



Tasiast Mauritania Limited SA Tasiast Gold Mine Expansion Project

Phase 1a(i): Access Road Upgrade: Access road, Borrow Pits, Temporary Mobile Crusher, Borefield Expansion, and Water Supply Pipeline

Environmental Impact Notice

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Prepared for



Tasiast

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The methodology adopted and the sources of information used by URS Scott Wilson in providing its services are outlined in this Report. The work described in this Report was undertaken between **December 2010** and **March 2011** and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

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List of Abbreviations

Abbreviation	Definition
CIL	Carbon-in-Leach
CNRE	Centre National des Ressources en Eau
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EIN	Environmental Impact Notice
EMS	Environmental Management System
GDP	Gross Domestic Product
HFO	Heavy Fuel Oil
IFC	International Finance Corporation
IMRS	Institut Mauritanien de Recherches Scientifiques
IUCN	International Union for Conservation of Nature
MLA	Mining License Area
MESD	Delegated Ministry of Environment and Sustainable Development (Ministère Délégué auprès du Premier Ministre chargé de l'Environnement et du Développement Durable)
MPEM	Ministry of Petroleum, Energy and Mines (Ministère de Petr oléum, Énergie Mines et des Mines)
MWS	Ministry of Water and Sanitation (Ministère de l'Hydraulique et de l'Assainissement)
PNBA	Parc National du Banc D'Arguin
RO	Reverse Osmosis
Tpd	Tonnes per day
ToR	Terms of Reference
TMLSA	Tasiast Mauritanie Limited SA
TSF	Tailings Storage Facility
UNESCO	United Nations Educational, Scientific and Cultural Organization

1 Introduction

Background

The Tasiast Gold Mine (the Mine) is an existing gold mine, situated in the Inchiri Wilaya of north western Mauritania. Operations at the Mine commenced in July 2007, initially under the ownership of Rio Narcea Gold Mines and subsequently, following acquisition, under Red Back Mining Inc. On commissioning, the Mine had a predicted life of ten years, at a nominal milling rate of 3,200 tpd. Tasiast Mauritanie Limited SA (TMLSA) is the operator of the Mine.

Kinross Gold Corporation (Kinross) completed the acquisition of the Mine on September 17, 2010, as part of its combination with Red Back Mining Inc.

The Mine currently operates at a nominal milling rate of 9,000 tpd and is undertaking expansion and development activities as permitted under previous assessments (SNC Lavalin 2004, Scott Wilson, 2008a, b, c, d and 2009a, b, 2010a). However, as a result of identifying additional gold resources through ongoing exploration within the mining licence area (MLA), Tasiast Mauritanie Limited SA (TMLSA) plans to expand the Mine's operations through an Expansion Project (the Project). Refer to Figure 1 for site location.

1.2 The Project

TMLSA has completed a mine scoping study for the Project. The Project is based on a 16 year mine plan (following a three year construction period) and there is potential to further extend the mine life. Construction of the proposed infrastructure and ancillary facilities will be phased over this three year period. During this time current mining operations will continue, and the Project is expected to be fully commissioned by early 2014.

The Project proposes to expand operations at the Mine to a nominal milling rate of approximately 70,000 tpd to 80,000 tpd. To achieve this, there will be an expanded open pit, a new mill, new Carbon-in-Leach (CIL) process plant, new Tailings Storage Facility (TSF) (comprising three cells) and new waste rock dumps.

Project power demands, for both construction and operations, will be supplied through additional new power plants and a new fuel farm. An initial new power plant will be installed followed by a second, larger power plant. Existing diesel power facilities at the borefield and intermediate pump station will be expanded. In addition, a separate power plant will be developed to supply power for the proposed sea water extraction and supply system.

Increased water demands will be required for both the Projects construction and expanded operations. It is proposed that the increased water demand for construction will be met through the temporary (approximately four years) expansion of the existing borefield. To support this temporary expansion it is proposed that additional wells are developed within and adjacent to the existing borefield and a new water supply pipeline be constructed. To meet the Projects operational water demands it is proposed that a sea water extraction and supply system is developed. In addition new water treatment facilities and water storage ponds will be developed on the existing Mine site.

To improve accessibility to the Mine, it is proposed to both upgrade the existing 60 km access road and to develop a new airstrip. There will also be development of new ancillary facilities such as, but not limited to, maintenance workshops, sewage and waste management facilities, new accommodation camps, new offices and new warehouse facilities.

Kinross has commissioned URS/Scott Wilson to undertake the Environmental Impact Assessment (EIA) requirements for the Project.

1.3 Approach to Permitting

In order to achieve Project commissioning by early 2014, it is necessary to phase the construction works and commence some early preparatory works in 2011. The overall Project has therefore been divided into three phases, based on the type of works to be carried out (components), construction timing, geographical location, permitting and EIA requirements. Each phase will be subject to EIA processes and any cumulative impacts will be assessed and mitigation actions will be incorporated into and implemented via the Mine's existing Environmental Management System (EMS) (Scott Wilson, 2010b).

A series of meetings with the Ministry of Petroleum, Energy and Mines (MPEM), the Ministry of Environment and Sustainable Development (MESD) and the Ministry of Water and Sanitation (MWS) have been held to present and discuss the proposed Project phasing. An initial meeting was held on 13 January 2011 and a subsequent meeting was held on 17 March 2011. On 24 March 2011, a meeting was held with Government where it was agreed to present the Phase 1a Environmental Impact Notice (EIN) as two assessments, namely Phase 1a(i) EIN and 1a(ii) EIN.

The Project has been divided into two distinct areas (Figure 1):

- **On-site:** within the Mine, which comprises the areas of the Mine site, access road and borefield. Existing operations are on-going in this area and the area has generally experienced a degree of disturbance. As part of permit requirements for the Mine operations, this area has previously been subject to several EIAs (SNC Lavalin 2004, Scott Wilson, 2008a, b, c, d and 2009a, b, 2010a); and
- **Off-site:** areas outside of the Mine. These areas may or may not be disturbed and have not previously been subject to EIA for Mine related operations.

Of the three Project Phases, 1 (ai, aii and b) and 2 are located on-site, whilst Phase 3 is located off-site.

Phase 1a(i) components are classified as Category B developments, in line with Mauritanian Decrees No. 2004-094 and No. 2007-105, and are subject to an EIN. This EIN will assess the significance of potential impacts resulting from the components of Phase 1a(i) and is relevant to Phase 1a(i) EIN only.

1.4 Reporting

This EIN has been prepared in accordance with the requirements of Mauritanian Legislation, in particular, the Environment Code No. 2000-045 and Decrees No. 2004-094 and No. 2007-105. It will comprise two reports, namely:

- **Terms of Reference (ToR) Report:** The ToR Report provides an overview of the proposed Phase 1a(i), the environmental and social issues and the terms of reference for the detailed studies and approach for the EIN; and
- **EIN Report:** The EIN Report will document the assessment process in accordance with the approach set out in the ToR Report.

The ToR was produced by URS/Scott Wilson, submitted to the Government of Mauritania and subsequently approved in May 2011 (Appendix 1). This document presents the EIN Report for the Phase 1a(i) of the Project.

In addition to Mauritanian legislation, the EIN is also being undertaken to the World Bank Group's International Finance Corporation (IFC) Performance Standards, it's supporting applicable IFC Environment Health and Safety (EHS) Guidelines and other general international industry best practice.

1.5 Report Structure

The EIN for Phase 1a(i) is structured as follows in line with Mauritanian legislation:

- **Section 1: Introduction;** Background and Report Structure.
- **Section 2: Legislative Framework;** a summary of Mauritanian legislation and international best practice relating to the EIN.
- **Section 3: The Project – Phase 1a(i);** an outline of existing operations and the proposed Phase 1a(i) components.
- **Section 4: Baseline Conditions;** an outline of the environmental and social baseline conditions.
- **Section 5: Impact Assessment;** overall methodology and impact assessment.
- **Section 6: Analysis of Alternatives;** a summary of the alternatives considered.
- **Section 7: Consultation;** a summary of the consultation process.
- **Section 8: Timeline;** a summary program of key activities.
- **Section 9: References;** a list of all documents used as reference material.

2 Legislation

This Section presents an overview of the national administration and legal framework and international best practice relevant to Phase 1a(i) of the Project as of April 2011.

2.1 National

2.1.1 National Regulatory Authorities

The key Authorities relevant to Phase 1a(i) are as follows.

- **Ministry of Petroleum, Energy and Mines (MPEM):** responsible for regulating the mineral industry in Mauritania. Functions include preparation and implementation of mining policy and regulation, promotion of exploration and development of geological studies and maps.
- **Ministry of Environment and Sustainable Development (MESD):** responsible for ensuring the inclusion of sustainable development in public policies and in the management of natural resources and industry.
- **Ministry of Water and Sanitation (MWS):** responsible for the protection and integrated management of water resources, and the coordination of all activities involving the abstraction, distribution and use of water including the treatment and discharge of effluents. The National Centre of Water Resources (the Centre National des Ressources en Eau or CNRE); a department of the MWS, is responsible for authorising and monitoring abstraction from the Mine's borefield.

2.1.2 National Legislative Framework

The Mauritanian legal hierarchy comprises the constitution, international treaties and agreements, primary legislation, decrees and orders (arrêtes). The legal framework in Mauritania is made up of legislative and regulatory instruments:

- Legislative instruments: comprising laws; and
- Regulatory instruments: composed of decrees, orders and rules.

A law is generally a framework of intervention within a specific sector. To be applied, each law needs regulatory instruments called implementation decrees. Ministries who have prepared the concerned law prepare decrees, which are then signed by the President.

A summary of the key Mauritanian environmental and social legislation and guidelines relating to the EIN for Phase 1a(i) is presented in Table 2.1 below.

Table 2.1: Summary of Relevant Mauritanian Legislation and Guidelines

Legislation	Summary
Mining	
The Mining Code Law No. 2008-011 (27 April 2008)	The Code is restricted to provision of: <ul style="list-style-type: none"> • Legal and property rights framework for mining; • Measures for protection of property, services, etc; • Safe and efficient working practices; and • Taxes and royalties.
Decree No. 2004-054 (6 July 2004) providing for application of the Law for the Mining Code	Provisions relating to environmental issues in mining activities are determined by this decree.
Environment	
Environment Code No. 2000-045 (26 July 2000)	Provides legislation relating to: <ul style="list-style-type: none"> • Protection of natural resources; • Protection of environmental conditions; and • Protection of sites of cultural and national interest.
Decree No. 2004-094 relating to Environmental Impact Assessment (24 November 2004)	Defines the legal regime covering EIA, as provided for in Articles 14 to 20 of Law No. 2000-045 of 26 July 2000 (Environment Code)
Decree No. 2007-105 modifying and supplementing certain provisions of Decree No. 2004-094 (13 April 2007)	Modifications of Certain provisions of Decree No. 2004-094 of 24 November 2004 relating to EIA including; project categorisation, content; and timeline for Approval.
Protection of Vegetation Law No. 2000-042 (26 July 2000)	Outlines the legislation for the protection of natural resources and the import and export of vegetation.
Law No. 2000-024 concerning the PNBA	Outlines rules concerning management and conservation of the PNBA.
Hunting Code No. 1997-006 (20 January 1997)	Allows for the management of zones by individuals or organisations in the interests of hunting and provides a list of faunal species that are protected.
Water	
The Water Code No. 2005-030 (2 February 2005)	Defines the legal regime for continental surface and groundwater (excluding seawater).
Decree No. 2007-047 regarding the creation of strategic water resource zones	Allows for the creation of Strategic water resource zones. These zones provide rules on how surface and sub-surface waters can be managed.
Social	
Law No. 2004-017 concerning the Labour Code (6 July 2004)	Defines the rights of employers and employees, including provisions for occupational health and safety.
Cultural Heritage	
Framework Law No. 2005-046 on the Protection of Tangible Cultural Heritage (25 July 2005)	This law defines and classifies tangible cultural heritage, its protection, and the sanctions for contravention of the law.

2.2 International

Where appropriate for the EIN, due reference is to be made to international standards in order to establish a regulatory framework for the Project which is in line with national and international requirements.

TMLSA is applying the IFC Performance Standards and applicable EHS Guidelines to the Project's impact assessment and mitigation process. The IFC is part of the World Bank Group and its standards and guidelines define both a robust approach to managing risks and impacts, and determine good international industry practice for significant project components. Where appropriate, due reference shall be made to those IFC standards and EHS Guidelines¹ that are relevant to the Project.

In line the World Banks Operational Policy 4.01 on Environmental Assessment, international environmental and social development agreements to which Mauritania is a party, and human rights conventions to which Mauritania is a signatory, have also been taken into consideration.

¹ The IFC Performance Standards and associated guidance are available in English, French and Arabic and can be freely downloaded from <http://www.ifc.org/ifcext/sustainability.nsf/Content/PerformanceStandards>. In addition, the IFC EHS Guidelines can be freely downloaded at <http://www.ifc.org/ifcext/sustainability.nsf/Content/EHSGuidelines>.

3 The Project – Phase 1a(i)

This Section presents an overview of the operations at the existing Mine and a detailed description of the Phase 1a(i) Project components.

The terminology used to describe and assess the Project components are summarised in Table 3.1.

Table 3.1: Terminology for the Project

Terminology	Components
Access Road	60 km existing two-lane unsealed road, which connects the main Nouakchott–Nouâdhibou road to the Mine.
Borefield	The borefield, located 60 km to the west of the Mine, includes 28 abstraction and 8 observation boreholes and is connected to the Mine site via two pipelines which supply the Mine’s operational and potable water requirements.
Mine site	The area where all mining and processing operations take place together with the associated infrastructure such as equipment, maintenance workshops, power supply, office buildings, and other supporting facilities such as, but not limited to, accommodation facilities and the air strip.
Mine	The Mine site, access road and borefield.
Access road and water pipeline corridor	The area of the existing access road and adjacent water pipeline.
On-site	Within the Mine (which comprises the areas of the Mine site, access road and borefield).
Off-site	Outside of the Mine.
Project	Expansion of the Mine’s operations, including both on-site and off-site infrastructure.

3.1 Project Location

Mauritania is situated in north west Africa and is bordered by Western Sahara and Algeria to the north, Mali to the east, Senegal to the south and Atlantic Ocean to the west.

The Mine is located in the Inchiri wilaya of north western Mauritania, approximately 300 km north of Nouakchott, 250 km south east of Nouâdhibou and 65 km east of the border of the Parc National du Banc d’Arguin (PNBA) (see Figure 1).

The Mine site is accessed from the main Nouakchott–Nouâdhibou N2 highway by a 60 km two-lane unsealed access road.

3.2 Existing Mine Operations

The Mine comprises three overall areas; the operational Mine site (see photographs 3-1 to 3-7), the borefield for water supply (see photographs 3-8 and 3-9) and the access road (see photograph 3-10). These are briefly outlined below.

3.2.1 Mine Site

Currently the Mine covers an area of approximately 700 ha and the perimeter of the Mine site is being fenced for safety and security risks. The Mine site comprises a series of open pits, two TSFs (TSF 1 is being decommissioned and TSF 2 is operational), dump leach facilities, a CIL process plant, waste rock dumps and several supporting ancillary facilities. These facilities include a power plant fuelled by HFO, workshops, laboratory, offices and a light aircraft air strip. Employees are accommodated on-site in an accommodation camp.

Two conventional process streams are currently utilised for gold extraction. High grade ore is crushed and treated in the CIL plant while low grade ore is treated using the dump leach facilities. Currently the Mine operates at nominal milling rate of up to approximately 9,000 tpd.

The existing site layout is shown on Figure 2.

3.2.2 Mine Access

The Mine site is accessed from the main Nouakchott – Nouâdhibou road by a 60 km two-lane unsealed access road as shown on Figure 1.

An airstrip is located at the Mine site and used for the transport of gold doré.

3.2.3 Water Supply

The current water requirements for operations are approximately 14,000 m³ per day. This is supplied to the Mine site via two pipelines which follow the access road, from the borefield located 60 km west of the Mine site. Water is treated by a reverse osmosis (RO) water treatment plant at the Mine site for higher quality process and construction requirements as well as domestic use. Additional supplies of bottled water are brought from Bennichab as necessary. The saline waste product from the treatment plant is either used as a dust suppressant on roads within the Mine site or disposed of in the TSFs.

3.3 Project Components - Phase 1a(i)

Phase 1a(i) involves the upgrade of the access road, water supply facilities, and communications which will support the expansion of the Mine. In summary these comprise:

- Access road upgrade;
- New borrow pits;
- Mobile crusher;
- Incremental increase in borefield water extraction; and
- New water supply pipeline and pump station.

See Figure 3 for the location of the components.

3.3.1 Access Road Upgrade

The Mine site is currently accessed via a two lane 60 km unsealed access road which extends from the Nouakchott – Nouâdhibou N2 highway (see photograph 3-10). The unsealed access road, which has been damaged by recent flooding, will be upgraded to a hard surfaced access road.

The hard surfaced access road will predominantly follow the footprint of the existing unsealed access road and has been designed for a 20 year life. There are two sections of the road that have been obliterated by recent flood events, and in these areas the alignment will need to be slightly altered. The hard surfaced access road will provide two traffic lanes (as the current road), traffic passing points and exits to the; radio tower, water pump station, contractors camp and assorted facilities.

Construction improvements will require additional water from the borefield (see Section 3.3.2.1), aggregates that will be sourced from waste rock and borrow pits (see Section 3.3.1.1) and crushed by a mobile crusher (see Section 3.3.1.2).

The two lane hard surfaced road will be approximately 60 km in length, 10 m wide, and crossing of wadis will be achieved by means of widening the road at these points. The base of the access road will initially be upgraded (composing of a sub-base and base of course aggregate). It will be treated with a dust suppressant during the Project construction period. Following Project construction, the road will be hard surfaced with asphalt.

A fibre optic cable, to improve the Mine sites communication systems, will be buried and/or suspended in areas along the access road shoulder (see Section 3.3.1.3 for details).

3.3.1.1 Construction Materials (Borrow Pits)

Approximately 250,000 m³ of aggregate will be required for upgrade of the access road. Wherever practical, waste rock from the existing mining operations will be used as a source for this aggregate. This will be supplemented with aggregate from new borrow pits.

The new borrow pits will be located either within, or adjacent to, the existing access road and water pipeline corridor footprint and within the Mine site. Borrow pits will be constructed with standard excavating equipment and developed to suit the local terrain and topography.

