreme weather preparedness, and emergency response

13.4 CONCLUSION

The Cumulative Impact Assessment (CIA) has evaluated how the El Aouj Project's residual impacts interact with those of existing, planned, and reasonably foreseeable developments across the Tiris Zemmour region. The assessment confirms that several VECs—particularly groundwater resources, pastoral livelihoods, social infrastructure and biodiversity—are already under pressure due to long-standing mining activities, regional groundwater abstraction, and natural drivers such as climate change. When combined with future mining developments, these pressures may intensify, resulting in cumulative effects that extend beyond the influence of any single project.

In addition to the mine area, the CIA also assesses cumulative effects along the SNIM railway corridor and within the Nouadhibou port environment, recognising that increased rail traffic, expanded logistics operations and higher vessel frequency contribute to regional-scale pressures. These include cumulative noise, dust and safety risks along transport corridors, increased disturbance to avifauna and terrestrial fauna in port-adjacent habitats, elevated vessel-collision risks for marine mammals, and additional pressures on marine critical habitats within the Cap Blanc and Dakhla areas. The inclusion of rail and port components ensures that cumulative impacts are evaluated across the full mine–rail–port value chain.

For environmental VECs, key cumulative concerns relate to regional groundwater drawdown and salinity evolution, potential contamination risks affecting Sebkha Idjill, and progressive loss or fragmentation of natural habitats. For social VECs, cumulative effects are expected on pastoral mobility, water supply, basic services in Zouerate and F'Dérick, community health risks linked to environmental exposure, and higher transport-related safety risks. For cultural heritage, cumulative risks remain limited but primarily relate to increased land disturbance and alterations to the broader cultural landscape. For biological VECs, cumulative effects may arise through additional habitat conversion, disturbance to avifauna, increased vessel-related risks to marine mammals, and pressures on critical habitats at the coast.

The CIA identifies a clear need for regional-scale, multi-operator coordination, particularly for water resource management, pastoral systems, shared rail and port infrastructure, biodiversity monitoring and marine ecological risk management. While the Project will mitigate its own impacts through the ESIA mitigation hierarchy, effective cumulative impact management will depend on joint planning, shared data, coordinated monitoring and strengthened collaboration between EMC, SNIM, public authorities and other regional operators.

This CIA has been prepared in alignment with the IFC Performance Standards (2012) and the IFC Good Practice Handbook on Cumulative Impact Assessment (2013), applying a structured VEC-based methodology, regional boundaries, and assessment of combined effects from past, present, and foreseeable developments, including those associated with the mine, the SNIM rail corridor and the Nouadhibou port environment. The chapter also complies with the African Development Bank (AfDB) Operational Safeguards, particularly OS1, OS3, OS4 and OS5, by evaluating cumulative pressures on natural resources, biodiversity, pollution pathways, pastoral livelihoods, community health and safety, and essential social services. The recommended measures reflect AfDB expectations for coordinated regional management, joint monitoring, and long-term sustainability across all interacting developments in the Tiris Zemmour region.

14.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan (ESMP) sets out the key measures and actions to assess, manage, and monitor the environmental and social risks and impacts of the Project El Aouj, identified in the Chapter 12.0. It documents agreed responsibilities, timing, and approaches, and supports effective resource allocation as the Project moves through construction, operation and closure.

The ESMP follows IFC Performance Standards and AfDB Operational Safeguards, along with related guidance notes as well as IFC and World Bank Group (WB) Environmental Health and Safety (EHS) guidelines. The ESMP will be applied through an adaptive management process, under which mitigation measures are regularly reviewed and adjusted based on monitoring results, project evolution, and emerging risks, ensuring continuous improvement and effective management of environmental and social impacts in accordance with IFC PS1 and AfDB OS1.

14.1 Mine area

Scope

This present ESMP is based on the ESMP framework (URS 2016), on mitigation measures already described in the previous ESIA (URS 2015), and on mitigation measures defined in the complementary impact assessment performed by WSP (WSP 2023).

The objectives of the ESMP are to:

- Summarize the impacts identified during the impact assessment process;
- Identify the measures and actions to be implemented in order to manage the environmental and social issues related to the Project. This will be achieved in close liaison with the ESIA;
- Build a program for the monitoring of identified measures with targets, key indicators and frequency of the follow-up;
- Establish the responsibilities of the implementation of the mitigation measures: an environmental consultancy company, commissioned by the person responsible for the implementation of the measure, will be the actor in the monitoring process and in the drafting of the relevant Environmental and Social Monitoring Report (ESMR);
- Estimate the costs of the implementation of the mitigation measures.

The process intends to facilitate adaptive management of the Project to allow the adaptation of mitigation measures implementation according to new information and situations that may be identified during the project's follow-up.

Roles and responsibilities

The roles and responsibilities specific to Project ESMP are presented in the table below.

Table 14-1: Roles and responsibilities

Roles	Responsibilities
General Manager	▪ Responsible for the approval of this ESMP and for the availability of the resources required for its implementation.

Roles	Responsibilities
Environment, Health, Safety, Manager	▪ Responsible for ownership and overall implementation of this ESMP. ▪ Establish and review the Environmental, Health and Safety (EHS) implementation measures to ensure their compliance with local regulation and international standards. ▪ Ensure that external Contractors effectively implement the required measures. ▪ Interact with the authorities and be the main point of contact to manage permits and authorizations when required by the activities; and to ensure every permits are in order.
Environmental coordinator	▪ Responsible for the overall implementation of this ESMP. ▪ Provide technical support to EMC Departmental Managers and Contractors to ensure compliance with the ESMP measures and to include these measures into the Contractors ESMP. ▪ Prepare quarterly and annual environmental reports including details on environmental performance. ▪ Ensure ESMP is known and available to all EMC employees and Contractors. ▪ Undertake periodic audits and inspections of EMC Department and Contractor workplaces against the requirements of this ESMP. ▪ Report all hazards, non-conformances and incidents.
Project Manager (Construction) Mine Operations Manager Contractor Managers	▪ Responsible for the overall implementation of this ESMP by the Contractors. ▪ Ensure Contractors and all actors involved in the Construction/Operation know, understand and implement the ESMP and related Management Plans (MPs). ▪ Ensure ESMP measures are integrated into all Contractors MP. ▪ Ensure all Contractors and all actors involved in the Construction/Operation have necessary internal resources to manage the ESMP requirements (like an EHS coordinator).
Workplace EHS supervisor	▪ Conduct routine work area inspections to ensure relevant activities are in accordance with the ESMP and related Management Plans. ▪ Report all hazards, non-conformances, and incidents.
All EMC and contractor staff, all visitors	▪ All personnel onsite, including employees, contractors, and consultants are responsible for the implementation of ESMP and good practices respect. ▪ All employees, contractors, consultants, and visitors will receive a mandatory induction on EHS main topics on site before starting to work on EMC site.

The EMC commits to developing detailed organizational charts for both the construction and operation phases, clearly defining roles, responsibilities, and reporting lines for environmental, social, health and safety (ESHS) management. In line with IFC Performance Standard 1 and AfDB Operational Safeguard 1, EMC will also undertake a capacity and competency assessment of the Project team. The objectives of this assessment are to:

1. Identify gaps in organizational capacity, including areas where additional staffing and/or specialized external support may be required to ensure effective implementation of the ESMP and associated management plans; and
2. Identify training and upskilling needs of Project personnel to strengthen technical competencies and ensure that environmental and social risks and impacts are managed in accordance with applicable national requirements and lender standards.

The results of the capacity assessment will inform targeted recruitment, use of external expertise, and the development of a structured training program, supporting continuous improvement of ESHS performance throughout the Project lifecycle.

Adaptive Management Framework

Effective management of environmental and social(E&S) risks throughout the lifecycle of the Project will required a structured and iterative Adaptive Management Framework. This framework ensures that mitigation measures remain appropriate, performance is continuously improved, and emerging risks are identified and addressed in a timely manner. The approach is aligned with IFC Performance Standard 1, AfDB OS1, and Good International Industry Practice (GIIP).

Adaptive management ensures that mitigation measures are adjusted whenever monitoring results indicate insufficient performance, enables the Project to respond effectively to unexpected or emerging environmental, social, health and safety, climate-related, operational or community-related risks, supports the integration of new information, technologies and evolving regulatory or lender requirements, and strengthens overall decision-making to ensure continuous improvement of ESMP implementation.

Adaptive Management Cycle

Step 1 – Monitoring & Data Collection:

Relevant ESHS indicators will be monitored as defined in each Management Plan and summarized in the ESMP tables. Monitoring will include:

- Environmental quality (air, noise, water, biodiversity)
- Health & safety performance (incidents, near misses, unsafe acts)
- Social indicators (grievances, community feedback, stakeholder engagement records)
- Contractor performance
- Climate and weather-related observations
- Security or influx-related trends

Step 2 – Analysis & Identification of Deviations

The EMC EHS Manager and relevant discipline will lead review data on a **monthly** and **quarterly** basis to identify:

- Non-compliance with standards or ESMP targets
- Repeated grievances or unresolved community concerns
- Deteriorating environmental trends
- New operational activities generating unanticipated impacts
- Climate-related stressors
- Gaps in workforce capacity or contractor performance

Step 3 – Decision-Making & Risk Response

When deviations or emerging risks are detected, EMC will trigger an internal review involving:

- Relevant operational departments
- Social, biodiversity, or hydrology specialists
- Contractors, when applicable
- SNIM (for rail or port-related issues)

This review will determine whether:

- Existing mitigation measures need to be strengthened
- Additional controls must be implemented
- Operating procedures require revision
- Emergency actions or rapid responses are necessary
- Further monitoring or investigation is required

Step 4 – Implementation of Corrective and Preventive Actions

Corrective actions may include:

- Engineering adjustments or improved housekeeping
- Revised traffic, blasting, or water abstraction procedures
- Additional training or induction
- Enhanced community communication
- Temporary suspension of specific activities

All actions are assigned responsibilities, deadlines, and verification requirements.

Step 5 – Documentation, Reporting & Feedback Integration

Adaptations will be documented in:

- Monthly ESHS reports
- Updated Management Plans (at least annually or as required)
- Contractor performance reviews
- Stakeholder Engagement Plan (SEP) updates
- Lessons-learned logbooks and incident registers

Findings are communicated to:

- EMC management
- Contractors
- SNIM (where relevant)
- Lenders (through periodic reporting)

Step 6 – Review & Continuous Improvement

At least **once per year**, EMC will undertake a structured review of:

- The ESMP and all Management Plans
- Monitoring results and trends
- Grievance management performance
- Effectiveness of corrective actions
- Capacity needs (staffing, training, tools)

This review informs systematic updates to the ESMP and supports continuous improvement across all Project phases.

Emerging risks—those not previously known or whose likelihood or severity may increase over time—will be identified through trends in grievances, findings from inspections and audits, worker feedback, seasonal environmental monitoring, changes in local socio-economic conditions, climate variability, and new regulatory guidance. When such risks arise, EMC will assess their significance and integrate appropriate mitigation and monitoring actions following the adaptive management cycle.

Community and worker grievances are a key input to adaptive management, and all grievances are logged, tracked, investigated, and closed in line with the SEP and community and Worker Grievance Mechanism. Recurrent or serious issues will trigger a review of mitigation measures and may require operational adjustments. Grievance trends will systematically inform ESMP updates and adaptive management decisions.

The EMC EHS Manager will lead the adaptive management process, coordinate reviews, and ensure corrective actions are implemented. Discipline leads will analyse monitoring data and recommend adaptations, while contractors will comply with updated measures and promptly report incidents or emerging issues. SNIM will contribute to adaptive management for all rail- and port-related aspects, and senior management will ensure the necessary financial, human and technical resources are available for effective ESMP implementation.

Climate Risk Management and Adaptation Measures

Climate-related risks will be managed through measures already embedded in the Mine Area ESMP (chapter 14.1), including stormwater diversion systems, erosion-control structures, protection of drainage and runoff infrastructure, and systematic inspection of unpaved surfaces after rainfall events.

Water and groundwater management measures will support resilience during drought and seasonal variability, while dust-control actions—including surface wetting, fogging during blasting, and maintenance of dust-abatement equipment—will mitigate risks linked to extreme heat and wind events.

Monitoring of rainfall, runoff behaviour, groundwater levels and dust emissions will feed into the adaptive management process, ensuring that mitigation actions are adjusted whenever climate variability or extreme events affect mine conditions or community well-being.

Specific management plans

As part of this ESMP recommendations, multiple topic-specific Management Plans were prepared for the project and presented in separate documentation.

- Stakeholder Management Plan
- Cultural Heritage Management Plan
- Community Development Plan
- Community Health, Safety & Security Management Plan
- Emergency Response Plan
- Groundwater and Surface Water Management Plan
- Non-Mineral Waste
- Traffic Management Plan
- Hazardous Materials
- Biodiversity Action Plan
- Energy Management Plan
- Occupational Health & Safety Management Plan
- Mine Closure Plan

ESMP Mitigation measures numbering

The mitigation measures presented hereafter are coming from the URS ESIA (URS 2015) and from the WSP ESIA update (WSP 2023). Each impact has a number corresponding to the subcomponent impacted (for example: GW01 for the first impact on groundwater).

Then, each impact is mitigated by dedicated mitigation measures associated to the main component, the project phase, and the impact number. For example: P_C_GW01a stands for Physical component, Construction phase, Groundwater impact n°01, mitigation measure a.

The codes used are the following:

- Main component: P=Physical, B=Biological, S=Social;
- Project phase: C=Construction, O=Operation, D=Decommissioning;
- Subcomponent: GW=Groundwater, SW=Surface water, etc;
- Number of the impact: 01, 02, 03, etc;
- Number of the mitigation measure: a, b, c, etc.

The following sections present the management measures (exclusion/mitigation, compensation, optimisation) to be implemented in order to mitigate the negative impacts or to enhance the positive ones on the Project environment, and their implementation process.

14.1.1 Mine ESMP during the construction phase

14.1.1.1 Physical component

Table 14-2: ESMP - Physical component - Construction phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Groundwater (GW)						
GW01	Declining groundwater levels in the P2 and P4 aquifers impacts on the Taoudeni Basin	P_C_GW01a. Update the Water & Groundwater Management Plan	An updated version of the Groundwater Management Plan is achieved and provides: ▪ Touajil wellfield: details about the maximum acceptable groundwater drawdown before the Aouchich wellfield commissioning ▪ Aouchich wellfield: details about the maximum acceptable groundwater drawdown before wellfield decommissioning ▪ operational details of each wellfield: o location of the GW abstraction points o location and technical characteristics of the associated facilities (pipe, tanks, overpressure valves stations, power supply and emergency power supply) o boreholes characteristics o pumping rates expected o GW abstraction operational process	before the start of each construction phase (Touajil and Aouchich)	EMC EHS Manager in collaboration with Mine Manager	40 000€ Included in the mining development design
		P_C_GW01b. Design the Water & Groundwater Management Plan	A first version of the Water Management Plan is achieved and provides water management	Before the start of the construction	EMC EHS Manager in collaboration	Refer to the GWSWMP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			consumption targets according to EMC ‘s objectives and integrated mitigation measures to lower the overall GW consumption.	phase for the existing wells As the new wells are drilled and equipped	with Mine Manager	
		P_C_GW01c. Develop the Groundwater Management Plan	100% of active monitoring boreholes equipped and operational 100% of production boreholes fitted with calibrated flow meters 100% availability of field monitoring equipment before operations start 100% implementation of approved sampling protocols Operational database established prior to commissioning 100% of designated personnel trained and competent	Before the start of the construction phase for the existing wells As the new wells are drilled and equipped	EMC EHS Manager in collaboration with Mine Manager	Refer to the GWSWMP
GW02	Declining groundwater quality as a result of long-term pumping	P_C_GW02a. Implement the Groundwater Abstraction Management Plan	An updated version of the Groundwater Management Plan is achieved and provides the GW Monitoring program and physico-chemical parameters to follow at each wellfield	before the start of each construction phase (Touajil and Aouchich)	EMC EHS Manager in collaboration with Mine Manager	included in P_C_GW01a
		P_C_GW02b. Implement good practices preventing groundwater contamination	Refer to P_C_LQU01e. Good practice prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment			Included in the EPC contract

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
						Refer to HAZMAT Refer to non-mineral waste MP
GW03	Impact of declining groundwater level on groundwater users	P_C_GW03a. Alternative water supply for groundwater users from EMC wellfields (direct pipeline or tanks)	An agreement is established between EMC and the Touajil Auberge defining: ▪ the water needs to be supplied to the oasis to ensure the sustainability of its operation; ▪ the means put in place for providing access to water (construction of a new borehole at sufficient depth for providing water during and after the mine operation, or water pipeline from the wellfield to the Auberge).	Before the Touajil wellfield commissioning	EMC EHS Manager and Mine Manager	Included in the mining development design
		P_C_GW03b. access to raw water of suitable quality for livestock watering and local communities	The number of raw water access points along the water pipeline are defined and water access infrastructures for local communities and livestock are designed. The water access points for local communities are built.	Before the Touajil and Aouchich wellfields commissioning At the end of each wellfield construction phase	EMC EHS Manager	34 water access points *5 000€= 170 000€ Included in the mining development design and mine construction costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		P_C_GW03c. Provision of potable water supply to F'Dérick	The drinking water supply infrastructures of the city of F'Derik are built as described in the project description and recalled in the Water & Groundwater Management Plan. The supply of drinking water from the mine processing plant to the town of F'Derik is operational.	At the end of the construction phase	EMC EHS Manager and Mine Manager	Included in the mine design and construction costs
		P_C_GW03d. Implement the Stakeholder Engagement Plan, including the communities grievance mechanism	Refer to S_C_SOC05b. Implement the Stakeholder Engagement Plan	During Construction Before Construction and Monthly	EMC Community Relations Manager	See S_C_SOC05b The costs will be supported by EMC
Surface Water (SW)						
SW01	Change in surface water flow and flood risk	P_C_SW01a. Prevention of changes in surface runoff or implementation of measures for separation and diversion of water flows onto the mine site	The installations at the mine site integrates all the provisions to separate or divert the runoff out of the mine site from the runoff on the mine site: ▪ the surface water interceptor dam above the tailing disposal area; ▪ Runoff water management systems within the mine site footprint: bridges, culverts, diversion channels at crossing, decanting basins, hydrocarbons separators. The installations for separation and diversion of runoff water onto the mine	During the mine design and before the start of the construction of each mine infrastructures At the end of each construction phase	EMC EHS Manager and Mine Manager	Included in the mine design and construction costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			site are compliant with the Project's design.			
		P_C_SW01b. Prevention of changes in surface runoff or implementation of measures for separation and diversion of water flows at the other mining facilities	The installations at the other mining facilities (rail spur, explosive depot, wellfields, new El Aouj city at F'Derik) integrates all the provisions to separate or divert the runoff out of the infrastructures: ▪ Runoff water management systems within the project footprint or infrastructures runoff bypass systems: bridges, culverts, diversion channels at crossing, decanting basins, hydrocarbons separators; ▪ Burial of the water pipelines from the wellfields to the mine site and F'Derik city. The installations for separation and diversion of runoff water onto the mine site are compliant with the Project's design	During the mine design and before the start of the construction of each mine infrastructures At the end of each construction phase	EMC EHS Manager and Mine Manager	Included in the mine design and construction costs
		P_C_SW01c. Minimise erosion and soil conveyance	The design of the infrastructures minimizes the creation of uncovered levelled surfaces and sediment retention and/or runoff flow mitigation systems are integrated upstream of the mining infrastructures.	During the mine design and before the start of the construction of each mine infrastructures	EMC EHS Manager and Mine Manager	Included in the mine design and construction costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			The installations minimising the erosion and soil conveyance are compliant with the Project's design.	At the end of each construction phase		
SW02	Changes of surface water quality and pollution of wadis	P_C_SW02/03a. Separation of clean and dirty runoff	Refer to P_C_SW01a. Prevention of changes in surface runoff or implementation of measures for separation and diversion of water flows at the other mining facilities.	-	-	-
		P_C_ SW02/03b. Control of polluted runoff	Proceed to inspection of water bodies ▪ report nature and origin of observed runoff pollution if any; ▪ identify and engage immediate appropriate remediation measures. A register records every inspection: ▪ Observations on the polluted runoff and origin; ▪ Eventual remediation actions engaged. Propose corrective measures to avoid a renewal of water pollution.	After every rain events	EMC EHS Manager and Mine Manager	Included in the EPC contract Included in the salary of the EMC EHS Manager
		P_C_ SW02/03c. Design, construction of an incinerator	The mine design includes the construction of an incinerator. The construction of the incinerator is compliant with the Project's design.	During the mine design and before the start of the construction of each mine infrastructures	EMC EHS Manager	Included in the mine design and construction costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
				At the end of each construction phase		
		P_C_ SW02/03d. Good practice including prevention, identification, control and monitoring of accidental discharges/ spills	Refer to P_C_LQU01e. Good practices prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment.	-	-	-
SW03	Pollution of Sebkha Idjill and the salt works	P_C_ SW02/03e. Control of wash water that may contain cement from concreting operations and reuse for dust control when practicable	Define a dedicated place to build a concrete mixer truck cleaning area, able to collect wastewater in a decanting basin. The concrete mixer cleaning area is in place at each construction area. Procedure describing concrete mixer cleaning process is in place. Procedure is provided to all drivers and concrete mixer cleaning process is monitored.	Before the start of each construction phase Before the start of each construction phase At the beginning of each construction phase During the construction phase	EMC EHS Environmental Manager	Included in the EPC contract
		P_C_ SW02/03f. Implement the Emergency Preparedness and Response Plan	Refer to measure P_C_LQU01f. Implement the Emergency Preparedness and Response Plan.	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		P_C_ SW02/03g. Implement the Non-Mineral Waste Management Plan	Refer to measure P_C_LQU01g. Implement the Non-Mineral Waste Management Plan.	-	-	-
Noise and vibration (NV)						
NV01	Noise impacts generated by Project activities and equipment impacting on receptors	P_C_NV01a. Compliance with international noise emissions limits	Ensure compliance with the following: ▪ Machinery and equipment used for the construction comply with international noise emission limits ▪ Identify the closest receptors to each construction site; ▪ Implement OHS MP :refer to S_C_SOC11) : Check that noise levels are in compliance with applicable international standards (55dB during daytime and 45dB during night time in residential : educational areas, or maximum increase in background levels of 3 dB at the nearest receptor location off-site if these levels are already exceeded).	At the beginning of each construction phase	EMC EHS Manager and Mine Manager	Refer to OHS MP Included in the contract of the EPC contractor (the call for tenders for the construction works shall stipulate that the contractor will take the necessary measures to comply with international standards applicable for noise and in charge of the noise monitoring during the construction

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
						of each infrastructure)
		P_C_NV01b. Good practices design and management	A procedure describing the management of vehicle and construction engines in the intervening periods between work is put in place and communicated to employees: ▪ implementation of a regular inspection and maintenance regime of vehicles and machines ▪ stopping of machines and vehicles when they are stationary; ▪ employee training; ▪ verification of the implementation of the procedure. ▪ Materials will be handled with care (not dropped)	During the construction phase	EMC EHS Manager and Mine Manager	Refer to OHS MP Included in the contract of the EPC contractor
NV02	Vibration impacts generated by Project activities and equipment impacting on receptors	P_C_NV02a. Proper design of foundations to crushers and other potential sources of ground borne vibration	The foundations of the crusher and other potential sources of ground borne vibration are designed to minimize the ground vibrations propagation.	During the mine design	EMC EHS Manager and Mine Manager	Included in the mine design and construction costs
		P_C_NV02b. Good practices design and management	Refer to P_C_NV01b. Good practices design and management	-	-	-
		P_C_NV02c. Implement Stakeholder Engagement Plan, including the grievance mechanism	Refer to S_C_SOC05b. Implement Stakeholder Engagement Plan, including the grievance mechanism.	-	-	Refer to SEP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Land quality and Land use (LQU)						
LQU01	Degradation in land quality: erosion and soil degradation	P_C_LQU01a. Minimisation of the Project footprint and soil disturbance	The EPC CESMP includes: ▪ recommendations detailed in the EMC Traffic Management Plan; ▪ detailed footprints for each construction works and recommendations to keep the construction works within the defined footprints. Implement the EPC ESMP and EMC Traffic Management Plan (TMP). The rail spur connecting the existing railway to the mine is built as a priority to allow the use of the railway for the transportation of mine construction material and equipment instead of the road.	Before the start of each construction phase During the construction activities At the beginning of the mine construction phase	EMC EHS Manager and Mine Manager	Included in the EPC contract Refer to TMP
		P_C_LQU01b. Mine infrastructures access road construction	The Mine infrastructures design includes the construction of access roads to the mine facilities, to the wellfields and haul roads to the open pit, avoiding grazing areas as much as possible. The CESMP defines constructions rules to reduce detrimental effects on soil / vegetation in compliance with the EMC Traffic Management Plan:	Before the start of each construction phase During the construction activities	EMC EHS Manager , Mine Manager and EPC Contractor EMC EHS Manager	Included in the EPC contract Refer to TMP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			▪ Forbid uncontrolled vehicles access and driving out of designated roads; ▪ Defining speed limits; ▪ Prohibiting driving out of the defined access roads. The CESMP includes Environmental awareness and driver training for the employees.			
		P_C_LQU01c. runoff & erosion management	The Mine infrastructures design includes the construction of culverts and drains to divert stormwater runoff during the construction phase Routine monitoring and maintenance of these culverts and drains are undertaken to prevent any risk of erosion.	Before the start of the construction phase After every rain event	EMC EHS Manager and EPC Contractor	Included in the contract of the EPC contractor
		P_C_LQU01d. wastewater treatment	The EPC provides for the design and construction of a wastewater treatment plant at the mine and in the new town of El Aouj, each in compliance with national standards and international benchmarks such as the IFC EHS Effluent Guidelines, to treat a sufficient volume of wastewater. The EPC CESMP include all temporary facilities to collect and treat the wastewater produced during the construction phase	Before the start of the construction phase During the start of the construction phase	EMC EHS Manager and EPC Contractor	Included in the contract of the EPC contractor Refer to GWSWMP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
	Degradation in land quality: soil contamination	P_C_LQU01e. Good practices prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment	The EPC CESMP includes all good practices for prevention, identification, control and monitoring of accidental discharges/ spills and provision of spill containment and clean-up equipment during all construction phases : ▪ Control of spillage through routine preventative maintenance on construction plant and vehicles, and use of drip trays under temporary plant; ▪ Secondary containment by bunding around chemical/ fuel/ lubricant/ hydraulic fluid storage tanks and facilities; ▪ Dedicated refueling areas with impervious surfacing and available spill containment and clean-up kits; ▪ Remediation of any contaminated soil and rehabilitation of disturbed areas. Develop and implement the Hazardous Material Management Plan.	Before the start of the construction phase	EMC EHS Manager and Mine Manager	Included in the contract of the EPC contractor Refer to HAZMAT
		P_C_LQU01f. Implement the Emergency Preparedness and Response Plan (EPR)	Specific procedure adapted to the specific construction facilities development and associated risk is developed for the construction period, in line with the EPR.	Before the start of each construction phase Every 6 months during the	EMC EHS Manager and Mine Manager	Included in the salary of the EMC and EPC EHS Managers Refer to ERP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			The EPR is reviewed, including necessary revisions made to reflect any changing construction circumstances. A written report is formally produced following each emergency response to an incident. The EPR is reviewed after any incident reported or test.	construction works After every incident report		
		P_C_LQU01g. Implement the Non-Mineral Waste Management Plan	Specific procedures for waste collection, characterization and registration are developed for the construction period, in line with the Non-Mineral waste Management Plan. The Non-Mineral Waste Management Plan is reviewed, including necessary revisions made to reflect any changing construction circumstances. Monitoring activities are put in place compliance with the Non-Mineral Waste Management Plan recommendations A register reports the key indicators as described in the Non-Mineral Management Plan to assess effectiveness of the mitigation strategies.	Before the start of each construction phase Every 6 months during construction works As mentioned in the Management Plan Routinely	EMC EHS Manager and Mine Manager	Included in the salary of the EMC and contract of the EPC contractor Refer to the Non-Mineral waste MP
		P_C_LQU01h. Implementation of awareness training on the risks of contamination of the natural	Personnel working on site have been trained in the various risks inherent in handling dangerous products, the risks	Before starting each type of work	EPC EHS Manager	Included in the salary of

