

Yerevan 2 CC Power Plant ArmPower CJSC

Environmental and Social Impact Assessment – Final Draft



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Acronyms and Abbreviations

ADB	Asian Development Bank
ADC	Air Dispersion Calculation
CCPP	Combined Cycle Power Plant
CEMS	Continuous Emissions Monitoring System
CJSC	Closed Joint Stock Company
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement, Construction
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GIIP	Good International Industry Practice
GLC	Ground Level Concentration
GT	Gas Turbine
GRM	Grievance Redress Mechanism
HHV	Higher Heating Value
HRSG	Heat Recovery Steam Generator
HSE	Health Safety and Environment
HSEMP	Health, Safety and Environment Management Plan
HSEMS	Health, Safety, and Environment Management System
IBA	Important Bird and Biodiversity Area
IFC	International Financing Corporation
IFIs	International Financing Institutions
ILO	International Labor Organization
kV	Kilo Volt
LHV	Lower Heating Value
MNP	Ministry of Nature Protection
MOE	Ministry of Energy and Natural Resources of RA
MPC	Maximum Permissible Concentration
MW	Mega Watt
NGO	Non-Governmental Organization
NPS	Noise Propagation Study
PAP	Project Affected People
PCB	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
PS	Performance Standards
RA	Republic of Armenia
SEP	Stakeholder Engagement Plan
SNCO	State Non-Commercial Organization
ST	Steam Turbine
UHC	Unburned Hydrocarbons
USD	US Dollar
WHO	World Health Organization

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Executive Summary

Project Background and Objectives

The Ministry of Energy (MOE) of the Republic of Armenia plans to improve the total output capacity of its electric energy production, complementing the power units of the existing Yerevan Combined Cycle Thermal Power Plant (YCCPP-1) with a modern and efficient power plant. For this reason a new gas fired Combined Cycle Power Plant of 254 MWe (YCCPP-2) is planned to be built at the site next to the existing YCCPP-1.

To obtain financing from the International Financing Corporation (IFC) and the Asian Development Bank (ADB), a bankable Environmental and Social Impact Assessment (ESIA) Report regarding the YCCPP-2 (“the Project”) on the basis of the relevant IFC/World Bank Group’s guidelines and the ADB Safeguard Policy Statement has to be delivered to the financing institutions for review and approval.

The new CCPP will include a Gas Turbine (GT), a Steam Turbine (ST), a Heat Recovery Steam Generator (HRSG), and all auxiliary equipment and systems that, at local conditions with an ambient temperature of 15°C, will produce 254 MW. Interconnections to gas, water and electrical grid are already planned. The new CCPP shall be connected with the facilities of the existing grid infrastructure.

Along with a rapidly growing economy and a rising population, power demand in Armenia is constantly increasing. The main objective of the construction of YCCPP-2 is to:

- Improve the total output capacity of electric energy production;
- Provide reliable power supply;
- Shift the financial burden for power generation from the government to the private sector;
- Promote commercial development of thermal technology and cost reduction that enables Armenia to become a major net exporter of electricity; and
- Build and sustain local capacity in the development and maintenance of power generation infrastructure.

Objectives and Methodology of the ESIA Study

On the basis of the existing environmental situation and the technical planning of the power plant, FICHTNER determined and evaluated the environmental and social impacts during construction, operation, and decommissioning of the planned YCCPP-2. The impact assessment focused on the relevant aspects of the biological, physical and social environment of the Project. In a second step appropriate measures were considered to avoid, minimize, mitigate and offset any adverse impacts and to monitor their implementation.

After public disclosure of the ESIA, including the ESMP, public consultations will be executed in order to seek feedback and concerns of stakeholders and people possibly affected by the Project. A Stakeholder Engagement Plan has also been prepared as part of this ESIA study.

A general overview about biophysical settings has been done based on a desktop study, including existing studies about the Project and on field surveys. The first field survey was conducted by FICHTNER's environmental and social experts in July 2017, visiting the proposed CCPP site. Other surveys have been undertaken consisting of sampling of air, soil and groundwater at the site and its surroundings. The environmental and social impacts of the Project are predicted in relation to environmental and social receptors and natural resources. This is accomplished by comparing baseline conditions with situations ensuing when the Project is implemented. Additional information was gained by consultations of representatives of governmental and non-governmental organizations. New campaigns for monitoring of surface water, groundwater and soil quality are being presently undertaken with the objective to deepen the knowledge about the existing pollution levels in the area. The results will be added to the final ESIA Report.

To obtain up-to-date data about the ground level concentrations (GLC) of air pollutants in the Project Area of Influence, and help defining the airshed as degraded or non-degraded (according to the WB EHS Guidelines), FICHTNER undertook air quality monitoring campaigns in summer and autumn 2017, including the measurement of SO₂, NO₂ and PM₁₀. This monitoring campaign will be repeated next winter and spring in order to cover all seasons of an annual cycle. The results will be used as an input for a new simulation and an updated Air Dispersion Calculation report.

To obtain data about the existing noise levels in the Project Area of Influence, FICHTNER undertook a noise monitoring campaign in an area around the YCCPP-2 site at five monitoring points. The results were used as an input for a Noise Propagation Study report.

Due to the fact that there is no official international consensus on an agreed approach for assessing the significance of impacts on the environment, FICHTNER uses an own evaluation procedure. This transparent evaluation procedure is based upon FICHTNER's extensive experience over the last fifteen years in performing Environmental and Social Impact Assessments and has proven to be a reliable method for assessing a project's impacts on the environment. It includes identification, prediction and evaluation of the significance of impacts based on IFC/WB guidelines and ADB Safeguard Policy Statement, as well as national legal requirements. Wherever possible, impacts are quantified. The focus of the used evaluation procedure is to decide whether the Project is likely to cause significant adverse environmental effects resulting from construction, operation, and decommissioning.

Policy, Legal and Administrative Framework

National Requirements

The planned implementation of any activity in Armenia that may cause environmental impacts needs a positive conclusion of an EIA expertise. All environmental impacts of planned physical activities or sectoral/ regional development plans/ programs have to be assessed during the EIA preparation period. The **RA Law on Environmental Assessment and Expertise** of 2014 stipulates provisions regarding environmental impact assessment, realization and terms, thus being the most important national law for carrying out the EIA. National Environmental Project approval from Ministry of Nature Protection has been given in July 2017 based on national EIA and geological reports. The national law requires an EIA, while the present draft report is about ESIA, as the Law on the Environmental Impact Assessment and Expertise does require coverage of social aspects of a proposed activity.

International Agreements

Armenia has ratified a number of international agreements and conventions relating to the protection of the environment and biodiversity as there are among others:

- The Convention on the Conservation of European Wildlife and Natural Habitats (Bern)
- Convention on Wetlands of International Importance (Ramsar)
- Conservation of Migratory Species of Wild Animals (Bonn)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington)
- European Landscape Convention (Florence)
- Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris)
- Convention on Biological Diversity (Rio de Janeiro).
- Framework Convention on Climate Change (Rio de Janeiro)
- Kyoto Protocol (linked to the Convention on Climate Change)
- Paris Agreement (linked to the Convention on Climate Change)

With respect to handling of hazardous substances, the Government of the Republic of Armenia ratified the Stockholm Convention and is a party of the Basel Convention. In addition, an important, environmentally relevant international agreement to which Armenia is a signatory is the Aarhus Convention on access to information, public participation in decision-making and access to justice in environmental matters.

International Requirements

According to IFC's Sustainability Framework (2012) the Project falls into environmental **Category A**. In accordance with ADB Safeguard Policy Statement (2009) the project is categorized as **Category A** for environment, Category C for Involuntary Resettlement and Category C for Indigenous Peoples. This categorization requires preparation of an ESIA study. ADB and IFC define that ESIA shall be conducted in line with national laws and regulations as well as in line with international environmental and social safeguard standards. From the policies, the following are highlighted as of importance for the present ESIA:

- IFC Performance Standards on Social and Environmental Sustainability (2012)
- IFC/ WB Environmental, Health and Safety (EHS) Guidelines (2007)
- ADB Safeguard Policy Statement (2009).

The specific IFC/World Bank Group guidelines applicable to this Project are the following:

- IFC/World Bank Group General EHS Guidelines (2007)
- IFC/World Bank Group EHS Guidelines for Electric Power Transmission and Distribution (2007)
- IFC/World Bank Group EHS Guidelines for Thermal Power Plants (2008)

The IFC Performance Standards (PS) triggered by the Project are given in the table below.

IFC Performance Standards triggered by the Project

IFC PS	Name of PS	Triggered by the Project?
PS 1	Assessment and Management of Environmental and Social Risks and Impacts	yes
PS 2	Labor and Working Conditions	yes
PS 3	Resource Efficiency and Pollution Prevention	yes
PS 4	Community Health, Safety, and Security	yes
PS 5	Land Acquisition and Involuntary Resettlement	no
PS 6	Biodiversity Conservation and Sustainable Management of Living Natural Resources	yes
PS 7	Indigenous Peoples	no
PS 8	Cultural Heritage	(yes)*

* In case of chance finds

ADB's Safeguard Policy Statement (SPS) (2009) sets out the policy objectives, scope and triggers, and principles for three key safeguard areas: environmental safeguards (triggered by the Project), involuntary resettlement safeguards, and Indigenous Peoples safeguards.

Detailed guidance on environmental and social management of the Project, as well as on ESIA and ESMP preparation is provided in ADB's Safeguards Requirements 1 to 3 in appendices 1 to 3 of ADB's SPS. An EIA report includes the following major elements: (i) executive summary, (ii) policy, legal and administrative framework, (iii) description of the project, (iv) description of the environment (with comprehensive baseline data), (v) anticipated environmental impacts and mitigation measures, (vi) analysis of alternatives, (vii) environmental management plan(s), (viii) consultation and information disclosure, (ix) grievance redress mechanism, and (x) conclusion and recommendations.

Gap Analysis regarding national and International Legislation

The legal framework of the Republic of Armenia does in the essence correspond with the international regulations and safeguards. Gaps however do exist in enforcement of the regulations. There is still a considerable lack of institutional capacities for implementation, monitoring and evaluation.

Project Description

The new YCCPP-2 will consist of a gas turbine with generator (GTG), a Heat Recovery Steam Generator (HRSG), and a steam turbine with generator (STG) which will be installed in a new West East shaft centerline, and related auxiliaries.

The Gross Power output at Design Conditions and 'Base Load' operation mode of the combined cycle (GT Gross Power output + ST Gross Power output), is:

- Guaranteed Gross Power Output: 254 MW (at design conditions)
- Gross Heat Rate (based on LHV: 47,479 kJ/kg): 6,438 kJ/kWh
- Efficiency: 55.91%

The new power plant will be designed for full power generation mode, but will also be capable to run at partial load operation. The design life for YCCPP-2 is set to 20 years.

Interconnections to gas, water and electrical grid are planned. The new CCPP shall be connected with the facilities of the existing grid infrastructure provided below (see Figure 3-3):

- Electricity: A new 220 kV substation is just under construction for YCCPP-1; the connection from the new power plant to the new substation will be via a new overhead transmission line or via a new underground cable; the distance between the new power plant and the new 220 kV substation is approx. 400 m
- New connection to the natural gas supply pipeline system from Gazprom, approx. 550 - 600 m

- New connection to the city water system managed by Veolia (make-up water), approx. 1,000 m
- New connections to the water sewerage of the city and the industrial waste water discharge system of YCCPP-1, approx. 450 m / 100 m.

The **Project Area** comprises the YCCPP-2 site which is located at 929 m a.s.l. (average) at the south eastern border of Shengavit, a highly industrialized district in the southern part of Yerevan. There are no people living in the Project Area/YCCPP-2 site. The site is situated approx. 2 km southeast of Erebuni Airport, bordering Erebuni district and has many large industrial plants and factories in its vicinity. Despite their industrial character, Shengavit and Erebuni Districts are home to a high number of residents of Yerevan.

In the proximity of YCCPP-2 site residential complexes are found. The **Project Area of Influence** thus comprises the YCCPP-2 site and adjacent residential areas, as those might be impacted e.g. by air emissions during operation of the new power plant (see Figure below).



Project Area located south of Yerevan, and nearest residential areas

For the construction of YCCPP-2 approx. 30 months are estimated. Thus, it is expected that the new power plant will be commissioned at the end of 2019/ beginning of 2020.

Analysis of Alternatives

The 'No Project' Scenario describes the situation without implementation of the Project. In this alternative, all environmental and social impacts of the Project would be avoided, but on the other hand the main objectives of the

Project would not be achieved, having potentially negative implications on the regional power supply, including also implications for potential business opportunities.

There are basically three different types of energy production: Renewable energy (mainly hydropower, wind, solar and geothermal power); Nuclear energy; and Thermal energy. The option of gas and steam combined cycle power plant was chosen, due to different constraints faced by the other alternatives for power production.

The foreseen site location allows co-utilizing the existing auxiliary systems of YCCPP-1 (e.g. water intake and discharge structures, fuel gas regulators, substations and devices). Possible alternative locations for the proposed new YCCPP-2 were considered prior to opting for the foreseen site. On account to minimize environmental impacts and additional costs for newly developing such a site and modifying the transmission network to accommodate the new power plant, the foreseen site was selected together with MOE as a final option.

The initial design of the new YCCPP-2 had foreseen a stack height of 35 meters. The results of the air dispersion calculation show, however, that a stack height of 66 meters (the Good Engineering Practice stack height) is more adequate because this may allow the fulfillment of the national and international air quality standards. Also a result of the ESIA process, the design of the power plant will include provisions for an eventual future installation of a CSR for reduction of the emissions of NOx.

The new YCCPP-2 is part of the strategic plan for energy production of the Government of Armenia. Design of the new plant reflects the latest available technology.

Description of the Environment (Baseline Data)

The baseline data collection for the Project Area of Influence focused on the subjects of protection: fauna and flora, soil, water, climate, air quality, noise, landscape, historical and cultural sites and socio-economic conditions (including health and safety).

The following documents have already been prepared for the Project:

- RENCO SPA: Armenia 250 MW CCGT Yerevan Capital City. Draft Feasibility Study [CCGT 250 MW – Yerevan /Armenia]
- Ecobarik-Audit LLC (2016): Report of Evaluation of Environmental Impact of the new Steam and Gas Combined Cycle Power Plant in Yerevan
- Geoterproject LTD (2016): Report on engineering-geological survey of Yerevan TPP new energy block area
- ArmPower CJSC (2017): Geological Report of Armhydroenergyproject CJSC
- Consecord LLC (2017): Report on Monitoring Services

Environmental Conditions

The construction site is part of the Yerevan industrial area. The site itself and the surrounding land are poorly vegetated with much of the area having been disturbed by industrial developments. Detailed data about **flora and fauna** at the construction site do not exist, however, only sparse vegetation composed of grass, herbs and some reed and bushes can be found at the construction site. The biodiversity value of the Project Area is assessed to be low. As water quality of the Hrazdan River is categorized as bad in the area south of Yerevan, the biodiversity value of the river is considered to be low.

No **Protected Areas** are located within or in the vicinity of the Project Area of Influence. This includes Important Bird and Biodiversity Areas (IBA) and Ramsar Sites.

In order to ensure the proper setting of YCCPP-2, two **geotechnical investigation programs** have been performed in 2016 and 2017 including topographic mapping, geophysical and engineering geological works, experimental borehole drilling, piezometer installation in some boreholes to measure the ground water level fluctuation, periodic measurement of water level and sample taking. The main outcomes of these studies include:

- In the study area underground waters have been detected in all the boreholes with 0.5-7.0 m depth and have seasonal fluctuation from 0.5 to 1.0 m. Detected underground waters have strong sulphate aggressiveness against ordinary concrete.
- There are no hazardous physical-geological phenomena and processes (landslides, rock slides, rockfall, erosion, suffosion, etc.) in the study areas.
- The study area is suitable for capital construction.

Earthquake risk has been considered in the design of the new YCCPP-2.

The geological studies which were performed at the construction site found mainly clayey **soils** which are in some places covered by fill up soils.

In August 2017 a monitoring study was performed regarding possible historic soil contamination at the construction site. As concentrations of heavy metals in the soil samples exceed national MACs, the soil at the construction site has to be regarded as contaminated by heavy metals. Thus, the soil that will be excavated for construction of YCCPP-2 will have to be stored, as no specialized hazardous waste landfill is available in Yerevan or Armenia for disposal of hazardous wastes at the time being.

Additional soil sampling in different depths is presently being undertaken at the site for analyses of Total Petroleum Hydrocarbons (TPH), Polycyclic Aromatic Hydrocarbons (PAH), BTEX (Benzene, Toluene, Ethylene, Xylene), and Metals. The results will allow deciding about the contamination of the soil and its handling before start of construction works.

The usage of the area for illegal disposal of different waste materials in the past has been reported. However during the site visit in July 2017 no asbestos-containing material or other hazardous waste was found, except of some empty oil drums. Near to these drums the topsoil was found to be contaminated by an oil leakage. Samples of the contaminated soil taken during the site visit in July 2017 were analyzed by a certified laboratory in Germany for content of PCBs. All PCB concentrations were below the detection limit of 0.2 ppm.

Regarding the Project Area, the nearest **water body**, Artashati Jrants Canal, is located 700 m south east of the construction site. No water from the canal will be used for YCCPP-2 and no water will be discharged to it. It is planned that YCCPP-2 will co-utilize the existing auxiliary systems of YCCPP-1 including water intake from grid and discharge structures leading to Hrazdan River. Samples of the surface water of the Hrazdan River are being presently undertaken. The results will allow confirming the impact of the present discharges and predict the impact of the future discharges in this (already very polluted) water course.

According to the geological studies **underground waters** have been detected in all the boreholes with 0.5-7.0 m depth and have seasonal fluctuation from 0.5 to 1.0 m. A monitoring study was performed in August 2017 regarding groundwater quality at the construction site. YCCPP-2 is located in Hrazdan River basin management area. Water in the lower stream of Hrazdan River is classified as “bad” (5th grade) according to Armenian water quality standards. The results of all water sampling tests were within the limits of the 5th grade of water quality. Consequently, the possible groundwater drainage can be directed to the downstream area of Hrazdan River without additional cleaning (according to national legislation).

Additional analysis of groundwater are presently being undertaken at three sampling sites (upstream of the site, at the site, and downstream of the site) for content of TPH, PAH, BTEX, Metals, as well as pH, dissolved oxygen, mineralization, BOD5, and COD5.

In Yerevan the prevailing **climate** is a mountainous continental climate. It is characterized by hot and arid summers and rather cold winters; in a year there are on average a hundred days with minimum temperatures below freezing. The average temperature in Yerevan is 11.6°C. In summer (July and August) the average temperature exceeds 30°C. The coldest month is January at -4°C. Generally, there is little rainfall throughout the year; precipitation averages 319 mm. The driest months are June to October with an average below 25 mm of rain. The wettest months are February, April and May with an average of 40 mm of rain.

On average, the most wind is seen in July. The strongest wind speed is observed in March and April (> 38 km/h). On average, the least wind is seen in September. The mean monthly wind speed over the year is 6.1 km/h. The wind mainly blows from NE, SSW and S.

The results of the air quality baseline monitoring show that the **airshed** in the Project Area of Influence surrounding the future YCCPP2 can be classified as **non-degraded** regarding the pollutants PM₁₀, SO₂ and NO₂. The baseline air quality monitoring covers presently only summer and autumn. New campaigns are being planned to cover the remaining seasons and will be added to the Final ESIA Report.

The results of the noise baseline monitoring that some receptors in the area **are presently affected by noise levels that exceed the limits** due to the presence of industrial facilities and traffic.

The Project Area is located in a highly industrialized area in southern Yerevan. Here, the existing YCCPP-1, chemical plants, metal factories and other industrial infrastructure dominate the **landscape**.

Socio-Economic Conditions

The **population** in the Project Area of Influence can be differentiated into urban population of the districts of Shengavit (approx. 140,000 inhabitants) and Erebuni (approx. 117,000 inhabitants); and the village population of Ayntap (approx. 11,000 inhabitants) and Kharberd (approx. 17,000 inhabitants).

Sensitive receptors which might be affected by noise and air emissions during construction, operation, and decommissioning of YCCPP-2 have been identified in the vicinity of the new power plant. These are people living in the adjacent residential areas in the Project Area of Influence and groups of people living in illegal housings adjacent to the site. There are no persons living within the YCCPP-2 site/Project Area.

Despite economic reforms and some recent growth, unemployment and poverty remain widespread in Armenia. Agriculture is the country's largest labor sector, followed by services and industry. The poorest Armenians are found in rural areas with the least favorable conditions for agricultural activities. There is a stark contrast between the city of Yerevan and the remote rural areas in terms of socio-economic opportunities.

The Project Area is part of a highly industrialized region of Yerevan. Only the area west of the foreseen construction site is used for pasture and/or agricultural purposes. The whole area of the construction site has already been acquired by ArmPower CJSC and local population does inhabit or **use the land** in any way.

As the history of human settlement in Armenia goes back to the Neolithic age and the area has since then been important as settlement, trade and agricultural area, numerous historical and cultural sites exist. No known **historical or cultural sites** are located within the Project Area. The Ministry of Culture shall be informed by the EPC Contractor about the Project prior to construction, in order to allow the Ministry to perform a proof of occurrence/absence of any cultural or historical goods at the Project

site, including a preconstruction field survey, if deemed necessary by the Ministry.

Environmental and Social Impact Assessment

Possible environmental and social impacts from the construction, operation, and decommissioning of YCCPP-2 and auxiliary facilities are analyzed. Potential impacts of the Project in relation to environmental and social receptors are characterized and the Significance of Impact (after implementation of mitigation measures) is assessed.

Environmental Impacts during Construction Phase

As the biodiversity value of the construction site is assessed to be low, there are only low impacts on **flora and fauna** expected during the construction phase. No **protected or sensitive areas** will be influenced by the Project.

The Project Area is not prone to soil erosion. **Soil** use is restricted to the area of the planned construction activities. Analysis of possible historic soil contamination at the construction site has been performed in August 2017 and an additional analysis is presently being done. As concentrations of heavy metals in the soil samples exceed national MACs, the soil at the construction site has to be regarded as contaminated with heavy metals. Thus, the soil that will be excavated for construction of YCCPP-2 will have to be handled as hazardous waste and specially stored at the YCCPP-2 site for final disposal at a specialized hazardous waste landfill in the future. Soil contamination during construction works can arise from improper waste disposal and accidental leakage from tanks of lubricants, solvents, paint, oil, diesel, chemicals, etc.

Surface water will not be influenced during the construction period. Contamination of the soil can indirectly lead to a pollution of the **groundwater**. One groundwater investigation has been undertaken. Additional analysis of groundwater is foreseen at three sampling sites (upstream of the site, at the site, and downstream of the site). A temporary lowering of the groundwater level for 2-3 m during construction is presently under evaluation. If the groundwater level will be lowered, according to IFC and ADB requirements a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater users (nearby industries, agricultural use, etc.), and impact on Hrazdan river basin needs to be prepared including a hydrogeological survey, groundwater mapping and modeling.

Dust generation from transportation and construction activities, as well as emissions from vehicles and construction machinery will be the main impacts on **air quality** during the construction phase of the proposed Project.

Construction of the new power plant will add further highly visible structures (e.g. stacks and buildings) to the Project Area of Influence. Due to the already existing industrial infrastructure in the area, the construction of YCCPP-2 will not enhance the contrast between the industrial site and the surrounding areas significantly.

Possible impacts on soil and water can be prevented and mitigated by a professional handling and storage of hazardous substances and a proper handling of waste. The EPC Contractor shall develop a **Waste Management Plan** for the construction period containing among others the waste management hierarchy of avoidance, preparing for reuse, recycling as much as possible, recovery, and proper disposal of remaining waste. Hazardous waste shall be stored in adequate storage sites (lockable, roofed, ventilated, concreted and bunded floor) at the new YCCPP-2 site, clearly identified by labels, and Materials Safety Data Sheets (MSDS) shall be provided for each kind of hazardous waste. The final disposal of hazardous waste is subject to medium to long term national-level solutions to be decided upon and provided by the Government of RA.

Social Impacts during Construction Phase

During the construction period **local workforce** (mainly unskilled workers) from the nearby villages and Yerevan shall be employed for the construction works. This will contribute to much needed monetary income in the region. Special attention shall be laid on the recruitment of women, wherever possible. However, the income generation opportunity is not of long term duration, as it will be mostly limited to the construction period.

No one lives at the YCCPP-2 site and there is no **land use** by the local population, as the area has already been acquired, fenced, and is foreseen for construction of the YCCPP-2. ArmPower/RENCO have entered a land purchase agreement with the seller (Yerevan Thermal Power Plant CJSC) in March 2017. No acquisition of further land will be necessary for this Project. There are no houses located inside the construction site, so that no project-related physical relocation is foreseen.

Within the construction site and the Project Area of Influence no cultural or historic sites are known. The Ministry of Culture shall be informed by the EPC Contractor about the Project prior to construction, in order to allow the Ministry to perform a proof of occurrence/absence of any cultural or historical goods at the Project site, including a preconstruction field survey, if deemed necessary by the Ministry. For the case of an unexpected encounter of Cultural and Historical Sites or Goods, a **Chance Find Procedure** has to be implemented. In case of any chance finds, the construction has to be stopped immediately and the Agency of Protection of Historical and Cultural Monuments/ Ministry of Culture has to be informed to agree on further steps (as according to Armenian Law).

For construction of YCCPP-2 a site-specific Health, Safety and Environment Management Plan (**HSEMP**) will be developed by RENCO as

EPC Contractor and a Health, Safety and Environment Management System (**HSEMS**) will be implemented during construction. An **H&S manager** of RENCO shall be on duty all the time during construction period. These HSEMP and HSEMS shall also be valid for any third parties or subcontractors in the supply chain.

Working personnel from abroad will be accommodated in RENCO's guesthouse or at hotels in Yerevan. Local workforce shall be employed from Yerevan and the adjacent villages. No workers' camps will have to be established as local workers will return to their homes daily. Transfer to and from the construction site will be carried out by private means or public transport, and in addition by means managed by the EPC Contractor. A Traffic Management Plan shall be developed and implemented by the EPC Contractor.

Adequate security measures to prevent accidents and injuries have to be taken when transporting construction equipment on trucks as this might be dangerous to residents, when trucks drive through residential areas or small villages (to be included in a Traffic Management Plan). The construction site itself will be fenced and the entrance gates will be guarded by security staff in order to prevent any unauthorized access to the site, thus also minimizing possible impacts on **community health & safety**. Development and implementation of a Security Force Management Plan include training and monitoring of security personnel regarding the use of force and conduct towards the community is foreseen.

The EPC Contractor shall develop an **Emergency Preparedness and Response Plan** for the construction period based on robust Quantitative Risk Assessment (QRA) / Hazard Identification Study (HAZID), and assist and collaborate with the potentially affected communities and local government agencies in their preparation to respond effectively to emergency situations.

Construction workers will wear ear protection devices as part of their Personal Protective Equipment (PPE), if they are exposed to **noise levels** higher than 80 dB (A), according to Armenian legislation. Residential areas in the vicinity of the site, which are located near to major roads, will be exposed to higher noise levels due to a greater volume of heavy truck traffic passing by on the main roads. Thus, truck movements shall only be allowed during daylight, but not between 7 pm and 6 am.

Environmental Impacts during Operation Phase

No sensitive **species** and no **protected areas** occur in the Project Area. All waste water (process water, storm water) from the new plant will be led to a waste water treatment plant (including API and CPI, if needed, oil separators) before discharging to the Hrazdan River using the existing discharge system of YCCPP-1. HRSG blow down and other drainage will be neutralized at the chemical shop of the power plant to meet the water quality standards still to be set up by national authorities for YCCPP-2 and

will then be discharged to the river. The utility sewerage will be connected to the city's sewerage system. Thus, there will be only a low (if any) impact on aquatic organisms of Hrazdan River.

Soil contamination can be possible due to spillages from oil/ fuel/ paint/ chemicals used during operation of the power plant.

All **water** will be taken from the Yerevan potable water grid and will be used for all civil utilities like cooking, drinking, etc. It will also be used as process water which is connected to the raw water storage tank and for all other uses (e.g. cooling tower make up, HRSG blow-down tank quench, firewater tank and network, utility water network, etc.). A monthly monitoring program shall be established to be performed by ArmPower and results shall be reported to the "Environmental Monitoring and Information Center" SNCO at the Ministry of Nature Protection in order to guarantee the adherence of all wastewater, sanitary water and drainage water to the effluent standards still to be set for YCCPP-2 or international limit values, whichever are more stringent.

Contamination of the soil can indirectly lead to a pollution of the **groundwater**. An evaluation is currently ongoing regarding a possible lowering of the groundwater level for 2-3 m at the power plant's site permanently during operation by a drainage system. If the groundwater level will be lowered, according to IFC and ADB requirements a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater users (nearby industries, agricultural use, etc.) and impact on Hrazdan river basin need to be assessed including hydrogeological survey, groundwater mapping and modeling.

The indicative results of the ADC show that the national and international **air quality** standards are expected to be fulfilled in the area if a stack height of 66 meters is considered in the design. The only exception may be the stringent national 24 hours standard, which will be fulfilled by the Project itself, but may not be fulfilled in a cumulative scenario. In this case, RENCO will install emission reduction measures in addition to those already foreseen. This conclusion needs to be updated at a later stage, when more results of the baseline air quality assessment will be available. A Continuous Emissions Monitoring System (CEMS) will be installed at the stack of the new power plant. Adherence to the limit values at the stack shall be checked continuously by ArmPower and the results shall be reported monthly to the "Environmental Monitoring and Information Center" SNCO at the Ministry of Nature Protection. Cooling towers' particulate emissions will be controlled through the use of drift eliminators, in order to have low drift phenomena (0.01 % drift loss).

The planned new power plant will add further highly visible structures (e.g. stacks and buildings). However, due to the already existing industrial infrastructure in the area, the realization of the project will not enhance the contrast between the industrial site and the surrounding areas.

Domestic **waste** produced by the plant staff shall be collected in provided bins and picked up by a contracted waste collector for disposal at Yerevan dumping site. All hazardous waste shall be stored in adequate storage sites (lockable, roofed, ventilated, concreted and bunded floor) at new YCCPP-2 site for future disposal. Materials Safety Data Sheets (MSDS) shall be provided for each kind of hazardous waste. The final disposal of hazardous waste is subject to medium to long term national-level solutions to be decided upon and provided by the Government of RA. The Waste Management Plan for operation of the power plant shall also include a risk assessment. Sizing of the storage area for hazardous waste shall be adapted to the projected volume of hazardous material and the anticipated storage duration.

Social Impacts during Operation Phase

Power demand in Armenia is constantly rising due to rapidly growing economy and a rising population. Operation of YCCPP-2 with a guaranteed gross power output of 254 MW will improve the total output capacity of electric energy production and provide a more reliable power supply.

For operation of YCCPP-2 a site-specific Health, Safety and Environment Management Plan (**HSEMP**) will be developed by ArmPower as Operator and a Health, Safety and Environment Management System (**HSEMS**) implemented for operation. An **H&S manager** of ArmPower shall be on duty all the time.

The area of the new power plant will be fenced and the entrance gates will be guarded by security staff in order to prevent any unauthorized access to YCCPP-2 site, thus also minimizing possible impacts on **community health & safety**. Security arrangements shall be guided by principles of proportionality, good international practice and Armenian law, and include training and monitoring of security personnel regarding the use of force and conduct towards the community. A Security Force Management Plan shall be prepared for the operation phase.

The operator shall develop an **Emergency Preparedness and Response Plan** based on robust Quantitative Risk Assessment (QRA) / Hazard Identification Study (HAZID) for the operation period, and assist and collaborate with the potentially affected communities and local government agencies in their preparation to respond effectively to emergency situations.

Performance Guarantees for the new power plant provide **noise levels** which comply with IFC/ World Bank Group General EHS Guidelines for workers and for the public, as well as with national legislation. The calculation outcomes of the noise study for YCCPP-2 have shown that the operation of the new plant will not produce any significant increase of the noise pressure at the sensitive receptors.

During operation most **jobs** at YCCPP-2 will be for skilled workers like engineers which will require specific power plant training and will not be

readily found in Armenia. Graduated people (with electrical and mechanical training) from Yerevan, who could potentially work at the new plant, would need extensive training on the job, as well as theory training. A few simpler jobs (e.g. food supply, housekeeping, etc.) however, will also be available for people which shall be employed from the adjacent residential areas (if possible) in order to create some additional income.

Additional Impacts from the new Connection Facilities

The impacts and mitigation measures mentioned in the sections above concerning the construction and operation of the Project also apply to the necessary additional connection facilities. **Additional aspects** to be considered are related to eventual fell of trees, soil erosion, eventual chance finds of historical and cultural goods, and possible damages to existing gas and water infrastructures.

Additional Impacts during Decommissioning Phase

If the power plant will be dismantled after closedown, environmental and social impacts will be mainly the same as during the construction phase. Dismantling works will have to adhere to the latest editions of national and international laws and guidelines, or even to new ones that will be relevant at this time. A Decommissioning Plan shall be prepared by the operator at least 5 years before closure of the plant, and a Detailed Decommissioning Plan shall be developed by the operator at least 18 months in advance of the closure of the plant.

A large amount of waste will have to be managed, if the plant will be dismantled. This will also include different types of hazardous waste. A detailed Waste Management Plan will have to be developed by ArmPower following the same principles as for the construction phase, respecting the waste management hierarchy.

Summary of Impacts

The assessment of environmental and social impacts **after implementation of the mitigation measures** presented in the ESMP is given in the following tables.

Summary of impacts during construction phase (incl. associated infrastructures)

Impact of/on	Significance of Impact on/by
Fauna, Flora and Biodiversity	■
Protected Areas	○
Soil Use and Soil Erosion	■
Soil Contamination	■
Surface Water	○
Groundwater level lowering	■■ (still unknown)

Impact of/on	Significance of Impact on/by
Groundwater contamination	■
Climate and Air Quality	■
Landscape and Visual Aspects	■
Waste	■■
Local Workforce	+
Land Use and Ownership	○
Historical and Cultural Sites	■ (if any)
Occupational Health and Safety	■
Community Health and Safety	■
Noise	■

Summary of impacts during operation phase (incl. associated infrastructures)

Impact of/on	Significance of Impact on/by
Fauna, Flora and Biodiversity	■
Protected Areas	○
Soil Contamination	■
Water Courses	■
Groundwater level lowering	■■ (still unknown)
Groundwater contamination	■
Climate and Air Quality	■
Landscape and Visual Aspects	■
Waste	■
Electricity Supply	++
Occupational Health and Safety	■
Community Health and Safety	■
Noise	■
Job opportunities	+

Summary of impacts during decommissioning phase (incl. associated infrastructures)

Impact of/on	Significance of Impact on/by
Fauna, Flora and Biodiversity	■
Protected Areas	○
Soil Use and Soil Erosion	■
Soil Contamination	■
Surface Water	○
Groundwater contamination	■
Climate and Air Quality	■
Landscape and Visual Aspects	■
Waste	■■
Local Workforce	+
Land Use and Ownership	○
Historical and Cultural Sites	○

Impact of/on	Significance of Impact on/by
Occupational Health and Safety	■
Community Health and Safety	■
Noise	■

Significance of Impact:

■■■	=	high
■■	=	medium
■	=	low
○	=	nil
+	=	locally positive
++	=	regionally positive

In conclusion, from the results of the impact assessment it can be seen that the environmental and social impacts will be low or medium, if all proposed mitigation measures of the ESMPs are implemented. Positive impacts are related to creating of job opportunities especially during construction. The additional power generation will increase the total output of electric energy, providing a more reliable power supply countrywide.

Information Disclosure, Consultation, and Participation

During the site visit in July 2017 FICHTNER's environmental and social specialists performed stakeholder meetings with mayors of the adjacent villages Kharberd and Ayntap, with the Heads of Departments of Erebuni and Shengavit Administrative Districts, with Environmental Monitoring and Information Center, with the Environmental Department of the Municipality of Yerevan, and with NGO Aarhus Center. Mayors of Kharberd and Ayntap had no concerns regarding the implementation of the Project. As both villages suffer under a high unemployment rate (> 70%) the mayors hope that the Project will create jobs for the local population. These statements have also been supported during the discussions with the Heads of Departments of Erebuni and Shengavit Administrative Districts.

The Draft Final ESIA, including the ESMP, will be disclosed to the public in English and Armenian versions. Interested people shall have real access to the documents, which shall therefore not only be posted on ArmPower's website, but shall also be delivered in printed copies to the local administration offices; advertisements in local media about their availability shall be made. Also the NGO Aarhus Center shall receive printed copies and ensure their sharing to representative civil society organizations. According to national Armenian requirements, the disclosure period is only 7 days, but disclosure of the documents for at least two weeks is recommended. After disclosure of the documents, one public consultation meeting on the Draft Final ESIA will be held. The consultation meeting shall concentrate on interpreting the ESIA report to the stakeholders and seeking their feedback and concerns, which will then be considered in the Final ESIA report. A Draft Final SEP (Stakeholder Engagement Plan) providing further details is presented as an Annex to this ESIA Report.

Grievance Redress Mechanism

In the course of the construction process, **project affected people (PAP)** may feel treated unjustly, for which case ArmPower shall maintain a viable grievance redress mechanism. PAPs are encouraged to proceed in the following way:

- a) Contact the contractor's designated grievance staff in the following way: in person via designated telephone number, via email, via regular mail. Alternatively, PAPs can contact their community leader, who would convey their grievance to the contractor's designated grievance staff.
- b) Lodge complaint and provide information on the case. Each complaint will be registered and a tracking number will be assigned to it. Responses to all complaints should be provided within 15 days (or 25 days in cases where complaint resolution requires special efforts).
- c) Agree with the contractor on mitigation measure.
- d) Sign if the mitigation measure has been implemented as agreed
- e) Seek redress from ArmPower if not satisfied with above mentioned procedure though designated telephone numbers, in person, or via email or regular mail. ArmPower should register all grievances and provide response within 15 days.
- f) Seek redress from court if all else fails.

Nevertheless, the above mentioned grievance mechanism does not limit the citizen's right to submit the case straight to the court of law just in the first stage of grievance process. The grievance mechanism is designed to avoid lengthy court procedures.

The EPC Contractor RENCO and the future operator of YCCPP-2 ArmPower are requested to implement an independent grievance management system to enable the workers (and their organizations, where they exist) to raise reasonable workplace concerns. This includes complaints related to non-compliance with Health & Safety matters, discrimination cases and non-consideration of equal opportunities. **The workers' grievance mechanism** shall follow the same principles as the one created for the general public: complaints must be answered in a timely and effective manner without fear of retribution; the access to the grievance mechanism shall not replace or impede the subsequent access to other redress mechanisms; the promoter will inform workers of the grievance mechanism at the time of hire and make it accessible to them.

Environmental and Social Management Plans (ESMPs)

The negative environmental and social impacts of the Project can be avoided, minimized or mitigated by performing suitable measures. The ESMPs deal with the concrete mitigation measures and the monitoring measures to be taken during the construction, operation, and decommissioning phases of YCCPP-2. They summarize the anticipated environmental and social impacts and provide details on the measures,

responsibilities to mitigate these impacts, the costs of mitigation, and the ways in which implementation and effectiveness of the measures will be monitored and supervised.

Mitigation Measures for the Construction Phase

The main possible impacts during construction period will be contamination of soil and water, impacts on health and safety of workers and the public, as well as possible lowering of the groundwater level at the construction site.

Contamination of soil and groundwater can be avoided e.g. by regular maintenance of all vehicles and machines at regular service stations, maintenance and re-fueling of the construction equipment only on sealed and enclosed areas, providing spill control material and training of workers regarding handling of oil, fuel, etc. and how to avoid and clean up spills.

The construction site has to be equipped with toilets and sanitary rooms separately for men and women. Sewage water shall be led to the city's sewage water system or septic tanks for collecting sewage water have to be used, which have to be emptied by a specialized company from time to time.

A groundwater study for the construction site is currently under preparation evaluating the possible lowering of the groundwater level for 2-3 m at the construction site during construction period, or permanently by a drainage system. If a lowering of the groundwater level at the construction site will be performed, a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater and impact on Hrazdan river basin needs to be assessed including hydrogeological survey, groundwater mapping and modeling.

The EPC Contractor shall develop a site-specific Health, Safety and Environment Management Plan (HSEMP) and implement a Health, Safety and Environment Management System (HSEMS) for construction phase. An H&S manager of EPC Contractor shall be on duty all the time during construction period. The HSEMP shall also include a Waste Management Plan as well as an Emergency Preparedness and Response Plan.

Mitigation Measures for the Operation Phase

The main possible impacts during the Operation Phase will be the air and noise emissions as well as effluents from the new power plant, and the possible permanent lowering of the groundwater level.

The stack of the new power plant will be equipped with a Continuous Emissions Monitoring System (CEMS). The foreseen emissions at the stack are below the relevant national and international limit values. Compliance of air emissions with the Performance Guarantees of ArmPower and IFC/ World Bank limits for air emissions shall be monitored by the operator and reported to national authorities, e.g. "Environmental Monitoring and Information Center" SNCO. Based on the ADC results, a Good Engineering Practice stack height of 66 meters (GEP stack height) will be built for the power plant to guarantee the compliance with the air quality standards at the ground level (instead of the originally foreseen 35 meters stack). To further guarantee compliance in case of new development projects in the area, or in

case the existing pollution load (baseline) is very high, additional NOx emissions reduction measures are planned, namely the installation of a SCR. The existing pollution load will be finally characterized once results of baseline measurements of Winter (specially) and Spring are available.

All waste water from the power plant's operation will be collected and routed to a waste water treatment plant (including API and, if needed, CPI oil separators) before being discharged to recipient existing system of YCCPP-1 discharging to Hrazdan River. Rain water which may be potentially oily will be routed to the same system; other rain water collected from the paved areas will be collected for irrigation purposes inside the power plant.

HRSG blow down and other drainage from steam/water system will be neutralized at the chemical shop of the power plant to meet relevant water quality standards and will then be discharged using the existing discharge system. The utility sewerage will be connected to the already existing city sewerage system. A monthly monitoring program shall be established to be performed by the operator and reported e.g. to "Environmental Monitoring and Information Center" SNCO in order to guarantee the adherence of all wastewater, sanitary water and drainage water to Performance Guarantees of ArmPower, national Armenian effluent limits (still to be defined specifically for the YCCPP-2 by the national authorities) and/or IFC/ World Bank limits, whichever are more stringent.

A groundwater study for the power plant's site is currently under preparation evaluating the possible lowering of the groundwater level for 2-3 m permanently site by a drainage system. If a permanent lowering of the groundwater level at the plant site will be performed, a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater and impact on Hrazdan river basin needs to be assessed including hydrogeological survey, groundwater mapping and modeling.

ArmPower as operator of the new power plant will have to develop and implement an Emergency Preparedness and Response Plan as part of its site-specific Health, Safety and Environment Management Plan (HSEMP).

Mitigation Measures for the Decommissioning Phase

Environmental and social impacts during the decommissioning phase will be mainly the same as during the construction phase. Thus, mitigation measures for the construction phase will be also valid for the dismantling works, which will have to adhere to the latest editions of national and international laws and guidelines.

Implementation Arrangements and Capacity Building

RENCO SPA as EPC Contractor has to implement the ESMP within its own site-specific Health, Safety and Environment Management System (HSEMS) in a proper way and shall have an HSE manager on duty throughout the construction period. This HSE officer shall prepare monthly reports of all HSE relevant incidents and accidents and send these reports to the Health, Safety and Environment Manager of ArmPower and the relevant national authorities as well as to the external internationally experienced auditor.

An external internationally experienced auditor shall perform quarterly supervision of the implementation of the ESMP and monitor the implementation of the mitigation measures during construction phase. The aim of the audits will be to ensure that all mitigation measures are implemented adequately. In case of any discrepancies, the specialist shall implement proper actions to establish compliance with the ESMP. If this is not possible and if the discrepancy is considered to be severe, the person(s) in charge shall be empowered to stop the work immediately until compliance is achieved again. Based on his quarterly supervision and the monthly reports provided by the Health, Safety and Environment Manager of RENCO, the external auditor will produce narrative analytical quarterly reports on environmental and social performance in the course of the Project and furnish these reports to ADB/ IFC and to ArmPower. Additional site investigations shall be performed by the external auditor during the commissioning and operation phases.

Measures for capacity building at “Environmental Monitoring and Information Center SNCO” shall be considered. These measures should include employment of additional staff or contracting outside resources for monitoring purposes (or both). Existing staff shall be trained in effective monitoring procedures including knowledge about national and international (ADB, IFC/World Bank) guidelines and limit values.

Reporting requirements

The results of the monitoring measures shall be compiled in the form of HSE monitoring reports. During the construction and decommissioning stages, a daily HSE log, HSE incidents and chance finds reports, internal HSE audit reports, and monthly HSE reports compiling all the previous shall be prepared. During operation, HSE incidents reports, internal HSE audit reports, and monthly HSE reports shall be prepared.

Adaptive management

The monitoring of the works may reveal the necessity to adapt the mitigation and monitoring measures of the ESMP to specific site conditions not known at the time of preparation of this ESIA.

Summary of Costs for Implementation of the EMSP

A total cost of **181,500 USD** is foreseen for implementation of the ESMP. This value includes quarterly supervision of construction sites and one additional site investigation during the commissioning phase to be performed by an internationally experienced auditor. Furthermore the total cost includes monitoring of air quality during commissioning and of noise during construction and commissioning. Expenses for other measures are included in the regular construction/ operational/ decommissioning works. Additional costs of 10,000 USD per year will arise for a yearly audit of the external auditor during the operation phase of YCCPP-2.

Gap Analysis regarding compliance with IFC Performance Standards

After implementation of the mitigation measures and the ESAP, the Project complies with the requirements of all applicable IFC Performance Standards and ADB Safeguard Requirements.

Environmental and Social Action Plan

An Environmental and Social Action Plan (ESAP) is presented in order to highlight the most urgent steps for implementation of the mitigation measures given in the ESMPs, according to the relevant IFC Performance Standards and ADB Safeguard Requirements as well as other international guidelines and standards.

Overall Findings, Conclusion and Recommendations

The main possible impacts of the Project will be contamination of soil and water, impacts on health and safety of workers and the public, possible lowering of the groundwater level (still to be investigated) at the construction/power plant site, air and noise emissions, and liquid effluents from the new power plant.

Negative environmental and social impacts of the Project will be low or medium, if all proposed mitigation measures of the ESMPs and ESAP are implemented. There will be no severe social impacts from the Project; no land acquisition or project-related resettlement will be necessary. Regular **monitoring of noise and air emissions as well as effluents** during construction and /or operation phase shall be performed, in order to guarantee adherence to relevant national and/or international limit values.

Calculations of the Noise Propagation Model for YCCPP-2 have shown that the operation of **the new plant will not produce any significant increase of the noise pressure at the sensitive receptors**. The indicative cumulative impacts of the power plant on air quality may be kept below the national and international standards if a **stack height with 66 meters** is installed, except possibly for the strict national 24 hr standard (notwithstanding, there may be the need to update this conclusion once all baseline monitoring results are available). RENCO will incorporate additional emission reduction measures in the design. Such measures would only be activated in

case a future development in the area (a new emission source, i.e., power or industrial plant) is reasonably foreseen, or the existing pollution load is very high.

Positive impacts are related to creating job opportunities, especially during construction. The additional power generation will increase the total output of electric energy, providing a more reliable power supply countrywide.

If a lowering of the groundwater level at the construction/ plant site will be performed, a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater and impact on Hrazdan river basin need to be assessed including hydrogeological survey, groundwater mapping and modeling.

In summary, it can be concluded that the proposed Project of Yerevan Steam and Gas Combined Cycle Power Plant (YCCPP-2) **can be implemented without having significant adverse impacts on the ecological and social environment**, if all mitigation measures proposed in the ESMPs and ESAP are implemented.