3.3.1.2 Mobile Crusher

A temporary mobile crusher will be utilised to produce coarse aggregates sourced from waste rock or the proposed new borrow pits (Section 3.3.1.1), for concrete and road base construction.

The mobile crusher will be pre-assembled and delivered to the Mine site and a temporary earthen pad will be built for the crusher, which will have a footprint of approximately 200 m². The temporary mobile crusher will be located at the Mine site or along the access road adjacent to the new borrow pits.

3.3.1.3 Data Communications and Telecommunications Line

A fibre optic cable will be installed to provide the Mine site with improved data communications and telecommunications. This line will be buried or hung alongside the upgraded access road and will be installed in conjunction with the upgrade of the existing access road (Section 3.3.1).

Prior to the fibre optic cable being laid, interim instalments are being considered to provide improved communication to the Mine site. These include:

- A microwave network system may be used to connect the Mine site into Mauritel's existing infrastructure at the highway. This interim instalment will facilitate enhanced communications prior to the access road being built. The infrastructure will be powered by battery, solar and wind; or

- The bandwidth on the existing Satellite communication system may be increased from its current 3Mbps to larger capacities to enhance communication at the early stages of the project.

3.3.2 Water Supply Improvements

3.3.2.1 Borefield

In order to provide water for the construction of the access road upgrade and other short term construction activities, it is proposed to temporarily increase the water supply from the existing borefield. The existing borefield is currently licensed for 14,000 m³ per day and it is proposed to incrementally increase the licence to approximately 17,000 m³ to cover expected demand for these construction activities.

To facilitate the incremental increase from the borefield it is proposed that approximately 17 additional water supply wells are constructed within and to the south of the existing borefield. Ten of these wells will be utilised as water supply wells and the remaining seven water supply wells will be used for back up water supply purposes when other water supply wells require maintenance, rehabilitation, or replacement. In addition to the water supply wells, observation boreholes and necessary portable power supply will be constructed (see Figure 6).

The boreholes will be drilled approximately 500 to 600 m apart from each other and the boreholes will extend to a depth of approximately 100 m beyond the gravel aquifer. Equipment, piping, and electrical instalments will also be installed as required.

3.3.2.2 Water Supply Pipeline and Pump Station

To support the temporary increase in water demand for the access road upgrade and other short term construction activities, it is proposed to construct a new water supply pipeline, adjacent to the existing pipelines, from the borefield to the Mine site. The proposed water supply system will include a water pumping and delivery system.

The water delivery system will comprise one new approximate 500 mm pipeline, constructed of high density polyethylene or other suitable materials. The new pipeline will run parallel to the access road. Once the new pipeline is operational, the existing 400 mm pipeline will be taken out of service for repairs and its future operation will be dependent upon future authorisations.

Approximately half way (30 km from the starting point); a booster pumping station will be installed. The pumping station will be powered by a diesel engine with approximate capacity of 1.5 MW. The pumping station will be self contained and check valves will be installed to ensure the system remains ready at all times.

Construction activities will be performed inside the footprint of the access road and water pipeline corridor as described in the EIN. Techniques will be determined according to specific conditions, but it is anticipated road crossings will be by open cut, and minimal boring or trenchless solutions are envisaged for wadi crossings.

4 Baseline Conditions

This Section presents the environmental and social baseline conditions, i.e. the prevailing conditions, against which potential Phase 1a(i) Project component impacts have been assessed. The establishment of the baseline conditions also allows identification of potentially sensitive receptors (e.g. ecosystems, local communities) and an evaluation of their level of sensitivity.

4.1 Methodology

Baseline conditions have been identified through our knowledge of the area, review of existing data, and undertaking Project specific surveys, where appropriate. Baseline conditions are dominated by the current mining operations as this is the area within which all the proposed components for Phase 1a(i) are located. Baseline conditions are presented on a discipline basis in Sections 4.3 to 4.12.

4.2 Background

The Mine is remotely situated in the Inchiri Wilaya of north western Mauritania. The nearest industries are at Boulanouar, Akjoujt (Guelb Moghrein Copper/Gold Mine) and Bennichab (water bottling), which are 120 km north west, 150 km east south east and 130 km south east respectively (see Figure 1).

The area is of a dry, arid climate dominated by north east trade winds with a low average annual rainfall (approximately 84 mm per annum) (URS/Scott Wilson 2011a). There are no permanent watercourses in the vicinity of the Mine, however, the area is crossed by numerous wadi systems that only flow for a few days per year following heavy rainfall.

Within the vicinity of the Mine a number of isolated families have set up temporary structures. Similarly, approximately 1 km east of the borefield, a few families have set up temporary structures and market stalls at the junction of the Mine access road and the main Nouakchott-Nouâdhibou N2 highway.

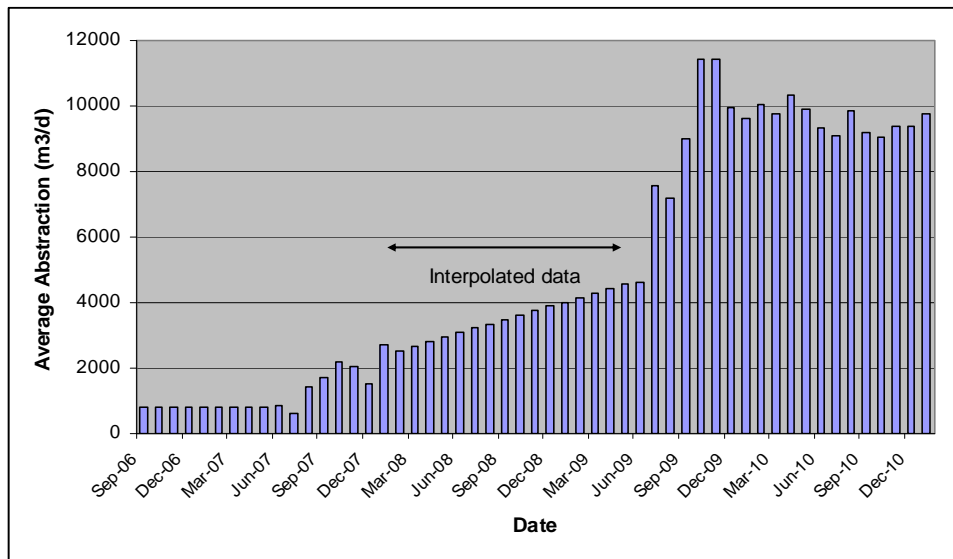
4.3 Groundwater Hydrology

The borefield is underlain by the Precambrian basement rocks at a depth of around 100m, increasing in depth towards the coast. The boreholes draw water from the overlying Continental Terminal aquifer as indicated in Figure 4. This aquifer is formed of sedimentary deposits of variable permeability. The main aquifer zone is at a depth of around 90 m, where transmissivity has been found to be as high as 1400 m²/d. and borehole yields are good at around 500 m³/d. Groundwater levels range between depths of 45 to 50 metres below ground level at the borefield.

There appears to be little infiltration of rain to replenish groundwater, with monitoring boreholes at the borefield showing no measurable response to storm events. The quality of groundwater at the borefield is highly saline, indicative of fossil water and low rainfall recharge. Recharge of groundwater is therefore assumed to be negligible and abstraction taken from storage.

The borefield storage was estimated as 570 Mm³ (PHY, 2003, 2004) based on an available aquifer area of 380 km², aquifer thickness 10 m and storage 15 %.

The borefield has been in use since 2006 and is permitted for an abstraction of 14,000 m³/d under Permit No. 408. Abstraction since 2006 is illustrated in the following graph. Recent abstraction has been at a rate of around 10,000 m³/d.



From 2006 to January 2011, 8 Mm³ or approximately 1.5 % of the estimated aquifer volume of 570 Mm³ had been abstracted. Drawdown's are monitored and can be used to assess the extent of the radius of influence of the borefield.

Potentially sensitive receptors are the fresh water borefields at Bennichab and Boulanouar, approximately 100 km to the south and north respectively. Water quality at the Mine borefield and these borefields is shown by the contours on Figure 5 which illustrate the saline to highly brackish groundwater at the borefield compared to the fresh water at Boulanouar and Bennichab. The Bennichab resource is of sufficiently high quality to be bottled and used as a source of drinking water. The boundary of the PNBA lies approximately 5 km to the west of the borefield. The ecology and habitats of the PNBA are not dependent on groundwater.

4.4 Surface Water Hydrology

Average annual precipitation at the Mine site is around 84mm. The rainfall intensity varies spatially and temporally, for example, 50% of the annual rainfall for any given location can fall within a few hours. Recently, two high rainfall events have occurred in the area in September 2010 and October 2010 these events have generated exceptional floods in the region.

The potential evaporation rate for the Mine is estimated from historical records at ATAR station, located approximately 265 km to the east where average recorded monthly evaporation is approximately 320 mm/month (3840 mm per year). Peak evaporation losses of above 400 mm/month occur in the summer period between April and August. Lower evaporation, below 200 mm/month, is recorded during the winter period between November and February. (Scott Wilson 2011a)

The high rate of evaporation and low rainfall means that there are no permanent watercourses but storms can produce ephemeral floods in wadis and across open ground.

4.5 Air Quality

Sensitive receptors to adverse air quality at the Mine are the Mine employees and nomadic people within the vicinity of the Mine. The nature and scale of works associated with Phase 1a(i) do not have the potential to significantly affect ecological receptors and have not been

considered in this assessment. Due to the remoteness of the Mine's location, air quality at the Mine is not affected by other industries which are at least 100 km distant.

Baseline levels of exposure of these receptors to airborne pollutants, at the Mine are determined by the combined contributions from both background sources of airborne pollutants and emissions from activities already undertaken at the Mine. Unconsolidated sand and dust particles may be re-suspended locally by both mining activities and by natural processes.

Atmospheric concentrations of both coarse dust particles and respirable particles (PM₁₀) are high as a result of the desert conditions (SNC Lavalin, 2004), particularly during windy periods. Due to the nature of the terrain e.g. loose and semi-consolidated sediments with sparse vegetation and windy conditions, it is common for sand storms and dust storms to occur. These storms are natural phenomena, which can be prolonged and cover vast areas.

Data on the existing operations were unavailable at the time of the preparation of this report, but a sampling programme has been initiated. Therefore these existing sources of air quality pollutants are not quantified, but are discussed in Section 5.4 together with mitigation measures currently applied.

Respirable particles and larger particles are also generated from the existing operations at the Mine site (vehicle movements, on the currently un-surfaced access road, un-surfaced haul roads, etc). These are subject to controls as required by the Environmental Management System (EMS) for the Mine (Scott Wilson 2010b).

Current sources of emissions of oxides of nitrogen, sulphur dioxide, carbon monoxide and carbon dioxide at the Mine include exhaust emissions from portable power plant, the 19 MW power plant, mobile plant, road vehicles and airstrip operations (weekly light aircraft). Potential sources of odour exist at facilities for the management of waste and waste water.

The existing dump leach facility and process plant are also a potential source of emissions of cyanide gas. These facilities and emissions are subject to stringent controls to meet specific guidelines, protect the health of mine workers and the wider environment.

4.6 Noise and Vibration

As with Air Quality, the sensitive receptors closest to the Mine are the employees located at the Mine site itself. Further sensitive receptors are nomadic/semi-nomadic communities, located within the vicinity of the Mine.

Due to the Mine's remote location noise levels are restricted to it's own operations. Similarly the borefield is remotely located with the nearest noise being from the periodic traffic on the Nouakchott–Nouâdhibou N2 highway, approximately 1 km away.

4.7 Soil and Land Use

The area is generally flat, and is affected by sand dune movements. Hence most of the area is covered by skeletal soils, generally comprised of hard rock overlain with sand. The soils of the Mine are predominantly sand and gravel, which are dry, extremely fragile, generally degraded, unproductive and easily eroded.

Representative soil sampling has been undertaken at the Mine site (Scott Wilson, 2010b). Soils were analysed for a range of geochemical parameters, in particular those elements typically associated with gold mining activities. There is no evidence of soil contamination resulting from the mining operations.

The remote location of the Mine has resulted in there being no permanent land uses in the area other than the existing Mine itself. A relatively small number of nomadic/semi-nomadic communities are located in the vicinity of the Mine and utilise the surrounding area for periodic grazing of livestock.

The Mine area offers very limited potential for residential, tourist, recreational development or agriculture.

4.8 Ecology

4.8.1 Habitats, Vegetation and Flora

The Mine is located within the Saharan zone, which occupies up to three-quarters of Mauritania. Climatic and geomorphological conditions are the primary determinants of the Saharan flora and fauna, although other factors such as, overgrazing and anthropogenic pressures contribute.

The typical habitat present is gravelly regs². Baseline surveys undertaken in February 2011 confirmed previous studies, that vegetation cover was typically low and not uniformly distributed. The plant assemblage associated with the regs habitat is dominated by groups of *Fagonia*, *Farsetia*, *Heliotropium*, *Seetzenia*, *Corchorus* and *Aristida*.

None of the plant species identified are considered to be rare or threatened and none have been designated by local, national or international (IUCN) standards for their nature conservation value. However, within the area, the trees *Acacia ehrenbergiana*, *Maerua crassifolia* and *Capparis decidua* are nationally protected.

4.8.1.1 Water Pipeline & Access Road Corridor

The vegetation around the existing access road appears to be impacted by vehicle movements and associated dust and sand cover up to approximately 10 m either side of the existing road in some areas. Tree cover was very low throughout the 60 km stretch of existing access road. The corridor south of the Nouakchott – Nouadhibou road also exhibits disturbance resulting from the water pipe upgrade and extends from the new pumping station to the mine site.

The plant communities along the corridor are largely species poor and *Fagonia* spp. dominated over stony 'reg' type formation, with more local areas of sandy substrate vegetated by species such as *Panicum* and *Aristida*.

4.8.1.2 Existing Borefield

The borefield exhibits damage from drilling activities and associated vehicle access. The plant communities are sparse and dominated by *Fagonia* spp with a range of other attendant herbaceous species. There are some wadis and these support a more varied flora including *Panicum turgidum*, *Cupressus compactum*, *Aerva javanica*, *Aristida* spp., and *Astragalus vogelii*. Tree cover is generally low and includes *Capparis decidua*.

4.8.2 Birds

The Mine is not located within an Important Bird Area and the results of the bird surveys do not indicate that it would merit consideration as one. Mauritania supports no bird species of

² Regs are desert landform defined as broad plains covered with sand and gravel. Regs are the dominant landform in most of the Sahara.

restricted range, although there are endemic subspecies of grey heron *Ardea cinerea monicae* and Eurasian spoonbill *Platalea leucorodia balsaci* which are primarily restricted to wetland habitats, particularly the PNBA (Shine, 2001). The Mine falls within the Sahara-Sindian biome which covers much of the north and centre of the country as well as much of north Africa and supports a biome-restricted assemblage of birds.

The 2011 ornithological survey recorded the presence of 31 species of resident and migratory bird within the Mine. The abundance of most species was low, with the exception of singing bushlark (*Mirafra cantillans*), black-crowned sparrow-lark (*Eromopterix nigriceps*), northern wheatear (*Oenanthe oenanthe leucorhoa*) and Thekla lark (*Galerida theklae*), which were more abundant.

No internationally (IUCN Red List) or nationally rare or threatened bird species were recorded, but two species were recorded that were uncommon in Mauritania. These species were bronze-winged courser (*Rhinoptilus chalcopterus*) and common quail (*Coturnix coturnix*).

4.8.3 Mammals

Given the habitat conditions many of the mammal species that occur, or that might potentially occur, would be expected to be present at low density or otherwise be nocturnal in occurrence. Investigations into the mammal fauna associated with the Mine were undertaken in February 2011. There was negligible evidence to indicate the presences of mammals are found in association with the Mine.

Previous survey work (Scott Wilson 2010a) recorded evidence of the presence of the following species in the general vicinity of the Mine: Cape hare (*Lepus capensis*), gerbil (Gerbillinae), jerboa (*Jaculus jaculus*), golden jackal (*Canis aureus*) and feral domestic dog (*Canis lepus familiaris*). None of these species are threatened or rare.

No bat species were recorded during the baseline surveys.

4.8.4 Other Fauna

A limited number of direct observations of reptiles were made, these being of Moorish gecko (*Tarentola mauritanica*) and ocellated skink (*Chalcides ocellatus*). Neither of these species is rare, threatened or specialist in their habitat requirements.

No systematic invertebrate survey was undertaken and limited direct observations were made. The regs habitat present within the Mine site is not rare or isolated in distribution and as such it is unlikely that the site would support any invertebrate species of high nature conservation importance.

4.9 Socio-Economics

Mauritania's population, estimated at approximately 3.2 million (World Bank, 2009), is mainly concentrated in the capital city of Nouakchott and along the Senegal River. The nomadic culture of the Mauritanian people accounts for the widespread location of the population across tribal villages and camps. However, severe droughts have led to a decline in the traditional way of life (World Bank 2009) and migration to the industrial and urbanised towns has risen so that the urban population makes up 41% of the total population. Approximately half of the Mauritanian population rely on agriculture and livestock as their main sources of livelihood.

The Mauritanian economy is one of the fastest growing in north west Africa. The gross domestic product (GDP) (as of 2008) is stated to be at \$3,030,534,351 with the Gross National Income (GNI) per capita at \$2100 (World Bank, 2009). Mauritania's GDP is currently made up

by agriculture (12.5 %), industries (46.7 %) and services (40.7 %). Industries are mainly natural resource based, including mining of iron ore, gold and copper, fish processing and oil production. Mauritania's coastal waters are amongst the richest fishing grounds in the world and fish account for about 45% of exports.

The mining and fishing industries also account for a large number of the Mauritanian workforce; however the geographic location of these industries means that there is limited interaction with the economic activities of the south, consisting primarily of traditional agriculture. Mauritanian labour force is currently at 1.318 million with an average annual growth of 3.1% (World Bank 2009). Unemployment rates are relatively high at 30%.

Literacy rates are at 57% with an average of 4.4% of the GDP being invested in the education system. Although education is compulsory in Mauritania, only 50% of children attend primary whilst secondary and higher education is severely limited. The Université de Nouakchott the only university in the country has an enrolment of roughly 10,000 students (A.C.A 2007).

For Mauritanian males, life expectancy at birth is 55, females have a slightly higher life expectancy of 60. The adult mortality rate is 325 per 1,000 for males and 246 per 1,000 for females. The total expenditure on health as a percentage of the country's GDP is 4.2%, and general government expenditure on health accounts for 76.8% of the total expenditure on health (WHO 2006).