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		environment, emergency procedures and respect for good environmental practices, for all staff (workers, managers, etc.)	of contamination of the natural environment and the emergency procedures to follow to avoid the dispersion of polluting products in the environment. Maintaining a training register (date, type of training, name of speakers, topics covered, validation).			the EPC EHS Manager (the call for tenders for the construction works shall stipulate that the contractor will take the necessary measures to provide staff trained in good environmental practices) Refer to the Non-Mineral waste MP
		P_C_LQU01i. Involve the EHS manager and site managers in monitoring compliance with good environmental practices	Monitor compliance with: ▪ A site inspections and weekly meetings register is kept up to date and records all breaches of procedures for managing risks of contamination of the natural environment; ▪ Implementation of follow-up measures to avoid repeat breaches of procedures.	During the construction works	EMC EHS Manager	Included in the salary of the EMC and EPC EHS Managers Refer to HAZMAT and Non-Mineral waste MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
LQU02	Change in land use	P_C_LQU02a. Minimisation of Project footprint and ground disturbance	Refer to measure P_C_LQU01a. Minimisation of the Project footprint and ground disturbance.	-	-	-
		P_C_LQU02b. Mine access road construction	Refer to measure P_C_LQU01b. Mine infrastructures access road construction.	-	-	-
		P_C_LQU02c. Implement Influx Management Strategy Implement Stakeholder Engagement Plan	Refer to measures S_C_SOC06a. Implement the Influx Management Strategy; and S_C_SOC05b. Implement the Stakeholder Engagement Plan.	-	-	Refer to S-C-SOC06a Refer to SEP
Landscape and Visual (LV)						
LV01	Effects on Landscape Character of Tiris Zemmour Guelbs (LCA 04)	P_C_LV01/02a. Minimisation of Project footprint	Refer to measure P_C_LQU01a. Minimisation of the Project footprint and ground disturbance	-	-	-
		P_C_LV01/02b. Encouragement of natural re-vegetation, wherever practicable	Refer to measures B_C_EB01g. and B_O_EB04a. related to the development and implementation of the Revegetation Plan	-	-	-
LV02	Effects on views at VP 03 Hassie El Aouj and VP 04 Sebkha Idjill Salt Works	P_C_LV01/02c. Controlled vehicle access through the landscape will reduce detrimental effects on character/ vegetation	Refer to measure P_C_LQU01b. Mine infrastructures access road construction	-	-	-

14.1.1.2 Biological component

Table 14-3: ESMP - Biological component - Construction phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Ecology and biodiversity (EB)						
EB01	Loss of legally protected flora, and degradation and fragmentation of habitat	B_C_EB01a. Paved mine access road and process plant fence together will reduce existing pressures on vegetation facilitating natural recolonization. This will compensate for some of the vegetation loss to the Project over the long-term.	The specified infrastructure has been constructed according to the mine design plan.	Once, at the end of the construction phase	EMC EHS Manager	Cost is included in EMC personnel salaries
EB01	Loss of legally protected flora, and degradation and fragmentation of habitat	B_C_EB01b. The removal of trees should be avoided when possible, specifically the removal of *Balanites aegyptiaca, Capparis decidua, Maerua crassifolia, Vachellia flava, and Vachellia tortilis radianna.* As possible, all trees recorded in the Water Corridor should be avoided through micro-siting.	Maximize the avoidance of tree removal when possible. Otherwise transplant or replant a tree of the same species for each legally protected tree destroyed, especially *Balanites aegyptiaca, Capparis decidua, Maerua crassifolia, Vachellia flava, and Vachellia tortilis raddiana.*	Prior to construction	EMC EHS Manager	Refer to Biodiversity Action Plan (BAP) costing
			Work areas are clearly demarcated to prevent accidental clearing or damage in treed areas near construction sites.	Prior to site clearing and earthworks	EMC EHS Manager	Included in the costs of construction
			As-built drawings confirm treed areas have been preserved in the Mine Site. This verification is confirmed in the first annual Environmental and Social Monitoring Report.	At the end of construction or the beginning of operations	EMC EHS Manager	Cost is included in EMC personnel salaries

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
EB01	Loss of legally protected flora, and degradation and fragmentation of habitat	B_C_EB01c. Integrate trees in the design and infrastructure / facilities layout to avoid their removal as much as possible.	Refer to measures: B_C_EB01b. The removal of trees should be avoided when possible, specifically the removal of *Balanites aegyptiaca, Capparis decidua, Maerua crassifolia, Vachellia flava, and Vachellia tortilis raddiana.* As possible, all trees recorded in the Water Corridor should be avoided though micro-siting; and B_C_EB01e. During the tree removal, the exact number and species of removed trees will be tracked, following to the Vegetation Clearing Plan procedures	-	-	-
EB01	Loss of legally protected flora, and degradation and fragmentation of habitat	B_C_EB01d. Develop and implement a Vegetation Clearing Plan that includes provision for tree salvage.	A Vegetation Clearing Plan is prepared and implemented.	Prior to construction	Environmental consultant and EMC EHS Manager	Included in the cost of the ESIA
			Legally protected trees are salvaged and replanted.	Prior to construction	Environmental consultant and EMC EHS Manager	Refer to BAP costing
EB01	Loss of legally protected flora, and degradation and fragmentation of habitat	B_C_EB01e. During the tree removal, the exact number and legally protected species of removed trees will be tracked, following to the Vegetation Clearing Plan procedures	An environmental technician with botanical identification skills is retained to monitor/audit the vegetation clearing procedures.	Prior to construction	EMC EHS Manager	Refer to BAP costing
			Tree clearing is monitored, and the final number of trees removed and salvaged is reported in a post-construction monitoring report.	At the end of construction	EMC EHS Manager	Refer to BAP costing

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
EB01	Loss of legally protected flora, and degradation and fragmentation of habitat	B_C_EB01f. Tree removal should follow the national legislation regarding the restrictions on *Balanites aegyptiaca, Capparis decidua, Maerua crassifolia, Vachellia flava, and Vachellia tortilis raddiana* (refer to Figure 12-12, Figure 12-13, Figure 12-14 of the Impact Assessment Chapter for known locations of these species). Authorization from the Ministry of Environment is required prior to protected tree clearing.	Permit application is prepared and includes an estimate of number of trees requiring clearing.	Prior to construction	Environmental consultant and EMC EHS Manager	Refer to BAP costing
			Permit is in place prior to tree clearing.	Prior to tree clearing	EMC EHS Manager	Cost is included in EMC personnel salaries

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
EB01	Loss of legally protected fora, and degradation and fragmentation of habitat	B_C_EB01g. Develop and implement a Revegetation Plan.	An initial draft of the Revegetation Plan is prepared. The Revegetation Plan includes: ▪ Objectives for revegetation, including returning protected trees; ▪ Principles of adaptive management; ▪ Revegetation constraints and opportunities; ▪ Measures to maximize the use of available water from the water pipeline's release valves; ▪ Identification of areas where salvaged vegetation can be replanted; ▪ Measures to improve the quality of existing natural vegetation (e.g., fences to exclude grazers); ▪ Framework for a revegetation feasibility study; ▪ Preliminary monitoring requirements; ▪ Next steps and timelines for actions, including timelines to address any identified information gaps.	Prior to construction	Environmental consultant and EMC EHS Manager	Included in the cost of the ESIA
EB01	Loss of legally protected flora, and degradation and fragmentation of habitat	B_C_EB01h. If an area of high relative abundance of protected grasses (*Stipagrostis pungens*) is encountered, salvage and transplant them before the start of construction works, following to the Vegetation Clearing Plan and Revegetation Plan procedures. Areas of high relative abundance are defined as those	Refer to measures: B_C_EB01d. Develop and implement a Vegetation Clearing Plan that includes provision for tree salvage; and B_C_EB01g. Develop a Revegetation Plan.	-	-	-
			A description of plant salvage and transplant activities is included in the first	At the end of construction	EMC EHS Manager	Refer to BAP costing

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		where 50% or more of the plants present are *Stipagrostis pungens.*	annual Environmental and Social Monitoring Report	or the beginning of operations		
EB01	Loss of legally protected flora, and degradation and fragmentation of habitat	B_C_EB01i. Develop and implement a Biodiversity Action Plan. The Biodiversity Action Plan should describe the Project's strategy to achieve no net loss of natural habitats, as prescribed in IFC PS6.	A Biodiversity Action Plan is prepared and includes: ▪ The Project's mitigation objectives (no net loss of natural habitat); ▪ The Project's mitigation strategy; ▪ A summary of mitigation measures and actions needed to monitor compliance; ▪ Provisions for adaptive management to address uncertainty, including thresholds for when adaptations in mitigation and management are required; ▪ Reporting requirements and schedule; ▪ Linkages to other topic specific management plans (e.g., Vegetation Clearing Plan, Revegetation Plan).	Prior to construction	Environmental consultant and EMC EHS Manager	Included in the cost of the ESIA
EB03	Impacts on bird species of conservation concern	B_C_EB03a. Minimize light dispersion with the use of high efficiency and directional lighting (i.e., lights fitted with shields to direct lighting towards the ground and minimize sky glow)	Type of lighting and use of shields are confirmed during site light inspections.	Twice annually, prior to migratory periods (March and August)	EMC EHS Manager	Cost is included in EMC personnel salaries
EB03	Impacts on bird species of	B_C_EB03b. Lighting should be kept to the minimum required, specifically targeting work areas in use.	Type of lighting and use of shields are confirmed during site light inspections.	Twice annually, prior to	EMC EHS Manager	Cost is included in EMC

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
	conservation concern	Consider the use of mobile, temporary lighting if the location of work areas shifts over time.		migratory periods (March and August)		personnel salaries
EB03	Impacts on bird species of conservation concern	B_C_EB03c. For areas not requiring full-time illumination, install motion sensor lights so that lights can turn on and off automatically based on need. These should be installed around administrative buildings and other facilities that do not typically require regular use during night-time hours.	Type of lighting is confirmed during site light inspections.	Twice annually, prior to migratory periods (March and August)	EMC EHS Manager	Cost is included in EMC personnel salaries
EB03	Impacts on bird species of conservation concern	B_C_EB03d. Develop and implement a Vegetation Clearing Plan.	Refer to measure B_C_EB01d. Develop and implement a Vegetation Clearing Plan that includes provision for tree salvage.	-	-	-
EB03	Impacts on bird species of conservation concern	B_C_EB03e. Develop and implement a Revegetation plan	Refer to measure B_C_EB01g. Develop a Revegetation Plan.	-	-	-
EB03	Impacts on bird species of conservation concern	B_C_EB03f. Develop and implement a Biodiversity Action Plan.	Refer to measure B_C_EB01i. Develop and implement a Biodiversity Action Plan.	-	-	-
EB03	Impacts on bird species of	B_C_EB03g. Implementation of awareness training	All personnel working on site have received environmental awareness training as part	Ongoing as workers are onboarded	Environmental consultant and	Refer to BAP costing

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
	conservation concern		of their induction training. The awareness training covers: ▪ Waste management ▪ Fauna and flora species of concern Up to date training records are maintained in a training register (date, type of training, name of speakers, topics covered, validation).		EMC EHS Manager	
EB03	Impacts on bird species of conservation concern	B_C_EB03h. Solar panels with an anti-reflective coating to prevent glare.	Install photovoltaic modules with anti-reflective coating below 5% reflectance to reduce the likelihood of glare-related avian attraction.	Before construction of solar plant	Environmental consultant and EMC EHS Manager	Included in the technical characteristics of the purchased PV
EB03	Impacts on bird species of conservation concern	B_C_EB03i. Verify solar panel glare measurements and implement corrective measures if acceptability thresholds are exceeded.	Reflectance is measured on site using a calibrated reflectometer to confirm compliance with the manufacturer's specified reflectivity range.	Once, after panels are installed	Environmental consultant and EMC EHS Manager	Refer to BAP costing
EB04	Natural habitat loss, degradation, and fragmentation	B_C_EB04a. Follow the Vegetation Clearing Plan procedures.	Refer to measure B_C_EB01d. Develop and implement a Vegetation Clearing Plan that includes provision for tree salvage.	-	-	-
EB04	Natural habitat loss, degradation, and fragmentation	B_C_EB04b. Develop and implement a Biodiversity Action Plan. The Biodiversity Action Plan should describe the Project's strategy to achieve no net loss of natural habitats, as prescribed in IFC PS6.	Refer to measure B_C_EB01i. Develop a Biodiversity Action Plan.	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
EB04	Natural habitat loss, degradation, and fragmentation	B_C_EB04c. Develop a Revegetation Plan.	Refer to measure B_C_EB01g. Develop a Revegetation Plan.	-	-	-
EB04	Natural habitat loss, degradation, and fragmentation	B_C_EB04d. Integrate a risk-based monitoring approach for non-native invasive species to the BAP.	Target: Zero detections of non-native invasive species. A detection of a non-native invasive species will trigger the requirement for risk assessment and development of a site-specific invasive species control and management plan.	Quarterly	EMC EHS Manager	Cost is included in EMC personnel salaries
Ecosystem services (ES)						
ES01	Degradation of livestock and forage resources	B_C_ES01a. In areas where forage resources are present and need to be removed, they will be cut and distributed to communities or pastoralists that use the area for grazing. Forage resources to consider are those listed in Table 7 of the Ecosystem Services Assessment.	Identification of targets and information of the dispositive. Target: 100% of targeted people informed. Potentially impacted and interested people are identified. Target: 100% of interested and impacted people are granted with forage resources after vegetation clearing. Target: 100% of forage resources cleared distributed within the week after the clearance.	Prior to construction	EMC EHS Manager	Included in the cost of the ESIA
		C_C_ES01b. Integrate forage resources to the Revegetation Plan.	Refer to B_C_EB01g. Develop a Revegetation Plan.	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		B_C_ES01c. Access roads to be clearly marked with defined speed limits	Refer to measure P_C_LQU01b. Mine infrastructures access road construction	-	-	-
		B_C_ES01d. Driver training, including safe practice and avoidance of hazards	Refer to measure P_C_LQU01b. Mine infrastructures access road construction	-	-	-
		B_C_ES01e. Implement Stakeholder Engagement Plan, including the grievance mechanism	Refer to measure S_C_SOC05b. Implement the Stakeholder Engagement Plan	-	-	-
		B_C_ES01f. Burying of the water pipe from the wellfields to the mine site (embedded mitigation)	Refer to measure P_C_SW01b. Prevention of changes in surface runoff or implementation of measures for separation and diversion of water flows at the other mining facilities	-	-	-
ES02	Alteration of water resources for groundwater users in water abstraction areas	No additional mitigation identified.	-	-	-	-
ES03	Increased access to water resources through pressure relief valves along the water pipelines	B_C_ES03a. Installation of outlet taps in raw water pipeline (embedded mitigation)	Refer to measure P_C_GW03b. Installation of outlet taps in raw water pipeline	-	-	-
		B_C_ES03b. Installation of water trough to collect water at pressure relief valves (embedded mitigation)	Ensure water access points are constructed at each pressure relief valve.	Before starting to use the water canalization	EMC EHS Manager	Included in the mine development design

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			Also refer to measure P_C_GW03b. access to raw water of suitable quality for livestock watering and local communities			The costs will be supported by EMC
ES04	Degradation of salt extraction activities at Sebkha Idjill	B_C_ES04a. Separation or diversion of clean and dirty runoff (embedded mitigation)	Refer to measure P_C_SW02/03a. Separation of clean and dirty runoff	-	-	-
		B_C_ES04b. Control of polluted runoff (embedded mitigation)	Refer to measures P_C_SW02/03b. Control of polluted runoff	-	-	-
		B_C_ES04c. Waste disposal center to be located away from the wadis and other surface water channels (embedded mitigation)	Refer to measures P_C_SW02/03c. Design, construction and maintenance of a proper Waste disposal center	-	-	-
		B_C_ES04d. Good practice including prevention, identification, control and monitoring of accidental discharges/spills	Refer to measures P_C_SW02/03d. Good practice including prevention, identification, control and monitoring of accidental discharges/ spills; and P_C_LQU01e. Good practices prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment	-	-	-
		B_C_ES04e. Control of wash water that may contain cement from concreting operations	Refer to measures P_C_SW02/03e. Control of wash water that may contain cement from concreting operations and reuse for dust control when practicable	-	-	-
		B_C_ES04f. Implement the Emergency Preparedness and Response Plan	Refer to measures P_C_SW02/03f. Implement the Emergency Preparedness and Response Plan; and	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			P_C_LQU01f. Implement the Emergency Preparedness and Response Plan			
		B_C_ES04g. Implement the Non-Mineral Waste Management Plan	Refer to measures P_C_SW02/03g. Implement the Non-Mineral Waste Management Plan; and P_C_LQU01g. Implement the Non-Mineral Waste Management Plan	-	-	-
		B_C_ES04h. Implement the Stakeholder Engagement Plan, including the Grievance Mechanism	Refer to measure S_O_SOC05b. Implement the Stakeholder Engagement Plan	-	-	-
		B_C_ES04i. Develop and implement a Livelihood Restoration Plan if ecosystem services provided by Sebkha Idjill are impacted by Project activities	Refer to measure S_C_SOC05a. Implement the Livelihood Restoration Plan	-	-	-
ES05	Degradation of ecosystems' water regulation capacity	B_C_ES05a. Integrate grass species with water storage capacity, including genera *Asphodelus*, *Gymnocarpos*, *Plantago*, and *Zygophyllum*, to the Revegetation Plan.	Refer to measure B_C_EB01g. Develop a Revegetation Plan.	-	-	-

14.1.1.3 Social component

Table 14-4: ESMP - Social component - Construction phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Social (SOC)						

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
SOC01	Increased Government Revenue	S_C_SOC01a Payments of taxes in a transparent, accurate and timely manner	The Finance and Legal team keep track of all the taxes applicable to the Project during Construction. Payments are made on time and consolidated for public disclosure.	Each year and/or as appropriate	Legal & Finance Managers	Covered by EMC internal resources and existing staff costs
		S_C_SOC01b Implementation of sound financial principles and accounting processes for the Project	An experienced Construction Finance Manager is recruited and set up accounting processes alginate with international best practice and Mauritanian law.	Before Construction	EMC Chief Executive Officer (CEO) and Finance Manager	Covered by EMC internal resources and existing staff costs
		S_C_SOC01c Annual publishing of taxes paid, in line with Extractive Industries Transparency Initiative (EITI) good practice guidelines	Information requested by EITI is disclosed on time. Payments to the government is disclosed in annual CSR report.	Each year	Finance Manager EMC Public Affairs Manager	€20, 000 (including the external provider and the impression costs)
SOC02	Enhancement of the Local Economy	S_C_SOC02a Implement the Procurement Strategy	A Local Procurement Strategy document with objective to maximize the participation of suppliers from the Tiris Zemmour Region and from Mauritania is developed. The Strategy includes: - identification of business opportunities suitable for local suppliers - adaptation of bidding/purchasing process (e.g payment terms, contract language)	Strategy developed Before Construction Indicators tracked Monthly	EPC and/or EMC Procurement, with EMC Community Relations Manager	€50,000 (if the strategy is developed by an external consultant) €20,000 (to organize workshops for suppliers)

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			- presentation of business practice and Project opportunities to local suppliers - monitoring of local procurement indicators such as: Number of suppliers with contract/purchase order from/ the Tiris Zemmour Region b/Mauritania; Amount of procurement spend from a/ supplier from Tiris Zemmour Region b/Maurtiania, number of suppliers in the vendor based from Tiris Zemmour and Mauritania Integration of the Strategy and/or local procurement clause included in EPC contract.			
		S_C_SOC02b Register interest of local suppliers prior to construction;	A database of suppliers from a/ the Tiris Zemmour region b/Mauritania is developed	Before Construction	EPC and/or EMC Procurement Manager with EMC Community Relations Manager assistance	Covered by EMC internal resources and existing staff costs
SOC03	Increase inflationary Pressures and Shortages	S_C_SOC03a. Monitoring of availability and prices of key goods and services in local markets to inform periodic	The price of a basket of goods is monitored	Every Month	EMC Community Relations Manager	Covered by EMC internal resources and existing staff costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		review of the Procurement Strategy				
SOC04	Increased Employment and Training	S_C_SOC04a. Implement the recruitment and training strategy	A Project recruitment policy is developed and includes: - a definition of local employee, recruitment process for non-skilled and skilled workers - recruitment process for employees from the Communities - Non-discrimination clauses - Monitoring indicators such as % of employees (EMC and contractors) from Tiris Zemmour, Mauritania, Expatriates	Before Construction Indicators tracked monthly	EMC Human Resources Manager, with EMC Community Relations Manager assistance	Covered by EMC internal resources and existing staff costs
		S_C_SOC04b. Implement the Stakeholder Engagement Plan (SEP), including proactive engagement with women and vulnerable groups on employment opportunities	A Stakeholder Engagement Plan for the Construction phase is developed and includes engagement regarding local employment opportunities, especially toward women and vulnerable groups. The Plan indicators include: Number of women attending meetings, Number of disaggregated meetings with women and vulnerable groups	Before Construction Indicators tracked monthly	EMC Community Relations Manager	Refer to Stakeholder Engagement Plan (SEP)
SOC05	Natural Resource-based	S_C_SOC05a. Implement the mitigation measures for impacted users:	<u>Mine:</u> – Number of speed-limit signs installed and inspected monthly.	Before and during Construction	EMC or EPC Health & Safety Manager	€40,000 (targeted socio-economic assessment/survey)

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
	Livelihood Impacts	- pastoralists using the mine site area as pastureland - artisanal salt-extraction workers at Sebkha d'Idjill - Auberge in Touajil using a borehole that could be impacted by the Touajil water field catchment - Seasonal pastoralists using the Aouchich, who rely on hand-dug wells and artesian boreholes for livestock watering - Undertake targeted identification and socio-economic assessment of pastoralist users potentially affected by Project activities, including seasonal users of grazing areas, transhumance routes and water points, to inform livelihood restoration planning. Mine area (pastoralists + salt workers): - Access road to be clearly marked with defined speed limits;	– Number of driver induction/refresher sessions delivered; % of trained vehicle operators. – Number of targeted engagement meetings held with pastoralists and salt workers; key issues recorded; actions closed. – Number of verified livelihood-impact cases and corresponding livelihood-restoration measures undertaken where impacts are confirmed. – Targeted identification and socio-economic assessment of potentially affected pastoralist users completed and documented. <u>Aouchich</u>: – Monthly water-level readings recorded for Aouchich hand-dug wells and artesian boreholes. – Monitoring reports compiled and reviewed to assess potential future abstraction impacts.	Indicators tracked monthly		€80,000 (LRP preparation) The costs will be supported by EMC

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		- Driver training, including safe practice and avoidance of hazards; - Targeted engagement with pastoralists and artisanal salt workers at the Sebkha d'Idjill to confirm transhumance routes, seasonal salt extraction periods, and any access or safety concerns associated with Project activities; - Development and implementation of livelihood restoration measures, where impacts are verified, in consultation with affected pastoralists and artisanal salt workers; - Prepare targeted livelihood support measures for salt-extraction workers and pastoralist households, aligned with IFC Performance Standards and consistent with national pastoral regulations on mobility and access to water. Aouchich:	– Social baseline update scheduled in project planning tools two years before planned wellfield development. – Confirmation that updated socio-economic data is documented and filed. – Number of drinking troughs constructed and operational. – GPS coordinates and photographic evidence of completed troughs. – Number of Aouchich-focused SEP engagements conducted. – Number of water-related grievances received/resolved; resolution time tracked. – Periodic checks confirming that pastoralists have access to raw water of acceptable conductivity, based on simple field measurements (conductivity/TDS) at water-access points.			

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		- Implement Groundwater & Surface Water Management Plan: monitor wells water levels during mining activities to re-assess the impact of water abstraction before developing the well field project in 20 years-time; - Update social baseline two years before the development of the well field project; - Construction of drinking troughs in new grazing areas; - Update and implement the Stakeholder Engagement Plan, including the community grievance mechanism: allow access to raw water with acceptable conductivity for local communities and livestock.				
		S_C_SOC05b. Implement the Stakeholder Engagement Plan, including: - a proactive approach to engage pastoralists about shared water usage - a grievance mechanism	A concertation framework about water is set up with EMC, the pastoralists and the local authorities to monitor any impacts and issues related to water.	During Construction Before Construction and Monthly	EMC Community Relations Manager	Refer to Stakeholder Engagement Plan (SEP)

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			The grievance mechanism and set up and the number of grievances related to livelihood impacts is measured			
SOC06	Unplanned Project-induced In-Migration Impacts	S_C_SOC06a. Implement the Influx Management Strategy	An Influx Management Plan is developed for the Construction phase and includes: - An estimate of expected influx and likely localization - Influx monitoring in F'Derik through monitoring the price of a basket of goods, the town overall water and electricity consumption, health center visitors - Measures to orient influx: worker accommodation housing and transport, trucks parking, recruitment policy - Engagement with the local authorities and communities about influx and outmigration (at the end of construction) impacts - Gender based violence (GBV) program - Support to F'Derik infrastructure and services to face increased pressure (Refer to S_C_SOC06d. Support to	Before Construction Implementation during construction Monthly indicators monitoring when appropriate	EMC Community Relations Manager	€50,000 (cost for a GBV Program) The costs will be supported by EMC

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			F'Derik infrastructures and services to face increased pressure)			
		S_C_SOC06b. Implement the Human Resources and Employment Plan	The recruitment policy defines the points of hiring which can impact population influx	Before construction	EMC Human Resources	Covered by EMC internal resources and existing staff costs.
		S_C_SOC06c. Implement the Stakeholder Engagement Plan, to include clear communication of all available employment positions at project shop front in F'Derick	A Stakeholder Engagement Plan is developed and includes clear communication on job opportunities and recruitment process	Before construction and during construction	EMC Community Relations Manager in Relations with Human Resources Manager	Refer to Stakeholder Engagement Plan (SEP)
		S_C_SOC06d. Support to F'Derik infrastructures and services to face increased pressure	EMC funds sustainable initiative, in coordination with the appropriate technical state services, the local authorities and external providers if appropriate (Non-Governmental Organizations (NGO), consulting firms) to support F'Derik: - health services; - water and sanitation; - waste management to mitigate a likely increased pressure on communal facilities and services.	During Construction	EMC Community relations Manager	€100, 000/year The costs will be supported by EMC
SOC08	Increased pressure on communal	S_C_SOC08a. Integration of workers residences into F'Derik municipality	A plan is elaborated with the municipality of F'Derik to:	During Project design and	EMC Project design Manager with	The costs will be supported by EMC

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
	facilities and services		- integrate the new residences in the municipality urban planning and services; - develop new infrastructures, as appropriate.	residence Construction	EMC Community Relations and Public Affairs Managers	
SOC09	Community Development opportunities and Community expectation management	S_C_SOC09a Develop a Community Development Plan prior to any community support/ investment initiatives being	A Community Development Plan is developed to define: - The voluntary contribution of EMC to local communities development during the Construction phase - Priority sectors, at the intersection of Project social risks and Community needs - The eligibility and projects selection process - Community and authorities' participation - Monitoring & Evaluation	Before and during Construction	EMC Community Relations Manager	Refer to Community Development Plan The costs will be supported by EMC
		S_C_SOC09b Implement a Stakeholder Engagement Plan (SEP)	A stakeholder engagement plan is developed and includes a concertation framework with regular meetings with the authorities and communities of F'Derik, Touajil, authorities of Tiris Zemmour and pastoralists groups. A Stakeholder Engagement Register is maintained as part of the SEP implementation	Before and during Construction	EMC Community Relations Manager (up to Hakem level) EMC Public Affairs Manager (Governor level)	Refer to Stakeholder Engagement Plan (SEP) The costs will be supported by EMC

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		S_C_SOC09c Maintain a commitment register	A commitment register is developed and used to track all community development commitments made to authorities and communities	During Construction	EMC Community Relations Manager	Refer to Stakeholder Engagement Plan (SEP) The costs will be supported by EMC
		S_C_SOC09d Maintain a request for support register	A register with all support requests from the communities and the authorities is developed and maintained. A written answer (positive or negative) is provided to all requests	During Construction	EMC Community Relations Manager	Refer to Stakeholder Engagement Plan (SEP) The costs will be supported by EMC
SOC13	Impact on Women and Vulnerable groups	S_C_SOC13a. Implement the HR policy that explicitly includes provisions on equal opportunities, non-discrimination, and the protection of vulnerable groups	Provisions relating to equal opportunity, non-discrimination, and the protection of vulnerable groups are developed in EMC's HR policy in accordance with IFC PS2 and AfDB OS2.	During Construction	EMC Human Resources Manager	The costs will be supported by EMC
		S_C_SOC13b. Implement a recruitment strategy that includes a minimum proportion of women, both in technical and non-technical positions, with suitable working hours and conditions that allow for a work-life balance	Proportion of women employed by EMC in technical and non-technical positions in the mine.	During Construction	EMC Human Resources Manager	The costs will be supported by EMC

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		S_C_SOC13c. Raise awareness among all project workers about compliance with the code of ethics and conduct, including standards relating to the prevention of harassment, gender-based violence, and discriminatory behavior	Report on employee awareness/training regarding compliance with EMC's code of ethics and conduct	Before and during Construction	EMC Human Resources Manager	The costs will be supported by EMC
		S_C_SOC13f. Implement the grievance management mechanism (GMM), including appropriate channels (telephone, community relays, focal points, complaint boxes), confidentiality guarantees, clear processing times, and specific procedures for the secure handling of GBV-related complaints.	Existence of an operational mechanism for managing complaints from communities; - Number of Community Awareness Sessions (women's groups) on the existence of the complaints management mechanism; - Complaints database.	Before and during Construction	EMC Community Relations Manager	Refer to Stakeholder Engagement Plan (SEP) The costs will be supported by EMC
SOC10	Impact on Community Health, Safety and Security Impacts and Risks	S_C_SOC10a. Implement the Community Health and Safety Management Plan	A Community Health & Safety Plan is developed and includes: - Measures to mitigate road traffic risks (dust, accidents): deployment of visible access and speed limit road signs, training of drivers, community road safety awareness Monitoring includes: number of speed limit controls, number of grievances related to traffic	Before construction Monthly tracking of indicators	EMC Community Relations Manager	Refer to Community Health and Safety Security Management PlanThe costs will be supported by EMC