1. Introduction

This report is the Final Draft version of the Environmental and Social Impact Assessment (ESIA) report for the Yerevan-2 CC Power Plant Project. This version reflects the status quo at the mid of December 2017. This ESIA is considered a “living” document, which means that further results from ongoing analyses and the public consultation process will be added to the Final version of the ESIA in the future.

1.1 Project Background

The Ministry of Energy (MOE) of the Republic of Armenia plans to improve the total output capacity of its electric energy production, complementing the power units of the existing Yerevan Combined Cycle Power Plant (YCCPP-1) with a most modern and efficient power plant. For this reason a new gas fired Combined Cycle Power Plant of 254 MW (YCCPP-2, or “the Project”) is planned to be built at the uninhabited site next to the existing YCCPP-1 (see Figure 1-1) in an already industrialized region in the south of Yerevan. The implementation of the Project is urgent in consideration of the closure of the Metsamor Nuclear Power Plant that will strongly reduce the capacity of electric energy production for the next years (US AID, 2010).

The new CCPP will include a Gas Turbine (GT), a Steam Turbine (ST), a Heat Recovery Steam Generator (HRSG) and all auxiliary equipment and systems that, at local conditions with an ambient temperature of 15°C, will produce 254 MW electrical output.

Interconnections to gas, water and electrical grid are planned. The new CCPP shall be connected with the facilities of the existing grid infrastructure provided below (see Figure 3-3):

- Electricity: A new 220 kV substation is just under construction for YCCPP-1; the connection from the new power plant to the new substation will be via a new overhead transmission line or via a new underground cable; the distance between the new power plant and the new 220 kV substation is approx. 400 m
- New connection to the natural gas supply pipeline system from Gazprom, approx. 550 - 600 m
- New connection to the city water system managed by Veolia (make-up water), approx. 1,000 m
- New connections to the water sewerage of the city and the industrial waste water discharge system of YCCPP-1, approx. 450 m / 100 m



Figure 1-1: Site location (red) of the planned YCCPP-2 (black), next to the existing YCCPP-1

The foreseen site location allows co-utilizing the existing auxiliary systems of YCCPP-1 such as water intake and discharge structures, fuel gas regulators, adjacent substation and devices. Possible alternative locations for the proposed new YCCPP-2 had been considered prior to opting for the foreseen site. On account to minimize the additional costs for newly developing such a site and modifying the transmission network to accommodate the new power plant, the foreseen site was selected together with MOE as a final option.

As the energy sector development has a critical impact on the economic development of the entire country, the Government of Armenia considers this project to be of outmost significance with the highest priority for execution (fast-track project).

The following documents have already been prepared for the Project:

- RENCO SPA: Armenia 250 MW CCGT Yerevan Capital City. Draft Feasibility Study [CCGT 250 MW – Yerevan /Armenia]
- Ecobarik-Audit LLC (2016): Report of Evaluation of Environmental Impact of the new Steam and Gas Combined Cycle Power Plant in Yerevan
- Geoterproject LTD (2016): Report on engineering-geological survey of Yerevan TPP new energy block area

These documents have been the basis for issuance of the national environmental approval to the planned Project, which is documented in the following Conclusion: “RA Minister of Nature Protection (11.01.2017): State Expert Examination Conclusion on Expert Examination of Influence on the Environment BP 02. Report of evaluation of influence on

environment of the new power station in Yerevan with combined cycle of steam and gas”.

1.2 Objective of the Project

Along with a rapidly growing economy and a rising population, power demand in Armenia is constantly increasing. The main objective of the construction of the 254 MW Combined Cycle Power Plant (YCCPP-2) is to:

- Improve the total output capacity of electric energy production;
- Provide reliable power supply;
- Shift the financial burden for power generation from the government to the private sector;
- Promote commercial development of thermal technology and cost reduction that enables Armenia to become a major net exporter of electricity; and
- Build and sustain local capacity in the development and maintenance of power generation infrastructure.

1.3 Objectives of the ESIA

The overall aim of the ESIA is to give an overview of the present situation in the area of implementation of the Project (“the Project Area”) and its vicinity (“the Project Area of Influence”), to assess the potential (positive and negative) impacts of the Project, and to name appropriate mitigation measures and monitoring approaches. This shall be for the benefit of the plant owner, the concerned public and the future sponsors of the Project.

The main objectives of the ESIA Study are to:

- (i) explain the Project framework including the current design and key technical aspects;
- (ii) analyze the environmental and social baseline in the Project Area of Influence and the resulting requirements for impact assessment in compliance with all relevant international policies (e.g. ADB’s Safeguard Policy Statement, IFC/World Bank EHS Guidelines, EU EIA Guideline) as well as Armenian national environmental guidelines and requirements;
- (iii) perform a detailed environmental and social impact assessment on the basis of the technical design, available data and field surveys with the purpose of understanding the current environmental and social situation in the Project Area of Influence and to assess the potential positive and negative impacts of the Project;
- (iv) identify and recommend measures to avoid, minimize or mitigate adverse environmental and social impacts of the Project during the construction, operation, and decommissioning phases, and recommend referring monitoring measures to be addressed during Project implementation through the preparation of an ESMP (Environmental and Social Management Plan).

On the basis of the existing environmental situation and the technical planning FICHTNER determined and evaluated the environmental and social impacts during construction, operation, and decommissioning of the planned YCCPP-2. The impact assessment focused on the ecological aspects of the Project and on the effects for the local population. In a second step, appropriate mitigation measures and monitoring measures were considered to reduce possible adverse impacts.

After public disclosure of the ESIA, including the ESMP, public consultations will be executed in order to seek feedback and concerns of stakeholders and people possibly affected by the Project (see also Draft Final Stakeholder Engagement Plan in Annex 12.7).

1.4 Methodology

The following documents have already been prepared for the Project:

- RENCO SPA: Armenia 250 MW CCGT Yerevan Capital City. Draft Feasibility Study [CCGT 250 MW – Yerevan /Armenia]
- Ecobarik-Audit LLC (2016): Report of Evaluation of Environmental Impact of the new Steam and Gas Combined Cycle Power Plant in Yerevan
- Geoterproject LTD (2016): Report on engineering-geological survey of Yerevan TPP new energy block area
- ArmPower CJSC (2017): Geological Report of Armhydroenergyproject CJSC
- Consecoard LLC (2017): Report on Monitoring Services

A **general overview** about the Project site's biophysical settings has been done based on a desktop study, including a review of the existing studies about the Project (see above) and on a field surveys. The first field survey was conducted by FICHTNER's environmental and social experts in July 2017, including visiting the proposed CCPP site. In July and August 2017 further surveys (air, noise, soil and groundwater baseline monitoring) have been undertaken.

The **environmental and social impacts** of the Project are predicted in relation to the environmental and social receptors (fauna and flora, land use, residents of villages, etc.) and natural resources. This is accomplished by comparing the baseline conditions with situations ensuing when the Project is implemented. Additional information was gained by consultations of representatives of governmental organizations (e.g. Yerevan Municipality, Environmental Monitoring and Information Center at the Ministry of Nature Protection) and non-governmental organizations (NGOs) (e.g. Aarhus Centers of Armenia).

To obtain up-to-date data about the ground level concentrations (GLC) of **air pollutants** in the Project Area of Influence, and help defining the airshed as degraded or non-degraded (according to the WB EHS

Guidelines), Fichtner undertook an air quality monitoring campaign including the measurement of SO₂, NO₂ and PM₁₀. For gases (SO₂ and NO₂), the Consultant performed a 7 day and a 10 days campaign with diffusion tubes at five sampling points, followed by a laboratory analysis in summer and autumn 2017. Measurement point Air 1 is situated in an industrial area near the southeast border of YCCPP-1. Measurement point Air 2 is placed approx. 1,700 m to the south-west of YCCPP-2; it is located near the northeast border of Ayntap community. Air 1 and Air 2 are located downwind the main wind direction. Measurement point Air 3 is placed in an industrial area near the northern border of the YCCPP-2. Two additional sampling points have been defined after one test model run, being located in the areas where the highest GLC of NO₂ resulting from the operation of YCCPP-2 are expected. For this reason, in these points only NO₂ has been measured. For particulates (PM₁₀), the Consultant performed two 5 day campaigns at the three above mentioned sampling points Air 1 – Air 5 in summer and autumn 2017. The dust concentration was measured by using the dust particle meter DT-96 in accordance with the GOST 17.2.4.05-83 - “Environmental protection. Atmosphere. Gravimetric method for determination of suspended dust particles”. The equipment has collected 5 daily measurements of 5 minutes along 5 days in each campaign.

These data have been used as an input for an **Air Dispersion Calculation** (ADC) whose complete report can be read in Annex 12.6. The ADC was performed using the dispersion modeling software BREEZE AERMOD, version 8.0.39 (2017), which predicts pollutant concentrations from continuous point, flare, area, line, volume and open pit sources. 3 scenarios were simulated: one where only YCCPP-1 is operating (indicative baseline scenario); one where only YCCPP-2 is operating; and one where both plants are operating (indicative future scenario, or indicative cumulative scenario). The results of the model conducted to the need to simulate an additional scenario, the future developments scenario (reflects the inclusion of additional emission reduction measures, in case future projects are reasonably foreseen for the area).

The above mentioned monitoring campaigns will be repeated in next winter and spring in order to cover all seasons of an annual cycle. The results will be used as an input for an updated Air Dispersion Calculation report.

To obtain data about the existing **noise levels** in the Project Area of Influence, FICHTNER undertook a noise monitoring campaign in an area around the YCCPP-2 site at five monitoring points. The campaign used the Sound Level Meter WS1361, a high precision instrument in line with the International Committee TYPE 2 ANSI S1.4 and the United States National Standard TYPE 2 IEC 651. Measurement point Noise 1 is at the same location as Air 2 (see above). Measurement point Noise 2 is situated approx. 1,750 m to the west of YCCPP-2. This point is located on the eastern border of Noragavit settlement in front of the highway. Measurement points Noise 3 and Noise 5 are located in Kharberd horticultural settlement. Both points are situated along the northern border of the settlement. Noise 5 is located at a distance of approx. 1,100 m, while the distance between Noise 3 and

YCCPP-2 is 1,500 m. Measurement point Noise 4 is at the same location as Air 3 (see above).

The results of the monitoring campaign were used as an input for a **Noise Propagation Study** whose complete report can be read in Annex 12.5. On the basis of the Project data, the sound contribution of the YCCPP-2 during operation at the most exposed sensors was calculated. The calculation was performed using SoundPlan (open field propagation simulation software) after setting the model parameters. The predictive noise pressure at the sensitive receptors has been calculated by adding the value of the background noise sound pressure to sound level contribution calculated by the model.

Due to the fact that there is no official international consensus on an agreed approach for **assessing the significance of impacts** on the environment, FICHTNER uses an own evaluation procedure. This transparent evaluation procedure is based upon FICHTNER's extensive experience over the last fifteen years in performing Environmental and Social Impact Assessments and has proven to be a reliable method for assessing a project's impacts on the environment. It includes identification, prediction (e.g. long or short term, direct or indirect, avoidable or unavoidable, reversible or irreversible) and evaluation of the significance of impacts based on the IFC/WorldBank guidelines and ADB Safeguard Policy Statement, as well as on legal requirements. Wherever possible, impacts are quantified. The focus of the used evaluation procedure is to decide whether the Project is likely to cause significant adverse environmental effects resulting from construction, operation, and decommissioning. The criteria used in this study for assessing negative impact significance are extent, duration and intensity. Three classes of significance/ importance are used: high, medium, or low negative. The more an impact is extended, durable or intense, the more significant/ important it will be. **Significance of Impacts** is mainly measured on basis of the impacted area: the more the impact has limited extent or is local, the more that impact is considered to be low. **Intensity** of an impact is measured based on the extent of modifications observed on the component affected by a project's activity. For a physical component, intensity of modification refers to the level of disturbance caused by the project; while for biological components, it additionally refers to specialists' value judgement that takes into consideration the ecological and social context of the relevant environment and the component's value. Regarding the **duration** of an impact, the construction of a power plant implies long-term impacts and temporary impacts. Long-term impacts may occur as long as the plant exists, such as aesthetic impacts. Temporary impacts occur during the construction or at less frequent intervals. The **significance** of an impact is therefore the result of an overall judgment on the effect of an activity of the project in regards with a component of the environment, based on the described criteria.

For the purpose of a transparent presentation and evaluation, a tabulated evaluation matrix is applied. On the basis of a point scale, the significance of the particular environmental or social impact together with its general

trend - that is, negative or positive - is described. The following evaluation scale is applied:

Significance of Impact:

■■■	=	high negative
■■	=	medium negative
■	=	low negative
	=	nil
+	=	locally positive
++	=	regionally positive

For final judgment of the significance of an impact, international standards like standards from the World Bank, World Health Organization (WHO), etc. are used (see Section 0), supported by Armenian standards (see Section 2.1). According to these standards, the evaluation of impacts is done as follows (Table 1-1):

Table 1-1: Evaluation of impacts using International and National Standards

Significance of impact	Reason
High	International and national standards are exceeded
Medium	Between international and national standards, international and national standards are barely met
Low	International and national standards are met

2. Policy, Legal and Administrative Framework

This Chapter presents the policy, legal and administrative framework for environmental and social management in the Republic of Armenia (RA), with particular reference to the provisions for conducting an ESIA. The Project will conform to applicable local/ national and international environmental and social legislation, regulations and guidelines as well as specific procedures and policies of State Authorities, the Asian Development Bank (ADB) and the International Financing Cooperation (IFC), and other available best practices. These require that an ESIA of the designed works is carried out, and the ESIA report reviewed and approved in the light of prevailing environmental and social policies and regulations.

2.1 National Requirements

Following independence in 1991, the environmental legislation was reviewed with the aim of developing a more comprehensive state policy towards ecological protection and sustainable use of resources. To this end, a series of laws have been developed, including regulations relating to protected areas, a land code (both 1991) and a forest statute (1994). From 1999 to today, a number of national laws of RA were implemented to regulate the protection of the environment. Key laws/ regulations related to the Project are given in Table 2-1 below and their relevance for the Project is indicated.

Table 2-1: National laws of RA, implemented to regulate the protection of the environment and expropriation issues

Law/ Policy	Year	Main scopes	Relevance for the Project
Decree of RA Supreme Council on Adoption of Fundamentals of the Nature Protection Legislation of RA	1991	RA nature protection policy is based on fundamentals dedicated to maintain protection and using arrangement of the natural environment in the territory of Armenia, as well as creation of the necessary legal basis to develop nature protection legislation to regulate relationships regarding mining; use and protection of forest and water, flora and fauna, atmospheric air protection.	Relevant for the Project, as this law provides fundamentals on use and protection of water, flora and fauna, as well as air protection.

Law/ Policy	Year	Main scopes	Relevance for the Project
RA Law on Protection of Atmospheric Air	1994	<p>Subjects of that law are prevention and elimination of atmospheric air pollution and realization of international cooperation within protection of atmospheric air. The main legislative issues in this domain are:</p> <ul style="list-style-type: none"> - maintenance of improvement of purity and quality of atmospheric air - prevention and reduction of chemical, physical, biological and other influences over atmospheric air conditions - regulation of public relationships within that sphere - strengthening of legality within that sphere. 	Relevant due to the air emissions from the planned power plant
RA Law on Environmental Protection and Environmental Usage Fees	1998	<p>That law provides definition of environmental protection and environmental usage fees, scope of payers, types of fees, calculation and payment rules, and liabilities against breach of that law as well regulates other relationships on fee payments.</p> <p>Types of environmental protection fees are payments:</p> <ul style="list-style-type: none"> - against emission of hazardous substances at environment (air and water basin) - for industrial waste and household refuse disposal within adopted regulation - against environmentally harmful products. <p>Types of environmental usage fees are payments:</p> <ul style="list-style-type: none"> - for water use - for resources of extracted minerals, - for bio-resources use. 	This law is relevant for the Project regarding emissions to air and water, waste disposal and water use.

Law/ Policy	Year	Main scopes	Relevance for the Project
RA Law on Conservation and Use of Historical and Cultural Monuments and Historic Environment	1998	<p>The subjects of that law are:</p> <ul style="list-style-type: none"> - provision of legal basis within domain of protection and use of monuments and - regulation of relationships, which are begotten within those activities. - The main issues of that law are: - envisaging of general provisions of the state policy within domain of protection and use of monuments - envisaging of regulation principals of recording, conservation, research, restoration, repair, restoration and use of monuments - envisaging of authorities of the state governmental and local self-governmental bodies, legal entities and natural persons within domain of protection and use of monuments - envisaging of special features of ownership rights to possess, use and dispose monuments, which are specific type of real estate. 	This law will only be relevant to the Project if during construction any historical or cultural goods will be found (Chance Find Procedure).

Law/ Policy	Year	Main scopes	Relevance for the Project
RA Law on Fauna	1999	<p>That law provides RA state policy regarding conservation, protection, reproduction and use of species of wild fauna.</p> <p>The subjects of that law are:</p> <ul style="list-style-type: none"> - conservation, protection, natural reproduction of genetic and species diversity - prevention of infringement of comprehensiveness of animals' living environment - protection of comprehensiveness of animal species, their populations and relatives - protection of animals migration routes - regulation of relationships regarding using of objects of fauna. <p>Responsibilities of different organizations, including government, ministries, state bodies, local self-governmental bodies are envisaged by that law.</p>	As biodiversity values at the construction site and in Hrazdan River are rated to be low, this law will not be relevant for the Project
RA Law on Flora	1999	Law on flora provides RA state policy regarding approved science-based protection, conservation, use and reproduction of natural flora.	Biodiversity value at the construction site is rated to be low, thus this law will not be relevant for the Project

Law/ Policy	Year	Main scopes	Relevance for the Project
RA Land Code	2001	<p>That Code provides legal basis of land relationships (regarding improvement of the state regulation, development of the land management in various organizational-legal forms, soil fertility, increment of the efficiency of land use, protection and improvement of favorable environment for human life and health, protection of rights to land) by taking into consideration significant environmental, economic and social essence of land, due to which the land is used and maintained as a condition of life for population in RA.</p> <p>According to the Code, possession, using and disposal of land must not damage the environment, security and defensibility of the state as well as must not violate rights and interests of citizens and other persons that are protected by the law.</p>	Not relevant for the Project as no additional land will have to be acquired and no project-related relocation will occur

Law/ Policy	Year	Main scopes	Relevance for the Project
RA Water Code	2002	<p>By this legal act, the relationships regarding using of water are mainly regulated. Article 3 of the Code envisages that RA Government through appropriate state authorized bodies realizes purposes of the code, maintain water saving, protection from harmful influence, using of water for public interests aimed at conserving security of each person.</p> <p>Vital principals of water resources management are:</p> <ul style="list-style-type: none"> - satisfaction of main vital needs of present and future generations - maintenance and increase of the volume of the national water resources - protection of water and related ecosystems and their biological diversity - recognition of complete and coherent relationship of land, air, water and biological diversity - regulation of water use through water use permission. 	Relevant for wastewater effluents from the planned power plant to surface water bodies, and for water use during operation
RA Law on Waste	2004	This law shall regulate relations on waste collection, transportation, storage, processing, recycling, removal, volume reduction and other relations regarding the before mentioned activities, as well as legal and economical bases for prevention of adverse effects of waste on human health and environment.	Relevant for waste management during construction, operation, and decommissioning, as well as for handling of existing material on the site.
RA Law on Environmental Assessment and Expertise	21 June 2014	This law regulates environmental impact assessment (through legal, economic and organizational principles) of proposed activities and concepts.	Most important law for carrying out EIA studies and therefore relevant for the Project

The planned implementation of any activity in Armenia that may cause environmental impacts needs a positive conclusion of an EIA expertise. All environmental impacts of planned physical activities or sectoral/ regional development plans/ programs have to be assessed during the EIA preparation period. The **RA Law on Environmental Assessment and Expertise** of 2014 stipulates provisions regarding environmental impact assessment, realization and terms, thus being the most important national law for carrying out an EIA.

In this law “*Thermo power plants, heat and hot water producing plants*” are listed requiring an EIA process.

The consequent steps for obtaining environmental approval, as set forth in the national legislation, are given below:

- 1) Preliminary stage: During this stage preliminary information regarding the project (activity) is presented to the head(s) of the affected community(ies), and public hearings are organized by the project proponent jointly with the head(s) of community(ies). The general information about the project and the notice should be published on the websites of the project owner and the affected community(ies) or other public media seven days prior to the date of the public hearing. According to the Draft Government Decree on organization of public hearings the notice should be published on the web sites not less than 7 days prior, and the project information not less than three days before.
- 2) An application is then to be submitted to the Ministry of Nature Protection (not to the *Nature Protection Expertise* SNCO directly). This request includes general description of the project, measures for mitigation/ compensation and the results of a first public hearing organized by the community(ies) head(s) and the project owner.
- 3) Within 30 days the Ministry of Nature Protection, 1) makes a decision about the a necessity of state environmental expertise, 2) provides an impact category to the project (e.g. a thermal power plant = Cat A), 3) provides a list of activities, and volume and depth of the works for the development of an Environmental Impact Assessment Report (provides the ToRs for the EIA). Within this period, the execution of a second public hearing is needed to be jointly performed by project proponent, head(s) of affected municipality(ies) and the Ministry of Nature Protection. The same rules for dissemination as for the first public hearing shall be applied.
- 4) The Project proponent prepares the draft EIA Report and submits it to the Ministry of Nature Protection.
- 5) The next stage is the main stage of the environmental expertise. During this stage, which lasts 40 days for Projects of Category B and 60 days for those of Category A, the Ministry of Nature Protection submits the draft EIA report to all involved and specialized parties (e.g. to its departments, to the relevant departments of Academy of Science, the Ministry of

Healthcare, the Ministry of Emergency Situations, State Committee for Water Resources, etc.) as an internal procedure of the Ministry. The Project proponent is not involved in this. During this stage the Project proponent, jointly with the head(s) of community(ies) and the Ministry, organizes the 3rd public hearing, during which the whole draft EIA report is introduced to the general public. The Ministry provides all the comments and recommendations of all parties involved in the revision of the draft EIA, as well as main comments and recommendations which were arisen during the 3rd public hearing. The Project proponent either makes amendments to the draft or justifies the rejection of amendments.

- 6) At the end, the Ministry organizes the final public hearing, during which it represents all the comments and recommendations provided, the results of these comments and recommendations (if the proposed changes were adopted or not), and gives an opinion on the EIA report (approval or rejection).
- 7) Based on this, the Ministry provides the final approval or rejection of the project, signed by the Minister. Steps 5-7 are included in the total duration (40 days for Category B and 60 days for Category A).

The above procedure is generally consistent with ADB's and IFC's environmental safeguard policies. The national law requires an EIA, at the same time that it requires coverage of the social aspects of a proposed activity. This is included in this report, which is denominated ESIA and not EIA for this motive. The National Environmental Project Approval from the Ministry of Nature Protection has been given in July 2017 based on the national EIA and geological reports. The Approval is documented in the Conclusion: "RA Minister of Nature Protection (11.01.2017): State Expert Examination Conclusion on Expert Examination of Influence on the Environment BP 02. Report of evaluation of influence on environment of the new power station in Yerevan with combined cycle of steam and gas".

ADB's and IFC's policies require that once a draft ESIA report is disclosed, sufficient time is allowed for stakeholders to get acquainted with the document prior to participating in a consultation meeting or otherwise communicating their feedback. According to ADB's Safeguard Policy Statement (2009) and ADB's Public Communication Policy (2011), a draft EIA report for a category A project shall be publicly disclosed for at least 120 days on ADB's website before Board consideration. IFC's Sustainability Framework (IFC 2012) requires a disclosure of 60 days for a category A project.

2.2 International Agreements

Armenia has ratified a number of international agreements and conventions relating to the protection of the environment and biodiversity, including:

- The Convention on the Conservation of European Wildlife and Natural Habitats (Bern)
- Convention on Wetlands of International Importance (Ramsar)
- Conservation of Migratory Species of Wild Animals (Bonn)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington)
- European Landscape Convention (Florence)
- Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris)
- Convention on Biological Diversity (Rio de Janeiro)
- Framework Convention on Climate Change (Rio de Janeiro)
- Kyoto Protocol (linked to the Convention on Climate Change)
- Paris Agreement (linked to the Convention on Climate Change).

With special respect to handling of hazardous substances:

- Stockholm Convention “On Persistent Organic Pollutants” (ratified by the Government of the Republic of Armenia 2003)
- Basel Convention “On the Control of Transboundary Movements of Hazardous Wastes and their Disposal” (being a party since 1999).

In addition Armenia is a signatory to the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters.

International agreements and conventions triggered by the Project are especially: Convention Concerning the Protection of the World Cultural and Natural Heritage (if any cultural or historical goods will be found at the construction site by chance); Framework Convention on Climate Change + Kyoto Protocol and Paris Agreement (due to air emissions including GHG emissions); Stockholm Convention On Persistent Organic Pollutants + Basel Convention On the Control of Transboundary Movements of Hazardous Wastes and their Disposal (due to necessary handling of hazardous material and waste); and Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (regarding all aspects of public consultations). These guidelines and conventions are the basis for related mitigation measures given in the ESMP.

2.3 International Requirements

ADB and IFC define that ESIA shall be conducted in line with national laws and regulations as well as in line with international environmental and social safeguard standards. To this end, projects financed by these institutions must meet the respective environmental, social and disclosure policies. From the policies, the following are highlighted as of importance for the present ESIA:

- IFC Performance Standards on Social and Environmental Sustainability (IFC, 2012)
- IFC/ WB Environmental, Health and Safety (EHS) Guidelines (IFC, 2007)
- ADB Safeguard Policy Statement (SPS, 2009).

In sectors where no appropriate IFC/ADB policies or guidelines exist, the banks apply “good international industry practice”.

2.3.1 IFC Sustainability Framework

IFC adopted eight Performance Standards (PS) on Social and Environmental Sustainability (IFC, 2012) in order to manage social and environmental risks and impacts and to enhance development opportunities.

Performance Standard 1 establishes the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client’s management of environmental and social performance throughout the life of the project.

Performance Standards 2 to 8 establish objectives and requirements to avoid, minimize, and where residual impacts remain, to compensate/ offset for risks and impacts to workers, affected communities, and the environment. While all relevant environmental and social risks and potential impacts should be considered as part of the assessment, Performance Standards 2 to 8 describe potential environmental and social risks and impacts that require particular attention. Where environmental or social risks and impacts are identified, the client is required to manage them through its Environmental and Social Management System (ESMS) consistent with Performance Standard 1.

A number of cross-cutting topics such as climate change, gender, human rights, and water, are addressed across multiple Performance Standards.

IFC PS 1: Assessment and Management of Environmental and Social Risks and Impacts

Performance Standard PS 1 **applies to all projects** that have environmental and social risks and impacts. It underscores the importance of managing environmental and social performance throughout the life of a project. Its objectives are:

- To identify and evaluate environmental and social risks and impacts of the project.
- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/ offset for risks and impacts to workers, affected communities, and the environment.
- To promote improved environmental and social performance of clients through the effective use of management systems.
- To ensure that grievances from affected communities and external communications from other stakeholders are responded to and managed appropriately.
- To promote and provide means for adequate engagement with affected communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

IFC PS 2: Labor and Working Conditions

Performance Standard PS 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. The requirements set out in PS 2 have been in part guided by a number of international conventions and instruments, including those of the International Labour Organization (ILO) and the United Nations (UN).

Its objectives are:

- To promote the fair treatment, non-discrimination, and equal opportunity of workers.
- To establish, maintain and improve the worker-management relationship.
- To promote compliance with national employment and labor laws.
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.
- To promote safe and healthy working conditions, and the health of workers.
- To avoid the use of forced labor.

Workers will be employed especially during the construction phase of the Project, thus **triggering this Performance Standard**. This PS also applies to the operational and decommissioning phases of the Project.

IFC PS 3: Resource Efficiency and Pollution Prevention

Performance Standard PS 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. PS 3 outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices. In addition, it promotes the ability of private sector companies to adopt such technologies and practices as far as their use is feasible in the context of a project that relies on commercially available skills and resources.

Its objectives are:

- To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.
- To promote more sustainable use of resources, including energy and water.
- To reduce Project-related GHG emissions.

As the new Combined Cycle Power Plant will have emissions to the air from burning gas for power generation and as certain amounts of waste water and different types of waste will be produced during construction, operation, and decommissioning of the plant, **this Performance Standard is triggered.**

IFC PS 4: Community Health, Safety, and Security

Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. While acknowledging the public authorities' role in promoting the health, safety, and security of the public, PS 4 addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups.

Its objectives are:

- To anticipate and avoid adverse impacts on the health and safety of the affected community during the project life from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the affected communities.

Community health, safety and security **will be a topic during all phases of the Project.**

IFC PS 5: Land Acquisition and Involuntary Resettlement

Performance Standard 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.

Its objectives are:

- To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs.
- To avoid forced eviction.
- To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.
- To improve, or restore, the livelihoods and standards of living of displaced persons
- To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.

This **Performance Standard will not be triggered by the Project**, as all land necessary for the construction, operation, and decommissioning of YCCPP-2 has already been acquired. ArmPower/RENCO has entered a land purchase agreement with the seller (Yerevan Thermal Power Plant CJSC) in March 2017. According to this agreement, the Seller guarantees that the land is free of any form of occupancy or any other possession by any third party and there are no current and, to the best of its knowledge, threatened or pending actions, suits or other proceedings which may affect the Seller's rights to dispose of the Project Land, and the Purchaser's title to the Project Land. The designated purpose of the Land is "for energy, transport, communication, utility infrastructure objects", as stated in the title certificate 18042017-01-0184. A legal opinion has been emitted by an Armenian lawyers company, which stated that the preliminary agreement is legally binding and enforceable. Existing access roads will be used and no physical relocation will be necessary for implementation of the Project.

IFC PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The

requirements set out in PS 6 have been guided by the Convention on Biological Diversity.

Its objectives are:

- To protect and conserve biodiversity.
- To maintain the benefits from ecosystem services.
- To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.

Due to air emissions from the planned power plant as well as due to the production of waste water and wastes during construction, operation, and decommissioning, this Performance Standard is **triggered by the Project**.

IFC PS 7: Indigenous Peoples

Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development.

Its objectives are:

- To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.
- To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.
- To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.
- To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle.
- To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.
- To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.

This **Performance Standard will not be triggered by the Project** as no groups of Indigenous People are living in the Project Area of Influence.

IFC PS 8: Cultural Heritage

Performance Standard 8 recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, PS 8 aims to ensure that clients protect cultural heritage in the course of their project activities. In addition, the requirements of this PS on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity.

Its objectives are:

- To protect cultural heritage from the adverse impacts of project activities and support its preservation.
- To promote the equitable sharing of benefits from the use of cultural heritage.

There is no cultural heritage known to be located in the Project Area of Influence. Thus, this Performance Standard would only be **triggered** if any unexpected cultural or archeological goods were found during construction. In this case a Chance Find Procedure would take effect.

In its Sustainability Framework (IFC, 2012) IFC uses a process of environmental and social **categorization** to reflect the magnitude of a Project's risks and impacts. These categories are:

- Category A. Business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented.
- Category B. Business activities with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures.
- Category C. Business activities with minimal or no adverse environmental or social risks and/or impacts.
- Category FI. Business activities involving investments in FIs or through delivery mechanisms involving financial intermediation.

According to IFC's Sustainability Framework (2012) the Project falls into environmental **Category A**, due to its likelihood of causing significant adverse environmental impacts by air pollution. Thus the Project requires an ESIA.

2.3.2 IFC/ World Bank EHS Guidelines

The IFC/ WB Environmental, Health and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). The General EHS Guidelines contain a series of specific guidelines for different projects. They are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent.

The specific guidelines applicable to this Project are the following:

- IFC/World Bank Group General EHS Guidelines (2007)
- IFC/World Bank Group EHS Guidelines for Electric Power Transmission and Distribution (2007)
- IFC/World Bank Group EHS Guidelines for Thermal Power Plants (2008)

2.3.3 ADB Safeguard Policy Statement

The ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, financial intermediation loans, and private sector investment operations. Environmental assessment is a process rather than a one-time report, and includes necessary environmental analyses and environmental management planning that take place throughout the project cycle.

The objectives of ADB's safeguards are to:

- avoid adverse impacts of projects on the environment and affected people, where possible;
- minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

ADB's SPS (2009) sets out the policy objectives, scope and triggers, and principles for three key safeguard areas:

- environmental safeguards,
- involuntary resettlement safeguards, and
- Indigenous Peoples safeguards.

ADB staff, through their due diligence, review, and supervision, will ensure that borrowers/clients comply with safeguard requirements during project

preparation and implementation. These safeguard requirements are as follows:

- Safeguard Requirements 1: Environment,
- Safeguard Requirements 2: Involuntary Resettlement,
- Safeguard Requirements 3: Indigenous Peoples, and
- Safeguard Requirements 4: Special Requirements for Different Finance Modalities.

ADB uses a classification system to reflect the significance of a project's potential impacts through three types of impacts of the proposed projects: environmental impacts, probable involuntary resettlement and potential impacts on Indigenous Peoples. ADB categorizes projects separately under environmental and social impacts.

- **Category A.** A proposed project is classified as category A if it is likely to have significant involuntary resettlement impacts, significant impacts on Indigenous Peoples and/or significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA), including an environmental management plan (EMP), an Indigenous Peoples plan (IPP), including assessment of social impacts and a resettlement plan, including assessment of social impacts are required, if the Project is categorized A both under environmental and social impacts.
- **Category B.** A proposed project is classified as category B if it includes involuntary resettlement impacts that are not deemed significant, if it is likely to have limited impacts on Indigenous Peoples, and/or if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE), including an EMP, a resettlement plan, including assessment of social impacts and an IPP, including assessment of social impacts, are required, if the Project is categorized B both under environmental and social impacts.
- **Category C.** A proposed project is classified as category C if it has no involuntary resettlement impacts, if it is not expected to have impacts on Indigenous Peoples, and if it is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications need to be reviewed.
- **Category FI.** A proposed project is classified as category FI if it involves the investment of ADB funds to, or through, a financial intermediary.

A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts, its most sensitive component in terms of involuntary resettlement impacts and its most sensitive component in terms of impacts on Indigenous Peoples.

The Project subject to this ESIA is classified as of **Category A** for environment, as impacts will affect an area larger than the site itself (due to air and water pollution). Neither resettlement impacts, nor impacts on Indigenous Peoples are expected. Thus, the Project is categorized as Category C for Involuntary Resettlement and Category C for Indigenous Peoples. An ESMP is included in Section 9.8.

Detailed guidance on environmental and social management of the Project, as well as on ESIA and ESMP preparation is provided in ADB's Safeguards Requirements 1 to 3 in appendices 1 to 3 of ADB's SPS. As a summary, the following items are of importance for the Project and are included in this report:

- Analysis of alternatives;
- Appropriate environmental and social baseline data;
- All potential impacts and risks of the project on physical, biological, socioeconomic (occupational health and safety, community health and safety, vulnerable groups and gender issues, and impacts on livelihoods through environmental media) and physical cultural resources in an integrated way and in the context of the project's area of influence;
- Preparation of an environmental management plan (EMP) including:
- proposed mitigation and compensation measures, environmental monitoring and reporting requirements, emergency response procedures, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators;
- Principles to monitor and measure the progress of implementation of the EMP;
- Information Disclosure, Consultation and Participation;
- A Grievance Redress Mechanism;
- Application of pollution prevention and control technologies and practices consistent with international good practice;
- Occupational and Community H&S.

Still according to ADB's SPS (2009), an EIA report includes the following major elements: (i) executive summary, (ii) policy, legal and administrative framework, (iii) description of the project, (iv) description of the environment (with comprehensive baseline data), (v) anticipated environmental impacts and mitigation measures, (vi) analysis of alternatives, (vii) environmental management plan(s), (viii) consultation and information disclosure, (ix) grievance redress mechanism, and (x) conclusion and recommendations.

2.3.4 Other Relevant Guidelines

Other international guidelines relevant for the Project are:

- EU EIA-Directive (2011/92/EU amended by Directive 2014/52/EU)
- EU Directive 2013/35/EC on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields)
- EU Directive 2008/98/EC on waste (Waste Framework Directive)
- ICNIRP (International Commission on Non-Ionizing Radiation Protection): Guidelines for Limiting Exposure to time-varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)

The three named EU Directives are for comparison of the Project's necessities on EU level. The ICNIRP Guidelines are triggered by the Project due to possible exposure of workers to electric, magnetic and electromagnetic fields. These Guidelines are the basis for the development of the related mitigation measures in the ESMP.

2.4 Environmental Standards

This Section presents a summary of the environmental standards applicable to the project, including national, international and performance guarantee standards/limits. The standards are to be applied according to the ESMP's instructions.

Table 2-2: Limit values for noise regarding population (IFC/WB General EHS Guidelines)

Receptor	One Hour L_{Aeq} (dB A)	
	Daytime 7:00 – 22:00	Night-time 22:00 – 7:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70
Noise impacts should not exceed the levels given above, or result in a maximum increase in background levels of 3 dB (A) at the nearest receptor location off-site.		

Table 2-3: Limit values for noise regarding population (Sanitary Norm N2-III-11.3)

Receptor	One Hour L_{Aeq} (dB A)	
	Daytime 7:00 – 22:00	Night-time 22:00 – 7:00
Residential areas	55	45
Industrial activities/buildings	50-80	
The limits refer to the total environment noise (the power plant contribution + the current sound pressure ("ante operam" sound pressure))		

Table 2-4: Limit values for noise regarding workers

<p>IFC/WB General EHS Guidelines: No employee should be exposed to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection’.</p>
<p>Armenian legislation: Construction workers will wear ear protection devices as part of their Personal Protective Equipment (PPE), if they are exposed to noise levels higher than 80 dB (A).</p>

Table 2-5: Performance Guarantees of YCCPP-2 - noise (ArmPower, 2017)

The average A-weighted sound pressure level of the turbine halls 1.5 m above ground level and at 1 m from the turbine installation shall not exceed 80 dB(A).
The A-weighted sound pressure level of the overall plant at the plant boundary 1.5 m above ground will not exceed 50 dB(A) the noise occurring in the free field (before construction is started).
A maximum of 3 dB(A) measured as incremental noise from the base line measured before plant is completed at plant fence

Table 2-6: IFC air emission guidelines for facilities larger than 50 MW with combustion turbines (IFC, 2008)

Pollutant	EG for combustion turbines; facilities > 50 MWth
	Natural Gas
NO ₂	51 mg/Nm ³
Dry gas, excess O ₂ content	15%
Temperature flue gas	0°C

Table 2-7: Performance Guarantees for YCCPP-2 - air emissions (ArmPower, 2017)

Pollutant	Performance Guarantees
CO	30 mg/Nm ³
NO ₂	51 mg/Nm ³
UHC	10 mg/Nm ³
Dry gas, excess O ₂ content	15%
Temperature flue gas	0°C
Load	From 60% to 100%

UHC: Unburned Hydrocarbons

Table 2-8: National and ECD Ambient Air Quality Standards

Pollutant		Averaging period	Air Quality Standards [$\mu\text{g}/\text{m}^3$]	
			National MAC	ECD
CO		Short-time	5,000	-
		24 hours	3,000	-
		Max. daily 8 hour mean	-	10,000
NO ₂		Short-time	200	-
		1 hour	-	200 Not to be exceeded more than 18 times per year
		24 hours	40	-
		1 year	-	40
UHC	Methane	-	-	-
	Ethane	-	-	-
	Propane	-	-	-
	Butane	Short-time	200,000	-
	Pentane	Short-time	100,000	-
24 hours		25,000	-	
PM ₁₀		Maximum	300	-
		24 hours	60	50 Not to be exceeded more than 35 times per year
		1 year	-	40
SO ₂		Maximum	500	-
		1 hour	-	350 Not to be exceeded more than 24 times per year
		24 hours	50	125 Not to be exceeded more than 3 times per year

ECD: European Council Directives

UHC: Unburned Hydrocarbons

MAC: Maximum Allowable Concentration

Table 2-9: Industrial Effluent Conditions as given in ArmPower Design Data, Effluent Standards for YCCPP-1 set by MNP, and applicable Effluent Guidelines for wastewater from thermal power plants (Source: IFC/WB EHS Guidelines for Thermal Power Plants)

Parameter	mg/l (except pH, temp. and total coliform bacteria)		
	Effluent conditions as given in ArmPower Design Data	Effluent Standards for operation of YCCPP-1	IFC/WB Effluent Guidelines (to be applicable at relevant wastewater streams) ¹
pH	6.5 – 8.5	6.5 – 8.5	6 – 9
Total suspended solids	50	40	50
Biochemical oxygen demand (BOD)	6	6	
Chemical oxygen demand (COD)	30	30	
Dissolved O ₂	> 4	> 4	
Smells, odors	1 level	should not exist	
Coloring	shall not exist in 10 cm column	shall not exist in 10 cm column	
Oil	10	0.3	10
Cu	0.1	0.1	0.5
Fe	0.5	0.3	1.0
Chlorides		350	
Sulfates		500	
Total coliform bacteria		< 1000 MPN/l	4000 MPN/l*
Temperature increase by thermal discharge from cooling system		Temperature of waste water: 5° C – 23° C	< 3°C increase of ambient water temperature*

* according to IFC/World Bank Group General EHS Guidelines
MPN = Most Probable Number

¹ as defined in IFC/WB EHS Guidelines for Thermal Power Plants (2008): Effluent guidelines (to be applicable at the relevant wastewater stream: e.g. from FGD system, wet ash transport, washing boiler / air preheater and precipitator, boiler acid washing, regeneration of demineralizers and condensate polishers, oil-separated water, site drainage, coal pile runoff, and cooling water)

Table 2-10: Guideline values for Sanitary Sewage Discharges (Source: IFC/WB General EHS Guidelines)

Parameter	Unit	IFC/WB Effluent Guidelines
pH	pH	6-9
BOD	mg/l	30
COD	mg/l	125
Total N	mg/l	10
Total Ph	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50
Total coliform bacteria	MPN*/100 ml	400

*MPN = Most Probable Number

Table 2-11: Dutch Standards for groundwater quality (Soil Remediation Circular, 2009)

Substance	Dutch Standards	
	Target value [$\mu\text{g/l}$]	Intervention value [$\mu\text{g/l}$]
Antimony (Sb)	0.15	20
Arsenic (As)	10	60
Barium (Ba)	50	625
Beryllium (Be)	0.05	15
Cadmium (Cd)	0.4	6
Chromium (Cr)	1	30
Cobalt (Co)	20	100
Copper (Cu)	15	75
Nickel (Ni)	15	75
Lead (Pb)	15	75
Molybdenum (Mo)	5	300
Selenium (Se)	0.07	160
Tin (Sn)	2.2	50
Vanadium (V)	1.2	70
Zinc (Zn)	65	800

Table 2-12: Limits defined by ICNIRP to manage human exposure to electric and magnetic fields

Source	El. Field strength [V/m]	Magn. flux density [μ T]
<u>ICNIRP recommends for 50/60 Hz:</u> Reference levels for exposure to time-varying electric and magnetic fields (unperturbed r.m.s. values) occupational exposure general public exposure	10,000 5,000	500 100
<u>Limit values according to the European Directive 2013/35/EC</u> exposure of workers	10,000	500

r.m.s. = root mean square (value)

ICNIRP=International Commission on Non-Ionizing Radiation Protection

These limits also conform to the values given in European Directive 2013/35/EC for the exposure of workers.

In some countries of the former USSR a formula is used to calculate the allowed exposure time of workers, that is:

$$T_{[\text{hrs}]} = 50/E - 2$$

$$E = \text{electric field [kV/m]}$$

That means that the exposure time in an electric field of 25 kV/m is 0 hrs. Working in an electric field of 25 kV/m or more is not allowed without special protecting clothing.

Table 2-13: Maximum allowable concentrations (MAC) of chemical substances in soil (Sanitary norms and rules N 2.1.7.003-10)

Substance	Maximum Allowable Concentration [mg/kg]
Vanadium (V)	150
Mercury (Hg)	2.1
Antimony (Sb)	4.5
Cobalt (Co)	5.0
Manganese (Mn)	400 – 700 (depending on pH)
Copper (Cu)	3
Nickel (Ni)	4
Lead (Pb)	6
Zinc (Zn)	23
Chromium (Cr)	6

2.5 Gap Analysis between National and International Legislation

The legal framework of the Republic of Armenia does in the essence correspond with the international regulations and safeguards. Gaps however do exist in enforcement of the regulations. There is still a considerable lack of institutional capacities for implementation, monitoring and evaluation.

There have been improvements during recent years, compared to the analysis of CENN (2004) on Effectiveness of Environmental Impact Assessment (EIA) System in Armenia, but some problematic issues still persist. There is a lack of specific Social and Environmental (S&E) qualification of governmental staff and a specific S&E department does often not exist in the implementing institutions, partly the existing structures are overloaded with work and staff is not sufficiently remunerated. In some cases, power relations are unfavorable to guarantee an effective enforcement. To some extent, the number of highly qualified staff is not sufficient to cope with the amount of work to guarantee an effective enforcement of the regulations.

The lack of access to legal support and lack of trust in the institutions, especially for weaker sections of the society may create further gaps concerning implementation of compensation and resettlement. Additional training would be a necessity but however not sufficient component to improve implementation and monitoring performance. Compliance with international safeguards could be increased with independent monitoring by internationally experienced auditors/ consultants.

The following tables have been prepared for comparison of the IFC Performance Standards (2012), the concerning conventions stipulated by the International Labor Organization (ILO), and the related IFC/ WB General EHS Guidelines (2007), as well as the EHS Guidelines for Thermal Power Plants (2008) with the current legislation of the Republic of Armenia (RA).

The Performance Standards are to be cross-read and refer to each other. Only applicable standards have been considered. Additionally, the concerning international conventions ratified by Armenia are considered, as they are converted into a constituent part of the legal system of RA. The focus was laid on the project relevant guidelines and laws. The relevant Armenian Legislation was compiled by national legal experts.

The comparison results in the following conclusions:

- The Constitution has the supreme legal force in Armenia. Article 6 sets the keystones of the Armenian Legislation, stipulating that laws shall conform to the Constitution, whereas other legal acts (mainly Decrees of the President and Decisions of the Government) have to conform both to the Constitution and the laws.
- International agreements come into force after being ratified or approved, being then converted into a constituent part of the legal system of the Republic of Armenia. They supersede Armenian Legislature.

International agreements not complying with the Constitution cannot be ratified.

- The Law of the Republic of Armenia on Environmental Assessment and Expertise (2014) defines the framework for the Project, covering environmental and social aspects of the proposed activities.
- In Armenia, the Labor Code is the general legal act that regulates labor relationship. The specific features for regulating particular spheres of labor relations may be determined by other laws.
- The IFC Performance Standard 2 on Labor and Working Conditions is based on a number of international conventions and instruments, including those of the International Labor Organization (ILO) and the United Nations (UN). All of them are ratified by the Republic of Armenia, except “UN - International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families”, which has only been signed and ratification is still pending.
- The remaining IFC Performance Standards are covered by a range of Laws, Government Decisions, Decrees and Orders.

As can be seen in the following tables, there are no known significant gaps relevant for the Project, i.e, the related national legislation addresses the requirements of the IFC Performance Standards (2012).

Covering the IFC Performance Standards does also imply adherence to the ADB Safeguard Requirements as given in the ADB Safeguard Policy Statement (SPS 2009).