The Mine is based in Inchiri wilaya, a region covering 41,700 km² (SNC Lavalin, 2004). The region consists of a very low population density, with approximately 9,900 inhabitants (approximately 0.3% of the total population of Mauritania) (ONS, 2009). The regional authority has its administrative capital at Akjoujt, where the majority of Inchiri's population live.

As stated in Section 4.2 the Mine is located in a remote area and the nearest industries are located more than 100 km away. Further a number of isolated families have set up temporary structures in the vicinity of the Mine and at the junction of the access road and the main Nouakchott-Nouâdhibou N2 highway.

4.10 Archaeology and Cultural Heritage

The baseline conditions have been defined through a range of investigations. A high-level archaeological survey was carried out during the feasibility study in 2004 (Vernet & Naffé, Nouakchott University, 2004). A subsequent baseline archaeological field survey was undertaken in January 2011 (Ould Mohamed Kaber, BEE/IMRS, 2011).

4.10.1 Critical cultural heritage, designated and legally protected sites

There are no specific internationally recognised or legally protected cultural heritage features or areas, or proposed critical cultural heritage features or areas, within or in the zone of influence of the Mine site (defined in IFC Performance Standard 8). Both tangible and intangible heritage is protected under Mauritanian law. No archaeological sites identified through the investigations cited above are considered to be rare, and none have been designated according local, national or international standards in terms of their outstanding social, aesthetic, community or scientific value.

Historic Muslim tombs are protected by national/Islamic law and customary practice and are protected from mining activities through mitigation and management proposals in the EMS. In all cases, human remains and funerary objects will be treated with dignity and respect at all times.

In the absence of published national guidelines, the significance of archaeological sites, monuments and artefact find spots is judged upon the characteristics indicated in Table 4.1.

Table 4.1: Factors for assessing the value of archaeological receptors

Significance/ value	Key characteristics of archaeological receptor
Very high	World Heritage Sites Receptors of acknowledged international importance Receptors that can contribute significantly to international research objectives
High	Monuments & sites of national quality and importance Receptors that can contribute significantly to national research objectives
Medium	Monuments & sites that contribute to regional research objectives.
Low	Monuments & sites of local importance Receptors compromised by poor preservation and/or survival or contextual associations. Receptors of limited value, but with the potential to contribute to local research objectives
Negligible	Receptors with very little or no surviving archaeological interest.
Unknown	The importance of the resource cannot be ascertained

4.10.2 Archaeological Background

The gravelly regs of Tasiast have been inhabited since the Middle Palaeolithic period (Aterian Culture; 29,000-18,000 Before Present (BP)), though no remains of this period have been identified at the Mine Site. Following a marine transgression and the deposition of ogolian dunes in the subsequent arid period, there followed a humid period in the early Neolithic (8,500-7,000 BP), characterised by the hunting of large fauna and the domestication of livestock. In the middle and late Neolithic periods (6,000BP-2,000BP) and the protohistoric period (end of prehistoric era-to first historical centuries), the area became increasingly arid. During the historic period, it was occupied by nomadic populations who have left little trace in the archaeological record, with the exception of Muslim tombs.

4.10.3 Inventory of Archaeological Sites

An archaeological desk-based review and field survey was undertaken in February to March 2011, in order to establish an inventory of archaeological sites at the Mine site, along the access roads and in the area of the borefield. No archaeological sites were located within the access road or in the borefield area.

4.11 Landscape and Visual

4.11.1 Landscape

Due to the Mines remote location, it forms the major land use in the immediate vicinity along with; isolated temporary/semi-permanent settlements of nomads and periodic grazing for livestock.

The Mine does not lie within an area of protected landscape and the key characteristics of the Mine landscape within and surrounding the Mine are presented in Table 4.2 below

Table 4.2: Key Landscape Characteristics

Key Landscape Characteristics
A national scale landscape, occupying approximately 75% of Mauritania and forming part of the wider Sahara Desert.
Isolated, sand dominated landscape of undulating topography.
Limited vegetation cover and land use but sufficient in some areas for sporadic grazing.
Inhabitation largely confined to small numbers of local nomads occupying temporary/

Key Landscape Characteristics
semi-permanent structures and the community of workers at the mine.
Mining is locally a significant element of the landscape but of a scale which is dwarfed by the landscape context.

The landscape of the Mine and its immediate context has no distinctive landscape features which are unique and is unremarkable apart from the presence of the existing Mine. As a result the landscape context is considered to be of low quality.

4.11.2 Visual

Photographs 4-1 and 4-2 (taken in February 2011) illustrate the context of the Mine and are considered to provide a typical example of views from the Mine. Categories of views include:

- Intermittently inhabited properties occupied by nomadic/semi-nomadic peoples;
- Tracks within the desert used primarily by nomadic peoples and workers at the Mine; and
- The Mine access road and worker locations around the Mine.

Existing screening from locations in the wider landscape is largely derived from the landform of the sand dunes and rocky ridgelines. Views of the existing Mine are obtained in close proximity from a small number of extremely isolated locations, primarily accessed by those within the Mine site.

4.12 Traffic

The Mine is accessed from the main Nouakchott – Nouâdhibou N2 highway by a 60 km two-lane unsealed access road. The access road to the Mine was previously a track which linked nomadic people to the highway and was predominantly used to deliver water to drop off points in the region. Following the Mine’s commissioning the track was upgraded to an unsealed access road which is regularly maintained.

Currently the unsealed access road is predominantly used by Mine vehicles and, also, water delivery vehicles which supply water for local semi-nomadic/nomadic people. There are approximately 5-10 vehicle movements per hour along the unsealed access road during the day. Within the Mine site a network of internal unsealed Mine roads exists for Mine traffic only. These roads are speed restricted and regularly maintained.

5 Impact Assessment

Section 5.1 presents the methodology and terminology used to assess the environmental and social impacts of Phase 1a(i) Project components. Methodologies adopted for the assessment of specific environmental and social disciplines are discussed in Sections 5.2 to 5.11 respectively.

5.1 Methodology

5.1.1 Background

The overall methodology adopted for undertaking this EIN is based on the requirements of Mauritanian legislation as set out in Decree No. 2004-094 and its amendment No. 2007-105, together with the Guide for Undertaking an Environmental Impact Notice in the Mining Sector (November 2006). With regard to terminology used in the EIN, specific technical terms are explained in the appropriate section of the text. However, in the interests of clarity and consistency, a number of generic Project terms are defined in Table 3.1. A listing of abbreviations used in the EIN is also presented at the front of this report.

It also takes into consideration international best practice and, in particular, IFC Performance Standards and relevant International Protocols, Agreements and Treaties applicable to Mauritania (see Section 2).

5.1.2 Identification and Assessment of Impacts

Potential impacts have been identified from a critical analysis of the proposed components for Phase 1a(i) in relation to their environmental and social setting. The assessment drew on secondary data; primary data from specialist baseline surveys commissioned for this EIN; and on the experience of the URS/Scott Wilson team. The results are presented in Sections 5.2 to 5.11. Terminology to assess impacts is presented in Table 5.1 and Table 5.2.

The significance of an impact is considered to reflect the relationship between two factors:

- The magnitude of the impact (i.e. the actual change taking place to the environment); and
- The sensitivity of the affected resource or receptor.

Within this EIN, the following generic matrix (see Table 5.1) is used has been applied to define the level of and significance of impacts.

Table 5.1: Level and Significance of Impacts

		Impact Magnitude		
		High	Medium	Low
Receptor sensitivity	High	High	High / Moderate	Moderate
	Medium	High / Moderate	Moderate	Moderate/ Low
	Low	Moderate	Moderate/ Low	Low/ Negligible

The residual impact, i.e. the impact remaining after mitigation, has been assessed using the terminology presented in Table 5.2.

Table 5.2: Assessment Terminology

Nature of predicted impacts	
Neutral	No overall environmental impact.
Adverse	Negative environmental impact.
Beneficial	Positive environmental impact.
Significance of predicted impacts	
High	An impact that is capable of causing sufficient change in the environment to affect the status, potential productivity or usage of the environment.
Moderate	An impact that is capable of causing change in the 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 environment
Negligible	No effect, not significant. Irrespective of other effects.
Duration of predicted impacts	
Short term	An impact that persists for 36 months or less (i.e. during construction period).
Medium term	An impact that persists for between 36 months and 16 years (i.e. during operations).
Long term	An impact that persists for longer than 16 years (i.e. Post Closure).

Where possible, the rating of impact significance, nature and duration will have been based upon relevant quantitative criteria (e.g. Environmental, Health and Safety (EHS) Guideline values), together with the use of value judgements and expert interpretations to establish to what extent an impact is environmentally significant. In addition, performance against environmental quality standards or pollution control thresholds and compatibility with environmental policies is taken into account where appropriate.

5.2 Groundwater Hydrology

5.2.1 Potential Impacts

Expansion of the borefield from 14,000 m³/d to 17,000 m³/d is proposed by means of ten water supply wells and seven back-up boreholes to the south (proposed production boreholes 311 to 315 on Figure 6).

Over a six month period the difference between abstracting 17,000 m³/d rather than the permitted 14,000 m³/d is 0.5 Mm³ i.e. 3.1 Mm³ compared to 2.6 Mm³ and is less than 0.1 % of the estimated aquifer storage.

Although the borefield source is highly saline, its potential impact on fresh water borefields at Bennichab to the south and Boulanouar to the north has to be considered. There will be an increase in radius of influence as a result of the abstraction at 17,000 m³/d as shown by model results reproduced in Figure 7. The influence of the abstraction is however local to the borefield and around 100 km from both Bennichab and Boulanouar, so no impacts on these borefields are predicted.

No other groundwater users have been identified within the radius of influence of the borefield. However, if potential users were identified at some later point and these users rely on boreholes in which the water level is close to the pump depth or base of borehole, the additional drawdown from the borefield abstraction may result in water levels falling below pump level

Since groundwater levels are already at least 45 m below surface, the incremental fall in levels as a result of abstraction is not expected to have any impact on the PNBA (see Figure 7) or surrounding users.

The access road upgrade is not expected to have a significant impact on groundwater. The potential impact of spillages along the road which have the potential to infiltrate and pollute groundwater will be mitigated by adopting pollution prevention measures in accordance with good practice.

5.2.2 Mitigation Measures

The effects of pumping from the borefield are not predicted to have a significant effect on regional groundwater resources. Monitoring is already in place and additional monitoring boreholes are proposed between the borefield and Bennichab (401 and 420 on Figure 6), so that the effects of drawdown can be recorded.

Potential impacts on groundwater users near to the borefield, if they exist, can usually be overcome by lowering the users' pumps or deepening their boreholes.

5.2.3 Summary

A summary of the potential residual impacts of the proposed Phase 1a(i) with respect to groundwater is presented in Table 5.3.

Table 5.3: Summary of potential residual impacts¹ - Groundwater

Location	Source of Impact	Mitigation Measure	Project Phase ²	Nature ³	Duration ³	Significance ³
Borefield	Impact on fresh water borefields	Monitor	C O	Neutral	Long term	Negligible
	Lower groundwater level	Deepen boreholes or pumps	C O	Neutral	Medium Term	Negligible

¹Following implementation of proposed Mitigation Measures

²Project Phase: C = Construction, O = Operation, D = Decommissioning and Closure

³Duration and significance refer to the residual impact (i.e. predicted impact after the implementation of proposed mitigation measures) and is based on the ratings provided in Table 5.2.

5.3 Surface Water Hydrology

5.3.1 Potential Impacts

The potential impact of the proposed works on surface water mainly relate to changes in surface water runoff as a result of changes in land use. For example, the presence of linear features such as pipelines and roads can result in diversion of flows but since the road and pipeline upgrades are generally following existing routes, the potential impacts will be no more than at present.

Infiltration is low so the effect of increased areas of hard standing on runoff volumes is anticipated to be negligible.

5.3.2 Mitigation Measures

The new areas of development will be constructed away from main wadi channels so as to minimise disruption of surface water runoff. Flood risk assessments are proposed and will assist in identifying those areas where water may flow and accumulate following rainfall.

5.3.3 Summary

A summary of the potential residual impacts of the proposed Phase 1a(i) with respect to surface water are presented in Table 5.4.

Table 5.4: Summary of potential residual impacts¹ - Surface Water

Location	Source of Impact	Mitigation Measure	Project Phase ²	Nature ³	Duration ³	Significance ³
Access road	Surface Water Runoff diversion	None	C O	Neutral	Long Term	Negligible
Borefield	None	None	None	None	None	None

¹Following implementation of proposed Mitigation Measures

²Project Phase: C = Construction, O = Operation, D = Decommissioning and Closure

³Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided in Table 5.2.

5.4 Air Quality

5.4.1 Potential Impacts

The potential air quality impacts on sensitive receptors due to Phase 1a(i) relate to both nuisance and health impacts. In addition, it temporarily introduces some additional sources of emissions with the potential to impact upon existing receptors.

Within or adjacent to the existing access road and water supply pipeline footprint there is the potential to locally increase the airborne concentration of particulate matter (dust and PM₁₀) as a result of dust generation during:

- Extraction of rock from borrow pits and associated material handling;
- Crushing of borrow pit material in the mobile crusher;
- Upgrading of the base of the access road; and
- Construction of the new water pipeline and an intermediate pump station.

At the borefield and within the existing access road and water delivery pipelines footprint there is the potential to locally increase the airborne concentration of nitrogen dioxide, sulphur dioxide and particulate matter (PM₁₀) as a result of emissions from portable power plant.

5.4.2 Mitigation Measures

Employees at the Mine are currently protected by controls and measures defined in occupational health and safety guidelines for the Mine. These controls and measures will be applied to Phase 1a(i) works and will provide all workers at the Mine with a consistent level of protection from the potential impact of airborne pollutants.

The proposed activities within the existing access road and water delivery pipelines footprint only have the potential to result in changes in measureable concentrations of air pollutants at locations close (within 100 m) to the source of the emission. Impacts would be infrequent and limited to the time period of the works. Dust controls that are already employed at the Mine, including use of water to damp down materials if necessary, the minimisation of drop heights and speed limits on haul routes are capable of delivering the required level of mitigation.

The use of well maintained vehicles, mobile plant and portable power plant would ensure that exhaust emissions of nitrogen dioxide, sulphur dioxide are negligible adverse impacts over the short to medium term.

The potential for dust generation from the movement of vehicles over the upgraded base of the access road would be minimised by the application of a dust suppressant during the construction period. Upon completion of Project construction, the hard asphalt surface of the access road would significantly reduce the potential for vehicle movements to re-suspend particulate matter (dust and PM₁₀) for the lifetime of the road. In the long term this would represent a beneficial effect of low significance to receptors using the road or located near to the road than currently.

5.4.3 Summary

A summary of the potential residual impacts of the proposed Phase 1a(i) with respect to air quality are presented in Table 5.5.

Table 5.5: Summary of potential residual impacts¹ - Air Quality

Location	Source of Impact	Mitigation Measure	Project Phase ²	Nature ³	Duration ³	Significance ³
Access road	Construction dust impacts	Dust controls as EMS.	C	Adverse	Short term	Negligible
	Dust and PM10 generated by vehicle movements	Dust suppressant during construction with permanent asphalt surface	C O	Beneficial	Long Term	Low
Borefield	Power plant emissions	Regular maintenance of plant	O	Neutral	Medium Term	Negligible

¹Following implementation of proposed Mitigation Measures

²Project Phase: C = Construction, O = Operation, D = Decommissioning and Closure

³Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided in Table 5.2.

5.5 Noise and Vibration

5.5.1 Noise Criteria

IFC EHS Environmental Guidelines³ provide guidance on acceptable noise levels to residential and other sensitive receptors and have been used as a guide to assess potential impacts from Phase 1a(i) activities. Table 5.6 presents these noise levels.

Table 5.6: IFC Noise Level Guidelines

Receptor	One Hour L _{Aeq}	
	Daytime (07:00 to 22:00)	Night-time (22:00 to 07:00)
Residential; Institutional; Educational	55	45
Industrial; Commercial	70	70

Source: International Finance Corporation, Environmental, Health and Safety Guidelines (2007)

The daytime limit of 55 B LAeq,1h is a free-field level. The night-time limit of 45 dB LAeq,1h is a façade level, meaning the noise level at the wall of a property (e.g. just outside a bedroom

³ The source for these guideline noise levels is International Finance Corporation, Environmental, Health and Safety Guidelines (2007)

window). A façade noise level of 45 dB LAeq is equivalent to an internal noise level of approximately 30 dB LAeq, assuming small open areas to the building. This would ensure no disturbance to sleep.

The Mine operates 24 hours per day and workers will be resting and sleeping during daytime and night-time. Therefore the 45 dB LAeq limit applies for daytime and night-time at the accommodation camp.

An external free-field noise level of 70 dB(A) would allow for a good internal noise climate to office accommodation, assuming a reasonable façade construction. Thus, the daytime and night-time noise limit of 70 dB LAeq for commercial receptors is applicable for offices on the Mine site

Due to the large distances between any significant sources of vibration (e.g. blasting, crushing equipment) and any sensitive receptors, no calculations of likely vibration levels have been carried out. Ground borne vibration for both construction and operation are thus scoped out of the assessment.

5.5.1.1 Impact Prediction – Construction Noise

Typical construction noise levels have been predicted for a number of distances from typical construction activities for this type of development using the methodology given in BS 5228 ‘Control of noise on construction and open sites’. Sound power levels for each piece of equipment have been sourced from BS 5228 ‘Control of noise on construction and open sites’ and are given in Table 1 of Appendix 2.

Specific details of construction works were not available at the time of preparation of this report and therefore representative construction activities have been assumed using experience of similar projects/ constructions.

5.5.1.2 Impact Prediction – Operational Noise

No quantitative data relating to operational equipment schedule and associated acoustic emission levels are available. However, a robust assessment of the operation of the Phase 1a(i) infrastructure is possible, based on the proposed operations, the distances to sensitive receptors and the existing noise climate.

5.5.2 Potential Impacts

5.5.2.1 Construction

Based on the methodology described in Section 4.6, Table 2.1 in Appendix 2 shows the predicted noise level for different construction activities at various distances from the activity. These predicted levels assume that there is direct line-of-sight between the noise source and receptor.

For most of the construction period, noise levels will be significantly lower than those given in Table 1 of Appendix 2, with high noise levels for short periods only. It should be noted that construction noise impacts are only temporary by their very nature. With appropriate phasing and employment of best practicable means, these impacts can be mitigated to an acceptable level if required.