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			incident between animals and Project vehicles, number of accidents involving communities etc - Measures to mitigate diseases (STT/HIV, Malaria, Waterborne): community awareness, support to F'Derik Health Post (include in Influx Management Measures), prevention of stagnant water during construction etc. Monitoring includes tracking health indicators in collaboration with the health services - Measures to mitigate Gender Based Violences (to be related to GBV Program in Influx Management Plan): Community and worker awareness, support to specialized structures, grievance mechanism, worker accommodation strategy. Monitoring include tracking GBV grievances			
		S_C_SOC10b. Implement the Stakeholder Engagement Plan, including grievance mechanism	A Grievance mechanism is included in the Stakeholder Management Plan and disseminated within EMC/Contractors, local authorities and Communities. Monitoring of grievances per category and lead time resolution	Before and During construction Monthly tracking of indicators	EMC Community Relations Manager	Refer to Stakeholder Engagement Plan (SEP) The costs will be supported by EMC

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			performance is reported every month.			
		S_C_SOC10c. Implement a Security Management Plan	A Security Plan is developed and includes: - Training of security personnel to human rights and the proportional used of force - Measures implemented to avoid site incursion Monitoring of security incidents involving communities, grievances related to security personnel	Before Construction Monthly monitoring	EMC Security Manager	Refer to Community Health and Safety Security Management Plan The costs will be supported by EMC
		S_C_SOC10d. Develop the Emergency Preparedness Response Plan in coordination with the local authorities	An Emergency preparedness Response plan is developed and includes local authorities in the chain of command and training for emergencies with potential impacts on communities	Before and during Construction	EMC HSE Manager	Refer to Emergency Response Plan The costs will be supported by EMC
		S_C_SOC10e. Reduction of risks related to HIV/AIDS and sexually transmitted infections (STIs); Information on responsible behaviour and good health practices.	Register/report on raising awareness among workers about the risks of infectious and sexually transmitted diseases;	During Construction	EMC EHS Manager	Refer to Community Health and Safety Security Management PlanThe costs will be supported by EMC
SOC11	Worker Health and Safety Impacts and Risks	S_C_SOC11a. Implement Project Human Resources Policy	The Project Human Resources Policy is developed in alignment with IFC PS2 and AfDB OS2 requirement: commitments to apply labor code, ban child labor, forced	Before Construction	EMC Human Resources Manager	Covered by EMC internal resources and existing staff costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			labor, discrimination, harassment; rights to join worker organization Policy is signed off by contractors			The costs will be supported by EMC
		S_C_SOC11b. Implement Human Resources Management Plan for the construction phase	The Project Human Resources Management plan for the Construction phase: is developed and includes: - Working conditions applicable to the Project - Specific measures to avoid harassment and sexual assaults - Workers grievance mechanism	Before and during Construction	EMC Human Resources Manager	Covered by EMC internal resources and existing staff costs The costs will be supported by EMC
		S_C_SOC11c. Implement the Occupational Health and Safety Management Plan for the Construction Phase	Project Occupational Health and Safety Management Plan is developed and aligned with the requirement of the ISO 45000, AFDB, IFC standards and national requirements.	Before and during Construction	EMC HSE Manager	Refer to Occupationnal Health & Safety Management Plan The costs will be supported by EMC
		S_C_SOC11d. Consideration of IFC and AfDB guidelines as appropriate in regard to worker accommodation during construction	Worker accommodation during Construction is designed in alignment with AfDB and IFC guidance note “workers’ accommodation process and standards”	Before Construction	Project Design Manager	Included in Project design and engineering costs
		S_C_SOC11e. Regular inspections of Contractor’s performance including health and safety and labor and working conditions	Contractor’s compliance and performance related to Occupational Health & Safety is monitored monthly and submitted to regular on-site inspections	During Construction	EMC HSE Manager EMC HSE Manager or	Covered by EMC internal resources and existing staff costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			Labor and working conditions' compliance is audited every 6 months for each contractor		EMC Human Resources Manager or Contract Manager	The costs will be supported by EMC
Cultural Heritage (CH)						
CH01	Damage to or removal of tangible archaeological cultural heritage	S_C_CH01a. Prepare Cultural Heritage Management Plan to consolidate all topic specific requirements and support effective implementation. S_C_CH01b. Develop Constraints Mapping to facilitate micro-design and avoidance of sensitive cultural heritage resources, and a 15m buffer zone surrounding the resource extent, within the proposed footprint. S_C_CH01c Implement exclusion zones in accordance with the Constraints Mapping (on site barriers and demarcation).	Development of bespoke 'site ready' Cultural Heritage Management Plan, to include accompanying Chance Find Procedure and cultural heritage sensitivity mapping (Avoidance Plans detailing archaeological exclusion zones). Completion of Chance Find Register and review schedule. Records of applicable staff training (e.g., Cultural Awareness programme at Induction) Preparation and execution of archaeological evaluation programme by competent expert team. Publication of archive report.	Developed prior to Construction Implemented throughout Construction (including pre-construction)	EMC EHS Manager, supported by procured Archaeological Contractor.	Refer to Cultural Heritage Management Plan and Stakeholder Engagement Plan (SEP)

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		S_C_CH01d. Develop and Implement Project-specific Chance Find Procedure.	Pre-construction walkover survey programme for any areas previously inaccessible for survey (as required / according to final Project Description). Commitments for ongoing cultural heritage engagement within the SEP.			
		S_C_CH01e. Develop site-specific mitigation and management as required e.g., targeted Archaeological Evaluation Programme and/or Vibration Monitoring in association with the Blasting Management Plan.				
		S_C_CH0f. Implement cultural heritage awareness training and supporting toolbox talks.				
		S_C_CH01g. Develop ongoing commitments for consultation with stakeholders (national regulator and affected community representatives) regarding cultural heritage management, in association with the Stakeholder Engagement Plan.				

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
CH02	Disturbance of intangible cultural heritage, including loss of usual resource access	S_C_CH02a. Prepare Cultural Heritage Management Plan to consolidate all topic specific requirements and support effective implementation	Development of bespoke 'site ready' Cultural Heritage Management Plan, to include accompanying cultural heritage sensitivity - Constraints mapping (Avoidance Plans detailing living cultural heritage / cemetery site etc, exclusion zones); - A calendar of local cultural events, to support the respect for periods of religious and community ceremonies, adapting activities where possible.	Developed prior to Construction Implemented throughout Construction (including pre-construction)	EMC EHS Manager, supported by procured Archaeological Contractor.	Refer to Cultural Heritage Management Plan and Stakeholder Engagement Plan (SEP) . .
		S_C_CH02b. Develop Constraints Mapping to facilitate micro-design and avoidance of sensitive cultural heritage resources, and a 15m buffer zone surrounding the resource extent, within the proposed footprint.	Demarcation of sensitive resources (active cemeteries etc) as per CHMP requirements (signage and barriers).			
		S_C_CH02d. Implement cultural heritage awareness training and supporting toolbox talks.	Implementation of Cultural Awareness Training (e.g., Cultural Awareness programme at Induction) – with supporting training records and delivery programme – including information on no-go areas local			
		S_C_CH02e. Implement ongoing Stakeholder				

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		Engagement Plan and community consultation regarding cultural heritage mitigation. S C_CH02f. Implement Project Grievance Mechanism.	taboos, religious / cultural calendar of events etc. Completion of stakeholder consultation register and related programme, as outlined within CHMP, linked to ongoing SEP and Project Grievance Mechanism. Maintenance of local (safe) access to cultural heritage resources.			
CH03	Changes to the setting of cultural heritage resources.	S_C_CH03a. Minimisation of project footprint and sensitive Project design of buildings, where appropriate. S_C_ACH03b. Implement Cultural Heritage Management Plan S_C_ACH03c. Dust suppression on roads and stockpiles S_C_CH03d. Implement cultural heritage awareness training and supporting toolbox talks.	Development of bespoke 'site ready' implementable Cultural Heritage Management Plan, and accompanying Chance Find Procedure and cultural heritage sensitivity mapping (Avoidance Plans). Implementation of Cultural Awareness Training (e.g., Cultural Awareness programme at Induction) – with supporting training records and delivery programme – including information on no-go areas local taboos, religious / cultural calendar of events etc.	Pre-construction. Throughout construction (including pre-construction) Throughout construction (including pre-construction)	EMC EHS Manager, supported by procured Archaeological Contractor. .	Refer to Cultural Heritage Management Plan and Stakeholder Engagement Plan (SEP).

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		S_C_CH03e. Implement ongoing Stakeholder Engagement Plan and community consultation regarding cultural heritage mitigation.	Completion of stakeholder consultation register and related programme, as outlined within CHMP, linked to ongoing SEP and Project Grievance Mechanism. Maintenance of safe local access to cultural heritage resources.			
		S C_CH03f. Implement Project Grievance Mechanism.				
Traffic and transportation (TT)						
TT01	Disruption to traffic travelling on the existing F'Derik road due to junction works.	S_C_TT01a. Driver training	Refer to P_C_LQU01b. Mine infrastructures access road construction (providing drivers training); and S_C_SOC10a. Implement the Community Health and Safety Management Plan	-	-	-
	Increased risk of accidents due to the construction works.	S_C_TT01b. Implement Traffic Management Plan	Refer to S_C_ACH01a. Implement Traffic Management Plan, identifying fixed traffic routes around sites Implement Cultural Heritage Management Plan, including the Ground Disturbance Procedure and Chance Find Procedures; and S_C_ACH04b. Implement Traffic Management Plan	-	-	-
	Inappropriate or unmanaged	S_C_TT01c. Implement appropriate traffic management at the mine	Refer to P_C_LQU01b. Mine infrastructures access road construction	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
	construction works.	access road junction during construction works				
TT02	Increased traffic flow, nuisance and accidents due to traffic generated by construction activities	S_C_TT02a. Driver training	Refer to P_C_LQU01b. Mine infrastructures access road construction (providing drivers training); and S_C_SOC10a. Implement the Community Health and Safety Management Plan	-	-	-
		S_C_TT02b. Development of rail spur and sidings to connect mine site with existing railway line	Refer to P_C_LQU01a. Minimisation of the Project footprint and ground disturbance	-	-	-
		S_C_TT02c. Movement of product, material and consumables by rail	Use preferably rail transportation (instead of road) Also Refer to P_C_LQU01a. Minimisation of the Project footprint and ground disturbance	Each time it is possible, as soon as the railway is functional	EMC Mine Manager EMC EHS Manager	Included in the salaries of the Mine Manager and EHS Manager
		S_C_TT02d. Construction of the mine access road (paved during construction)	Refer to P_C_LQU01b. Mine infrastructures access road construction	-	-	-
		S_C_TT02e. Workers accommodation located at the mine site	Refer to S_C_SOC11d. Consideration of IFC and AfDB guidelines as appropriate in regard to worker accommodation during construction	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		S_C_TT02f. Transport of employees to/ from the mine site in organised buses	Transport of employees is organized to allow them to move to/from the Mine Site: ▪ Buses shifts are organised regularly; ▪ Buses stops are located in safe areas; ▪ Buses stops are located in areas were workers can go back home or can take another transportation mode; ▪ Buses shifts and capacities cover the workers needs for transportation.	Before the start of construction work During the whole construction phase	EMC Mine Manager EMC EHS Manager	Included in the salaries of the Mine Manager and EHS Manager
		S_C_TT02g. Implement Traffic Management Plan	Refer to measure S_C_ACH01a. Implement Traffic Management Plan, identifying fixed traffic routes around sites Implement Cultural Heritage Management Plan, including the Ground Disturbance Procedure and Chance Find Procedures; and S_C_ACH04b. Implement Traffic Management Plan	-	-	-
		S_C_TT02h. Installation of road markings and signage (including speed limits) on the mine access road	Refer to measure P_C_LQU01b. Mine infrastructures access road construction; P_C_LV01/02c. Controlled vehicle access through the landscape will reduce detrimental effects on character/ vegetation; and	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			S_C_SOC10a. Implement the Community Health and Safety Management Plan			

14.1.2 Mine ESMP during the operation phase

14.1.2.1 Physical component

Table 14-5: ESMP - Physical component - Operation phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
Groundwater (GW)						
GW01	Declining groundwater levels in the P2 and P4 aquifers from abstraction of groundwater from the Touajil and Aouchich wellfields	P_O_GW01a. Implement the Water & Groundwater Management Plan.	The Groundwater Management Plan is updated with results of the GW monitoring and effective abstraction process: ▪ details about abstraction activities and rates per borehole provided; ▪ monitoring results with modelled results compared and expected drawdown over the incoming years updated; ▪ potential change in GW quality assessed and recommendations about abstraction regimes changes for minimizing the declining GW quality provided; ▪ possibility of operating the Touajil well field for 20 years as initially planned Confirmed;	Every year until mine decommissioning	EMC EHS Manager in collaboration with EMC Mine Manager	Refer to GWSWMP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
			▪ potential GW drawdown and quality decline at the hand dug wells is Assessed and compensatory water supply to the herders until full hand dug groundwater recovery anticipated.			
		P_O_GW01b. Implement the Water & Groundwater Management Plan	The Water Management Plan is updated with effective water consumption per activity (ore treatment, dust abatement, potable water consumption, raw water provisioning to stakeholders (herders at Touajil and Aouchich, Touajil Auberge…)	Every year until mine decommissioning	EMC EHS Manager in collaboration with EMC Mine Manager	Refer to GWSWMP
		P_O_GW01c. Monitor GW water abstraction in Touajil to determine timing for development of the wellfield at Aouchich	The Water & Groundwater Management Plan provides an updated GW monitoring allowing to assess the evolution of the GW drawdown and quality at the Touajil wellfield to determine the right timing for the total or partial transfer of GW abstraction from Touajil to Aouchich wellfield	updated every year until Touajil wellfield decommissioning	EMC EHS Manager in collaboration with EMC Mine Manager	Refer to GWSWMP
		P_O_GW01d. Update the Groundwater model	The groundwater model is updated, re-validated and re-run with all the monitoring data recorded since the wellfields commissioning	Updated every two years	External consultant with EMC EHS Manager	Refer to GWSWMP
		P_O_GW01e. Photovoltaic panels dry cleaning method	The photovoltaic plant at the mine site is equipped with dry cleaning system / method to clean the solar panels	During the mine operation	EMC EHS Manager in collaboration	Equipement :≈180 k€ Maintenance : ≈ 25 k€/year

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
					with EMC Mine Manager	
GW02	Declining groundwater quality as a result of long-term pumping	P_O_GW02a. Implement the Water & Groundwater Management Plan	Refer to measure P_O_GW01a. Implement the Water & Groundwater Management Plan.			Refer to GWSWMP
		P_O_GW02b. Monitor GW water abstraction in Touajil to determine timing for development of the wellfield at Aouchich	Refer to measure P_O_GW01c. Monitor GW water abstraction in Touajil to determine timing for development of the wellfield at Aouchich.			Refer to GWSWMP
GW03	Impact of declining groundwater level on groundwater users	P_O_GW03a. Alternative water supply for groundwater users from EMC wellfields	The agreement set up between EMC and Touajil Auberge is implemented: the defined volume of water to provision the palm grove once the Auberge's boreholes are depleted (depletion monitored through the Water & Groundwater Management Plan) is provided	Before the depletion of the Touajil Auberge wells	EMC EHS Manager in collaboration with EMC Mine Manager	Included in the Management costs of the Mine
		P_O_GW03b. Access to raw water of suitable quality for livestock watering and local communities	GW consumption attributed to the populations via the water access points is monitored and reported into the updated Water & Groundwater Management Plan	Every year	EMC EHS Manager	Refer to GWSWMP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
		P_O_GW03c. Provision of potable water supply to F'Derik	The Potable water quality is regularly assessed: a monitoring program is put in place and define the chemical and physio-chemical parameters to monitor. The updated Water & Groundwater Management Plan reports the total volume of drinking water supplied to the City of F'Derik and water quality analysis and results.	Quaterly Every year	EMC EHS Manager	Refer to GWSWMP Included in the operational costs of the Mine
		P_O_GW03d. Implement the Stakeholder Engagement Plan, including the communities grievance mechanism	Refer to S_O_SOC05b. Implement the Stakeholder Engagement Plan	During Operation	EMC Community Relations Manager	Refer to SEP The costs will be supported by EMC
Surface Water						
SW01	Change in surface water flow and flood risk	P_O_SW01a. Prevention of changes in surface runoff or implementation of measures for separation and diversion of water	The installations for separation and diversion of runoff water onto the mine site are regularly checked. A register records every inspection: ▪ Observations on the runoff infrastructures; ▪ Eventual Rehabilitation / repair actions engaged on the runoff system.	After every rain events	EMC EHS Manager	Included in the operational costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
		flows onto the mine site				
		P_O_SW01b. Prevention of changes in surface runoff or implementation of measures for separation and diversion of water flows at the other mining facilities	The installations at the other mining facilities (rail spur, dynamite storage area, well fields, new El Aouj city at F'Derik) are regularly checked. A register records every inspection: ▪ Observations on the runoff infrastructures; ▪ Eventual Rehabilitation / repair actions engaged on the runoff system.	After every rain events	EMC EHS Manager	Included in the operational costs
		P_O_SW01c. Minimise erosion and soil conveyance	Unpaved surfaces around the mine infrastructures and within the project footprint are checked for any trace of erosion and rebuilt (filled and stabilized) if necessary A register records every inspection: ▪ Observations on the degraded surfaces; ▪ Eventual Rehabilitation / repair actions engaged on the degraded surfaces.	After every rain events	EMC EHS Manager	Included in the operational costs
SW02	Changes of surface water runoff quality and pollution of wadis	P_O_SW02/03a. Separation of clean and dirty runoff	Refer to measure P_O_SW01a. Prevention of changes in surface runoff or implementation of measures for	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
			separation and diversion of water flows onto the mine site .			
		P_O_SW02/03b. Control of polluted runoff	Proceed to inspection of water bodies: ▪ report nature and origin of observed runoff pollution if any; ▪ identify and engage immediate appropriate remediation measures. A register records every inspection: ▪ Observations on the polluted runoff and origin ▪ Eventual remediation actions engaged; ▪ propose corrective measures to avoid a renewal of water pollution.	After every rain events	EMC EHS Manager	Refer to ERP The costs will be supported by EMC
		P_O_SW02/03c. Only inert mine waste material to be disposed of in waste dump area	Only waste rock from the stripping of surface layers above the ore is disposed in the waste dump area.	During all the mining operation	EMC EHS Manager and EMC Mine operations Manager	Included in the operational costs Refer to Non-Mineral Waste MP
		P_O_SW02/03d. Good practice including prevention, identification, control and monitoring of accidental discharges/ spills	Refer to measure P_O_LQU01e. Good practice prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment.	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
		P_O_SW02/03e. Control and reuse of treated domestic water	All domestic Waste water from the mine area, including office and camp, as well as F'Dérik new El Aouj City is treated in dedicated WWTP. The Management plan provides recommendations regarding a) the treated domestic water monitoring program and b) agronomic reference values to comply with in farming activities. Weekly analysis are performed at the discharge water point to verify the compliance with landfarming use. Turbidity and pH are continuously monitored (see Water & Groundwater Management Plan).	Every week	EMC EHS Manager	Refer to GWSWMP
		P_O_SW02f. control and maintenance of the incinerator	Routine controls and maintenance are undertaken on the incinerator to keep the system operational and in compliance with GIIP	Routinely as defined by the incinerator manufacturer	EMC EHS manager and incinerator operator	Included in the operational costs
SW03	Pollution of Sebkha Idjill and the salt works	P_O_SW02/03e. Implement the Emergency Preparedness and Response Plan	Refer to measure P_O_LQU01f Implement the Emergency Preparedness and Response Plan, including training.	-	-	-
		P_O_SW02/03f. Implement the Non-Mineral Waste Management Plan	Refer to measure P_O_LQU01g. Implement the Non-Mineral Waste Management Plan.	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
Noise and vibration (NV)						
NV01	Noise impacts generated by Project activities and equipment impacting on receptors	P_O_NV01a. Compliance with international noise emissions limits	Monitor compliance by: ▪ Identify the closest receptors to each noise generating activity site; ▪ Carry out noise measurements at these receptors; ▪ Check that noise levels are in compliance with applicable international standards.	At the beginning of each mine operations (blasting, ore treatment, ore transportation, traffic around F'Derik)	EMC EHS Manager	Refer to OHS MP
		P_O_NV01b. Regular inspection	An operational procedure is established and implemented: ▪ to ensure regular maintenance of the plant installations; ▪ to check if the equipment is in compliance with the noise specifications provided by the equipment manufacturer. Corrective measures are taken if the initially established sound level is exceeded. A maintenance regime is established with regular inspections undertaken on noise emitting facilities at the ore treatment plant. A maintenance register is kept up to date with record keeping of all	Before the start of mine operation During operation Adapted to mine activities (blasting, ore treatment, loading, stockpiling, power plant) and weather conditions	EMC EHS Manager Treatment plant Maintenance Manager	Refer to OHS MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
			maintenance and corrective actions performed on the equipment. Also refer to measure P_O_NV01a. Compliance with international noise emissions limits.			
NV02	Vibration impacts generated by Project activities and equipment impacting on receptors	P_O_NV02a. Shut down of machines in intermittent use in the intervening periods between work	Refer to measure P_C_NV01b. Shut down of machines in intermittent use in the intervening periods between work	-	-	-
		P_O_NV02b. Appropriate blast design	A blasting plan is established before any blasting operation. The document describes: ▪ Drilling methods and parameters ▪ Type and quantity of explosive ▪ Placement of explosive charges in the blastholes ▪ Use of detonators ▪ Optimized blast sequence for minimizing the vibration impacts ▪ Ground vibration controls (delay patterns) ▪ Limits of acceptable ground vibrations levels ▪ Blast timing	Before the start of each blasting operation	EMC EHS Manager and EMC Mine operations Manager	Included in the mine operation costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
			▪ Communications to local communities, workers and authorities ▪ Monitoring measures of the blasting effects ▪ Records keeping of the blasting operations (blast logs, monitoring data, incident reports)			
		P_O_NV02c. Implement the Stakeholder Engagement Plan	Refer to measure S_O_SOC05b. Implement Stakeholder Engagement Plan, including the grievance mechanism	-	-	-
Air quality (AQ)						
AQ01	Operational Emissions on Receptors at F'Derik, El Aouj Wells, Sebkha Idjill Salt Works	P_O_AQU01/02a. Dust capture by enclosure of equipment, wherever possible	The following mitigation measures embedded in the ore treatment design are implemented: ▪ Dry mineral processing dust control measures (ore wetting, capture dust generated by enclosing equipment, air ingress minimization and sufficient air capture velocities to prevent dust egress, use of cyclone separators for minimizing dust reporting to dust collectors, modified low velocity duct design to convey dust to multiple fabric filter dust collectors, moistening of the collected dust);	Before the start of the mine operation During the mine operation	EMC EHS Manager	Included in the design of the mine facilities

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
			▪ Used of adapted materials handling equipment minimizing transfer points, reduce fall heights, double handling, limit ore exposure to open air.			
		P_O_AQU01/02b. Bag houses on crushing, screening, stockpile and train loading with maintenance programs and bag replacement schedules	The following mitigation measures embedded in the ore treatment design are implemented: ▪ focused on maintenance programs and bag replacement schedules to maintain the performance of all dust collection and separation equipment.	Before the start of the mine operation During the mine operation	EMC Mine Manager	Refer to OHS MP
		P_O_AQU01/02c. Dust and gas emissions monitoring	An air quality Monitoring program is implemented at the closest identified receptors: ▪ Kedja Idjill Salt works (PM2.5 and PM10) ▪ Mine accommodation (PM2.5, PM10, NOx, SOx, CO Adapt to new potential receptors such as temporary nomads dwellings Monitoring activities covers all kind of mining activities and weather conditions	Adapted to mine activities (blasting, ore treatment, loading, stockpiling, power plant) and weather conditions	EMC EHS Manager and EMC Mine operations Manager	30 000€/year
AQ02	Operational Emissions on the Mine Accommodation	P_O_AQU01/02d. Vacuum ports whenever dust	The following mitigation measures embedded in the ore treatment design are implemented:	During the mine operation	EMC EHS Manager and EMC Mine	Included in the design of the mine facilities

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
		emissions >1 kg/h within a 10 m radius	▪ Mineral treatment plant facilities have vacuum ports for housekeeping connected to dust collectors.		operations Manager	
		P_O_AQU01/02e. Dust suppression on roads and stockpiles with raw water and brine from RO plant supplemented by polymers and inorganic salts, if necessary	The following mitigation measures embedded in the ore treatment design are implemented: ▪ A pilot test is engaged as soon as possible for use of biodegradable polymers or inorganic salt as dust particles stabilizer solution to minimize dust emission and reduce raw water consumption. ▪ Use of raw water with polymer for dust abatement on access roads, haul roads, stockpiles, tailings and all uncovered areas emitting dust.)	As soon as possible During the mine operation	EMC EHS Manager and EMC Mine operations Manager	Included in the operational costs
		P_O_AQU01/02f. Surface wetting supplemented by fogging during blasting	The following mitigation measures embedded in the ore treatment design are implemented: ▪ Use of misting and fogging equipment during blasting.	At each blasting operation	EMC EHS Manager and EMC Mine operations Manager	Included in the operational costs and the salary of the Mine Manager and EHS Manager
		P_O_AQU01/02g. Stack height to reduce impacts associated with	The following mitigation measures embedded in the mine design are implemented:	Before the start of the mine operation	EMC EHS Manager and EMC Mine	Included in the construction costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
		power generating facility	▪ The stacks of the Power plant is built at a sufficient height (minimum 30m) to avoid any air contamination at the nearest receptor (mine accommodation). Air quality is monitored: Refer to measures P_O_AQU01/02c. Dust and gas emissions monitoring	During the mine operation	operations Manager	
Greenhouse gas (GHG)						
GHG01	Emissions from the mine power plant and wellfields	P_O_GHG01a. Regular plant maintenance and servicing	An operational procedure is established and implemented: ▪ to ensure regular maintenance of the plant installations. ▪ to check if the equipment is in compliance with the fuel consumption specifications provided by the equipment manufacturer. Corrective measures are taken if fuel consumption exceeds equipment manufacturer expected consumption or fuel leaks are detected A maintenance regime is established with regular inspections undertaken on fuel consumption and exhaust gas at the power plant.	Before the start of the mine operation Every months / as needed during the mine operation	EHS Manager Treatment plant Maintenance Manager	Refer to Energy MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
			A maintenance register is kept up to date with record keeping of all maintenance and corrective actions performed on the plant.			
		P_O_GHG01b. Measure and monitoring of fuel use and emissions	The maintenance register is kept up to date with record keeping of fuel consumption. the fuel consumption recorded on each equipment conforms to the consumption announced by the manufacturer Refer to measures P_O_GHG01a. Regular plant maintenance and servicing; and P_O_AQU01/02c. Dust and gas emissions monitoring	Every months / as needed	Power plant Manager	Refer to Energy MP
		P_O_GHG01c. Where options exist, specify use of lower carbon fuels	Consult all fuel suppliers to compare and select the least polluting fuel.	Before the start of the mine operation Every 5 years during operation	Power plant Manager	Included in the salary of the Power plant Manager
		P_O_GHG01d. Reducing idling time on electrically powered equipment	Turn off any electrically powered device when not in use. Also Refer to P_C_NV01b. Shut down of machines in intermittent use in the intervening periods between work.	During all operations	EMC EHS Manager and EMC Mine operations Manager	Refer to Energy MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
		Checking for, and eliminating, leaks on systems.	Perform regular check to research any leak on system. Repair any leak on system once detected.	Every month / as needed		
GHG02	Emissions from Use of Vehicles, Mobile Plant and Transport of Goods	P_O_GHG02a. Specify fuel efficient vehicles and minimise travel	Compare all vehicles fuel efficiency and select the least polluting ones for the operational phase and exploitation activities. Keep track and record the fuel efficiency of all vehicles used on-site. Follow the Traffic Management Plan to optimise the road traffic and limit the travels to the minimum necessary. Also Refer to measure P_O_LQU01b. Traffic Management	Before the start of the mine operation During all operations	EMC EHS Manager and EMC Mine operations Manager	Refer to Energy MP
		P_O_GHG02b. Specify efficient generator equipment and consider GHG emissions of fuel	Monitor the generators energy efficiency of the units	During all operations	EMC EHS Manager and EMC Mine operations Manager	Refer to Energy MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
		P_O_GHG02c. Implementation of regular maintenance and servicing	An operational procedure is established and implemented: ▪ to ensure regular maintenance of all machines and installations; **to check if the equipment is in compliance with the fuel consumption specifications provided by the equipment manufacturer.**Corrective measures are taken if fuel consumption exceeds equipment manufacturer expected consumption A maintenance regime is established with regular inspections undertaken on fuel consumption and exhaust gas. A maintenance register is kept up to date with record keeping of all maintenance and corrective actions performed. Also Refer to measure P_O_GHG01b. Measure and monitoring of fuel use and emissions (regarding maintenance and fuel consumption tracking)	Before the start of the mine operation Every months / as needed during the mine operation	EMC EHS Manager Treatment plant Maintenance Manager	Refer to Energy MP
		P_O_GHG02d Develop green energy sources for El Aouj homes and accommodations.	The design of the new city of El Aouj incorporates the production of green energy, such as photovoltaic systems, in homes and buildings.	Lors de la conception de la ville	Le concepteur de la ville	Included in the city designer's service