IFC Performance Standard 1 and related Armenian Legislation

IFC Performance Standard	Ratified International Treaties (ILO / EHS guidelines)	Armenian Legislation
PS 1 - Assessment and Management of Environmental Risks and Impacts		
<p>Conduct a social and environmental assessment and establish and maintain an Environmental and Social Management System (ESMS) including: Policy, Identification of risks and impacts, Management programs, Organizational capacity and competency, Emergency preparedness, Monitoring and Review, Stakeholder engagement, External Communication and Grievance Mechanisms for Affected Communities.</p> <p>The Impact assessment and the ESMS apply to all the project activities. Corresponding details are given for each applicable Performance Standard.</p>		<ul style="list-style-type: none"> • Law of the Republic of Armenia on Environmental Assessment and Expertise (2014)

IFC Performance Standard 2 and related Armenian Legislation

IFC Performance Standard	Ratified International Treaties (ILO / EHS guidelines)	Armenian Legislation
PS 2 - Labor and Working Conditions		
<p>Social risks and impacts are assessed and necessary actions are managed through the ESMS (see Performance Standard 1).</p> <p>The scope of application is direct workers (engaged by the client) as well as contracted workers (engaged by third parties).</p>		<ul style="list-style-type: none"> • Law of the Republic of Armenia on Environmental Assessment and Expertise (2014); covering environmental and social aspects of proposed activities • "Civil relationship contracts" with third parties (companies providing appropriate services, having appropriate certificates and licenses required by RA law) can be signed. Within those contracts parties may envisage necessary requirements.
<p>Provide reasonable working Conditions and Terms of Employment (eventually regarding collective bargaining agreements)</p>	<ul style="list-style-type: none"> • ILO – Convention On Collective Bargaining 	<ul style="list-style-type: none"> • RA Constitution, Article 48 • RA Labor Code, Article 2 and 3 • RA Constitution, Article 35 : special protection for maternity • RA Government Decree N201-N (2007): schedule features of work and rest for workers of power supply sector. • RA Government Decree N1223-N (2005): workers that can be involved in works with 24 hours working day

IFC Performance Standard	Ratified International Treaties (ILO / EHS guidelines)	Armenian Legislation
PS 2 - Labor and Working Conditions		
Provide workers with documented information (clear and understandable) regarding national labor and employment laws	<ul style="list-style-type: none"> EHS - 2.2 Communication and Training 	<ul style="list-style-type: none"> RA Labor Code Chapter 7, Article 43
If accommodation services are provided, a reasonable policy regarding their quality is provided		<ul style="list-style-type: none"> There is no equivalent requirement within RA legislation. Employer pays employee for accommodation during business trip according to RA Government Decree N2335-N (2005)
Compliance with national law regarding workers' Organizations, adequate collaboration with their representatives	<ul style="list-style-type: none"> ILO – Convention on Freedom of Association and Protection of the Right to Organise 	<ul style="list-style-type: none"> RA Labor Code Chapter 3
Assure non-discrimination and equal opportunity to all the workers (regarding age, origin, gender, health etc., in concern to employment, wages, benefits, etc.), compliance with national laws regarding this concern	<ul style="list-style-type: none"> ILO - Convention on Discrimination in Respect of Employment and Occupation ILO - Convention on Equal Remuneration for Men and Women Workers ILO - Convention on Labor Inspection 	<ul style="list-style-type: none"> RA Constitution, Article 32 RA Labor Code Chapter 19, Article 180: Organization of Remuneration for Work RA Law on Remuneration (2003) RA Labor Code Chapter 5: control and supervision over compliance with labor legislation
Retrenchment only after an analysis of possible alternatives, a timely notice of dismissal and after elaboration of a retrenchment plan, considering pack pays and social security benefits		<ul style="list-style-type: none"> RA Labor Code Chapter 15
Provision of a Grievance Mechanism for workers	<ul style="list-style-type: none"> ILO - Convention on Labor Administration 	<ul style="list-style-type: none"> If the right of the employee is breached, a claim can be submitted to the court Some mechanisms can be envisaged by collective agreement as well. However, collective agreement will not deter an employee to submit a claim to the court. An employee may submit any grievance to employer for consideration and hearing. Also, grievance mechanisms may be stipulated by collective agreement.
Not employ children in any manner that is economically exploitative or could be harmful to them	<ul style="list-style-type: none"> ILO - Convention on Worst Forms of Child Labor ILO – Convention On Minimum Age UN – Convention on the Rights of the Child 	<ul style="list-style-type: none"> RA Constitution, Article 32
Not employ forced labor	<ul style="list-style-type: none"> ILO - Convention on the Forced Labor ILO - Convention on Abolition of Forced Labor 	<ul style="list-style-type: none"> RA Constitution, Article 32

IFC Performance Standard	Ratified International Treaties (ILO / EHS guidelines)	Armenian Legislation
PS 2 - Labor and Working Conditions		
Occupational Health and Safety: provide a safe and healthy work environment	<ul style="list-style-type: none"> • EHS - 2.3 Physical Hazards • EHS - 2.4 Chemical Hazards • EHS - 2.7 Personal Protective Equipment (PPE) • EHS - 2.8 Special Hazard Environments • EHS - 2.9 Monitoring • EHS Guidelines for Thermal Power Plants: 1.2 Occupational Health and Safety • ICNIRP Guidelines for Limiting Exposure to time-varying Electric, Magnetic, and Electromagnetic Fields 	<ul style="list-style-type: none"> • RA Constitution, Article 32: right to working conditions in compliance with the safety and hygiene requirements • RA Labor Code Chapter 23 • RA Government Decree N1698-N (2010): heavy, harmful, especially heavy and especially harmful productions, works, professions and positions.

IFC Performance Standard 3 and related Armenian Legislation

IFC Performance Standard	Ratified International Treaties (ILO / EHS guidelines)	Armenian Legislation
PS 3 - Resource Efficiency and Pollution Prevention		
The principles and techniques applied during the project life-cycle will be tailored to the hazards and risks associated with the nature of the project and consistent with good international industry practice (see Performance Standard 1)		<ul style="list-style-type: none"> • Law of the Republic of Armenia on Environmental Assessment and Expertise (2014) • RA Constitution, Article 10
Resource Efficiency (Greenhouse Gases): Implement technically and financially feasible and cost-effective options to reduce project-related GHG-emissions during design and operation (e.g. reduction of fugitive emissions)	<ul style="list-style-type: none"> • EHS - 1.1 Air Emissions and Ambient Air Quality • EHS Guidelines for Thermal Power Plants: 1.1 Air Emissions, GHG Emissions • Convention on Climate Change (+ Kyoto Protocol, Paris Agreement) 	<ul style="list-style-type: none"> • RA Law on Protection of Atmospheric Air (1994) • RA Decree No. 160-N: Norms of maximum permissible concentrations of atmospheric air pollutants in residential areas

IFC Performance Standard	Ratified International Treaties (ILO / EHS guidelines)	Armenian Legislation
PS 3 - Resource Efficiency and Pollution Prevention		
<p>Resource Efficiency (Water Consumption): adopt measures that avoid or reduce water usage so that the project's water consumption does not have significant adverse impacts on others</p>	<ul style="list-style-type: none"> • EHS - 1.3 Wastewater and Ambient Water Quality • EHS - 1.4 Water Conservation • EHS Guidelines for Thermal Power Plants: 1.1 Water Consumption, Effluents 	<ul style="list-style-type: none"> • RA Water Code (2002) • The RA Law "On National Water Program" • The RA Law "On the Fundamentals of National Water Policy (2005) • RA Government Decision N 1147-N (2005): On the Regulations of Defining Water Standards • RA Government Decision N 982-N (2003): On Approving the Procedure for Use of Absorbent Pits, Exhausted Mines and Open Shafts for Discharge of Wastewater and Drainage Water and Outflow Permission • RA Government Decision N 75-N (2011): On Defining the Norms for Securing Water Quality of Each Basin Management Area Depending on the Features of the Specific Area • RA Government Decision N 118-N (2010) "On Defining The Measures for Application of Advanced Technologies, Improvement of Monitoring, Reduction and Prevention of Pollution of Water Resources" • RA Government Decision N 354-N (2003)" On Approving the Procedure for Determination of Quantities and Regimes of Water intake from Water Resources for Water Users" • Order of RA Minister of Nature Protection N 464-N (2003) "On Approving the Methodology of Calculation of Allowed Marginal Outflow Quantities Discharged onto Water Resources"
<p>Resource Efficiency (Waste): Generation of waste is avoided where possible. If not, reduction and reuse are considered. Where waste cannot be recovered or reused, the client will treat, destroy, or dispose of it in an environmentally sound manner</p>	<ul style="list-style-type: none"> • EHS - 1.6 Waste Management • EHS Guidelines for Thermal Power Plants: 1.1 Solid Wastes 	<ul style="list-style-type: none"> • RA Law "On Waste" (2004) • RA Law "On Refuse Collection and Sanitary Cleaning" • RA Government Decision No 47-N "On Defining Procedure for Waste Passportization (2006) • Order No 19-N of RA Minister of Nature Protection(2007): On Defining the Form of Sample Passport of Waste • Order No 342-N of RA Minister of Nature Protection (2006): On Approving the List of Industrial (Including Mining) and Consumption Waste Generated in the Territory of the Republic of Armenia • Order N 430-N of RA Ministry of Nature Protection (2006): On Defining the List of Waste Classified by Risk Level • Order No 112-N (2002) of the Ministry of Nature Protection

IFC Performance Standard	Ratified International Treaties (ILO / EHS guidelines)	Armenian Legislation
PS 3 - Resource Efficiency and Pollution Prevention		
<p>Resource Efficiency (Hazardous Materials Management): If the generated waste is considered hazardous, the client will adopt alternatives for its environmentally sound disposal while adhering to the limitations applicable to its transboundary movement.</p> <p>The production, transportation, handling, storage, and use of hazardous materials for project activities should be assessed</p>	<ul style="list-style-type: none"> • EHS - 1.5 Hazardous Materials Management • EHS Guidelines for Thermal Power Plants: 1.1 Hazardous Materials and Oil • Stockholm Convention "On Persistent Organic Pollutants" (ratified 2003) • Basel Convention "On the Control of Transboundary Movements of Hazardous Wastes and their Disposal" (being a party since 1999) 	<ul style="list-style-type: none"> • RA Government Decision No 874-N (2004) On Approving the List of Hazardous Wastes of the Republic of Armenia • Government Decree N97(1995): "Regulating the Import, Export and Transboundary Movement of Hazardous and Other Types of Waste in the Territory of the Republic of Armenia" • RA Government Decision N 546-N (2015): On Approving the Technical Regulation for Lubrication Substances, Oil and Special Liquids • Decree No 1483-N On Fulfillment of the obligations of the Republic of Armenia proceeding from UN Stockholm Convention

IFC Performance Standard 4 and related Armenian Legislation

IFC Performance Standard	Ratified International Treaties (ILO / EHS guidelines)	Armenian Legislation
PS 4 - Community Health, Safety, and Security		
The client will identify risks and impacts and propose mitigation measures that are commensurate with their nature and magnitude. These measures will favor the avoidance of risks and impacts over minimization (see Performance Standard 1)	<ul style="list-style-type: none"> • EHS Guidelines for Thermal Power Plants: 1.3 Community Health and Safety 	<ul style="list-style-type: none"> • Law of the Republic of Armenia on Environmental Assessment and Expertise (2014); covering environmental and social aspects of proposed activities
Design, construction, operation, and decommission of the structural elements or components is done considering safety risks to third parties or Affected Communities	<ul style="list-style-type: none"> • EHS - 3.2 Structural Safety of Project Infrastructure • EHS - 3.3 Life and Fire Safety (L&FS) 	<ul style="list-style-type: none"> • The Law of the RA On Fire Safety (2001)
Potential for community exposure to hazardous materials and substances that may be released will be avoided or minimized	<ul style="list-style-type: none"> • EHS - 3.5 Transport of Hazardous Materials 	<ul style="list-style-type: none"> • RA Law On Waste (2004) chapter 2, article 9 • Order N 20-N of the Minister of Healthcare (2009): On Defining Sanitary Rules and Norms N 2.1.7.001-09 "Hygienic Requirements to the Management of Hazardous Waste and Storage and Transportation of Hazardous Chemical Substances" • RA Government Decision N 546-N (2015): On Approving the Technical Regulation for Lubrication Substances, Oil and Special Liquids

IFC Performance Standard	Ratified International Treaties (ILO / EHS guidelines)	Armenian Legislation
PS 4 - Community Health, Safety, and Security		
Identify risks and potential impacts on priority ecosystem services (incl. those that may be exacerbated by climate change). Adverse impacts should be avoided, and if these impacts are unavoidable, the client will implement mitigation measures	<ul style="list-style-type: none"> EHS - 3.1 Water Quality and Availability 	<ul style="list-style-type: none"> RA Government Decision N 927-N (2011) "On Defining Assessments of the Demand of Water Used for Drinking-Household and Agricultural Purposes as well as Environmental Flows for Water Basin Areas of the Republic of Armenia"
Emergency Preparedness and Response to concerns of Affected Communities, local government agencies, and other relevant parties	<ul style="list-style-type: none"> EHS - 3.7 Emergency Preparedness and Response 	<ul style="list-style-type: none"> The Law of the RA On Protection of the Population in Emergency Situations (1998)

IFC Performance Standard 6 and related Armenian Legislation

IFC Performance Standard	Ratified International Treaties (ILO / EHS guidelines)	Armenian Legislation
PS 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources		
Any significant residual impact must be assessed including: Relevant threats to biodiversity and ecosystem services, especially focusing on habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, and pollution. It will also take into account the differing values attached to biodiversity and ecosystem services by Affected Communities and, where appropriate, other stakeholders. (see Performance Standard 1)		<ul style="list-style-type: none"> Law of the Republic of Armenia on Environmental Assessment and Expertise (2014)
Impacts on biodiversity and ecosystem services will be avoided where possible. If not avoidable, the impacts will be minimized and mitigation measures that aim to maintain the value and functionality of priority services will be implemented	<ul style="list-style-type: none"> Convention on the Conservation of European Wildlife and Natural Habitats (Bern) Convention on Wetlands of International Importance (Ramsar) Conservation of Migratory Species of Wild Animals (Bonn) Convention on Biological Diversity (Rio de Janeiro) 	<ul style="list-style-type: none"> RA Constitution, Article 10 Law of the Republic of Armenia on Environmental Assessment and Expertise (2014) RA Government Decision N 927-N (2011) "On Defining Assessments of the Demand of Water Used for Drinking-Household and Agricultural Purposes as well as Environmental Flows for Water Basin Areas of the Republic of Armenia"

3. Description of the Project

3.1 Summary Technical Description

A combined-cycle plant produces electricity and captures waste heat from the gas turbine to increase efficiency and electrical output (see Figure 3-1). The compressed air is mixed with fuel that is heated to a very high temperature. The hot air-fuel mixture then moves through the gas turbine blades, making them spin. A generator is driven by the fast-spinning turbine and converts the spinning-energy partly into electricity. A Heat Recovery Steam Generator (HRSG) captures exhaust heat from the gas turbine that would otherwise escape through the exhaust stack. The heat is used to produce high pressure steam which is delivered to the steam turbine to produce additional electricity. In a multi-shaft CCPP, in contrary to a single-shaft CCPP, each gas turbine and each steam turbine has its own generator.

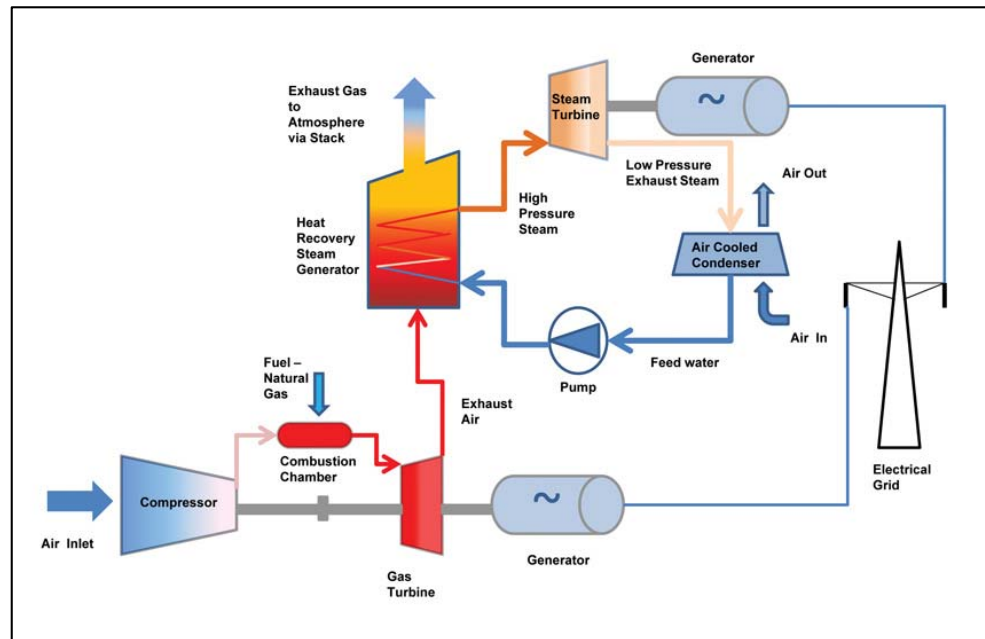


Figure 3-1: General design of a Combined Cycle Power Plant ²

Sophisticated design will minimize operational and maintenance working load and so increase the reliability and availability of the total plant. For optimizing the layout of the new power plant, coordinated building and plant area location and orientation are considered to minimize influences due to meteorological conditions and to realize better accessibility during construction, installation and maintenance. Special attention is paid to the power plant internal roads, interconnecting route and access requirements for construction, erection, operation and maintenance to minimize interference and crossing of main routes and to obtain short connection paths of main piping and cabling ways.

² <http://www.wrexham-power.com/wrexham-energy-centre-eng.html>

The new power plant, owing to its multi-shaft design, will have the immense advantages of higher efficiency, wider flexibility, higher availability to the maximum extent with simple piping arrangement.

The following technical description and the components specifications are taken from the Basic Engineering Design Data (ArmPower, 2017):

Already existing main access roads and auxiliary systems of YCCPP-1 such as water intake and discharge structures, fuel gas regulators, substation for power evacuation, etc. shall be used also for YCCPP-2:

- The water supply for YCCPP-2 shall be branched from the existing water pipelines which serve YCCPP-1 and are located near to the new power plant. Two water supply systems are foreseen for drinking water and raw water.
- The fuel gas source will be branched from the existing pipeline located in the proximity of the new power plant.

The new power plant will consist of a gas turbine with generator (GTG), a Heat Recovery Steam Generator (HRSG), and a steam turbine with generator (STG) which will be installed in a new West East shaft centerline (see Figure 4-2), and related auxiliaries.

The Gross Power output at Design Conditions and 'Base Load' operation mode of the combined cycle (GT Gross Power output + ST Gross Power output) is:

- Guaranteed Gross Power Output: 254 MW (at design conditions)
- Gross Heat Rate (based on LHV: 47,479 kJ/kg): 6,438 kJ/kWh
- Efficiency: 55.91%

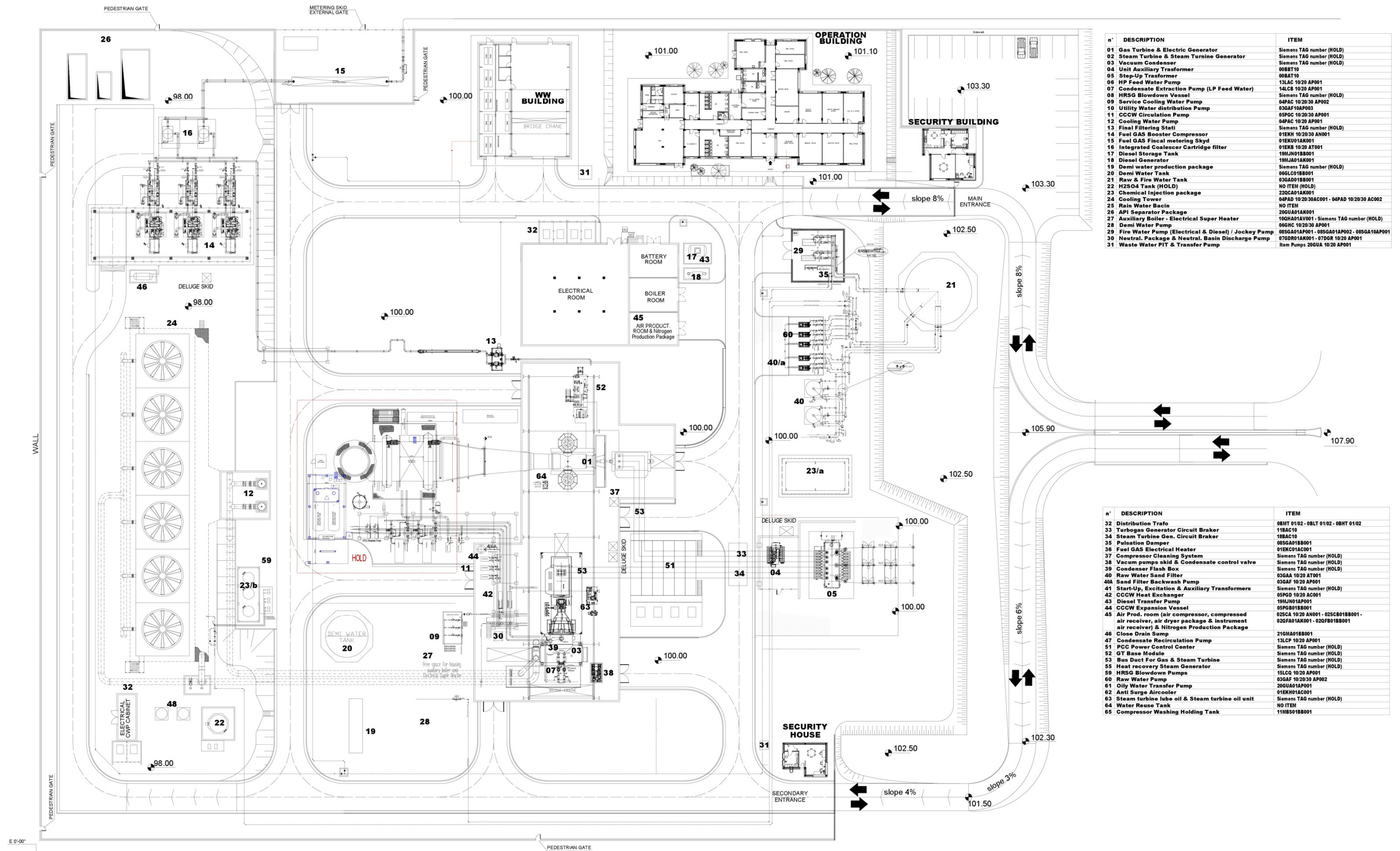


Figure 3-2: YCCPP-2 Key Plan (Source: RENCO SPA)

The new power plant will be designed for full power generation mode, but will also be capable to run at partial load operation. The design life for YCCPP-2 is set to 20 years. YCCPP-2 will include the following main elements:

Gas Turbine

The gas turbine package will mainly be composed by:

- Air compressor (axial type driven directly by the gas turbine, coupled at the same shaft)
- Burner (dry low NO_x)
- Gas Turbine (installed into a dedicated enclosure)
- Gas Turbine Air Preheater System
- Anti-icing System
- Evaporative Cooler
- High Fogging System
- Fuel Gas Filtration Skid
- Main Lube Oil System

The highly efficient gas turbine with the dry low NO_x combustion system is coupled with a generator. The gas turbine will convert the fuel energy into mechanical energy to drive the generator. The gas turbine will be designed to be continuously operated at loads from 75% up to full load rating. It will be out of service only for periodical maintenance. The combustor will be designed of low NO_x type to keep NO_x emission level low. A part of compressor flow will be extracted for cooling turbine blades. The gas turbine will be provided with an air inlet system both filtering and silencing of the combustion air. Dust laden outside air will flow into a field of two stage high efficiency filter system.

Heat Recovery Steam Generator

The exhaust gas flows inside the HRSG in counter current with the high pressure boiling feed water. It shall be an outdoor, two pressure level type with a main stack, condensate preheater, low pressure drum, low pressure evaporator, low pressure super heater, high pressure economizer, high pressure drum, high pressure evaporator and high pressure super heater. A Blow Down vessel will collect all continuous and non-continuous drains from HP and LP drums. A stack provided with a Continuous Emissions Monitoring System (CEMS) will be installed at the end of the HRSG. The height of the stack is foreseen to be of 35 meters.

Steam Turbine

The steam, produced and superheated in the HRSG, is supplied at two different pressure levels to the Steam Turbine stages (High pressure stage and Low pressure stage). The turbine is provided also with a high pressure and low pressure bypass. The exhaust steam discharged by the turbine is condensed by a cooling water exchanger. The condensed mixture of steam and air will be discharged to a suitable drain, leading to the wastewater treatment plant.

Main Generators

Two generators will be provided to the new plant:

- Generator for the gas turbine: nominal capacity 205 MVA at 15.0 kV
- Generator for the steam turbine: nominal capacity 100 MVA at 11.5 kV

The two generators will be capable of operating at power factor of 0.9 lagging to 0.9 leading. They shall be connected by MV bus duct through No. 1 three winding step up transformer (15-11,5/220 kV) for the connection to the new 220 kV substation. The connection between the transformer and the substation shall be provided by high voltage power underground cables or by overhead transmission line.

Emergency Diesel Generator System

Emergency Diesel Generator System shall be 400V, 50 Hz connected to LV Power Center in the electrical building. The emergency Diesel Generator will be designed to feed all emergency load in case of power failure.

Instrument/ Service Air Stream

The instrument air compressor package shall be provided with 2x100% + 10% extra capacity screw compressors oil free type. Two air dryers heatless type designed for 100% (+10 % overdesign) of the maximum compressor capacity shall be foreseen. Between compressors and dryers one buffer vessel of appropriately designed volume shall be foreseen in order to dump the pulsation. Downstream the dryer a storage vessel of sufficient capacity to assure 15 minutes shall be provide the instrument air consumption for plant shutdown scenario.

Auxiliary Boiler

A fired auxiliary boiler shall be provided, in order to guarantee the start-up activities of power train and the building heating during the Plant Shutdown. The boiler will be fed by fuel gas. The required design duty shall be evaluated.

Main Cooling System

The main cooling system will consist of a system of six evaporative towers designed for 110% of maximum flow rate and duty. Evaporative towers shall be designed also to have a low drift phenomena (0.01% drift loss) to limit the water make up. Number three 50% capacity (+ 10% overdesign) vertical pumps shall be provided to pump water to Steam Turbine condenser; three (each at 50% capacity) other pumps shall be installed to provide the water circulation in closed cooling water circuit.

Fuel Gas Supply System

The Plant shall be operated on the specified fuel gas without any backup of fuel oil. The Centrifugal compressors shall be designed for the available fuel gas composition and quality. The compressor, without the use of a bypass,

shall be suitable for continuous operation at any capacity at least 10% greater than the predicted surge capacity.

Demineralized Water System

The Demineralized water production package is part of TP supply and will provide the necessary make up for Combined Cycle consumption.

The demi water system will use the reverse osmosis (RO) technology and ion exchange resin and will include:

- Multimedia Filters;
- Coagulant and Antiscalant dosing package;
- Cartridge Filters;
- Reverse Osmosis Unit;
- Deionization unit;
- Demineralized Water Storage Tank and pumps

The demineralized water is distributed to the users by three 50% Demineralized Feeding Water Pumps which supply the water to the expected pressure. The capacity of the whole system shall foresee a 10% margin; the raw water pumps and the demi water pump shall follow the sparing philosophy.

Waste Water System

The wastewater treatment system is designed to treat the oily wastewater (API and CPI separators) and chemical wastewater (neutralization system) generated at the plant to meet the following effluent conditions, which fulfill the standards of IFC/ World Bank Group EHS Guidelines for Thermal Power Plants (to be confirmed during detailed engineering):

- Total suspended solids: 50 mg/l
- Biochemical oxygen demand (BOD): 6 mgO₂/l
- Iron: 0.5 mg/l
- Copper: 0.1 mg/l
- Smells, odors: 1 level
- Coloring: shall not be in 10 cm column
- pH: 6.5 - 8.5
- Dissolved O₂ not less than 4 mg/l
- COD: 30 mg/l
- Oil : 10 mg/l

According to RENCO the **site facilities** will include the following:

Table 3-1: Planned Site Facilities at YCCPP-2 (source: RENCO)

Description	Size [m²]
Office Project Management	29.16
Office Employer	17.26
Office ArmPower – Independent Engineer	14.40
Office Construction Management	28.74
Office TP - Construction Management	30.23
First Aid Room	39.14
Office Secretaries + DCC + Translator	Open Space
Office Health, Safety and Environment (HSE)	Open Space
Commissioning	Open Space
General Archivium	Open Space
Toilette 1	25.16
Toilette 2	18.70
Office Site Engineering	Open Space
Printers Room	18.69
Office IT Room	19.00
Office TP – Specialists	Open Space
Office Planning + Cost Control + Quantity Surveyor	Open Space
Dining Room	116.90
Kitchen	17.26
Meeting Room - 12 Attendants	27.84
Meeting Room - 6/8 Attendants	18.75
Office Procurement	Open Space
Office Logistic + Material Managment	Open Space
Office QA/QC	Open Space
Civil Prefabrication Area	195.00
Batching Plant	3558.00
Storage Area – Mech. & Piping	5620.00
Warehouses	1585.00
Open Storage Area	1564.00
Piping Prefabrication Area	4624.00
Toilettes	144.00
35 kV Electrical Substation	-
Vehicles Parking Lot	1660.00
Vehicles Workshop + Diesel Storage	775.00
Subcontractor Office Area	1587.00
I&C Workshop	262.00
TP Warehouse	804.00
Available Area – 1	2840.00
Available Area – 2	1976.00
Available Area – 3	264.00
Available Area – 4	2560.00

Interconnections to gas, water and electrical grid are planned. The new CCPP shall be connected with the facilities of the existing grid infrastructure provided below (see Figure 3-3):

- Electricity: A new 220 kV substation is just under construction for YCCPP-1; the connection from the new power plant to the new substation will be via a new overhead transmission line or via a new underground cable; the distance between the new power plant and the new 220 kV substation is approx. 400 m
- New connection to the natural gas supply pipeline system from Gazprom, approx. 550 - 600 m
- New connection to the city water system managed by Veolia (make-up water), approx. 1,000 m
- New connections to the water sewerage of the city and the industrial waste water discharge system of YCCPP-1, approx. 450 m / 100 m

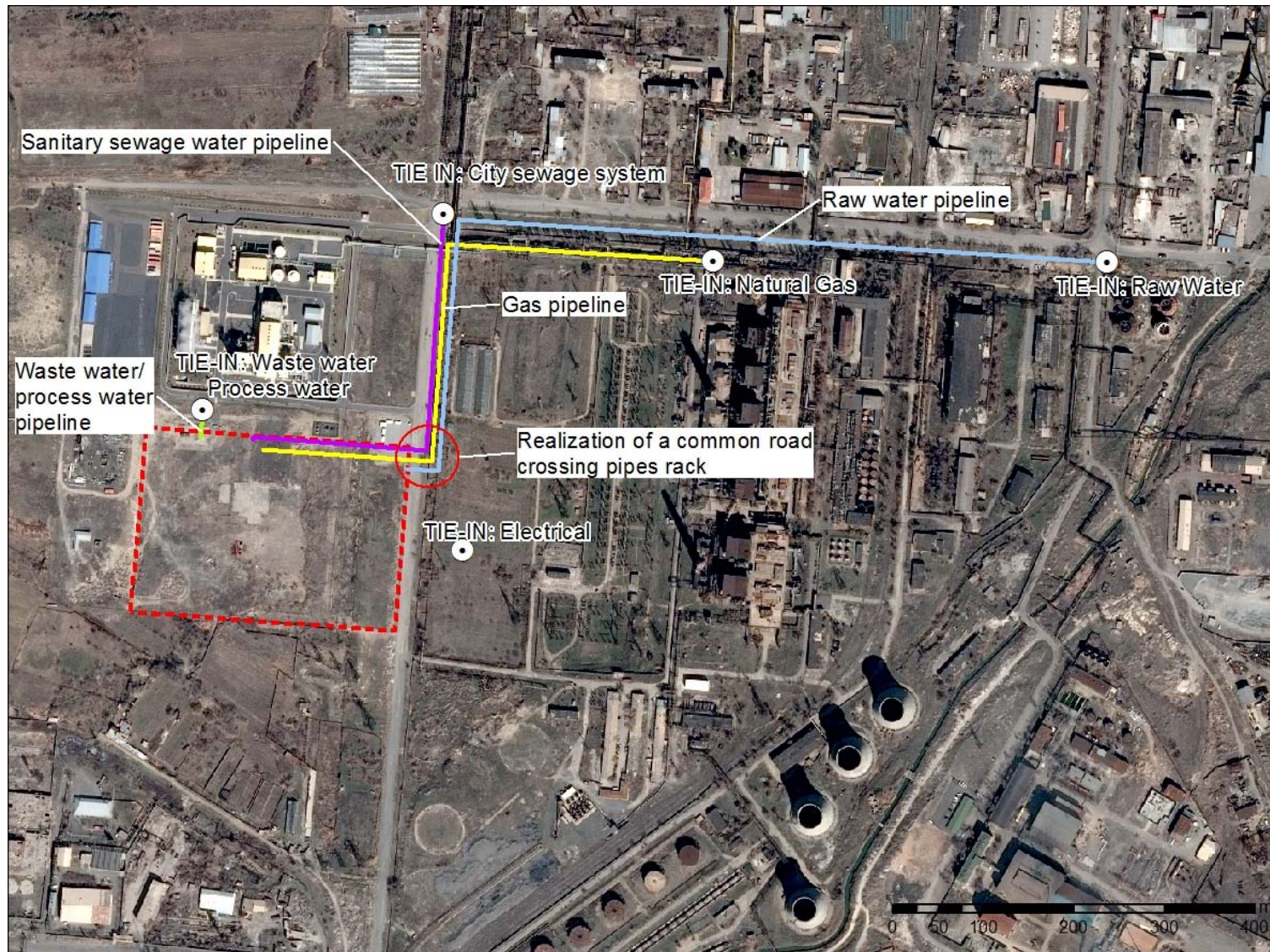


Figure 3-3: Overview plan showing the new interconnections of YCCPP-2

3.2 Project Area and Project Area of Influence

The **Project Area** comprises the site of YCCPP-2 which is located at 929 m a.s.l. (average) at the south eastern border of Shengavit, a highly industrialized district in the southern part of Yerevan (see Figures 4-3 and 4-4). The Project Area is uninhabited. The coordinates of the site center are approximately:

- Northing: 40° 6'48.06"N;
- Easting: 44°29'49.55"E;
- Zone: 38T (WGS 84).

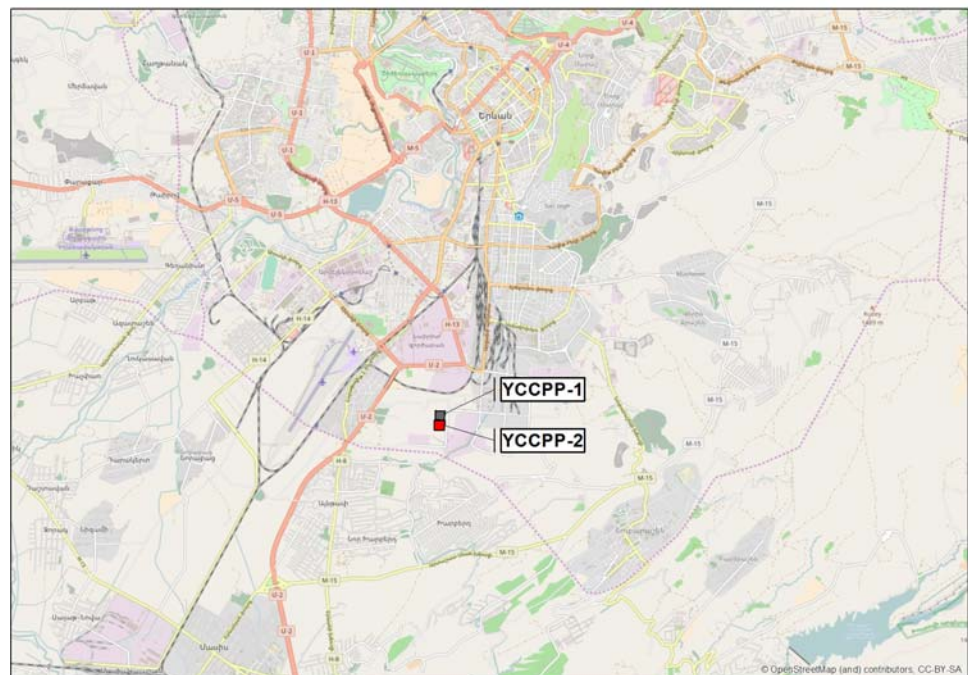


Figure 3-4: Location of existing YCCPP-1 and future YCCPP-2 in the south of Yerevan

The Project Area is situated approx. 2 km southeast of Erebuni Airport, bordering Erebuni district and has many large industrial plants and factories in its vicinity. Despite their industrial character, Shengavit and Erebuni Districts are home to a high number of residents of Yerevan.

The following residential complexes are in the proximity of the YCCPP-2 site:

- the nearest residential area of Shengavit District (Noragavit village) is located approx. 1,350 m to the west
- Ayntap, a major village in the Ararat Province is located approx. 1,500 m to the south west
- Kharberd, another major village in the Ararat Province is located approx. 1,200 m to the south

- the nearest residential area of Erebuni District is located approx. 1,200 m to the north east.

The **Project Area of Influence** thus comprises the uninhabited YCCPP-2 site and the adjacent residential areas, as those might be impacted e.g. by air emissions during operation of the new power plant.



Figure 3-5: Project Area located south of Yerevan, and nearest residential areas

3.3 Schedule for Project Realization

For the construction of the YCCPP-2, approx. 30 months are estimated (see Figure 3-6 below). Thus, it is expected that the new power plant will be commissioned at the end of 2019/ beginning of 2020.

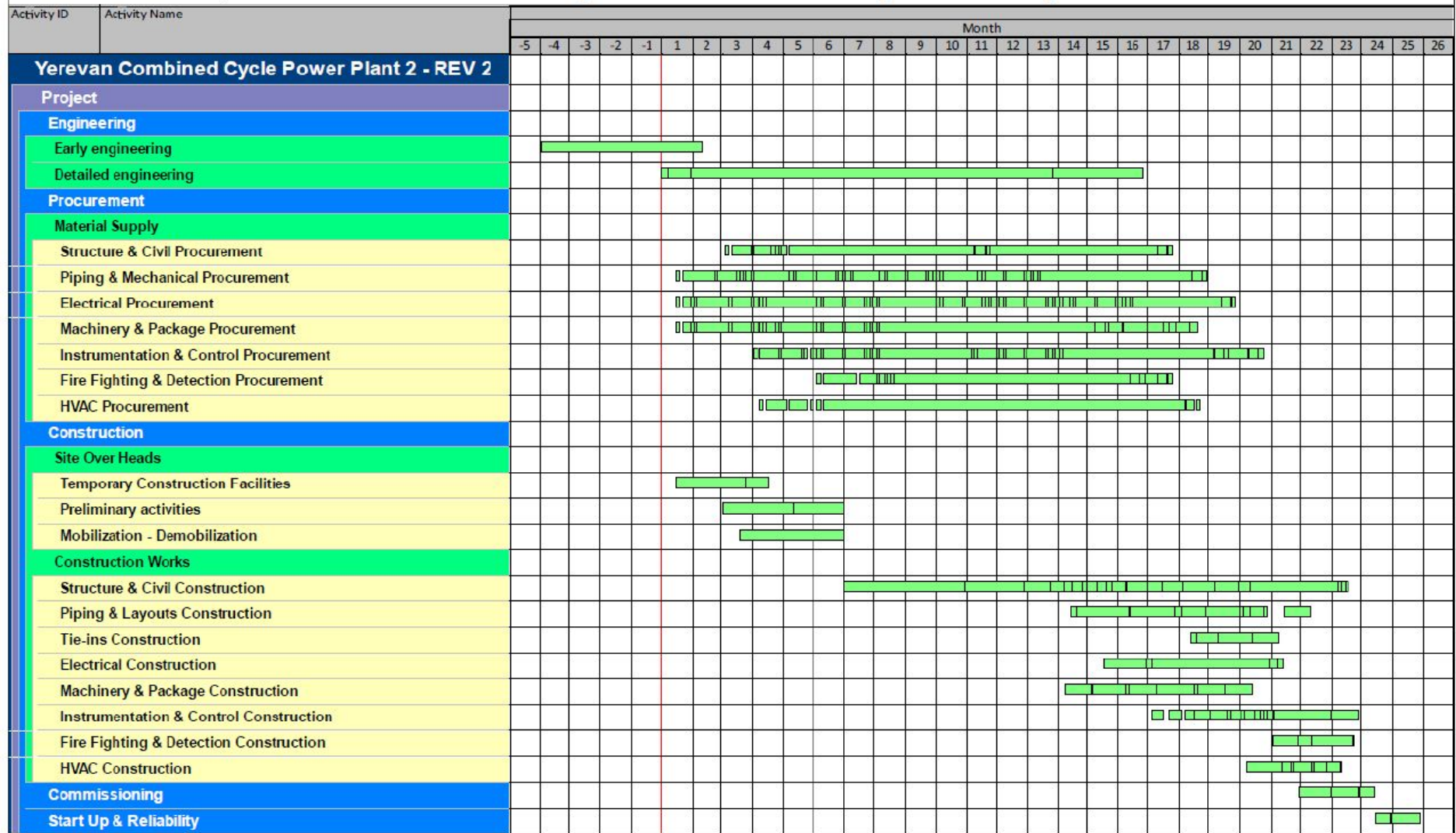


Figure 3-6: Preliminary Project Schedule

4. Analysis of Alternatives

4.1 The ‘No Project’ Scenario

The ‘No Project’ Scenario describes the situation without implementation of the Project. In this alternative, all environmental and social impacts of the Project would be avoided but it would potentially have negative implications on the regional power supply, as well as on potential business opportunities. In this case main objectives of the Project would not be achieved, like e.g. improving the total output capacity of electric energy production; providing reliable power supply; and promoting commercial development of thermal technology and cost reduction in order to enable Armenia to become a major net exporter of electricity.

4.2 Comparison of Alternatives and Options

4.2.1 Location

The site for YCCPP-2 is located in an industrial area south of Yerevan city which is foreseen for further industrial development. In the neighborhood an old thermal power plant that is no longer working and will be dismantled in the near future can be found, and other industrial plants are located in the vicinity. Directly north of the foreseen site, the YCCPP-1 is located. This plant has been constructed in 2010 and allows common utilization of already existing systems and structures. In the foreseen area no protected or ecologically sensitive zones are found which could be the case at a potential greenfield construction site. The land was previously owned by Yerevan Thermal Power Plant CJSC, so that no additional land acquisition from private land owners will be necessary. Furthermore, the foreseen site location allows co-utilizing the existing auxiliary systems of YCCPP-1 such as water intake and discharge structures, fuel gas regulators, substations and devices, as well as main access roads, which is an advantage compared to another potential brownfield or greenfield construction site.

Possible alternative locations for the proposed new YCCPP-2 were considered prior to opting for the foreseen site. On account to minimize environmental impacts and additional costs for newly developing such a site and modifying the transmission network to accommodate the new power plant, the foreseen site was selected together with MOE as the final option.

4.2.2 Alternative Methods of Power Generation

There are basically three different types of energy production:

- Renewable energy: common resources used are water (hydropower), wind, solar and geothermal power;
- Nuclear energy;
- Thermal energy.

Renewable energy

Special regard is taken on the renewable energy sources, because they are considered as the basis for a sustainable future power system development. Nonetheless, they face several constraints:

In order to produce the same amount of electricity as the YCCPP-2 using hydropower, a large dam would need to be build. The environmental and social impacts of large dams may be difficult to mitigate and manage. Alternatively, a cascade of medium sized dams would need to be build, or the energy production of several independent hydropower plants would need to be combined. This would spread the environmental impacts through several locations, making them more difficult to handle and control. In addition, according to SREP (2014), the identified potential for HPP investment in Armenia is of only up to 90 MW. This is not sufficient to compete with the energy output of the YCCPP-2.

In the dry climate of Armenia, solar energy is quite favorable. The potential for development of the photovoltaic industry in Armenia has been studied in the framework of the project “Assistance for Development of Actual Solar PV Energy in Armenia”. Based on this, a Renewable Energy Investment Plan for Armenia was approved, in accordance to which resources are being allocated to develop up to 110 MW utility-scale photovoltaic plants.³ However, some constrains are imposed: high land consumption, the need for great investments and, based on SREP (2014), the limited capacity for equipment acquisition and installation, together with a lack of experience with the technology in Armenia. Given the above, solar energy is not considered at this stage to be an alternative to thermal generation in Armenia, but instead a complementary energy source which is being planned under parallel programs, and which faces different challenges to be overcome in the right instances.

Wind is an unsteady energy resource. Both its varying direction and intensity do not allow guarantying that energy is always produced, which would be a disadvantage in comparison to thermal production, especially at a time when the pressing need to replace the nuclear power generation emerged in Armenia. Besides, the Ministry of Energy and Natural Resources plans to develop up to 500 MW of its wind energy potential by the year 2025. 500 MW is the amount that can be economically feasible for commercial utility scale presently (US AID, 2010). This implies that further investments in this technology are presently not feasible.

In the field of geothermal energy, big advances were made to spread these technologies. They are generally considered as reliable, cost effective and sustainable. Nonetheless, there are still serious and long-term researches required for the arrangement of geothermal energy production, making it a

³ <http://www.minenergy.am/en/page/416>

disadvantageous source for the case at hand, where a pressing energy demand requires a solution which is readily and easily implementable.

Nuclear energy

Nuclear power is electric power generated in a nuclear reactor. Nuclear power stations generally work in a similar way as conventional fossil fuel-burning stations. The main difference is the fuel. Nuclear fuel is typically uranium-based rods, instead of coal or gas. Nuclear Power plants do not create smoke or carbon dioxide and are more reliable compared to above mentioned renewables. Although power generation does not produce much waste, the residual radiation of the waste is very dangerous and requires sophisticated handling for years and centuries to come. Nuclear reactors are discussed controversial, with many people categorizing them as inherently unsafe. Despite laying in a seismically active zone, Armenia has one operating nuclear reactor (Metsamor) and there are plans to build another. There are many controversies and concerns about its security. Given the environmental, health and safety risks derived from an eventual failure of the power plant, as well as the difficulties in the management of the waste, this is considered a disadvantageous alternative.

Thermal energy

Thermal energy uses organic fossils for energy production, therefore releasing formerly stored greenhouse gases which contribute to climate change. This makes it generally unfavorable from an environmental point of view. It has to be considered that power stations working on the basis of natural gas have far less impact on the environment than stations working on the basis of other fuel types. Besides, they are less capital-intensive. Modern gas turbines allow to significantly increase the efficiency and to reduce the generation of combustion outcome.

Conclusion

Given these considerations the option of gas and steam combined cycle power plant was chosen. The new YCCPP-2 is part of the strategic plan for energy production of the Government of Armenia⁴ in order to improve the total output capacity of its electric energy production with a most modern and efficient power plant. The Government of RA considers this project to be of utmost significance with highest priority for execution (fast-track project), due to the fact that the energy sector development has a critical impact on the economic development of the entire country.

4.2.3 Design alternatives

The initial design of the new YCCPP-2 had foreseen a stack height of 35 meters. The results of the air dispersion calculation (Annex 12.6 to this report) show, however, that a stack height of 66 meters is more adequate because this corresponds to the Good Engineering Practice (GEP) stack height.