The detailed assessments for the various construction elements for Phase 1a(i) are also provided in Appendix 2. The significance of the noise impacts caused by the construction of the

access road upgrade, borefield expansion, new water supply pipeline, borrow pits and mobile crusher is assessed as negligible for both residential and office accommodation.

5.5.2.2 Operational Noise

The existing noise climate across the Mine site is dominated by noise from the ongoing mining operation. However, as stated above, noise levels at the accommodation camp resulting from these mining operations are negligible.

The significance of operational noise impacts arising from Phase 1a(i) Project components is assessed as negligible for both residential and office accommodation.

5.5.3 Mitigation Measures

5.5.3.1 Construction

Best Practicable Means should be followed to reduce noise impacts upon the nearest noise sensitive receptors. Best practicable means should include the following:

- All construction plant and equipment should comply with generally accepted noise emission limits;
- All vehicles and mechanical plant used for the purpose of the works should be fitted with effective exhaust silencers and should be maintained in good efficient working order;
- Machines in intermittent use should be shut down in the intervening periods between work or throttled down to a minimum; and
- Plant and equipment such as flat bed lorries, skips and chutes should be lined with noise attenuating materials. Materials should be handled with care and be placed, not dropped.

All ancillary plant such as generators, compressors and pumps should be positioned so as to cause minimum noise disturbance, i.e. furthest from receptors or behind close boarded noise barriers. If necessary, further measures should be taken, such as localised noise barriers to screen specific noise sources.

5.5.3.2 Operation

No specific measures for noise mitigation are required to ensure negligible effects at offices and the accommodation camp. However, where applicable the following techniques and good site management practices should be employed to minimise operational noise levels:

- All workers to wear appropriate PPE;
- Employment of earth berms as noise barriers at facility boundaries where appropriate;
- Optimisation of internal traffic routing to maximize distances to sensitive receptors and to minimise need for reversing (reducing noise from reversing alarms);
- Proper use of plant with respect to minimising noise emissions and regular maintenance. All vehicles and mechanical plant should be fitted with effective exhaust silencers and should be maintained in good efficient working order;
- Selection of inherently quiet plant where appropriate;
- Machines in intermittent use should be shut down in the intervening periods between work or throttled down to a minimum;

- All ancillary plant such as generators, compressors and pumps should be positioned so as to cause minimal noise disturbance; and
- Implementation of ground vibration and air overpressure control with appropriate drilling grids.

5.5.4 Summary

A summary of the potential residual impacts of the proposed Phase 1a(i) with respect to noise and vibration is presented in Table 5.7.

Table 5.7: Summary of potential residual impacts¹ - Noise and Vibration

Location	Source of Impact	Mitigation Measure	Project Phase ²	Nature ³	Duration ³	Significance ³
Access road and Borefield	Construction Noise	Best Practicable Means	C	Adverse	Short Term	Negligible
	Operational Noise	Control techniques and Site Management Practices	O	Adverse	Medium Term	Negligible

¹Following implementation of proposed Mitigation Measures

²Project Phase: C = Construction, O = Operation, D = Decommissioning and Closure

³Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided in Table 5.2.

5.6 Soil and Land Use

5.6.1 Potential Impacts

Phase 1a(i) Project components are all located within the footprint of areas which have experienced a degree of disturbance from the existing mining activities and previous exploration works.

5.6.1.1 Soil

The main impacts on soils during construction and operation of Phase 1a(i) are:

- Disturbance of soils caused by upgrading the access road, laying the optic fibre cable and water pipeline, excavation of borrow pits and drilling of boreholes.
- Risk of erosion of soils caused by wind, resulting from upgrading the access road, laying the optic fibre cable and water pipeline and drilling of boreholes; and
- Potential soil contamination caused by any spillage and leaking of oils, chemicals and hazardous liquids outside of bunded areas or equipment.

5.6.1.2 Land Use

The main impacts on land use, around the borefield and along the access road, during construction and operation of Phase 1a(i) are:

- Limiting land use around the borefield and access road for other purposes such as seasonal grazing land for livestock herds or artisanal mineral exploitation.
- Construction activities may also result in temporary loss of access through area for the seasonal movement of nomadic herds.

5.6.2 Mitigation Measures

5.6.2.1 Soil

Disturbance of soil will be restricted by undertaking Phase 1a(i) activities in areas which have previously been disturbed. Borrow pits for aggregate will be located within or adjacent to existing access road and water pipeline corridor footprint or in the Mine site footprint; these borrow pits will be re-profiled after use. The access road upgrade will follow the existing access road route and the placement of optic fibre cables and water pipeline will be located within the footprint of the access road and water pipeline corridor. The impacts are therefore assessed to be low significance during construction.

The low rainfall in the area results in an insignificant risk of erosion of soils and its redistribution on surrounding land.

Processes for cleaning up spills will be dealt with in accordance with the emergency response plan (Scott Wilson, 2010a). Spill kits will be available and all workers will be trained to undertake clean up routines including disposal of contaminated materials. Routine monitoring and maintenance will take place to reduce the risks of spills and accidents.

5.6.2.2 Land Use

Phase 1a(i) Project components will not alter the current land use on-site. In addition, components will be located in areas, or closely adjacent areas, which have been previously disturbed by Mine activities. The impacts will therefore be negligible during both construction and operational phases.

Further, at the borefield and along the access road, surrounding communities and livestock handlers will be notified of construction activities. This community awareness will include construction timescales, potential safety risks, and encouragement to avoid the affected areas when works are under way.

5.6.3 Summary

A summary of the potential residual impacts of the proposed Phase 1a(i) with respect to soil and land use are presented in Table 5.8.

Table 5.8: Summary of potential residual impacts¹ – Soil and Land Use

Location	Source of Impact	Mitigation Measure	Project Phase ²	Nature ³	Duration ³	Significance ³
Access road and Borefield	Soil disturbance and/or erosion	Use of waste rock to minimise new borrow pits	C	Adverse	Short term	Low
	Soil contamination	Emergency Response Plan	C O	Adverse	Short term	Low
	Change in land use	No mitigation measure required as land use is not changing	C O	Neutral	Medium term	Negligible

¹Following implementation of proposed Mitigation Measures

²Project Phase: C = Construction, O = Operation, D = Decommissioning and Closure

³Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided in Table 5.2.

5.7 Ecology

5.7.1 Potential Impacts

Certain Phase 1a(i) Project components (such as, the access road upgrade and water pipeline) are located within previously disturbed areas of the Mine and can therefore be screened out of consideration as the scope for ecological impacts is negligible. The remaining Phase 1a(i) Project components (such as, borrow pits, temporary mobile crusher, borefield) will require greater consideration as these components will be located in areas previously not disturbed.

Phase 1a(i) potential impacts on the ecological resources of the area are as follows:

- Habitat loss (land-take): this is a direct impact arising from Phase 1a(i). The significance of this is related to the area lost, the proportion of the total area and the ecology and nature conservation value of that habitat.
- Habitat fragmentation: land-take can sever habitats, leaving areas too small to support viable populations, and create physical barriers to the movement of animals and plant propagules between areas cut off by the Project. Fragmentation can lead to reduced genetic diversity and can increase the likelihood of local populations being lost.
- Indirect effects: these impacts may affect habitats outside the boundary of the construction site. They may arise from disturbance (visual, noise or vibration), dust deposition, pollution incidents and changes in site hydrology or the flow and/or quality of watercourses.
- Cumulative impacts: these are considered in two ways; firstly, the cumulative effect of the Project on the collective resource of particular habitats or species in the study area, or part of it; secondly, the cumulative impact of the Project in conjunction with other development projects expected to occur near the Project over a similar time period.

The main sources of impacts on flora and fauna as a result of Phase 1a(i) are likely to relate to:

During construction:

- Clearance of vegetation and loss of habitat;
- Soil erosion and dust impacts on vegetation;
- Noise and dust disturbance to wildlife; and
- Involvement of wildlife in accidents with vehicles or as a result of working practices.

During operations:

- Ongoing soil erosion and dust impacts on vegetation;
- Ongoing disturbance to wildlife due to noise and dust; and
- Involvement of wildlife in accidents with vehicles.

Given the above considerations, the significance of the predicted impact resulting from:

- Clearance of habitats and vegetation is assessed as low, adverse and medium term. The existing corridor has suffered from habitat disturbance, and impacts upon currently undisturbed areas (for borrow pits etc) can be minimised by avoidance.
- Dust generation on vegetation is assessed as low, adverse over the short term with the potential to change to low beneficial over the medium term as sealing of the upgraded access road, will reduce fugitive dust emissions smothering any surrounding vegetation.

- Disturbance and accidents to flora and fauna is assessed as low, adverse and short term.

5.7.2 Mitigation Measures

The mitigation requirements for Phase 1a(i) are relatively modest due to the relatively small scale of activities and the degree of existing disturbance to the road corridor. Given the sparse distribution of vegetation, where previously undisturbed areas are affected (e.g for the borrow pits), it is anticipated that areas of protected trees can be avoided. The mitigation measures detailed below have been developed with reference to, and to ensure the compliance of the Project with, IFC Performance Standard 6 as well as national legislation.

Prior to site clearance works an ecologist should undertake a walkover or driving through of the relevant land areas (depending on size of the relevant land areas) to check for the presence of any newly established ecological constraints requiring mitigation as part of good practice e.g. active mammal dens. The ecologist would provide advice on the appropriate course of action should any issues be identified.

During construction and operational activities, dust control (Section 5.4.2) and traffic (Section 5.11.2) mitigation measures will be applied to mitigate the impacts of dust and traffic accidents on flora and fauna respectively.

The need for habitat compensation is not anticipated, in the unlikely event of unavoidable loss of protected tree species (*Acacia ehrenbergiana*, *Capparis decidua* and *Maeria crassifolia*). pilot tests on tree planting would be undertaken on native species including the three protected species. To ensure that invasive alien plant species are not introduced, as required by IFC Performance Standard 6, no plantings of non-native flora will be undertaken anywhere within the Mine.

5.7.3 Summary

A summary of the potential residual impacts of the proposed Phase 1a(i) with respect to ecology are presented in Table 5.9.

Table 5.9: Summary of potential residual impacts¹ - Ecology

Location	Source of Impact	Mitigation Measure	Project Phase ²	Nature ³	Duration ³	Significance ³
Access road	Dust generation	Apply dust control measures	C	Adverse	Short term	Low
Borefield	Habitat loss	Habitat compensation	C	Adverse	Medium term	Low

¹Following implementation of proposed Mitigation Measures

²Project Phase: C = Construction, O = Operation, D = Decommissioning and Closure

³Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided in Table 5.2.

5.8 Socio-Economics

5.8.1 Potential Impacts

5.8.1.1 Socio-economic Impacts

The Mine currently employs 1,200 local employees, expat staff and contractors. It is anticipated that the construction of Phase 1a(i) components will require recruitment of additional contract workers (approximately 110 personnel). Recruitment exercises will support TMLSA's Mauritanisation Plan, which includes general capacity building and training of local staff.

Phase 1a(i) Project components are located on-site and therefore there will be no loss of land use for the local community, however the land use on-site will be intensified as a result of Phase 1ai.

The development of Phase 1a(i) will contribute to the wider socio-economic benefits of the Project at the national and local level and will generate direct and indirect benefits such as additional employment and purchase of goods and services to support the Mine from within Mauritania.

5.8.1.2 Community Health and Safety Impacts

Health and safety impacts during construction, operation and after closure can relate to both impacts on staff (Occupational health and safety) and impacts on the wider local community. Occupational health and safety is not covered within this EIN and has not been documented within this EIN Report.

Health and safety impacts on the wider local communities (i.e. injuries or health impairments) may arise as a result of:

- Access to the Mine and existing infrastructure and any accidents as a consequence (e.g. accidents involving vehicles, machinery or plant); or
- Transmission of communicable diseases, such as respiratory and sexually transmitted infections, as a result of influx of project labour.

5.8.2 Mitigation Measures

Given that Phase 1a(i) will generate direct and indirect benefits and that the Mine has a positive impact on the socio-economic environment of the region, no mitigation measures are proposed.

The risks associated with Phase 1a(i) to the health and safety of local communities do not differ significantly from those associated with the existing Mine operations and will be mitigated both by design and within the framework of existing and planned management systems, such as the EMS (Scott Wilson 2010a).

5.8.3 Summary

A summary of the potential residual impacts of the proposed Phase 1a(i) with respect to socio-economics are presented in Table 5.10.

Table 5.10: Summary of potential residual impacts¹ – Socio-Economics

Location	Source of Impact	Mitigation Measure	Project Phase ²	Nature ³	Duration ³	Significance ³
Access road	Increased employment	No mitigation measures required	C	Beneficial	Short term	Moderate
	Health and safety impacts to staff and local community	Raise community awareness in traffic safety	C	Adverse	Short term	Low
Borefield	Increased employment	No mitigation measures required	C	Beneficial	Short term	Moderate
	Health and safety impacts to staff and local community	Raise community awareness	C	Adverse	Short term	Low

¹Following implementation of proposed Mitigation Measures

²Project Phase: C = Construction, O = Operation, D = Decommissioning and Closure

³Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided in Table 5.2.

5.9 Archaeology and Cultural Heritage

5.9.1 Potential Impacts

No archaeological remains will be impacted by improvement of the access road and associated works (pipeline, fibre-optic cable, new borrow pits) inside or adjacent to the access road and water pipeline corridor footprint as sites are distant from the routes. The local archaeological expert also advises that the likelihood of archaeological remains in the borefield extension area is low.

5.9.1.1 Assessment of the Magnitude of Impact

The magnitude of an archaeological impact has been judged on a five-point scale as shown in Table 5.11.

Table 5.11: Factors in the assessment of the magnitude of archaeological impacts

Factors in the Assessment of Magnitude of Impacts	
Major	Change to most or all key archaeological elements such as the resource is totally altered Comprehensive changes to setting
Moderate	Changes to many key archaeological elements, such that the resource is clearly modified Considerable changes to setting
Minor	Changes to key archaeological elements,, such that the receptor is slightly altered Slight changes to setting
Negligible	Very minor changes to elements or setting
No change	No change

5.9.1.2 Potential Impacts on Cultural Heritage

The wider Project's potential adverse impacts on the cultural heritage resource are:

- Total or partial removal of sites;
- Chance finds and illicit removal of archaeological artefacts from within the site or the surrounding area; or
- Damage by vehicle tracking.

During construction of Phase 1a(i), the main sources of impacts on cultural heritage as a result of the Project are likely to relate to:

- Localised destruction of any archaeological remains in the borefield area; or
- Vehicle tracking damage.

The local archaeological expert advises that the likelihood of archaeological remains in the borefield extension area is low, and none were noted during his site visit. However, it is recommended that a rapid, non-intrusive area field survey be undertaken in order to be sure that no remains are present. It is not anticipated that the deep borehole abstraction activity will have a significant impact on archaeological remains; any archaeological deposits in the wider area are at surface level and are already desiccated due to the prevailing arid climate.

The construction of the access road and associated infrastructure (including pipeline and fibre-optic cable) has little potential to disturb and/or damage archaeological receptors; none were noted within the access road and water pipeline corridor footprint or in the immediate vicinity. Any archaeological deposits along the route corridor will already have been heavily disturbed by the construction of the existing route.

To the extent practical, mine waste rock will be used to reduce the requirement for the production of aggregate for the Project from new sources. Where additional supplies of aggregate are required, borrow pits will be located within the existing heavily disturbed road and water pipeline corridor with negligible implications for cultural heritage. Any borrow pits beyond the access road and water pipeline corridor footprint or the Mine site would be subject to further archaeological assessment.

All sites are potentially vulnerable to casual looting and vehicle damage, in particular the Neolithic surface scatters on the old dunes and the tombs in the regs. Damage may involve crushing of artefacts, rutting, soil displacement and increased erosion.

There are no additional impacts associated with operation and closure.

The duration of the predicted impacts will be long term. Archaeological sites are a finite and irreplaceable resource, so any physical impacts are permanent.

5.9.2 Mitigation Measures

5.9.2.1 Cultural Heritage Mitigation Options

In the borefield extension area, it is recommended that a rapid, non-intrusive area field survey be undertaken in order to be sure that no remains are present. If any remains are identified, and would be subject to impacts, appropriate mitigation will be proposed and agreed (e.g. targeted excavation, watching brief).

Vehicles will adhere to controlled routes identified by signage and vehicles will not go off-route. This will form part of the EMS.

Chance Finds Procedures are in place and will be strictly applied, in conformity with national legislation and the 1970 UNESCO Convention on Cultural Property. This will form part of the EMS.

All fieldwork will be undertaken either by or supervised by a Ministry of Culture approved archaeological specialist/IMRS staff.

5.9.3 Summary

A summary of the potential residual impacts of the proposed Phase 1a(i) with respect to cultural heritage are presented in Table 5.12.

Table 5.12: Summary of potential residual impacts¹ –Archaeology and Cultural Heritage

Location	Source of Impact	Mitigation Measure	Project Phase ²	Nature ³	Duration ³	Significance ³
Access road	None	None. Any borrow pits beyond immediate vicinity of the access road and water pipeline would be subject to further archaeological assessment.	C O	Neutral	Long term	Negligible
Borefield	Borehole	Rapid field survey. If	C O	Adverse	Long	Negligible

Location	Source of Impact	Mitigation Measure	Project Phase ²	Nature ³	Duration ³	Significance ³
extension	sinking, groundwork's & associated infrastructure	required, targeted excavation/watching brief			term	
All stages of Project	Destruction of archaeological remains	EMS. Develop and implement Chance Finds Procedures & control vehicle tracking	C O D	Adverse	Long term	Negligible

¹Following implementation of proposed Mitigation Measures

²Project Phase: C = Construction, O = Operation, D = Decommissioning and Closure

³Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided in Table 5.2.

5.10 Landscape and Visual

5.10.1 Potential Impacts

5.10.1.1 Landscape

Potential landscape impacts were considered for the following Phase 1a(i) Project components:

- Access road upgrade; and
- Incremental increase in borefield water extraction.

It is considered that Phase 1a(i) Project components will be similar in nature to that currently experienced on-site, and therefore Phase 1a(i) will not introduce a new land use to the Mine.

Potential landscape effects applicable to Phase 1a(i) are therefore considered to be low. The development would not entail removal of characteristic landscape elements and is a relatively minor addition to infrastructure currently present. Overall it is assessed that the development would have a negligible effect on the baseline landscape character.