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
		P_O_GHG02e. Provision of driver training and awareness to improve fuel use efficiency	Refer to measures P_C_LQU01b. Mine infrastructures access road construction (providing drivers training); and S_C_SOC10a. Implement the Community Health and Safety Management Plan	-	-	-
		P_O_GHG02f. Use of rail transport (as opposed to road transport) where possible	Enhance the preferential use of rail transportation (instead of road) Also Refer to measure P_C_LQU01a. Minimisation of the Project footprint and ground disturbance	Each time it is possible, as soon as the railway is functional	EMC Mine Manager	Included in the operational costs
		P_O_GHG02g. Use solar energy for powering the wellfields	The Touajil and Aouchich wellfields installations are powered by solar energy : Refer to P_O_GW01e.	During the wellfields operation	EMC EHS Manager and EMC Mine operations Manager	-
Land quality and Land use (LQU)						
LQU01	Degradation in land quality	P_O_LQU01a. Minimisation of the Project footprint and ground disturbance	Implement all further measure P_O_LQU01. recommended mitigation measures	-	-	-
		P_O_LQU01b. Traffic Management	Implement the Traffic Management Plan	During mine operation	EMC EHS Manager and EMC Mine operations Manager	Refer to TMP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
		P_O_LQU01c. runoff & erosion management	Routine monitoring and maintenance of the culverts and drains are undertaken to prevent any risk of erosion.	During mine operation : After every rain event		Included in operational costs
		P_O_LQU01d. wastewater treatment	A maintenance and monitoring program for the wastewater treatment plant is developed.	Before the start of the WWTP	WWTP manufacturer	Included in the WWTP construction contract Refer to GWSWMP
			Routine inspections are carried out on the WWTP. Preventive maintenances are carried out on the WWTP. Records and documentation of the WWTP maintenance are kept (logs, monitoring results, operation maintenance performed)	During mine operation : weekly detailed inspection Monthly to quarterly, per manufacturer manuals	WWTP Operator	Included in O&M of the WWTP operator
			Effluent quality monitoring is performed according to national regulatory requirement and GIIP for WWTP operation	Monitoring frequency and parameters to be reviewed periodically and adjusted based on operational performance, sensitivity of the	WWTP Operator	Refer to GWSWMP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
				receiving environment, and applicable regulatory requirements.		
			Sludge management and disposal is tracked (volume, final disposal method)	Continuous; disposal as generated	WWTP Operator / Licensed Contractor	3 000 to 10 000€/year Refer to non-mineral waste MP
		P_O_LQU01e. Good practice prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment	EMC operational procedures for prevention, identification, control and monitoring of accidental discharges/ spills and provision of spill containment and clean-up equipment during all operational phases are in place: ▪ Control of spillage through routine preventative maintenance on construction plant and vehicles, and use of drip trays under temporary plant; ▪ Secondary containment by bunding around chemical/ fuel/ lubricant/ hydraulic fluid storage tanks and facilities; ▪ Dedicated refuelling areas with impervious surfacing and available spill containment and clean-up kits; ▪ Remediation of any contaminated soil and rehabilitation of disturbed areas.	Before the mine commissioning	EMC EHS Manager and EMC Mine operations Manager	Refer to HAZMAT MP Refer to non-mineral waste MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
			Implement the Hazardous Material Management Plan.			
		P_O_LQU01f Implement the Emergency Preparedness and Response Plan (ERP), including training	Implement the Emergency Preparedness and Response Plan. The ERP is reviewed, including necessary revisions made to reflect any changing construction circumstances. A written report is formally produced following each emergency response to an incident. The ERP is reviewed after any incident reported or test.	During the mine operation Once per year After every incident report	EMC EHS Manager	Refer to ERP Refer to ERP
		P_O_LQU01g. Implement the Non-Mineral Waste Management Plan	Specific procedures for waste collection, characterization and registration are developed for the mine operation, in line with the Non-Mineral waste Management Plan. The Non-Mineral Waste Management Plan is reviewed, including necessary revisions made to reflect any changing circumstances during the mine operation.	Before the mine commissioning Once per year As mentioned in the Management Plan Routinely	EMC EHS Manager	Refer to Non-mineral Waste MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
			Monitoring activities are put in place in compliance with the Non-Mineral Waste Management Plan recommendations. A register reports the key indicators as described in the Non-Mineral Management Plan to assess effectiveness of the mitigation strategies.			
		P_O_LQU01h. Implementation of awareness training on the risks of contamination of the natural environment, emergency procedures and respect for good environmental practices, for all staff (workers, managers, etc.)	Personnel working on site have been trained in the various risks inherent in handling dangerous products, the risks of contamination of the natural environment and the emergency. Procedures to follow to avoid the dispersion of polluting products in the environment. Maintaining a training register (date, type of training, name of speakers, topics covered, validation).	Before starting each type of work	EPC EHS Manager	Refer to ERP
		P_O_LQU01i. Involve the EHS manager and site managers in monitoring compliance with good environmental practices	A site inspections and weekly meetings register is kept up to date and records all breaches of procedures for managing risks of contamination of the natural environment. Implementation of follow-up measures to avoid repeat breaches of procedures.	During the mine operation	EMC EHS Manager	Refer to ERP Refer to Non-mineral Waste MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
LQU02	Change in land use	P_O_LQU02a. Minimisation of Project footprint and ground disturbance	Implement all further measure P_O_LQU01. recommended mitigation measures	-	-	-
		P_O_LQU02b. Traffic Management	Refer to measure P_O_LQU01b. Traffic Management	-	-	-
		P_O_LQU02c. Implement Stakeholder Engagement Plan Implement Influx Management Strategy	Refer to measures S_C_SOC06a. Implement the Influx Management Strategy ; and S_O_SOC05b. Implement the Stakeholder Engagement Plan.	-	-	-
Landscape and Visual (LV)						
LV01	Effects on Landscape Character of Tiris Zemmour Guelbs (LCA 04)	P_O_LV01/02a. Minimisation of Project footprint	Implement all further measure P_O_LQU01. recommended mitigation measures	-	-	-
		P_O_LV01/02b. Encouragement of natural re-vegetation, wherever practicable	Refer to measures B_C_EB01g. and B_O_EB04a. related to the development and implementation of the Revegetation Plan	-	-	-
LV02	Effects on views at VP 03 Hassie El Aouj	P_O_LV01/02c. Controlled vehicle	Refer to measure P_O_LQU01b. Traffic Management	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency and duration	Responsibility	Estimated costs
	and VP 04 Sebkha Idjill Salt Works	access through the landscape will reduce detrimental effects on character/ vegetation				
		P_O_LV01/02d. Dust suppression on roads by water trucks and on stockpiles	Refer to P_O_AQU01/02e. Dust suppression on roads and stockpiles with raw water and brine from RO plant supplemented by polymers and inorganic salts, if necessary	-	-	-

14.1.2.2 Biological component

Table 14-6: ESMP - Biological component - Operation phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Ecology and biodiversity (EB)						
EB01	Loss and Degradation of Legally Protected Flora	B_O_EB01a. Paved mine access road will reduce dust emission from the traffic, and process plant fence will exclude grazers from the area; both reducing the tree degradation.	Refer to measure B_C_EB01a. Paved mine access road and process plant fence together will reduce existing pressures on vegetation facilitating recolonization be natural vegetation. This will compensate for some of the tree loss to the Project over the long-term.	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		Refer to measure P_O_AQU01/02e. Dust suppression on roads and stockpiles with raw water and brine from RO plant supplemented by polymers and inorganic salts, if necessary	Refer to measure P_O_AQU01/02e.	-	-	-
EB01	Loss and Degradation of Legally Protected Flora	B_O_EB01b. Implement the Revegetation Plan.	A botanical expert is retained to lead the implementation of revegetation efforts over the life of the mine.	Prior to Operation	EMC EHS Manager	Refer to BAP costing
			Annual reporting on revegetation activities, including a summary of actions undertaken, results of trials/vegetation monitoring, and if applicable, any learnings and proposed adaptive management actions.	Annually during operations	EMC botanical expert	Included above
			Pilot study results involving nursing of trees, planting of trees and seeding of grasses.	Three years after the start of operations	EMC botanical expert and EMC EHS Manager	Refer to BAP costing
			Annual work plan establishing priorities for the revegetation program based on progress and learnings to date.	Annually after year three of operations	EMC botanical expert and EMC EHS Manager	Refer to BAP costing
EB03	Impacts on Bird Species of	B_O_EB03a. Minimize light dispersion	Refer to measure B_C_EB03a. Minimize light dispersion with the use	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
	Conservation Concern		of high efficiency and directional lighting (i.e., lights fitted with shields to direct lighting towards the ground and minimize sky glow)			
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03b. Lighting should be kept to the minimum required	Refer to measure B_C_EB03b. Lighting should be kept to the minimum required, specifically targeting work areas in use.	-	-	-
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03c. Motion sensor lights	Refer to measure B_C_EB03c. For areas not requiring full-time illumination, install motion sensor lights so that lights can turn on and off automatically based on need. These should be installed around administrative buildings and other facilities that do not typically require regular use during night-time hours.	-	-	-
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03d. Implement the Revegetation Plan.	Refer to measure B_O_EB01g. Implement the Revegetation Plan.	-	-	-
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03e. Implement Biodiversity Action Plan	Refer to measure B_C_EB01i. Develop and implement a Biodiversity Action Plan.	-	-	-
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03f. Update training and awareness of employees	Every 5 years carry out refresher training for personnel working on site about environmental concerns: ▪ Waste management	Every 5 years during operations	EMC EHS Manager	Included in the cost of the EHS Manager's salary

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			▪ Fauna and flora species of concern Up to date training records are maintained in a training register (date, type of training, name of speakers, topics covered, validation).			
			All new personnel working on site have received environmental awareness training as part of their induction training. Up to date training records are maintained in a training register (date, type of training, name of speakers, topics covered, validation).	Ongoing as workers are onboarded	EMC EHS Manager	Included in the cost of the EHS Manager's salary
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03g. Pre blast inspection: inspection of the blast area by an ecologist prior to explosive use (to confirm absence of nests).	Areas scheduled for blasting are systematically surveyed by an ecologist and documented in a field report. No active nests are recorded. If nests are detected, appropriate measures are documented and implemented accordingly.	Before blasting	Environmental consultant and EMC EHS Manager	Refer to BAP costing
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03h. Use of explosives outside sensitive daily periods: avoid early morning / late afternoon.	Explosive charges are detonated outside sensitive daily periods, which are early in the morning or late in the afternoon.	Planned before blasting	EMC EHS Manager	No additional costs, included in operational planning
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03i. Progressive warning system: siren with gradually increasing sound levels from blasting zone.	Warning signals are activated before each blast to deter birds present in the vicinity.	Before blasting	EMC EHS Manager	No additional costs, included in standard mining procedures

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03j. Systematic incident reporting: documentation of interactions or incidents between blasting activities and birds.	100% of interactions or incidents involving blasting activities and birds are recorded and documented. Effectiveness of avian mitigation measures will be assessed through trigger thresholds. More than one incident per month, or any mortality event, will trigger a review and reinforcement of the mitigation measures. An upward trend in recorded incidents over two consecutive months will also require corrective actions. Additional corrective measures are implemented whenever thresholds are exceeded.	Ongoing – incidents reviewed and reported monthly	EMC EHS Manager and Environmental Coordinator	Refer to BAP costing
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03k. Deterrence measures (acoustic or chemo sensory) around the solar plant area.	Deterrent measures are implemented and effective around the solar panel field. Acoustic recommendations: ▪ Intermittent, ▪ Randomized, ▪ Short-duration signals, ▪ Variation in frequency and amplitude (2–10 kHz), ▪ “Off-days” to prevent habituation.	Multiple times a day (can be adjust during operation phase based on B_O_EB03m. results.)	EMC EHS Manager	Refer to BAP costing
EB03	Impacts on Bird Species of	B_O_EB03l. Maintain vegetation under and	Compatible vegetation under and between solar panel rows is encouraged and maintained.	Quarterly	EMC EHS Manager, Environmental	Refer to BAP costing

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
	Conservation Concern	between solar panel rows to preserve habitat structure			Coordinator and EMC Botanical Expert	
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03m. Systematic incident reporting: documentation of any interaction between solar panels and birds.	100% of interactions or incidents involving solar panels and birds are recorded and documented. Effectiveness of avian mitigation measures will be assessed through trigger thresholds. More than one incident per month, or any mortality event, will trigger a review and reinforcement of the mitigation measures. Any upward trend in recorded incidents over two consecutive months will also require corrective actions. Additional corrective measures are implemented whenever thresholds are exceeded.	Weekly checks for the first 12 months of operation Punctual thereafter when an incident is detected	EMC EHS Manager and Environmental Coordinator	Refer to BAP costing
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03n. Implement a bird friendly power line design to eliminate the risk of electrocution for birds	The overhead power line design includes bird friendly design	Once	EMC EHS Manager	Included in the Design and Construction Cost
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03o. Install bird flight diverters along sensitive areas of the overhead power line (1 km inside the Kediet ej Jill KBA)	Bird flight diverters are installed as planned.	Once	EMC EHS Manager	Refer to BAP costing

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
EB03	Impacts on Bird Species of Conservation Concern	B_O_EB03p. Monitor avian mortality along the transmission line for two years post-construction. Adjust mitigation measures as needed, based on monitoring results	No mortality of priority species, including globally threatened species (listed as CR, EN or VU) and species that trigger the KBA/IBA criteria for Kediet ej Jill. Additional corrective measures are implemented whenever thresholds are exceeded.	Monthly for a two-year period	EMC EHS Manager and external consultant (avifaunal expert)	Refer to BAP costing
EB04	Natural habitat loss, degradation, and fragmentation	B_O_EB04a. Implement the Revegetation Plan.	Refer to measure B_O_EB01b. Implement the Revegetation Plan as defined for the construction phase.	-	-	-
EB04	Natural habitat loss, degradation, and fragmentation	B_C_EB04b. Integrate a risk-based monitoring approach for non-native invasive species to the BAP.	Target: Zero detections of non-native invasive species. A detection of a non-native invasive species will trigger the requirement for risk assessment and development of a site-specific invasive species control and management plan.	Annually	EMC Botanical Expert and EMC EHS Manager	Cost is included in EMC personnel salaries
ES01	Degradation of livestock and forage resources	B_O_ES01a. Access roads to be clearly marked with a defined speed limits.	Refer to measure P_C_LQU01b. Mine infrastructures access road construction.	-	-	-
		B_O_ES01b. Driver training, including safe practice and avoidance of hazards.	Refer to measure P_C_LQU01b. Mine infrastructures access road construction.	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		B_O_ES01c. Implement Stakeholder Engagement Plan, including the grievance mechanism.	Refer to measure S_O_SOC05b. Implement the Stakeholder Engagement Plan.	-	-	-
		B_O_ES01d. Implement the Revegetation Plan.	Refer to measure B_O_EB01b. Implement the Revegetation Plan as defined for the construction phase.	-	-	-
ES02	Alteration of water resources for groundwater users in water abstraction areas	B_O_ES02a. Implement the Water & Groundwater Management Plan.	Refer to measure P_O_GW01a. Implement the Water & Groundwater Management Plan.	-	-	-
		B_O_ES02b. Implement the Water & Groundwater Management Plan.	Refer to measure P_O_GW01b. Implement the Water & Groundwater Management Plan.	-	-	-
		B_O_ES02c. Monitor abstraction in Touajil to determine timing for development of the wellfield at Aouchich.	Refer to measure P_O_GW01c. Monitor abstraction in Touajil to determine timing for development of the wellfield at Aouchich.	-	-	-
		B_O_ES02d. Update the groundwater model.	Refer to measure P_O_SW02/03bc. Control of polluted runoff.	-	-	-
		B_O_ES02e. Provide alternative water supply for groundwater users at Touajil Auberge and Aouchich from EMC wellfieds (direct pipeline, tanks or pumps).	Refer to measure P_O_GW03b. Installation of outlet taps in raw water pipeline.	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		B_O_ES02f. Implement the Stakeholder Engagement Plan, including the Grievance Mechanism.	Refer to measure S_O_SOC05b. Implement the Stakeholder Engagement Plan.	-	-	-
ES03	Increased access to water resources through pressure relief valves along the water pipelines	B_O_ES03a. Implement the Water & Groundwater Management Plan.	Refer to measure P_O_GW01a. Implement the Water & Groundwater Management Plan.	-	-	-
ES04	Degradation of salt extraction activities at Sebkha Idjill	B_O_ES04a. Separation or diversion of clean and dirty runoff (embedded mitigation).	Refer to measure P_O_SW02/03a. Prevention of changes in surface runoff or implementation of measures for separation and diversion of water flows onto the mine site.	-	-	-
		B_O_ES04b. Control of polluted runoff (embedded mitigation).	Refer to measure P_O_SW02/03b. Control of polluted runoff.	-	-	-
		B_O_ES04c. Only inert mine waste material to be disposed of in waste dump area (embedded mitigation).	Refer to measure P_O_SW02/03c. Only inert mine waste material to be disposed of in waste dump area.	-	-	-
		B_O_ES04d. Good practice including prevention, identification, control and monitoring of accidental discharges/spills.	Refer to measures P_O_SW02/03d. Good practice including prevention, identification, control and monitoring of accidental discharges/ spills; and P_O_LQU01e. Good practice prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			provision of spill containment and clean-up equipment			
		B_O_ES04e. Control of wash water that may contain cement from concreting operations	Refer to measures P_O_SW02/03e. Control of wash water that may contain cement from concreting operations and reuse for dust control when practicable			
		B_O_ES04f. Implement the Emergency Preparedness and Response Plan.	Refer to measures P_O_SW02/03e. Implement the Emergency Preparedness and Response Plan; and P_O_LQU01f Implement the Emergency Preparedness and Response Plan, including training.	-	-	-
		B_O_ES04g. Implement the Non-Mineral Waste Management Plan.	Refer to measures P_O_SW02/03f. Implement the Non-Mineral Waste Management Plan; and P_O_LQU01g. Implement the Non-Mineral Waste Management Plan.	-	-	-
		B_O_ES04h. Implement the Stakeholder Engagement Plan, including the Grievance Mechanism.	Refer to measure S_O_SOC05b. Implement the Stakeholder Engagement Plan.	-	-	-
		B_O_ES04i. Develop and implement a Livelihood Restoration Plan if ecosystem services provided by Sebkha Idjill are	Refer to measure S_O_SOC05a. Implement the Livelihood Restoration Plan.	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		impacted by Project activities.				
ES05	Degradation of ecosystems' water regulation capacity	B_O_ES05a. Dust capture by enclosure of equipment, wherever possible, or dust suppression through fogging/misting (embedded mitigation).	Refer to measure P_O_AQU01/02a. Dust capture by enclosure of equipment, wherever possible, or dust suppression through fogging/misting.	-	-	-
		B_O_ES05b. Bag houses on crushing, screening, stockpile and train loading with maintenance programmes and bag replacement schedules (embedded mitigation).	Refer to measure P_O_AQU01/02b. Bag houses on crushing, screening, stockpile and train loading with maintenance programmes and bag replacement schedules.	-	-	-
		B_O_ES05c. Vacuum ports whenever dust emissions >1 kg/h within a 10 m radius (embedded mitigation).	Refer to measure P_O_AQU01/02d. Vacuum ports whenever dust emissions >1 kg/h within a 10 m radius.	-	-	-
		B_O_ES05d. Dust suppression on roads and stockpiles with raw water and brine from RO plant supplemented by polymers and inorganic salts, if necessary (embedded mitigation).	Refer to measure P_O_AQU01/02e. Dust suppression on roads and stockpiles with raw water and brine from RO plant supplemented by polymers and inorganic salts, if necessary.	-	-	-
		B_O_ES05e. Surface wetting supplemented by	Refer to measure P_O_AQU01/02f. Surface wetting supplemented by fogging during blasting.	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		fogging during blasting (embedded mitigation).				
		B_O_ES05f. Stack height to reduce impacts associated with power generating facility (embedded mitigation).	Refer to measure P_O_AQU01/02g. Stack height to reduce impacts associated with power generating.	-	-	-
		B_O_ES05g. Implement the Water & Groundwater Management Plan.	Refer to measure P_O_GW01a. Implement the Water & Groundwater Management Plan.	-	-	-
		B_O_ES05h. Implement the Revegetation Plan.	Refer to measure B_O_EB01b. Implement the Revegetation Plan as defined for the construction phase.	-	-	-

14.1.2.3 Social component

Table 14-7: ESMP - Social component - Operation phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Social (SOC)						
SOC01	Increased Government Revenue	S_O_SOC01a Payments of taxes in a transparent, accurate and timely manner	The Finance and Legal team keep track of all the taxes applicable to the Project's operation. Payments are made on time and consolidated for public disclosure.	Each year and/or as appropriate	EMC Legal & Finance Managers	Covered by EMC internal resources and existing staff costs.
		S_O_SOC01b Implementation of sound financial principles and	An experienced Mining Finance Manager is recruited and set up accounting processes alginate with	During Operation	EMC CEO and Finance Manager	Covered by EMC internal resources

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		accounting processes for the Project	international best practice and Mauritanian law.			and existing staff costs.
		S_O_SOC01c Annual publishing of taxes paid, in line with EITI good practice guidelines	Information requested by EITI is disclosed on time. Payments to the government is disclosed in annual CSR report.	Each year	EMC Finance Manager EMC Public Affairs Manager	€20, 000 (for external provider and costs) The costs will be supported by EMC
SOC02	Enhancement of the Local Economy	S_O_SOC02a. Implement Local Procurement Strategy for the Operation phase	The Local Procurement Strategy document is updated for the Operation phase. Integration of the Strategy and/or local procurement clause included in main contractors' contract.	Strategy updated before Operations Indicators tracked Monthly	EMC Procurement, with EMC Community Relations Manager	€20,000 The costs will be supported by EMC
		S_O_SOC02b. Identify potential local suppliers	The database of suppliers from a/ the Tiris Zemmour region b/Mauritania is updated.	Before Operation	EPC and/or EMC Procurement Manager with EMC Community Relations Manager assistance	Covered by EMC/EPC internal resources and existing staff costs
SOC03	Increase inflationary Pressures and Shortages	S_O_SOC03a. Monitoring of availability and prices of key goods and services in local markets to inform periodic review of the Procurement	The price of a basket of goods is monitored.	During 2 first years of operation Every quarter	EMC Community Relations Manager	Covered by EMC/EPC internal resources and existing staff costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		Strategy, especially agricultural products				
SOC04	Increased Employment and Training	S_O_SOC04a. Implement the Recruitment Policy	New operation contractor signs the Project recruitment policy. Monitoring indicators such as % of employees (EMC and contractors) from Tiris Zemmour, Mauritania, Expatriates.	During Operations Indicators tracked monthly	EMC Human Resources Manager and EMC Procurement Managers	Covered by EMC/EPC internal resources and existing staff costs
		S_O_SOC04b. Implement the Stakeholder Engagement Plan, including proactive engagement with women and vulnerable groups on employment opportunities	A Stakeholder Engagement Plan for the Operation phase is developed and includes engagement regarding local employment opportunities, especially toward women and vulnerable groups. The Plan indicators include: ▪ Number of women attending meetings; ▪ Number of disaggregated meetings with women and vulnerable groups.	During operations Indicators tracked monthly	EMC Community Relations Manager	Refer to Stakeholder Engagement Plan (SEP_
SOC05	Natural Resource-based Livelihood Impacts	S_O_SOC05a Continue implementing mitigation measures to avoid, minimise, and manage impacts on natural-resource-based livelihoods for pastoralists, artisanal salt-extraction workers,	The livelihood restoration plan continues to be implemented until livelihood restoration is completed.	During 1st years of Operations Indicators tracked monthly If the borehole of the Auberge is impacted	EMC or EPC Health & Safety Manager	Refer to the Stakeholder Engagement Plan and Groundwater & Surface Water

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		and seasonal users of the Aouchich area. Mine: - Access road to be clearly marked with defined speed limits; - Driver training, including safe practice and avoidance of hazards; - Implement Stakeholder Engagement Plan, including the grievance mechanism; - Targeted engagement with pastoralists and artisanal salt workers at the Sebkha d'Idjill to confirm transhumance routes, seasonal salt extraction periods, and any access or safety concerns associated with Project activities; - Development and implementation of livelihood restoration measures, where impacts are verified, in consultation with affected pastoralists and artisanal salt workers; - Prepare targeted livelihood support measures for salt-extraction workers and pastoralist households,				Management Plan, as applicable LRP preparation: €80,000, Livelihood restoration implementation costs to be defined through the LRP The costs will be supported by EMC

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		aligned with IFC Performance Standards and consistent with national pastoral regulations on mobility and access to water. Aouchich - Implement Groundwater & Surface Water Management Plan: monitor wells water levels during mining activities to re-assess the impact of water abstraction before developing the well field project in 20 years-time; - Update social baseline two years before the development of the well field project; - Update and implement the Stakeholder Engagement Plan, including the community grievance mechanism: allow access to raw water with acceptable conductivity for local communities and livestock.				
		S_O_SOC05b, Implement the Stakeholder Engagement Plan (SEP), including: - a proactive approach to engage pastoralists about shared water usage - a grievance mechanism	The water concertation framework developed during Construction continue to meet regularly during operations. The number of grievances related to livelihood impacts is monitored.	During Operation	EMC Community Relations Manager	Refer to Stakeholder Engagement Plan (SEP)

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
SOC06	Unplanned Project-induced In-migration Impacts	S_O_SOC06a. Implement the Influx Management Strategy	- EMC HR register; - EMC recruitment reports (recruitment rates) during the operational phase; - Register of occupation of EMC base camps by project workers.	Implementation during Operations	EMC Human Resources	Covered by EMC internal resources and existing staff costs
		S_O_SOC06c. Implement the Stakeholder Engagement Plan, to include clear communication of all available employment positions at Project shop front in F'Derick	A Stakeholder Engagement Plan is developed and includes clear communication on job opportunities and recruitment process	Before and during Operations	EMC Community Relations Manager in Relations with Human Resources Manager	Refer to Stakeholder Engagement Plan (SEP)
		S_O_SOC06e. Coordinate with local and regional authorities to monitor and manage secondary risks associated with in-migration	- Number of coordination meetings held with local/regional authorities; - Number of joint actions (EMC and local/regional authorities) implemented to manage secondary risks.	Before and during Operations	EMC Community Relations Manager in Relations with Human Resources Manager	Covered by EMC internal resources and existing staff costs.
SOC08	Increased pressure on communal facilities and services	S_O_SOC08b Development of infrastructure in F'Derik for worker residences	- Report on the reception of accommodation for workers on the project in F'Derik; - Minutes or progress report on the Workers El Aouj city in F'Derik	Before and during Operations	EMC Project design Manager with EMC Community Relations and Public Affairs Managers	Included in the Project costs for the development of El Aouj City at F'Dérick.