⁴ <http://minenergy.am/en/page/493>

To assure a future sustainable development in the area, RENCO will incorporate additional emission reduction measures in the design, going beyond increasing the stack height to 66 meters. These measures will be implemented by means of a two-stage procedure in such a way to optimize the CAPEX of the project:

- Stage 1 (design and construction): the new power plant will be designed and built considering the installation of a transition spool between the gas turbine's exhaust and the HRSG. This transition spool will allow installing a SCR (catalytic device) in Stage 2. In addition, there will be a space provided to install the catalyst system necessary to operate the SCR.
- Stage 2 (implementation): In case a development project which causes NOx emissions in the same airshed of the new power plant can be reasonably foreseen, the provision spool will be removed and replaced by the SCR and storage and distribution system of the chemical (ammonia) being installed in the space left unoccupied during Stage 1. The intervention works for Stage 2 will be short and the new facilities will immediately start operating to drop the emissions.

The measures as described above will allow reducing the emissions of NO₂ in 55%.

Stage 2 is preventive, i.e., it will be activated only in the following situations:

- The results of the new baseline measurement (special focus on the Winter results) show that the existing pollution load is very high. This implies that YCCPP-2 needs to reduce its emissions to avoid a high cumulative impact; *and/or*
- a NOx emission source (power plant or similar) is installed in the same airshed (up to 10 km). The future installation of other industrial plants in the area cannot be reasonably foreseen at this stage.

5. Description of the Environment (Baseline Data)

The following chapter provides baseline data for the Project Area of Influence focusing on the subjects of protection: fauna and flora, soil, water, climate, air quality, noise, landscape, historical and cultural sites and socio-economic conditions. The documents already prepared for the Project (see Section 1.4) have been used, among others, as a basis for writing this Section.

5.1 Environmental Conditions

5.1.1 Flora, Fauna and Biodiversity

The Republic of Armenia is a mountainous country characterized by a rich diversity of plants and animals, as well as landscapes and vegetation types. More than 3,800 species of vascular plants and more than 17,700 animal species including 549 species of vertebrates are found on the territory of Armenia. The biodiversity of Armenia is notable for its high endemism: about 500 species of fauna and 144 species of flora are considered endemics (MNP 2014).

The foreseen construction area of YCCPP-2 is bordering the already existing YCCPP-1. The construction site is part of the Yerevan industrial area. The construction site itself and the surrounding land are poorly vegetated with much of the area having been disturbed by industrial developments in the past. Detailed data about flora and fauna at the construction site do not exist, however, only sparse vegetation composed of grass, herbs and some reed and bushes can be found at the construction site (see pictures below). The biodiversity value of the Project Area is assessed to be low. As the water quality of the Hrazdan River is categorized as bad (5th class of the surface water quality assessment system of RA⁵) in the area south of Yerevan, the biodiversity value of the river is considered to be low.

⁵ Source: RA Decision N75-N (2014) on the definition of the norms of ensuring water quality of management zone of each water basin based on peculiarities of the area



Figure 5-1: Typical vegetation at the construction site with some reed and bushes (Source: Fichtner, July 2017)

5.1.2 Protected Areas

Biodiversity conservation in Armenia is implemented mainly in the specially protected natural areas, where 60-70% of the species composition of the flora and fauna is concentrated including the overwhelming majority of rare, critically endangered, threatened and endemic species.

According to MNP (2014) at present approx. 13% of the total territory of Armenia are covered by protected areas. These comprise 3 state reserves, (Khosrov, Shikahogh and Erebuni), 4 national parks (Sevan, Dilijan, Arpi Lake and Arevik), 232 natural monuments, and 27 state sanctuaries.

However, no Protected Areas are located within or in the vicinity of the Project Area of Influence. Also no other sensitive areas like Important Bird and Biodiversity Areas (IBA) or Ramsar Sites are located near the Project Area of Influence.

5.1.3 Geology and Seismic Situation

5.1.3.1 General Geological Conditions of the Area

Yerevan is part of the quaternary geologic unit. According to MNP (2002), Armenia is a part of the Transcaucasus great arched fold and medium-Araxian intermountain lowering. These two geological structural units are included in the Caucasus-Anatolia-Iranian segment of the Mediterranean plicate zone. Given the time of establishment of geological structural units

and accomplishment age of plicate formation the territory of Armenia is divided into the Somkheti-Ghapan complex, Bazum-Zangezur and trans-Araksian zones.

The trans-Araksian weak plicate zone is divided into the Yerevan-Ordubad and orogenic lowering sub-zones. The Project area of Influence is part of the Yerevan-Ordubad sub-zone which is located in the south of the Bazum-Zangezur zone and is characterized by meogeocyncline type. Land, carbonate, ophiolite, volcanic and sedimentary formation stratum, as well as volcanic origin and land formations of Quaternary period are found here. The sub-zone is composed of two structural units: the Yerevan-Ordubad concave fold and Urts-Vayots Dzor arched fold.

5.1.3.2 Tectonics and Seismicity

Armenia is located in a seismically active zone stretching from Turkey to the Arabian Sea. Here, the Arabian landmass slowly collides with the Eurasian plate. As large earthquakes with magnitudes over 5.5 occur in Armenia every 30 to 40 years reaching magnitudes up to 7.1 on the Richter scale, a high-level seismic hazard is indicated for the country. The Garni earthquake in 1679 was the most destructive one, with a magnitude oscillating between 5.5 and 7. Another destructive earthquake with a magnitude of 6.9 occurred in Spitak in 1988⁶. In 2011 an earthquake with a magnitude of 3.2 occurred 37 km north of Gyumri⁷.

Maximum seismic risk is given around the city of Yerevan, where the Project Area is located, and in a zone from Gyumri to Vanadzor and the northern part of Lake Sevan, where active faults exist.

Seismic stability of 9 magnitudes by Richter scale and more is to be followed because the country is classified as the third seismic zone under MSK 64 standards with an acceleration value of 0.4G m/s and a speed of 32 cm/s.⁸

Earthquake risk has been considered in the design of the new power plant YCCPP-2.

5.1.3.3 Field Investigations at the Construction Site

In order to ensure the proper setting of YCCPP-2, a geotechnical investigation program has been performed⁹. The program comprised execution of core drillings, engineering-geological reconnaissance surveys and collection and review of existing geological data. The scope of

⁶<http://info.worldbank.org/etools/docs/library/114715/istanbul03/docs/istanbul03/09melku/myan3-n%5B1%5D.pdf>

⁷ <http://www.emsc-csem.org/Earthquake/earthquake.php?id=210376>

⁸ RENCO SPA: Armenia 250 MW CCGT Yerevan Capital City. Draft Feasibility Study [CCGT 250 MW – Yerevan /Armenia]

⁹ Geoterproject LTD (2016): Report on engineering-geological survey of Yerevan TPP new energy block area

investigations was set to determine the natural, geo-mechanical and geo-hydraulic characteristics of the underground, as well as groundwater levels and the location of rock surfaces, if any.

Another geological study¹⁰ has been performed in 2017 by “Armhydroenergyproject” CJSC in the construction site area including topographic mapping, geophysical and engineering geological works, experimental borehole drilling, piezometer installation in some boreholes to measure the ground water level fluctuation, periodic measurement of water level and sample taking.

The following main outcomes resulted from the geological studies:

- The territory’s geological-lithological structure is mainly formed by clayey soils, in some places covered by fill up soils.
- In the study site the 2nd and the 3rd layers can serve as foundation bottom.
- In the study area underground waters have been detected in all the boreholes with 0.5-7.0 m depth and have seasonal fluctuation from 0.5 to 1.0 m. According to the laboratory data, the detected underground waters have strong sulphate aggressiveness against ordinary concrete.
- There are no hazardous physical-geological phenomena and processes (landslides, rock slides, rockfall, erosion, suffosion, etc.) in the study area.
- According to RA Construction Standards II-6.02-06 the guideline largely passes by the third (III) seismic zone (9 points and more). The class of the soils of the areas according to their seismic characteristics belongs to the II (second) and III (third) classes.
- The maximum depth of frost in soil is 60 cm.
- The study area is suitable for capital construction.

5.1.4 Soil

In the area where the Project will be situated, semi-desert alkali soils are common. The warm, mild and variable humid climate, the long period of active soil formation, presence of sufficient drainage system and seasonal change in ground streams direction promote deep and intensive weathering of primary minerals, formation of secondary mineral substances and rather thick clay soils. The geological structure of the area and the study site is represented by radical clays, generally covered by contemporary alluvial, diluvial-proluvial, and technogenic generations, formed of clayey and sandy soils.

The geological studies which were performed at the construction site found mainly clayey soils which are in some places covered by fill up soils.

According to the information gathered during the site visit in July 2017, the construction site has never been covered by buildings. The area might have

¹⁰ Armpower CJSC (2017): Geological Report of Armhydroenergyproject CJSC

been used for illegal disposal of different waste materials in the past, however during the site visit in July 2017 no asbestos-containing material or other hazardous waste was found, except for some empty oil drums at two different spots. Near to these drums the topsoil was found to be contaminated by an oil leakage (see Figure 5-2). During the site visit in July 2017, FICHTNER’s environmental specialist took samples of the contaminated soil at each of the two spots. The samples were analyzed by a certified laboratory in Germany for contents of PCBs. All PCB concentrations were below the detection limit of 0.2 ppm (see Section 12.3 in the Annexes for test results).



Figure 5-2: Oil leakages near to some empty oil drums at YCCPP-2 site (Source: Fichtner, July 2017)

In August 2017 a monitoring study was performed on behalf of RENCO regarding groundwater quality and possible historic soil contamination at the construction site (Consecoard LLC, 2017). Sampling was conducted according to the methodology of the “Environmental Monitoring and Information Center” SNCO of the Ministry of Nature Protection and the samples have been analyzed for metal contents at the laboratory of the named institution. The measured concentrations of Chromium, Manganese, Cobalt, Nickel, Copper, Zinc and Lead exceed the limit values of the national Sanitary Norms and Rules N 2.1.7.003-10 (see Table 5-1 below). For details and further analysis results see Section 12.4 in the Annexes.

Table 5-1: Maximum allowable concentrations (MAC) of chemical substances in soil (Sanitary norms and rules N 2.1.7.003-10) and measured values

Substance	MAC [g/kg]	Measured values		
		Sample 1	Sample 2	Sample 3
Vanadium (V)	0.15	0.0633	0.1329	0.1010
Antimony (Sb)	0.0045	0.00027	0.00086	0.00039
Cobalt (Co)	0.005	0.0077	0.0179	0.0164
Manganese (Mn)	0.4 – 0.7 (depending on pH)	0.1579	0.8231	0.4255
Copper (Cu)	0.003	0.0167	0.0691	0.0354
Nickel (Ni)	0.004	0.0218	0.0549	0.0472
Lead (Pb)	0.006	0.0065	0.0369	0.0129
Zinc (Zn)	0.023	0.0454	0.1010	0.0588

Substance	MAC [g/kg]	Measured values		
		Sample 1	Sample 2	Sample 3
Chromium (Cr)	0.006	0.0174	0.0957	0.0518

As concentrations of heavy metals in the soil samples exceed national MACs, the soil at the construction site has to be regarded as contaminated by heavy metals. Thus, the soil that will be excavated for construction of YCCPP-2 will have to be stored, as no specialized hazardous waste landfill is available in Yerevan or Armenia for disposal of hazardous wastes at the time being (see Section 6.1.7).

Additional soil sampling at different depths is presently being undertaken at the site for analyses of Total Petroleum Hydrocarbons (TPH), Polycyclic Aromatic Hydrocarbons (PAH), BTEX (Benzene, Toluene, Ethylene, Xylene), and Metals. This will allow deciding about the contamination of the soil and its handling before start of construction works.

5.1.5 Water Resources

5.1.5.1 Surface Water

The Republic of Armenia is covered with a dense net of rivers. Armenian rivers belong to the Caspian Sea basin. Basins of the tributaries of Kur River occupy an area of 700 km² (Debed, Pambak, Aghstev, Tavush Rivers, etc.), and basins of the tributaries of Arax River an area of 22,790 km² (Akhuryan, Kasakh, Metsamor, Hrazdan, Azat, Vedi, Arpa, Vorotan Rivers, etc.). Armenia's rivers have mixed feeding - melting, groundwater, and rain. Their flow changes considerably within a year. During summer-time and fall, when water demand is approaching its maximum, the annual water share amounts to 20-25 %, in winter-time to 10-12 % of the total flow, whereas in spring-time is 55-70 %.

The Republic of Armenia is not rich in lakes. Sevan is the biggest lake in the Caucasus and Armenia. Its surface amounts to 1,240 km². The lake is located at an altitude of 1,897 m a.s.l. The rest of the lakes in the country (Kari, Akna, and Sev, etc.) are small and mostly located in the highland zones. Lake Arpi and Lake Parz (in Dilijan National Park) are located at a medium altitude highland zone. Lake Ayghr is a lowland lake fed by underground waters.

The Hrazdan River is the primary waterway in Armenia and the country's second largest river. While the Hrazdan River receives effluent from various agricultural, commercial, industrial, and residential sources, it is most significantly impacted by the discharge of Yerevan's almost entirely untreated wastewater. The effects of this poorly treated wastewater are evident through a variety of water quality indicators, most notably through

drastic drops in dissolved oxygen levels downstream of the city¹¹. Water quality of the Hrazdan River is categorized as bad (5th class of the surface water quality assessment system of RA¹²) in the area south of Yerevan¹³. Comparative data for assessing the water quality are given in Table 5-2 below.

Table 5-2: Water quality comparative data¹²

Parameter	Unit	Water Quality Class				
		I	II	III	IV	V
pH	-	6.5 - 9	6.5 - 9	6.5 - 9	6.5 - 9	<6.5 / >9
Dissolved oxygen	mg O ₂ /l	>7	>6	>5	>4	<4
Mineralization	mg/l	74	148	1000	1500	>1500
BOD ₅	mg O ₂ /l	3	5	9	18	>18
Lithium	μg/l	-	-	-	<2500	>2500
Beryllium	μg/l	0.014	0.028	0.056	100	>100
Boron	μg/l	9	450	700	1000	>2000
Natrium	mg/l	5	10	20	40	>40
Magnesium	mg/l	2,8	50	100	200	>200
Aluminum	μg/l	65	130	260	5000	>5000
Total phosphorus	mg/l	0.025	0.2	0.4	1	>1
Potassium	mg/l	1.5	3.0	6.0	12.0	>12.0
Calcium	mg/l	9.7	100	200	300	>300
Vanadium	μg/l	1	2	4	8	>8
Chrome	μg/l	1.0	11.0	100	250	>250
Iron	mg/l	0.08	0.16	0.5	1	>1
Manga	μg/l	5	10	20	40	>40
Cobalt	μg/l	0.14	0.28	0.56	1.12	>1.12
Nickel	μg/l	1.0	11.0	50	100	>100
Copper	μg/l	3.0	23.0	50	100	>100
Zinc	μg/l	3.0	100	200	500	>500
Arsen	μg/l	0.13	20	50	100	>100
Selene	μg/l	0.5	20	40	80	>80
Molybdenum	μg/l	7	14	28	56	>56
Cadmium	μg/l	0.02	1.02	2.02	4.02	>4.02
Tin	μg/l	0.09	0.18	0.36	0.72	>0.72
Antimony	μg/l	0.2	0.38	0.76	1.52	>1.52
Barium	μg/l	9	18	36	1000	>1000
Lead	μg/l	0.3	10.3	25	50	>50

¹¹ <http://ace.aua.am/monitoring-dissolved-oxygen-in-the-hrazdan-river/>

¹² Source: RA Decision N75-N (2014) on the definition of the norms of ensuring water quality of management zone of each water basin based on peculiarities of the area

¹³ Ecobarik-Audit LLC (2016): Report of Evaluation of Environmental Impact of the new Steam and Gas Combined Cycle Power Plant in Yerevan

Regarding the Project Area, the nearest water body, Artashati Jrants Canal, is located 700 m south east of the construction site. No water from the canal will be used for YCCPP-2 and no water will be discharged to it. It is planned that YCCPP-2 will co-utilize the existing auxiliary systems of YCCPP-1 including water intake from grid and discharge structures (see Figure 3-3 in Section 3 for location of water intake, waste water and process water tie-in points). The discharge point of the existing YCCPP-1 structures to the Hrazdan River is located ca. 10 km away from the site (aerial distance) - Figure 5-3.



Figure 5-3: Discharge point for the waste water from YCCPP-2

5.1.5.2 Groundwater

According to one of the geological studies¹⁴ the main water horizon at the construction site is connected with quaternary age sediments, which are spread on Miocene age hydrophobic clays. In quaternary water sediments the ground waters have widespread diffusion. These waters are non-pressure ground water flow, which is directed towards the incidence of the relief. The mentioned water horizon is fed by technical waters through precipitation, which penetrate into old CCPP area from Artashat channel underground drain and irrigation waters. The latter plays a great role connected with the intensity of irrigation associated with water level in the area. In the area of Yerevan CCPP during different years, ground water level fluctuate measuring data have shown that there is no pattern which proves that ground water level is related to irrigation, discharge of technical waters and drainage works.

Besides the described main horizon of the ground waters, also layer waters with weak pressure are met. Their level height from pit mouth is 0.3 m, which extends in Miocene age clays, in first layers and sub layers of sand. These layers have weak water tankage; in some places they supply to the water horizon and in some way affect its chemical composition. According to the archival materials the waters of the study area mainly have sulphate-sodium partly chlorine-sulphate-magnesium chemical composition. Ground waters existing in the area are considered to be strong saline, where the content of dissolved minerals according to archival materials fluctuates from 1,949 mg/l to 10,884.4 mg/l that is why they have a sulphate aggressive attitude to concrete marks.

According to one of the geological studies¹⁵, the groundwater level in the Project area is located at a depth of 0.5 to 7.0 m and shows a seasonal fluctuation of 0.5 to 1.0 m.

An additional monitoring study was performed in August 2017¹⁶ regarding groundwater quality and possible historic soil contamination at the construction site. Sampling was conducted according to the methodology of the “Environmental Monitoring and Information Center” SNCO of the Ministry of Nature Protection and the samples have been analyzed at the laboratory of the named institution. RA Government Decree “On defining water quality norms for each water basin management area taking into consideration the peculiarities of the Locality,” (RA Government Decree N 75-N, dated on 27 January 2011), the surface water quality assessment system in Armenia distinguishes five classes or grades: "excellent" (1st grade), "good" (2nd grade), "mediocre" (3rd grade); "insufficient" (4th grade) and "bad" (5th grade). The government's decision envisages maximum

¹⁴ Armpower CJSC (2017): Geological Report of Armhydroenergyproject CJSC

¹⁵ Geoterproject LTD (2016): Report on engineering-geological survey of Yerevan TPP new energy block area

¹⁶ Consecoard LLC (2017): Report on Monitoring Services

permissible concentrations (MPC) for all classes. In case of exceeding them, the flow to water resources is prohibited.

YCCPP-2 is located in Hrazdan River basin (water shade) management area. The water in the lower stream of the Hrazdan River is classified as "bad". The results of all groundwater sampling tests were within the limits of the 5th grade of water quality, consequently (according to national legislation) the groundwater can be directed by drainage to the downstream area of Hrazdan River without additional cleaning. For details and analysis results see Section 12.4 in the Annexes.

Additional analyses of groundwater are being undertaken at three sampling sites (upstream of the site, at the site, and downstream of the site) for content of TPH, PAH, BTEX, Metals, as well as pH, dissolved oxygen, mineralization, BOD5, and COD5. The data will be added to the Final ESIA Report.

Dutch Standards¹⁷ are internationally used reference values for environmental pollutants used mainly in environmental remediation, investigation and cleanup. Values are given as “target values” and “intervention values” for groundwater and soil. For shallow groundwater between 1 m and 10 m below ground, the concentrations of all analyzed heavy metals are below the intervention values except for Vanadium and Zinc¹⁶ (see Table below).

Table 5-3: Groundwater quality comparative data

Substance	Dutch Standards		Measured values [µg/l]		
	Target value [µg/l]	Intervention value [µg/l]	Sample 1	Sample 2	Sample 3
Antimony (Sb)	0.15	20	0.15	0.1	0.08
Arsenic (As)	10	60	54.1	1.1	5.9
Barium (Ba)	50	625	26.8	7	21.9
Beryllium (Be)	0.05	15	< 0.001	< 0.001	< 0.001
Cadmium (Cd)	0.4	6	0.17	0.01	0.14
Chromium (Cr)	1	30	7.9	1	6.3
Cobalt (Co)	20	100	1.7	0.7	0.2
Copper (Cu)	15	75	3.4	0.6	3.3
Nickel (Ni)	15	75	2.9	0.3	1.2
Lead (Pb)	15	75	1.1	0.2	0.5
Molybdenum (Mo)	5	300	58.8	0.9	48.5
Selenium (Se)	0.07	160	5.4	0.2	1.4
Tin (Sn)	2.2	50	1.09	0.2	0.41
Vanadium (V)	1.2	70	347.5	21.3	9.2
Zinc (Zn)	65	800	3062.8	2.5	3.8

¹⁷ Soil Remediation Circular (2009). http://esdat.net/Environmental_Standards.aspx

5.1.6 Climate and Air Quality

5.1.6.1 Climate

Because of Armenia's position in the deep interior of the northern part of the subtropical zone, enclosed by lofty ranges, its general climate is dry and continental. Nevertheless, regional climatic variation is considerable. The capital Yerevan is located at the lowest altitudes of the country (between 900 and 1200 m a.s.l.). Here, the prevailing climate is a mountainous continental climate. The location is classified as BSk by Köppen and Geiger. It is characterized by hot and arid summers (Figure 5-43) and rather cold winters; in a year there are on average a hundred days with minimum temperatures below freezing. The average temperature in Yerevan is 11.6°C. In summer (July and August) the average temperature exceeds 30°C. The coldest month is January at -4°C. Generally, there is little rainfall throughout the year; precipitation averages 319 mm. The driest months are June to October with an average below 25 mm of rain. The wettest months are February, April and May with an average of 40 mm of rain.

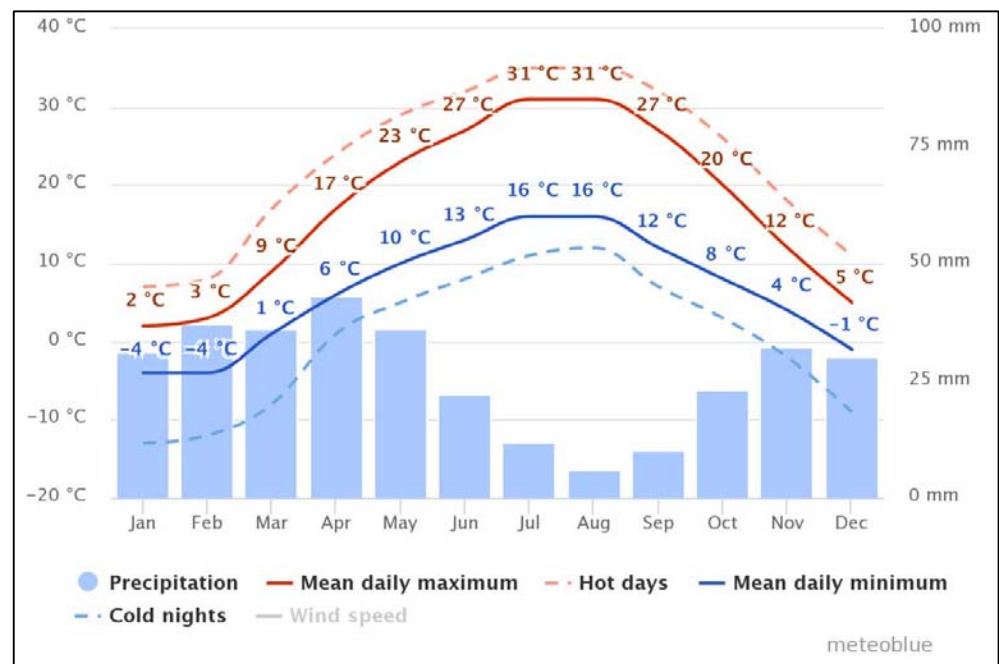


Figure 5-4: Average temperatures (min. and max.) and precipitation (mm) in Yerevan (30-year global history with hourly weather data).¹⁸

On average, the most wind is seen in July. The strongest wind speed is observed in March and April (> 38 km/h). On average, the least wind is seen in September. The mean monthly wind speed over the year is 6.1 km/h (Figure 5-54).

¹⁸ <https://www.weather-and-climate.com>

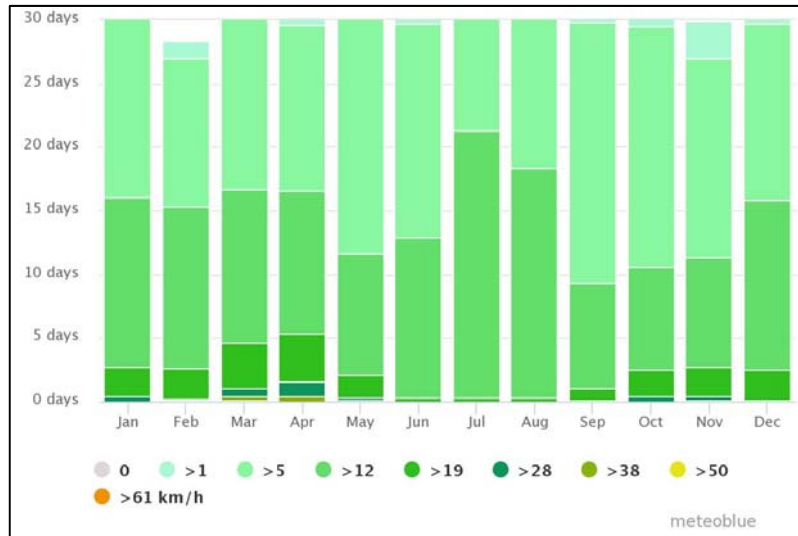


Figure 5-5: The diagram for Yerevan shows how many days within one month can be expected to reach certain wind speeds

Figure 5-65 presents the wind rose for the years 2014 to 2016. It shows that the prevailing winds blow from northeast (NE). The wind rose also indicates that the more frequent wind speeds are between 1.5 and 3 m/sec, which is equivalent, in the Beaufort scale, to the levels “light air” and “light breeze”. The wind data is relevant especially for the Air Dispersion Calculation (see Section 12.6 in the Annexes).

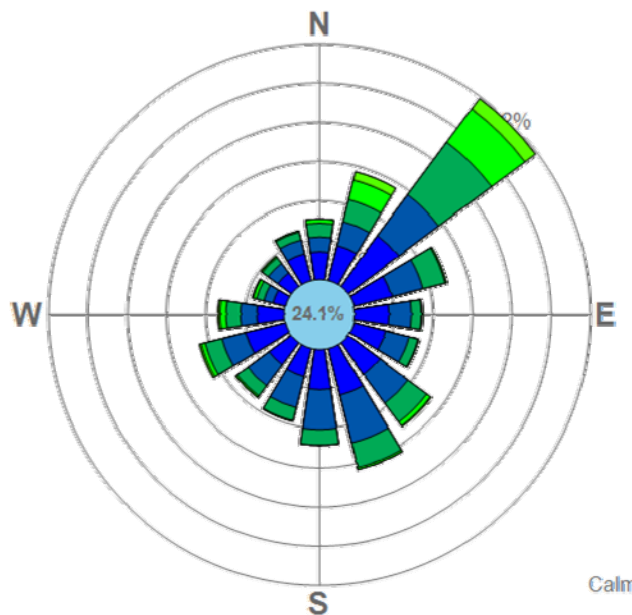


Figure 5-6: Wind rose for the years 2014-2016 (wind blowing from)

5.1.6.2 Air Quality

Air pollution has always been a sensitive issue in Armenia. According to a recent report of the WHO¹⁹ these unfavorable conditions have hardly improved and Armenia is on the top ten list of deaths linked to air pollution in Europe, with 125 deaths per 100,000 inhabitants per annum. Although data from 2004 (when population depended mainly on solid fuel) was used, numbers are still very high. Particulate matter (PM₁₀) is the most important air pollutant in urban atmospheres of Armenia, which is created in a considerable degree from vehicle air emissions. Old diesel vehicles, an insufficiently developed public transport and problematic traffic management lead to high emissions from motor transport.

The City of Yerevan is surrounded by mountains on three sides which does not allow for natural dispersion of pollutants in the atmosphere, thereby resulting in high concentrations in the air. The main source of air pollutants are emissions arising from automobiles.

According to Ecobarik-Audit LLC (2016) the "Environmental Monitoring and Information Center" SNCO (Ecomonitoring) of the Ministry of Nature Protection of the RA monitors the atmospheric air pollution of Yerevan city with five stationary points of measurement. On the basis of their measurements the background level of city air pollution is calculated. The following data on the pollution of the air basin of Yerevan are according to 2014 reference of Ecomonitoring:

- Air basin observations were done by 24-hour active sampling. The contents of dust, SO₂, NO_x and near-ground O₃ were determined. In total 9,963 air samples were taken by active sampling. The average annual concentrations of the determined materials did not exceed the maximum permissible concentrations (MPC).
- Atmospheric air observations through automatic devices were made at five observation points in the city. The contents of CO, SO₂ and NO_x in the atmosphere were determined. In total 347,538 observations of air were made through automatic devices. According to the data of automatic observations the average annual concentrations of the materials determined in the atmosphere did not exceed the MPC.
- Air basin observations with passive samplers were made in 48 observation points of the city. 4,715 samples of air were taken, in which the average annual concentrations of SO₂ and NO_x did not exceed the maximum permissible concentrations (MPC).

To obtain up-to-date data about the ground level concentrations (GLC) of air pollutants in the Project Area of Influence, and help defining the airshed as degraded or non-degraded (according to the WB EHS Guidelines), FICHTNER undertook a baseline air quality assessment in July/August 2017 (Summer) and October/November 2017 (Autumn) in the Project Area

¹⁹ WHO (2016), World Health Statistics 2016

of Influence. These campaigns included the measurement of SO₂, NO₂ and PM₁₀ in 5 locations around the project area, including the specific areas where the highest pollution levels resulting from the operation of the YCCPP - 2 are expected:

- For gases (SO₂ and NO₂), the Consultant performed a 7 days campaign in summer and a 10 days campaign in autumn with diffusion tubes, followed by a laboratory analysis.
- For particulates (PM₁₀), the Consultant performed 5 days campaigns in summer and autumn.

The results show that the airshed surrounding the future YCCPP - 2 can be classified as **non-degraded** regarding the pollutants PM₁₀, SO₂ and NO₂. Please consult further details on this study on Annex 12.6 to this ESIA.

New monitoring campaigns will be undertaken in Winter 2017/2018 and Spring 2018 to capture the seasonal variations in the pollutant's GLC, and reinforce or adapt this conclusion. The Air Dispersion Calculation and the ESIA will be updated based on these results.

5.1.6.3 Noise

To obtain data about the existing noise levels in the Project Area of Influence, FICHTNER undertook a noise monitoring campaign in an area around the YCCPP-2 site at five monitoring points, including work-days and weekends at day-time as well as night-time. Measurement point Noise 1 is placed approx. 1,700 m to the south-west of YCCPP-2; it is located near the northeast border of Ayntap community. Measurement point Noise 2 is situated approx. 1,750 m to the west from YCCPP-2. This point is located on the eastern border of Noragavit settlement in front of the highway. Measurement points Noise 3 and Noise 5 are located in Kharberd horticultural settlement. Both points are situated along the northern border of the settlement, south of YCCPP-2. Noise 5 is located at a distance of approx. 1,100 m, while the distance between Noise 3 and YCCPP-2 is 1,500 m. Measurement point Noise 4 is placed in an industrial area near the northern border of the YCCPP-2. The results are shown in Table 5-4. Please consult further details on this study on Annex 12.7 to this ESIA.

The campaign used the Sound Level Meter WS1361, a high precision instrument in line with the International Committee TYPE 2 ANSI S1.4 and the United States National Standard TYPE 2 IEC 651. According to The Sanitary Norms N2-III-11.3, the applicable noise limits in the residential areas are 45 dB(A) during the night time and 55 dB(A) during the day time. In the industrial areas the limits fluctuate from 50 dB(A) to 80 dB(A) depending on the category of works. The said limits are referred to the total environment noise (the power plant contribution + the current sound pressure ("ante operam" or baseline sound pressure)).

Table 5-4: Results of the baseline noise monitoring at the Project site

Point of measurement	Wind speed [m/s]	Time of measurement	Leq(A) [dB(A)]
Work-day			
R1	< 1.7	Day-time	49.8
	< 1.8	Night-time	47.1
R2	< 1.9	Day-time	72.6
	< 2.3	Night-time	62.4
R3	< 1.8	Day-time	48.1
	< 1.7	Night-time	40.0
R4	< 1.6	Day-time	53.6
	< 1.9	Night-time	57.3
R5	< 1.7	Day-time	36.2
	< 2.0	Night-time	39.4
Weekend			
R1	< 1.5	Day-time	43.3
	< 2.1	Night-time	49.0
R2	< 1.8	Day-time	72.8
	< 2.5	Night-time	59.2
R3	< 1.9	Day-time	43.9
	< 2.0	Night-time	33.9
R4	< 1.8	Day-time	56.4
	< 2.0	Night-time	57.2
R5	< 1.5	Day-time	35.6
	< 1.8	Night-time	34.2

Note: On sensitive receptor R4 the limit of 70 dB(A) is applicable during the day and during the night.

Baseline day-time noise evaluation

Based on the noise measurement results conducted during work-days and weekend days, it can be concluded that the noise equivalent levels in/near the residential areas were generally within the applicable limits except the point R2 (located in front of the highway), where the noise level exceeded the 55 dB(A) normative value. This can be explained by the movement of heavy vehicles and high traffic density along the highway.

Baseline night-time noise evaluation

Equivalent noise levels during work-days and weekend days at measurement points R3 and R5 are within the 45 dB(A) limit. Noise levels at point R1 during both work-days and weekend days were slightly exceeding the limit (2.1 dB(A) and 4 dB(A) accordingly). This is due to the existence of background night noise from the facilities located in the vicinities. As a result of night-time measurements, the equivalent noise level at point R2 (located in front of the highway) is above the 45 dB(A) limit. The reason is high traffic density along the highway even at night-time.

5.1.7 Landscape

In spite of its comparably small surface area, Armenia is topographically highly diverse. A broad range of landscapes is found. Yerevan is part of the “low mountain dry steppe” landscape zone.

The Project Area is located in a highly industrialized area in southern Yerevan. Here, the existing YCCPP-1, chemical plants, metal factories and other industrial infrastructure dominate the landscape.

5.1.8 Socio-economic Conditions

5.1.8.1 Population within the Project Area of Influence

The Republic of Armenia has a population of approx. 3 million people with a territory of 29,743 km². Population density is 101 persons/km². Nominal GDP is \$10.56 billion (2015), per capita \$ 3,595. The Human Development Index is estimated for 2010 at 0.733 which ranks the country 85th, the lowest among the Transcaucasian republics. After the break-up of the USSR the country has experienced a problem of population decline due to elevated levels of emigration. The rates of emigration have decreased drastically in the recent years and a moderate influx of Armenians returning to Armenia is expected to continue.

Ethnic Armenians make up 98.1 % of the population. Yazidis make up 1.2 %, and Russians 0.4 %. Other minorities include Assyrians, Ukrainians, Greeks, Kurds, Georgians, and Belarusians. There are also smaller communities of Vlachs, Mordvins, Ossetians, Udis, and Tats. Minorities of Poles and Caucasus Germans also exist though they are heavily russified.²⁰ According to the Statistical Yearbook of Armenia 2016²¹ Yerevan has a population of 1,075,000 inhabitants with a density of 4,815 persons/km².

There are no people living within the YCCPP-2 site/Project Area. The population in the Project Area of Influence can be differentiated into urban population of the districts of Shengavit (approx. 140,000 inhabitants) and Erebuni (approx. 117,000 inhabitants) and the village population of Ayntap (approx. 11,000 inhabitants) and Kharberd (approx. 17,000 inhabitants).

5.1.8.2 Sensitive Receptors

People living in the vicinity of YCCPP-2 might be affected by noise and air emissions during construction, operation, and decommissioning of the new power plant. As YCCPP-2 will be located in an industrial area with the existing YCCPP-1, chemical plants, metal factories and other industrial

²⁰ Source: Asatryan, Garnik; Arakelova, Victoria (2002). The Ethnic Minorities of Armenia. Routledge

²¹ National Statistical Service of RA 2016; <http://www.armstat.am>

infrastructure, the newly created noise and air emissions will accumulate with the already existing burden.

This might be the case for people living in the legal and illegal residential areas in the Project Area of Influence, as well as the training center of the fire brigade located to the southwest of the project site. All these receptors, including illegal residents, are located outside the land plot allocated for the project (see Figure 5-76 and Pictures below). Notwithstanding, since these residential areas are located within the Project Area of Influence, they are considered in this ESIA as receptors for potential impacts. It shall be noted that, according to a written communication from the Municipality of Yerevan, the YCCPP-2 Project will not have any influence on the future of the nearby illegal dwellings (see Annex 12.1).

In a distance of about 1 km from the new YCCPP-2 no schools, kindergartens, hospitals, etc. are found.



Figure 5-7: Location of illegal houses located northeast and south of new YCCPP-2 and training center of fire brigade



Figure 5-8: Illegal houses located northeast of YCCPP-1 and YCCPP-2 (Source: Fichtner, July 2017)

5.1.8.3 Livelihood and Housing

Despite economic reforms and some recent growth, unemployment and poverty remain widespread in Armenia. Agriculture is the country's largest labor sector, followed by services and industry. The UNDP report (Spoor 2004) analyses that rural poverty used to be lower than urban poverty, and access to land has been important in the explanation of this phenomenon. However, rural poverty in 2003 has surpassed its urban counterpart, stagnating at a level similar to 1996. While access to land is still widespread in rural Armenia, amongst farm households, the poor and extreme poor are those who own very little land, or the landless. The poorest Armenians are found in rural areas with the least favorable conditions for agricultural activities. There is a stark contrast between the city of Yerevan and the remote rural areas in terms of socio-economic opportunities. The industrial area in the south of Yerevan provides some jobs also for people living in the surrounding villages.

5.1.8.4 Land Usage and Ownership

According to the Statistical Yearbook of Armenia (2016) RA has approx. 2 million ha of agricultural land, meaning about 70 % of the country's land area. Most of this, however, are pastures (about 1 million ha). Cultivable land comprises about 446,700 ha arable land, 34,400 ha perennial grass, 121,100 ha plough-land, and 392,200 ha others.

The Project Area is part of a highly industrialized region of Yerevan. Only the area west of the foreseen construction site (but outside of it) is used for pasture and/or agricultural purposes. The whole area of the construction site has already been acquired by ArmPower CJSC and local population does not live in nor use the land in any way. ArmPower/RENCO entered a land purchase agreement with the seller (Yerevan Thermal Power Plant CJSC) in March 2017. According to this agreement, the Seller guarantees that the land is free of any form of occupancy or any other possession by any third party and there are no current and, to the best of its knowledge, threatened or pending actions, suits or other proceedings which may affect the Seller's rights to dispose of the Project Land, and the Purchaser's title to the Project Land. The designated purpose of the Land is "for energy, transport,

communication, utility infrastructure objects", as stated in the title certificate 18042017-01-0184. A legal opinion has been emitted by an Armenian lawyers company, which stated that the preliminary agreement is legally binding and enforceable.

5.1.9 Historical and Cultural Sites

As the history of human settlement in Armenia goes back to the Neolithic age and the area has since then been important as settlement, trade and agricultural area, numerous historical and cultural sites exist. However, there are no maps indicating exact locations (GPS coordinates) of the sites. Also, only a minor part of the existing monuments are visible and known to the public. Others are known only to a few local experts linked to the Department for the Protection of Monuments of RA.

No known historical or cultural sites are located within the Project Area of Influence. The Erebuni Museum of History and Architecture is located approx. 4 km from the foreseen construction site.

The Ministry of Culture shall be informed by the EPC Contractor about the Project prior to construction, in order to allow the Ministry to perform a proof of occurrence/absence of any cultural or historical goods at the Project site, including a preconstruction field survey, if deemed necessary by the Ministry.

6. Environmental and Social Impact Assessment

In this chapter, possible environmental and social impacts from the construction, operation and decommissioning of YCCPP-2 are analyzed. Potential impacts of the Project in relation to environmental and social receptors are characterized and the extent of the impact (after implementation of mitigation measures) is assessed. The following evaluation scale is applied:

Significance of impact:

■■■	=	high negative
■■	=	medium negative
■	=	low negative
	=	nil
+	=	locally positive
++	=	regionally positive

6.1 Environmental Impacts during Construction Phase

6.1.1 Fauna, Flora and Biodiversity

Site preparation for the plant extension requires clearing of vegetation and ground excavation. Hence, the construction activities will result in a permanent loss of the sparse vegetation composed of grass, herbs and some bushes. As the biodiversity value of the construction site is assessed to be low, there are only low impacts on biodiversity expected during the construction phase.

Under normal dry weather conditions, a significant amount of dust will be released by excavating activities. Hence, vegetation and animal habitats in the vicinity of the site might be affected by wind-blown dust and its deposition. The contribution to the natural dust concentration in the air will only be of relevance at the beginning of the construction phase, during the main excavation activities. During this period, dust can be expected to settle on plant leaves, which could hinder plant's air exchange and assimilation.

The temporarily increased vehicular traffic coupled with high noise levels due to various construction activities may also have some negative impacts on animals. Especially birds and other acoustically orientated animals living in the vicinity of the site and the roads used can be disturbed by noise. The permanent disturbance during the period of construction could drive noise-sensitive species (e.g. birds) away from their habitats. It is expected that these species (if any) will return after construction has been finished and noise and dust levels decrease. No significant impacts by dust and noise on the flora and fauna in the vicinity of the site and the used roads are to be expected.

The impact significance will be low if mitigation measures are implemented. Adequate mitigation measures are possible and are given in the ESMP.

Impact of/ on	Significance of Impact (after Mitigation)
Fauna and Flora	■

6.1.2 Protected Areas

As no Protected Areas or other sensitive areas like Ramsar Sites or Important Bird and Biodiversity Sites (IBA) are located within or near to the Project Area of Influence, there will be no impacts from the Project on any of these areas.

Impact of/ on	Significance of Impact (after Mitigation)
Protected Areas	○

6.1.3 Soil

6.1.3.1 Soil Use and Soil Erosion

During construction of YCCPP-2, the loss of land is inevitable. Loss of vegetation and soil compaction increases the soils' vulnerability to erosion. Erosion can cause further unwanted interactions. Earthmoving activities such as vegetation clearing, grading and grubbing for site preparation, and heavy equipment hauling over unpaved ground, may loosen soils and cause fugitive dust and particulate matter to become airborne.

Armenia suffers significant soil erosion problems. But, compared to other regions in Armenia, the Project Area is not prone to soil erosion due to the following reasons:

- the terrain at construction site is nearly flat
- there are no hazardous physical-geological phenomena and processes (like landslides, rock slides, rock fall, erosion, suffosion, etc.) in the Project Area

Due to the restricted surface area of the planned construction activities and after implementation of the mitigation measures given in the ESMP, impacts on soil use and soil erosion are considered low. However, it is recommended that the EPC Contractor develops and implements an Erosion and Sediment Control Plan.

Impact of/ on	Significance of Impact (after Mitigation)
Soil Use and Soil Erosion	■

6.1.3.2 Soil Contamination

As mentioned in Section 5.1.4, an analysis of a possible historic soil contamination at the construction site has been performed in August 2017 and an additional analysis to confirm the initial results and obtain a more detailed picture of the site will be done. For details and analysis results see Section 12.4 in the Annex. IFC/World Bank Group General EHS Guidelines (2007) state that the national limit parameters have priority, and only if no national parameters exist, other internationally recognized parameters shall be used. As concentrations of heavy metals in the soil samples exceed national MACs, the soil at the construction site has to be regarded as contaminated by heavy metals. Thus, the soil that will be excavated for construction of YCCPP-2 will have to be handled as hazardous waste and stored at YCCPP-2 site for final disposal at a specialized hazardous waste landfill in future.

Soil contamination during construction works can arise from improper waste disposal and accidental leakage from tanks of lubricants, solvents, paint, oil, diesel, chemicals, etc. Depending on the kind of the contaminant, soil can be polluted short- or long-term. Measures given in the ESMP to prevent pollution of soil by oil and chemical spills have to be implemented during construction phase.

Impact of/ on	Significance of Impact (after Mitigation)
Soil Contamination	■

6.1.4 Water Resources

6.1.4.1 Surface Water

The nearest water body to the construction site is Artashati Jrants Canal, located about 700 m to the south east. The Hrazdan River is located at least 5 km away from the construction site. Thus, surface water is not expected to be influenced during the construction period.

Impact of/ on	Significance of Impact (after Mitigation)
Surface Water	○

6.1.4.2 Groundwater

Operation of workers' camps during the construction period will not be necessary, as local workforce from Yerevan will be employed who can return to their homes daily, and those from other cities/abroad will be lodged in RENCO's guesthouse or hotels. However, during construction period toilets and sanitary rooms will have to be provided for the workforce at the construction site, separately for men and women and according to IFC/ EBRD Guidance Note²². Sewage water shall be led to the sewage water system of the adjacent YCCPP-1 and then to the city sewage system, or septic tanks will have to be used for collecting sewage water which then would have to be emptied by a specialized company from time to time. An alternative has not yet been chosen by the EPC Contractor. In terms of environmental impacts, both alternatives are acceptable as long as a proper final destination of the liquid effluents is provided.

Contamination of the soil can indirectly lead to a pollution of the groundwater. Groundwater contamination can e.g. arise from improper waste storage and accidental leakage from tanks of lubricants, solvents, paint, oil, diesel, chemicals, etc. Depending on the kind of the contaminant, the groundwater may be polluted short or long term. Measures given in the ESMP to prevent pollution of groundwater by oil and chemical spills have to be implemented during construction phase.

An effective mitigation strategy to prevent pollution of the groundwater at the construction sites is to enforce a Waste Management Plan (see Section 6.1.7). Storing of construction material and any kinds of waste outside defined places shall be prevented and potential pollutants shall be handled properly. The impact magnitude is expected to be low when applying the identified mitigation measures.

An evaluation is currently ongoing regarding a possible lowering of the groundwater level for 2-3 m at the construction site during construction period, or permanently also during operation by a drainage system. According to the groundwater analysis study (Consecoard, 2017) the drained groundwater could be directed to the downstream area of Hrazdan River without additional cleaning (according to national legislation), as the results of all sampling tests were within the limits of the 5th grade of water quality, which conforms to the water quality of Hrazdan River (see Section 12.4. in the Annexes).

Additional analysis of groundwater is being undertaken at three sampling sites (upstream of the site, at the site, and downstream of the site) for content of TPH, PAH, BTEX, Metals, as well as pH, dissolved oxygen, mineralization, BOD5, and COD5. The results will be added to the final ESIA Report.

²² see IFC/ EBRD Guidance Note on Workers' Accommodation (2009)

If the groundwater level will be lowered, according to IFC and ADB requirements a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater users (nearby industries, agricultural use, etc.) and impact on Hrazdan river basin needs to be assessed including hydrogeological survey, groundwater mapping and modeling.

Impact of/ on	Significance of Impact (after Mitigation)
Groundwater level lowering	■■ (still unknown)
Groundwater contamination	■

6.1.5 Climate and Air Quality

Dust generation from transportation and construction activities as well as emissions from vehicles and construction machinery will be the main impacts on air quality during the construction phase of the proposed Project.

During construction activities dust particles can be swirled up resulting in a visible dust deposition close to the construction activities. Dust generation and distribution is dependent on weather conditions, wind speed, precipitation rate, as well as type and extent of construction activities. Dust deposition under low precipitation rates and high temperatures will be much higher than under wet conditions.

The main sources of dust emissions during construction are site clearing, site excavation and other earthworks as well as movement of construction vehicles.

During construction, the proposed project will lead to an increase in overall traffic flows for a limited period, which will cause a rise in vehicular emissions. These emissions together with exhaust emissions from construction machinery are likely to result in marginal increases in the emissions of SO₂, NO_x, CO, CO₂, and unburned hydrocarbons (UHC).