5.10.1.2 Visual

Visual impacts have been assessed during construction, operation and post closure when the buildings/infrastructure of Phase 1a(i) has been removed. The significance of visual impact for temporary residential location used by nomads would be low. For other locations, outside of the perimeter fence, accessed by nomads, the significance of visual impacts would be slight (i.e. the development would cause a perceptible deterioration in the existing view). For Mine workers using the vicinity of the Mine, visual impact is assessed as insignificant.

5.10.2 Mitigation Measures

The nature of Phase 1a(i) Project components and the location of the Mine in a remote desert location are such that no specific mitigation measures are proposed for landscape or visual impacts.

5.10.3 Summary

A summary of the potential residual impacts of the proposed Phase 1a(i) with respect to landscape and visual are presented in

Table 5.13.

Table 5.13: Summary of potential residual impacts¹ – Landscape and Visual

Location	Source of Impact	Mitigation Measure	Project Phase ²	Nature ³	Duration ³	Significance ³
Access road	Change in landscape	No mitigation measure required	C O	Neutral	Medium term	Negligible
	Visual impact of additional infrastructure and equipment		C O	Neutral	Medium term	Negligible
Borefield	Change in landscape	No mitigation measure required	C O	Neutral	Medium term	Negligible
	Visual impact of additional infrastructure and equipment		C O	Neutral	Medium term	Low

¹Following implementation of proposed Mitigation Measures

²Project Phase: C = Construction, O = Operation, D = Decommissioning and Closure

³Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided in Table 5.2.

5.11 Traffic

5.11.1 Potential Impacts

Potential impacts on traffic involve, increasing traffic volumes and vehicle movements associated with Phase 1a(i).

During construction of Phase 1a(i), there will be a slight increase in vehicle movements outside of the existing Mine for the delivery of materials and upgrade of the access road. The majority of these materials will be transferred with routine deliveries. A contractor will upgrade the access road and therefore increased traffic within the Mine site will be low.

During operation of Phase 1a(i), there will be an increase in vehicle movement associated with the construction of subsequent Project Phases and their operation.

During construction and operation there is a minor risk of accidents at the junction of the access road and the Nouakchott – Nouâdhibou N2 highway, along the access road or within the Mine site.

5.11.2 Mitigation Measures

Existing best practice on-site will be extended to include Phase 1a(i) activities. Where relevant contractors will undergo driver training to reduce the risk of accidents along the access road and on internal roads within the Mine Site, and plant will only be operated by specially trained drivers. Delivery drivers will be given instructions on entering and leaving the Mine site and will be required to stay on the road.

All roads within the Mine site and along the access road will be clearly marked and sign posted to ensure that vehicles only operate on designated roads. In addition a speed limit will be set for the access road and within the Mine site.

5.11.3 Summary

A summary of the potential residual impacts of the proposed Phase 1a(i) with respect to traffic is presented in Table 5.14.

Table 5.14: Summary of potential residual impacts¹ – Traffic

Location	Source of Impact	Mitigation Measure	Project Phase ²	Nature ³	Duration ³	Significance ³
Access road	Increased traffic	The enforcement of driver training and speed limits along all roads. Also ensure that all roads are clearly sign posted.	C O	Adverse	Medium term	Low
	Traffic accidents		C O	Adverse	Medium term	Moderate
Borefield	Increased traffic	The enforcement of driver training and speed limits along all roads. Also ensure that all roads are clearly sign posted.	C O	Adverse	Medium term	Negligible/Low
	Traffic accidents		C O	Adverse	Medium term	Low/Moderate

¹Following implementation of proposed Mitigation Measures

²Project Phase: C = Construction, O = Operation, D = Decommissioning and Closure

³Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided in Table 5.2.

6 Analysis of Alternatives

This Section presents a description of the alternatives considered for the Project and Phase 1a(i). The “zero option” considers that the Project would not take place and that operations at the Mine would continue as present. The “project components” option considers the alternative for design and location of Phase 1a(i) Project components.

6.1 The Zero Option

The zero option signifies that the Project, and hence Phase 1a(i), would not take place and that existing operations at the Mine would continue as present.

The Mine expansion activities will allow the existing operations to expand and maximise the efficiency and productivity. The zero option has therefore been discounted as it does not maximise recovery from ore and reduces the revenue generated by the Mine. In turn the benefits of increased employment opportunities, infrastructure development and contribution to the national economy would not be realised.

6.2 Project Components - Phase 1a(i)

The alternatives considered for Phase 1a(i) Project components are summarised below.

- **Access Road:** A new alignment independent to the existing access road, however, this was discounted in order to reduce new land take. Wherever possible it is preferable to use the existing footprint as a completely new alignment would inevitably have more impacts.
- **Borrow Pits and Mobile Crusher:** The key alternative to the development of new borrow pits is to use potential sources of aggregate on site or existing pits. Both options have been considered; existing borrow pits on-site are depleted, but wherever practical, waste rock will be used as aggregate. Any new borrow pits will be developed in, or adjacent to, the existing road and water pipeline corridor footprint and the mine site footprint to minimise impacts.
- **Borefield expansion and raw water pumping system:** Additional water requirements are needed to support the upgrade of the access road and other short term construction activities. As no other water resource, besides the borefield, is currently available it is necessary to incrementally increase the borefield. In addition the existing pipelines are at maximum capacity at 14,000 m³ per day, experiencing leakages, and requiring significant ongoing maintenance, it was therefore considered necessary to develop a new water supply pipeline in order to mitigate the above impacts.

7 Consultation

Public consultation has been undertaken for the operating mine, during the compilation of previous EIAs (SNC Lavalin 2004, Scott Wilson, 2008a, b, c, d and 2009a, b, 2010a).

Consultation with relevant stakeholders regarding Project will be ongoing, and the process is outlined in the Project Public Consultation and Disclosure Plan.

As outlined in Section 1.3 numerous meetings have been held with Government and the ToR for Phase 1a(i) EIN was subsequently approved in May 2011.

8 Timeline

Phase 1a(i) will commence with the physical construction of Phase 1a(i) Project components once the EIN has been approved and the permit has been issued by the MPEM.

Phase 1a(i) will comprise an approximate construction period of 12 months, anticipated to commence in 2011, for the access road upgrade to support the expansion of the Mine. Phase 1a(i) construction timeline is summarised in Figure 8.

The Project will have a 16 year life and there is potential to further extend the mine life. It is expected the Project will be fully commissioned by early 2014.

Following the operational period, the Project will enter its closure phase where operations and infrastructure will be decommissioned in accordance with the agreed Closure and Rehabilitation Plan (Decree No. 2004-054). Once the closure phase is completed TMLSA will submit an application to Government for release of the Financial Guarantee.

Each Phase of the Project will be subject to EIA processes and any cumulative impacts will be assessed and mitigation actions will be incorporated into and implemented via the Mine's existing EMS (Scott Wilson, 2010b). As required by Mauritanian legislation, annual environmental audits will be submitted to the Government after the first year of construction for the duration of the Project.

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Phase 1a(i) Environmental Impact Notice - Photographs



Photograph 3-1: Existing open pit



Photograph 3-2: Mining within existing open pit



Photograph 3-3: Existing CIL Process Plant



Photograph 3-4: Existing CIL Process Plant, Power Plant, Fuel Storage, Offices and Warehouse Facilities



Photograph 3-5: Existing Dump Leach Facility



Photograph 3-6: Existing Tailing Storage Facility 2



Photograph 3-7: Existing Accommodation Camp



Photograph 3-8: Existing Well at Borefield



Photograph 3-9: Borefield Pumping Station (located along access road)



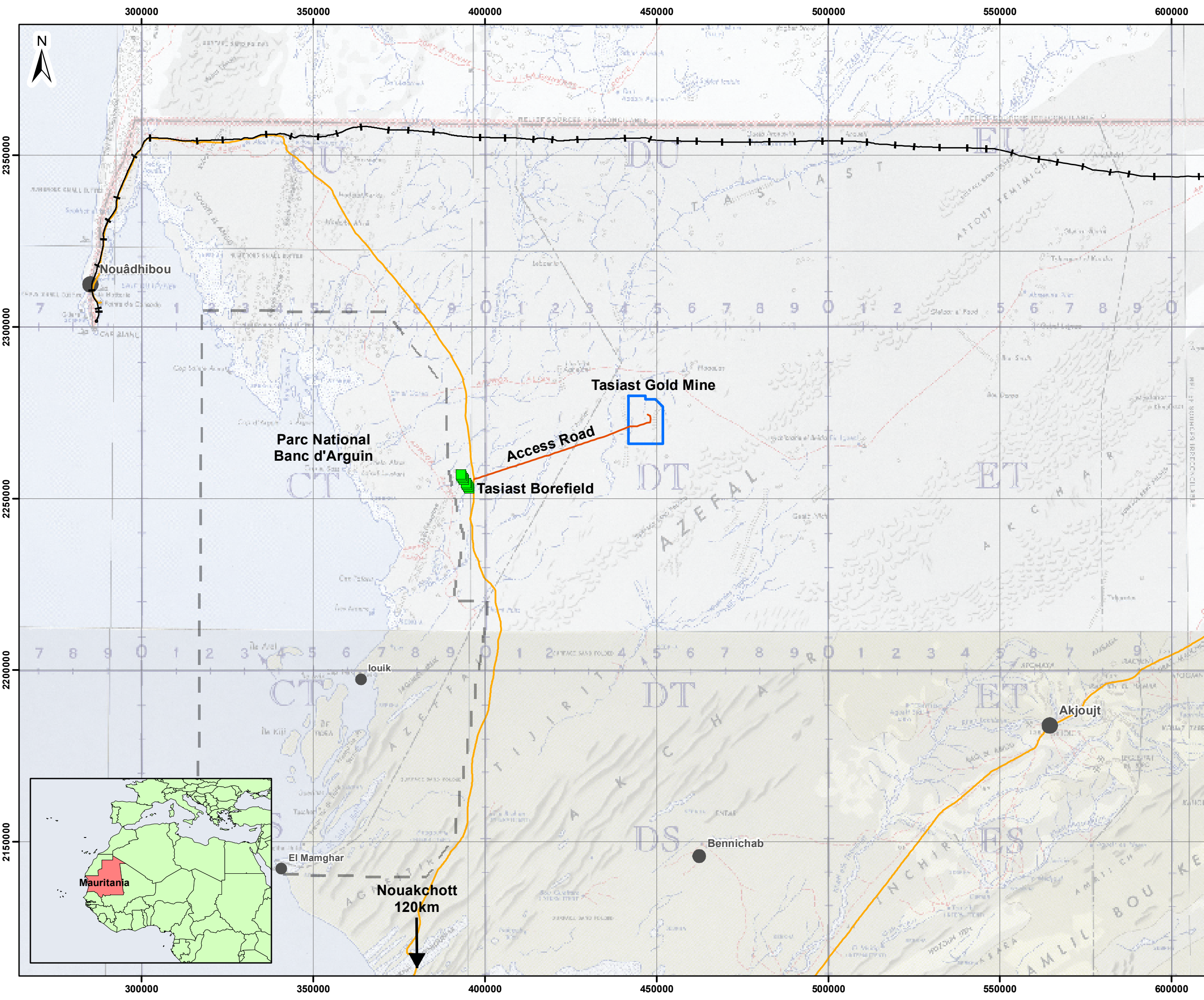
Photograph 3-10: Access Road connecting the Nouakchott–Nouâdhibou N2 highway to the Mine site



Photographs 4-1 and 4-2: View from Mine showing typical landscape



Phase 1a(i) Environmental Impact Notice - Figures



NOTES

- Tasiast Borefield
- Tasiast Gold Mine
- Mine Site Access Road
- Railroad
- Nouakchott
- Nouadhibou N2 Highway
- Parc National Banc d'Arguin

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Revision Details	By	Date	Suffix

Drawing Status: **FINAL**

Job Title: **TASIAST GOLD MINE EXPANSION PROJECT**

Drawing Title: **SITE LOCATION PLAN**

Scale at A3: **1:1,000,000**

Drawn: JM	Approved: RL
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Stage 1 check: 	Stage 2 check: 	Originated: 	Date: 02.03.11
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450000

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2275000

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Job Title
**TASIAST GOLD MINE
EXPANSION PROJECT**

Drawing Title
**EXISTING MINE
SITE LAYOUT**

Scale at A3
1:25,000

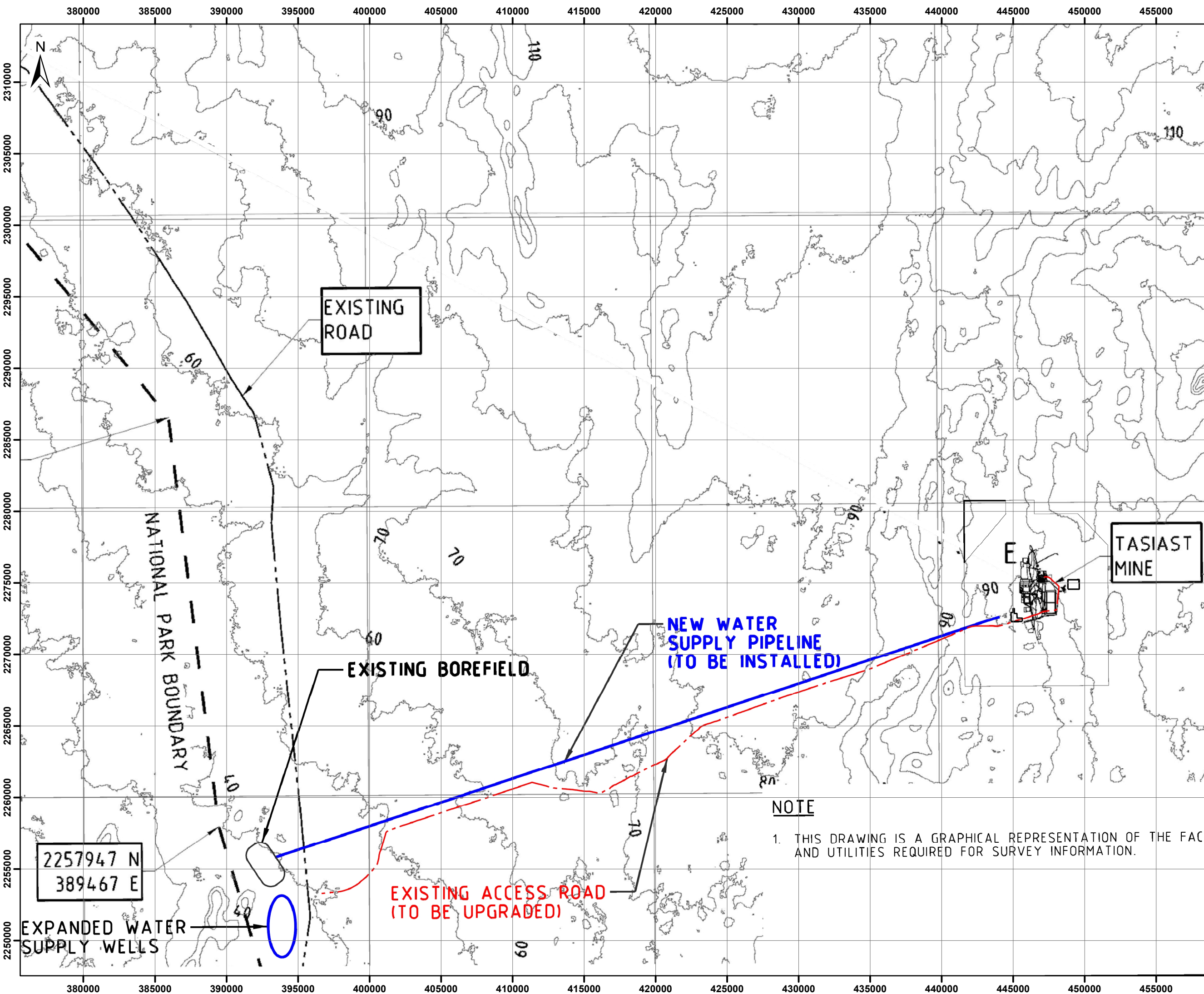
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FIGURE 2

Rev



EXISTING ROAD

TASIAST MINE

NEW WATER SUPPLY PIPELINE (TO BE INSTALLED)

EXISTING BOREFIELD

EXISTING ACCESS ROAD (TO BE UPGRADED)

NATIONAL PARK BOUNDARY

**2257947 N
389467 E**

EXPANDED WATER SUPPLY WELLS

NOTE

1. THIS DRAWING IS A GRAPHICAL REPRESENTATION OF THE FACILITIES AND UTILITIES REQUIRED FOR SURVEY INFORMATION.

NOTES



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Job Title: **TASIAST GOLD MINE EXPANSION PROJECT**

Drawing Title: **ACCESS ROAD**

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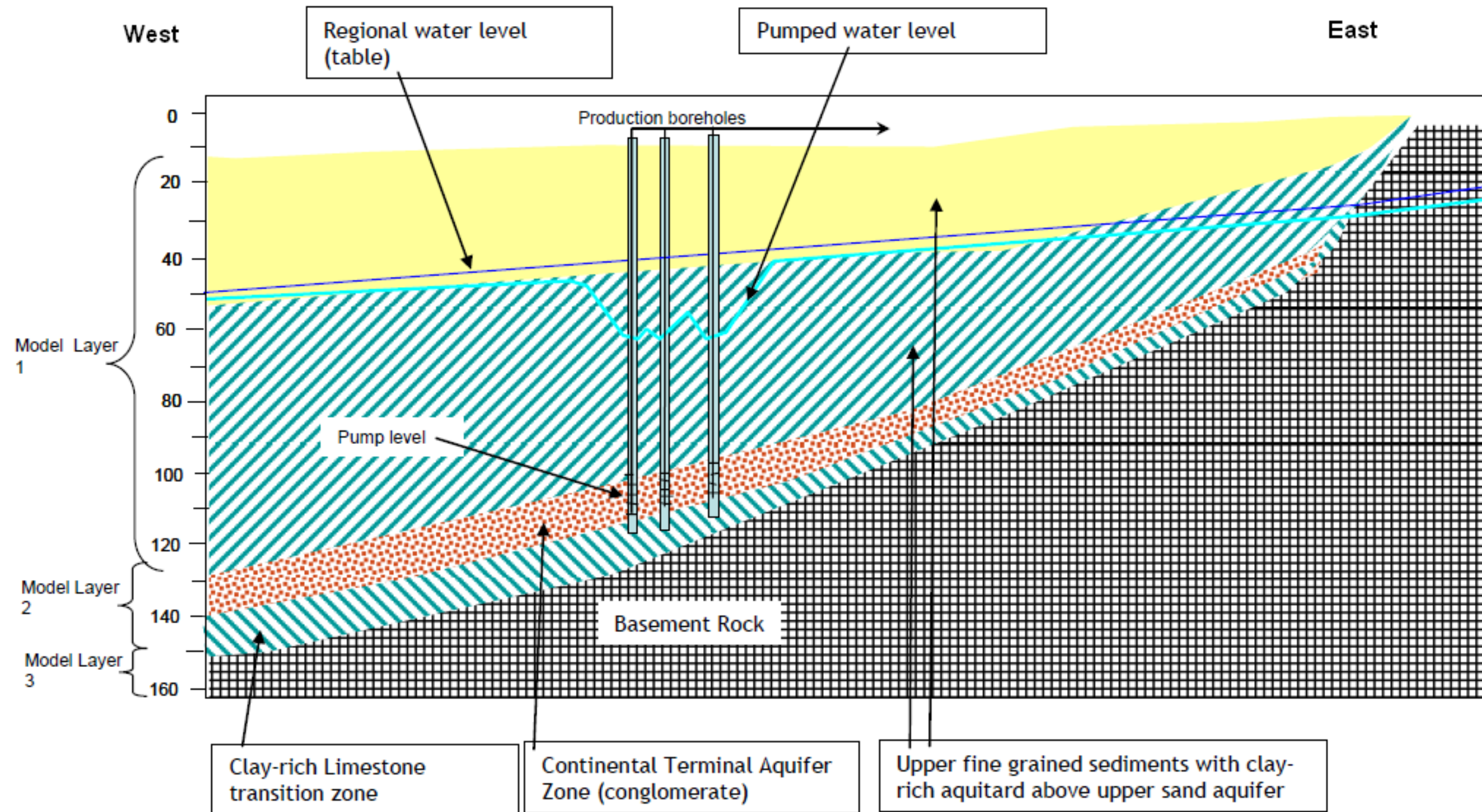
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Drawing Status **FINAL**