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		S_O_SOC08c EMC to establish health services dedicated to project workers and their families	Health /dispensary services available set up by EMC for project workers and their families;	Before and during Operations	EMC Project design Manager with EMC Community Relations and Public Affairs Managers	Included in Project costs for the development and operation of worker health facilities/services
		S_O_SOC08d EMC will provide technical and material support to the basic social services of the city of F'Derik (health, education).	Reports/receipt forms signed by the relevant departments (education, health, municipality, etc.) regarding the support provided by EMC	During Operations	EMC Project design Manager with EMC Community Relations and Public Affairs Managers	Refer to Community Development Plan
SOC09	Community Development opportunities and Community expectation management	S_O_SOC09a Develop a Community Development Plan prior to any community support/ investment initiatives being	The Community Development Plan is updated for the operation phase.	Before and during Operation	EMC Community Relations Manager	Refer to Community Development Plan (CDP)
		S_O_SOC09b Implement a Stakeholder Engagement Plan	The stakeholder engagement plan is updated and includes a concertation framework with regular meetings with the authorities and communities of F'Derik, Touajil, authorities of Tiris Zemmour and pastoralists groups. A Stakeholder Engagement Register is maintained as part of the SEP implementation.	During Operations	EMC Community Relations Manager (up to Hakem level) EMC Public Affairs Manager (Governor level)	Refer to Stakeholder Engagement Plan (SEP)

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		S_O_SOC09c Maintain a commitment register	A commitment register is developed and used to track all community development commitments made to authorities and communities.	During Operations	EMC Community Relations Manager	Refer to Stakeholder Engagement Plan (SEP)
		S_O_SOC09d Maintain a request for support register	A register with all support request from the communities and the authorities is developed and maintained. A written answer (positive or negative) is provided to all requests.	During Operations	EMC Community Relations Manager	Refer to Stakeholder Engagement Plan (SEP)
SOC13	Impact on Women and Vulnerable groups	S_O_SOC13a. Implement the HR policy that explicitly includes provisions on equal opportunities, non-discrimination, and the protection of vulnerable groups	Provisions relating to equal opportunity, non-discrimination, and the protection of vulnerable groups are developed in EMC's HR policy in accordance with IFC PS2 and AfDB OS2.	Throughout Operations	EMC Human Resources Manager	Covered by EMC internal resources and existing staff costs.
		S_O_SOC13b. Implement a recruitment strategy that includes a minimum proportion of women, both in technical and non-technical positions, with suitable working hours and conditions that allow for a work-life balance	Proportion of women employed by EMC in technical and non-technical positions in the mine.	Throughout Operations	EMC Human Resources Manager	Covered by EMC internal resources and existing staff costs
		S_O_SOC13d. Support women's cooperatives in the mining area, in particular through training, capacity building, access to financing, or equipment, in order to improve their livelihoods in a sustainable manner	Material, technical, or financial support provided to women's cooperatives or associations by EMC in the mining region	Throughout Operations	EMC Human Resources Manager EMC Community Relations Manager	Refer to Community Development Plan

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		S_O_SOC13e. Train individuals or groups who lack the necessary skills to access job opportunities related to the project, with a particular focus on vulnerable or disadvantaged groups	Report on training sessions organised by EMC, including the number of people trained and the percentage of participants from vulnerable groups.	Throughout Operations	EMC Human Resources Manager EMC Community Relations Manager	Refer to Community Development Plan
		S_O_SOC13f. Implement the grievance management mechanism (GMM), including appropriate channels (telephone, community relays, focal points, complaint boxes), confidentiality guarantees, clear processing times, and specific procedures for the secure handling of GBV-related complaints.	Existence of an operational mechanism for managing complaints from communities; - Number of Community Awareness Sessions (women's groups) on the existence of the complaints management mechanism; Complaints database.	Throughout Operations	EMC Community Relations Manager	Refer to Stakeholder Engagement Plan (SEP)
SOC10	Impact on Community Health, Safety and Security	S_O_SOC10a. Implement the Community Health and Safety Management Plan	The Community Health & Safety Plan is updated for the Operation phase	Before and during operations	EMC Security Manager	Refer to the Community Health and Safety and Security Management Plan
		S_O_SOC10b. Implement the Stakeholder Engagement Plan, including grievance mechanism	A grievance mechanism is included in the updated Stakeholder Management Plan and disseminated within EMC/Contractors, local authorities and Communities.	Before and During Operations Monthly tracking of indicators	EMC Community Relations Manager	Refer to Stakeholder Engagement Plan (SEP)

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			Monitoring of grievances per category and lead time resolution performance is reported every month.			
		S_C_SOC10c. Implement a Security Management Plan	The Security Plan is updated. Monitoring of security incidents involving communities, grievances related to security personnel.	Before and during Operations Monthly monitoring	EMC Security Manager	Refer to the Community Health and Safety and Security Management Plan
		S_O_SOC10d. Develop the Emergency Preparedness Response Plan in coordination with the local authorities	The Emergency preparedness Response plan is updated and includes local authorities in the chain of command and training for emergencies with potential impacts on communities.	Before and during Operations	EMC EHS Manager	Refer to the Emergency Preparedness Response Plan
		S_O_SOC10e. Reduction of risks related to HIV/AIDS and sexually transmitted infections (STIs); Information on responsible behaviour and good health practices.	Register/report on raising awareness among workers about the risks of infectious and sexually transmitted diseases;	During Operations	EMC EHS Manager	Refer to the Community Health and Safety and Security Management Plan
SOC11	Worker Health and Safety Impacts and Risks	S_O_SOC11a. Implement Project Human Resources Policy	The Project Human Resources Policy is implemented. Policy is signed off by contractors.	During Operations	EMC Human Resources Manager	Covered by EMC internal resources and existing staff costs
		S_O_SOC11b. Implement Human Resources Management Plan for the operations phase	The Project Human resources Management plan for the Operation phase is updated and includes: ▪ Working conditions applicable to the Project;	Before and during Operations	EMC Human Resources Manager	Covered by EMC internal resources and existing staff costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			▪ Specific measures to avoid harassment and sexual assaults; ▪ Workers grievance mechanism.			
		S_O_SOC11c. Implement the Occupational Health and Safety Management Plan for the Operation Phase	Project Occupational Health and Safety Management Plan is updated and aligned with national requirements as well as ISO 45000 standards, IFC and AfDB standards Develop Standard Operating Procedures to address explosives management and work in remote areas	Before and during Operations	EMC EHS Manager	Refer to Occupational Health and Safety Management Plan
		S_O_SOC11d. Regular inspections of Contractor's performance including health and safety and labor and working conditions	Contractor's compliance and performance related to Occupational Health & Safety is monitored monthly and submitted to regular on-site inspections. Labor and working conditions' compliance is audited every 6 months for each contractor.	During Operations	EMC EHS Manager EMC EHS Manager or Human Resources Manager or Contract Manager	The costs will be supported by EMC
Cultural heritage (CH)						

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
CH01	Damage to or removal of tangible archaeological cultural heritage	S_C_CH01a. Long term implementation of Cultural Heritage Management Plan to support delivery of all topic specific requirements and support effective mitigation and management. S_C_CH01b. Long-term adherence to avoidance of sensitive cultural heritage resources, and a 15m buffer zone surrounding the resource extent, within the proposed footprint / Mining Area. S_O_CH01c. Staff heritage awareness training and toolbox talks S_O_CH01d. Deliver ongoing commitments for consultation with stakeholders (national regulator and affected community representatives) regarding cultural heritage management, in association with the Stakeholder Engagement Plan – and Project Grievance Mechanism.. S_C_CH01e. Implement long-term,/ site-specific mitigation and	Records of applicable staff training (e.g., Cultural Awareness programme at Induction). In-situ protection (via site demarcation) and long-term preservation. Commitments for ongoing cultural heritage engagement within the SEP. Completion of stakeholder consultation register as outlined within CHMP, linked to ongoing SEP and Project Grievance Mechanism. Consideration of cultural heritage receptors in the Blasting Management Plan. Completion of Chance Find Register and review schedule. Implementation of dust suppression	Throughout Operations Throughout Operations	EMC EHS Manager, supported by procured Archaeological Contractor.	Refer to the Cultural Heritage Management Plan and Stakeholder Engagement Plan (including Grievance Mechanism.)

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		management as required e.g., Vibration Monitoring in association with the Blasting Management Plan.				
		S_C_CH01f. Implement Project-specific Chance Find Procedure.				
		S_C_CH01h. Dust suppression on roads and stockpiles.				
CH-02	Disturbance of intangible cultural heritage, including loss of usual resource access	S_O_CH02a. Implement Traffic Management Plan	Ongoing demarcation of sensitive cultural resources as per CHMP requirements (signage and barriers). Implementation of Cultural Awareness Training.	Throughout Operations	EMC EHS Manager, supported by procured Archaeological Contractor.	Refer to the Cultural Heritage Management Plan and Traffic Management Plan
		S_O_CH02b. Implement Cultural Heritage Management Plan			EMC EHS Manager, supported by procured Archaeological Contractor. (Preparation of CHMP and CFP included in ESIA fee)	Refer to the Cultural Heritage Management Plan
		S_O_CH02c. Deliver ongoing commitments for consultation with stakeholders (national regulator	Completion of stakeholder consultation register as outlined within CHMP, linked to ongoing SEP and Project Grievance Mechanism – to identity and mitigate / manage any unforeseen	Throughout Operations	EMC EHS Manager, supported by procured	Refer to the Cultural Heritage Management Plan and Stakeholder Engagement Plan (

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		and affected community representatives) regarding cultural heritage management, in association with the Stakeholder Engagement Plan – and Project Grievance Mechanism..	impacts to intangible cultural heritage, site access etc.		Archaeological Contractor.	including Grievance Mechanism.)
CH03	Changes to the setting of cultural heritage resources.	S_C_ACH03a. Implement Cultural Heritage Management Plan S_C_ACH03c. Dust suppression on roads and stockpiles S_C_CH03b. Implement cultural heritage awareness training and supporting toolbox talks. S_C_CH03c. Implement ongoing Stakeholder Engagement Plan and community consultation regarding cultural heritage mitigation. S C_CH03d. Implement Project Grievance Mechanism.	Delivery of bespoke Cultural Heritage Management Plan, and cultural heritage sensitivity mapping (Avoidance Plans). Implementation of Cultural Awareness Training (e.g., Cultural Awareness programme at Induction) – with supporting training records and delivery programme – including information on no-go areas local taboos, religious / cultural calendar of events etc. Completion of stakeholder consultation register and related programme, as outlined within CHMP, linked to ongoing SEP and Project Grievance Mechanism – to identity and mitigate / manage any unforeseen impacts to setting.	Throughout Operations	EMC EHS Manager, supported by procured Archaeological Contractor.	Refer to the Cultural Heritage Management Plan and Stakeholder Engagement Plan (including Grievance Mechanism.)

14.1.3 Mine ESMP during the decommissioning phase

14.1.3.1 Physical component

Table 14-8: ESMP – Physical component – Decommissioning phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Groundwater (GW)						
GW01	Declining groundwater levels in the P2 and P4 aquifers	P_D_GW01a. Implement the Water & Groundwater Management Plan	The Water & Groundwater Management Plan is updated and presents: ▪ All the GW abstraction facilities left in place in operating conditions ; ▪ All the facilities remaining in place at the end of the mine decommissioning; ▪ A detailed summary of the GW levels and quality evolution at the monitored wells since the beginning of the Touajil and Aouchich wellfields.	At the end of the Touajil wellfield operation / at the end of the Mine decommissioning	EMC EHS Manager in collaboration with EMC Mine Manager	Refer to Mine Closure MP
GW02	Declining groundwater quality as a result of long-term pumping	P_D_GW02a. Implement the Water & Groundwater Management Plan	Refer to measure P_D_GW01a.	-	-	-
GW03	Impact of declining groundwater level on groundwater users	P_D_GW03f. Implement the detailed Mine Closure Plan, with the objective of ownership transfer of wellfield, pipelines and RO plant to enable continued use (at a reduced level) post-closure	The Mine closure Plan provides all details regarding the ownership transfer agreement of the wellfields and RO plant to enable continued use at reduced level: ▪ list of facilities included in the ownership transfer;	Prior the mine closure	EMC EHS Manager in collaboration with EMC Mine Manager and Mauritanian authorities	Refer to Mine Closure MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			▪ relocation of the RO water treatment plant to F'Dérick ▪ cost estimate of the maintenance processes of the facilities of concern; ▪ signed agreements and engagements between EMC and the Mauritanian Authorities, with precision of the duration of the commitment which must correspond: ▪ for the GW users: at least to the return to access to water for all users identified prior the Touajil and Aouchich wellfields commissioning; ▪ for the City of F'Dérick: to the continuity of the city's drinking water supply.			
GW04	Mine open-Pit Management	P_D_GW04a. Implement the detailed Mine Closure Plan for the open pit securing after its closure	The Mine closure Plan provides all details for securing the open pit: ▪ Construction of a 3m high perimeter bund around the open-pit; ▪ Installation of appropriate stormwater drainage around the open-pit; ▪ Installation of warning signs following open-pit closure.	One year before the mine decommissioning At the end of the mine decommissioning	EMC EHS Manager in collaboration with EMC Mine Manager	Refer to Mine Closure MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			All the recommendations described in the mine closure plan for securing the access to the open pit are put in place			
Surface Water (SW)						
SW01	Change in surface water flow and flood risk	P_D_SW01b. Management of dam, bridges, culverts or diversion channels at crossings	The Mine closure plan describes the Runoff water management systems within the project footprint to implement for the closure and after the closure: ▪ For installations requiring complete removal; ▪ For installations remaining in place after the closure and requiring maintenance.	1 year before de mine closure	EMC EHS Manager	Refer to Mine Closure MP
		P_D_SW01c. Minimise erosion and soil conveyance	Refer to measure P_D_LQU01a. Minimisation of the Project footprint and ground disturbance	-	-	-
		P_D_SW01d. Implement the detailed Mine Closure Plan	a) The Mine closure plan includes all necessary measures to ensure that runoff and storm flows can continue unimpeded after post-closure. b) The Mine Closure Plan includes a detailed program for implementing mitigation measures associated with the dismantling and runoff and storm flows management.	a-b-c) 1 year before de mine closure d) Regularly during the site closure and until the official acceptance of the mine closure and infrastructures handover	a-b-c) EMC EHS Manager & Consultant company d) External auditor	Refer to Mine Closure MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			c) The Mine Closure Plan includes a procedure for verifying the implementation of mitigation measures during the closure phase. d) All the mitigation measures detailed in the Mine closure plan for the storm flow management after closure are implemented.			
SW02	Changes of surface water quality and pollution of wadis	P_D_ SW02/03e. Good practice including prevention, identification, control and monitoring of accidental discharges/ spills	Refer to measure P_D_LQU01d. Good practices prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment	-	-	-
SW03	Pollution of Sebkha Idjill and the salt works	P_D_ SW02/03g. Implement the Emergency Preparedness and Response Plan	Refer to measure P_D_LQU01e. Implement the Emergency Preparedness and Response Plan, including training	-	-	-
		P_D_ SW02/03h. Implement the Non-Mineral Waste Management Plan	Refer to measure P_D_LQU01f. Implement the Non-Mineral Waste Management Plan	-	-	-
Noise and vibration (NV)						
NV01	Noise impacts generated by Project activities and equipment impacting on receptors	P_D_NV01a. Compliance with international noise emissions limits	Ensure compliance with the following: ▪ Machinery and equipment used for the decommissioning comply with international noise emission limits	At the beginning of each decommissioning phase	Decommissioning Contractor EMC EHS Manager	Included in the contract of the decommissioning contractor

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			▪ Identify the closest receptors to each decommissioning site; ▪ Carry out noise measurements regularly at these receptors; ▪ Check that noise levels are in compliance with applicable international standards.			(the call for tenders for the decommissioning works shall stipulate that the contractor will take the necessary measures to comply with international standards applicable for noise and in charge of the noise monitoring during the decommissioning of each infrastructure) Refer to Mine Closure MP
		P_D_NV01b. Good practices design and management	A procedure describing the management of vehicle and decommissioning engines in the intervening periods between work is put in place and communicated to employees: ▪ implementation of a regular inspection and maintenance regime of vehicles and machines	During the decommissioning phase	Decommissioning Contractor	Included in the contract of the decommissioning Contractor Refer to Mine Closure MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			▪ stopping of machines and vehicles when they are stationary; ▪ employee training; ▪ verification of the implementation of the procedure.			
NV02	Vibration impacts generated by Project activities and equipment impacting on receptors	P_D_NV02b. Good practices design and management	Refer to measure P_D_NV01b. Good practices design and management	-	-	-
		P_D_NV02d. Implement the Stakeholder Engagement Plan including the grievance mechanism (as described in SOC05)	Refer to measure S_D_SOC02b. Implement the stakeholder engagement plan.	-	-	-
Air quality (AQ)						
AQ01	Residual Emissions on Receptors at F'Derik, El Aouj Wells, Sebkha Idjill Salt Works	P_D_AQU01 Implement the detailed Mine Closure Plan	▪ The Mine closure Plan include all necessary measures to ensure that waste dump area and the tailings deposit are stabilized and cannot be prone to erosion and dust dispersion after the mine closure ▪ All the measures to prevent any erosion and dust dispersion from the tailings deposit and waste dump are in place	1 year before the mine closure At the end of the mine closure process	EMC EHS Manager & consultant company External auditor	Refer to Mine Closure MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Land quality and Land use (LQU)						
LQU01	Degradation in land quality	P_D_LQU01a. Minimisation of the Project footprint and ground disturbance	The Mine Closure Management plan details the methods for restoring surfaces after dismantling of the installations. Recommendations are made and implemented to eliminate the risk of erosion of freed surfaces. Ensure a supply of substrate allowing the revegetation of freed / backfilled surfaces.	Before the end of the Mine closure	EMC EHS Manager	Included in the closure costs Refer to Mine Closure MP
		P_D_LQU01d. Good practice prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment	The Mine closure includes all necessary measures to ensure that any potentially contaminating material is rendered harmless to the soil and water environment by removal, treatment or reinstatement.	Before the end of the Mine closure	EMC EHS Manager	Depends on the nature and volume of contaminated soils Refer to Mine Closure MP Refer to ERP
		P_D_LQU01e. Implement the Emergency Preparedness and Response Plan, including training	Specific procedure adapted to Mine closure and associated risk is developed for the decommissioning period, in line with the ERP. The ERP is reviewed, including necessary revisions made to reflect any changing circumstances in the decommissioning process.	Before the start of each decommissioning phase Every 6 months during the decommissioning works	EMC EHS Manager Decommissioning EHS Manager	Included in the salary of the EMC and decommissioning EHS Managers Refer to Mine Closure MP Refer to ERP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			A written report is formally produced following each emergency response to an incident. The ERP is reviewed after any incident reported or test.	After every incident report		

		P_D_LQU01f. Implement the Non-Mineral Waste Management Plan	Specific procedures for waste collection, characterization and registration are developed for the decommissioning period, in line with the Non-Mineral Waste Management Plan. The Non-Mineral Waste Management Plan is reviewed, including necessary revisions made to reflect any changing circumstances in the decommissioning process. Monitoring activities are put in place compliance with the Non-Mineral Waste Management Plan recommendations. A register reports the key indicators as described in the Non-Mineral Waste Management Plan to assess effectiveness of the mitigation strategies.	Before the start of each decommissioning phase Every 6 months during the decommissioning works As mentioned in the Management Plan Routinely	EMC EHS Manager Decommissioning EHS Manager	Included in the salary of the EMC and decommissioning EHS Managers Refer to Non-mineral Waste MP Refer to Mine Closure MP
		P_D_LQU01g. Implement the detailed Mine Closure Plan	A register reports the key indicators as described in the Mine closure Management Plan to assess effectiveness of the mitigation strategies	Routinely during each decommissioning phase	Decommissioning Contractor EMC EHS Manager	Included in the decommissioning contract Refer to Mine Closure MP
		P_D_LQU01h. Environmental awareness and driver training	The decommissioning ESMP defines decommissioning rules to reduce detrimental effects on soil / vegetation	Before the start of each construction phase	EPC Contractor EMC EHS Manager	Included in the EPC contract Refer to TMP

			in compliance with the EMC Traffic Management Plan: ▪ Forbid uncontrolled vehicles access and driving out of designated roads; ▪ Defining speed limits; ▪ Prohibiting driving out of the defined access roads.	During the construction activities		Refer to Mine Closure MP
LQU02	Change in land use	P_D_LQU02a. Minimisation of Project footprint and ground disturbance	The decommissioning ESMP includes: ▪ recommendations detailed in the EMC Traffic Management Plan; ▪ detailed footprints for each decommissioning works and recommendations to keep the decommissioning works within the defined footprints. The decommissioning ESMP defines rules to reduce detrimental effects on soil / vegetation in compliance with the EMC Traffic Management Plan: ▪ Forbid uncontrolled vehicles access and driving out of designated roads; ▪ Defining speed limits; ▪ Prohibiting driving out of the defined access roads. Implement the decommissioning ESMP and EMC Traffic Management Plan The rail spur connecting the existing railway to the mine is preferentially	Before the start of each decommissioning phase During the decommissioning activities	Decommissioning Contractor EMC EHS Manager	Included in the decommissioning contract Refer to TMP Refer to Mine Closure MP

			used for the transportation of mine decommissioning material and equipment instead of the road			
		P_D_LQU02c. Implement detailed Mine Closure Plan	Refer to P_D_LQU01g. Refer to B_D_EB01a.	Routinely during each decommissioning phase	Decommissioning Contractor EMC EHS Manager	Included in the decommissioning contract
Landscape and Visual (LV)						
LV01	Effects on Landscape Character of Tiris Zemmour Guelbs (LCA 04)	P_D_LV01/02a. Minimisation of Project footprint	Refer to measure P_D_LQU02a. Minimisation of Project footprint and ground disturbance	-	-	-
		P_D_LV01/02b. Encouragement of natural re-vegetation, wherever practicable	Refer to measures B_C_EB01g and B_O_EB04a related to the development and implementation of the Revegetation Plan	-	-	-
LV02	Effects on views at VP 03 Hassie El Aouj and VP 04 Sebkha Idjill Salt Works	P_D_LV01/02c. Controlled vehicle access through the landscape will reduce detrimental effects on character/ vegetation	Refer to measure P_D_LQU02a. Minimisation of Project footprint and ground disturbance	-	-	-
		P_D_LV01/02d. All site roads, including access roads, service roads and haul roads, not required for post closure activities, will be ripped, re-graded to local topography and	Refer to measure P_D_LQU01a. Minimisation of the Project footprint and ground disturbance	-	-	-

		covered with a layer of site sourced sand				

14.1.3.2 Biological component

Table 14-9: ESMP - Biological component - Decommissioning phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Ecology and biodiversity (EB)						
EB01	Loss of protected flora species, and degradation and fragmentation of tree habitat	B_D_EB01a. Continue implementing the Revegetation Plan	Refer to measure B_O_EB01b. Implement the Revegetation Plan as defined for the construction phase.	-	-	-
EB03	Impacts on globally threatened birds	B_D_EB03a. Continue implementing the Revegetation Plan	Refer to measure B_O_EB01b. Implement the Revegetation Plan as defined for the construction phase.	-	-	-
EB04	Loss, degradation and fragmentation of natural habitat	B_D_EB04a. Continue implementing the Revegetation Plan.	Refer to measure B_O_EB01b. Implement the Revegetation Plan as defined for the construction phase.	-	-	-
EB04	Natural habitat loss, degradation, and fragmentation	B_D_EB04b. Integrate a risk-based monitoring approach for non-native invasive species to the BAP.	Target: Zero detections of non-native invasive species. A detection of a non-native invasive species will trigger the requirement for risk assessment and development of a site-specific invasive species control and management plan.	Annually	EMC Botanical Expert and EMC EHS Manager	Cost is included in EMC personnel salaries
Ecosystem services (ES)						
ES01	Degradation of livestock and forage	B_D_ES01a. Reseed the Project site with native forage species seeds as	Refer to measures B_C_EB01g. Develop and implement a Revegetation Plan; and	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
	resources	described in the Revegetation Plan.	B_O_EB04a. Maintain and develop the oases and plant some local vegetation species to enhance the presence of local fauna			
ES02	Alteration of water resources for groundwater users in water abstraction areas	B_D_ES02a. Implement the detailed Mine Closure Plan, with the objective of ownership transfer of wellfield, pipelines and reverse osmosis plant to enable continued use (at a reduced level) post-closure	Refer to measure P_D_GW03e. Implement the detailed Mine Closure Plan	-	-	-
ES03	Increased access to water resources through pressure relief valves along the water pipelines	B_D_ES03a. Implement the detailed Mine Closure Plan, with the objective of ownership transfer of wellfield, pipelines and reverse osmosis plant to enable continued use (at a reduced level) post-closure	Refer to measure P_D_GW03e. Implement the detailed Mine Closure Plan	-	-	-
ES04	Degradation of salt extraction activities at Sebkha Idjill	B_D_ES04a. Implement the detailed Mine Closure Plan	Refer to measure P_D_SW01d. Implement the detailed Mine Closure Plan	-	-	-
ES05	Degradation of ecosystems' water regulation capacity	B_D_ES05a. Reseed the Project site with native species with water storage capacity seeds, as described in the Revegetation Plan	Refer to measures B_C_EB01g. Develop and implement a Revegetation Plan; and B_O_EB04a. Maintain and develop the oases and plant some local vegetation species to enhance the presence of local fauna	-	-	-
		B_D_ES05b. Fertilize the planted seeds with manure from local livestock	Refer to measure B_C_EB01g. Develop and implement a Revegetation Plan	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		B_D_ES05c. Fence the area during 3 years in order to avoid traffic, trampling and grazing, but to allow the circulation of reptiles and small mammals	Refer to measure B_C_EB01g. Develop and implement a Revegetation Plan	-	-	-

14.1.3.3 Social component

Table 14-10: ESMP - Social component - Decommissioning phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Social (SOC)						
SOC02 SOC04 SOC09 SOC11 SOC12 SOC13	Enhancement of the Local Economic	S_D_SOC02a. Implement the Mine Closure Plan	A Mine closure plan is developed and details the conditions applicable to the worker demobilization and support to find new employment and business opportunities.	Before and during decommissioning phase	EMC Site, Human Resources and EMC Community Mine Manager	Refer to Mine Closure Plan.
		S_D_SOC02b Implement the stakeholder engagement plan	The stakeholder engagement plan is updated for the decommissioning phase.	Before and during decommissioning phase	EMC EHS Manager	Refer to Stakeholder Engagement Plan (SEP)
SOC12	Employment at Mine Closure (retrenchment & transition)	S_D_SOC12a Develop a Retrenchment and Transition Plan during the late operational phase, in line with IFC PS2 and AfDB OS2, and implement it in alignment with	- a Retrenchment and Transition Plan approved; - Minutes of consultations with employees; - HR registers (exit files);	Before and during decommissioning phase	EMC Site, Human Resources and EMC Community Mine Manager	Refer to Mine Closure Plan

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		the Mine Closure Plan and related social management plans.	- Lists of employees eligible for training/redeployment.			
		S_D_SOC12b Inform local suppliers and SMEs of upcoming reductions in purchase orders, allowing them to anticipate closure and adjust their business activities accordingly	Percentage of suppliers/subcontractors informed by EMC on the closure and cessation of activities: - Communication records (emails, letters sent); - Minutes of meetings with suppliers/subcontractors.	Before and during decommissioning phase	EMC Procurement Manager, with EMC Community Relations Manager assistance	Refer to the Mine Closure Plan
		S_D_SOC12c Provide information and guidance to women and vulnerable workers, including adapted training schedules and basic support for exploring micro-enterprise opportunities, where feasible	Number of women and vulnerable workers who have benefited from an information or guidance session (opportunities, microenterprise) by EMC	Before and during decommissioning phase	EMC Site, Human Resources and EMC Community Mine Manager	Refer to Mine Closure Plan
		S_D_SOC12d Ensure alignment with the Mine Closure Plan, including communication about any opportunities for infrastructure transfer or post-closure community support	- Disclosure of information to communities on opportunities for transfer of project infrastructure; - Number of infrastructure transferred by EMC to communities in accordance with the project community development plan; - Minutes or report of reception of infrastructures signed by authorities or beneficiaries	Before and during decommissioning phase	EMC Site, Human Resources and EMC Community Mine Manager	Refer to Mine Closure Plan
Cultural heritage CH)						

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
CH01. CH02, CH03,	Accidental disturbance of cultural heritage resources during closure activities	S_D_ACH04a. Integrate Closure commitments within the Cultural Heritage Management Plan	Implementation of Chance Find Procedure – completion of chance find register and review programme. Implementation of Cultural Awareness Training re requirements of CHMP and avoidance of sensitive areas (e.g., at Induction).	Throughout closure	EMC EHS Manager, supported by procured Archaeological Contractor.	Refer to Cultural Heritage Management Plan.

14.2 Rail area

Scope

This ESMP is derived from the Environmental and Social Impact Notice and the related mitigation measures documented by SNIM in October 2024 for the railway infrastructure expansion (SNIM, 2024). This notice aims to assess the impact of resizing the railway infrastructure required to transport future mining production from the El AOUJ (EMC) and ATOMAI (TAKAMUL) projects. This resizing includes the addition of rolling stock, passing loops, and the expansion of maintenance workshops. The El Aouj project, which will be developed first, only requires more rolling stock and an increase in railway traffic. Therefore, this ESMP for the El Aouj Project activities on the rail details only the identified impacts and measures related to the increase in railway traffic.

The objectives of this ESMP are to:

- Provide a summary of the impacts identified during the impact assessment process associated with the use of the existing rail infrastructure.
- Identify the measures and actions to be implemented in order to manage the environmental and social issues related to the use of the existing rail by the Project;
- Build a program for the monitoring of identified measures with targets, key indicators and frequency of the follow-up;
- Define the roles and responsibilities for implementing mitigation measures: As the railway network is owned by SNIM and SNIM operates all the ore transport on behalf of EMC, SNIM will assume full responsibility for carrying out the proposed mitigation measures. EMC's role will be limited to:
  - Collaborating with SNIM for establishing and monitoring the proposed mitigations measures
  - Verifying that these measures are properly implemented in accordance with applicable national and international standards, and
- Estimate the costs of implementing the mitigation measures. As the railway network is operated by SNIM, the sole owner of these infrastructures, the costs of implementing the measures will be borne solely by SNIM.

Roles and responsibilities

The roles and responsibilities specific to Project ESMP are presented in the table below.

Table 14-11: Roles and responsibilities

Roles	Responsibilities
SNIM	▪ Responsible for the approval of this ESMP and for the availability of the resources required for its implementation. ▪ Responsible for ownership and overall implementation of this ESMP.
EMC Environmental coordinator	▪ Provide technical support to SNIM EHS Departmental Managers to ensure compliance with the ESMP measures. ▪ Collaborate with SNIM in establishing and monitoring the proposed mitigation measures ▪ produce quarterly and annual environmental monitoring reports including details on environmental performance in collaboration with SNIM. ▪ Report all identified hazards, non-conformances and incidents to SNIM.

ESMP Mitigation measures numbering

All identified potential impacts relating to rail activities are first identified with “Rail”. Each impact has then a number corresponding to the subcomponent impacted (for example: AQ01 for the first impact on air quality).

Then, each impact is mitigated by dedicated mitigation measures associated to the main component, and the impact number. For example: Rail_AQ01a stands for air quality for the rail activities, air quality impact n°01, mitigation measure a.

The codes used are the following:

- Project phase: not mentioned for the rail as all impacts are related to transport regardless the phase of the Project;
- Subcomponent: AQ=Air quality, NV=noise and vibrations, etc;
- Number of the impact: 01, 02, 03, etc;
- Number of the mitigation measure: a, b, c, etc.