Due to the limited duration of the construction period and implementation of mitigation measures, the impact on air quality during construction can be considered as low.

Impact of/ on	Significance of Impact (after Mitigation)
Climate and Air Quality	■

6.1.6 Landscape and Visual Aspects

The construction site is located in a highly industrialized area in southern Yerevan. Here, the existing YCCPP-1, chemical plants, metal factories and other industrial infrastructure dominate the landscape. During construction activities heavy construction machinery will be working at the site producing dust (e.g. due to excavation works) and thus representing a visual impact which can be mitigated by spraying water during this kind of activity. The construction of the new power plant will add further highly visible structures (e.g. stacks and buildings) to the Project Area of Influence. However, due to the already existing industrial infrastructure in the area, the construction of YCCPP-2 will not enhance the contrast between the industrial site and the surrounding areas significantly. Fences can be used for temporary screening of the construction site. It is recommended to develop and implement a landscape / planting plan for the YCCPP-2 site. After construction works all construction waste shall be cleared up and all machinery shall be removed. Any adjacent damaged areas (if any) shall be reinstated.

Impact of/ on	Significance of Impact (after Mitigation)
Landscape and Visual Aspects	■

6.1.7 Waste

The main waste types generated during construction works can be generally classified as follows:

- domestic wastes generated by the workers (e.g. paper, plastic, drink containers, food waste etc.)
- plant debris from clearance of the construction site
- excavated inert material
- excavated contaminated material (e.g. soil polluted by fuel, engine oil and lubricants, and historically contaminated soil), if any
- construction waste (e.g. unused/ unusable construction material, wood from framework, maintenance waste, packaging material, empty containers etc.)
- hazardous waste like fuel, oils, paint, lubricants, contaminated soil, etc.

Waste Management Plan:

Possible impacts on soil and water can be prevented and mitigated by a professional handling and storage of hazardous substances and a proper handling of waste. The EPC Contractor (RENCO) shall develop a **Waste Management Plan** for the construction period that contains at least the following principles:

- respecting the waste management hierarchy of avoidance, preparing for reuse, recycling as much as possible, recovery, and proper disposal of remaining waste according to EU Directive 2008/98/EC (Waste Framework Directive)
- segregating all waste by category on site, based on their nature, and ultimate disposal sites
- good technical planning in order to minimize the generation of construction waste
- regular staff training to increase awareness of waste minimization issues and handling of different wastes.

A **Waste Management System** shall be implemented. In general, the generated construction waste shall be recycled as much as possible on site and the construction activities shall be controlled regularly. Storing of construction material, excavated soil and all kinds of waste outside defined places as well as throwing waste in open spaces shall be prevented.

The EPC Contractor will have to establish an official agreement with municipal authorities regarding the final disposal of the different wastes resulting from the works. This may include using the services of communal service providers for domestic waste disposal purposes during the construction period. If any scrap metal will accrue as waste, this can be sold to local recycling companies in Yerevan like e.g. Metexim LLC, or others.

Small amounts of hazardous waste like residual oil, fuel, paint or spill contaminated soil may accrue and shall be stored in adequate storage sites (lockable, roofed, ventilated, concreted and banded floor) at the new YCCPP-2 site. All hazardous wastes shall be securely packed in sealed drums or other suitable containers, clearly identified by labels, and marked according to national and internationally recognized requirements and standards, including the International Chemical Safety Cards (ICSC), Materials Safety Data Sheets (MSDS), or equivalent. Soil polluted with heavy metals that is excavated during construction will have to be stored on site on a concreted and banded area, protected against rain and wind. The final disposal of hazardous waste is subject to medium to long term national-level solutions to be decided upon and provided by the Government of RA, as no suitable disposal sites do exist in Yerevan or Armenia at the time being.

During the site visit in July 2017 empty oil drums, scrap metal, old metal cabins, old changing rooms and wash basins and other material that has been disposed on the foreseen construction site of YCCPP-2 were found (see figure and pictures below). All this material presently existing at the site has to be segregated and stored or disposed of accordingly before construction. There are also some concreted areas at the construction site which will have to be removed. Concrete waste can be disposed of at Yerevan dumping site or used as land filling material.



Figure 6-1: Location of waste on the site found during the site visit of July 2017

If all mitigation measures given in the ESMP are implemented, including a Waste Management Plan and a Waste Management System, the impact from waste is rated as medium (because there is not a solution for hazardous waste disposal in Armenia presently).

Impact of/ on	Significance of Impact (after Mitigation)
Waste	■ ■



Figure 6-2: Scrap metal



Figure 6-3: Wooden and metal material



Figure 6-4: Metal cabin on concreted area



Figure 6-5: Old changing rooms and wash basins



Figure 6-6: Gas cylinders / scrap metal



Figure 6-7: Old filter

(Source: Fichtner, July 2017)

6.2 Environmental Impacts during Operation Phase

6.2.1 Fauna, Flora and Biodiversity

Compliance with the performance guarantees for NO_x, CO and UHC will be achieved at the plant and monitored by a CEMS. Added to this, as no sensitive fauna and flora species occur in the Project Area of Influence the impact on these components derived from air emissions will be low.

Impacts on aquatic organisms of the Hrazdan River, which is categorized as having a bad water quality, are foreseen to be low. The waste water streams will be treated and discharged according to applicable requirements (see Section 6.2.4 for further details).

Impact of/ on	Significance of Impact (after Mitigation)
Fauna and Flora	■

6.2.2 Protected Areas

As no Protected Areas or other sensitive areas like Ramsar Sites or Important Bird and Biodiversity Sites (IBA) are located near the Project Area of Influence, there will be no impacts from the operation of YCCPP-2 on any of these areas.

Impact of/ on	Significance of Impact (after Mitigation)
Protected Areas	○

6.2.3 Soil

Soil contamination can be possible due to spillages from oil/ fuel/ paint/ chemicals used during operation of the power plant. However, if the mitigation measures given in the ESMP (like correct storage and handling of those items; use of spill-fighting materials, etc.) are implemented, the impact is rated low.

Impact of/ on	Significance of Impact (after Mitigation)
Soil Contamination	■

6.2.4 Water Resources

6.2.4.1 Water Supply

Water supply during operation of the YCCPP-2 will be branched from the existing water pipelines which are presently serving the YCCPP-1. All water will be taken from the Yerevan potable water grid and will be used for all civil utilities like cooking, drinking, etc. It will also be used as process water which is connected to the raw water storage tank and for all other uses (e.g. cooling tower make up, HRSG blow-down tank quench, firewater tank and network, utility water network, etc.). Cooling towers are designed as evaporative towers needing the highest share of the raw water (approx. 310 m³/h). The maximum power plant water flow rate (referred to normal operation) will be 450 m³/h (annual average). The necessary average monthly water quantity will be around 300,000 m³. Use of potable water is agreed and described in the Framework Agreement between ArmPower and the Government of Armenia. The location of the tie-in point for raw water can be consulted in Figure 3-3 in Section 3.

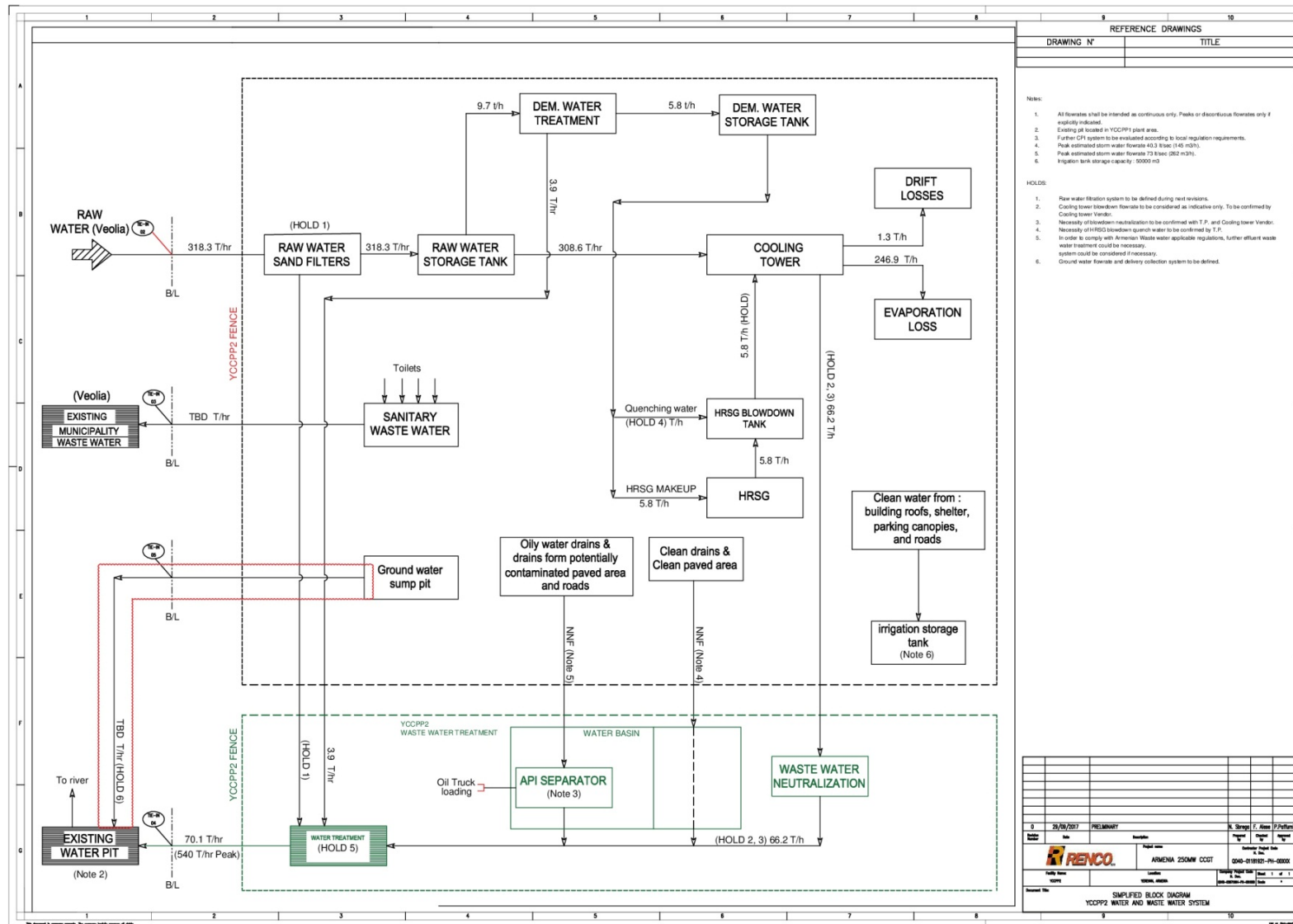


Figure 6-8: Preliminary Water Balance of YCCPP-2 (Source: RENCO)

6.2.4.2 Surface Water

The oily waste water coming from the power plant operation will be duly collected and routed to a waste water treatment plant at YCCPP-2 (with an API and, if necessary, CPI oil separator) before being discharged to the existing system of YCCPP-1. The treatment system will be suitably selected and implemented to meet the environmental limits and the good industry practice.

Since there are no Armenian standards for the quality of the liquid effluents, the limits applicable to the effluents of the YCCPP-2 will be defined by the Ministry of Nature Protection based on a nationally recognized calculation method. This ESIA recommends that such limits are at least as stringent as those provided in the Design Data of ArmPower for YCCPP-2 (2017), as these comply with the IFC Guidelines (see Section 2.4 of this report, where also the allowed concentrations on the effluent of YCCPP-1 is provided for comparison).

According to RENCO, rain water from internal roads and other paved areas will be collected and led to the waste water treatment plant before discharging it to the existing system of YCCPP-1. Rain water from roofs of buildings and shelters will be collected in an underground tank (location and routing will be defined) for reusing the water without any treatments for irrigation inside the YCCPP-2 site.

The HRSG blow down and other drainage from the steam/water system will be neutralized at the chemical shop of the power plant to meet the relevant water quality standards, and will then be discharged using the existing discharge system of YCCPP-1.

The domestic sewage will be connected to the already existing city sewage collection system.

According to RENCO's water balance, approx. 70 m³/h of waste water will be discharged by YCCPP-2 into the existing discharge system of YCCPP-1, which is large enough to accommodate this additional flow (for location of the tie-in point see Figure 3-3). Additionally, approx. 14 m³/h of sanitary sewage water will be led to the city sewage system operated by VEOLIA, which is (according to RENCO) large enough to receive this additional flow.

A monthly monitoring program shall be established to be performed by ArmPower and results shall be reported to the "Environmental Monitoring and Information Center" SNCO at the Ministry of Nature Protection. The objective is to guarantee the adherence of all industrial wastewater, sanitary water and drainage water to the effluent standards that are still to be set by national authorities for YCCPP-2, the design data/performance guarantee values, or international limit values, whichever are **more stringent**.

In order to assess the influence of the YCCPP-2 waste water (together with YCCPP-1 waste water) on the water quality of the recipient Hrazdan River, chemical water quality parameters shall be analyzed from samples taken upstream and downstream of the discharge point to the River. Results will be presented in the Final ESIA study.

According to RENCO the temperature of the waste water will be in the range of 15°C to max. 44°C, depending on the seasonally varying ambient temperature. However, thermal impacts of the water discharged to Hrazdan River via the existing system of YCCPP-1 are not expected to be significant, as the discharge point for waste water is located far away from the plant, and before reaching the river it is transported in open channels for over 10 km (aerial distance).

If all mitigation measures given in the ESMP are implemented the impact is rated to be low.

Impact of/ on	Significance of Impact (after Mitigation)
Water Courses	■

6.2.4.3 Groundwater

An evaluation is currently ongoing regarding a possible lowering of the groundwater level for 2-3 m at the power plant's site permanently during operation by a drainage system. This underground collection system would divert the ground water from the footprint area of the plant to keep the foundations dry and to increase the seismic response and the foundation's life. This system would consist of holed pipes installed inside a gravel bed and conveying the water to a boundary location of the plant plot area. According to the groundwater analysis study (Consecoard, 2017), the drained groundwater could be directed to the downstream area of Hrazdan River without additional cleaning (according to national legislation), as the results of all sampling tests were within the limits of the 5th grade of water quality which conforms to the water quality of Hrazdan River.

If the groundwater level will be permanently lowered, according to IFC and ADB requirements a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater users (nearby industries, agricultural use, etc.) and impact on Hrazdan river basin needs to be assessed including an hydrogeological survey, groundwater mapping and modeling.

Contamination of the soil can indirectly lead to pollution of the groundwater. Contamination can be possible due to spillages from oil/ fuel/ paint/ chemicals used during operation of the power plant. However, if the mitigation measures given in the ESMP (like correct storage and handling of

those items; use of spill-fighting materials, etc.) will be implemented, the impact from contamination is rated low.

Impact of/ on	Significance of Impact (after Mitigation)
Groundwater level lowering	■■ (still unknown)
Groundwater contamination	■

6.2.5 Climate and Air Quality

Stack emissions:

During the operation of the new power plant the impact on atmospheric air is due to emissions generated as a result of fuel combustion. IFC/World Bank Group EHS Guidelines for Thermal Power Plants (2008) describe emission levels for new thermal power plants. For combustion turbines using natural gas the NO_x emissions shall be less than 51 mg/Nm³ (referring to dry exhaust and 15% O₂). In order to comply with this limit value, a low-NO_x burner will be used in the new YCCPP-2.

There are no Armenian air emission limits for thermal power plants. The specifications for YCCPP-2 demand compliance with the following Performance Guarantee values (ArmPower, 2017): NO_x emissions equal or less than 50 mg/Nm³, CO emissions equal or less than 30 mg/Nm³ and UHC emissions equal or less than 10 mg/Nm³ (referring to dry exhaust and 15% O₂).

A Continuous Emissions Monitoring System (CEMS) will be installed at the stack of the new power plant. Adherence to the limit values shall be continuously checked by ArmPower and the results shall be monthly reported to “Environmental Monitoring and Information Center” SNCO at Ministry of Nature Protection. When emissions are exceeded, this means that the conditions of the performance guarantee tests are not fulfilled anymore - there needs to be a verification of the combustion conditions and the air reduction equipment. If the situation does not improve, or a problem is detected, the plant must be temporarily shut down for repairing.

An Air Dispersion Calculation (ADC) has been prepared to allow understanding what is the expected impact of the YCCPP-2 in the airshed of Yerevan (see Section 12.6 in the Annex). Indicative results for the cumulative effects have also been assessed. Altogether 3 scenarios were initially simulated:

- one with only YCCPP-1 operating (indicative baseline scenario, or Scenario A);
- one with only YCCPP-2 operating (Scenario B),

- and one with both plants operating (indicative future scenario, indicative cumulative scenario, or Scenario C).

Each of the 3 scenarios was simulated for a stack height of 35 meters (design), for a stack height of 43 meters (alternative), and for a stack height of 66 meters, or Good Engineering Practice - GEP - stack height (alternative 2).

As a result of some previous model iterations, the need to simulate an additional scenario has come up:

- Future developments scenario: reflects the inclusion of additional emission reduction measures, in case future projects are reasonably foreseen for the area.

AERMOD calculated 66 meters as the GEP stack height, and this will be followed by the project's design.

The results of the ADC show that the standards for CO are expected to be fulfilled in all cases. The effect of YCCPP-2 on the ground level concentrations of NO₂ is, however, expected to represent more than 25% of the national and international standards for this pollutant, even when the stack is raised to 66 meters. This goes against the IFC recommendation for a future sustainable development in the area. In addition, it is at this stage unknown what will be the real cumulative effect of the Project, because the existing pollution loads are only partly known. In case these are very high, the Project's emissions may need to be further reduced. This will be assessed once complete baseline air quality data for the area is available.

Taking both conditions as described above into consideration, RENCO will incorporate additional emission reduction measures in the design that will allow reducing the emissions of NO₂ in 55%. These measures will be implemented by means of a two-stage procedure in such a way to optimize the CAPEX of the project:

- Stage 1 (design and construction): the new power plant will be designed and built considering the installation of a transition spool between the gas turbine's exhaust and the HRSG. This transition spool will allow installing a SCR (catalytic device) in Stage 2. In addition, there will be a space provided to install the catalyst system necessary to operate the SCR.
- Stage 2 (implementation): In case a development project which causes NO_x emissions in the same airshed of the new power plant can be reasonably foreseen, the provision spool will be removed and replaced by the SCR and storage and distribution system of the chemical (ammonia) being installed in the space left unoccupied during Stage 1. The intervention works for Stage 2 will be short and the new facilities immediately operating to drop the emissions.

The simulation of the effect of these measures together with the effect of a stack with 66 meters, shows that the contribution of the YCCPP-2 can stay then below the 25% of the applicable standards. Such measures are planned in the design, but would only be activated in case:

- The results of the new baseline measurement (special focus on the Winter results) show that the existing pollution load is very high. This implies that YCCPP-2 needs to reduce its emissions to avoid a high cumulative impact; *and/or*
- a NOx emission source (power plant or similar) is installed in the same airshed (up to 10 km). The future installation of other industrial plants in the area cannot be reasonably foreseen at this stage.

Greenhouse gases:

The project's greenhouse gases emissions are, according to RENCO, expected to be 785,000 tons CO_{2eq}/year (considering 8,350 OH at 12°C) and 371 g CO₂/kWh gross, respectively. This value is within the range of the typical CO_{2eq} emissions provided in the IFC/World Bank Group EHS Guidelines for Thermal Power Plants (CCGT with 51% efficiency: 396 g CO₂/kWh gross). According to IFC Performance Standard PS 3 an annual quantification of greenhouse gas emissions shall be done for plants emitting more than 25,000 t CO₂/year, which is the case for YCCPP - 2. The quantification shall include direct and indirect emissions²³ and be reported to the financing institutions and the national authorities.

In its "Intended Nationally Determined Contribution (INDC)" from 2015²⁴, Armenia describes its approach to establishing a level of GHG emissions of 5.4 tons CO_{2eq}/year (average) that it will not exceed during the period 2015-2050. The INDC notes Armenia's 2010 GHG emissions of 2.14 tons per person²⁵.

The emissions of the power plant correspond to a per capita value of 0.23 tons CO_{2eq}/year (according to the INDC, a population of 3.35 million is accounted for in Armenia). This corresponds to 11% of the 2010 emission levels and to 4% of the 2015-2050 annual averaged emission target. Given this, there is no reason to declare that the new YCCPP-2 negatively affects the pursue of recent national strategies and policies promoting the reduction of greenhouse gas emissions like the 'Action Plan for Implementation of the National Program for Energy Saving and Renewable Energy (2010)', 'RA Renewable Energy Development Roadmap (2011)', 'Energy Security Concept of RA (2013)' and others (MNP 2015).

²³ Indirect emissions refer to the off-site generation by others of electricity, and heating and cooling energy used by the Project (IFC, 2012)

²⁴ <http://www4.unfccc.int/Submissions/INDC/Published%20Documents/Armenia/1/INDC-Armenia.pdf>

²⁵

https://www.climatelinks.org/sites/default/files/asset/document/2017_USAID_GHG%20Emissions%20Factsheet_Armenia.pdf

Particulate Matter (PM) emissions from cooling towers:

The principal air pollutant emitted directly from wet cooling towers is small particulate matter (PM). Dissolved solids in the circulating water result in fine particulate emissions (PM₁₀ / PM_{2.5}) when water droplets are ejected from the tower evaporate before they reach the ground. Cooling tower particulate emissions are controlled through the use of drift eliminators, which are shaped materials that collect small water droplets as they exit the tower. Design Data of ArmPower (2017) mention that the evaporative towers of YCCPP-2 shall be designed to have a low drift phenomena (0.01 % drift loss, which will be approx. 1.3 m³/h according to the preliminary water balance provided by RENCO).

In order to reduce the emissions of particulate matter from the cooling towers during operation of the power plant, drift eliminators according to Good International Industry Practice (GIIP) shall be included in the design of cooling towers and raw water shall be filtered in order to reduce the content of Total Dissolved Solids (TDS). A baseline air quality monitoring was just undertaken by FICHTNER in August 2017 at the surroundings of the power plants’ site which included the measurement of PM₁₀. Results show that PM₁₀ concentrations (measured at different daytime periods) are clearly below the maximum permissible concentrations and the daily average concentration limits as set by RA Decree No. 160-N “Norms of maximum permissible concentrations of atmospheric air pollutants in residential areas”. The international air quality standards for PM₁₀ are also fulfilled.

Implementing all mitigation and monitoring measures as given in the ESMP, the impact of the Project on climate and air quality is rated at this stage as low.

Impact of/ on	Significance of Impact (after Mitigation)
Climate and Air Quality	■

6.2.6 Landscape and Visual Aspects

The Project Area is located in a highly industrialized area in southern Yerevan. Here, the existing YCCPP-1, chemical plants, metal factories and other industrial infrastructure dominate the landscape. The planned new power plant will add further highly visible structures (e.g. stacks and buildings). However, due to the already existing industrial infrastructure in the area, the realization of the project will not enhance the contrast between the industrial site and the surrounding areas.

Impact of/ on	Significance of Impact (after Mitigation)
Landscape and Visual Aspects	■

6.2.7 Waste

According to IFC/World Bank Group EHS Guidelines for Thermal Power Plants (2008), gas fired thermal power plants generate essentially no solid waste during operation because of the negligible ash content.

Domestic waste produced by the plant staff shall be collected in provided bins and picked up by a contracted waste collector for disposal at Yerevan dumping site.

Currently there are no suitable dumping sites for hazardous waste in Armenia. All hazardous waste generated by the Project shall therefore be stored in adequate storage sites (lockable, roofed, ventilated, concreted and with bunded floor) at the new YCCPP-2 site for future disposal (see also Section 6.1.7).

In the Chemical Workshop of the new YCCPP-2, acids and alkaline solutions will be used for neutralization of HRSG blow down and other drainage from steam/water system in order to meet the effluent standards (still to be set by national authorities for YCCPP-2) or international limit values, whichever are more stringent (see Section 6.2.4). These hazardous materials have to be adequately stored and used only by trained personnel using the adequate Personal Protective Equipment (PPE). Material has to be clearly labeled and marked according to national and internationally recognized requirements and standards, including the International Chemical Safety Cards (ICSC), Materials Safety Data Sheets (MSDS), or equivalent. Waste material from these processes as well as e.g. used turbine oil, has to be stored accordingly as hazardous waste (see above). Related to the mid-term or long-term storage of hazardous waste on the site, the Waste Management Plan (WMP) for operation of the power plant shall also include a risk assessment considering among others (i) implications of long-term storage of waste types including consideration of any potential change in hazardous properties over time, (ii) risks associated with reactivity between waste types, and (iii) type of containers to be used for storage

including consideration of container integrity and resilience over the projected timeframe of storage. Furthermore, the size of the storage area for hazardous waste shall be adapted to the projected volume of hazardous material and the anticipated storage duration. The frequency of checks for the integrity of the waste storage facilities shall be as well defined in the WMP.

Impact of/ on	Significance of Impact (after Mitigation)
Waste	■

6.3 Social Impacts during Construction Phase

6.3.1 Local Workforce

During the construction period local workforce (mainly unskilled workers) from the nearby villages and Yerevan shall be employed for the construction works. According to RENCO in peak construction times about 450 workers will be needed. This will contribute to much needed monetary income in the region. Special attention shall be laid on the recruitment of women, wherever possible. However, the income generation opportunity is not of long term duration, as it will be limited to the construction period. The EPC Contractor shall discuss potential barriers for employment with local labor / training organizations so that measures to overcome these barriers can be developed and put in place.

RESCO SPA as the EPC Contractor has a systematic approach which fully complies with the international standards ISO 14001 and OHSAS 18001. RENCO has a Human Resources Policy in place that will be applied to the Project as it has been done by RENCO for many other projects in the past (including a non-discriminatory hiring and wage policy according to IFC PS 2; clearly stating that the company will not discriminate in hiring and salaries based on gender, age, religion, ethnicity or place of origin, etc.) The Human Resources Policy shall in addition include international labor standards as defined in ILO (2014), in order to fulfill the requirements of IFC PS 2.

Impact of/ on	Significance of Impact (after Mitigation)
Local Workforce	+

6.3.2 Land Usage and Ownership

There are no people living at the site nor the land is used by the local population. The area has already been acquired, fenced, and foreseen for construction of YCCPP-2. ArmPower/RENCO entered a land purchase agreement with the seller (Yerevan Thermal Power Plant CJSC) in March 2017. According to this agreement, the Seller guarantees that the land is free of any form of occupancy or any other possession by any third party and there are no current and, to the best of its knowledge, threatened or pending actions, suits or other proceedings which may affect the Seller's rights to dispose of the Project Land, and the Purchaser's title to the Project Land. The designated purpose of the Land is "for energy, transport, communication, utility infrastructure objects", as stated in the title certificate 18042017-01-0184. A legal opinion has been emitted by an Armenian lawyers company, which stated that the preliminary agreement is legally binding and enforceable. Also, there are no houses or private assets located inside the construction site, so that no physical relocation or acquisition of further land will be necessary for this Project.

Impact of/ on	Significance of Impact (after Mitigation)
Land usage and ownership	○

6.3.3 Historical and Cultural Sites

Within the construction site and the Project Area of Influence no cultural or historic sites are known. For the case of an unexpected encounter of Cultural and Historical Sites or Goods a **Chance Find Procedure** has to be implemented. In case of any chance finds, the construction has to be stopped immediately and the Agency of Protection of Historical and Cultural Monuments/ Ministry of Culture has to be informed to agree on further steps (as according to Armenian Law). The Chance Find Procedure will include:

- Stop the construction activities immediately in the area of the find.
- Notify the responsible local authorities and the Ministry of Culture.
- Evaluation of the findings to be performed by the archaeologists of the Agency of Protection of Historical and Cultural Monuments/ Ministry of Culture.
- Decision on how to handle the find to be taken by the responsible authorities and implementation of the decision concerning the management of the finding.
- Construction work could resume only after written permission is given from the responsible local authorities and the Ministry of Culture concerning safeguard of the heritage.

Impact of/ on	Significance of Impact (after Mitigation)
Historical and Cultural Sites	■ (if any)

6.3.4 Occupational and Community Health and Safety

6.3.4.1 Occupational Health and Safety

RENCO SPA will be the EPC Contractor for this Project. RENCO has a Health, Safety and Environment Policy (2015) in place, in order to meet the requirements, regulations and communities affairs for the health of all persons working under the control of RENCO, environment protection and plants safety. An integrated system for safety, environment and quality has been implemented in compliance to international guidelines and standards (RENCO is OHSAS 18001 and ISO 14001 certified).

For construction of YCCPP-2 a site-specific Health, Safety and Environment Management Plan (HSEMP) will be developed and a Health, Safety and Environment Management System (HSEMS) implemented during construction, considering national and international requirements like Occupational Health and Safety Guidelines presented in the IFC/WB General EHS Guidelines and the IFC/WB EHS Guidelines for Thermal Power Plants. An H&S manager of RENCO shall be on duty all the time during construction period. These HSEMP and HSEMS shall also be valid for any third parties or subcontractors in the supply chain.

The HSEMS shall include among others medical health care, proper sanitation installations and use of Personal Protective Equipment (PPE) such as wearing of helmets and ear plugs when working under high noise levels, wearing of safety shoes, protection clothes, etc. The HSEMS shall explicitly include measures aiming at health and safety of the public (e.g. Life and Fire Safety, Traffic Safety, etc.). Construction workers shall be trained in proper handling and storage of hazardous construction materials etc. Handling and storing materials involve diverse operations such as driving a truck; hoisting tons of steel with a crane; carrying bags or materials manually and stacking materials such as drums, iron parts, barrels, etc. Therefore, specially designated, logistically applicable lay-down areas will be set up inside the boundaries of the foreseen construction site.

To manage human exposure to electric and magnetic fields IFC PS and IFC/ WB EHS Guidelines for Electric Power Transmission and Distribution require respecting the limits established by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) - see Section 2.4.

Areas (if any) at the construction site and the adjacent new substation (which will be connected by overhead transmission line or underground cable to the new power plant), where high electric or magnetic fields occur,

shall be signed. The exposure of workers has to be below the values given above. Workers have to be equipped with special Personal Protective Equipment (PPE) for working in these areas.

Skilled working personnel (partly from abroad) will be accommodated in RENCO’s guesthouse or at hotels in Yerevan. Distance to the construction site is approx. 7 km. Local (mainly unskilled) workforce shall be employed from Yerevan and the adjacent villages. No workers’ camps will have to be established as local workers will return to their home daily, and workers from abroad/other cities will be lodged in RENCO’s guesthouse or hotels. Transfer to and from the construction site will be carried out by personnel private means or public transport, and in addition by means managed by the EPC Contractor. A Traffic Management Plan shall be developed and implemented by the EPC Contractor including, among others, the transport of workers, planning of truck movements, short-term closure of roads (if necessary: details about road use (by whom and for what purpose) and alternative routes), description of communication measures, etc.

Impact of/ on	Significance of Impact (after Mitigation)
Occupational Health and Safety	■

6.3.4.2 Community Health and Safety

Transporting construction equipment on trucks might be dangerous to residents, when trucks drive through residential areas or small villages. Thus, adequate security measures to prevent accidents and injury have to be foreseen as part of the Traffic Management Plan (e.g. keeping speed limits, inform population along public roads in advance in case of transporting heavy equipment, etc.)

The construction site itself will be fenced and the entrance gates will be guarded by security staff in order to prevent any unauthorized access to the site, thus also minimizing possible impacts on community health and safety. Development and implementation of a Security Force Management Plan guided by principles of proportionality, good international practice²⁶ and Armenian national law and include training and monitoring of security personnel regarding the use of force and conduct towards the community.

The new transmission line (overhead line or underground cable) connecting new YCCPP-2 with the high voltage substation just under construction, will be constructed mainly inside the properties of YCCPP-2 or the new substation, just crossing one road.

²⁶ e.g. UN Code of Conduct for Law Enforcement Officials; UN Basis Principles on the Use of Force and Firearms by Law Enforcement Officials; IFC (2017): Good Practice Handbook on Use of Security Forces - Assessing and Managing Risks and Impacts.

Emergency Preparedness and Response Plan

RENCO as EPC Contractor shall develop an **Emergency Preparedness and Response Plan** based on robust Quantitative Risk Assessment (QRA) / Hazard Identification Study (HAZID) for the construction period that contains at least the following principles (according to IFC PS 1):

- Identification of areas where accidents and emergency situations may occur
- Consideration of earthquake risks
- Identification of communities and individuals that may be impacted
- Establishment of response procedures
- Provision of equipment and resources
- Designation of responsibilities
- Communication with workers and the public
- Training of workers

RENCO shall also assist and collaborate with the potentially affected communities and local government agencies in their preparation to respond effectively to emergency situations. RENCO shall provide appropriate information to potentially affected communities and relevant government agencies. The emergency preparedness and response activities shall be periodically reviewed and revised, if necessary.

The impact on human health for the public during construction can be assessed to be low, if the mitigation measures of the ESMP are implemented.

Impact of/ on	Significance of Impact (after Mitigation)
Community Health and Safety	■

6.3.4.3 Noise

As stipulated in the General EHS Guidelines of IFC/ World Bank Group, ‘no employee should be exposed to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection’. Construction workers will wear ear protection devices as part of their Personal Protective Equipment (PPE), if they are exposed to noise levels higher than 80 dB (A), according to Armenian legislation (see also Section 2.4).

Noise impacts to the public will be generated by operation of heavy equipment at the construction site and by an increased frequency of vehicular traffic in the area. However, these impacts are short term, intermittent and temporary in nature.

Residential areas in the vicinity of the site, which are located near to major roads, will be exposed to higher noise levels due to a greater volume of

heavy truck traffic passing by on the main roads. Thus, truck movements shall only be allowed during daylight, but not between 7 pm and 6 am.

The overall impact of noise on the environment that is generated during construction of the plant is temporary only and mainly confined to daylight hours, as working hours will only be during the day. It is anticipated that - with the measures outlined in ESMP - it will be possible to reduce noise impacts during construction to an acceptable minimum according to the most stringent limits (see Section 2-4).

Impact of/ on	Significance of Impact (after Mitigation)
Noise	■

6.4 Social Impacts during Operation Phase

6.4.1 Electricity Supply

Power demand in Armenia is constantly rising due to rapidly growing economy and a rising population. The Armenian Government is becoming more focused on financial support for projects that have nation-wide significance, are capable of ensuring an adequate level of energy security and independence, and can secure social and economic development (Government of Armenia, 2005). The new YCCPP - 2 is listed as one of the projects that shall support achieving these objectives.

The operation of YCCPP-2 with a guaranteed gross power output of 254 MW will increase the total output of electric energy, providing a more reliable power supply countrywide.

Impact of/ on	Significance of Impact (after Mitigation)
Electricity Supply	++

6.4.2 Occupational and Community Health and Safety

6.4.2.1 Occupational Health and Safety

The new power plant YCCPP-2 will be operated by ArmPower CJSC, which is a subsidiary company of RENCO SPA. ArmPower is a fit-to-purpose new company. Shareholders are Renco and Siemens. It is assumed that the shareholders' certification will apply to ArmPower, too.

RENCO SPA has a Health, Safety and Environment Policy (2015) in place, in order to meet the requirements, regulations and communities affairs for

the health of all persons working under the control of RENCO, environment protection and plants safety. An integrated system for safety, environment and quality has been implemented in compliance to international guidelines and standards (like OHSAS 18001 and ISO 14001 standards).

The implementation of the HSE management system assures a systematic control of safety and environment performances through a constant internal monitoring in order to improve the performances itself.

To meet these targets, among others the following actions have been established:

- Provide a safe working environment to safeguard health of personnel and environment
- Prevent risk situation and hazard to the people, to the material and to the environment
- Prevent and protect in the field of safety and environment (incidents, damages pollution, etc.), under overall aspects managing all the activities in conformity with applicable laws and local regulations
- Provide adequate equipment and qualified personnel to match the requirements of the task
- Provide training, information and dialogue to our personnel
- Preparation of environmental and safety reporting in order to monitor the performance of each project site
- RENCO’s responsibilities cover all people working under the RENCO control: consultants, suppliers, subcontractors, etc.

Among others, RENCO SPA has also a Social and Cultural Heritage Policy (2016), as well as an Anti-Corruption Policy (2016) and a Code of Ethics in place.

The above mentioned policies and HSE management systems shall also be established at ArmPower CJSC as subsidiary company of RENCO SPA considering national and international requirements like Occupational Health and Safety Guidelines presented in the IFC/WB General EHS Guidelines and the IFC/WB EHS Guidelines for Thermal Power Plants (including among others exposure to heat, confined spaces, fire and explosion hazards, and chemical hazards). The HSEMS shall explicitly include measures aiming at health and safety of the public (including Life and Fire Safety).

RESCO’s Human Resources Policy shall include international labor standards as defined in ILO (2014), in order to fulfill the requirements of IFC PS 2.

Impact of/ on	Significance of Impact (after Mitigation)
Occupational Health and Safety	■

6.4.2.2 Community Health and Safety

The Performance Guarantees (ArmPower, 2017) demand the guaranteed gaseous emissions described in Section 2.4. These limits comply with the IFC/World Bank Group EHS Guidelines for Thermal Power Plants (2008). There are no national air emission limits for thermal power plants.

The Final Draft Air Dispersion Calculation (see Section 12.6 in the Annex) proposes a rise in the stack height to 66 meters in order to assure compliance with national and international air quality standards. RENCO will implement this proposal.

Emission of particulate matter (PM₁₀ / PM_{2.5}) from cooling towers will be reduced by including drift eliminators according to Good International Industry Practice (GIIP) in the design of cooling towers and filtering of raw water in order to reduce the content of Total Dissolved Solids (TDS).

The area of the new power plant will be fenced and the entrance gates will be guarded by security staff in order to prevent any unauthorized access to YCCPP-2 site. Development and implementation of a Security Force Management Plan guided by principles of proportionality, good international practice²⁷ and Armenian national law is recommended. This shall include training and monitoring of security personnel regarding the use of force and conduct towards the community.

The new transmission line (overhead line or underground cable) connecting new YCCPP-2 with the high voltage substation just under construction, will run nearly completely inside the properties of YCCPP-2 or the new substation, crossing one road.

Emergency Preparedness and Response Plan

ArmPower as Operator of YCCPP-2 shall develop an **Emergency Preparedness and Response Plan** for the operation phase, based on the emergency preparedness and response activities already implemented during construction phase of the project. The plan shall be based on robust Quantitative Risk Assessment (QRA) / Hazard Identification Study (HAZID) taking into account general and site-specific risks and contain at least the following principles (according to IFC PS 1):

- Identification of areas where accidents and emergency situations may occur
- Consideration of earthquake risk
- Identification of communities and individuals that may be impacted
- Establishment of response procedures
- Provision of equipment and resources

²⁷ e.g. UN Code of Conduct for Law Enforcement Officials; UN Basis Principles on the Use of Force and Firearms by Law Enforcement Officials; IFC (2017): Good Practice Handbook on Use of Security Forces - Assessing and Managing Risks and Impacts.

- Designation of responsibilities
- Communication with workers and the public
- Training of workers

ArmPower shall also assist and collaborate with the potentially affected communities and local government agencies in their preparation to respond effectively to emergency situations. ArmPower shall provide appropriate information to potentially affected communities and relevant government agencies. The emergency preparedness and response activities shall be periodically reviewed and revised, if necessary.

If the mitigation measures given in the ESMP will be implemented the impact on public health and safety will be low.

Impact of/ on	Significance of Impact (after Mitigation)
Community Health and Safety	■

6.4.2.3 Noise

Noise levels will have to be measured regularly during operation phase of the new power plant and their compliance with Performance Guarantees (see Section 2.4) will have to be monitored.

YCCPP-2 has been designed with particular attention to limit the noise emissions. The most relevant noise sources will be located inside soundproofed cabins/ buildings to minimize noise propagation.

A Noise Propagation Study is available in Annex 12.5 and includes a Noise Calculation for the new power plant (YCCPP-2) site. The Noise Calculation has been done by using the propagation model SoundPlan. The model determines sound propagation based on the provisions of ISO 9613. This model is widely used in EU noise mapping projects. Application of this model allows determining whether the noise levels emitted by the new plant will represent a nuisance to the surrounding areas, i.e., if the resulting ambient noise will be above the national and international standards. For more details and methodology refer to Annex 12.5.

The calculation outcomes of the model for YCCPP-2 have shown that the operation of **the new plant will not produce any significant increase of the noise pressure at the sensitive receptors** (not more than 0.15 dB(A)). In particular:

- where the current noise pressure is under the applicable limits, the YCCPP-2 operation will not produce any exceedance of the said limit either during the daytime or during the night time;
- where the current noise pressure is already over the applicable limits, the YCCPP-2 will produce a negligible contribution.

As last consideration, it has to be underlined that, although at the YCCPP-2 fence no sensible receivers are present, the sound level contribution of the plant will be significantly below the applicable international industrial areas noise limits (70 dB(A)).

Under implementation of the mitigation measures given in the ESMP the impact of noise generated during operation of YCCPP-2 is at the moment rated to be low.

Impact of/ on	Significance of Impact (after Mitigation)
Noise	■

6.4.3 Job Opportunities

During operation phase the workforce is estimated by RENCO to be approx. 120 people comprised of administration, and operation and maintenance staff on roster working shifts. Most jobs during operation of YCCPP-2 will be for specialized workers (electrical engineers, automation and control engineers, mechanical engineers, etc.) which will require specific power plant training and will not be readily found in Armenia, with exception of personnel presently operating at similar plants (e.g. YCCPP-1). These personnel would also require some retraining to adapt to the new facilities. There are also graduated people (with electrical and mechanical training) from Yerevan who could potentially work at the new plant. However, extensive training on the job as well as theory training is recommended. .

A few simpler jobs (e.g. food supply, housekeeping, etc.) however, will also be available for people which shall be employed from the adjacent residential areas (if possible) in order to create some additional income. Special attention shall be laid on the recruitment of women.

Impact of/ on	Significance of Impact (after Mitigation)
Job opportunities	+

6.5 Additional Impacts from new Connection Facilities

Interconnections to gas, water and electrical grid are planned. The new CCPP shall be connected with the facilities of the existing grid infrastructure provided below (see Figure 3-3):

- Electricity: A new 220 kV substation is just under construction for YCCPP-1; the connection from the new power plant to the new substation will be via a new overhead transmission line or via a new underground cable; the distance between the new power plant and the new 220 kV substation is approx. 400 m
- New connection to the natural gas supply pipeline system from Gazprom, approx. 550 - 600 m
- New connection to the city water system managed by Veolia (make-up water), approx. 1,000 m
- New connections to the water sewerage of the city and the industrial waste water discharge system of YCCPP-1, approx. 450 m / 100 m

6.5.1 Additional Impacts during Construction Phase

Impacts and mitigation measures mentioned in the sections above concerning the construction phase of the Project also apply to the construction of the necessary additional connection facilities. **Additional aspects** to be considered are presented in the following, based on the information available at the time of writing this report.

Impacts on **flora and fauna** from construction of the new connection facilities will be low after implementation of mitigation measures. If any trees will have to be felled for construction of water and gas pipelines or for the transmission line/ underground power cable, replanting of trees (native site-adapted tree species) shall be performed, based on a replanting plan to be developed.

Possible **soil erosion** due to the excavation for underground pipelines shall be additionally considered in the Erosion and Sediment Control Plan that is already recommended.

No additional **land** will have to be acquired for the construction of the planned connections, as the land is already in possession of the operator or the Government. No physical relocation will be necessary for the above mentioned construction activities.

The Chance Find Procedure regarding **historical and cultural goods** will also apply to the construction activities considered here in this section.

HSE Management Plan and HSE Management System to be set up by the EPC Contractor have to consider also the construction of the mentioned connection facilities. Specially trained workers equipped with the necessary personal protective equipment will be required for connecting the additional gas pipeline to the existing gas infrastructure. The same applies for

connection of the new transmission line/ underground cable to the substation.

The **Traffic** Management Plan to be developed by the EPC Contractor has also to consider the construction works of these connections. Construction sites will have to be clearly signed and a short-time closure of roads for construction works may be necessary.

Special attention has to be paid to already **existing infrastructure** like e.g. gas, water and power connections of the already existing YCCPP-1 and existing communal supply lines or sewerage systems, in order not to damage any existing infrastructure during construction works. If for connections works the gas or water supply has to be interrupted, all affected parties (e.g. industries, private persons) will have to be informed in advance about the date, extent and duration of the foreseen interruption.

6.5.2 Additional Impacts during Operation Phase

Impacts and mitigation measures mentioned in the sections above concerning the operation phase of the Project also apply to the operation of the necessary additional connection facilities. These have also to be considered in the Emergency Preparedness and Response Plan to be developed and implemented by the operator of YCCPP-2.

6.6 Additional Impacts during Decommissioning Phase

Design life of YCCPP-2 is 20 years. Even though the operator ArmPower will probably apply for an extension of the operating permit, the decommissioning phase is also considered shortly in this ESIA.

If the power plant will be dismantled after closedown, environmental and social impacts regarding air emissions, noise, traffic, local workforce, etc. will be mainly the same as during the construction phase. The dismantling works will have to adhere to the latest editions of national and international laws and guidelines, or even to new ones that will be relevant at this time. Mitigation measures regarding the impacts during decommissioning will also be mainly the same as during construction phase. A Decommissioning Plan shall be prepared by the operator at least 5 years before closure of the plant, and a Detailed Decommissioning Plan shall be developed at least 18 months in advance of the closure of the plant.

It shall be highlighted that a large amount of waste will have to be managed, if the plant will be dismantled. This will also include different types of hazardous waste. A detailed Waste Management Plan for Decommissioning will have to be developed by ArmPower following the same principles as given in Section 6.1.7 respecting the waste management hierarchy of avoidance, preparing for reuse, recycling as much as possible (e.g. scrap metal, batteries), recovery, and proper disposal of remaining waste according to EU Directive 2008/98/EC (Waste Framework Directive). Scrap

metal and used batteries can be sold to local recycling companies at Yerevan like e.g. Metexim LLC, or others.

In the next 20 years a solution for the final disposal of hazardous waste will probably be decided upon and provided by the Government of RA. Hazardous waste shall be stored first in adequate storage sites (lockable, roofed, ventilated, concreted and bunded floor) at the YCCPP-2 site. All hazardous wastes shall be securely packed in sealed drums or other suitable containers, clearly identified by labels, and marked according to national and internationally recognized requirements and standards, including the International Chemical Safety Cards (ICSC), Materials Safety Data Sheets (MSDS), or equivalent. Hazardous waste shall then be disposed of, if adequate disposal sites exist at the time.

6.7 Summary of Impacts

A summary of the assessment of the environmental and social impacts, **after implementation of the mitigation measures** presented in the ESMP, is given in the following tables.