Job Title
**TASIAST GOLD MINE
EXPANSION PROJECT**

**SCHEMATIC REPRESENTATION
OF THE BOREFIELD
AQUIFER SYSTEM
(EAST WEST CROSS SECTION)
FROM GCS, 2010**

Scale at A3 **NOT TO SCALE**

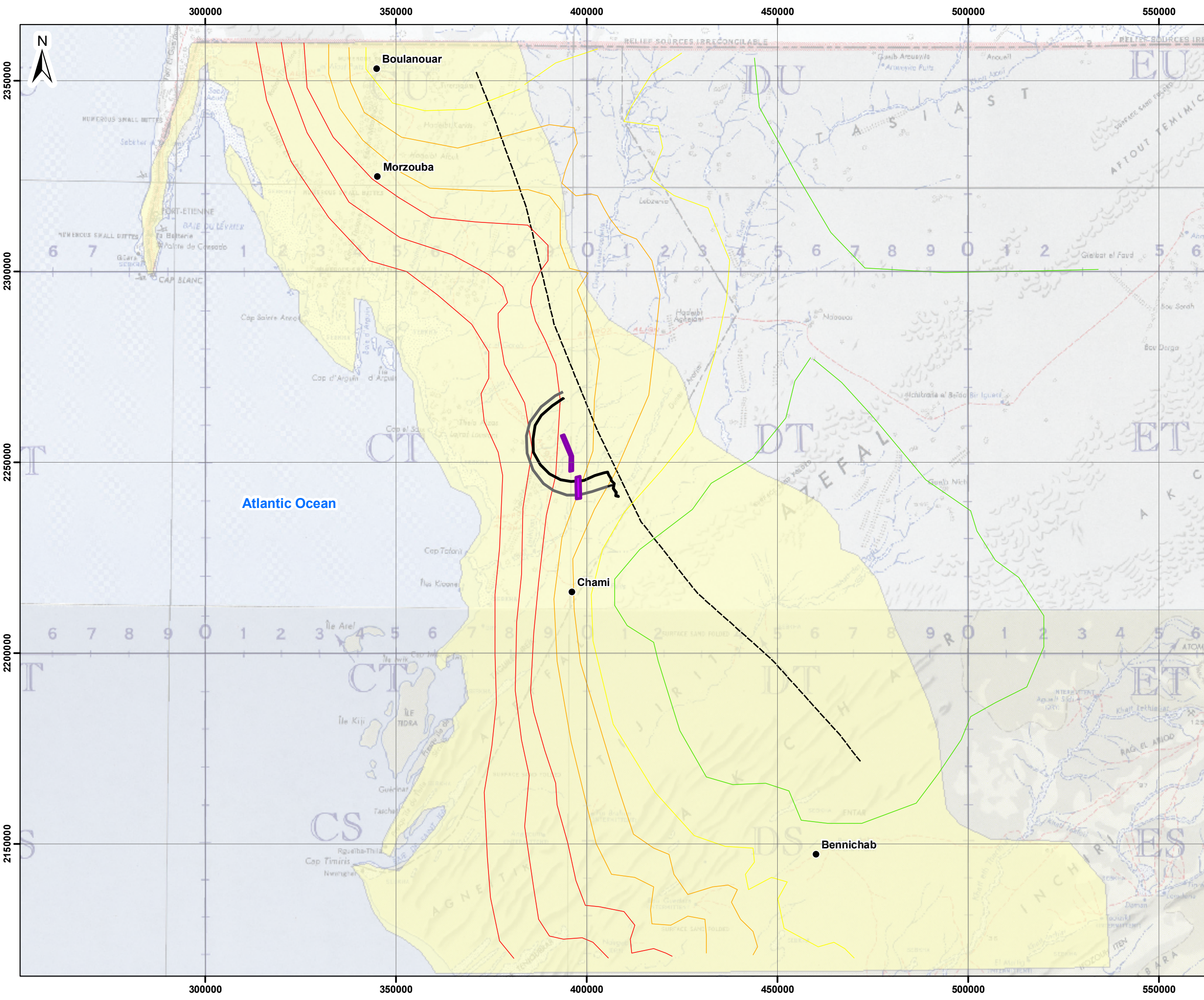
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Drawing Number **FIGURE 4** Rev



NOTES

- Town
- Approximate Wellfield Area
- 0.5 m drawdown
- current
- 6 months @ 17 M/d

Salinity

- Fresh Water
- Brackish
- Highly Brackish
- Saline

Geology

- - - Aquifer Boundary
- Coastal Deposits of Quaternary-Tertiary Age

0 10 20 30 40
Kilometres

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Job Title: **TASIAST GOLD MINE EXPANSION PROJECT**

BOREFIELD LOCATION AND RADIUS OF INFLUENCE

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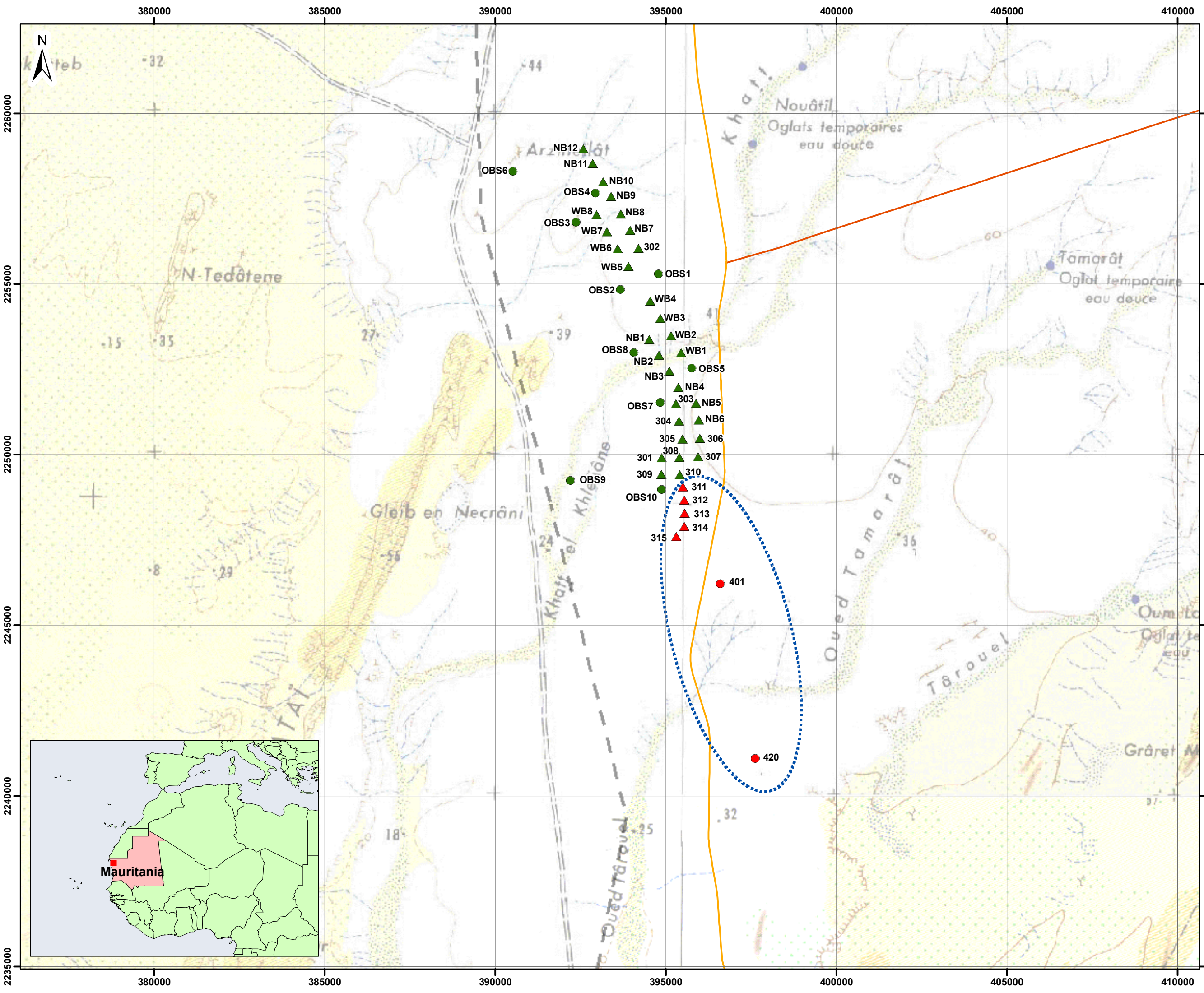
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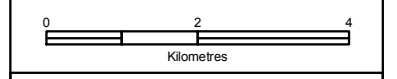
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Drawing Number: **FIGURE 5** Rev



- NOTES**
- Existing Production Boreholes
 - Proposed Production Boreholes ①
 - Observation Boreholes
 - Proposed Observation Boreholes
 - Mine Site Access Road
 - Nouakchott Nouadhibou N2 Highway
 - Parc National Banc d'Arguin

① First 5 water supply wells as indicated. Position of remaining 5 water supply wells and 7 back-up wells to be determined within the general area shown by the dotted line.



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Parc National Banc d'Arguin:
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Revision Details	By	Date	Suffix
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Drawing Status: **FINAL**

Job Title:
**TASIAST GOLD MINE
EXPANSION PROJECT**

Drawing Title:
**TASIAST BOREFIELD
LOCATION**

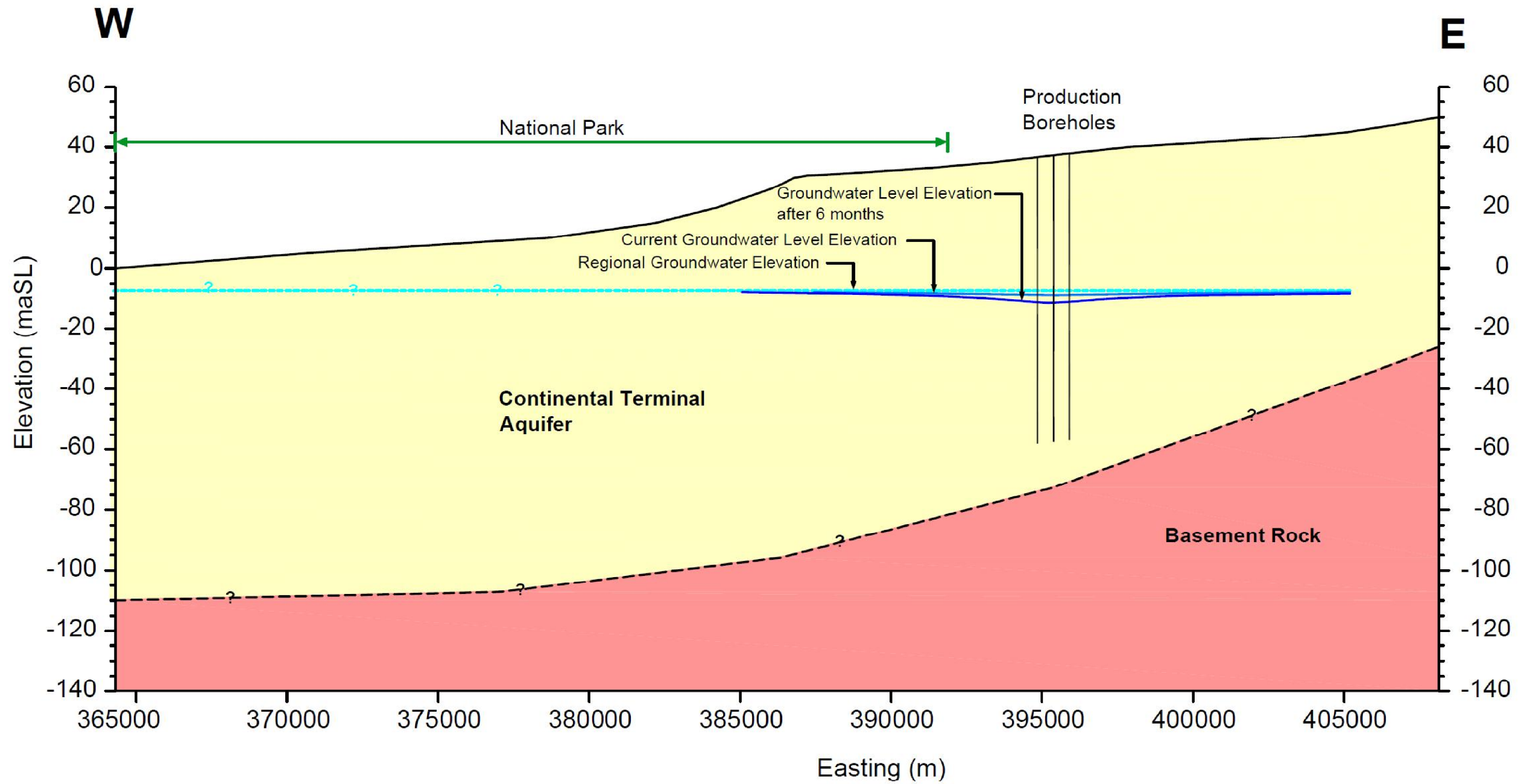
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CROSS SECTION WEST TO EAST AT NORTHING 2550000

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Drawing Status **FINAL**

Job Title
TASIAST GOLD MINE EXPANSION PROJECT

CROSS SECTION AT BOREFIELD

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Drawing Number **FIGURE 7** Rev

Tasiast Gold Mine Expansion Project	Month 0	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Phase 1ai: Construction Period													
Access Road		[Blue bar]											
Borrow Pits		[Blue bar]											
Mobile Crusher		[Blue bar]											
Borefield			[Blue bar]										
Data Communication and Telecommunications Line						[Blue bar]							

NOTES

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Drawing Status **FINAL**

Job Title
**TASIAST GOLD MINE
EXPANSION PROJECT**

**PHASE 1ai
CONSTRUCTION
TIMEFRAMES**

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Drawing Number **FIGURE 8** Rev

Appendix 1 – Phase 1a(i) Environmental Impact Notice Terms of Reference Report



Tasiast Mauritania Limited SA Tasiast Gold Mine Expansion Project

Phase 1a(i): Access Road Upgrade: Access road, Borrow Pits, Temporary Mobile Crusher, Borefield Expansion, and Water Supply Pipeline

Environmental Impact Notice Terms of Reference

Final report 5 May 2011



Prepared for



Tasiast

Revision Schedule

Terms of Reference Phase 1a(i) EIN 5 May 2011

Rev	Date	Details	Prepared by	Reviewed by	Approved by
01	7 February 2011	Draft for approval	Reine Loader Environmental Specialist	Julie Raynor Associate	Russell Foxwell Associate Louise Porteus Technical Director
02	16 February 2011	Draft for Approval	Reine Loader Environmental Specialist	Russell Foxwell Associate	Russell Foxwell Associate
03	25 February 2011	Final	Reine Loader Environmental Specialist	Julie Raynor Associate	Russell Foxwell Associate
04	25 March 2011	Revised Draft for Approval	Reine Loader Environmental Specialist	Louise Porteus Technical Director	Louise Porteus Technical Director
05	5 May 2011	Final	Reine Loader Environmental Specialist	Russell Foxwell Associate	Louise Porteus Technical Director

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Limitations

The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by URS Scott Wilson has not been independently verified by URS Scott Wilson, unless otherwise stated in the Report.

The methodology adopted and the sources of information used by URS Scott Wilson in providing its services are outlined in this Report. The work described in this Report was undertaken between **December 2010** and **March 2011** and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

Where assessments of works or costs identified in this Report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

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List of Abbreviations

Abbreviation	Definition
CIL	Carbon-in-Leach
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EIN	Environmental Impact Notice
EMS	Environmental Management System
HFO	Heavy Fuel Oil
IFC	International Finance Corporation
MLA	Mining License Area
MESD	Delegated Ministry of Environment and Sustainable Development (Ministère du Développement Rural et de l'Environnement Secrétaire d'Etat auprès du Premier Ministre chargé de l'Environnement)
MPEM	Ministry of Petroleum, Energy and Mines (Ministère de l'Énergie, des Mines et des Pétroles)
MWS	Ministry of Water and Sanitation (Ministère de l'Hydraulique et de l'Assainissement)
PCC	Project Coordination Committee
PNBA	Parc National Banc D'Arguin
TMLSA	Tasiast Mauritania Limited SA
tpa	Tonne per annum
tpd	Tonnes per day
ToR	Terms of Reference
TSF	Tailings Storage Facility

1 Introduction

1.1 Background

The Tasiast Gold Mine (the Mine) is an existing gold mine, situated in the Inchiri Wilaya of north western Mauritania. Operations commenced in July 2007, initially under the ownership of Rio Narcea Gold Mines in July 2007 and subsequently following acquisition by Red Back Mining Inc.. On commissioning the Mine had a predicted life of ten years, at a nominal milling rate of 3,200 tpd.