The following sections present the management measures (exclusion/mitigation, compensation, optimisation) to be implemented in order to mitigate the negative impacts or to enhance the positive ones on the Project environment, and their implementation process.

14.2.1.1 Physical component

Table 14-12: Rail ESMP - Physical component - all phases

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Land Quality (Rail-LQ)						
Rail -LQ01	Increase of impacts on land quality	Rail-LQ01a. Implement good practices procedures against land contamination as proposed in the SNIM ESIN	All good practice procedures recommended in the SNIM ESIN are put in place: ▪ Environmental awareness ▪ Storage area for oil and fuels ▪ Equip fuel tanks with automatic shut-off pumps ▪ Implement a system for collecting and recovering/recycling wastewater ▪ Solid Waste management: provide equipment, establish procedures and select accredited companies for waste disposal ▪ Prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment	During all the Project's life	SNIM for the implementation EMC EHS Manager in collaboration with SNIM for establishing and monitoring the mitigations measures	Included into SNIM operational costs Included in the salaries of the EHS Manager
		Rail-LQ01b. Implement the Emergency Preparedness and Response Plan (ERP)	The ERP is reviewed, including necessary revisions made to reflect any changing operation circumstances.	At all phases of the Project necessitating the use of SNIM rail	SNIM for the implementation EMC EHS Manager in collaboration with SNIM for establishing and	Included into SNIM operational costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			A written report is formally produced following each emergency response to an incident. The ERP is reviewed after any incident reported or test. .	infrastrucures and services Once per year After every incident report	monitoring the mitigations measures	Included in the salaries of the EHS Manager
		Rail-LQ01c. Implement the Hazardous Material Management Plan (HAZMAT)	Implement the Hazardous Material Management Plan. The HAZMAT is reviewed, including necessary revisions made to reflect any changing operation circumstances.	During the rail operation Once per year	SNIM for the implementation EMC EHS Manager in collaboration with SNIM for establishing and monitoring the mitigations measures	Included into SNIM operational costs Included in the salaries of the EHS Manager
Surface water (Rail-SW)						
Rail -SW01	Increase of impacts on surface water	Rail-SW01. Implement good practices procedures against surface water contamination	Refer to Rail-LQ01a. Implement good practices procedures against land contamination as proposed in the SNIM ESIN Refer to Rail-LQ01b. Implement the Emergency Preparedness and Response Plan (ERP) Refer to Rail-LQ01c. Implement the Hazardous Material Management Plan (HAZMAT)	-	-	-

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Groundwater (Rail-GW)						
Rail -GW01	Increase of impacts on groundwater	Rail-GW01. Implement good practices procedures against groundwater contamination	Refer to Rail-LQ01a. Implement good practices procedures against land contamination as proposed in the SNIM ESIN Refer to Rail-LQ01b. Implement the Emergency Preparedness and Response Plan (ERP) Refer to Rail-LQ01c. Implement the Hazardous Material Management Plan (HAZMAT)	-	-	-
Air Quality (Rail-AQ)						
Rail -AQ01	Increase of emissions on receptors along the railway	Rail-AQ01a. implement embedded mitigation measures planned by EMC to minimize dust dispersion during ore loading and transportation.	▪ The rail load-out facility features an automatic air quality monitor for PM2.5 and PM10. ▪ systematic dust monitoring is performed during wagon loading processes Any abnormal detection of a high concentration of PM immediately leads to a thorough analysis of the causes and an intervention to repair faulty dust reduction systems.	Before the operation phase Every ore loading process As necessary	EMC EHS Manager in collaboration with Mine Manager	Included in the mining operational cost Refer to OHS MP

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		Rail-AQ01b. apply mitigation measures proposed in the ESIN	▪ All mechanical equipment purchases comply with World Health Organization (WHO) standards and Good International Industry Practice (GIIP) recommendations ▪ Mechanical equipment are subject to a documented preventive maintenance program based on manufacturer instructions and GIIP ▪ Routine inspections and functional tests (including fine particle measures) are carried out	Each purchase of new equipment As required my manufacturer	SNIM	Included into SNIM operational costs
Noise and vibrations (Rail-NV)						
Rail-NV01	Increase of noise and vibrations impact generated by increased train traffic	Rail-NV01. apply mitigation measures proposed in the ESIN	Apply mitigation measures proposed in the ESIN	-	-	-

14.2.1.2 Biological component

Table 14-13: Rail ESMP - Biological component – construction and operation phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Ecology and biodiversity (EB)						
EB05	Fauna Habitat Degradation, Disturbance and Collision risk	B_O_EB05a. Implement a Monitoring and track fauna collision incident	100% of incidents involving rail and train. Incidents are tracked and mapped, and an incident hotspot map is developed and updated regularly. Number of adaptive routing/scheduling measures implemented. Wildlife is detected and recorded.	Punctual when incident Review of hotspot data: **quarterly** Adjustments to schedule: **as needed**	SNIM for the implementation EMC EHS Manager in collaboration with SNIM for establishing and monitoring the mitigations measures	Included in SNIM operational costs

14.2.1.3 Social component

Table 14-14: Rail ESMP - Social component - Construction phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Social (SOC-Rail)						
SOC-R01 SOC-R02	Impact on Community Health & Safety between F'Derik and Nouadhibou Impact on pastoral Livelihood Interface (Barrier & Livestock Risk)	S_O_SOC-R01-R02a Install enhanced and visible safety signs at crossing points (signs, audible warning devices if possible)	- Number of operational safety visual sign and audible warning devices available at crossing points between F'Derik and Nouadhibou; - Number of incidents or quasi-incidents (pedestrians, vehicles, livestock) reported at crossing points.	Monthly and throughout the operation	SNIM	Included into SNIM operational costs
		S_O_SOC-R01-R02b Restricting train speeds in urban and rural areas, in line with international best practices for preventing rail collisions	Check to see if trains are actually complying with speed limits when passing through urban and rural areas : - Logbook including sections with speed limits available on the train; - Number of rail accidents/incidents recorded and reported (pedestrians, vehicles, livestock) ; - Incident tracking database in the rail area.	During the Operation	SNIM EHS Manager	Included into SNIM operational costs
		S_O_SOC-R01-R02c Harmonize the use of a sound signal by introducing a standardized klaxon procedure when approaching inhabited areas or community crossings, in order to ensure rapid and	Verify that harmonizing audible warning devices in the area improves understanding and reactivity among communities near the railway: - Incident tracking database in the rail area.	During the Operation	SNIM EHS Manager	Included into SNIM operational costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		consistent information for people living near the railway				
		S_O_SOC-R01-R02d A coordinated emergency response plan between EMC and SNIM to ensure a rapid response in the event of accidents affecting communities in the area;	- Existence of a coordinated emergency response plan in place; - Measures put in place to enable communities to contact the emergency coordination team; - Number of emergency response exercises conducted by the coordination team per year with the participation of local communities in each locality crossed by railway.	Every year and throughout the Operation	SNIM EHS Manager in collaboration with EMC EHS Manager	Included into SNIM operational costs
		S_O_SOC-R01-R02e Develop an HSE plan compliant in compliance with the IFC HSE guidelines for railway operations	- Presence of a specific HSE plan for the railway area including: hazard identification, operational control, emergency preparedness, incident management, monitoring, audits, etc. - Percentage of staff (and/or subcontractors) trained in HSE plan procedures in the rail area.	During the Operation	SNIM EHS Manager	Included into SNIM operational costs
		S_O_SOC-R01-R02f Maintain an accessible and appropriate complaints management mechanism for the communities concerned	- Complaints register (database of recorded complaints) - Reports of meetings with communities mentioning feedback on the accessibility of the complaints mechanism.	Before and during the Operation	SNIM community Manager in collaboration with EMC community Manager	Included into SNIM operational costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		S_O_SOC-R01-R02g Organize periodic information meetings in the localities crossed by trains on the risks associated with train passage and promote appropriate safety procedure	- Minutes of information meeting in each locality traversed by the railway (sign-in sheets, photos, presentations used); - Number of safety messages disseminated in each locality crossed by the railway (visual media, local radio stations, posters).	Every six month and throughout the Operation	SNIM community Manager in collaboration with EMC community Manager	Included into SNIM operational costs

Table 14-15: Rail ESMP - Social component - Operations phase

Cultural heritage (CH-Rail)						
CH-R01	Damage and Disturbance of Tangible and Intangible Cultural Heritage	S_O_CH-R01-R01a Implement Chance Find Procedure	Completion of chance find register and review programme.	Throughout Operation	EMC EHS Manager, supported by procured Archaeological Contractor.	EHS Manager salary. Archaeological contractor fee.
		S_O_CH-R01-R01a Implement ongoing Stakeholder Engagement Plan and community consultation regarding any unforeseen cultural heritage impacts e.g., disruption of local access to sacred places.	Completion of stakeholder consultation register and related programme, as outlined within CHMP, linked to ongoing SEP delivery and the Project Grievance Mechanism – to identity and mitigate / manage any unforeseen impacts to cultural heritage resources (tangible and intangible) during rail operation..	Throughout Operation	SNIM Community Manager	Included into SNIM operational costs
		S_O_CH-R01-R01c Implement Project Grievance Mechanism.		Throughout Operation	SNIM Community Manager	Included into SNIM operational costs

14.3 Port area

Scope

The El Aouj project, will beneficiate of the existing port infrastructures owned and manged by SNIM. Therefore, this ESMP for the El Aouj Project activities on the Mineral Port details only the identified impacts and measures related to the increase in concentre ore management (unloading, temporary storage and carrier loading) at the Port.

The objectives of this ESMP are to:

- Provide a summary of the impacts identified during the impact assessment process associated with the use of the existing rail infrastructure.
- Identify the measures and actions to be implemented in order to manage the environmental and social issues related to the use of the existing rail by the Project;
- Build a program for the monitoring of identified measures with targets, key indicators and frequency of the follow-up;
- Define the roles and responsibilities for implementing mitigation measures: As the railway network is owned by SNIM and SNIM operates all the ore transport on behalf of EMC, SNIM will assume full responsibility for carrying out the proposed mitigation measures. EMC's role will be limited to:
  - Collaborating with SNIM for establishing and monitoring the proposed mitigations measures
  - Verifying that these measures are properly implemented in accordance with applicable national and international standards, and
- Estimate the costs of implementing the mitigation measures. As the Mineral port is operated by SNIM, the sole owner of these infrastructures, the costs of implementing the measures will be borne solely by SNIM.

Roles and responsibilities

The roles and responsibilities specific to Project ESMP are presented in the table below.

Table 14-16: Roles and responsibilities

Roles	Responsibilities
SNIM	▪ Responsible for the approval of this ESMP and for the availability of the resources required for its implementation. ▪ Responsible for ownership and overall implementation of this ESMP.
EMC Environmental coordinator	▪ Provide technical support to SNIM EHS Departmental Managers to ensure compliance with the ESMP measures. ▪ Collaborate with SNIM in establishing and monitoring the proposed mitigation measures ▪ produce quarterly and annual environmental monitoring reports including details on environmental performance in collaboration with SNIM. ▪ Report all identified hazards, non-conformances and incidents to SNIM.

ESMP Mitigation measures numbering

All identified potential impacts relating to Mineral Port activities are first identified with a "P". Each impact has then a number corresponding to the subcomponent impacted (for example: AQ01 for the first impact on air quality).

Then, each impact is mitigated by dedicated mitigation measures associated to the main component, and the impact number. For example: P_PAQ01a stands for Physical component, air quality for the rail activities, air quality impact n°01, mitigation measure a.

The codes used are the following:

- Main component: P=Physical, B=Biological, S=Social;
- Project phase: not mentioned for the rail as all impacts are related to transport regardless the phase of the Project;
- Subcomponent: AQ=Air quality, NV=noise and vibrations, etc;
- Number of the impact: 01, 02, 03, etc;
- Number of the mitigation measure: a, b, c, etc.

The following sections present the management measures (exclusion/mitigation, compensation, optimisation) to be implemented in order to mitigate the negative impacts or to enhance the positive ones on the Project environment, and their implementation process.

14.3.1.1 Physical component

Table 14-17: Port ESMP - Physical component - all phases

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Land Quality (P-LQ)						
Port - LQ01	Increase of impacts on land quality	Port-LQ01a. Implement good practices procedures against land contamination	The following good practice procedures are put in place: ▪ Environmental awareness ▪ Storage area for oil and fuels ▪ Prevention, identification, control and monitoring of pollutants and accidental discharges/ spills and provision of spill containment and clean-up equipment	During all the Project's life	SNIM for the implementation EMC EHS Manager in collaboration with SNIM for establishing and monitoring the mitigations measures	Included into SNIM operational costs Included in the salaries of the EHS Manager
		Port-LQ01b. Implement the Emergency Preparedness and Response Plan (ERP)	Verify that a EPRP is put in place and take into consideration the increase of ore handling activities The ERP is reviewed, including necessary revisions made to reflect any changing operation circumstances. A written report is formally produced following each emergency response to an incident. The ERP is reviewed after any incident reported or test. .	During the operation phase Once per year After every incident report	SNIM for the implementation EMC EHS Manager in collaboration with SNIM for establishing and monitoring the mitigations measures	Included into SNIM operational costs Included in the salaries of the EHS Manager
		Port-LQ01c. Implement the	Implement the Hazardous Material Management Plan.	During the operation phase	SNIM for the implementation	Included into SNIM

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		Hazardous Material Management Plan (HAZMAT)	The HAZMAT is reviewed, including necessary revisions made to reflect any changing operation circumstances.	Once per year	EMC EHS Manager in collaboration with SNIM for establishing and monitoring the mitigations measures	operational costs Included in the salaries of the EHS Manager
Air Quality (Port-AQ)						
Port-AQ01	increase of dust emissions on receptors	Port-AQ01a. Verify that SNIM create and implement the H&S plan	Create a health and safety management plan featuring targeted actions to enhance and regulate air quality Implement all mitigation measures identified in the H&S management plan Carry out routine inspections and maintenance of gas and dust abatement systems	-	-	Included into SNIM operational costs Included in the salaries of the EHS Manager
		Port-AQ01b. . Verify that SNIM Conduct routine air quality monitoring	An air quality monitoring protocol defines all areas for routine monitoring. Routine air quality monitoring is performed in accordance with established air quality monitoring protocols.	EMC to check before Project operation phase weekly	SNIM for the implementation EMC EHS Manager, working in partnership with SNIM,	Included into SNIM operational costs Included in the salaries of

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
						the EHS Manager
		Port-AQ01c. . Verify that SNIM Systematically checks vessel technical suitability and Statutory and compliance documents (Safety Management System manual, Planned Maintenance System, Engine logbook) of each vessel	The Statutory and compliance documents of each vessel are systematically requested and checked Suspension or conditioning of operations if propulsion deficiencies are identified.	Upon the arrival of each ore vessel and prior to loading	SNIM Terminal operator in collaboration with EMC HSE Manager to check that compliance documents are provided and compliant for each ore vessel	Included into SNIM operational costs Included in the salaries of the EHS Manager
Marine Physical Environnement (Port-ME)						
Port-ME01	increase of the degradation of sediment and sea water quality	Port-ME01a**. Verify that SNIM** Conducts routine inspection of fuel and lubricant lines on loading equipment	All loading equipment has regular fuel and lubricant line inspections; leaks are immediately fixed and logged to track equipment condition.	Daily	SNIM for periodic monitoring EMC EHS Manager for verifying equipment maintenance records	included into SNIM operational costs Included in the salaries of the EHS Manager

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		Port-ME01b. Verify that SNIM conducts Regular maintenance of vessels engines and equipment	Refer to Port-AQ01c. Systematically verify the compliance documents of each ore vessel			included into SNIM operational costs included into EMC operational costs
		Port-ME01c. Verify that SNIM adopt a strict “zero discharge overboard” policy for all vessels operating in or approaching the port	A waste overboard non-discharge charter is signed in advance with all maritime transport companies sourcing ore from the EL Aouj mine. The "zero discharge overboard" policies are explicitly communicated to all vessel companies and reiterated to each vessel as they approach the mineral port.	Prior agreement signed between EMC and the maritime ore transport company A chaque approche d’un nouveau bateau minéralier	EMC Environmental Management Direction	included into SNIM operational costs included into EMC operational costs
Port-ME02	increase of marine noise emissions	Port-ME02a. Reduction of navigation speed	Inclusion of recommended or mandatory speed limits in terminal access and approach procedures communication of speed requirements to Masters and pilots prior to arrival coordination with the Port Authority			
Port-ME02	increase of marine noise emissions	Port-ME02a. Reduction of navigation speed	Inclusion of recommended or mandatory speed limits in terminal access and approach procedures	At each port call Monitoring via AIS	SNIM Terminal operator	included into SNIM

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			communication of speed requirements to Masters and pilots prior to arrival coordination with the Port Authority	post voyage verification: periodic (monthly or quarterly) reporting	EMC EHS Manager in collaboration with SNIM for periodic monitoring	operational costs Included in the salaries of the EHS Manager
		Port-ME2b. Maintenance of propellers	Refer to Port-AQ01c. Systematically verify the statutory and compliance documents of each ore vessel	-	-	-
		Port-ME2c. Voluntary adoption of the revised IMO Guidelines	Integration of relevant IMO instruments and guidelines into terminal procedures inclusion of documentary requirements in berth acceptance conditions			
		Port-ME2c. Voluntary adoption of the revised IMO Guidelines	Integration of relevant IMO instruments and guidelines into terminal procedures inclusion of documentary requirements in berth acceptance conditions	Documentary verification at each vessel call Annual internal audit	SNIM Terminal Management EMC EHS Manager in collaboration with SNIM for annual internal audit	included into SNIM operational costs Included in the salaries of the EHS Manager

14.3.1.2 Biological component

Table 14-18: Port ESMP - Biological component - operation phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Ecology and biodiversity (EB)						
EB06	Degradation of legally protected areas and internationally recognized areas	B_O_EB06a. Require vessel operators to adhere to the Ballast Water Management Convention	The contract with vessel operators includes a clause noting the obligation to comply with the requirements of the Ballast Water Management Convention (IMO, 2024) Verified compliance documented through periodic inspections. Documentation of corrective actions, such as training or penalties, where applicable	Quarterly inspections **Corrective measures applied on an as-needed basis**	Vessel operators for the implementation EMC EHS Manager for verification.	Included in the salary of the EHS Manager
EB06	Degradation of legally protected areas and internationally recognized areas	B_O_EB06b. Operational Emergency Preparedness and Response Plan	Verify that SNIM maintains an operational Emergency Preparedness and Response Plan, with clear communication channels for informing authorities and mandatory reporting timelines. The plan assigns responsibilities for spill/accident cleanup and the materials/equipment that must be on hand to ensure a timely response by SNIM.. Incidents relevant to EMC's Project activities are summarized in Project HSE reports. Report trends in incident occurrence,	Confirm that the Emergency Preparedness and Response Plan and supporting equipment are in place before the start of operation. Annual review of the Emergency Preparedness and Response Plan performance and incidents. Annual reporting of relevant incidents and trends.	SNIM for the plan implementation EMC EHS Manager working in partnership with SNIM for annual plan reviews. EMC EHS Manager for integrating relevant incidents in El Aouj HSE reports EMC EHS Manager working in partnership with SNIM to identify	Included in SNIM operational costs Included in the salary of the EHS Manager

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
			and document corrective measures applied.		appropriate corrective actions, when needed	
EB07	Degradation of bird habitat and bird disturbance	B_O_EB073a. Adhere to the Ballast Water Management Convention	Refer to measure B_O_EB06a. Require vessel operators to adhere to the Ballast Water Management Convention	-	-	-
EB07	Degradation of bird habitat and bird disturbance	B_O_EB037b. Operational Emergency Preparedness and Response Plan	Refer to measure B_O_EB06b. Operational Emergency Preparedness and Response Plan	-	-	-
EB08	Degradation of aquatic species habitat and disturbance	B_O_EB08a. Implement a “Stop-Work / Slow-down” protocol if monk seals, dolphins or sea turtles are observed within a defined exclusion radius around manoeuvring vessels	Implement measures defined in the Biodiversity Action Plan regarding exclusion radius, speed limits and speed reductions, and communication protocols regarding sightings and stop work events.	Continuous monitoring and reporting of stop work events Stop work events involving fauna are summarized in monthly HSE reports	EMC EHS Manager and Mine Operations Manager inform vessel operators of requirements and expectations Vessel operators responsible for implementing procedures and reporting fauna-related stop work events. EMC EHS Manager, responsible for tracking and reporting stop work events in monthly HSE reports.	Included in the salary of the EHS Manager

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
EB08	Degradation of aquatic species habitat and disturbance	B_O_EB08b. Implement a wildlife incident reporting system (collisions, disturbance events) with regular reviews to adjust mitigation measures.	100% of incidents involving vessels and fauna are documented and investigated. Incidents involving fauna are summarized in HSE reports. Appropriate corrective measures are documented and implemented if incident trends are noted (e.g., one or more incidents in two consecutive months, or a single incident involving Mediterranean Monk seal) or as deemed necessary from root cause investigations.	Ongoing monitoring and reporting of fauna-related incidents Monthly reporting of fauna incidents and incident trends in HSE reports.	Vessel operators report incidents EMC EHS Manager responsible for communicating expectations and protocols to vessel operators, for generating reports, and ensuring that incidents are investigated.	Included in the salary of the EHS Manager
EB08	Degradation of aquatic species habitat and disturbance	B_O_EB08c. Lighting management plan (amber/long-wavelength spectrum, shielding, switch-off during migration corridors/sensitive time windows), visibility testing on vertical structures (masts, cranes, conveyors).	Lighting plan approved and implemented on all offshore structures and vessels. Light-visibility test reports completed.	Lighting inspections and visibility testing: **bi-annually** or before peak migration periods Seasonal switch-off checks: **during migration windows**	SNIM for the implementation EMC EHS Manager, working in partnership with SNIM for monitoring and reporting.	Included into SNIM operational costs Included in the salary of the EHS Manager

14.3.1.3 Social component

Table 14-19: ESMP - Social component - Construction phase

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
Social (SOC-Port)						
SOC-P01	Increased Government Revenues- iron ore export	S_O_SOC-P01a Establish an annual reporting system on the volumes and values of iron ore production and exports and the royalties paid to the State	- Payments made to the government are disclosed in the annual corporate social responsibility report; - Information on ore exports from the project is disclosed annually; - Data on mineral exports are shared with EITI and published annually in the country's EITI report.	Each year and during Operation	EMC Finance Manager in collaboration with SNIM Finance Manager	Included into SNIM operational costs
SOC-P02	Impacts on community (including fishers) health and safety	S_O_SOC-P02a Collaborate with the Port Authority to strengthen ship traffic management, maintaining and, where feasible, improving existing traffic-monitoring and user-notification procedures for large-vessel approaches and departures at the mineral port	Maritime traffic monitoring procedures functional and used during the arrival and departure of ships in the port area: - Minutes of meetings with port authorities; - Register of alert procedures traffic-monitoring in place; - Annual audit reports on security procedures in the port area;	Each year and during Operation	SNIM EHS Manager SNIM Community Manager	Included into SNIM operational costs
		S_O_SOC-P02b Organize awareness campaigns for artisanal fishermen on the arrival and departure times of ore-carrying cargo ships as well as on the risk areas to be avoided near the mineral port and its access channel (including	▪ Register of notifications (emails, messages, letters, etc.) sent to cooperatives or fishermen's associations regarding compliance with coastal fishing zones; ▪ Report on raising awareness among fishermen about the risks	Begin and during Operation	SNIM Community Manager SNIM EHS Manager	Included into SNIM operational costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		night/fog navigation and visibility/lighting good practices	associated with the presence of ore vessels.			
		S_O_SOC-P02c Strengthen maritime signage and visual navigation aids near the mineral port and along the access channel to improve small-craft visibility and situational awareness	Presence of warning signs indicating risks associated with cargo ships near the mineral port	Begin and during Operation	SNIM EHS Manager	Included into SNIM operational costs
		S_O_SOC-P02d Implement and maintain Emergency Preparedness and Response plan	Existence of an emergency preparedness and response plan for the mineral port;	Begin and during Operation	SNIM EHS Manager	Included into SNIM operational costs
		S_O_SOC-P02e Ensure that safe loading and bunkering procedures are applied to minimise the likelihood of small hydrocarbon releases, and ensure rapid containment and clear communication to artisanal boat users if an incident occurs, in order to reduce risks of human exposure and unsafe navigation conditions	Signed checklists and HSE inspection reports when loading cargo ships at the mineral port	During Operation	SNIM EHS Manager	Included into SNIM operational costs
		S_O_SOC-P02f Record and review incidents and near-misses involving artisanal canoes and industrial vessels; share lessons learned with	- Register of incidents related to maritime traffic in Nouadhibou; - Minutes of meetings with fishermen's cooperatives or associations.	During the Operation	SNIM Community manager SNIM EHS Manager	Included into SNIM operational costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		cooperatives and update measures accordingly				
		S_O_SOC-P02g Maintain an accessible grievance mechanism for safety-related incidents in the port area, with systematic registration, investigation, feedback and closure	- Complaints register (database of recorded complaints) - Reports of meetings with communities mentioning feedback on the accessibility of the complaints mechanism	Before and during Operation	SNIM Community Manager	Included into SNIM operational costs
SOC-P03		S_O_SOC-P03a Provide navigation information to maritime users, including artisanal fishing cooperatives, regarding periods of increased vessel movements near the port approaches	Number of navigation information disseminated to maritime users (including small-scale fishing cooperatives): - port communications register; - distribution lists (SMS, emails, letters).	During Operation	SNIM EHS Manager SNIM Community Manager	Included into SNIM operational costs
		S_O_SOC-P03b Promote maritime safety awareness for artisanal fishers, in coordination with the Port Authority and fishing associations	Number of information and awareness campaigns conducted on maritime safety, in collaboration with port authorities and fishing associations: - Report on awareness-raising activities (photo, attendance list, poster, etc.) - Reports from fishermen's associations; - Reports from port authorities.	During the Operation	SNIM EHS Manager	Included into SNIM operational costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		S_O_SOC-P03c Maintain incident-reporting systems, ensuring that navigation incidents and near misses involving artisanal craft are logged and shared with the Project to inform fisheries related monitoring	▪ Incident reporting systems set up in the mineral port. ▪ Proportion of incidents/near accidents involving small-scale fishing boats or canoes: - Register/database of incidents in the port area; - Reports from fishing cooperatives/associations.	Before and during the Operation	SNIM EHS Manager	Included into SNIM operational costs
		S_O_SOC-P03d Verify that SNIM maintains pollution-prevention procedures (routine inspection and maintenance of fuel, lubricant and hydraulic systems on port equipment) to reduce the likelihood of minor releases that can trigger temporary avoidance of fishing grounds	Preventive inspections of port equipment carried out by SNIM: - Preventive maintenance schedule (weekly/monthly/annual) - Inspection checklists; - Inspection reports (findings, anomalies, recommendations) for equipment.	During Operation	SNIM EHS Manager	Included into SNIM operational costs
		S_O_SOC-P03e Ensure that SNIM maintains an operational Emergency Preparedness and Response Plan, with clear communication channels for informing authorities and fishing cooperatives so that artisanal fishers can plan around short-term restrictions or avoidance zones following minor releases	Emergency response plan available and up to date in the mineral port, including minor discharge scenarios, alert procedures, mapping of exclusion zones near mineral port: - Copy of the emergency response plan; - Record of revisions to the emergency plan each year.	During Operation	SNIM EHS Manager SNIM Community Manager	Included into SNIM operational costs

Impact number	Impacts	Mitigation and enhancement measures	Targets / Key indicators	Frequency	Responsibility	Estimated costs
		S_O_SOC-P03f Maintain an accessible grievance mechanism for fishing stakeholders, with systematic recording, follow-up, and feedback;	▪ Complaints register (database of recorded complaints) ▪ Reports of meetings with fishing stakeholders mentioning feedback on the accessibility of the complaints mechanism.	Before and during Operation	SNIM Community Manager	Included into SNIM operational costs
		S_O_SOC-P03g Promote continued stakeholder engagement, including regular communication with fishing cooperatives to address navigation or pollution-related concerns affecting fishing operations and value chains	Number of meetings and information sessions planned and held with fishing cooperatives: - Meeting minutes; - Attendance list and photo; - Action plan implemented with fishermen's associations or cooperatives.	Throughout Operation	SNIM Community Manager	Included into SNIM operational costs

Table 14-20: ESMP - Social component - Operations phase

Cultural heritage (CH-Port)						
CH-P01	Damage and Disturbance of Tangible and Intangible Cultural Heritage	S_O_CH-P01-P01a Implement Chance Find Procedure	Completion of chance find register and review programme.	Throughout Operation	EMC EHS Manager, supported by procured Archaeological Contractor.	EHS Manager salary. Archaeological contractor fee.
		S_O_CH-R01-P01a Implement ongoing Stakeholder Engagement Plan and community consultation regarding any unforeseen cultural heritage impacts e.g.,	Completion of stakeholder consultation register and related programme, as outlined within CHMP, linked to ongoing SEP delivery and the Project Grievance Mechanism – to identity and mitigate / manage any unforeseen	Throughout Operation	SNIM Community Manager	Included into SNIM operational costs

		disruption of local access to sacred places. S_O_CH-P01-P01c Implement Project Grievance Mechanism.	impacts to cultural heritage resources (tangible and intangible) during port operation..			