Table 6-1: Summary of impacts during construction phase (incl. associated facilities)

Impact of/on	Significance of Impact on/by
Fauna, Flora and Biodiversity	■
Protected Areas	○
Soil Use and Soil Erosion	■
Soil Contamination	■
Surface Water	○
Groundwater level lowering	■■ (still unknown)
Groundwater contamination	■
Climate and Air Quality	■
Landscape and Visual Aspects	■
Waste	■■
Local Workforce	+
Land Use and Ownership	○
Historical and Cultural Sites	■ (if any)
Occupational Health and Safety	■
Community Health and Safety	■
Noise	■

Table 6-2: Summary of impacts during operation phase (incl. associated facilities)

Impact of/on	Significance of Impact on/by
Fauna, Flora and Biodiversity	■
Protected Areas	○
Soil Contamination	■
Water Courses	■
Groundwater level lowering	■■ (still unknown)
Groundwater contamination	■
Climate and Air Quality	■
Landscape and Visual Aspects	■
Waste	■
Electricity Supply	++
Occupational Health and Safety	■
Community Health and Safety	■
Noise	■
Job opportunities	+

Table 6-3: Summary of impacts during decommissioning phase (incl. associated facilities)

Impact of/on	Significance of Impact on/by
Fauna, Flora and Biodiversity	■
Protected Areas	○
Soil Use and Soil Erosion	■
Soil Contamination	■
Surface Water	○
Groundwater contamination	■
Climate and Air Quality	■
Landscape and Visual Aspects	■
Waste	■■
Local Workforce	+
Land Use and Ownership	○
Historical and Cultural Sites	○
Occupational Health and Safety	■
Community Health and Safety	■
Noise	■

Significance of Impact:

- = high
- = medium
- = low
- = nil
- +
- ++ = locally positive
- +++ = regionally positive

In conclusion, from the results of the impact assessment it can be seen that the environmental and social impacts will be of low or medium extent, if all proposed mitigation measures of the ESMP are implemented. The highest expected impacts relate to solid waste, as presently there is not a solution for management of hazardous waste in Armenia. Positive impacts are related to creating of job opportunities especially during construction. The additional power generation will increase the total output of electric energy, providing a more reliable power supply countrywide.

7. Information Disclosure, Consultation, and Participation

During the preparation of the National ESIA (Ecobarik-Audit LLC 2016), consulting and information disclosure activities with some stakeholder groups have been undertaken. The invitations for these sessions can be consulted in the Draft Final SEP (Stakeholder Engagement Plan) presented as an Annex (Section 12.7) to this ESIA Report.

This chapter describes shortly the stakeholder meetings held by FICHTNER during the site visit in July 2017 and provides an overview about the requirements for disclosure of the ESIA study to the public and performing of Public Consultation meetings, where stakeholders and Project Affected People (PAP) can give their feedback and concerns regarding the ESIA study and the implementation of the Project. The Draft Final SEP provides further details.

During the site visit in July 2017, FICHTNER's environmental and social specialists performed stakeholder meetings with mayors of the adjacent villages Kharberd and Ayntap, with the Heads of Departments of Erebuni and Shengavit Administrative Districts, with the Environmental Monitoring and Information Center, with the Environmental Department of the Municipality of Yerevan, and with the NGO Aarhus Center ²⁸(for a record of the meetings see Section 12.2).

The mayors of the villages Kharberd and Ayntap had no concerns regarding the implementation of the Project. No medical/ health issues of local population concerning the operation of existing YCCPP-1 were reported. As both villages suffer under a high unemployment rate (> 70%) the mayors hope that the Project will create jobs for the local population. These statements have also been supported during the discussions with the Heads of Departments of Erebuni and Shengavit Administrative Districts.

The Final Draft version of the ESIA, including the ESMP and Non Technical Executive Summary (NTES), will be disclosed to the public in English and Armenian versions. Interested people shall have real access to the documents, which shall therefore not only be posted on ArmPower's website, but shall also be delivered in printed copies to the local administration offices; advertisements in local media about their availability shall be made. Also Aarhus Center shall receive printed copies and ensure their sharing to the representatives of civil society organizations.

ADB's and IFC's policies require that once draft final ESIA report is disclosed, sufficient time is allowed for stakeholders to get acquainted with the document prior to participating in a consultation meeting or otherwise communicating their feedback. According to national Armenian

²⁸ Aarhus Center Yerevan is a NGO that promotes public participation in environmental/ social decision making processes and in managing activities of upcoming projects.

requirements the disclosure period is only 7 days, but disclosure of the documents for at least two weeks is recommended.

After disclosure of the documents, public consultation meeting(s) on the ESIA will be held. Consultation meeting(s) shall concentrate on interpreting the ESIA report to the stakeholders and seeking their feedback and concerns, which will then be used as an input for in the revision of the Final Draft ESIA report.

ArmPower shall ensure that all public consultations are culturally sensitive. This means that the consultation shall include representation of the public (incl. women, youth, and vulnerable groups).

Various NGOs, including the Aarhus Center will be invited to the public consultations meeting. The Aarhus Center shall help to identify relevant NGOs and ensure sharing of information/ studies.

According to ADB's Safeguard Policy Statement (2009) and ADB's Public Communication Policy (2011), a draft environmental impact assessment (EIA) report for an environment category A project, shall be disclosed for at least 120 days on ADB's website before Board consideration. IFC's Sustainability Framework (IFC 2012) requires a disclosure of 60 days for a category A project.

For further details see the Draft Final Stakeholder Engagement Plan in Section 12.7.

8. Grievance Redress Mechanism

8.1 General Public Grievance Mechanism

In the course of the construction process, Project Affected People (PAP) may feel treated unjustly. This might happen for various reasons such as: the contractor does not adhere to sound construction principles, misunderstandings have arisen, or disagreement with procedures of consultation or notification. If this happens people shall be encouraged to lodge their complaints in a timely and effective manner without directly addressing the court, i.e., through a grievance mechanism.

All PAP will be notified about the Grievance Redress Mechanism (GRM) of the YCCPP -2 Project during the Public Consultation meetings, as well as through the disclosed project information leaflets. Contact data of the **ArmPower's Grievance Coordinator (GC)**, part of the **Grievance Committee**, will be disclosed.

During consultation the PAP shall be notified orally or in a written form about their rights and the procedure of filing complaints. Local NGOs, e.g. the local Aarhus Centre, can inform communities about the possibility to raise complaints and how and where to address them. The grievance mechanism has to be locally implemented at the level of village institutions and local self-government, as well as bundled on national level at ArmPower.

Grievances can be addressed at the local community level ('marzpet'), where the grievance will be recorded and forwarded to ArmPower's GC. Grievances that are addressed to the EPC Contractor during the execution of civil works shall also be forwarded to ArmPower's GC. Even if the constructor decides to settle the grievance on the spot, the documentation of the grievance settlement procedure needs to be prepared by ArmPower's GC.

All project related complaints can in addition be directly addressed to ArmPower's GC via phone, e-mail or grievance form (the SEP presents an example of the public grievances form). A project grievance hotline shall be made available by ArmPower for direct complaints (at national level), and all received grievances shall be recorded in a grievance log-book.

The ArmPower GC then decides whether to settle directly, to arrange a meeting with the Grievance Committee, or go to court. The decision has to be taken within 15 days. In case of major grievances that cannot be directly settled, permanent and non-permanent members of the Grievance Committee will be called for a meeting.

In case of failure of the grievance redress system, the PAP can submit their case to the appropriate court of law.

The EPC Contractor is obliged to carry out the work in accordance with the contractual requirements that include:

- Nominate a person of staff responsible for the reception and handling of grievances;
- Preparation of regular monitoring reports including details of any complaints that arose and how they were handled;
- If vulnerable affected people are identified, then the contractor will appoint professional advocates (social workers/legal experts) to assist those people during the entire process, and to act as independent advocates for them should any grievances arise;
- Arbitration of grievances with ArmPower and PAP.

ArmPower will carry out works that include:

- Nominate a person of staff responsible for grievance procedure coordination, hereby referred to as Grievance Coordinator (including first contact, periodical site visiting of mitigation measure to be implemented by contractor);
- A telephone line, e-mail address and contact name on project boards;
- Arbitration of grievances with contractor and PAP.
- Liaison with court.

The PAP have the option to choose a different representative, or directly liaison with ArmPower' staff responsible for grievance redress. Vulnerable households will have the support of their individual social worker and legal support, if applicable.

NGOs, e.g. Aarhus Centre or local member organizations will monitor grievance redress negotiations, assist with grievance arbitration, and raise public awareness. PAP need to be informed that in case of conflict with the community leader they can address NGO staff to follow up their complaint. NGOs will monitor the relationship between PAP and the community leader.

The aggrieved person (PAP) is encouraged to proceed in the following way:

- a) Contact contractor's designated grievance staff in the following way: in person via the designated telephone number, via email, via regular mail. Alternatively, the PAP can contact their community leader, who would convey their grievance to the contractor's designated grievance staff.
- b) Lodge a complaint and provide information on the case. Each complaint will be registered and a tracking number will be assigned to it. Responses to all complaints should be provided within 15 days (or 25 days in cases where complaint resolution requires special efforts).
- c) Agree with the contractor on a mitigation measure.
- d) Agree with the contractor on time limit for grievance settlement. Grievances have to be settled within two weeks, or otherwise specified in scheduled agreement.

- e) Sign if the mitigation measure has been implemented as agreed
- f) Seek redress from ArmPower if not satisfied with the above mentioned procedure through the designated telephone numbers, in person, or via email or regular mail. ArmPower should register all grievances and provide response within 15 days.
- g) Involve appropriate NGOs
- h) Seek redress from court if all else fails.

Although the grievance mechanism is designed to avoid lengthy court procedures, it does not limit the citizen's right to submit the case straight to the court of law. As a last resource to be utilized in case the GRM is not effective, the citizens are recommended to utilize ADB' Accountability Mechanism.

ADB/ IFC are not directly a part of the Grievance procedure but shall receive reports about which complaints were received and how they have been followed up/ mitigated.

Special consideration has to be taken for vulnerable people as complaint mechanisms may be unusual and contact with legal procedures let alone courts of law may appear uninviting. This would prevent the most disadvantaged persons from addressing their grievance. A close monitoring on a village level by an independent social expert during the implementation of the project and a personal contact with PAP is therefore recommended.

Vulnerable PAP (all households below the poverty line) will be entitled to a legal aid/ social worker to support them with complaints procedures.

8.2 Workers Grievance Mechanism

The EPC Contractor RENCO and the future operator of YCCPP-2 ArmPower are requested to implement an independent grievance management system to enable the workers (and their organizations, where they exist) to raise reasonable workplace concerns. This includes complaints related to non-compliance with Health & Safety matters, discrimination cases and non-consideration of equal opportunities.

The workers grievance mechanism shall follow the same principles as the one created for the general public: complaints must be answered in a timely and effective manner without fear of retribution; the access to the grievance mechanism shall not replace or impede the subsequent access to other redress mechanisms; the promoter will inform workers of the grievance mechanism at the time of hire and make it accessible to them.

The grievance management system shall consider the possibility to contact directly a member of the Site Management Staff. The contacted staff members must take a note of the reported complaint or non-compliance and must report it to the Site Manager.

The Site Manager is requested to solve the complaint or non-compliance within 3 working days. In case the problem cannot be solved an action procedure specifying the needed activities together with a predicted deadline for resolution of the problem must be prepared and submitted to the general manager.

The EPC Contractor and ArmPower are requested to provide as well the possibility for the workers to notify a complaint or non-compliance in a confidential way.

According to RENCO SPA a grievance mechanism for workers will be established for this Project, as it has been done in other international projects before. The system will allow staff and contractors to provide feedback on any element of the work via email or by hand delivery to a box placed on site. Grievances will be logged into a spreadsheet where they will be then delegated to the appropriate person for close out. Grievances will be confidential and staff and contractors will be in no way penalized for providing their feedback.

9. Environmental and Social Management Plans (ESMPs)

The negative environmental and social impacts of the Project that are described in Chapter 6 can be avoided, minimized or mitigated by performing suitable measures.

This chapter deals with the concrete mitigation measures (Section 9.1) and the monitoring measures (Section 9.2) to be taken during the construction, operation and decommissioning phases of YCCPP-2. It summarizes the anticipated environmental and social impacts and provides details on the measures; responsibilities to mitigate these impacts; the costs of mitigation; and the ways in which implementation and effectiveness of the measures will be monitored and supervised.

The compliance of the Project with IFC Performance Standards (PS) after implementation of the mitigation and monitoring measures given in the ESMPs is analyzed in Section 9.7.

An Environmental and Social Action Plan (ESAP) is presented in Section 9.8 in order to highlight the most urgent steps for implementation of the mitigation measures given in the ESMP, according to the relevant IFC Performance Standards and/or international guidelines and standards.

9.1 Mitigation Measures

9.1.1 Mitigation Measures for the Construction Phase

Table 9-1: Summary of Mitigation Measures during Construction Activities concerning Fauna and Flora

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Impacts on Fauna and Flora		
Mitigation measures (considering IFC PS 6 and General EHS Guidelines)	Responsible Party	Budget for implementing (USD)
Prohibition of herbicides for site clearance (use mechanical process only)	EPC Contractor	Included in construction costs
Mitigation measures to be implemented to reduce risks of soil and water contamination also mitigate the impact on flora and fauna (see Table 9-3 and Table 9-4)		
Mitigation measures to be implemented to noise reduction like using low sound power mechanical equipment also mitigate the impact on noise sensitive fauna (if any)		
Dust generated by construction works (e.g. excavation works) shall be suppressed by spraying water		

Table 9-2: Summary of Mitigation Measures during Construction Activities concerning Erosion Control

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Erosion		
Mitigation measures (considering IFC PS 3 and General EHS Guidelines)	Responsible Party	Budget for implementing (USD)
Develop and implement an Erosion and Sediment Control Plan	EPC Contractor	Included in construction costs
Minimization of the area of construction site and material storage		
Minimize removing topsoil at construction site and store in line with international good practice, so that it can be re-used after construction, if the soil is not contaminated		
Protect excess spoils, if any, from runoff, if the soil is not contaminated		

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Erosion		
Mitigation measures (considering IFC PS 3 and General EHS Guidelines)	Responsible Party	Budget for implementing (USD)
Excess spoil and soil, if any, will be left in orderly piles, covered with topsoil, and re-vegetated with native species, if the soil is not contaminated	EPC Contractor	Included in construction costs

Table 9-3: Summary of Mitigation Measures during Construction Activities concerning Soil Pollution

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Soil pollution		
Mitigation measures (considering IFC PS 3, General EHS Guidelines and EHS-Guidelines: Waste Management, Hazardous Material Management)	Responsible Party	Budget for implementing (USD)
Handle excavated soil from the construction site (if contaminated) as hazardous waste and store on site (at concreted, bunded area and protected against wind and rain) for final disposal at specialized hazardous waste landfill (when available in future).	EPC Contractor	Included in construction costs
Regular maintenance of all vehicles and machines at regular service stations, if possible		
Maintenance and re-fueling of the construction equipment only on sealed and enclosed areas		
In case of any spillage: Localization of the spilled material and immediate cleaning of the contaminated area in order to prevent the pollutant from entering soil		
Store all liquid materials (e.g. fuel, engine oil, paint, chemicals, lubricants, etc.) in locked tanks and on sealed, bunded and roofed areas. Installation of secondary containment for storing liquid materials is recommended.		
Store construction material (bags of cement etc.) in containers in order to avoid rinsing out		
Train transporters and workers in spill prevention and control especially in handling of oil and fuel		
Provide spill-control materials to drivers and workers, in order to clean up spills, if necessary		
Equip all construction vehicles with spill-control kits		
Report and respond to spills promptly and train workers in how to report		
Remove contaminated soil if spills occur and handle as hazardous waste		

Table 9-4: Summary of Mitigation Measures during Construction Activities concerning Water Pollution

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Water pollution		
Mitigation measures (considering IFC PS 3, General EHS Guidelines and EHS-Guidelines: Water and Sanitation, Wastewater and Ambient Water Quality, Waste Management, Hazardous Material Management)	Responsible Party	Budget for implementing (USD)
Mitigation measures given in Table 9-3 (Soil Pollution) also apply to avoid groundwater pollution	EPC Contractor	Included in construction costs
Construction site has to be equipped with toilets and sanitary rooms according to IFC/ EBRD Guidance Note ²⁹ - separately for men and women; lead sewage water to city sewage water system or use septic tanks for collecting sewage water, which have to be emptied by a specialized company from time to time.		
Train workers in appropriate sanitation practices		
Provide waste bins at the construction site in order to collect workers' waste (implement Waste Management Plan)		
If groundwater level will be lowered for construction, a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater users (nearby industries, agricultural use, etc.) and impact on Hrazdan River basin need to be assessed including hydrogeological survey, groundwater mapping and modeling.		

Table 9-5: Summary of Mitigation Measures during Construction Activities concerning Climate and Air Quality

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Impacts on Air Quality and Climate Change		
Mitigation measures (considering IFC PS 3, General EHS Guidelines and EHS-Guideline: Air Emissions and Ambient Air Quality)	Responsible Party	Budget for implementing (USD)
Reduction of speed to 20 km/h within the construction site and optimization of the movement of vehicles	EPC Contractor	Included in construction costs
Optimize transportation management to avoid needless truck trips (as part of a Traffic Management Plan)		
Maintain vehicles and construction machinery properly maintained, as recommended by suppliers		
Cover truck beds with tarps during material transport		
Use dust-suppressing water spray during civil works, where necessary		

²⁹ see IFC/ EBRD Guidance Note on Workers' Accommodation (2009)

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Impacts on Air Quality and Climate Change		
Mitigation measures (considering IFC PS 3, General EHS Guidelines and EHS-Guideline: Air Emissions and Ambient Air Quality)	Responsible Party	Budget for implementing (USD)
Store and handle material appropriately to limit dust (e.g. protect cement with tarpaulins)	EPC Contractor	Included in construction costs
Avoid unnecessary idling of construction machines and vehicles		

Table 9-6: Summary of Mitigation Measures during Construction Activities concerning Landscape and Visual Aspects

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Impacts on Landscape and Visual Aspects		
Mitigation measures (considering General EHS)	Responsible Party	Budget for implementing (USD)
Use dust-suppressing water spray during civil works, where necessary	EPC Contractor	Included in construction costs
Fences can be used for temporary screening of the construction site		
Clear up the construction waste and remove all machinery after construction works		
Reinstate any adjacent damaged areas		
Development and implementation of a landscape / planting plan is recommended		

Table 9-7: Summary of Mitigation Measures during Construction Activities concerning Waste Management

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Impacts from Waste generation and disposal		
Mitigation measures (considering IFC PS 3, General EHS Guidelines and EHS-Guidelines: Water and Sanitation, Wastewater and Ambient Water Quality, Waste Management, Hazardous Material Management)	Responsible Party	Budget for implementing (USD)
Collect and segregate all type of wastes. EPC Contractor will agree with municipal authorities about using services of communal service providers for waste disposal purposes.	EPC Contractor Local authorities	Included in construction costs
Development of a Waste Management Plan (as part of the site specific HSE Management Plan) containing the following principles: (I) respecting the waste management hierarchy of avoidance, preparing for reuse, recycling as much as possible, recovery, and proper disposal of remaining waste according to EU guideline 2008/98/EC; (II) segregating all waste by category on site, based on their nature, and ultimate disposal sites; (III) good technical planning in order to minimize the generation of construction waste; (IV) regular staff training to increase awareness of waste minimization issues and handling of different wastes.	EPC Contractor	Included in construction costs
Implementation of a Waste Management System		
Store all hazardous waste (e.g. oil, fuel, paint, spill contaminated soil) in adequate storage sites (lockable, roofed, ventilated, concreted and banded floor) for future disposal		
Pack all hazardous wastes securely in sealed drums or other suitable containers, clearly identify them by labels, and provide Materials Safety Data Sheets (MSDS)		
Soil polluted with heavy metals that is excavated during construction, will have to be stored on site on a concreted and banded area, protected against rain and wind for future disposal as hazardous waste (once an adequate disposal site is available)		
Train workers in handling and disposal of recyclable, sanitary, solid, liquid and hazardous waste		
Presently existing waste material at the construction site (e.g. empty oil drums, scrap metal, old cabins, old changing rooms and wash basins, etc.) has to be segregated and stored or disposed of accordingly. Concrete waste can be disposed of at Yerevan dumping site or be used as land filling material		
Scrap metal shall be sold to local recycling companies		

Table 9-8: Summary of Mitigation Measures during Construction Activities concerning Historical and Cultural Sites and Goods

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Impacts on Historical and Cultural Sites and Goods		
Mitigation measures (considering IFC PS 8 and General EHS-Guideline)	Responsible Party	Budget for implementing (USD)
Inform the Ministry of Culture about the Project prior to construction, in order to allow the Ministry to perform a proof of occurrence/absence of any cultural or historical goods at the Project site.	EPC Contractor	Included in construction costs
Implementation of a Chance Find Procedure (see Section 6.3.3) and training of the construction workers		
Report chance finds immediately to RA Ministry of Culture, Dep. Protection of Monuments and Historical Sites		

Table 9-9: Summary of Mitigation Measures during Construction Activities concerning Occupational Health & Safety

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Impacts on Workers' Health and Safety		
Mitigation measures (considering IFC PS 1, PS 2, General EHS-Guideline and EHS-Guidelines: Occupational Health and Safety)	Responsible Party	Budget for implementing (USD)
EPC Contractor shall develop and implement a site-specific Health, Safety and Environment Management Plan (HSEMP) for the construction phase	EPC Contractor	Included in construction costs
EPC Contractor shall develop and implement a Health, Safety and Environment Management System (HSEMS) for construction phase. An H&S manager of EPC Contractor shall be on duty all the time during construction period.		
These HSEMP and HSEMS shall also be valid for any third parties or subcontractors in the supply chain		
Make sure that all workers have a health insurance or provide it to workers who don't have		
Awareness raising regarding sexually transmitted diseases (STD) should be provided to workforce		
Consider possible occurrence of venomous snakes during working (train the workers on venomous species identification and bite handling, provide related first aid equipment).		
According to national legislation for workers noise levels shall be kept below 80 dB (A), wherever possible. Hand out ear protection devices to all workers, when necessary (according to WB/IFC General EHS Guideline, workers are obliged to wear ear protectors where 85 dB (A) are exceeded for a duration of more than 8 hours).		
Provide workers with appropriate protective equipment (PPE) according to RENCO's Occupational Health & Safety Standards		
Train workers accordingly regarding work at heights, electrical and vehicular safety, handling of hazardous materials, PPE, hazard avoidance and reduction measures, use of first aid and rescue techniques, emergency response, etc.		

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Impacts on Workers' Health and Safety		
Mitigation measures (considering IFC PS 1, PS 2, General EHS-Guideline and EHS-Guidelines: Occupational Health and Safety)	Responsible Party	Budget for implementing (USD)
Forbid alcohol and other drugs at the construction site	EPC Contractor	Included in construction costs
Assure transfer of injured workers to hospitals in the case of serious accidents		
Identify area emergency responders, hospitals, and clinics		
Limit occupational exposure to electric or magnetic fields (EMF) by use of shielding materials, signing of relevant areas and training of workers		
Licensing and training of drivers; improvement of driving skills		
Training and licensing industrial vehicle operators in the safe operation of specialized vehicles, including safe loading/ unloading, and load limits		
Maintain vehicles regularly and use manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure		
Record work-hours as well as all accidents and incidents		
Skilled working personnel (partly from abroad) will be accommodated in RENCO's guesthouse or at hotels in Yerevan. Local (mainly unskilled) workforce shall be employed from Yerevan and the adjacent villages. No workers' camps will have to be established as local workers will return to their home daily		
Transfer of workers to and from the construction site shall be managed by the EPC Contractor (e.g. bus transfer) by means of a Traffic Management Plan		
Implement and communicate an accessible grievance mechanism for workers to address any complaints		

Table 9-10: Summary of Mitigation Measures during Construction Activities concerning Community Health & Safety

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Impacts on Public Health and Safety		
Mitigation measures (considering IFC PS 1, PS 4, General EHS-Guideline and EHS-Guidelines: Community Health and Safety)	Responsible Party	Budget for implementing (USD)
Optimization of transportation management to avoid needless truck drives (as part of Traffic Management Plan)	EPC Contractor	Included in construction costs
Allow truck movements only during daylight, but not between 7 pm and 6 am (as part of Traffic Management Plan)		
Reduce vehicle speeds (stick to recommended speeds; 20 km/h for heavy trucks) in populated areas to avoid noise and accidents (as part of Traffic Management Plan)		
Development and implementation of a Traffic Management Plan (including regulations for truck movements, transport of workers, short-term closure of roads (if necessary), etc.)		
Use of machines with low sound power and fitting of construction machines with silencers or mufflers		
Regular maintenance and service of building machinery and other vehicles during construction works		
Shut down or throttling down of noisy machinery to a minimum		
For residents the noise levels may not exceed 50 dB (A) during daytime and 45 dB (A) during night.		
Notify population in advance about start date and duration of the overall construction works and of specific operations with high noise level (see also SEP in Annex 12.7)		
The construction site itself will be fenced and the entrance gates will be guarded by security staff in order to prevent any unauthorized access to the site, thus also minimizing possible impacts on community health.		
Security arrangements to be guided by principles of proportionality, good international practice ³⁰ and national law. A Security Force Management Plan shall be prepared for the construction stage.		
Security personnel shall be trained and monitored regarding the use of force and conduct towards the community		
Provide adequate security measures to prevent accidents and injury (e.g. keeping speed limits on public roads)		
Inform population of small villages along public roads in advance, in case of transporting heavy equipment		
Establish worker code of conduct to help prevent friction or conflict with communities		

³⁰ e.g. UN Code of Conduct for Law Enforcement Officials; UN Basis Principles on the Use of Force and Firearms by Law Enforcement Officials; IFC (2017): Good Practice Handbook on Use of Security Forces - Assessing and Managing Risks and Impacts.

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Impacts on Public Health and Safety		
Mitigation measures (considering IFC PS 1, PS 4, General EHS-Guideline and EHS-Guidelines: Community Health and Safety)	Responsible Party	Budget for implementing (USD)
Provide cultural awareness training to be given for non-local workers (expand to local workers if grievances are raised or observations made of inappropriate behavior)	EPC Contractor	Included in construction costs
Develop and implement an Emergency Preparedness and Response Plan (see Section 6.3.4)		
Provide appropriate information about the Emergency Preparedness and Response Plan to potentially affected communities and individuals		

Table 9-11: Summary of Mitigation Measures during Construction Activities concerning Social Aspects

Mitigation measures to be applied during construction phase		
Issue for Mitigation: Social Aspects		
Mitigation measures (considering IFC PS 2, General EHS-Guideline and EHS-Guideline: Occupational Health and Safety)	Responsible Party	Budget for implementing (USD)
EPC's Human Resources Policy shall include international labor standards as defined in ILO (2014), in order to fulfill IFC PS 2	EPC Contractor	Included in construction costs
Develop and implement a non-discriminatory hiring and wage policy according to international labor standards as defined in ILO 2014 (clearly stating that the company will not discriminate in hiring and salaries based on gender, age, religion, ethnicity or place of origin), if not already in place		
Prosecute offenses related to payment of wages by sub-contractors strictly		
Prioritize employment of local people for construction works (offer job opportunities in nearby villages and Yerevan)		
Improve recruitment of women for construction works		
Discuss potential barriers for local employment with labor / training organizations so that measures to overcome these barriers (if any) can be developed and put in place		
Zero tolerance for sexual harassment at the work place		
Implement and communicate an accessible grievance mechanism for PAP to address any complaints		
If groundwater level will be lowered for construction, a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater users (nearby industries, agricultural use, etc.) and impact on Hrazdan river basin need to be assessed including hydrogeological survey, groundwater mapping and modeling.		

9.1.2 Mitigation Measures for the Operation Phase

Table 9-12: Summary of Mitigation Measures during Operation concerning Protection of Flora and Fauna.

Mitigation measures to be applied during operation		
Issue for Mitigation: Flora and Fauna		
Mitigation measures (considering IFC PS 6, General EHS Guidelines and EHC Guideline: Thermal Power Plants)	Responsible Party	Budget for implementing (USD)
Oily waste water from Power plant operation will be duly collected and routed to a treatment plant including API and, if needed, CPI separators before being discharged to the existing system of YCCPP-1.	ArmPower	Included in operational costs
HRSB blow down and other drainage from steam/water system will be neutralized at the chemical shop to meet relevant water quality standards and will then be discharged to the Hrazdan River using existing YCCPP-1 discharge system		
Compliance with international stack emission standards ensures that critical levels will not be exceeded and will thus not represent any danger for flora and fauna		
Compliance with national and international noise emission standards ensures that critical levels will not be exceeded and will thus not represent any danger for fauna		
Strict prohibition of herbicide use for maintaining YCCPP-2 site (use mechanical methods only)		

Table 9-13: Summary of Mitigation Measures during Operation concerning Soil and Water Pollution

Mitigation measures to be applied during operation		
Issue for Mitigation: Soil and Water Pollution		
Mitigation measures (considering IFC PS 3, General EHS Guidelines and EHS-Guidelines: Water and Sanitation, Wastewater and Ambient Water Quality, Waste Management, Hazardous Material Management, Thermal Power Plants)	Responsible Party	Budget for implementing (USD)
Oily waste water from Power plant operation will be duly collected and routed to a treatment plant including API and, if needed, CPI separators before being discharged to recipient existing system. Treatment system will be suitably selected and implemented to meet the environmental limits and the good industry practice.	ArmPower	Included in operational costs

Mitigation measures to be applied during operation		
Issue for Mitigation: Soil and Water Pollution		
Mitigation measures (considering IFC PS 3, General EHS Guidelines and EHS-Guidelines: Water and Sanitation, Wastewater and Ambient Water Quality, Waste Management, Hazardous Material Management, Thermal Power Plants)	Responsible Party	Budget for implementing (USD)
Rain water from internal roads and other paved areas will be collected and led to the waste water treatment plant before discharging it to the existing system of YCCPP-1. Rain water from roofs of buildings and shelters will be collected in an underground tank for reusing the water without any treatments for irrigation inside the plant site.	ArmPower	Included in operational costs
HRSB blow down and other drainage from steam/water system will be neutralized at chemical shop to meet relevant water quality standards (see Section 6.2.4.2) and will then be discharged to Hrazdan River using the existing YCCPP-1 discharge system		
The utility's domestic sewerage will be connected to the city's sewerage system		
Train staff in appropriate sanitation practices		
Provide spill-control materials at YCCPP-2, in order to clean up spills, if necessary		
Enforcement of a Waste Management Plan		
Elaboration of an emergency plan in case of accidental leakage		
Remove contaminated soil if spills occur and handle as hazardous waste		
Prohibition of herbicides for maintenance of YCCPP-2		
Proper handling and storage of hazardous material (lockable, roofed, ventilated, concreted and bunded floor)		
Train staff in proper management of recyclable, sanitary, solid, liquid, and hazardous wastes		
Regular maintenance of all vehicles and machines at regular service stations, if possible		
Maintenance and re-fueling of the equipment only on sealed and enclosed areas		
If groundwater level will be lowered for operation phase, a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater users (nearby industries, agricultural use, etc.) and impact on Hrazdan river basin need to be assessed including hydrogeological survey, groundwater mapping and modeling.		

Table 9-14: Summary of Mitigation Measures during Operation concerning Climate and Air Quality

Mitigation measures to be applied during operation		
Issue for Mitigation: Impacts on Air Quality and Climate Change		
Mitigation measures (considering IFC PS 3, General EHS Guidelines and EHS-Guidelines: Air Emissions and Ambient Air Quality, Thermal Power Plants)	Responsible Party	Budget for implementing (USD)
Maintain vehicles and engines properly, as recommended by suppliers	ArmPower	Included in operational costs
Avoid unnecessary idling of vehicles		
Compliance with performance guarantees of the operator for emission values (see Section 6.2.5)		
Rise the stack height to 66 meters		
Plan additional emission reduction measures in the design (installation of a transition spool between the gas turbine's exhaust and the HRSG, which will allow installing a SCR (catalytic device)), in case a future development in the same airshed (up to 10 km radius) can be reasonably foreseen, or in case the existing pollution loads are already very high		
Greenhouse gas emissions shall be quantified at least annually and results reported to the national authorities and the financing institutions.		

Table 9-15: Summary of Mitigation Measures during Operation concerning Landscape and Visual Aspects

Mitigation measures to be applied during operation		
Issue for Mitigation: Landscape and Visual Aspects		
Mitigation measures (considering General EHS)	Responsible Party	Budget for implementing (USD)
Visual impact due to buildings and stack of YCCPP-2 is unavoidable	ArmPower	Included in operational costs
Planting of indigenous trees and bushes along YCCPP-2 boundaries is recommended, in order to reduce the visual burden at least to some extent (develop and implement landscape / planting plan)		

Table 9-16: Summary of Mitigation Measures during Operation concerning Waste Management

Mitigation measures to be applied during operation		
Issue for Mitigation: Impacts from Waste		
Mitigation measures (considering IFC PS 3, General EHS Guidelines and EHS-Guidelines: Water and Sanitation, Wastewater and Ambient Water Quality, Waste Management, Hazardous Material Management, Thermal Power Plants)	Responsible Party	Budget for implementing (USD)
Collect all types of wastes including domestic and sanitary wastes during CAPP operation. Make arrangements for proper waste handling, treatment and disposal with municipal authorities about using services of communal service providers for waste disposal purposes.	ArmPower	Included in operational costs
Store all hazardous waste in adequate storage sites (lockable, roofed, ventilated, concreted and bunded floor) at YCCPP-2 site for future disposal		
Clearly label all hazardous waste and provide Materials Safety Data Sheets (MSDS)		
Train staff in handling and disposal of recyclable, sanitary, solid, liquid and hazardous waste		
Adequate storage and clear labeling and marking according to national / internationally recognized requirements and standards, including the International Chemical Safety Cards (ICSC), Materials Safety Data Sheets (MSDS), or equivalent, of all hazardous substances in chemical workshop (e.g. acids and alkaline solutions)		
Waste Management Plan for operation shall also include a risk assessment associated with the mid-term to long-term storage of hazardous waste, as well as an appropriate sizing and monitoring requirements of the storage facilities (see Section 6.2.7)		

Table 9-17: Summary of Mitigation Measures during Operation concerning Occupational Health & Safety

Mitigation measures to be applied during operation		
Issue for Mitigation: Impacts on Workers' Health and Safety		
Mitigation measures (considering IFC PS 1, PS 2, General EHS-Guideline and EHS-Guidelines: Occupational Health and Safety, Thermal Power Plants)	Responsible Party	Budget for implementing (USD)
ArmPower will have a Health, Safety and Environment Management System (HSEMS) in place, according to their HSE Policy, considering IFC/WorldBank EHS guidelines for Thermal Power Plants	ArmPower	Included in operational costs
Make sure that all staff has a health insurance		
Consider possible occurrence of poisonous snakes (train the workers on venomous species identification and bite handling, provide related first aid equipment).		
According to national legislation for workers noise levels shall be kept below 80 dB (A). Hand out ear protection devices to all workers, when necessary (according to WB/IFC General EHS Guideline, workers are obliged to wear ear protectors where 85 dB (A) are exceeded for duration of more than 8 hours).		
Staff will be provided with appropriate protective equipment (PPE) according to RENCO's Occupational Health & Safety Standards and IFC/WorldBank EHS guidelines for Thermal Power Plants		
Train staff accordingly regarding work at heights, electrical and vehicular safety, handling of hazardous materials, use of PPE, hazard avoidance and reduction measures, use of first aid and rescue techniques, emergency response, firefighting, etc.		
Forbid alcohol and other drugs at YCCPP-2 site		
Assure transfer of injured staff to hospitals in the case of serious accidents		
Limit occupational exposure to electric or magnetic fields (EMF) by use of shielding materials, signing of relevant areas and training of staff (see Section 6.3.4.1)		
Maintain vehicles and machinery regularly and use manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure		
ArmPower's/RENCO's Human Resources Policy shall include international labor standards as defined in ILO (2014), in order to fulfill IFC PS 2		
Record work-hours as well as all accidents and incidents		
Implement and communicate an accessible grievance mechanism for staff to address any complaints		

Table 9-18: Summary of Mitigation Measures during Operation concerning Community Health & Safety

Mitigation measures to be applied during operation		
Issue for Mitigation: Impacts on Public Health and Safety		
Mitigation measures (considering IFC PS 1, PS 4, General EHS-Guideline and EHS-Guidelines: Community Health and Safety, Thermal Power Plants)	Responsible Party	Budget for implementing (USD)
For residents the noise levels may not exceed 50 dB (A) during daytime and 45 dB (A) during night.	ArmPower	Included in operational costs
Compliance with performance guarantees for emission limits and compliance with design specifications to keep noise emissions low		
YCCPP-2 site will be fenced and the entrance gates will be guarded by security staff in order to prevent any unauthorized access.		
The development and implementation of a Security Force Management Plan guided by principles of proportionality, good international practice ³¹ and national law is recommended		
Security personnel shall be trained and monitored regarding the use of force and conduct towards the community		
Develop and implement an Emergency Preparedness and Response Plan (see Section 6.4.2)		
Provide appropriate information about Emergency Preparedness and Response Plan to potentially affected communities and individuals		
Undertake regular public communication of the company's environmental and social performance (for example, via the website)		
If a lowering of the groundwater level at the construction/ plant site will be performed, an additional impact assessment including development of mitigation measures will be required, such as communications to third parties, providing water supply alternatives in case of need, etc.		

³¹ e.g. UN Code of Conduct for Law Enforcement Officials; UN Basis Principles on the Use of Force and Firearms by Law Enforcement Officials; IFC (2017): Good Practice Handbook on Use of Security Forces - Assessing and Managing Risks and Impacts.

9.1.3 Mitigation Measures for the Decommissioning Phase

Environmental and social impacts during the decommissioning phase will be mainly the same as during the construction phase. Thus, mitigation measures for the construction phase will be also valid for the dismantling works, which will have to adhere to the latest editions of national and international laws and guidelines, or even to new ones that will be relevant at the time.

A Decommissioning Plan shall be prepared by the operator at least 5 years before closure of the plant, and a Detailed Decommissioning Plan shall be developed at least 18 months in advance of the closure of the plant.

The main impacts during decommissioning phase will be due to waste from dismantling, including different types of hazardous waste. A detailed Waste Management Plan will have to be developed by ArmPower following the same principles as given in Section 6.1.7 respecting the waste management hierarchy of avoidance, preparing for reuse, recycling as much as possible (e.g. scrap metal; batteries), recovery, and proper disposal of remaining waste according to EU Directive 2008/98/EC (Waste Framework Directive). Scrap metal and used batteries can be sold to local recycling companies at Yerevan like e.g. Metexim LLC, or others.

In the next 20 years a solution for the final disposal of hazardous waste will probably be decided upon and provided by the Government of RA. Hazardous waste resulting from the decommissioning activities shall be stored first in adequate storage sites (lockable, roofed, ventilated, concreted and bunded floor) at the YCCPP-2 site. All hazardous wastes shall be securely packed in sealed drums or other suitable containers, clearly identified by labels, and marked according to national and internationally recognized requirements and standards, including the International Chemical Safety Cards (ICSC), Materials Safety Data Sheets (MSDS), or equivalent. Hazardous waste shall then be disposed of, if adequate disposal sites exist at the time.

9.2 Monitoring Measures

The local HSE officer of ArmPower will monitor the implementation of mitigation measures by the EPC Contractor (RENCO SPA), based on regular inspections. An external internationally experienced auditor will prepare environmental and social performance reports for ADB/ IFC, based on quarterly site inspections and the monthly reports of ArmPower’s HSE officer during construction and one additional site inspection during commissioning. ArmPower will be responsible for monitoring of environmental and social performance during operation and decommissioning of the CCPP. The external auditor will also perform one audit per year during operation.

9.2.1 Monitoring during the Construction Phase

Table 9-19: Summary of monitoring measures during Construction Phase

Activity/ Impact	What <i>parameter is to be monitored?</i>	Where <i>is the parameter to be monitored?</i>	How <i>is the parameter to be monitored/ type of monitoring equipment?</i>		When <i>is the parameter to be monitored-frequency of measurement or continuous?</i>	Responsibility
			Method	Indicator		
Impacts on flora and fauna	Prohibition of herbicides for site clearance	Construction Site	Visual inspection	No herbicides used	At the beginning of construction period during site clearance	ArmPower
	Mitigation measures to be implemented to reduce risks of soil and water contamination do also mitigate the impact on flora and fauna			Measures for reduction of soil and water contamination implemented (see below)	Regularly during construction	ArmPower External auditor
	Mitigation measures to be implemented to noise reduction like using low sound power mechanical equipment do also mitigate the impact on noise sensitive fauna (if any)			Measures for noise reduction implemented (see below)		

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Impacts on flora and fauna	Suppress dust generated by construction works by spraying water	Construction Site	Visual inspection	Dust effectively suppressed	Regularly during construction	ArmPower External auditor
Soil Erosion	Develop and implement an Erosion and Sediment Control Plan	Construction Site Office of EPC Contractor	Visual inspection	Erosion and Sediment Control Plan implemented	In advance of construction	ArmPower External auditor
	Minimization of areas for construction and material storage	Construction Site	Visual inspection	Areas as small as possible	Regularly during construction	ArmPower External auditor
	Minimize removing topsoil at construction site and store in line with international good practice, so that it can be re-used after construction, if the soil is not contaminated			Topsoil stored accordingly		
	Protect excess spoils, if any, from runoff, if the soil is not contaminated			Excess spoils protected		
	Excess spoil / soil, to be left in orderly piles, covered with topsoil, and re- vegetated, if the soil is not contaminated			Excess spoil / soil covered with topsoil and re- vegetated with native species		

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Historical soil pollution	Handle excavated soil from the construction site (if contaminated) as hazardous waste and store on site (at concreted, bunded area and protected against wind and rain) for final disposal at specialized hazardous waste landfill (when available in future).	Construction Site	Visual inspection	Contaminated soil stored accordingly	At the beginning of construction works	ArmPower External auditor
Soil (and water) pollution from vehicles and construction equipment	Regular maintenance of vehicles/ machines at regular service stations, if possible	Construction Site	Inspection of maintenance records	Vehicles and machines adequately maintained	Regularly during construction	ArmPower External auditor
	Maintenance and re-fueling of construction equipment on sealed and enclosed areas		Visual inspection of maintenance/ re-fueling areas	No unsuitable areas used for maintenance and re- fueling		
Soil (and water) pollution from inadequate storage	Store all liquid materials (e.g. fuel, engine oil, paint, chemicals, lubricants) in locked tanks and on sealed, bunded and roofed areas. Installation of secondary containment for storing liquid materials is recommended.	Construction Site Storage areas	Inspection of storage areas	All liquid materials stored accordingly	Regularly during construction	ArmPower External auditor
	Store construction material (bags of cement etc.) in containers in order to avoid rinsing out			Construction material stored accordingly		

Activity/ Impact	What <i>parameter is to be monitored?</i>	Where <i>is the parameter to be monitored?</i>	How <i>is the parameter to be monitored/ type of monitoring equipment?</i>		When <i>is the parameter to be monitored-frequency of measurement or continuous?</i>	Responsibility
			Method	Indicator		
Soil (and water) pollution from spills	In case of any spillage: Localization of the spilled material and immediate cleaning of the contaminated area in order to prevent the pollutant from entering soil	Construction Site	Inspection of spill reports	Area accordingly cleaned	Regularly during construction	ArmPower External auditor
	Train transporters and workers in spill prevention and control especially in handling of oil and fuel		Inspection of training records	All workers and transporters trained accordingly		
	Provide spill-control materials to drivers and workers, in order to clean up spills, if necessary		Inspection of equipment	Spill-control equipment provided		
	Equip all construction vehicles with spill-control kits		Visual inspection	All vehicles equipped accordingly		
	Report and respond to spills promptly and train workers in how to report		Inspection of spill reports, and training records	Number of spill reports All workers trained accordingly		
	Remove contaminated soil if spills occur and handle as hazardous waste	Construction Site Storage areas	Inspection of spill reports and storage areas	All contaminated materials adequately stored		

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Water pollution from sanitation	Construction site equipped with toilets and sanitary rooms according to IFC/ EBRD Guidance Note - separately for men and women	Construction Site	Visual inspection	Number and quality according to IFC/ EBRD Guidance Note ³²	Regularly during construction	ArmPower External auditor
	Lead sewage water to the city's sewage water system or use septic tanks for collecting sewage water, which have to be emptied by a specialized company from time to time.		Visual inspection Inspection of contract with specialized company (if necessary)	Sewage water led to the city's sewage system or septic tanks in place. Appropriate emptying of tanks (if necessary)		
	Train workers in appropriate sanitation practices		Inspection of training records	All workers trained accordingly		
Water pollution from waste	Provide waste bins at the construction site in order to collect workers' waste (implement Waste Management Plan)	Construction Site	Visual inspection	Waste bin sin place and used by workers	Regularly during construction	ArmPower External auditor

³² see IFC/ EBRD Guidance Note on Workers' Accommodation (2009)

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Lowering of groundwater level	If groundwater level will be lowered for construction, a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater users (nearby industries, agricultural use, etc.) and impact on Hrazdan River basin need to be assessed including hydrogeological survey, groundwater mapping and modeling.	Near construction sites	Review of report Interviews with third parties Inspection of complaints	Mitigation measures of additional report implemented; Third parties informed and water supply secured; no complaints	In advance of construction	ArmPower External auditor
Limitation of exhaust gas pollution	Reduction of speed and limited movement of vehicles	Construction Site	Inspection of complaints	No complaints from residents	Regularly during construction	ArmPower External auditor
	Optimize transportation management to avoid needless truck trips (as part of a Traffic Management Plan)		Inspection of transportation management	No needless truck trips Traffic Management Plan implemented		
	Maintain vehicles and construction machinery properly, as recommended by suppliers		Inspection of maintenance records	Equipment regularly maintained		
	Avoid unnecessary idling of construction machines and vehicles		Visual inspection	No unnecessary idling		

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Limitation of dust	Cover truck beds with tarps during material transport	Construction Site	Visual inspection	Truck beds covered	Regularly during construction	ArmPower External auditor
	Use dust-suppressing water spray during civil works, where necessary		Inspection of complaints	No complaints from residents		
	Store and handle material appropriately to limit dust (e.g. protect cement with tarpaulins)		Visual inspection	Appropriate storage		
Landscape and Visual Aspects	Use dust-suppressing water spray during civil works, where necessary	Construction Site	Inspection of complaints	No complaints from residents	Regularly during construction	ArmPower External auditor
	Fences can be used for temporary screening of the construction site			Fences built up		
	Clear up the construction waste and remove all machinery after construction works		Visual inspection	All waste and machinery removed		
	Reinstate any adjacent damaged areas		Inspection of complaints	No complaints from residents		
	Development and implementation of a landscape / planting plan is recommended		Visual inspection	Landscape / planting plan implemented		
Waste management	Develop Waste Management Plan for construction period	Construction Site Office of EPC Contractor	Control of Waste Management Plan	Waste Management Plan developed	In advance of construction	ArmPower External auditor

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Waste management	Implementation of Waste Management System	Construction Site	Control of Waste Management System	Waste Management System implemented	In advance of construction	ArmPower External auditor
	EPC Contractor will agree with municipal authorities about using services of communal service providers for waste disposal purposes.	Office of EPC Contractor	Control of written agreement	Written agreement provided		
	Collect and segregate all type of wastes	Construction Site Storage areas	Visual inspection	All wastes collected and segregated	Regularly during construction	ArmPower External auditor
	Store all hazardous waste in adequate storage sites (lockable, roofed, ventilated, concreted and banded floor)			All hazardous wastes adequately stored		
	Pack all hazardous wastes securely in sealed drums or other suitable containers, clearly identify them by labels, and provide Materials Safety Data Sheets (MSDS)			All hazardous wastes adequately packed and labeled and MSDS provided		
	Soil polluted with heavy metals that is excavated during construction will have to be stored on site on a concreted and banded area, protected against rain and wind for future disposal as hazardous waste			All contaminated soil stored accordingly		

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Waste management	Existing waste material at the construction site has to be segregated and stored or disposed of accordingly	Construction Site	Visual inspection	All existing waste material segregated and stored or disposed of	In advance of construction	ArmPower
	Concrete waste can be disposed of at Yerevan dumping site or be used as land filling material			Concrete waste handled accordingly		
	Scrap metal shall be sold to local recycling companies			Scrap metal recycled		
Training in waste handling	Train workers in handling and disposal of recyclable, sanitary, solid, liquid and hazardous waste	Construction Site	Inspection of training records	All workers trained accordingly	Regularly during construction	ArmPower External auditor
Impacts on Historical and Cultural Sites and Goods	Inform the Ministry of Culture about the Project prior to construction, in order to allow the Ministry to perform a proof of occurrence/absence of any cultural or historical goods at the Project site.	Construction Site	Follow-up of the Ministry's answer	Ministry informed about Project	In advance of construction	ArmPower
	Implementation of Chance Find Procedure and training of the construction workers	Construction Site	Inspection of chance find reports and training records	Chance Find Procedure implemented and all workers trained	Regularly during construction	ArmPower External auditor