Kinross completed the acquisition of the Tasiast mine on September 17, 2010, as part of its combination with Red Back Mining.

As a result of identifying additional gold resources through ongoing exploration within the mining licence area (MLA), TMLSA plans to expand the Mine's operations through an Expansion Project (the Project).

Refer to Figure 1 for site location.

1.2 The Project

TMLSA has completed a mine scoping study for the Project. The Project is based on a 16 year mine plan (following a three year construction period) and there is potential to further extend the mine life. The Project is anticipated to have a three-year construction period, whilst current mining operations are ongoing, and is expected to be fully commissioned by early 2014. Construction of the proposed infrastructure and ancillary facilities will be phased over this three year period.

The Project proposes to expand operations at the Mine to a nominal milling rate of approximately 70,000 tpd to 80,000 tpd. To achieve this, there will be an expanded open pit, a new mill, new Carbon-in-Leach (CIL) process plant, new Tailings Storage Facility (TSF) (comprising three cells) and new waste rock dumps.

Project power demands, for both construction and operations, will be supplied through additional new power plants and a new fuel farm. An initial new power plant will be installed followed by a second, larger power plant. Existing diesel power facilities at the borefield and intermediate pump station will be expanded. In addition, a separate power plant will be developed to supply power for the proposed sea water extraction and supply system.

Increased water demands will be required for the Project construction and expanded operations. It is proposed that the increased water demand for construction will be met through the temporary (approximately four years) expansion of the borefield. To support this temporary expansion it is proposed that additional wells are developed within and adjacent to the existing borefield and a new water supply pipeline be constructed. To meet the Projects operational water demands it is proposed that a sea water extraction and supply system is developed. In addition new water treatment facilities and water storage ponds will be developed on the existing Mine site.

To improve accessibility to the Mine, it is proposed to both upgrade the existing 60 km access road and to develop a new airstrip. There will also be development of new ancillary facilities such as but not limited to, new accommodation camps, sewage and waste management facilities, new maintenance workshops, new offices and new warehouse facilities.

Kinross has commissioned URS/Scott Wilson to undertake the Environmental Impact Assessment (EIA) requirements for the Project.

1.3 Approach to Permitting

In order to achieve Project commissioning by early 2014, it is necessary to phase the construction works and commence some early preparatory works in 2011. The overall Project has therefore been divided into three Phases, based on the type of works to be carried out (components), construction timing, geographical location, and permitting and environmental assessment requirements. Each Phase will be subject to EIA processes and any cumulative impacts will be assessed and mitigation actions will be incorporated into and implemented via the Mine's existing Environmental Management System (EMS) (Scott Wilson, 2010b).

The Project has also been divided into two distinct areas:

- **On-site:** within the Mine, which comprises the areas of the Mine site, access road and borefield. Existing operations are on-going in this area and the area has experienced a degree of disturbance. As part of permit requirements for the Mine operations, this area has previously been subject to several EIAs (SNC Lavalin, 2004; Scott Wilson, 2008a,b,c,d, 2009a,b, 2010a); and
- **Off-site:** areas outside of the Mine. These areas may or may not be disturbed and have not previously been subject to EIA for Mine related operations.

The proposed Project components for Phase 1a(i) permitting requirements and geographical areas are summarised in Table 1-1 below.

Table 1-1: Phase 1a(i) Project Components

Project Phase	Location	Overview	Permitting Requirement
Phase 1a(i)	On-site	Supporting infrastructure and preliminary upgrades. <ul style="list-style-type: none"> • Access road upgrade • Data communications and telecommunication line • New borrow pits • Temporary mobile crusher • Incremental increase in borefield water extraction • New water supply pipeline 	EIN

¹ The list of project components for Phase 1a(i) is indicative. A comprehensive listing is included within this ToR report. Phase 1a(i) components are detailed in Section 2.3 of this report.

Phase 1a(i) components are classified as Category B developments in line with Mauritanian Decrees No. 2004-094 and No. 2007-105. As such this phase is subject to an Environmental Impact Notice (EIN). The EIN will assess the significance of potential impacts resulting from the components of Phase 1a(i). This Report is relevant to Phase 1a(i) EIN, only.

To introduce the Project and the phased approach to permitting, an initial meeting with Ministries was held in Nouakchott on 13 January 2011. This meeting involved TMLSA - Kinross, URS/Scott Wilson, the Ministry of Petroleum, Energy and Mines (MPEM), the Ministry of Environment and Sustainable Development (MESD) and the Ministry of Water and Sanitation (MWS). During this meeting, a Project Coordination Committee (PCC) was proposed to support the Phased approach to permitting. The PCC is expected to be formed of key Ministry officials and members from TMLSA - Kinross.

1.4 Reporting

The EIN will be prepared and structured in accordance with the requirements of Mauritanian Legislation, in particular, the Environment Code No 2000-045 and Decrees No. 2004-094 and No. 2007-105. It will comprise two reports, namely:

- **Terms of Reference (ToR) Report:** The ToR Report provides an overview of the proposed Phase 1a(i), the environmental issues and the terms of reference for the detailed studies and approach for the EIN; and
- **EIN Report:** The EIN Report will document the assessment process in accordance with the approach set out in the ToR Report.

This Report presents the ToR for Phase 1a(i) EIN.

In addition to Mauritanian legislation, the EIN is also being undertaken to the World Bank Group's International Finance Corporation (IFC) Performance Standards, it's supporting applicable IFC Environment Health and Safety (EHS) Guidelines and other general international industry best practice.

2 The Project

2.1 Existing Operations

The Mine is situated in the Inchiri Wilaya of north western Mauritania, approximately 300 km north of Nouakchott, 250 km southeast of Nouâdhibou and 65 km east of Parc National Banc D'Arguin (PNBA) (see Figure 1). Water is supplied to the Mine via two pipelines from the borefield located 60 km to the west of the Mine. Access to the Mine from the main Nouakchott–Nouâdhibou N2 highway is via a 60 km two-lane unsealed road (see Figure 2)

Currently the Mine covers an area of approximately 700 ha. It comprises a series of open pits, two TSFs (TSF 1 being decommissioned and TSF 2 is operational), dump leach facilities, a CIL process plant, waste rock dumps and several supporting ancillary facilities. These facilities include a power plant fuelled by HFO, workshops, laboratory, offices and a light aircraft air strip. Employees are accommodated on-site in a mine camp.

Two conventional process streams are currently utilised for gold extraction. High grade ore is crushed and treated in the CIL plant while low grade ore is treated using the dump leach facilities. Currently the Mine operates at nominal milling rate of up to 9,000 tpd and has an operating life of ten years.

2.2 Project Terminology

The Project comprises all the components required for the expansion of Mine operations to achieve a nominal milling rate of approximately 70,000 to 80,000 tpd.

The terminology to be used to assess the Project is summarised in Table 2-1.

Table 2-1: Terminology for the Project

Terminology	Components
Access Road	60 km existing two-lane unsealed road, which connects the main Nouakchott–Nouâdhibou road to the Mine.
Borefield	The borefield, located 60 km to the west of the Mine, includes 28 abstraction and 8 observation boreholes and is connected to the Mine site via two pipelines which supply the Mine's operational and potable water requirements.
Mine site	The area where all mining and processing operations take place together with the associated infrastructure such as equipment, maintenance workshops, power supply, office buildings, and other supporting facilities such as, but not limited to, accommodation facilities and the air strip.
Mine	The Mine site, access road and borefield.
On-site	Within the Mine (which comprises the areas of the Mine site, access road and borefield).
Off-site	Outside of the Mine.
Project	Expansion of the Mine's operations and on-site and off-site infrastructure.

2.3 Phase 1a(i) Project Components

Phase 1a(i) involves the following components to support the expansion of the Mine (See Figure 2):

- **Upgrade of existing access road:** it is proposed to hard surface the existing unsealed 60 km access road from the main highway to the Mine site. The base of the access road will initially be upgraded and treated with a dust suppressant during the Project construction period. Following Project construction, the road will be hard surfaced with asphalt. In addition, a telecommunications line will be buried in or adjacent to the access road. The access road upgrade will occur within or adjacent to the existing access road and water delivery pipeline footprint;
- **New borrow pits for aggregate:** in order to upgrade the access road and enable Mine construction works it is proposed that new borrow pits will be located either within or adjacent to the existing access road and water delivery pipeline route footprint or within the Mine site. Alternatively, Mine waste rock may also be utilised as an aggregate source;
- **Temporary mobile crusher;** in order to meet construction specifications for aggregates, a temporary mobile crusher will be utilized to crush borrow pit or Mine waste materials;
- **Borefield expansion:** it is proposed to incrementally increase the water supply by up to 3,000m³ per day. This increase is expected to come from, and adjacent to, the existing borefield (currently licensed for 14,000 m³ per day). The water is required to provide water for the access road upgrade and other short term construction activities. To facilitate the incremental increase from the borefield it is proposed that approximately ten additional water supply wells, additional observation boreholes and necessary portable power supply be constructed. In addition, it is proposed that approximately seven additional water supply wells be constructed and used for back up water supply purposes when other water supply wells require maintenance, rehabilitation, or replacement; and
- **New water supply pipeline and pump station:** in order to supply the increased water requirements for the access road upgrade and other short term construction activities, it is proposed to construct a new water supply pipeline, adjacent to the existing pipelines, from the borefield to the Mine site. The existing pipelines comprise one 400mm pipeline and one 500mm pipeline, which are; at maximum capacity; experiencing leakages; and requiring significant ongoing maintenance. The new water supply pipeline will comprise one additional 500mm pipeline (approximately), which will replace the existing 400mm pipeline. This will enable the 400mm will be closed for repairs, pending the outcome of a future application for water abstraction. Future water requirements for both operational and construction water consumption will be provided to the Ministry.

3 Environmental and Social Setting

3.1 Introduction

This Section presents a brief overview of the current environmental and social conditions of the Inchiri Wilaya, in which the existing Mine (including the Phase 1a(i) Project components) is located. These conditions will be described in more detail in the EIN and used as the baseline against which potential impacts will be assessed and monitored.

3.2 Environmental Setting

The Mine is located in an arid region. Data derived from the Akjoujt meteorological station, located 150 km southeast of the Project, for the period between 1995 and 2005; indicate that the average annual rainfall is 84mm (Service de la Météorologie, 2009). Prevailing winds are from the north and east, with westerly winds during July and August. Average temperatures for Akjoujt are between 22.3°C (minimum) and 36.3°C (maximum) (Service de la Météorologie, 2009).

The Project is located within the “Aouéouat” sector, and is entirely composed of crystalline and metamorphic rocks from the Precambrian period characterized by their low permeability. The rocky substrata are composed of slightly fractured Archean rocks on which there is a thin layer of sand and laterite (Scott Wilson 2010a). The arid climate and underlying geology of the region give rise to a topography characterised by sand dunes, plains and rocky outcrops. The soils in the Project area are characterized by gravelly soils, and dry, sandy desert soils.

There are no permanent watercourses in the vicinity of the Mine. However, the Project area is crossed by a number of Wadi systems that only flow for a few days per year following heavy rainfall, notably Khatt Ataoui, Khatt el Khleijane and Echrak Wadis (Scott Wilson 2010a). The Khatt Ataoui Wadi is located approximately 6 km west of the Mine site (Scott Wilson 2010a). The Khatt el Khleijane Wadi is located south of the borefield and Echrak Wadi is located north of the borefield. The Mine site is located in an area of Precambrian base rock with a low permeability and aquifer potential. A number of hydrogeological exploration campaigns were undertaken at the Mine site, which determined that groundwater is located between 40 and 60 m below the surface (Scott Wilson 2010a). However water quality analysis indicates that this water is highly saline with high concentrations of chloride, sulphate and heavy metals making it generally unsuitable for industrial or potable use.

Mauritanian vegetation is essentially distributed according to climatic and geomorphological conditions. The Mine is located in the Saharan zone, the predominant ecological area in Mauritania, where flora is very scarce and is mainly colonised by *Zygophyllum album*, along with *Maerua crassifolia* (atil) and *Asistida pungens* (sbot). Acacias are also present along many of the Wadis. There are no forests in the area. Jackals, fennec foxes and zorille foxes have been recorded as being present in the vicinity. Although vegetation is sparse, previous surveys have identified the presence of three nationally protected tree species, on site.

3.3 Socio-Economic Setting

The Mine is remotely situated approximately 300 km north of Nouakchott, 250 km southeast of Nouâdhibou and 65 km east of PNBA (see Figure 1). There are no formal settlements in the vicinity the Mine. The nearest industries are in the towns of Boulanour, Akjoujt and Bennichab, which are located approximately 100 km northwest, east southeast and southeast from the Mine respectively. Bennichab has a water bottling operation, whilst the Guelb Moghreïn Copper/Gold mine is located near Akjoujt.

A number of isolated families have set up temporary structures and inhabit the area surrounding the Mine. Similarly, approximately 1 km east of the borefield, a few families have set up temporary structures and market stalls at the junction of the Mine access road and the main Nouakchott-Nouâdhibou road.

The nomadic way of life is a feature of Mauritanian culture, whilst this way of life is in decline there are a number of nomadic people located within the vicinity of the Mine.

3.4 Archaeology Setting

The Mine site contains a few historic Muslim tombs which are protected by national/Islamic law and customary practice. None of the archaeological sites identified are considered to be rare, and none have been designated according local, national or international standards in terms of their outstanding social, aesthetic, community or scientific value.

4 Environmental Scope of Work

4.1 Approach to Assessment

An assessment of the environmental and social impacts associated with the Phase 1a(i) will be undertaken as part of the EIN. This assessment will address potential impacts from construction, operation and closure. Potential receptors of impacts will be identified from baseline data, with an assessment of the significance of potential impacts on these receptors.

Extensive baseline data, including both primary and secondary data, was gathered for the initial permitting (SNC Lavalin, 2004) and has been updated through additional EIAs (Scott Wilson, 2008a,b,c, 2009a,b, 2010a). This information will be updated where necessary, and supplemented by the commissioning of additional baseline studies.

This ToR report has been developed based on these existing data, URS/Scott Wilson's extensive knowledge of the area and a scoping visit undertaken in December 2010. This information will be further supported by validation baseline surveys. The following baseline surveys have been undertaken (February 2011) for Phase 1a(i):

- Archaeology; and
- Ecology.

The findings of the baseline studies will be incorporated into the Phase 1a(i) EIN.

As noted in Section 1.4, this assessment will be undertaken in line with the relevant Mauritanian legislation and World Bank Group's IFC Performance Standards; it's supporting applicable IFC EHS Guidelines and other general international industry best practice. As such the approach will include:

- Gathering of available environmental and social baseline data;
- Analysis of the proposed development and alternatives with regard to potential impacts and risks during construction, operation and closure;
- Identification of environmental mitigation strategy;
- Prediction and assessment of impacts of the mitigated Project in terms of their magnitude, significance and duration; and
- Collation of the above information into the EIN report.

The EIN process is iterative and will be undertaken in tandem with the Project design.

4.2 Report Structure

The EIN report will be prepared in line with Annex II of Decree No. 2007 – 105 and will document the assessment process in accordance with the approach set out in the ToR report. The proposed EIN contents are as follows:

1. Executive summary
2. Legislation, legal and institutional framework
3. Description of the project
4. Baseline conditions
5. Impacts assessment
6. Analysis of alternatives
7. Public Consultation
8. Timeline
9. References

5 Environmental Impacts

As the Project components being assessed in this EIN for Phase 1a(i) are all within the Mine and do not result in any amendments to operational activities, the potential for significant environmental or social impacts is anticipated to be limited.

A summary of the potential sources of environmental and social impacts relating to the Phase 1a(i) are listed in Table 5-1 below.

The EIN will further assess these sources, their impacts and propose mitigation where appropriate using standard methods of assessment and terminology.

It is intended that **all** environmental parameters are documented in the EIN but only potentially significant impacts arising from the proposed Project will be examined in detail.

Table 5-1: Phase 1a(i) Potential Environmental and Social Impacts

Parameter	Potential Source
Air Quality	Dust generation cause by construction vehicles and construction activities.
	Production of CO ₂ , NO ₂ and SO ₂ from vehicles during construction.
Noise and Vibration	Noise and vibration from vehicles and plant during construction.
Soils and Land Use	Soil erosion cause by stripping for the borrow pits.
	Soil contamination from oils and hazardous chemicals for the borrow pits, and borefield expansion.
Water Resources and Quality	Contamination of groundwater cause by spillage of oils and hazardous chemicals during construction of water supply wells.
	Impact of increased draw down on existing borefield.
Flora and Fauna	Clearance of vegetation and loss of habitat for the borrow pits
Socio-Economic	Direct and indirect contribution to Mauritania's economy.
Archaeology and Cultural Heritage	Damage or loss of archaeological sites for the borrow pits and water pipeline.
Waste Management	Increased waste production (domestic and hazardous) due to construction activities.
Health and Safety	Effects on health due to increased noise, dust and vibration during construction activities.
	Accidents with vehicles due to increased traffic during construction.

6 Consultation

Previous and ongoing consultation has been undertaken for the Mine in general and reported in previous EIAs (SNC Lavalin, 2004; Scott Wilson, 2008a,b,c,d, 2009a,b, 2010a).

Consultation shall be undertaken as part of the Project. The process was initiated in January 2011 when introductory meetings were undertaken with the MPEM, MESD and MWS (see Section 1.3).