14.4 Environmental and social cost estimate

The Environmental and Social Management Plan (ESMP) implementation budget refers to costs that will be incurred to implement the commitments, requirements or recommendations of the approved ESIA. In the ESMP the requirements are to ensure that implementation of the project integrates environmental and social issues for the sustainability of the project as well as its components and sub-components. The costs of implementation focus on review and monitoring mechanisms that are used to continually improve the environmental and social performance of the Project.

The ESMP implementation costs include project construction and operations costs associated with the implementation of environmental and social monitoring / surveillance and assurance programs, and relevant stakeholder training and awareness programs, that are part of the current commitments in the ESIA. The closure design for the Project is conceptual at this stage of project development and will be refined/advanced during operations leading up to the submission of a detailed closure plan to applicable regulators.

14.4.1 Specific Management Plans

Most mitigation, compensation and enhancement measures proposed in the ESMP are further specified in dedicated management plans, prepared jointly and incorporated into this ESIA. When such a measure is referenced in the ESMP, its implementation cost is addressed in the corresponding management plan. The sections below outline the costs associated with these measures, as set out in the relevant plans.

14.4.1.1 Groundwater and Surface Water Management Plan (GWSWMP)

14.4.1.1.1 Objectives

The Groundwater and Surface Water Management Plan (GWSWMP) has been developed for the El Aouj Iron Ore Project to ensure the responsible management, protection, and sustainable use of water resources throughout the Project lifecycle, from construction and operation to closure and post-closure phases. The Plan supports EMC's commitment to avoiding significant impacts on groundwater and surface water resources, conserving water, and implementing efficient water management practices consistent with the principles of continuous improvement and adaptive management.

The El Aouj Project is located in an arid Region where no permanent surface water resources are available to support mining activities. Consequently, the Project relies entirely on groundwater abstraction from the Taoudeni Basin aquifers through the Touajil and Aouchich wellfields. Over the 41-year mine life, these groundwater resources will provide the water required for potable water production, mineral processing support activities, dust suppression, domestic consumption, and community water supply. Total raw water demand is estimated at approximately 5.57 ML/day, making efficient resource management a critical component of the Project's environmental and social performance.

This Management Plan establishes a comprehensive framework for water supply, groundwater abstraction, monitoring, wastewater management, stormwater control, and water quality protection. Particular attention is given to the long-term sustainability of the P2 aquifer at Touajil and the P4 aquifer at Aouchich, where groundwater abstraction may result in drawdown and progressive changes in groundwater quality. To address these risks, the Plan defines an extensive groundwater monitoring programme covering production boreholes, observation wells, community wells, and irrigation sources. Monitoring data will be used to verify hydrogeological model predictions, support decision-making regarding the transfer of abstraction from Touajil to Aouchich, and guide updates to groundwater management strategies throughout the life of the mine.

In addition to protecting aquifer resources, the Plan promotes water efficiency through recycling and reuse measures. Treated wastewater will be reused for irrigation, reverse osmosis brine will be reused for dust

suppression, and annual reviews of the mine water balance will identify opportunities to reduce water consumption. The Plan also incorporates mitigation measures to maintain water access for local communities, pastoralists, and the Touajil palm grove, including the development of community water supply points along the water pipeline corridor and compensation measures where groundwater abstraction may affect existing users.

14.4.1.1.2 Initial Management plan implementation

The implementation of the Groundwater and Surface Water Management Plan requires an initial capital investment to establish the water supply, monitoring, treatment, and management infrastructure necessary to ensure sustainable water resource management throughout the life of the El Aouj Project.

Table 14-21: Initial implementation cost (GWSWMP)

Item	Justification	Cost (€)
Automatic piezometric loggers	Groundwater level monitoring	60 000
Field multi-parameter probes	pH, EC, TDS, temperature	15 000
Water abstraction meters and instrumentation	monitoring of pumped volumes	20 000
QA/QC sampling equipment	field and quality control	10 000
Hydrogeological database and dashboards	Management and reporting	15 000
Initial training for water monitoring teams	System implementation	10 000
Total		**130 000 €**

14.4.1.1.3 Periodic implementation

Operational expenditure includes the recurring costs required to operate, maintain, monitor, and periodically update the Groundwater and Surface Water Management Plan throughout the life of the El Aouj Project.

14.4.1.1.4 Cost estimates

Table 14-22: Annual implementation costs (GWSWMP)

Item	€/year
Hydrogeological Monitoring	
Piezometric leveling and data validation	30 000
Logger and instrumentation maintenance	5 000
Hydrogeological database management	5 000
Subtotal	**40 000**
Water Quality	
Groundwater analyses	20 000
Drinking water quality control	20 000
Treated wastewater control	5 000
Laboratory transport and logistics	10 000
Subtotal	**55 000**
Water Resource Management and Reporting	
Abstraction and water consumption monitoring	10 000

Item	€/year
Water balance updates	10 000
Reporting and interpretation	15 000
Hydrogeological model update	30 000
Community water point management	20 000
Technical assistance / External audits and reviews	15 000
Subtotal	**100 000**
TOTAL	**195 000 €**

14.4.1.2 Hazardous Material Management Plan (HAZMAT)

14.4.1.2.1 Objectives

The Hazardous Materials Management Plan (HMMP) has been developed for the El Aouj Iron Ore Project to ensure the safe storage, handling, transport, use, and disposal of hazardous materials throughout the Project lifecycle. The Plan provides a structured framework to protect workers, local communities, and the environment from risks associated with fuels, chemicals, explosives, oils, solvents, hazardous wastes, and other potentially dangerous substances used during mining operations.

The HAZMAT establishes requirements for hazardous material approval, classification, inventory management, storage facilities, emergency preparedness, occupational exposure monitoring, spill prevention, waste tracking, and personnel training. It also defines monitoring, auditing, and reporting procedures to ensure compliance with Mauritanian legislation, international standards and international good industry practice.

Through regular inspections, training programmes, emergency response measures, and continuous improvement processes, the Plan aims to minimize hazardous material incidents, protect human health, prevent environmental contamination, and maintain safe mining operations throughout construction, operation, and closure phases.

14.4.1.2.2 Initial Management plan implementation

The Initial Management plan implementation for the Hazardous Materials Management Plan includes the investments required to establish compliant hazardous material management infrastructure, including storage facilities, secondary containment systems, explosive storage compounds, security systems, spill response equipment, emergency installations, monitoring equipment, signage, and hazardous material tracking systems.

14.4.1.2.3 Periodic implementation

The periodic implementation associated with the Hazardous Materials Management Plan includes the recurring costs required for hazardous material inspections, inventory management, monitoring programmes, emergency response preparedness, specialist training, occupational exposure monitoring, waste tracking, audits, reporting, maintenance of storage facilities and safety equipment, and continuous improvement of hazardous material management practices.

14.4.1.2.4 Cost estimates

Table 14-23: Initial implementation cost (HAZMAT)

Item	Justification	Estimated Cost (€)
Spill kits	workshops, fuel storage, maintenance	15 000
Secure chemical storage cabinets	laboratory, workshops, infirmary	20 000
HAZMAT signage and GHS labeling	storage, workshops, logistics areas	5 000
HAZMAT Register system and database	centralized register required by the plan	10 000
Portable exposure monitoring equipment	gas detectors and spot measurements	15 000
HAZMAT training materials development	chapter 10 requirements	5 000
Total		**70 000 €**

Table 14-24: Annual implementation costs (HAZMAT)

Item	€/year
HAZMAT Management	
HAZMAT register management	10 000
Weekly inventories	10 000
Daily storage inspections	15 000
MSDS document control	5 000
Subtotal	**40 000**
Training & Awareness	
HAZMAT staff training	20 000
Annual refresher training	10 000
Toolbox talks & awareness	5 000
Subtotal	**35 000**
Monitoring & Compliance	
Chemical spill exercises	10 000
Exposure / industrial hygiene controls	15 000
Regulatory audits	15 000
Incident investigations & reporting	10 000
Subtotal	**50 000**
Hazardous Waste	
Hazardous waste administration	10 000
Contractor control & traceability	5 000
Subtotal	**15 000**

Item	€/year
TOTAL	**140 000 €**

14.4.1.3 Traffic Management Plan (TMP)

14.4.1.3.1 Objectives

The Traffic Management Plan (TMP) has been developed for the El Aouj Iron Ore Project to ensure the safe and efficient movement of vehicles, mobile equipment, and pedestrians throughout the Project lifecycle. Given the scale of mining activities and the reliance on on-site, off-site, and third-party transport routes, the Plan provides a structured framework to manage traffic-related risks to workers, contractors, local communities, and other road users. It applies to all Project personnel, contractors, subcontractors, and transport providers operating within the Project area.

The TMP establishes requirements for road design, vehicle selection and maintenance, traffic control measures, driver competency and training, speed management, vehicle-pedestrian interaction, community road safety awareness, incident reporting, and continuous monitoring. The Plan also includes specific measures to reduce the risk of traffic accidents, improve driver behaviour, maintain safe operating conditions.

Through regular inspections, performance monitoring, audits, training programmes, and community engagement activities, the TMP aims to minimize traffic-related incidents, protect public safety, and support the safe operation of the Project throughout construction, operation, closure, and post-closure phases.

14.4.1.3.2 Initial Management plan implementation

The Initial Management plan implementation for the Traffic Management Plan includes the investments required to establish traffic management infrastructure and safety systems, including road signage, pedestrian segregation measures, access-control barriers, vehicle visibility equipment, communication systems, speed monitoring devices, GPS/RFID vehicle tracking systems, traffic-calming measures, community road safety infrastructure, and traffic management training and induction resources.

14.4.1.3.3 Periodic implementation

The periodic implementation associated with the Traffic Management Plan includes the recurring costs required to implement and maintain traffic management measures, including driver training and competency assessments, vehicle inspections, road maintenance, speed monitoring, incident investigations, audits, community road safety awareness campaigns, contractor compliance monitoring, communication system maintenance, traffic signage replacement, reporting, and continuous improvement activities throughout the life of the Project.

14.4.1.3.4 Cost estimates

Table 14-25: Initial implementation cost (TMP)

Item	Justification	Cost (€)
Bilingual road signage (FR/AR)	speed signs, STOP, intersections, pedestrian crossings	15 000
Marking and reflective devices	mine roads, intersections, road works	8 000
Mobile radars / speed control equipment	speed monitoring requirement	10 000
Basic GPS / RFID for HSE fleet tracking	simplified safety tracking system	7 000

Item	Justification	Cost (€)
Training materials and awareness resources	drivers and communities	5 000
Total		**45 000 €**

Table 14-26: Annual implementation cost (TMP)

Item	€/year
Training & Skills	
Driver training	15 000
Annual refresher training	5 000
Subcontractor awareness	5 000
Subtotal	**25 000**
Traffic Control	
Speed checks	7 000
GPS data analysis	5 000
Driving behavior analysis	3 000
Subtotal	**15 000**
Inspections & Maintenance	
Road inspections	5 000
Signage control	3 000
Marking replacement & maintenance	2 000
Subtotal	**10 000**
Community Awareness	
Village & school campaigns	10 000
Vulnerable user awareness	5 000
Communication materials	5 000
Subtotal	**20 000**
Audits & Reporting	
Internal TMP audits	5 000
External audit	5 000
KPI reporting	5 000
Incident investigations	5 000
Subtotal	**20 000**
Contractor Management	
Contractor audits	10 000

Item	€/year
Road accident exercises & drills	5 000
Subtotal	**25 000**
TOTAL	**105 000 €**

14.4.1.4 Emergency Preparedness and Response Plan (ERP)

14.4.1.4.1 Objectives

The Emergency Preparedness and Response Plan (ERP) has been developed for the El Aouj Iron Ore Project to establish a comprehensive framework for preventing, preparing for, and responding to emergency situations that may occur during construction, operation, and closure of the Project. The Plan covers a broad range of potential emergencies, including fire and explosions, medical incidents, traffic accidents, hazardous material releases, geotechnical failures, natural disasters, civil disturbances, security incidents, and environmental emergencies. It aims to protect workers, contractors, nearby communities, Project assets, and the environment through coordinated preparedness and response measures.

The ERP defines emergency response procedures, communication protocols, responsibilities, evacuation arrangements, incident reporting requirements, emergency team mobilisation processes, training programmes, and performance monitoring systems. Particular emphasis is placed on maintaining effective on-site emergency response capacity given the remote location of the Project and ensuring coordination between the Security Response Team (SRT), Emergency Response Team (ERT), Emergency Medical Team (EMT), contractors, and external authorities.

14.4.1.4.2 Initial Management plan implementation

The Initial Management plan implementation for the Emergency Preparedness and Response Plan includes the investments required to establish emergency response infrastructure and operational readiness systems, including emergency response equipment, firefighting and rescue equipment, emergency communications systems, emergency vehicles and ambulances, medical clinic equipment, emergency assembly areas, alarm and notification systems, incident management tools, emergency signage, and the establishment of dedicated emergency response facilities and teams.

14.4.1.4.3 Periodic implementation

The periodic implementation associated with the Emergency Preparedness and Response Plan includes the recurring costs required for maintenance of emergency response equipment, emergency team staffing, emergency drills and simulation exercises, emergency response training programmes, inspections, audits, incident investigations, emergency equipment replacement, communications systems operation, medical emergency preparedness, reporting, and continuous improvement of emergency response capabilities throughout the life of the Project.

14.4.1.4.4 Cost estimates

Table 14-27: Initial implementation cost (ERP)

Item	Justification	Cost (€)
Evacuation plans and emergency mapping	display and procedures	10 000
Signage and assembly points	ERP compliance	10 000
Additional ERT equipment	first intervention equipment	20 000

Item	Justification	Cost (€)
Emergency communication means	radios and coordination	10 000
ERP procedures and registers development	documentation and reporting	5 000
Initial ERT / Fire Wardens training	system startup	10 000
Total		**65 000**

Table 14-28: Annual implementation cost (ERP)

Item	€/year
Exercises & Simulations	
Fire drills	5 000
Evacuation exercises	5 000
Spill exercises	5 000
Multi-risk simulations	5 000
Subtotal	**20 000**
Training & Competency	
ERP staff training	15 000
ERT training	10 000
Fire warden training	10 000
Annual refresher training	5 000
Subtotal	**40 000**
Operational Readiness	
Emergency equipment inspections	2 500
Emergency inventory updates	2 500
Subtotal	**5 000**
Audits & Reporting	
Internal ERP audits	10 000
Annual external audit	10 000
Incident investigations	10 000
KPI reporting	10 000
Subtotal	**40 000**
External Coordination & Improvement	
Exercises with local authorities	10 000
External emergency services coordination	5 000
Annual plan review	10 000
Subtotal	**25 000**

Item	€/year
TOTAL	**130 000 €**

14.4.1.5 Energy Management Plan (EnMP)

14.4.1.5.1 Objectives

The Energy Management Plan (EnMP) has been developed for the El Aouj Iron Ore Project to promote efficient energy use, reduce fuel and electricity consumption, and improve overall energy performance throughout the Project lifecycle. The Plan covers all major energy-consuming activities, including the HFO power plant, PV-BESS systems, mining fleet, ore processing facilities, water supply infrastructure, camps, and associated support facilities.

The EnMP establishes a framework for integrating energy efficiency into Project design, construction, operation, and closure activities through energy-efficient technologies, optimized operating practices, renewable energy integration, monitoring programmes, and continuous improvement measures. Particular emphasis is placed on reducing fuel consumption, increasing the contribution of solar energy, improving pumping and processing efficiency, and strengthening energy-performance monitoring across all facilities.

The Plan aims at supporting responsible resource use, reduced greenhouse gas emissions, and long-term operational efficiency.

14.4.1.5.2 Initial Management plan implementation

The Initial Management plan implementation for the Energy Management Plan includes the investments required to establish energy-efficiency and monitoring systems, including smart metering infrastructure, energy monitoring software, sub-metering of major facilities, energy-efficient lighting and HVAC systems, optimisation equipment for pumps and process facilities, renewable energy integration systems, and associated energy management tools required to support Project-wide energy performance objectives.

14.4.1.5.3 Periodic implementation

The periodic implementation associated with the Energy Management Plan includes the recurring costs required for energy monitoring, data analysis, performance audits, energy-efficiency inspections, training programmes, preventive maintenance activities, KPI reporting, management reviews, energy awareness campaigns, and continuous improvement actions aimed at reducing energy consumption and improving operational efficiency throughout the life of the Project.

14.4.1.5.4 Cost estimates

Table 14-29: Initial implementation cost (EnMP)

Item	Justification	Cost (€)
Energy sub-metering	mine, plant, camp, pumping	40 000
Energy instrumentation and sensors	consumption measurement	30 000
Energy dashboard	KPI tracking and reporting	10 000
EnMP registers and procedures development	document management	5 000
Initial energy staff training	system startup	5 000
Total		**90 000 €**

Table 14-30: Annual implementation cost (EnMP)

Item	€/year
Energy Monitoring	
Electricity consumption monitoring	5 000
Fuel consumption monitoring	5 000
Energy database management	5 000
Energy KPI analysis	5 000
Subtotal	**20 000**
Audits & Inspections	
Internal energy audits	10 000
Annual external audit	10 000
Field inspections	5 000
Subtotal	**25 000**
Training & Awareness	
Energy training	10 000
Annual refresher training	5 000
Awareness campaigns	5 000
Subtotal	**20 000**
Energy Performance Management	
Annual energy review	10 000
EnMP objectives update	2 500
Performance gap analysis	2 500
Subtotal	**15 000**
Reporting & Improvement	
ESG / ESMS reporting	5 000
External technical support	5 000
Subtotal	**10 000**
TOTAL	**90 000 €**

14.4.1.6 Non-mineral Waste Management Plan (NMWMP)

14.4.1.6.1 Objectives

The Non-Mineral Waste Management Plan (NMWMP) has been developed for the El Aouj Iron Ore Project to ensure the safe, efficient, and environmentally responsible management of all non-mineral waste generated throughout the Project lifecycle. The Plan covers both hazardous and non-hazardous wastes arising from mining, maintenance, camp operations, workshops, laboratories, medical facilities, offices, and support infrastructure. It aims to minimize waste generation, maximize reuse and recycling opportunities, and ensure

that waste storage, treatment, transport, and disposal are carried out in accordance with Mauritanian regulations and international standards.

The NMWMP establishes a structured framework based on the waste hierarchy of avoidance, reduction, segregation, recycling, treatment, and disposal. It includes provisions for waste tracking, hazardous waste traceability, operation of the Waste Management Facility (WMF), personnel training, monitoring, auditing, and continuous improvement to reduce environmental and social risks associated with waste management activities.

14.4.1.6.2 Initial Management plan implementation

The Initial Management plan implementation for the Non-Mineral Waste Management Plan includes the infrastructure, equipment, and systems required to establish effective waste management operations, including the Waste Management Facility (WMF), waste collection points, segregation containers, hazardous waste storage areas, recycling and treatment facilities, biomedical waste incineration equipment, hydrocarbon remediation areas, waste tracking systems, and associated environmental protection measures.

14.4.1.6.3 Periodic implementation

The periodic implementation associated with the Non-Mineral Waste Management Plan includes the recurring costs required for waste collection, transportation, segregation, storage, treatment, recycling, disposal, hazardous waste tracking, monitoring, inspections, third-party audits, personnel training, reporting, contractor management, and maintenance of waste management infrastructure throughout the life of the Project.

14.4.1.6.4 Cost estimates

Table 14-31: Initial implementation cost (NMWMP)

Item	Justification	Cost (€)
Sorting bins and collection points	source separation at mine, plant and camp	20 000
Waste signage / display	coding and storage areas	5 000
Waste tracking database	register and reporting	10 000
Additional WMF equipment	weighing, storage, traceability	20 000
Hazardous waste retention and safety kits	HSE compliance	15 000
Initial staff training	system startup	10 000
Total		**80 000 €**

Table 14-32: Annual implementation cost (NMWMP)

Item	€/year
Waste Management Operations	
Waste administration	15 000
Registers & traceability	10 000
Quarterly inventories	5 000
ESMS reporting	10 000
Subtotal	**40 000**

Item	€/year
Collection, Sorting & Recycling	
Internal waste collection	25 000
Sorting & packaging	20 000
Recycling management	20 000
Waste quality control	5 000
Subtotal	**70 000**
Hazardous Waste	
Hazardous waste management	25 000
Manifest tracking	10 000
External contractor control	10 000
Recycler audits	10 000
Subtotal	**55 000**
Training & Audits	
Continuous training	15 000
Inspections & audits	15 000
Exercises & awareness	5 000
Subtotal	**35 000**
TOTAL	**200 000 €**

14.4.1.7 Biodiversity Action Plan (BAP)

14.4.1.7.1 Objectives

The Biodiversity Action Plan (BAP) has been developed for the El Aouj Iron Ore Project to ensure the protection, conservation, and sustainable management of biodiversity throughout the Project lifecycle, from construction to closure. The Plan focuses on the avoidance, minimization, restoration, and monitoring of impacts on natural habitats, critical habitats, and species of conservation concern that may be affected by mining, water supply infrastructure, rail, and port-related activities.

The BAP establishes a framework for vegetation protection and salvage, revegetation, fauna protection, biodiversity monitoring, habitat restoration, and implementation of additional conservation actions. Its long-term objective is to achieve No Net Loss of natural habitats and, where applicable, Net Gain for critical habitats, through a combination of mitigation measures, rehabilitation programmes, monitoring, and support for regional conservation initiatives.

The Plan aims at ensuring that Project activities are managed in a manner that minimizes biodiversity risks while promoting long-term ecological resilience

14.4.1.7.2 Initial Management plan implementation

The initial BAP implementation includes the investments required to establish biodiversity management and restoration programmes, including vegetation salvage operations, nursery development, seed collection and

germination facilities, revegetation infrastructure, biodiversity monitoring equipment, specialist ecological surveys, fauna protection measures, and the implementation of conservation and habitat restoration initiatives.

14.4.1.7.3 Periodic implementation

The periodic implementation associated with the BAP includes the recurring costs required for biodiversity monitoring, ecological surveys, revegetation and nursery operations, specialist botanical and ecological expertise, conservation programme support, environmental inspections, reporting, audits, staff training, adaptive management actions, and long-term habitat restoration and maintenance activities throughout the life of the Project.

14.4.1.7.4 Cost estimates

Table 14-33: Initial implementation costs (BAP)

Item	Cost (€)
Pre-Construction/Construction	
Pilot nursery	40,000
Seed collection and propagation material	15,000
Transplanting equipment	15,000
Ecological monitoring equipment (GPS, camera traps, binoculars)	20,000
GIS biodiversity database	15,000
Biodiversity program setup	15,000
Flight diverters	7,000
Total during Pre-construction and Construction	**127,000**
Operation	
Verify solar pannel reflectance parameters	5,000
Acoustic Bird Deterrent System	7,000
Total during Operation	**12,000**

Table 14-34: Annual implementation costs during the pre-construction and construction activities (BAP)

Item	€/year[(a)]
Footprint and disturbance tracking (mine)	10,000
Preconstruction flora survey (mine)	15,000
Flora transplants and tracking (mine)	10,000
Biodiversity expert / botanist (mine)	40,000
Wildlife/flora incident tracking (mine)	5,000
Permit application for tree clearing (mine)	5,000
Critical habitat qualifying bird surveys (port)	8,000
TOTAL	**93,000**

(a) Some monitoring activities do not occur annually. In these instances, the annual cost presented corresponds to the average annual cost of implementing the program over the duration of the applicable Project phase (i.e., over a 5-year construction period or a 40-year operation period).

Table 14-35: Annual implementation costs during operation phase (BAP)

Item	€/year[(a)]
Mitigation Monitoring and Ecological Monitoring during Operation (Mine)	
Biodiversity expert / botanist	40,000
Inventory avifauna mortality around solar panels	250
Pre-blast fauna surveys	10,000
Avian carcass monitoring for the overhead power line	3,000
Wildlife/flora incident tracking	5,000
Database and GIS	10,000
Subtotal	**68,250**
Revegetation	
Nursery operation	20,000
Germination & propagation	10,000
Planting & maintenance	25,000
Planting monitoring	10,000
Subtotal	**65,000**
Ecological Monitoring During Operation (Port)	
Critical habitat qualifying bird surveys	7,000
Subtotal	**7,000**
Additional Conservation Actions	
Monk seal program contribution	2,500
Marine invasive species program	15,000
Kediet ej Jill program	5,000
External technical support and scientific partnerships	10,000
Subtotal	**32,500**
Training, Audits and Reporting	
Biodiversity training	5,000
External audits	5,250
Annual reporting	35,000
Subtotal	**45,250**
Total	**218,000**

(a) Some monitoring activities do not occur annually. In these instances, the annual cost presented corresponds to the average annual cost of implementing the program over the duration of the applicable Project phase (i.e., over a 5-year construction period or a 40-year operation period).

14.4.1.8 Cultural Heritage Management Plan (CHMP)

14.4.1.8.1 Objectives

The Cultural Heritage Management Plan (CHMP) has been developed for the El Aouj Iron Ore Project to ensure the protection, preservation, and responsible management of cultural heritage resources that may be affected by Project activities. The Plan addresses both tangible heritage (archaeological sites, tombs, cemeteries, mosques, rock art and historical features) and intangible heritage (traditional knowledge, cultural practices and local beliefs) identified within the Project Area of Influence.

The CHMP establishes a framework for avoiding, minimizing, and managing impacts on cultural heritage throughout all Project phases through site protection measures, archaeological investigations, cultural heritage awareness training, stakeholder engagement, and the implementation of a Chance Find Procedure. The Plan also promotes continuous consultation with local communities and authorities to ensure that culturally significant sites are respected and appropriately managed.

The CHMP aims to preserve the cultural heritage values of the Project area while supporting the sustainable development of the El Aouj Project.

14.4.1.8.2 Initial Management plan implementation

The Initial Management plan implementation for the Cultural Heritage Management Plan covers the one-time investments required to establish cultural heritage protection measures, including site demarcation and signage, archaeological surveys and evaluations, heritage recording programmes, specialist studies, and implementation of the Chance Find Procedure framework.

14.4.1.8.3 Periodic implementation

The periodic implementation associated with the Cultural Heritage Management Plan includes the recurring costs required to implement and maintain cultural heritage management measures, including awareness training, stakeholder consultation, archaeological specialist support, site inspections, environmental and vibration monitoring, reporting, audits, and periodic updates of heritage management records and procedures

14.4.1.8.4 Cost estimates

Table 14-36: Initial implementation cost (CH)

Item	Justification	Cost (€)
Heritage GIS mapping and exclusion zones	constraints mapping	15 000
Initial signage and marking	graves, mosques, archaeological sites	15 000
Chance Find Register development	register and reporting	5 000
Documentary and photographic equipment	site recording	10 000
Initial cultural heritage training	site induction	10 000
Total		**55 000 €**

Table 14-37: Annual implementation cost during pre-construction and construction activities (CH)

Item	€/year
Heritage Management & Consultations	
Heritage committee operations	10 000

Item	€/year
Community consultations	15 000
Heritage authorities coordination	5 000
Registry management	5 000
Subtotal	**35 000**
Training & Awareness	
Heritage induction training	10 000
Annual refresher courses	5 000
Awareness materials	5 000
Subtotal	**20 000**
Site Monitoring & Protection	
Heritage inspections	15 000
Exclusion zone control	10 000
Vibration monitoring (sensitive sites)	10 000
Signage maintenance	5 000
Subtotal	**40 000**
Preventive Archaeology	
Expert archaeologist	25 000
Field campaigns	20 000
Test pits & assessments	25 000
Rock art recording	10 000
Documentation & archiving	5 000
Subtotal	**85 000**
Audit & Reporting	
Heritage audits	10 000
Annual reporting	5 000
Chance Find Procedure management	5 000
Subtotal	**30 000**
TOTAL	**200 000 €**

Table 14-38: Annual implementation cost during operation phase (CH)

Item	€/year[(a)]
Heritage Management & Consultations	
Heritage committee operations	3 000
Community consultations	4 000

Item	€/year[(a)]
Heritage authorities coordination	2 000
Registry management	2 000
Subtotal	**11 000**
Training & Awareness	
Heritage induction training	0
Annual refresher courses	1 000
Awareness materials	1 000
Subtotal	**2 000**
Site Monitoring & Protection	
Heritage inspections	3 000
Exclusion zone control	3 000
Vibration monitoring (sensitive sites)	2 000
Signage maintenance	2 000
Subtotal	**10 000**
Preventive Archaeology	
Expert archaeologist	4 000
Field campaigns	3 000
Test pits & assessments	3 000
Rock art recording	2 000
Documentation & archiving	2 000
Subtotal	**14 000**
Audit & Reporting	
Heritage audits	3 000
Annual reporting	2 000
Chance Find Procedure management	2 000
Subtotal	**7 000**
TOTAL	**44 000**

(a) Some monitoring activities do not occur annually. In these instances, the annual cost presented corresponds to the average annual cost of implementing the program over the duration of the applicable Project phase (i.e., over a 5-year construction period or a 40-year operation period).

14.4.1.9 Stakeholder Engagement Plan (SEP)

14.4.1.9.1 Objectives

The Stakeholder Engagement Plan (SEP) has been developed for the El Aouj Iron Ore Project to provide a structured framework for transparent communication, inclusive consultation, and continuous dialogue with stakeholders throughout the Project lifecycle. The Plan identifies Project-affected communities, vulnerable groups, public authorities, civil society organisations, local economic actors, pastoralists, and other interested

parties, and defines how their concerns, expectations, and feedback will be considered during Project planning, construction, and operation.