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Impacts on Historical and Cultural Sites and Goods	Report chance finds immediately to RA Ministry of Culture, Dep. Protection of Monuments and Historical Sites	Construction Site Office of EPC Contractor	Inspection of chance find reports	All chance finds reported to Ministry of Culture	Regularly during construction	ArmPower External auditor
HSE Policy and HSE Management	EPC Contractor develops and implements site-specific Health, Safety and Environment Management Plan (HSEMP) for the construction phase	Office of EPC Contractor	Inspection of relevant documents	HSE Management Plan developed	In advance of construction works	ArmPower External auditor
	EPC Contractor develops and implements Health, Safety and Environment Management System (HSEMS) for construction phase. An H&S manager of EPC Contractor shall be on duty all the time during construction period.	Office of EPC Contractor Construction Site		HSE Management System implemented H&S Manager employed	Regularly during construction	
	HSEMP and HSEMS shall also be valid for any third parties or subcontractors in the supply chain			Subcontracts contain adequate HSEMP		
Occupational Health and Safety	Make sure that all workers have a health insurance or provide to workers who don't have	Construction Site	Inspection of workers' health documents	All workers have health insurance	Regularly during construction	ArmPower External auditor

Activity/ Impact	What <i>parameter is to be monitored?</i>	Where <i>is the parameter to be monitored?</i>	How <i>is the parameter to be monitored/ type of monitoring equipment?</i>		When <i>is the parameter to be monitored-frequency of measurement or continuous?</i>	Responsibility
			Method	Indicator		
Occupational Health and Safety	Awareness raising regarding sexually transmitted diseases (STD) should be provided to workforce	Construction Site	Inspection of training records	All workers trained accordingly	Regularly during construction	ArmPower External auditor
	Consider possible occurrence of poisonous snakes during working		Inspection of incident and accident reports	No accidents related to poisonous snakes		
	For workers noise levels shall be kept below 80 dB (A), wherever possible. Hand out ear protection devices to all workers, when necessary.		Measurement with noise meter	Noise level below 80 dB (A); if noise levels are higher: workers fitted with PPE and warning signs installed		
	Provide workers with appropriate protective equipment (PPE) according to RENCO's Occupational Health & Safety Standards		Visual Inspection	All workers provided with and using PPE		
	Train workers accordingly regarding work at heights, electrical and vehicular safety, handling of hazardous materials, PPE, hazard avoidance and reduction measures, use of first aid and rescue techniques, emergency response, etc.		Inspection of training records	All workers trained accordingly		

Activity/ Impact	What <i>parameter is to be monitored?</i>	Where <i>is the parameter to be monitored?</i>	How <i>is the parameter to be monitored/ type of monitoring equipment?</i>		When <i>is the parameter to be monitored-frequency of measurement or continuous?</i>	Responsibility
			Method	Indicator		
Occupational Health and Safety	Identify area emergency responders, hospitals, and clinics, and provide advance notice of Project activities	Construction Site	Interviews	Area emergency responders informed about Project activities	Regularly during construction	ArmPower External auditor
	Forbid alcohol and other drugs at construction site		Inspection of incident records	No workers found under influence of alcohol or other drugs		
	Assure transfer of injured workers to hospitals in the case of serious accidents		Inspection of accident records	Workers transferred to hospital in case of serious accidents		
	Limit occupational exposure to electric or magnetic fields (EMF) by use of shielding materials, signing of relevant areas and training of workers		Interviews Inspection of training records	Shielding materials in place All workers trained accordingly		
	Licensing and training of drivers; improvement of driving skills		Inspection of licensing records	All drivers licensed and trained		
	Training and licensing industrial vehicle operators in the safe operation of specialized vehicles, including safe loading/unloading, and load limits		Inspection of training records	All vehicle operators trained and licensed		

Activity/ Impact	What <i>parameter is to be monitored?</i>	Where <i>is the parameter to be monitored?</i>	How <i>is the parameter to be monitored/ type of monitoring equipment?</i>		When <i>is the parameter to be monitored-frequency of measurement or continuous?</i>	Responsibility
			Method	Indicator		
Occupational Health and Safety	Maintain vehicles regularly and use manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure	Construction Site	Inspection of maintenance records	Vehicles regularly maintained and approved parts used	Regularly during construction	ArmPower External auditor
	Record work-hours as well as all accidents and incidents		Inspection of records	Recording implemented		
	Skilled working personnel (partly from abroad) will be accommodated in RENCO's guesthouse or at hotels in Yerevan. Local (mainly unskilled) workforce shall be employed from Yerevan and the adjacent villages. No workers' camps will have to be established as local workers will return to their home daily		Interviews	Accommodation for skilled personnel in adequate condition No workers' camps established		
	Transfer of workers to and from the construction site shall be managed by the EPC Contractor (e.g. bus transfer)		Interviews	Transfer for workers established		

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Occupational Health and Safety	Implement and communicate an accessible grievance mechanism for workers to address any complaints	Construction Site Office of EPC Contractor	Inspection of grievance log book Interviews	All grievances adequately treated	Regularly during construction	ArmPower External auditor
Noise impacts on public and on workers	Use of machines with low sound power and fitting of construction machines with silencers or mufflers	Construction Site	Visual inspection and inspection of complaints	Low sound equipment used; no complaints from residents	Regularly during construction	ArmPower External auditor
	Regular maintenance and service of building machinery and vehicles during construction works		Inspection of maintenance records	Equipment regularly maintained		
	Shut down or throttling down of noisy machinery		Inspection of complaints	No complaints from residents		
Noise impacts on public	Optimize transportation management to avoid needless truck drives (as part of a Traffic Management Plan)	Construction Site	Inspection of complaints	No complaints from residents	Regularly during construction	ArmPower External auditor
	Allow truck movements only during daylight, but not between 7 pm and 6 am (TMP)					
	Reduce vehicle speeds (stick to recommended speeds; 20 km/h for heavy trucks) in populated areas (TMP)	Villages around construction site				

Activity/ Impact	What <i>parameter is to be monitored?</i>	Where <i>is the parameter to be monitored?</i>	How <i>is the parameter to be monitored/ type of monitoring equipment?</i>		When <i>is the parameter to be monitored-frequency of measurement or continuous?</i>	Responsibility
			Method	Indicator		
Noise impacts on public	For residents the noise levels may not exceed 50 dB (A) during daytime and 45 dB (A) during night.	Residential areas near construction site (up to 5 points)	Instrumental measurement	Noise level below 50 dB (A) during daytime and 45 dB (A) during night,	5 hours of day-time measurements, twice per month during construction period (assumed no construction works at night)	RENCO/ ArmPower External auditor
	Notify population in advance about start date and duration of the overall construction works and of specific operations with high noise level	Residential areas near construction site	Inspection of complaints	No complaints from public	Regularly during construction	ArmPower External auditor
Community Health and Safety	Development and implementation of a Traffic Management Plan (including regulations for truck movements, transport of workers, short-term closure of roads (if necessary), details about road use (by whom and for what purpose) and alternative routes.)	Office of EPC Contractor	Inspection of Traffic Management Plan Inspection of complaints	Traffic Management Plan implemented No complaints from public	In advance of construction and regularly during construction	ArmPower External auditor

Activity/ Impact	What <i>parameter is to be monitored?</i>	Where <i>is the parameter to be monitored?</i>	How <i>is the parameter to be monitored/ type of monitoring equipment?</i>		When <i>is the parameter to be monitored-frequency of measurement or continuous?</i>	Responsibility
			Method	Indicator		
Community Health and Safety	The construction site itself will be fenced and the entrance gates will be guarded by security staff in order to prevent any unauthorized access to the site, thus also minimizing possible impacts on community health.	Construction Site	Inspection of incidents/ accidents records	No incidents/ accidents regarding public health and safety	Regularly during construction	ArmPower External auditor
	Security arrangements to be guided by principles of proportionality, good international practice ³³ and national law	Construction Site Office of EPC Contractor	Inspection of security concept and contracts	Arrangements according to good international practice; No complaints from public		
	Security personnel shall be trained and monitored regarding the use of force and conduct towards the community		Inspection of training records Review of recorded security incidents and adaptation of security management , if required	All security staff trained accordingly; No complaints from public; Adaptation of security management, if required		

³³ e.g. UN Code of Conduct for Law Enforcement Officials; UN Basis Principles on the Use of Force and Firearms by Law Enforcement Officials; IFC (2017): Good Practice Handbook on Use of Security Forces - Assessing and Managing Risks and Impacts.

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Community Health and Safety	Provide adequate security measures to prevent accidents and injury (e.g. keeping speed limits)	Construction Site	Inspection of complaints and accident records	No complaints from residents; no accidents	Regularly during construction	ArmPower External auditor
	Inform population of small villages along public roads in advance, in case of transporting heavy equipment	Office of EPC Contractor				
	Establish worker code of conduct to help prevent friction or conflict with communities	Construction Site Office of EPC Contractor	Inspection of complaints	Worker code of conduct established		
	Provide cultural awareness training to be given for non-local workers (expand to local workers if grievances are raised or observations made of inappropriate behavior)	Construction Site Office of EPC Contractor	Inspection of training records Inspection of complaints	All non-local workers trained accordingly No grievances		
	Develop and implement an Emergency Preparedness and Response Plan		Inspection of documents	Emergency Preparedness and Response Plan implemented		
	Provide appropriate information about Emergency Preparedness and Response Plan to potentially affected communities and individuals	Residents living near construction sites	Interviews with residents	Residents informed accordingly		

Activity/ Impact	What <i>parameter is to be monitored?</i>	Where <i>is the parameter to be monitored?</i>	How <i>is the parameter to be monitored/ type of monitoring equipment?</i>		When <i>is the parameter to be monitored-frequency of measurement or continuous?</i>	Responsibility
			Method	Indicator		
Employment	EPC's Human Resources Policy shall include international labor standards as defined in ILO (2014)	Office of EPC Contractor	Inspection of Human Resources Policy	According to international labor standards, fulfilling IFC PS 2	Regularly during construction	ArmPower External auditor
	Develop and implement a non-discriminatory hiring and wage policy according to international labor standards as defined in ILO 2014 (clearly stating that the company will not discriminate in hiring and salaries based on gender, age, religion, ethnicity or place of origin), if not already in place	Construction Site	Inspection of employment contracts (also of subcontractors)	Employment contracts according to international labor standards No complaints		
	Prosecute offenses related to payment of wages by sub-contractors strictly	Office of EPC Contractor	Inspection of complaints Interviews with employees	Employment contracts according to international labor standards No complaints		
	Prioritize employment of local people for construction works (offer job opportunities in nearby villages and Yerevan)			High percentage of local people employed		

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Employment	Discuss potential barriers for local employment with labor / training organizations so that measures to overcome these barriers (if any) can be developed and put in place	Construction Site Office of EPC Contractor	Inspection of results and measures	High percentage of local people employed	In advance of construction and regularly during construction	ArmPower External auditor
Employment / Gender aspects	Improve recruitment of women for construction works	Construction Site Office of EPC Contractor	Inspection of employment contracts	25% of employees are female; thorough justification, if this rate cannot be kept	Regularly during construction	ArmPower External auditor
Gender aspects	Zero tolerance for sexual harassment at the work place	Construction Site	Inspection of complaints	No complaints from residents and from workers	Regularly during construction	ArmPower External auditor
Grievance Redress Mechanism	Implement and communicate an accessible grievance mechanism for PAP to address any complaints	Construction Site Office of EPC Contractor	Inspection of grievance log book Interviews with PAP	All grievances adequately treated	Regularly during construction	ArmPower External auditor

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Lowering of groundwater	If groundwater level will be lowered for construction, a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater users (nearby industries, agricultural use, etc.) and impact on Hrazdan river basin need to be assessed including hydrogeological survey, groundwater mapping and modeling.	Construction Site Office of EPC Contractor Residents living near to construction site	Visual inspection of report Inspection of complaints Interviews with residents	Mitigation measures implemented (if necessary) No complaints from residents	In advance of construction and regularly during construction	ArmPower External auditor

9.2.2 Monitoring during the Commissioning Phase

Additionally to the monitoring measures provided for the operation phase, during the commissioning phase of the Project especially ambient air quality and noise emissions shall be monitored:

- Ambient air quality regarding NO₂ shall be monitored at the residential areas near YCCPP-2 site (up to 5 points) by instrumental measurement (e.g. diffusion tubes). 7 days of measurements shall be performed once per month. Ground level concentration of NO₂ shall not exceed national and international standards. Results shall be reported to the national authorities (Environmental Monitoring and Information Center SNCO).
- For residents the noise levels may not exceed 50 dB (A) during daytime and 45 dB (A) during night. Instrumental measurements shall be done at legal and illegal residential areas near the YCCPP-2 site (up to 5 points) and results reported to the national authorities. 5 hours of day-time and night-time measurements shall be performed twice per month during the commissioning period.

9.2.3 Monitoring during the Operation Phase

Table 9-20: Summary of monitoring measures during Operation Phase

Activity/ Impact	What <i>parameter is to be monitored?</i>	Where <i>is the parameter to be monitored?</i>	How <i>is the parameter to be monitored/ type of monitoring equipment?</i>		When <i>is the parameter to be monitored-frequency of measurement or continuous?</i>	Responsibility
			Method	Indicator		
Impacts on flora and fauna	Oily waste water from Power plant operation will be duly collected and routed to a treatment plant including API and eventually CPI separators before being discharged to the existing system of YCCPP-1.	YCCPP-2 site	Visual inspection	Water treatment plant installed and working properly	Monthly monitoring	ArmPower (results to be reported to Environmental Monitoring and Information Center SNCO)
	Inspection of monitoring reports					
	HRSB blow down and other drainage from steam/water system will be neutralized at chemical shop to meet relevant water quality standards and will then be discharged to Hrazdan River using existing YCCPP-1 discharge system		Inspection of waste water monitoring reports	Drainage water does not exceed applicable limits		
	Compliance with international stack emission standards ensures that critical levels will not be exceeded and will thus not represent any danger for flora and fauna		Inspection of air emission monitoring reports	Air emission does not exceed applicable limits		

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Impacts on flora and fauna	Compliance with national and international noise emission standards ensures that critical levels will not be exceeded and will thus not be dangerous for sensitive fauna (if any)	YCCPP-2 site	Inspection of design data and noise measurements	Noise emissions do not exceed applicable limits (see below: noise impacts)	Regularly during operation	ArmPower
	Strict prohibition of herbicide use for maintaining YCCPP-2 site		Visual inspection	No herbicides used for maintaining	Regularly during operation	ArmPower
Soil and Water pollution	Oily waste water from Power plant operation will be duly collected and routed to a treatment plant including API and eventually CPI separators before being discharged to r the YCCPP-1 existing system. The treatment system will be suitably selected and implemented to meet the environmental limits and the good industry practice.	YCCPP-2 site	Visual inspection Inspection of monitoring reports	Treatment plant (oil separator) installed and working properly Drainage water does not exceed respective limits for water quality	Monthly monitoring	ArmPower (results to be reported to Environmental Monitoring and Information Center SNCO)

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Soil and Water pollution	Rain water from internal roads and other paved areas will be collected and led to the waste water treatment plant before discharging it to the existing system of YCCPP-1. Rain water from roofs of buildings and shelters will be collected in an underground tank for reusing the water without any treatments for irrigation inside the plant site.	YCCPP-2 site	Visual inspection Inspection of monitoring reports	Treatment plant (oil separator) installed and working properly Drainage water does not exceed respective limits for water quality	Monthly monitoring	ArmPower (results to be reported to Environmental Monitoring and Information Center SNCO)
	HRSB blow down and other drainage from steam/water system will be neutralized at chemical shop to meet relevant water quality standards and will then be discharged to Hrazdan River using the existing discharge system of YCCPP-1.		Visual inspection Inspection of waste water monitoring reports	Drainage water does not exceed respective limits for water quality		
	Utility sewerage will be connected to city's sewerage system		Inspection of monitoring reports	Sewage water led to city's sewerage system; not exceeding applicable limits for water quality		
	Train staff in appropriate sanitation practices		Inspection of training records	All staff trained accordingly	Regularly during operation	ArmPower

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Soil and Water pollution	Provide spill-control materials at YCCPP-2, in order to clean up spills	YCCPP-2 site	Inspection of equipment	Spill-control equipment provided	Regularly during operation	ArmPower
	Enforcement of a Waste Management Plan		Site inspection	All waste collected, segregated and stored/ disposed of appropriately		
	Elaboration of an emergency plan in case of accidental leakage		Inspection of emergency plan and of accident reports	Emergency Plan implemented and accidental leakages treated appropriately (if any)		
	Remove contaminated soil if spills occur and handle as hazardous waste	YCCPP-2 site Storage areas	Visual inspection	Contaminated soil handled as hazardous waste		
	Prohibition of herbicides for maintenance of YCCPP-2	YCCPP-2 site		No herbicides used for maintaining		
	Proper handling and storage of hazardous material (lockable, roofed, ventilated, concreted and bunded floor)	YCCPP-2 site Storage areas		Hazardous material properly handled and stored		
	Train staff in proper management of recyclable, sanitary, solid, liquid, and hazardous wastes	YCCPP-2 site	Inspection of training records	All staff trained accordingly		
	Regular maintenance of all vehicles and machines at regular service stations, if possible		Inspection of maintenance records	Vehicles and machines adequately maintained		

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Soil and Water pollution	Maintenance and re-fueling of the equipment only on sealed and enclosed areas	YCCPP-2 site	Visual inspection of maintenance and re-fueling areas	No unsuitable areas used for maintenance and re- fueling	Regularly during operation	ArmPower
Permanent lowering of groundwater level	If groundwater level will be lowered for operation phase, a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater users (nearby industries, agricultural use, etc.) and impact on Hrazdan river basin need to be assessed including hydrogeological survey, groundwater mapping and modeling.	Near the YCCPP- 2 site	Interviews with third parties Inspection of complaints	Third parties informed and water supply secured; no complaints	Regularly during operation	ArmPower
Limitation of exhaust gas pollution	Maintain vehicles and engines properly, as recommended by suppliers	YCCPP-2 site	Inspection of maintenance records	Equipment properly maintained	Regularly during operation	ArmPower
	Avoid unnecessary idling of vehicles		Visual inspection	No unnecessary idling		
Air emissions and air quality	Compliance with performance guarantees of the operator for emission values	Stack of YCCPP- 2	Inspection of monitoring reports of CEMS data	Air emissions do not exceed ArmPower's Performance Guarantees (NOx: < 50; CO < 30; UHC < 10 mg/Nm ³)	Continuously	ArmPower (results to be reported to Environmental Monitoring and Information Center SNCO)

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Air emissions and air quality	Greenhouse gas emissions shall be quantified at least annually and results reported to national authorities and financial institutions	YCCPP-2 site	Inspection of monitoring reports of CEMS data	GHG emissions do not exceed IFC/ WB typical value of 396 g CO ₂ /kWh gross	At least annually during operation	ArmPower (results to be reported to Environmental Monitoring and Information Center SNCO and financing institutions)
	Monitoring of ambient air quality - NO ₂	Residential areas near the Plant's site (up to 5 points)	Instrumental measurement - e.g., diffusion tubes	Ground level concentrations of NO ₂ do not exceed national and international standards	7 days of measurements, once per month during commissioning period	ArmPower (results to be reported to Environmental Monitoring and Information Center SNCO)
Landscape and Visual Aspects	Planting of indigenous trees and bushes along YCCPP-2 boundaries is recommended, in order to reduce the visual burden at least to some extent (develop and implement landscape / planting plan)	YCCPP-2 site	Visual inspection Inspection of landscape / planting plan	Native site adapted tree species planted according to landscape / planting plan	Regularly during operation	ArmPower

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Waste Management	Collect all type of wastes during CCPP operation. Make arrangements for proper waste handling, treatment and disposal with municipal authorities about using services of communal service providers for waste disposal purposes	YCCPP-2 site	Visual inspection Inspection of agreement with waste collector	All waste collected, segregated and stored/ disposed of appropriately Domestic waste picked up regularly by waste collector	Regularly during operation	ArmPower
	Store all hazardous waste in adequate storage sites (lockable, roofed, ventilated, concreted and bunded floor) at YCCPP-2 site for future disposal	YCCPP-2 site Storage areas	Visual inspection Inspection of hazardous material/waste register	Hazardous waste and materials stored appropriately and clearly labelled; Materials Safety Data Sheets (MSDS) provided		
	Clearly label all hazardous waste and provide Materials Safety Data Sheets (MSDS)					
	Adequate storage and clear labeling according to national / internationally recognized requirements and standards, including the International Chemical Safety Cards (ICSC), Materials Safety Data Sheets (MSDS), of all hazardous substances in chemical workshop (e.g. acids and alkaline solutions)	YCCPP-2 site Storage areas	Visual inspection Inspection of hazardous material/waste register	Hazardous waste and materials stored appropriately and clearly labelled; Materials Safety Data Sheets (MSDS) provided		

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Waste Management	Waste Management Plan for operation shall also include a risk assessment associated with the mid-term to long-term storage of hazardous waste and adequate sizing of the storage area, as well as monitoring procedures	YCCPP-2 site Storage areas	Inspection of Waste Management Plan and storage sites	Risks assessed in Waste Management Plan and adequate storage implemented	Regularly during operation	ArmPower
	Train staff in handling and disposal of recyclable, sanitary, solid, liquid and hazardous waste	YCCPP-2 site	Inspection of training records	All staff trained accordingly		
HSE Policy and HSE Management	ArmPower will have a Health, Safety and Environment Management System (HSEMS) in place, according to their HSE Policy, considering IFC/WorldBank EHS guidelines for Thermal Power Plants	YCCPP-2 site	Inspection of relevant documents	HSEMS in place, considering relevant guidelines	Regularly during operation	ArmPower
Employee Health and Safety	Make sure that all staff has a health insurance	YCCPP-2 site	Inspection of workers' health documents	All staff has health insurance	Regularly during operation	ArmPower
	Consider occurrence of poisonous snakes		Inspection of incident and accident reports	No accidents related to poisonous snakes		

Activity/ Impact	What <i>parameter is to be monitored?</i>	Where <i>is the parameter to be monitored?</i>	How <i>is the parameter to be monitored/ type of monitoring equipment?</i>		When <i>is the parameter to be monitored-frequency of measurement or continuous?</i>	Responsibility
			Method	Indicator		
Employee Health and Safety	For workers noise levels shall be kept below 80 dB (A), wherever possible. Hand out ear protection devices to all workers, when necessary	YCCPP-2 site	Visual Inspection	Noise level below 80 dB (A); if noise levels are higher: workers fitted with PPE and warning signs installed	Regularly during operation	ArmPower
	Staff will be provided with appropriate protective equipment (PPE) according to RENCO's Occupational Health & Safety Standards and IFC/WorldBank EHS guidelines for Thermal Power Plants		Visual Inspection	All staff provided with and using PPE		
	Train staff accordingly regarding work at heights, electrical and vehicular safety, handling of hazardous materials, use of PPE, hazard avoidance and reduction measures, use of first aid and rescue techniques, emergency response, firefighting, etc.		Inspection of training records	All staff trained accordingly		
	Forbid alcohol and other drugs at YCCPP-2 site		Inspection of incident records	No staff found under influence of alcohol or other drugs		
	Assure transfer of injured staff to hospitals in the case of serious accidents		Inspection of accident reports	Staff transferred to hospital in case of serious accidents		

Activity/ Impact	What <i>parameter is to be monitored?</i>	Where <i>is the parameter to be monitored?</i>	How <i>is the parameter to be monitored/ type of monitoring equipment?</i>		When <i>is the parameter to be monitored-frequency of measurement or continuous?</i>	Responsibility
			Method	Indicator		
Employee Health and Safety	Limit occupational exposure to electric or magnetic fields (EMF) by use of shielding materials, signing of relevant areas and training of staff	YCCPP-2 site	Interviews Inspection of training records	Shielding materials in place All workers trained accordingly	Regularly during operation	ArmPower
	Maintain vehicles and machinery regularly and use manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure		Inspection of maintenance records	Vehicles regularly maintained and approved parts used		
	Operator's Human Resources Policy shall include international labor standards as defined in ILO (2014)		Inspection of Human Resources Policy	According to international labor standards, fulfilling IFC PS 2		
	Record work-hours as well as all accidents and incidents		Inspection of records	Recording implemented		
	Implement and communicate an accessible grievance mechanism for staff to address any complaints		Inspection of grievance log book Interviews	All grievances adequately treated		

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Noise impacts on public	For residents the noise levels may not exceed 50 dB (A) during daytime and 45 dB (A) during night.	Residential areas near the YCCPP- 2 site (up to 5 points)	Instrumental measurement	Noise level below 50 dB (A) during daytime and 45 dB (A) during night,	5 hours of day-time and night-time measurements, twice per month during commissioning period	ArmPower (results to be reported to Environmental Monitoring and Information Center SNCO)
Public Health and Safety	Compliance with Performance Guarantees emission levels	YCCPP-2 site	Inspection of monitoring reports of CEMS data Inspection of complaints	Air emissions do not exceed limits of ArmPower's Performance Guarantees No complaints	Regularly during operation	ArmPower (results to be reported to Environmental Monitoring and Information Center SNCO)
	YCCPP-2 site will be fenced and the entrance gates will be guarded by security staff in order to prevent any unauthorized access.	YCCPP-2 site	Inspection of incidents/ accidents records	No incidents/ accidents regarding public health and safety		ArmPower
	Development and implementation of a Security Force Management Plan guided by principles of proportionality, good international practice and national law, is recommended	Construction Site Office of Operator at YCCPP-2	Inspection of security concept and contracts	Arrangements according to good international practice; No complaints from public		ArmPower

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Public Health and Safety	Security personnel shall be trained and monitored regarding the use of force and conduct towards the community	Construction Site Office of Operator at YCCPP-2	Inspection of training records Review of recorded security incidents and adaptation of security management , if required	All security staff trained accordingly; No complaints from public; Adaptation of security management, if required	Regularly during operation	ArmPower
	Develop and implement Emergency Preparedness and Response Plan	Office of Operator at YCCPP-2	Inspection of documents	Emergency Preparedness and Response Plan implemented		
	Provide appropriate information about Emergency Preparedness and Response Plan to potentially affected communities and individuals	Near the YCCPP-2 site	Interviews with residents	Residents informed accordingly		
Information of public	Undertake regular communication of the company's environmental and social performance	Residents living near to site	Interviews with third parties	Third parties informed accordingly	Regularly during operation	ArmPower

Activity/ Impact	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored/ type of monitoring equipment?		When is the parameter to be monitored-frequency of measurement or continuous?	Responsibility
			Method	Indicator		
Permanent lowering of groundwater	If a lowering of the groundwater level at the construction/ plant site will be performed, an additional impact assessment including development of mitigation measures will be required, such as communications to third parties, providing water supply alternatives in case of need, etc.	Near the YCCPP-2 site	Interviews with third parties Inspection of complaints	Third parties informed and water supply secured; no complaints	Regularly during operation	ArmPower
One audit per year by an external internationally experienced auditor	Compliance with ESMP; monitoring data	YCCPP-2 site Office of ArmPower	Inspection of power plant, HSE reports from ArmPower, monitoring data (air emissions, noise emissions, waste water, etc.)	All mitigation measures of ESMP implemented and adaptive measures applied, where necessary; Monitoring data below the defined limit values or regulative measures implemented	One audit per year during the operation phase	External auditor Costs per audit: 10,000 USD

9.2.4 Monitoring during the Decommissioning Phase

As mitigation measures for decommissioning will be mainly the same as for the construction phase, also monitoring measures will be similar. Especially implementation of a Waste Management Plan for all wastes from deconstruction of the power plant will have to be monitored. This includes also the proper storage and disposal of hazardous wastes. Monitoring will be under the responsibility of ArmPower.

9.3 Implementation Arrangements and Capacity Building

The new power plant YCCPP-2 will be constructed by RENCO SPA and operated by ArmPower CJSC, which is a subsidiary company of RENCO SPA.

RENCO SPA has a Health, Safety and Environment Policy (2015) in place, in order to meet the requirements, regulations and communities affairs for the health of all persons working under the control of RENCO, environment protection and plants safety. An integrated system for safety, environment and quality has been implemented in compliance to international guidelines and standards (like OHSAS 18001 and ISO 14001 standards). Among others RENCO SPA has also a Social and Cultural Heritage Policy (2016) as well as an Anti-Corruption Policy (2016) and a Code of Ethics in place.

The above mentioned policies and HSE management systems shall also be established at ArmPower CJSC as subsidiary company of RENCO SPA.

RENCO SPA as EPC Contractor has to implement the ESMP within its own site-specific Health, Safety and Environment Management System (HSEMS) in a proper way and shall have an HSE manager on duty throughout the construction period. This HSE officer shall prepare monthly reports of all HSE relevant incidents and accidents as well as possible non-compliance during implementation of the mitigation measures as given in the ESMP. These reports shall be forwarded to the Health, Safety and Environment Manager of ArmPower and the relevant national authorities (like the Ministry of Nature Protection, Ministry of Health) as well as to the external internationally experienced auditor.

An external internationally experienced auditor shall perform quarterly supervision of the implementation of the ESMP and monitor the implementation of the mitigation measures during construction period. The aim of the audits will be to ensure that all mitigation measures are implemented adequately. In case of any discrepancies, the specialist shall implement proper actions to establish compliance with the ESMP. If this is not possible and if the discrepancy is considered to be severe, the person(s) in charge shall be empowered to stop the work immediately until compliance is achieved again. Based on his quarterly supervision and the monthly reports provided by the Health, Safety and Environment Manager

of RENCO, the external auditor will produce narrative analytical quarterly reports on environmental and social performance in the course of the Project and furnish these reports to ADB/ IFC and to ArmPower. Additional site inspections by the external auditor shall be performed during the commissioning and the operational phases.

The monitoring of noise levels during construction and commissioning phases, of air emissions during commissioning and operation (during operation based on CEMS at the stack), as well as of liquid effluents during operation of YCCPP-2 shall be done by ArmPower and the results shall be shared with the “Environmental Monitoring and Information Center SNCO” of the Ministry of Nature Protection of the RA. During the site visit in July 2017 FICHTNER’s environmental specialist was informed that **there are not enough capacities** at the named institution for implementing additional monitoring programs. Thus, measures for capacity building shall be considered so that in the future spot checks of the monitoring results can be undertaken by this authority. These measures should include employment of additional staff or contracting outside resources for monitoring purposes (or both). Existing staff shall be trained in effective monitoring procedures including knowledge about national and international (ADB, IFC/World Bank) guidelines and limit values.

9.4 Reporting requirements

The results of the monitoring measures foreseen in Section 9.2 of this ESIA shall be compiled in the form of HSE monitoring reports.

During the construction and decommissioning stages, the EPC Contractor (RESCO SPA) shall prepare:

- a daily HSE log;
- HSE incidents and chance finds reports;
- internal HSE audit reports;
- monthly HSE reports compiling all the above.

During operation, ArmPower shall prepare:

- HSE incidents reports;
- internal HSE audit reports;
- monthly HSE reports.

All reports shall be kept within the project’s documentation and be readily available for disclosure to the national authorities, the financing institutions and the external and internal auditors.

9.5 Adaptive management

The monitoring of the works may reveal the necessity to adapt the mitigation and monitoring measures of the ESMP to specific site conditions

not known at the time of preparation of this ESIA. Items which are not anticipated in the ESMP may come up, as well as areas that need improvements. The Contractors shall be ready to handle both cases by adapting the dispositions of this ESIA.

Any changes to the commitments of this ESIA and the ESMP shall not be undertaken without the previous approval of the Project Owner and the Lenders.

9.6 Summary of Costs for Implementation of the EMSP

All costs for mitigation of the impacts during the construction, operation, and decommissioning periods of the Project are included in the regular construction / operational / decommissioning costs. Construction works are foreseen to run for 2.5 years.

Costs for the monitoring of ambient air and ambient noise at the power plant's surroundings are calculated as 71,500 USD. Additional costs are foreseen for quarterly supervision of the construction sites and one additional site investigation during the commissioning phase, to be performed by an internationally experienced auditor. One supervision mission is estimated to cost approx. 10,000 USD, including flights and reporting. Thus, the supervision will sum up to 110,000 USD for 10 visits during the 2.5 years of construction period and one visit during commissioning.

A total cost of **181,500 USD** is foreseen (**Error! Not a valid bookmark self-reference.**).

Additional costs of 10,000 USD per year will arise for a yearly audit of the external auditor during the operation phase of YCCPP-2.

Table 9-21: Monitoring costs for implementation of the ESMP

Parameter	Stage	Frequency and duration	Location	Total cost
Ambient Noise	Construction	Twice per month, 5 hours each time, for 30 months	Up to 5 points in residential areas	50,000 USD
	Commissioning	Twice per month, 5 hours each time, for 12 months	Up to 5 points in residential areas	20,000 USD
Ambient air quality - NO ₂	Commissioning	Once per month, 7 days each time, for 12 months	Up to 5 points in residential areas	1,500 USD
<i>SUB- TOTAL</i>				<i>71,500 USD</i>
All EHS issues as per the ESIA	Construction	Every quarter of the year, for 2.5 years	The whole construction site	100,000 USD
	Commissioning	One time	The power plant	10,000 USD
<i>SUB- TOTAL</i>				<i>110,000 USD</i>
TOTAL				181,500 USD *

* Additional costs of 10,000 USD per year will arise for a yearly audit of the external auditor during the operation phase of YCCPP-2.

9.7 Gap Analysis regarding compliance with IFC Performance Standards

The compliance of the Project with the main requirements of the IFC Performance Standards after implementation of the mitigation and monitoring measures given in the ESMPs is analyzed in Table 9-22 below.

Table 9-22: Compliance of the Project with main requirements of IFC Performance Standards (PS)

Main requirements of Performance Standards	Assessment
PS 1: Assessment and Management of Environmental and Social Risks and Impacts	
PS 1: Policy	
Has a formal policy defining the environmental and social objectives and principles that guide the project been established?	Yes; RENCO has Health, Safety and Environment Policy in place and will develop a site specific Health, Safety and Environment Management System (HSEMS) for the Project; this shall also be established at ArmPower which is a subsidiary company of RENCO SPA
Is the policy consistent with the principles of the PS or other internationally recognized standards?	Yes; the certified Policy complies to OHSAS 18001 and ISO 14001 standards
PS 1: Identification of risks and impacts	
Is there a process to assess the environmental and social impacts and risks of the project?	Yes; A National Environmental Impact Assessment has been prepared in 2016; Fichtner currently prepares the ESIA study (including ESMP) assessing environmental and social impacts
Have recent environmental and social baseline data at an appropriate level of detail been used in the assessment?	Yes; Site visit by Fichtner’s environmental and social experts in 2017 including stakeholder interviews; recent reports on geological situation and national EIA study as baseline; reports on groundwater quality and soil contamination at the site have just been prepared; measurements of background air quality and noise levels by Fichtner for Air Dispersion Calculation and Noise Propagation Study as part of the ESIA
Have all relevant risks and impacts been assessed, including the issues identified in PS 2 to 8?	Yes; all relevant impacts assessed in Fichtner’s ESIA study. PS 5 and PS 7 are not applicable to the Project
Are the risks and impacts related to the emission of GHG and climate change considered, as well as adaptation opportunities?	Yes; see Section 6.2.5 of Fichtner’s ESIA study
Have transboundary effects been considered?	Not applicable
Have the impacts been identified in the context of the project’s area of influence?	Yes; assessed Project Area of Influence includes residential areas and illegal housings in the vicinity of the planned power plant

Main requirements of Performance Standards	Assessment
Have cumulative impacts been assessed?	Yes; Air Dispersion Calculation and Noise Propagation Study as part of Fichtner's ESIA study consider also the existing background levels
Have risks and impacts related to the actions of third parties been assessed?	Yes; if any third parties will be engaged they will have to comply to RENCO's HSE Policy and site-specific HSEMS
Has the assessment considered the findings of plans, studies and assessments prepared by relevant government authorities and other parties directly related to the project?	Yes; National project approval from Ministry of Nature Protection has been given in 2017 based on the national EIA and geological reports; National reports have been used as baseline for Fichtner's ESIA study
Have disadvantaged or vulnerable groups been identified?	Yes; Some illegal residents are located in the vicinity of the planned construction site
If so, do any adverse impacts fall disproportionately on them?	No
PS 1: Management Programs	
Has a program of mitigation and performance improvement measures that addresses identified impacts and risks been developed?	Yes; Environmental and Social Management Plans for construction, operation, and decommissioning phases of the Project are part of Fichtner's ESIA study. Mitigation Measures of the ESMPs will have to implemented by the EPC Contractor (RENCO SPA)
Does the program take into account the engagement process with affected communities?	Yes; Engagement process with affected communities is foreseen; Stakeholder Engagement Plan is part of Fichtner's ESIA study
Does the program include estimates of the resources for implementation?	Yes; Implementation of all mitigation measures during construction, operation and decommissioning phases are part of construction/ operational/ decommissioning budgets
Does the program include definition of the responsibilities for implementation?	Yes; Implementation arrangements are defined in Section 9.2.4 of Fichtner's ESIA study
PS 1: Organizational Capacity and Competency	
Are responsibilities and authorities for implementation of the management program defined and communicated appropriately through the client's organization?	Yes; National project approval has already been given by Ministry of Nature Protection; other authorities (e.g. for waste management, monitoring of air and noise emissions as well as effluents, possible chance finds of cultural goods) are named in Fichtner's ESIA and will be contacted by the client.

Main requirements of Performance Standards	Assessment
Do the persons with responsibility for implementing the management program have the necessary knowledge, skills and experience?	Yes; RENCO has a certified Health, Safety and Environment Policy in place and will establish a HSE Manager for the Project; the same will be done at ArmPower as subsidiary of RENCO
PS 1: Emergency Preparedness and Response	
Are there emergency preparedness and response plans that are commensurate with the level of project risks?	Yes; Emergency preparedness and response plans will have to be developed by EPC Contractor for construction and Operator for operational phase; these plans are part of the mitigation measures given in Fichtner's ESIA study
In the event emergency preparedness and response requires participation of the community and the local governmental agencies, have they been involved?	Yes; Communities and local government authorities will be involved in those plans
PS 1: Monitoring and Review	
Have procedures to monitor and measure on a regular basis the effectiveness of the management program established, including the use of external experts and/or affected communities where appropriate?	Yes; Monitoring the implementation of mitigation measures is part of Fichtner's ESIA study; Monitoring will be done by RENCO's and ArmPower's HSE Managers and an internationally experienced auditor
Is the management program regularly updated based on the results of the monitoring?	Yes; Monitoring reports will update the ESMP regularly, if necessary
Is appropriate environmental and social performance information periodically reported internally to senior management?	Yes; ArmPower's HSE Manager will report the monitoring results to senior management of ArmPower and to internationally experienced auditor
PS1: Stakeholder Engagement	
Has the range of stakeholders for the project been identified?	Yes; see Stakeholder Engagement Plan (including Grievance Redress Mechanism) which is part of Fichtner's ESIA study
Has a Stakeholder Engagement Plan been established?	
Are differentiated measures deemed to allow the participation of those identified as disadvantaged or vulnerable included?	
Has appropriate disclosure of relevant project information to, and consultation with, affected communities been conducted?	Yes; affected communities have been informed and possible concerns collected during site visit of Fichtner's environmental and social experts in 2017; Draft ESIA and ESMP will be disclosed to public and Public Consultation meeting will be performed to finalize ESIA study

Main requirements of Performance Standards	Assessment
Has the disclosure and consultation process been: <ul style="list-style-type: none"> • Timely (early in the process)? • Culturally appropriate (language, gender issues)? • Free of external manipulation, interference, coercion or intimidation? • Transparent? • Meaningful? • Documented? 	Yes; see Stakeholder Engagement Plan (including Grievance Redress Mechanism) which is part of Fichtner's ESIA study
For projects with potentially significant adverse impacts on Affected Communities, has a process of Informed Consultation and Participation been undertaken?	
Are Indigenous Peoples engaged in a process of ICP (Informed Consultation and Participation)?	Not applicable
Was the Indigenous Peoples FPIC (Free, Prior and Informed Consent) obtained?	
PS 1: External Communications and Grievance Mechanisms	
Is there a procedure for receiving external communications, screening and assessing the issues raised and providing answers and adjustments to the management plan?	Yes; Grievance Mechanism is part of Fichtner's ESIA study and of the Stakeholder Engagement Plan; Public Consultation Meeting will be performed to finalize ESIA study
Are reports on the environmental and social sustainability of the project publicly available?	Yes; ESIA study and ESMP will be disclosed before Public Consultation meeting
Has an effective grievance mechanism for affected communities been established?	Yes; Grievance Mechanism is part of Fichtner's ESIA study and of the Stakeholder Engagement Plan
PS 1: Ongoing reporting for affected communities	
Are (at least) annually reports provided to the affected communities describing the progress with the implementation of the Action Plans on issues involving risks to them and on those issues identified through the consultation/grievance mechanisms?	Yes; see Stakeholder Engagement Plan (including Grievance Redress Mechanism) which is part of Fichtner's ESIA study
PS 2: Labor and Working Conditions	
PS 2: Human Resource Policies and Procedures	
Are appropriate human resources policies and procedures available that address all requirements of PS 2 and national law?	Yes; RENCO has a certified Health, Safety and Environment Policy (2015), a Social and Cultural Heritage Policy (2016), an Anti-Corruption Policy (2016), and a Code of Ethics in place, which shall all also be established at ArmPower as subsidiary company of RENCO
Are the workers provided with information regarding their rights?	

Main requirements of Performance Standards	Assessment
PS 2: Working conditions and terms of employment	
Are any established collective bargaining agreement with workers' organizations respected?	Yes; RENCO has a certified Health, Safety and Environment Policy (2015), a Social and Cultural Heritage Policy (2016), an Anti-Corruption Policy (2016), and a Code of Ethics in place, which shall all also be established at ArmPower as subsidiary company of RENCO.
Is it ensured that the migrant workers are engaged on substantially equivalent terms and conditions to the non-migrant workers carrying similar work?	
<p>Where accommodation services are provided, is it ensured that:</p> <ul style="list-style-type: none"> • Policies on the quality and management of the accommodations and basic services are implemented? • Principles of non-discrimination and equal opportunity guide the accommodation services? • The accommodation's arrangements do not restrict worker's freedom of movement or association? 	
PS 2: Workers' Organizations	
Is there a compliance with the national law in allowing workers to form and join workers organizations?	PS 2 is based on a number of international conventions and instruments, including those of the International Labor Organization (ILO) and the United Nations (UN). All of them are ratified by the Republic of Armenia, except "UN - International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families" which has only been signed and ratification is still pending. For RENCO's and ArmPower's policies see above.
If national law substantially restricts workers organizations, have there been restrictions imposed to workers to express their grievances and protect their rights organizations?	
PS 2: Non-discrimination and Equal Opportunity	
Is it ensured that employment decisions are not made on the basis of personal characteristics unrelated to job requirements?	Yes; For RENCO's and ArmPower's policies see above. These issues are also part of the ESMPs in Fichtner's ESIA study.
Is harassment, intimidation and/or exploitation of workers, especially women and migrant workers, avoided?	
PS2: Retrenchment	
If any collective dismissal was applied, has an analysis of alternatives to retrenchment been made?	Not applicable
If retrenchment of a significant number of employees is expected, has a plan been developed to implement the retrenchment in compliance with all legal and contractual requirements?	