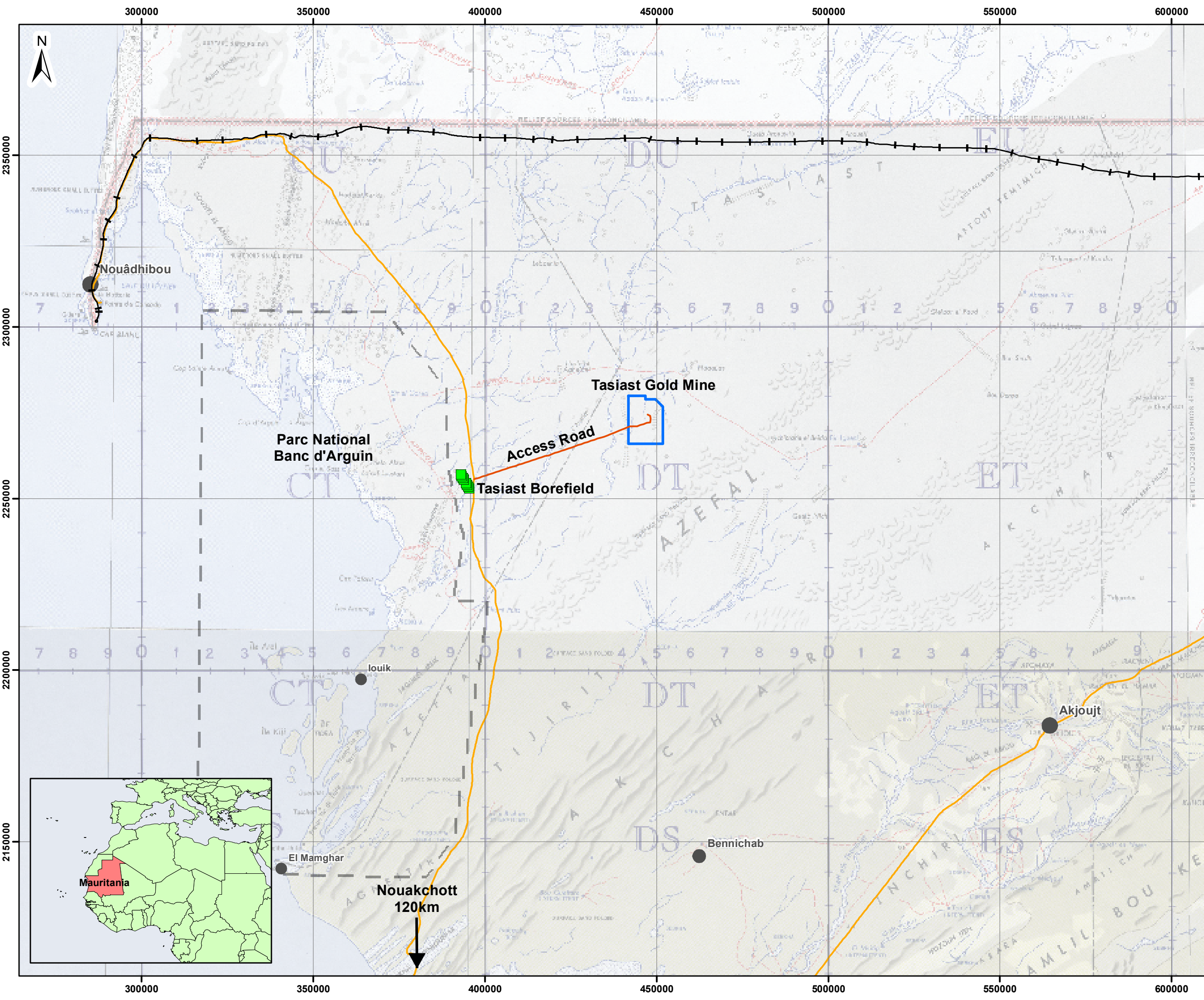
In addition, to facilitate open and transparent communications regarding the Project, a PCC has been proposed to ensure that information exchange regarding permitting is transparent and timely. The Project permitting professionals will also engage and collaborate with Ministries and other key stakeholders throughout the process.

A site visit was carried out to inspect the areas proposed for construction of the Phase1a(i) components, between 21-23 April 2011 by representatives of MESD and MPEM.

7 References

- Scott Wilson, 2010a. *Tasiast Gold Mine, West Branch Development Environmental Impact Assessment*, Reference D126101.
- Scott Wilson, 2010b. *Framework Environmental Management System, Specific plans and procedures include Environmental Programme SGDE01 and Environmental Monitoring Plan SGDE04*, Reference D128137
- Scott Wilson, 2010c. *Tasiast Gold Mine, Preliminary Environmental and Social Appraisal*, Reference D134261.
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- Scott Wilson, 2008b. *Tasiast Gold Project, Environmental Impact Study, Addendum II of IV, Environmental Impact Review*, Reference D116554/R17929.
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- Scott Wilson, 2008d. *Tasiast Gold Project, Environmental Impact Study, Addendum IV of IV Preliminary Rehabilitation and Closure Plan*.
- Service de la Météorologie, 2009. Climatologie: Evolution des hauteurs annuelles de pluies, available at Office de National Statistics : www.ons.mr (Accessed 02/02/11)
- SNC Lavalin, 2004. *The Tasiast Gold Project Environmental Impact Study*.

Figures



NOTES

- Tasiast Borefield
- Tasiast Gold Mine
- Mine Site Access Road
- Railroad
- Nouakchott
- Nouadhibou N2 Highway
- Parc National Banc d'Arguin

0 10 20 30 40
Kilometres

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Parc National Banc d'Arguin:
Ministry of the environment and sustainable development

Revision Details			
By	Check	Date	Suffix

Drawing Status: **FINAL**

Job Title: **TASIAST GOLD MINE EXPANSION PROJECT**

Drawing Title: **SITE LOCATION PLAN**

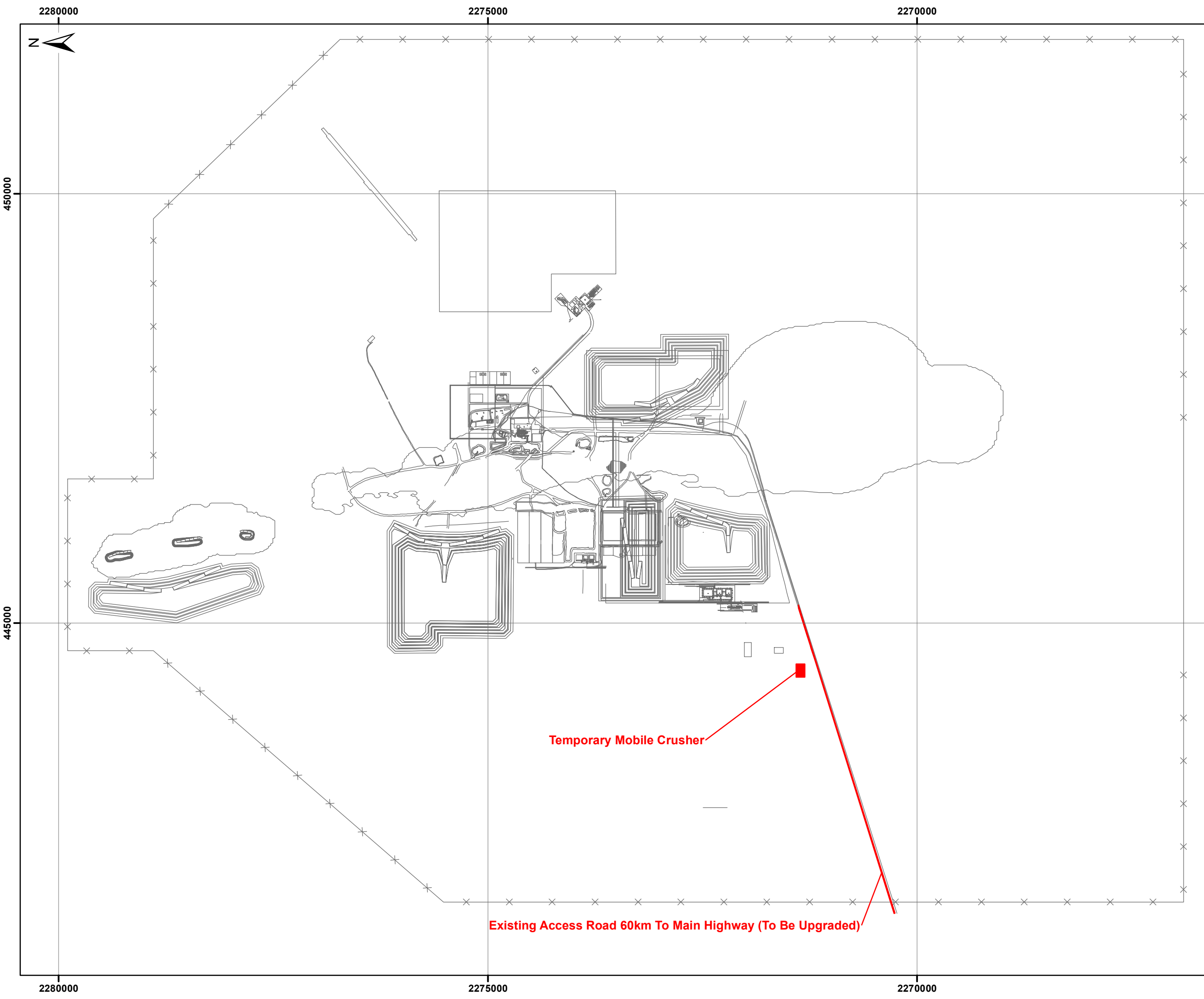
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Stage 1 check		Stage 2 check	
Originated		Date	02.03.11

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Drawing Number: **FIGURE 1** Rev



- NOTES
- Phase 1ai Project Components
 - Existing Mine Site Layout
 - ×× Fenceline



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Revision Details	By	Date	Suffix

Drawing Status
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Job Title
**TASIAST GOLD MINE
EXPANSION PROJECT**

Drawing Title
PHASE 1ai SITE LAYOUT

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FIGURE 2

Appendix 2 – Noise Impact Assessment

Noise Impact Assessment

Table 1 below outlines potential levels of noise impacts for pieces of equipment which would be utilised in construction and operation.

Sound power levels for each piece of equipment have been sourced from BS 5228 'Control of noise on construction and open sites'.

Table 1: Control of noise on construction and open sites

Construction Activity	Plant	Sound Power Level LW dB(A)	No. of Plant	Overall LW dB(A)	On-time (% of hour)	Reference
Site Clearance	Chainsaw	114	1	114	10	BS 5228 Table D.2 no. 14
	Dozer	108	1	108	50	BS 5228 Table C.2 ave no.'s 10-13
	Dumper	111	1	111	50	BS 5228 Table C.2 ave no.'s 30-31
	Scraper	110	1	110	50	BS 5228 Table D.9 no. 14
	Loading lorries	106	1	106	83	BS 5228 Table C.2 ave no.'s 26-28
Earthworks	Excavator (tracked)	110	1	110	83	BS 5228 Table D.3 ave no.'s 34-40
	Dumper	111	1	111	50	BS 5228 Table C.2 ave no.'s 30-31
	Dozer	108	1	108	50	BS 5228 Table C.2 ave no.'s 10-13
	Lorries/hr	105	6	113	83	BS 5228 Table D.7 ave no.'s 121-122
Excavations and foundations	Excavator (tracked)	110	1	110	83	BS 5228 Table D.3 ave no.'s 34-40
	Loader (tracked)	112	1	112	50	BS 5228 Table D.3 ave no.'s 7-21
	Lorry	105	1	105	50	BS 5228 Table D.7 ave no.'s 121-122
	Cement mixer truck	105	1	105	50	BS 5228 Table C.4 ave no.'s 18 & 20
	Concrete pump	107	1	107	50	BS 5228 Table D.6 ave no.'s 34 & 36
	Compressor	104	3	109	83	BS 5228 Table D.7 ave no.'s 18-22
	Poker vibrator	98	3	104	83	BS 5228 Table D.6 no. 40
Slab Construction	Cement mixer truck	105	1	105	50	BS 5228 Table C.4 ave no.'s 18 & 20
	Concrete pump	107	1	107	50	BS 5228 Table D.6 ave no.'s 34 & 36
	Compressor	104	3	109	83	BS 5228 Table D.7 ave no.'s 18-22

Construction Activity	Plant	Sound Power Level LW dB(A)	No. of Plant	Overall LW dB(A)	On-time (% of hour)	Reference
	Poker vibrator	98	3	104	83	BS 5228 Table D.6 no. 40
Steelwork Construction	Crane	106	1	106	50	BS 5228 Table C.4 no. 38
	Generator	102	1	102	50	BS 5228 Table C.4 no. 32
	Electric drills	104	2	107	33	BS 5228 Table D.6 no. 54
	Metal cutter	107	2	110	33	BS 5228 Table C.1 no. 18
	Electric bolter	104	2	107	33	BS 5228 Table D.6 no. 54
	Lorries/hr	105	6	113	50	BS 5228 Table D.7 ave no.'s 121-122
Finishing and Fitting	Generator	94	6	102	33	BS 5228 Table C.4 no. 85
	Welding plant	102	1	102	33	BS 5228 Table C.3 no. 31
	Electric drills	104	2	107	33	BS 5228 Table D.6 no. 54
	Lorries/hr	105	6	113	33	BS 5228 Table D.7 ave no.'s 121-122
Road Construction	Road roller	108	1	108	83	BS 5228 Table C.5 no. 19
	Excavator (tracked)	110	1	110	83	BS 5228 Table D.3 ave no.'s 34-40
	Dumper	101	1	101	83	BS 5228 Table D.7 ave no.'s 81-92
	Asphalt spreader	110	1	110	83	BS 5228 Table D.8 no. 21
Aggregates Crusher	Dozer	113	1	113	83	BS 5228 Table D.3 ave no.'s 65-67
	Crusher	115	1	115	83	Scott Wilson Internal

CONSTRUCTION NOISE ASSESSMENT

Access Road Upgrade

The nearest sensitive receptor to the access road is the new office facilities. These are located approximately 265 m to the north of the access road. Noise levels from upgrading the access road at these offices, if in use while the access road is being upgraded, are likely to be in the region of 56-59 dB $L_{Aeq,1h}$. Internal noise levels, assuming the façade will provide 30 dB attenuation, will be between 36-39 dB L_{Aeq} which meet the BS 8233 guideline levels for offices. As external noise levels are below the 70 L_{Aeq} dB limit for offices, the significance of the impact is assessed as negligible.

The nearest residential receptors (at the existing accommodation camp) are located approximately 4200 m from the access road and therefore noise levels from the road upgrade will be below 37 dB, with internal noise levels falling below 10 dB. These construction activities are therefore likely to be inaudible. As external noise levels are below the 45 dB L_{Aeq} limit for rooms to be used for resting and sleeping, the significance of the impact is assessed as negligible.

Borehole Expansion

Expansion of the number of boreholes is required at the borefield site located 60 km from the main mine site. As no sensitive receptors are located within approximately 1 km of the borefield site, it is highly unlikely that any significant noise impact will occur. The significance of the impact is assessed as negligible.

New Water Supply Pipeline

The new water supply pipeline is to be located alongside the access road. The closest sensitive receptors to the pipeline will be the new office facilities if occupied, located approximately 265 m away. Noise levels from the construction of the new pipeline have been predicted to be in the region of 60-64 dB $L_{Aeq,1h}$. This would result in internal noise levels of between 30-34 dB L_{Aeq} , which meet the BS 8233 internal noise level criteria for offices. The construction of the pump station associated with the new pipeline is unlikely to result in any significant noise impact due to being in a remote location with no sensitive receptors in the vicinity. The significance of the impact is assessed as negligible.

Borrow Pits

In order to upgrade the access road it is proposed that new borrow pits are excavated. It has been assumed that these will be located to the south of the access road. The nearest sensitive receptors to the borrow pits will be the new office facilities, if occupied, located approximately 400 m to the north. Noise levels in the region of 58 dB $L_{Aeq,1h}$ have been predicted, resulting in internal noise levels of 28 dB L_{Aeq} within the offices. As external noise levels are below the 70 dB L_{Aeq} limit for offices, the significance of the impact is assessed as negligible.

Mobile Crusher

A mobile crusher will be used on the site to crush material extracted from the borrow pits or mine waste materials. It is anticipated that the mobile crusher will be located approximately 165 m from the nearest sensitive receptors, those being the new office facilities if occupied. Noise levels from the crusher are likely to be in the region of 65-68 dB $L_{Aeq, 1h}$ and internal noise levels of between 35-38 dB L_{Aeq} . As external noise levels are below the 70 dB L_{Aeq} limit for offices, the significance of the impact is assessed as negligible.

OPERATIONAL NOISE ASSESSMENT

Access Road Upgrade

The nearest sensitive receptor to the access road is the proposed new office facilities. These are located approximately 265 m to the north of the access road. Noise levels at these offices resulting from operational traffic on the access road will be significantly less than the 70 dB L_{Aeq} limit (2 HGV passing by on the access road every minute would result in a noise level less than 60 dB $L_{Aeq,1\text{ hour}}$). The significance of the impact is assessed as negligible.

The nearest residential accommodation (at the existing accommodation camp) is located approximately 4200 m from the access road and therefore noise levels resulting from operational traffic on the access road will be significantly less than the 45 dB L_{Aeq} limit. The significance of the effect is assessed as negligible.

Borrow Pits for Aggregate

The exact location of the borrow pits is not finalised although it is likely that they will be located as near as feasible to the new access road.

Assuming a reasonable worst-case location, the nearest sensitive receptor to the borrow pits is the proposed new office facilities at a distance of approximately 410 m. Noise levels at these offices resulting from working the borrow pits should be significantly less than the 70 dB L_{Aeq} limit. The significance of the effect is assessed as negligible.

The nearest residential accommodation (at the existing accommodation camp) is located approximately 3200 m from the borrow pits and therefore noise levels resulting from working the borrow pits should be significantly less than the 45 dB L_{Aeq} limit. The significance of the effect is assessed as negligible.

Temporary Mobile Crusher

The nearest sensitive receptor to the temporary mobile crusher is the proposed new office facilities. These are located approximately 165 m to the north east of the crusher. Noise levels at these offices resulting from crusher operation will be in the region of 65 dB L_{Aeq} . This is below the 70 dB L_{Aeq} limit and the significance of the effect is assessed as negligible.

The employment of pre-crushed and crushed material as a barrier around the crusher will reduce noise levels even further.

The nearest residential accommodation (at the existing accommodation camp) is located approximately 4200 m from the temporary crusher and therefore noise levels resulting from crusher operation will be significantly less than the 45 dB L_{Aeq} limit. The significance of the effect is assessed as negligible.

Borefield Expansion

There are office facilities located at the borefield. Noise levels to these offices resulting from the expanded borefield should be well below the 70 dB L_{Aeq} limit and the significance of the effect is assessed as negligible.

A few families have set up temporary structures and market stalls at the junction of the mine access road and the main Nouakchott-Nouadhibou road, 1 kilometre to the east of the borefield. Noise levels to this settlement resulting from the expanded borefield should be well below the 45 dB L_{Aeq} limit and the significance of the effect is assessed as negligible.

Water Supply Pipeline and Pumping Station

Once operational, there will be negligible noise emissions from the water supply pipeline. The intermediate pumping station may emit significant noise. However, there are no sensitive receptors within 30 km and the significance of the effect is assessed as negligible.