The SEP sets out the principles, methods, responsibilities, and monitoring arrangements required to ensure meaningful stakeholder engagement, timely disclosure of Project information, and effective management of grievances. It includes engagement activities conducted during the 2015 ESIA process and additional consultations carried out in 2023 and 2025, as well as a forward-looking engagement programme for construction and operation phases.

The Plan aims to maintain long-term relationships between EMC and local communities, support informed participation, manage expectations, and ensure that stakeholder feedback is integrated into Project management systems.

14.4.1.9.2 Initial Management plan implementation

The Initial Management plan implementation for the Stakeholder Engagement Plan includes the one-time investments required to establish stakeholder engagement systems, including stakeholder databases and registers, grievance mechanism tools, communication materials, consultation platforms, public information channels, social team mobilisation, training materials, and initial engagement activities with local communities, authorities, vulnerable groups, pastoralists, and other key stakeholders.

14.4.1.9.3 Periodic implementation

The periodic implementation associated with the Stakeholder Engagement Plan includes the recurring costs required to implement and maintain stakeholder engagement activities throughout the Project lifecycle, including public meetings, focus groups, committee meetings, grievance management, stakeholder database updates, community liaison activities, monitoring and reporting, disclosure of Project information, perception surveys, communication campaigns, contractor coordination, and periodic review of the SEP.

14.4.1.9.4 Cost estimates

Table 14-39: Initial SEP implementation cost

Item	Cost (€)
SEP database / stakeholder register	15 000
Grievance management system	15 000
Communication materials development	10 000
Reporting system setup	10 000
Initial SEP team training	10 000
Total	**60 000 €**

Table 14-40: annual SEP implementation cost

Item	€/year
SEP Team	
Community Relations Officer	35 000
Community Liaison Officer	20 000
Community Development support	20 000
Social team operations	15 000

Item	€/year
Subtotal	**90 000**
Consultations	
Public meetings	20 000
Focus groups	15 000
Municipal committee	10 000
Regional committee	10 000
NGO & institutional consultations	10 000
Travel & logistics	15 000
Subtotal	**80 000**
Grievance Mechanism	
Grievance management & tracking	15 000
Field investigations	10 000
Sensitive case assistance (GBV)	10 000
Records & archiving	5 000
Subtotal	**40 000**
Information Disclosure	
Printed materials	10 000
Digital communication	5 000
Annual public reports	10 000
Translation & interpretation	10 000
Subtotal	**35 000**
Monitoring & Reporting	
Perception surveys	10 000
SEP audits	10 000
Lender reporting	10 000
Contingency	15 000
Subtotal	**45 000**
TOTAL	**290 000 €**

14.4.1.10 Occupational Health and Safety Management Plan (OHSMP)

14.4.1.10.1 Objectives

The Occupational Health and Safety Management Plan (OHSMP) has been developed for the El Aouj Iron Ore Project to prevent occupational injuries, illnesses, and fatalities and to ensure safe and healthy working conditions throughout all phases of the Project lifecycle. The Plan applies to all employees, contractors, subcontractors, and third-party workers involved in Project activities and establishes a comprehensive framework for hazard identification, risk assessment, exposure monitoring, emergency preparedness, training, health surveillance, and continuous improvement of occupational health and safety performance.

The OHSMP addresses the principal occupational risks associated with mining activities, including traffic and mobile equipment interactions, blasting, excavation and earthworks, maintenance activities, hazardous substances, noise, vibration, dust, heat stress, behavioural risks, and biological hazards. The Plan adopts a risk-based approach and applies the hierarchy of controls to reduce workplace risks to levels that are as low as reasonably practicable.

The Plan aims to ensure that worker health, safety, welfare, and wellbeing remain central to Project management and operations.

14.4.1.10.2 Initial Management plan implementation

The Initial Management plan implementation for the Occupational Health and Safety Management Plan includes the investments required to establish Project-wide health and safety systems and infrastructure, including occupational monitoring equipment, industrial hygiene instrumentation, emergency response equipment, worker accommodation safety systems, health surveillance facilities, training infrastructure, communication systems, safety signage, permit-to-work systems, and the development of occupational health and safety procedures and management tools.

14.4.1.10.3 Periodic implementation

The periodic implementation associated with the Occupational Health and Safety Management Plan includes the recurring costs required to implement and maintain occupational health and safety programmes, including workforce training, medical surveillance, industrial hygiene monitoring, PPE provision and replacement, inspections, audits, incident investigations, emergency response drills, contractor OHS management, occupational exposure assessments, reporting, and continuous improvement activities throughout the life of the Project.

14.4.1.10.4 Cost estimates

Table 14-41: Initial implementation cost (OHSMP)

Item	Justification	Cost (€)
Noise monitoring equipment	dosimeters and sound level meters	15 000
Dust/silica equipment	personal pumps and sensors	25 000
OHS register and incident software	KPIs, audits, corrective actions	10 000
OHS training materials	induction and specialized modules	10 000
Field inspection equipment	tablets, digital checklists	10 000
Initial ISO 45001 implementation	document management system	20 000
Total		**90 000 €**

Table 14-42: Annual implementation cost (OHSMP)

Item	€/year
Exposure Monitoring	
Dust & silica campaigns	30 000
Noise monitoring	10 000
Vibration monitoring	10 000
Chemical exposure	15 000

Item	€/year
Heat stress program	10 000
Subtotal	**75 000**
Medical Surveillance	
Occupational medicine	35 000
Audiometry	15 000
Respiratory surveillance	15 000
Fitness for work	10 000
Subtotal	**75 000**
Training & Skills	
OHS induction training	15 000
Specialized training	20 000
Drills & simulations	10 000
Skills management	5 000
Subtotal	**50 000**
Audits & Inspections	
Internal audits	10 000
ISO 45001 external audits	20 000
Field inspections	15 000
Contractor audits	10 000
OHS reporting	10 000
Subtotal	**65 000**
Participation & Improvement	
Incident reporting system	5 000
Safety meetings / toolbox talks	10 000
Incident investigations	10 000
Contingency	20 000
Subtotal	**45 000**
TOTAL	**310 000 €**

14.4.1.11 Community Health, Safety and Security Management Plan (CHSSMP)

14.4.1.11.1 Objectives

The Community Health, Safety and Security Management Plan (CHSSMP) has been developed for the El Aouj Iron Ore Project to identify, manage, and mitigate potential risks to local communities arising from Project activities throughout construction, operation, and closure. The Plan addresses risks associated with increased traffic, interactions between workers and local populations, communicable diseases, dust and noise emissions,

workforce influx, emergency situations, and security arrangements. Particular emphasis is placed on protecting vulnerable groups and ensuring that Project activities do not adversely affect the health, safety, and wellbeing of surrounding communities.

The CHSSMP establishes a framework for community awareness programmes, grievance management, worker health screening, vaccination and disease prevention programmes, road safety campaigns, coordination with local healthcare authorities, emergency preparedness, and implementation of security measures consistent with the Voluntary Principles on Security and Human Rights. The Plan also defines monitoring requirements, performance indicators, training programmes, and reporting mechanisms to ensure effective management of community-related risks.

14.4.1.11.2 Initial Management plan implementation

The Initial Management plan implementation for the Community Health, Safety and Security Management Plan includes the investments required to establish community protection and risk management systems, including community awareness and communication materials, site fencing and access-control infrastructure, security infrastructure, emergency response interfaces, health screening and vaccination programme set-up, grievance management tools, community information systems, signage, and implementation of security management systems aligned with international good practice.

14.4.1.11.3 Periodic implementation

The periodic implementation associated with the Community Health, Safety and Security Management Plan includes the recurring costs required to implement and maintain community awareness campaigns, road safety programmes, worker health screening and vaccination programmes, grievance management activities, stakeholder engagement, security personnel training, health and safety monitoring, community liaison activities, audits, reporting, and continuous improvement measures throughout the Project lifecycle.

14.4.1.11.4 Cost estimates

Table 14-43: initial implementation cost (CHSSMP)

Item	Cost (€)
CHSS monitoring system and incident register	15 000
Community grievance management system	10 000
Community awareness materials	10 000
Community security procedures development	10 000
Initial CHSS staff training	10 000
Total	**55 000 €**

Table 14-44: Annual implementation cost (CHSSMP)

Item	€/year
Community Awareness	
Community health campaigns	20 000
Road safety campaigns	20 000
School & vulnerable group awareness	15 000
Communication materials	10 000

Item	€/year
Subtotal	**65 000**
Public Health	
STI/HIV program	15 000
Vaccination campaign support	20 000
Public health coordination	10 000
Health monitoring & reporting	10 000
Subtotal	**55 000**
Grievance Management	
Community grievance management	15 000
Field investigations	10 000
CHSS-specific community meetings	10 000
Archiving & reporting	5 000
Subtotal	40 000
Security & Human Rights	
Security & human rights training	15 000
Private security audits	10 000
Personnel vetting & screening	5 000
Public forces coordination	5 000
Subtotal	**35 000**
Monitoring & Reporting	
CHSS monitoring	15 000
Internal audit	10 000
External audit	10 000
IFC/AfDB lender reporting	10 000
Contingency	15 000
Subtotal	**60 000**
TOTAL	**255 000 €**

14.4.1.12 Community Development Plan (CDP)

14.4.1.12.1 Objectives

The Community Development Plan (CDP) has been developed for the El Aouj Iron Ore Project to establish a framework for voluntary and sustainable community investment that contributes to long-term socioeconomic development within the Project Area of Influence. The Plan focuses primarily on the communities of F'Derik, Touajil, and surrounding pastoralist groups, while also supporting broader regional development objectives in Zouerate and the Tiris Zemmour Region. Its purpose is to create positive and lasting benefits that extend beyond the operational life of the Project.

The CDP is built around four strategic objectives: promoting local economic development and employability, improving access to health, water and sanitation services, strengthening education and community infrastructure, and supporting the institutional capacity of local authorities and community organisations. The Plan places particular emphasis on youth employment, women's economic empowerment, pastoral livelihoods, community participation, and sustainable development initiatives aligned with regional priorities and stakeholder expectations.

Implementation of the CDP relies on a participatory approach involving local authorities, community representatives, civil society organisations, and development partners. Through targeted programmes, local initiatives, stakeholder engagement mechanisms, and long-term monitoring and evaluation, the Plan seeks to foster social cohesion, improve livelihoods, and enhance community resilience throughout the life of the Project and beyond mine closure.

14.4.1.12.2 Initial Management plan implementation

The Initial Management plan implementation for the Community Development Plan includes the investments required to establish community development programmes and governance mechanisms, including consultation committees, community engagement platforms, vocational training and employability initiatives, support infrastructure for health, education and community facilities, programme design studies, monitoring systems, community development management tools, and initial funding mechanisms for local development initiatives and community partnerships.

14.4.1.12.3 Periodic implementation

The periodic implementation associated with the Community Development Plan includes the recurring costs required to implement and sustain community development programmes, including annual community investment funding, local economic development projects, vocational training programmes, support to women's and youth initiatives, community consultations, operation of concertation committees, monitoring and evaluation activities, stakeholder engagement, management of local initiative funds, reporting, audits, and adaptive management throughout the Project lifecycle.

14.4.1.12.4 Cost estimates

Table 14-45: Initial implementation cost (CDP)

Item	Cost (€)
CDP system setup	15 000
Monitoring and evaluation tools	10 000
Local initiatives fund creation	20 000
CDP procedures development	10 000
Community development team training	10 000
Total	**65 000 €**

Table 14-46: Annual implementation cost (CDP)

Item	€/year
CDP Management	
CDP management	50 000

Item	€/year
Social team operations	30 000
Consultation & governance	20 000
Subtotal	**100 000**
Local Economic Development	
Women & cooperatives program	75 000
Youth employability & training	75 000
Pastoral & agricultural support	50 000
Local initiatives fund	50 000
Subtotal	**250 000**
Health, Education & Infrastructure	
Community health support	50 000
Education support	50 000
Sports/cultural infrastructure	50 000
Subtotal	**150 000**
Institutional Strengthening	
Local institution support	30 000
Association capacity building	20 000
Local governance assistance	20 000
Subtotal	**70 000**
Monitoring & Evaluation	
Periodic evaluations	15 000
Perception surveys	10 000
Lender reporting	10 000
Contingency	15 000
Subtotal	**50 000**
TOTAL	**620 000 €**

14.4.1.13 Mine Closure Plan (MCP)

14.4.1.13.1 Objectives

The Conceptual Mine Closure Plan (CMCP) has been developed for the El Aouj Iron Ore Project to establish the strategic framework for the safe, environmentally responsible, and socially sustainable closure of the mine at the end of its operational life. The Plan covers the decommissioning, rehabilitation, post-closure monitoring, and long-term management of all Project components, including the open pit, waste rock dumps, tailings storage facility, mine infrastructure, transport corridors, water supply facilities, and associated support infrastructure. Its objective is to ensure that closure activities are planned early and progressively integrated into Project management throughout the mine lifecycle.

The CMCP defines the principles and requirements for mine closure in accordance with Mauritanian legislation, IFC Performance Standards, AfDB Operational Safeguards, and international mining good practice. The Plan establishes measures to eliminate or reduce long-term environmental and social risks, ensure public safety, restore landforms, manage mine wastes and contaminated materials, protect water resources, support workforce transition, and facilitate the sustainable transfer or decommissioning of infrastructure where appropriate.

The Plan adopts an adaptive management approach and provides the foundation for the future Detailed Mine Closure Plan, which will be prepared during the final years of operation. Through stakeholder engagement, environmental rehabilitation, post-closure monitoring, and socioeconomic transition measures, the CMCP aims to leave a stable, safe, and sustainable post-mining landscape that does not create unacceptable risks for future generations

14.4.1.13.2 Initial Management plan implementation

The Initial Management plan implementation for the Mine Closure Plan includes the investments required to prepare and implement closure activities, including closure planning studies, geotechnical and environmental assessments, dismantling and demolition works, rehabilitation of disturbed areas, pit safety infrastructure, waste facility stabilisation measures, contaminated land investigations, groundwater well decommissioning works, post-closure monitoring infrastructure, stakeholder consultation programmes, workforce transition initiatives, and infrastructure transfer arrangements where applicable.

14.4.1.13.3 Periodic implementation

The periodic implementation associated with the Mine Closure Plan includes the recurring costs required to implement closure and post-closure management activities, including closure monitoring programmes, geotechnical inspections, groundwater and water quality monitoring, maintenance of erosion and drainage controls, inspections of closed facilities, stakeholder engagement, grievance management, environmental audits, adaptive management actions, post-closure reporting, maintenance of transferred infrastructure monitoring systems, and long-term socioeconomic transition support measures.

14.4.1.13.4 Cost estimates

Table 14-47: Initial implementation cost (MCP)

Item	Cost (€)
Closure monitoring system development	15 000
Closure database and risk register	10 000
GIS mapping and infrastructure inventory	15 000
Updated closure strategy development	15 000
EMC teams training	10 000
Total	**65 000 €**

Table 14-48: Annual implementation cost (MCP)

Item	€/year
Governance & Planning	
Annual MCP update	15 000
Risk register update	5 000

Item	€/year
ESMS closure reporting	10 000
Internal audits	10 000
Subtotal	**40 000**
Consultations & Socio-Economics	
Stakeholder consultations	15 000
Asset transfer preparation	10 000
Reconversion / re-skilling planning	15 000
Social closure documentation	5 000
Subtotal	**45 000**
Studies & Technical Monitoring	
Periodic closure studies	20 000
Geotechnical review	10 000
Hydrogeological support	10 000
Closure cost revision	10 000
Subtotal	**50 000**
TOTAL	**135 000 €**

14.4.2 Additional costs

The costs presented in this section are identified as not being included in the various specific management plans. They therefore come in addition to the costs presented previously.

14.4.2.1 Additional costs for the implementation of mitigation measures that are not included in the specific Management Plans

Only these costs are directly indicated in the ESMP table.

Table 14-49: additional costs for selected measures

Phase	Component	Measure	Initial implementation (€)	Annual maintenance / monitoring (€ / year)
Construction	Physical	P_C_GW01a. An updated version of the Groundwater Management Plan is achieved and provides all information and operational details for the GW monitoring	40 000 €	
Construction	Physical	P_C_GW03b. access to raw water of suitable quality for livestock watering and local communities : The water access points for local communities are built.	170 000 €	
Construction	Social	S_C_SOC05a – Targeted identification and socio-economic assessment of potentially affected pastoralist users	40 000€	0 €

Phase	Component	Measure	Initial implementation (€)	Annual maintenance / monitoring (€ / year)
Construction	Social/ Biodiversity (Ecosystem es Services)	S_C_SOC05a / B_O_ES04i – Livelihood restoration planning and preparation of the LRP, based on verified livelihood impacts and consultation with affected pastoralists and artisanal salt workers	80 000€	
Construction	Social	S_O_SOC01c – Annual disclosure of taxes paid in line with EITI good practice guidelines		20 000 €
Construction	Social	S_C_SOC02a – Implement the Procurement Strategy	70 000 €	
Construction	Social	S_C_SOC06a – Implement the Influx Management Strategy – GBV Program	50 000 €	
Construction	Social	S_C_SOC06d – Support to F'Derik infrastructures and services to face increased pressure		100 000 €
Operation	Physical	P_O_GW01e. development and maintenance of photovoltaic panels dry cleaning method	180 000 €	25 000 €
Operation	Physical	P_O_AQU01/02c. Dust and gas emissions monitoring on sensitive receptors outside the mine facilities		30 000 €
Operation	Biological	B_O_EB01b, B_O_EB03d, and B_O_EB04a. Implement the Revegetation Plan - the Revegetation Plan requires updating to integrate learning from the pilot restoration program	100,000 €	
Operation	Social	S_O_SOC01c – Annual publishing of taxes paid, in line with EITI good practice guidelines		20 000€
Operation	Social	S_O_SOC02a – Implement Local Procurement Strategy for the Operation phase	20 000 €	
		TOTAL	**750 000 €**	**195 000 €**

14.4.2.2 Annual HSE management cost

The annual HSE management budget covers the remuneration of the HSE personnel who will lead, coordinate and supervise environmental, health and safety management during the operational phase. Their functions include governance of the HSE management system, coordination of the specific management plans, regulatory and lender compliance, contractor oversight, performance monitoring, incident follow-up, reporting and continuous improvement. Because this personnel cost supports the overall HSE management structure across all plans, it is accounted for separately from the activity-based implementation and audit budgets contained in the Specific Management Plans implementation.

The annual HSE management budget is estimated to 600 000€/year during the construction phase and 1 000 000€/year during the operation phase.

14.4.2.3 Independent Environmental and Social Monitoring

As part of the process for implementing and verifying the Project's EHS measures, an independent Environmental and Social (E&S) auditor appointed by the Project's financial institutions and/or the competent authorities conducts periodic reviews of compliance with the ESIA, ESMP, applicable specific management plans, the Environmental and Social Action Plan, national regulatory requirements and applicable lender standards. During construction, the monitoring is undertaken quarterly through four audits per year, comprising two desktop reviews based on Project documentation and monitoring records and two audits combining documentary review with site visits covering the mine, associated facilities and relevant Project-affected areas.

During operation, the monitoring frequency is reduced to semi-annual reviews, comprising two audits per year. For budgeting purposes, the operational programme is assumed to include one desktop review and one audit with a site visit each year, unless a different arrangement is agreed with the mandating institutions or competent authorities.

Each review assesses E&S performance, verifies the implementation and effectiveness of mitigation and monitoring measures, examines incidents, grievances, permits, monitoring data and previous corrective actions, and identifies non-compliance or emerging risks. Following each audit, the auditor issues a report to EMC and the mandating institutions and/or authorities presenting the audit scope, evidence reviewed, findings, compliance status, identified gaps, prioritized corrective actions, responsible parties and target completion dates.

The estimated annual budget is 190,000 € during construction, based on two desktop-review reports and two reports involving site visits. During operation, the estimated annual budget is 95,000 € based on one desktop-review report and one report involving a site visit. These amounts include audit preparation, document review, interviews, field verification, reporting and follow-up of findings.

Table 14-50: External E&S Monitoring cost estimates

Project phase / audit modality	Frequency	Unit cost	Annual cost
Construction: desktop review and report	2/year	40,000€	80,000€
Construction: document review, site visit and report	2/year	55,000€	110,000€
CONSTRUCTION TOTAL	**4 audits/year**		**190,000€**
Operation: desktop review and report	1/year	40,000€	40,000€
Operation: document review, site visit and report	1/year	55,000€	55,000€
OPERATION TOTAL	**2 audits/year**		**95,000€**

14.4.3 Synthesis of the cost Estimation

14.4.3.1 Methodology and Key Assumptions

To provide a coherent overview of the financial requirements by project phase, this summary has been structured around the three main development phases of the Project — construction, operation and closure — as well as the three key environmental and social components: physical, biological and social.

All costs related to the initial implementation of the specific plans ("Initial Management plan implementation") have been allocated to the construction phase, since these management tools must be available before the effective commencement of project activities.

With regard to recurring maintenance and monitoring costs (“Periodic Implementation”), only the following specific plans, for which implementation will be the responsibility of EMC, have been considered active from the construction phase onward:

- Groundwater and Surface Water Management Plan (GWSWMP),
- Emergency Preparedness and Response Plan (ERP),
- Stakeholder Engagement Plan (SEP),
- Community Development Plan (CDP),
- Cultural Heritage Management Plan (CHMP),
- Biodiversity Action Plan (BAP).

This implementation cost estimate adopts a conservative approach, as not all management plans are expected to be fully deployed from the outset of the construction phase.

It is considered that the other specific plans, particularly those relating to waste management, traffic management and hazardous materials management during the construction phase, should fall under the contractual requirements imposed on the EPC Contractor. Their implementation should therefore be integrated into the Contractor’s scope of work and be subject to specific requirements in the tender specifications prepared for the procurement process. Consequently, the costs associated with these measures are deemed to be included in the construction costs.

For the operation phase, it is assumed that all specific plans will be fully implemented by EMC and will include the monitoring, auditing and reporting activities defined under the Project’s environmental and social management system. This assumption also reflects a conservative approach to annual implementation costs, since the activities described in the specific management plans may not all remain applicable throughout the entire operation period.

Additional costs, identified as not being covered by the various specific management plans, have been assessed separately and then incorporated into the analysis in order to establish a consolidated estimate of the ESMP financial requirements. The results systematically distinguish one-off development costs from annual implementation and monitoring costs, in order to provide a clearer view of the financial commitments required throughout the Project life cycle.

14.4.3.2 Cost analysis by phase and component

Construction

During construction, the **initial implementation of all specific management plans** is estimated at **€932,000**, plus **€450,000** in additional development costs identified in **Table 14-49**. These additional costs mainly relate to updating the GWSWMP, developing raw water access points, preparing the LRP, the development of photovoltaic panels dry cleaning method and the implementation of the Revegetation Plan. Annual maintenance and monitoring costs during construction cover the implementation of six initial plans (GWSWMP, ERP, SEP, CDP, BAP and CHMP), together with an additional 120,000€/year mainly intended to support F’Dérik infrastructure and services in response to increased pressure. Annual HSE management (600,000€/year) and E&S external monitoring (190,000€/year) are also to be included into the E&S costs for the construction phase. The **total annual maintenance and monitoring cost during construction is estimated at €3,755,000/year**.

Table 14-51: Costs of implementing specific management plans and E&S mitigation measures (initial implementation)

Specific Management Plan	Total cost
Groundwater and Surface Water Management Plan (GWSWMP)	130 000 €
Hazardous Material Management Plan (HAZMAT)	70 000 €
Traffic Management Plan (TMP)	45 000 €
Emergency Preparedness and Response Plan (ERP)	65 000 €
Energy Management Plan (EnMP)	90 000 €
Non-mineral Waste Management Plan (NMWMP)	80 000 €
Biodiversity Action Plan (BAP)	127 000 €
Cultural Heritage Management Plan (CHMP)	55 000 €
Stakeholder Engagement Plan (SEP)	60 000 €
Occupational Health and Safety Management Plan (OHSMP)	90 000 €
Community Health, Safety and Security Management Plan (CHSSMP)	55 000 €
Community Development Plan (CDP)	65 000 €
Additional costs for the implementation of mitigation measures that are not included in the specific Management Plans (see table 14-49)	
Total of additional measure out of the Specific Management Plans	450 000 €
TOTAL	**1 382 000 €**

Table 14-52: Costs of implementing specific management plans (annual implementation) during pre-construction and construction phase

Specific Management Plan	Total cost (per year)
Groundwater and Surface Water Management Plan (GWSWMP)	130 000 €
Emergency Preparedness and Response Plan (ERP)	130 000 €
Biodiversity Action Plan (BAP)	93 000 €
Cultural Heritage Management Plan (CHMP)	200 000 €
Stakeholder Engagement Plan (SEP)	290 000 €
Community Development Plan (CDP)	620 000 €
Other additional E&S costs	
Total of additional measure out of the Specific Management Plans	120 000 €
EHS management	600 000 €
E&S external monitoring	190 000 €
TOTAL	**2 373 000 €**

Operation

During operation, an additional Biodiversity Action Plan will be prepared to verify solar panel reflectance and implement an acoustic bird deterrent system, at an estimated cost of €12,000. All other plans are assumed to have been developed during construction. Additional costs identified in **Table 14-49** include implementation of the revegetation plan (€100,000) and other one-off measures related to development of photovoltaic panels dry cleaning method (180,000€) and implementation of Local Procurement Strategy for the Operation phase (20,000€). The **total initial cost for complementary measures during operation is therefore estimated at €312,000**. Annual implementation of all specific management plans is estimated at 2,597,000€/year. Further annual costs of 75,000€/year are associated with dry cleaning of photovoltaic panels and dust/gas emissions monitoring. Annual HSE management (1,000,000€/year) and E&S external monitoring (95,000€/year) are also to be included into the E&S costs for the operation phase. The **total average annual maintenance and monitoring cost during operation is estimated at 3,767,000€/year**.

Table 14-53: Costs of implementing specific management plans and E&S mitigation measures (annual implementation) during the operation phase

Specific Management Plan	Total cost (per year)
Groundwater and Surface Water Management Plan (GWSWMP)	195 000 €
Hazardous Material Management Plan (HAZMAT)	140 000 €
Traffic Management Plan (TMP)	105 000 €
Emergency Preparedness and Response Plan (ERP)	130 000 €
Energy Management Plan (EnMP)	90 000 €
Non-mineral Waste Management Plan (NMWMP)	200 000 €
Biodiversity Action Plan (BAP)	218 000 €
Cultural Heritage Management Plan (CHMP)	44 000 €
Stakeholder Engagement Plan (SEP)	290 000 €
Occupational Health and Safety Management Plan (OHSMP)	310 000 €
Community Health, Safety and Security Management Plan (CHSSMP)	255 000 €
Community Development Plan (CDP)	620 000 €
Additional costs for the annual implementation of mitigation measures that are not included in the specific Management Plans (see table 14-49)	
Total of additional measure out of the Specific Management Plans	75 000 €
EHS management	1 000 000 €
E&S external monitoring	95 000 €
TOTAL	**3 767 000 €**

Closure

At this stage, the Closure Management Plan cost estimate remains conceptual. The conceptual Mine Closure Plan provides an initial estimate of **€65,000 for** initial development **and €135,000/year for periodic implementation** through to the end of the post-closure phase. This estimate covers only ESMP-level closure and post-closure management, monitoring and reporting activities. It excludes major demolition, rehabilitation,

geotechnical stabilisation and closure financial assurance costs, which should be quantified separately in the Detailed Mine Closure Plan. Annual HSE management (1,000,000€/year) is also to be included into the E&S costs for the closure phase.

Table 14-54:Cost synthesis by phase and component (initial implementation)

Phase	Component	Specific Management Plan Initial implementation (€)	Additional initial implementation (€)	**TOTAL cost initial implementation**
Construction	Physical	480 000 €	210 000 €	**1 262 000€**
Construction	Biological	127 000 €		
Construction	Social	325 000 €	120 000 €	
Construction TOTAL		932 000 €	330 000 €	
Operation	Physical		180 000 €	**292 000€**
Operation	Biological	12 000 €	100 000 €	
Operation	Social			
Operation TOTAL		12 000 €	280 000 €	
Closure TOTAL		65 000 €		**65 000€**

Table 14-55:Cost synthesis by phase and component (annual implementation)

Phase	Component	Periodic Implementation of Specific Management Plans (€/year)	Additional maintenance / monitoring (€/year)	EHS management (per year)	E&S external monitoring (per year)	TOTAL cost annual implementation
Construction	Physical	260 000 €		600 000 €	190 000 €	**2 373 000 €**
Construction	Biological	93 000 €				
Construction	Social	1 110 000 €	120 000 €			
Construction TOTAL		1 463 000 €	120 000 €			
Operation	Physical	860 000 €	55 000 €	1 000 000 €	95 000 €	**3 767 000 €**

Phase	Component	Periodic Implementation of Specific Management Plans (€/year)	Additional maintenance / monitoring (€/year)	EHS management (per year)	E&S external monitoring (per year)	TOTAL cost annual implementation
Operation	Biological	218 000 €				
Operation	Social	1 519 000 €	20 000 €			
Operation TOTAL		2 597 000 €	75 000 €			
Closure TOTAL		135 000 €		1 000 000 €		**1 135 000€**

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