Main requirements of Performance Standards	Assessment
PS 2: Grievance Mechanism for workers	
<p>Is a grievance mechanism for workers provided to raise workplace concerns that:</p> <ul style="list-style-type: none"> • is easily accessible; • is understandable? • is transparent? • allows anonymous complains? 	Yes; RENCO and ArmPower will establish adequate grievance mechanisms for workers as has been done in many other international projects; this issue is also part of the ESMPs of Fichtner's ESIA study.
PS 2: Child Labor	
Does the project employ children?	No; for RENCO's and ArmPower's policies see above
<p>Where national laws allow the employment of minors:</p> <ul style="list-style-type: none"> • are the provisions of those laws followed by the client? • are minors kept away from hazardous work? • are minors subject to appropriate risk assessment and regular monitoring of health, working conditions and hours of work? 	Not applicable; national law does not allow child labor
PS 2: Forced Labor	
Does the project employ forced labor or trafficked persons?	No; for RENCO's and Armpower's policies see above
PS 2: Occupational Health & Safety (OHS)	
Does the project provide the workers with a safe and healthy work environment?	Yes; RENCO as EPC Contractor will establish site-specific HSE Management System according to its certified HSE Policy and employ an HSE Manager for the project. ArmPower shall do the same for operation. Emergency preparedness and response plans will be developed for the Project. These topics are also part of the ESMPs in Fichtner's ESIA study
Have steps been taken to prevent accidents, injury, and disease?	
Have the workers been trained in occupational health and safety?	
Are occupational accidents, diseases, and incidents documented and reported?	
Is there an emergency prevention, preparedness and response arrangement for the project?	
PS 2: Workers Engaged by Third Parties	
Are there policies and procedures for managing and monitoring the performance of third party employers in relation to the requirements of this PS?	Yes; if any third parties will be engaged they will have to comply to RENCO's HSE Policy and site-specific HSEMS, including grievance mechanism
Is the access of the workers engaged by third parties to a grievance mechanism guaranteed?	
PS 2: Supply Chain	
If there is a high risk of child or forced labor in the primary supply chain, are these risks identified and monitored, and are the necessary steps taken to remedy them?	Yes; supply chain has to comply to RENCO's HSE Policy and site-specific HSEMS

Main requirements of Performance Standards	Assessment
If there is a high risk of significant safety issues related to supply chain workers, is it ensured that the primary suppliers are preventing these situations?	Yes; supply chain has to comply to RENCO's HSE Policy and site-specific HSEMS
In case of need, does the project shift its primary supply chain to suppliers that can demonstrate the compliance with this PS?	
PS 3: Resource Efficiency and Pollution Prevention	
PS 3: Resource Efficiency	
Have the project's operations incorporated resource conservation and energy efficiency measures?	Yes; Power plant will use highly efficient state-of the-art equipment and will work as closed cycle system
Where GHG emissions (direct plus indirect from purchased electricity) exceed 25,000 tons CO ₂ annually is annual quantification undertaken?	Yes; annual quantification of GHG emissions is part of the operational ESMP in Fichtner's ESIA study
In case the project is a potentially significant consumer of water, have measures to avoid or reduce the water usage been adopted?	Power Plant will work as closed cycle system
PS 3: Pollution Prevention	
Is the release of pollutants avoided/ minimized?	Yes; release of pollutants will be minimized, e.g. by using highly efficient technology like low-NOx burner, cleaning/ neutralizing waste water; air emissions and effluents will be monitored in order to fulfill relevant national and IFC/WB standards
Have the following factors been included in the assessment of potential adverse project impacts: existing ambient conditions; the finite assimilative capacity of the environment; existing and future land use; the project's proximity to areas of importance to biodiversity; and the potential for cumulative impacts?	Yes; most factors included in Fichtner ESIA study; ambient air pollution and noise level are measured as background data; land use, influence on biodiversity and potential for cumulative impacts have been assessed
Is the following hierarchy for waste management followed: avoidance, reduction, recovery, re-usage, treatment, destruction and final environmentally sound disposal?	Yes; EPC Contractor will have to implement Waste Management Plan as part of his HSE Management Plan; these issues are also part of the ESMPs in Fichtner's ESIA study
Are special provisions for hazardous waste disposal considered?	Yes; Hazardous waste will have to be stored in closed, roofed, ventilated, concreted and banded storage areas for final disposal according to mitigation measures of ESMPs in Fichtner's ESIA study

Main requirements of Performance Standards	Assessment
Is the release of hazardous materials avoided/minimized/controlled?	Yes; oily waste water will be led to an oil separator before entering discharge system of YCCPP-1; HRSG blow down and other drainage from steam/water system will be neutralized at the chemical shop of the power plant before discharging
Are hazardous materials which are subject to international bans or phase-outs used?	No
If pesticides are used, is their selection and management consistent with good international industry practice and part of an integrated pest management and/or vector management strategy?	Not applicable, as no pesticides will be used for clearing of construction site or for maintenance during operation, according to the ESMPs in Fichtner's ESIA study
PS 4: Community Health, Safety, and Security	
PS 4: Community Health and Safety	
Has the potential for community risks and impacts associated with the project been evaluated?	Yes; risks and impacts are assessed in Fichtner's ESIA study and mitigation measured presented in the ESMPs
Have preventive and control measures consistent with GIIP been established?	
PS 4: Infrastructure and Equipment Design and Safety	
Have the structural elements of the project been designed, constructed, operated and decommissioned in accordance with GIIP?	Yes; new YCCPP-2 will be constructed as state-of-the-art power plant
PS 4: Hazardous Materials Management and Safety	
Is the potential for community exposure to hazardous materials and substances that may be released by the project avoided or minimized?	Yes; hazardous waste will be stored accordingly on-site; waste water will be cleaned and neutralized; construction site and power plant will be fenced and guarded by security personnel to avoid unauthorized entry; these topics are part of the ESMPs in Fichtner's ESIA study
PS 4: Ecosystem Services	
Have impacts and risks on priority ecosystem services in use by the Affected Communities been identified?	Not applicable
PS 4: Community Exposure to Disease	
Does the project avoid or minimize the potential for community exposure to water-related and vector-borne diseases caused by the project, including influx of labor?	Not applicable
PS 4: Emergency Preparedness and Response	
See PS 1	

Main requirements of Performance Standards	Assessment
PS 4: Security Personnel	
Have security arrangements guided by principles of proportionality, good international practice, and the national law been made?	Yes; Construction site and power plant will be fenced and guarded by security personnel; PS 4 requirements are part of the ESMPs of Fichtner's ESIA study and thus, will have to be implemented by EPC Contractor and Operator; Grievance Mechanism will be implemented
Is it assured that the security personnel has not been implied in past abuses?	
Have the security personnel been provided training in the use of force and conduct towards the community?	
Has the community been provided with a grievance mechanism through which complains regarding the security arrangements can be done?	
PS 5: Land Acquisition and Involuntary Resettlement	
PS 5 is not triggered by the Project: all land for construction/ operation of YCCPP-2 already acquired. No physical relocation. Existing access roads will be used.	
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	
PS 6: General	
Has the significance of project impacts on biodiversity and ecosystem services been specifically addressed as part of the social and environmental assessment process?	Yes; see Sections 6.1.1 and 6.2.1 and mitigation measures in the ESMPs of Fichtner's ESIA study
Has the practice of adaptive management been adopted?	Not applicable
PS 6: Protection and Conservation of Biodiversity	
Has a hierarchy of avoidance, minimization, restoration and compensation (biodiversity offsets) been considered?	Not applicable
Have natural habitat areas been conversed or degraded? If yes, have the conditions of PS 6 been respected?	No
Have natural habitat areas suffered a net loss of biodiversity?	
Has the implementation of project activities been undertaken in critical habitat? If yes, have the conditions of PS 6 been respected?	
If critical habitat is affected, has a Biodiversity Action Plan been designed to achieve net gains of biodiversity?	Not applicable
Has the implementation of project activities been undertaken in a protected or internationally recognized area? If yes, have the conditions of PS 6 been respected?	No

Main requirements of Performance Standards	Assessment
Do the project activities imply the introduction of alien species and/or of alien species with a high risk of invasive behavior?	No
If applicable, has the intentional introduction of alien species been carried out according to specific regulatory framework?	Not applicable
Have measures been designed to avoid unintentional introduction or spreading of alien species?	
PS 7: Indigenous Peoples	
PS 7 is not triggered by the Project as no groups of Indigenous People are living in the Project Area of Influence.	
PS 8: Cultural Heritage	
PS 8: Protection of Cultural Heritage in Project Design and Execution	
Has cultural heritage been considered as part of the environmental and social assessment?	Yes; see Section 6.3.3 of Fichtner's ESIA study
If the project is located in an area where cultural heritage is expected to be found, has a Chance Find Procedure been established?	No cultural heritage is expected to be found during construction. However, a Chance Find Procedure will be implemented, according to ESMP of Fichtner's ESIA study
Have the Affected Communities who use or have used the cultural heritage for long-standing cultural purposes been consulted?	Not applicable
Is continued access allowed to the cultural site or is an alternative route provided, in case of affectation of sites used for long-standing cultural purposes?	
Has a hierarchy of avoidance, minimization, restoration in situ and restoration off site, and compensation been undertaken?	
If non-replicable cultural heritage needs to be removed, have the following conditions of PS 8 been satisfied?: no technically or financially feasible alternatives existed; the benefits of the projects outweighed the anticipated cultural heritage loss from removal; and removal was conducted by the best available technique.	
If critical heritage is removed, significantly altered, or damaged by the project, have a process of ICP been undertaken with the Affected Communities?	
If the project is located in a legally protected area or a legally defined buffer zone, have the following conditions of PS 8 been satisfied?: compliance with defined regulations and the protected area management plans; consultation with the protected area sponsors and managers, local communities and other key stakeholders? Implementation of additional programs as appropriate to promote and enhance the conservation aims of the protected area.	

Main requirements of Performance Standards	Assessment
PS 8: Project's use of cultural heritage	
If the project will use cultural resources, knowledge, innovations, or practices of local communities embodying traditional lifestyles for commercial purposes, has the client entered a process of ICP?	Not applicable
Have fair and equitable sharing of benefits been ensured?	

After implementation of the mitigation measures and the below defined Environmental and Social Action Plan (ESAP), the Project complies with the requirements of all applicable IFC Performance Standards and ADB Safeguard Requirements.

9.8 Environmental and Social Action Plan

An Environmental and Social Action Plan is presented in this section in order to highlight the most urgent steps for implementation of the mitigation measures given in the ESMPs, naming also the relevant IFC Performance Standards and/or international guidelines and standards.

Table 9-23: Environmental and Social Action Plan including the main mitigation topics

Action	Requirement (IFC Performance Standard, Best Practice)	Responsibility	Implementation Schedule (Timeline)	Target for successful implementation / Reporting requirement
Public Consultations	IFC PS 1	ArmPower with support from FICHTNER as ESIA Consultant	After disclosure of Draft Final ESIA study and ESMP (see detailed time schedule in Annex 12.7) In advance of construction	All Project Affected People and relevant stakeholders involved in Public Consultations (PC); Concerns and comments from PC included in final version of the ESIA Report
Implementation of a Grievance Redress Mechanism for Project Affected People	IFC PS 1	RENCO as EPC Contractor ArmPower as Operator	In advance of construction; to be valid during construction, operation and decommissioning	Grievance log book and reports on successful handling the grievances
If the groundwater level will be lowered (temporarily or permanently), a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater users (nearby industries, agricultural use, etc.) and impact on Hrazdan river basin needs to be assessed including hydrogeological survey, groundwater mapping and modeling.	IFC PS 4 IFC/ WB General EHS-Guidelines	RENCO as EPC Contractor ArmPower as Operator	In advance of construction	Impact assessment and Management Plan including measures such as informing third parties and provision of water supply alternatives, if necessary

Action	Requirement (IFC Performance Standard, Best Practice)	Responsibility	Implementation Schedule (Timeline)	Target for successful implementation / Reporting requirement
Emergency Preparedness and Response Plans based on robust Quantitative Risk Assessment (QRA) / Hazard Identification Study (HAZID) taking into account general and site-specific risks (e.g. adjacent power plant, seismic risk, etc.)	IFC PS 1, 4	RENCO as EPC Contractor ArmPower as Operator	In advance of construction	Emergency Preparedness and Response Plans for construction, operation and decommissioning
Security Force Management Plan guided by principles of proportionality, good international practice and Armenian national law, including training and monitoring of security personnel regarding the use of force and conduct towards the community	IFC PS 1, 4 IFC (2017): Good Practice Handbook on Use of Security Forces - Assessing and Managing Risks and Impacts.	RENCO as EPC Contractor ArmPower as Operator	In advance of construction	Security Force Management Plan for construction and for operation developed and implemented according to named requirements
Development of a site-specific Health, Safety and Environment Management Plan (HSEMP), Health, Safety and Environment System (HSEMS) including grievance mechanism for workers, and establishment of HSE officer	IFC PS 2, 3 IFC/ WB General EHS-Guidelines IFC/ WB EHS Guidelines for Thermal Power Plants IFC/ WB EHS Guidelines for Electric Power Transmission and Distribution	RENCO as EPC Contractor ArmPower as Operator	In advance of construction, valid during construction, operation and decommissioning phases	Site-specific HSEMP and HSEMS for construction, operation and decommissioning periods; Grievance log book and reports on successful handling the grievances; HSE officers established at RENCO and ArmPower

Action	Requirement (IFC Performance Standard, Best Practice)	Responsibility	Implementation Schedule (Timeline)	Target for successful implementation / Reporting requirement
Development of Waste Management Plan and Waste Management System for construction, operation and decommissioning phases including, for operation: risk assessment associated with the mid-term to long-term storage of hazardous waste and adequate sizing and monitoring frequency of the storage area	IFC PS 3 EU Directive 2008/98/EC (Waste Framework Directive)	RENCO as EPC Contractor ArmPower as Operator	In advance of construction	Waste Management Plans according to EU Directive 2008/98/EC
Provision of toilets and sanitary rooms for the workforce at the construction site, separately for men and women, as part of the HSEMP. Sewage water to be led to the sewage water system of YCCPP-1 or installation of septic tanks for collecting sewage water, which then would have to be emptied by a specialized company from time to time.	IFC PS 2, 3 IFC/ EBRD Guidance Note on Workers' Accommodation (2009)	RENCO as EPC Contractor	In advance of construction and during construction phase	Provision of adequate toilets and sanitary facilities and appropriate handling of sewage water Contract with specialized disposal company (if necessary)
Additional soil sampling in different depths will be done at the site for analyses of TPH, PAH, BTEX, and Metals. Depending on the results the volume of the contaminated soil can be quantified and it can be decided about the necessity of a site remediation or removal of contaminated soil (handling as hazardous waste).	IFC PS 3	RENCO as EPC Contractor	In advance of construction	Analysis Report and measures for handling of potentially contaminated soil
Additional analysis of groundwater upstream, at the site, and downstream for content of TPH, PAH, BTEX, Metals, as well as pH, dissolved oxygen, mineralization, BOD5, COD5.	IFC PS 3	RENCO as EPC Contractor	In advance of construction	Analysis Report and measures for handling of groundwater

Action	Requirement (IFC Performance Standard, Best Practice)	Responsibility	Implementation Schedule (Timeline)	Target for successful implementation / Reporting requirement
Analysis of water quality parameters of Hrazdan River upstream and downstream of the discharge point	IFC PS 3, 6	RENCO as EPC Contractor	In advance of construction	Analysis Report and measures for handling of waste water
Development of Chance Find Procedure regarding historic and cultural goods; and information of the Ministry of Culture about the Project prior to construction, in order to allow the Ministry to perform a proof of occurrence/absence of any cultural or historical goods at the Project site, including a preconstruction field survey, if deemed necessary by the Ministry	IFC PS 8	RENCO as EPC Contractor	In advance of construction to be valid during construction	Chance Find Procedure established as well as training program for workforce. Ministry of Culture informed about the Project
Development of site-specific non-discriminatory hiring and wage policy; Employment of local people for construction works (offer job opportunities in nearby villages and Yerevan); Improve recruitment of women for construction works	IFC PS 2 Guidelines of International Labor Organization (ILO)	RENCO as EPC Contractor ArmPower as Operator	In advance of construction	Work contracts according to guidelines of International Labor Organization (ILO)
Development of a Traffic Management Plan including among others transport of workers, planning of truck movements, short-term closure of roads (if necessary: including details about road use (by whom and for what purpose) and alternative routes), etc.	IFC PS 2, 3, 4	RENCO as EPC Contractor	In advance of construction	Transport of workers implemented; additional traffic due to construction adapted to existing traffic situation
Air quality monitoring campaign to be repeated in next winter and spring in order to cover all seasons of an annual cycle	IFC PS 3, 4	RENCO as EPC Contractor	In advance of construction	Updated Air Dispersion Calculation (ADC)

Action	Requirement (IFC Performance Standard, Best Practice)	Responsibility	Implementation Schedule (Timeline)	Target for successful implementation / Reporting requirement
Based on the updated ADC results, analyze the need for further mitigation measures for air quality impacts	IFC PS 3, 4	RENCO as EPC Contractor	In advance of construction	Updated Air Dispersion Calculation (ADC)
Development of a Decommissioning Plan and of a Detailed Decommissioning Plan	IFC PS 2, 3, 4	ArmPower as Operator	Decommissioning Plan: At least 5 years before closure of YCCPP-2 Detailed Decommissioning Plan : At least 18 months before closure of YCCPP-2	Decommissioning Plan prepared and implemented

10. Overall Findings, Conclusion, and Recommendations

The main possible impacts of the Project will be contamination of soil and water, impacts on health and safety of workers and the public, possible lowering of the groundwater level (still to be investigated) at the construction/power plant site, air and noise emissions, and liquid effluents from the new power plant.

Negative environmental and social impacts of the Project will be low or medium, if all proposed mitigation measures of the ESMPs are implemented. There will be no severe social impacts from the Project; no land acquisition or related resettlement will be necessary. Regular **monitoring of noise and air emissions as well as effluents** during construction and /or operation phase shall be performed, in order to guarantee adherence to relevant national and/or international limit values.

The calculations undertaken with a Noise Propagation Model for YCCPP-2 have shown that the operation of **the new plant will not produce any significant increase of the noise pressure at the sensitive receptors.**

Based on the Air Dispersion Calculation results, a Good Engineering Practice stack height of 66 meters (GEP stack height) will be built for the power plant to guarantee the compliance with the **air quality** standards at the ground level (instead of the originally foreseen 35 meters stack). To further guarantee compliance in case of new development projects in the area, or in case the existing pollution load (baseline) is very high, additional NOx emissions reduction measures are planned, namely the installation of a SCR. The existing pollution load will be finally characterized once results of baseline measurements of Winter (specially) and Spring are available.

Positive impacts are related to creating job opportunities, especially during construction. New job opportunities during operation may be created if investment on training of qualified workers is done. The additional power generation will increase the total output of electric energy, providing a more reliable power supply countrywide.

If a lowering of the groundwater level at the construction/ plant site will be performed, a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater and impact on Hrazdan river basin need to be assessed including a hydrogeological survey, groundwater mapping and modeling.

In summary, it can be concluded that the proposed Project of Yerevan Steam and Gas Combined Cycle Power Plant (YCCPP-2) **can be implemented without having significant adverse impacts on the ecological and social environment**, if all mitigation measures proposed in the ESMPs and the ESAP are implemented.

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12. Annexes

12.1 Communication from Yerevan Municipality - illegal dwellings



ԵՐԵՎԱՆԻ ԶԱՂԱՔԱՊԵՏԱՐԱՆ
ԵՐԵՎԱՆ ԲԱՂԱՔԻ ԳԼԽԱՎՈՐ ՃԱՐՏԱՐԱՊԵՏ

ԳՅ, 0015, ք. Երևան, Արգիշտիի 1

№ 50/2-41827

« 10 » 11 2017 թ.

«ԱՐՄՓԱՌԻԵՐ» ՍՊԸ ԳԼԽԱՎՈՐ ՏՆՕՐԵՆ
ՊԱՐՈՆ Բ.ԿՈՒԿՈՒՐԱԿԻՆ

Հարգելի պարոն Կուկուրակի

Ի պատասխան Երևանի քաղաքապետին հասցեագրված Ձեր 07.11.2017թ. գրության Երևանի Շենգավիթ վարչական շրջանում նախատեսվող ՀՇԳՑ-2 էլեկտրակայանի կառուցման կապակցությամբ բարձրացված հարցերի վերաբերյալ տեղեկացնում ենք, որ նախատեսվող ՀՇԳՑ-2 էլեկտրակայանից դեպի հյուսիս-արևելք ընկած հարակից տարածքներում Շենգավիթ վարչական շրջանի համար մշակված գոտիավորման նախագծով քաղաքաշինական ծրագրային գործունեություն չի նախատեսվում: ՀՇԳՑ-2 էլեկտրակայանի շինարարությունը որևէ սոցիալական բացասական ազդեցություն չի կարող ունենալ շինարարական հրապարակից նշված հեռավորության վրա գտնվող կացարանների հետագա ճակատագրի վրա: Միաժամանակ այդ կացարանների և դրանց բնակիչների հետ կապված հետագա գործողությունները որևէ գույքային, սոցիալական և ֆինանսական հետևանքներ չեն կարող առաջացնել ՀՇԳՑ-2 էլեկտրակայանի շինարարության ծրագրի համար:

S.ԲԱՐՍԵՂՅԱՆ

Փո: 011 514 150

(BLANK OF)
YEREVAN MUNICIPALITY
MAIN ARCHITECTURE OF YEREVAN

10.11.2017

Nº 50/2-71827

To the general director
Of "ArmPower" CJSC
Mr. C. Cucurachi

Dear Mr. Cucurachi,

In response to Your letter of 07.11.2017 addressed to the Yerevan Mayor, on the questions arisen for the planned CCPP-2 construction in the Shengavit administrative area, we inform, that in the adjacent areas situated to the north-east of the CCPP-2, a planned action of urban development is not foreseen by the project of the developed zoning for the Shengavit administrative area. The CCPP-2 construction cannot have any social negative impact on the further destiny of dwellings situated in the indicated distance from the construction site. At the same time, the further actions regarding those dwellings and their inhabitants cannot cause any property, social and financial consequences for the CCPP-2 construction project.

T. Barseghyan

12.2 Record of Meetings

Date	Agency/ Institution	Place	Name of Person consulted	Reason for Visit
04.07.2017	RENCO SPA	Yerevan	Gegham Baklachev (RENCO), Vram Tevosyan (Consecoard LLC)	Discussion of technical and environmental issues of construction and operation of YCCPP-2
04.07.2017	Municipality of Kharberd village	Kharberd	Kamo Kakoyan (Mayor of Kharberd), Gegham Baklachev, Vram Tevosyan	Introducing the Project; discussing possible concerns
04.07.2017	Municipality of Ayntap village	Ayntap	Karen Sargsyan (Mayor of Ayntap), Gegham Baklachev, Vram Tevosyan	Introducing the Project; discussing possible concerns
05.07.2017	YCCPP-2 site	Yerevan	Gegham Baklachev, Vram Tevosyan	Visit of site and surrounding area
05.07.2017	RENCO SPA	Yerevan	Gabriele Colletta (RENCO engineer), Vram Tevosyan	Discussion of technical issues of construction and operation of YCCPP-2
06.07.2017	Municipality of Yerevan, Staff of Head of Erebuni Administrative District	Yerevan	Edgar Mkrtchyan (Head of Department), Gegham Baklachev, Vram Tevosyan	Introducing the Project; discussing possible concerns
06.07.2017	Aarhus Center (NGO)	Yerevan	Silva Ayvazyan (Coordinator of Yerevan Aarhus Center), Gegham Baklachev, Vram Tevosyan	Introducing the Project; discussing environmental and social concerns
06.07.2017	Environmental Monitoring and Information Center	Yerevan	Shahnazaryan Gayane (Deputy Director), Gegham Baklachev, Vram Tevosyan	Discussing monitoring of stack emissions and of ambient air pollution
06.07.2017	YCCPP-1	Yerevan	Arkadi Gevorgyan (Chief Engineer), Gegham Baklachev, Vram Tevosyan	Discussing technical and environmental issues of operation of YCCPP-1
07.07.2017	Municipality of Yerevan, Environmental Department	Yerevan	Avet Martirosyan (Head of Environmental Department), Gegham Baklachev, Vram Tevosyan	Introducing the Project; discussing possible concerns
07.07.2017	Municipality of Yerevan, Staff of Head of Shengavit Administrative District	Yerevan	Armen Sargsyan (Head of Department), Gegham Baklachev, Vram Tevosyan	Introducing the Project; discussing possible concerns
07.07.2017	RENCO SPA	Yerevan	Avetik Horkannisyan (RENCO Engineer), Gegham Baklachev, Vram Tevosyan	Discussion of technical and environmental issues of construction and operation of YCCPP-2

12.3 Analysis of Oil in the Contaminated Soil from Construction Site

BERATUNG ANALYTIK PLANUNG	WESSLING WESSLING GmbH Impexstraße 5 · 69190 Walldorf www.wessling.de				
WESSLING GmbH, Impexstraße 5, 69190 Walldorf GefaÖ GmbH - Gesellschaft für angewandte Ökologie und Umweltplanung Herr Dr. Roland Marthaler Impexstraße 5 69190 Walldorf	Geschäftsfeld: Umwelt Ansprechpartner: J. Thomsen Durchwahl: +49 6227 8 209 96 Fax: +49 6227 8 209 15 E-Mail: Julian.Thomsen@wessling.de				
<h3>Prüfbericht</h3> <h4>Jerevan CCPP-2</h4>					
Prüfbericht Nr.	CWA17-016172-1	Auftrag Nr.	CWA-06752-17	Datum	18.07.2017
Probe Nr.	17-109040-01				
Eingangsdatum	10.07.2017				
Bezeichnung	Stelle 1				
Probenart	Feststoff allgemein				
Probenahme	06.07.2017				
Probenahme durch	Auftraggeber				
Probennehmer	Jonas Mertin				
Probengefäß	Tüte				
Anzahl Gefäße	1				
Untersuchungsbeginn	11.07.2017				
Untersuchungsende	18.07.2017				
Probenvorbereitung					
Probe Nr.	17-109040-01				
Bezeichnung	Stelle 1				
Gesamtmasse der Originalprobe	g	200			
Polychlorierte Biphenyle (PCB)					
Probe Nr.	17-109040-01				
Bezeichnung	Stelle 1				
PCB Nr. 28	mg/kg	OS	<0,05		
PCB Nr. 52	mg/kg	OS	<0,05		
PCB Nr. 101	mg/kg	OS	<0,05		
PCB Nr. 118	mg/kg	OS	<0,05		
PCB Nr. 138	mg/kg	OS	<0,05		
PCB Nr. 153	mg/kg	OS	<0,05		
PCB Nr. 180	mg/kg	OS	<0,05		
Summe der 6 PCB	mg/kg	OS	-/-		
PCB gesamt (Summe 6 PCB x 5)	mg/kg	OS	-/-		
Seite 1 von 4					
Deutsche Akkreditierungsstelle DIN-13283-20:00	Durch die DAkkS nach DIN EN ISO/IEC 17025 akkreditiertes Prüflaboratorium. Die Akkreditierung gilt für die mit * markierten Prüfverfahren. Eine detaillierte Auflistung unserer akkreditierten Prüfverfahren befindet sich in der Urkunde des Labors der DAkkS auf unserer Internetseite unter www.wessling.de. Messergebnisse beziehen sich ausschließlich auf die uns vorliegenden Prüfobjekte. Prüfberichte dürfen ohne Genehmigung der WESSLING GmbH nicht auszugsweise vervielfältigt werden.				Geschäftsführer Julia Wessling, Florian Wessling AB Steinfurt 493 1153

Prüfbericht Nr.	CWA17-016172-1	Auftrag Nr.	CWA-06752-17	Datum	18.07.2017
Probe Nr.					17-109040-01
Summe der 7 PCB		mg/kg	OS	-/-	



Deutsche
 Akkreditierungsstelle
 DAF-14152-01-00

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Geschäftsführer
 Julia Weßling, Florian Weßling
 AB-Steinfurt RR 9/93

Prüfbericht Nr. CWA17-016172-1 Auftrag Nr. CWA-06752-17 Datum 18.07.2017

Probe Nr.	17-109040-02
Eingangsdatum	10.07.2017
Bezeichnung	Stelle2
Probenart	Feststoff allgemein
Probenahme	06.07.2017
Probenahme durch	Auftraggeber
Probenahmer	Jonas Martin
Probengefäß	Tüte
Anzahl Gefäße	1
Untersuchungsbeginn	11.07.2017
Untersuchungsende	18.07.2017

Probenvorbereitung

Probe Nr.	17-109040-02
Bezeichnung	Stelle2
Gesamtmasse der Originalprobe	g 200

Polychlorierte Biphenyle (PCB)

Probe Nr.	17-109040-02
Bezeichnung	Stelle2
PCB Nr. 28	mg/kg OS <0,05
PCB Nr. 52	mg/kg OS <0,05
PCB Nr. 101	mg/kg OS <0,05
PCB Nr. 118	mg/kg OS <0,05
PCB Nr. 138	mg/kg OS <0,05
PCB Nr. 153	mg/kg OS <0,05
PCB Nr. 180	mg/kg OS <0,05
Summe der 6 PCB	mg/kg OS -/-
PCB gesamt (Summe 6 PCB x 5)	mg/kg OS -/-
Summe der 7 PCB	mg/kg OS -/-

Seite 3 von 4



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Beschäftigte:
 Julia Weßling, Florian Weßling
 AB Steinfurt HRB 1953

Prüfbericht Nr. **CWA17-015172-1** Auftrag Nr. **CWA-06752-17** Datum **18.07.2017**

Abkürzungen und Methoden

Polychlorierte Biphenyle (PCB)

DIN EN 15006^A

ausführender Standort

Umweltanalytik Walldorf

Umweltanalytik Walldorf

OS

Originalsubstanz



Julian Thomsen
M. Sc. Biogeowissenschaften
Sachverständiger Umwelt und Wasser

Seite 4 von 4



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Beauftragter:
Julia Weßling, Florian Weßling
AB Standort 1818 1913

12.4 Report on Groundwater Quality and Possible Soil Contamination

Report
On Monitoring Services
Yerevan, August 11, 2017

Based on the contract signed between "Renco Armestate" LLC and "Consecoard" LLC on 14.07.2017, the specialists of "Consecoard" LLC carry out monitoring of Yerevan TPP-2 construction site, which includes:

- topsoil, surface water and groundwater sampling according to the list submitted by the Client,
- organizing the tests in the appropriate licensed laboratory according to the List of Materials and Indicators Provided by the Client,
- analysis of results and comparison with sanitary norms in the Republic of Armenia.

Currently, "Consecoard" LLC specialists have conducted all samplings:

1. Land
 - from the central part of the area allocated for construction,
 - from the roadside,
 - near the pile of barrels of used oils existing in the area
2. Water
 - water leak during drilling of the area. Sampled water taken during drilling of a site for construction. The water was taken from the wells 7.9 m and 2.8 m, dug for sampling near the BH 1 (x – 457072.44, y – 4440369.06) and BH 17 (x – 457316.96, y – 4440491.54) wells for geological survey. Sampling was carried out 3 hours after the drilling works to ensure water simplicity.
 - water running through the pipe in the central part of the construction site,
 - outflow of canal water from the operating Yerevan TPP1

The sampling was conducted by the methodology of the Monitoring Center of the Ministry of Nature Protection of the Republic of Armenia with the participation of the representative of Renco company: Gegham Baklachev.

The collected samples have been moved to the “Laboratory of Environmental Monitoring and Information Center” SNCO of the Ministry of Nature Protection of the Republic of Armenia.

The results and data analysis are presented below.

Table 1. Water, common indicators:

№	Measured indicator	Unit of measurement	The results of analysis			The method of analysis
			Sample 1	Sample 2	Sample 3	
1	Hydrogen indicator (pH)	-	7.25	6.68	8.34	Electrochemical
2	Dissolved oxygen	mgO ₂ /l	1.34	7.37	6.61	Electrochemical
3	Mineralization	mg/l	1708	111	786	Electrochemical
4	BOD ₅	mgO ₂ /l	1.50	1.19	6.80	Electrochemical
5	COD ₅ ¹	mgO ₂ /l	288	136	416	Oxidation by bichromate

¹ The COD value is high since the laboratory test was performed weeks after sampling.

Table 2. Water, Metals and Organic Compounds:

№	Measured indicator	Unit of measurement	The results of analysis			The method of analysis
			Sample 1	Sample 2	Sample 3	
6	Lithium	Mg/l	0.0340	0.0038	0.0212	ICP-MS ²
7	Beryllium	Mg/l	<10 ⁻⁶	<10 ⁻⁶	<10 ⁻⁶	ICP-MS
8	Boron	Mg/l	0.9258	0.0259	0.2678	ICP-MS
9	Natrium	Mg/l	269.5	6.8	95.5	ICP-MS
10	Magnesium	Mg/l	18.8	5.8	24.0	ICP-MS
11	Aluminum	Mg/l	0.0795	0.0052	0.0097	ICP-MS
12	Total phosphorus	Mg/l	0.0798	0.1148	0.2157	ICP-MS
13	Potassium	Mg/l	2.4	2.4	8.2	ICP-MS
14	Calcium	Mg/l	171.1	14.8	28.8	ICP-MS
15	Titan	Mg/l	0.0110	0.0037	0.0020	ICP-MS
16	Vanadium	Mg/l	0.3475	0.0213	0.0092	ICP-MS
17	Chrome	Mg/l	0.0079	0.0010	0.0063	ICP-MS
18	Iron	Mg/l	0.2262	0.0337	0.0828	ICP-MS
19	Manga	Mg/l	0.0818	0.0009	0.0020	ICP-MS
20	Cobalt	Mg/l	0.0017	0.0007	0.0002	ICP-MS
21	Nickel	Mg/l	0.0029	0.0003	0.0012	ICP-MS
22	Copper	Mg/l	0.0034	0.0006	0.0033	ICP-MS
23	Zinc	Mg/l	3.0628	0.0025	0.0038	ICP-MS
24	Arsen	Mg/l	0.0541	0.0011	0.0059	ICP-MS
25	Selen	Mg/l	0.0054	0.0002	0.0014	ICP-MS
26	Strontium	Mg/l	2.2267	0.0821	0.2446	ICP-MS
27	Molybdenum	Mg/l	0.0588	0.0009	0.0485	ICP-MS

² The applied method: Inductively coupled plasma mass spectrometry (ICP-MS)

28	Cadmium	Mg/l	0.00017	0.00001	0.00014	ICP-MS
29	Tuna	Mg/l	0.00109	0.00020	0.00041	ICP-MS
30	Antimony	Mg/l	0.00015	0.00010	0.00008	ICP-MS
31	Barium	Mg/l	0.0268	0.0070	0.0219	ICP-MS
32	Lead	Mg/l	0.0011	0.0002	0.0005	ICP-MS
33	Benzene	Mg/l	<0,0001	-	<0,0001	Gas chromatography
34	Toluene	Mg/l	<0,0001	-	0.001	Gas chromatography
35	Oktan	Mg/l	<0,0001	-	<0,0001	Gas chromatography
36	Ethylbenzene	Mg/l	<0,0001	-	<0,0001	Gas chromatography
37	Xylol	Mg/l	<0,0001	-	<0,0001	Gas chromatography
38	Nona	Mg/l	<0,0001	-	0.00014	Gas chromatography
39	Mixture of alkanes (C ₁₀ H ₂₂ -C ₂₂ H ₄₆)	Mg/l	3.474	-	2.758	Gas chromatography

According to RA Government Decree “ On defining water quality norms for each water basin management area taking into consideration the peculiarities of the Locality,” (RA Government Decree N 75-N, dated on 27 January 2011,) the surface water quality assessment system in Armenia distinguishes five class statuses for each grade: "excellent" (1st grade), "good" (2nd grade), "mediocre" (3rd class); "Insufficient" (grade 4) and "bad" (5th grade).

The government's decision envisages maximum permissible concentrations for all classes, in case of exceeding them, the flow to water resources is prohibited.

Yerevan Thermal Power Plant territory is located in Hrazdan river basin(watershade) management area. According to "Armeconitoring"'s reference outcomes on " Ecological Monitoring of the RA Environment" for 2015, the water in the lower stream of the Hrazdan River is "bad" (5th grade).

Below are the 5 th class limits for the Hrazdan River basin management, along with the results of the analysis.

Table 3. Water quality comparative data. General indicators

№	Comparable index	Unit of measurement	Norms by Water Quality Classes					The average result of the analysis
			I	II	III	IV	V	
1	2	3	4	5	6	7	8	9
1	Hydrogen indicator (pH)	-	6.5-9	6.5-9	6.5-9	6.5-9	<6.5 >9	7.25 - 8.34
2	Dissolved oxygen	mgO ₂ /l	>7	>6	>5	>4	<4	1.34 - 7.37
3	Mineralization	mg/l	74	148	1000	1500	>1500	111 - 1708

4	BOD ₅	mgO ₂ /l	3	5	9	18	>18	1.19 - 6.80
5	Benzene	Mg/l	-	-	-	-	-	<0,0001
6	Toluene	Mg/l	-	-	-	-	-	0.001
7	Octane	Mg/l	-	-	-	-	-	<0,0001
8	Ethylbenzene	Mg/l	-	-	-	-	-	<0,0001
9	Xylol	Mg/l	-	-	-	-	-	<0,0001
10	Nona	Mg/l	-	-	-	-	-	0.00014
11	Mixture of alkanes (C ₁₀ H ₂₂ - C ₂₂ H ₄₆)	Mg/l	-	-	-	-	-	2.758 – 3.474

Table 4. Water quality comparative data. Metals

№	Comparable index	Unit of measurement	Norms by Water Quality Classes					The average result of the analysis
			I	II	III	IV	V	
1	Lithium	mkg/l	5	5	5	<2500	>2500	3.8 – 34.0
2	Beryllium	mkg/l	0.014	0.028	0.056	100	>100	< 0.001
3	Boron	mkg/l	9	450	700	1000	>2000	25.9 – 925.8
4	Natrium	mg/l	5	10	20	40	>40	6.8 – 269.5
5	Magnesium	mg/l	2,8	50	100	200	>200	5.8 – 24.0
6	Aluminum	mkg/l	65	130	260	5000	>5000	5.2 – 79.5
7	Total phosphorus	mg/l	0,025	0,2	0,4	1	>1	0.08 – 0.2157
8	Potassium	mg/l	1,5	3,0	6,0	12,0	>12,0	2.4 – 8.2
9	Calcium	mg/l	9,7	100	200	300	>300	14.8 – 171.1
10	Titanium	mg/l	-	-	-	-	-	0.002 – 0.011
11	Vanadium	mkg/l	1	2	4	8	>8	9.2 – 34.79
12	Chrome	mkg/l	1.0	11.0	100	250	>250	1.0 – 7.9
13	Iron	mg/l	0,08	0,16	0,5	1	>1	0.0337 – 0.226
14	Manga	mkg/l	5	10	20	40	>40	0.9 – 81.8
15	Cobalt	mkg/l	0,14	0,28	0,56	1,12	>1,12	0.2 – 1.7
16	Nickel	mkg/l	1.0	11.0	50	100	>100	0.3 – 2.9
17	Copper	mkg/l	3.0	23.0	50	100	>100	0.6 – 3.4
18	Zinc	mkg/l	3.0	100	200	500	>500	2.5 – 3063.0
19	Arsen	mkg/l	0,13	20	50	100	>100	1.1 – 54.1
20	Selene	mkg/l	0,5	20	40	80	>80	0.2 – 5.4
21	Strontium	mg/l	-	-	-	-	-	0.081 – 2.2267
22	Molybdenum	mkg/l	7	14	28	56	>56	0.9 – 58.8
23	Cadmium	mkg/l	0,02	1,02	2,02	4,02	>4,02	0.01 – 0.17
24	Tin	mkg/l	0,09	0,18	0,36	0,72	>0,72	0.2 – 1.09
25	Antimony	mkg/l	0,2	0,38	0,76	1,52	>1,52	0.08 – 0.15
26	Barium	mkg/l	9	18	36	1000	>1000	7.0 – 26.8
27	Lead	mkg/l	0,3	10,3	25	50	>50	0.2 – 1.1

As can be seen from the table, the results of all sampling tests are within the limits of this class of water, and consequently, this quality water can be directed to the downstream of Hrazdan River, without additional cleaning.

2. Land

Based on the characteristics of soil analysis, preliminary analysis have been performed for some indicators, the results of which are given below.

External inspection: brown soil and ground, with the average content of rock material.

Vegetal and sub-vegetal layer, 13 -22 cm:

pH- in water extract ` 6.5 – 7.3

The sum of absorbed cations, m/eqv 100g in land: 28.5 – 32.2.

Table 5. Soil quality data. Metals

N	Measured index	Unit	Measured value			Method applied
			Sample 1	Sample 2	Sample 3	
6	Lithium	g/kg	0.0061	0.0175	0.0140	ICP-MS
7	Beryllium	g/kg	0.0004	0.0012	0.0010	ICP-MS
8	Boron	g/kg	0.0373	0.0435	0.0440	ICP-MS
9	Sodium	g/kg	6.0	15.7	10.3	ICP-MS
10	Magnesium	g/kg	2.4	14.8	8.7	ICP-MS
11	Aluminium	g/kg	9.17	73.24	45.77	ICP-MS
12	General Phosphorus	g/kg	0.28	0.84	0.64	ICP-MS
13	Potassium	g/kg	5.8	14.9	10.9	ICP-MS
14	Calcium	g/kg	18.2	83.4	44.4	ICP-MS
15	Titanium	g/kg	1.72	4.40	3.24	ICP-MS
16	Vanadium	g/kg	0.0633	0.1329	0.1010	ICP-MS
17	Chromium	g/kg	0.0174	0.0957	0.0518	ICP-MS
18	Iron	g/kg	5.77	41.04	22.07	ICP-MS
19	Manganese	g/kg	0.1579	0.8231	0.4255	ICP-MS
20	Cobalt	g/kg	0.0077	0.0179	0.0164	ICP-MS
21	Nickel	g/kg	0.0218	0.0549	0.0472	ICP-MS
22	Copper	g/kg	0.0167	0.0691	0.0354	ICP-MS
23	Zinc	g/kg	0.0454	0.1010	0.0588	ICP-MS
24	Arsenic	g/kg	0.0086	0.0118	0.0110	ICP-MS

25	Selenium	g/kg	0.0018	0.0012	0.0043	ICP-MS
26	Strontium	g/kg	0.1022	0.3144	0.1845	ICP-MS
27	Molybdenum	g/kg	0.0101	0.0049	0.0106	ICP-MS
28	Cadmium	g/kg	0.00008	0.00025	0.00016	ICP-MS
29	Tin	g/kg	0.00049	0.00206	0.00098	ICP-MS
30	Antimony	g/kg	0.00027	0.00086	0.00039	ICP-MS
31	Barium	g/kg	0.0779	0.4139	0.2195	ICP-MS
32	Lead	g/kg	0.0065	0.0369	0.0129	ICP-MS

The applied method: Inductively coupled plasma mass spectrometry (ICP-MS)

The results of soil survey and general indicators analysis indicate that soil quality is in line with the general characteristics of the region and is within the limits of permitted norms.

V. Tevosyan, director of "Consecoard" LLC

12.5 Noise Impact Study

Yerevan 2 CC Power Plant ArmPower CJSC

Noise Impact Study

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3	20/11/2017	Draft Final Report	E C Consulting /F.Sormani	Sousa <i>Sousa</i>

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1. Scope of the Report

This Noise Propagation Study has been produced as part of the ESIA Report.

A Noise Calculation (NC) was produced for this purpose for the new power plant (YCCPP-2) site. The NC has been done by using the propagation model SoundPLAN (Braunstein + Berndt GmbH). The model determines sound propagation based on the provisions of ISO 9613 - 2. This model is widely used in EU noise mapping projects.

The application of the model allowed determining whether the noise levels emitted by the new plant will represent a nuisance to the surrounding areas, i.e., if the resulting ambient noise will be above the national and international standards.

2. Brief Project Description

To partially reduce the gap between the offer and demand of electric energy foreseen in the Republic of Armenia for the next years, the MOE has signed for the construction of a new 250 MW Combined Cycle type Power Plant, gas fired (the CCGT), in the surroundings of Yerevan city.

The electrical power shall be generated by means of a gas turbine driven generator and, at the same time, steam shall be produced from heat recovery from the GT exhausts. The steam will be fed to a steam turbine, driving an additional power generation unit.

The technology of the most modern gas turbine improving the overall efficiency of the thermal cycle joined with the low environmental impact makes the natural gas fired combined cycle technology, at present, an ideal solution in power sectors.

The Project is a combined cycle plant in a multi-shaft arrangement. The plant will consist of a Gas Turbine (GT) with generator, a Steam Turbine (ST) with generator, a Heat Recovery Steam Generator (HRSG) and other associated equipment and systems.

The plant will be designed for highly efficient operation and for high reliability and availability.

The multi-shaft arrangement is a proper solution with its high flexibility allowing different modes of operation and easy maintenance.

3. Methodology

The aims of this study are:

- calculation of noise emission contributions at the sensitive receptors determined by the CCGT operation;
- predictive definition of the acoustic pressure at the sensitive receptors during CCGT operation;
- predictive verification of the compliance with the applicable limits at sensitive receptors.

On the basis of the Project data, the sound contribution of the CCGT during operation at the most exposed sensors was calculated.

The values thus obtained were compared to the applicable limits.

The new 250 MW Yerevan Combined Cycle Power Plant (“CCPP”) will be located in the vicinity of Yerevan city, in the area adjacent to the existing Yerevan CCPP, currently managed by the Yerevan TPP CJSC.



Figure 3-1: Geographic overview of the project

The following figure shows the location of the Power Plant.

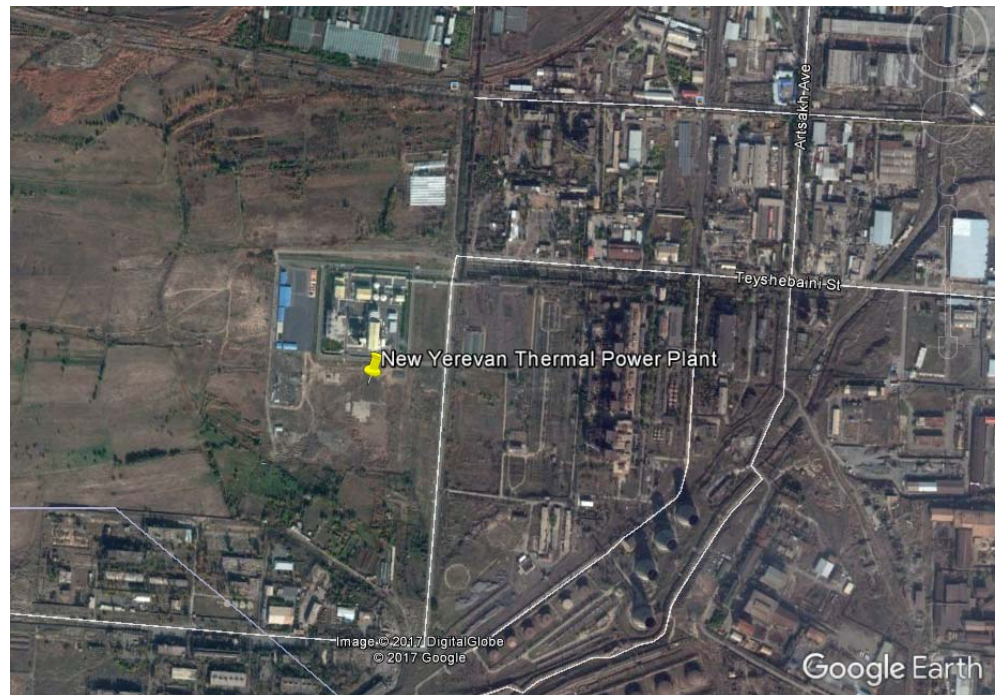


Figure 3-2: Detailed Geographic overview of the project

The first step of the Noise Calculations has been to state the area potentially most affected by the Project's noise emissions, defined as Assessment area.

4. Noise sources

The whole plant has been designed with particular attention to limit the noise emissions.

The most relevant noise sources will be located inside soundproofed cabin/buildings to minimize noise propagation.

The acoustic enclosure for Gas Turbine and Generator is located over the Gas Turbine thermal block and the generator. It includes the sidewalls for the exhaust gas diffuser area.

The acoustical enclosure is designed and suitable for indoor application, i.e. the thermal block compartment, the generator compartment and the exhaust gas diffuser area compartment are located inside a building.

The main purposes of the acoustic enclosure and the related installations are:

- To reduce the noise emissions generated by the Gas Turbine thermal block, the exhaust gas diffuser and the generator
- To cool down the Gas Turbine set environment during operation.

The acoustical enclosure is completely equipped with structural steel frame, acoustic panels (removable for maintenance), penetration elements for cabling and piping, fully automatic ventilation system, access stairs and ladders, industrial grade/self-closing access doors with panic bars and internal lighting, emergency lighting and small power outlets.

5. Noise Propagation Model

The calculation of the predictive noise propagation was performed in accordance with the ISO 9613-2.

The calculation was performed through SoundPlan (open field propagation simulation software) after setting the model parameters:

- contour setting (geomorphological-acoustic parameters of the propagation environment);
- calculation settings;
- characterization of sound emission sources.

5.1 Software used for simulation: Sound Plan

SOUND PLAN is an open-field sound propagation simulation program and is one of the most used software in environmental noise studies. Modeling of sound propagation is done through a numerical calculation model called 'search angle method'. Starting from every single point of reception considered in the simulation of sound propagation, SOUND PLAN simulates a series of search rays that propagate uniformly in all directions and, for each of them, the software analyzes the physical-geometric and acoustic characteristics of the propagation environment, determines the 'path' leading to the sound source by applying known properties on the direction of propagation of the sound rays.

Therefore, for each sound radius that reaches the source, it applies the attenuating factors related to the acoustic phenomena affected by the ray (the attenuating factors are evaluated quantitatively by means of the ISO 9613-2) and then, it sums, at the receiving point considered, all the contributions made by the sound rays that had reached at least one sound source.

For this numeric procedure to be executed in a reasonable time by the computer, using Sound Plan it is possible to make 'settings' on the accuracy of the calculation model and in particular on:

- the incremental value of the angle that identifies two contiguous rays of search;
- the maximum number of reflections to be considered for the search radius before its contribution is considered null;
- the circular width of the field of research.

Sound Plan is basically based on three modules:

- a 'geo-database'
- a calculation module
- a result display module

In the geo-database, the propagation environment is represented in the three dimensions and the surfaces of the same are acoustically characterized. Emission sources are also located, each of which must be associated with acoustic characterization (source spectrum or total source sound pressure level).

By the calculation module it's possible to select the calculation standard to be used and once selected, the standard can be 'set' in the values of the propagation environment conditions.

The result display module renders the calculation results according to the purpose of the calculation.

5.2 Model runs

The model has been set up and launched. The results have been collected and analyzed.

The Set up of the model has implied the input of all basic data into the software. This has included information regarding the location of sensitive receptors, the noise emission and the technical data of the new YCCPP-2 including terrain data, and dimensions of the nearby structures.

The following aspects have been considered

- The soil use and occupation (including sensitive receptors)
- The terrain characteristics:
- The Plant's noise emissions and technical data.

5.1.1 Setting boundary conditions

The propagation area considered is the installation area of the Project Center and its immediate vicinity and is such as to include sensitive receptors identified.

The calculation of the contribution of the sound sources has been carried out on an area of the territory so that the effects of the sound can be considered as null.

In order to cover within the spatial scope of the study the sensitive receptors identified a computational area of about 3 km x 3 km was considered.

The geo-database was built through a detailed plan of the area.



Figure 5-1: The computational area

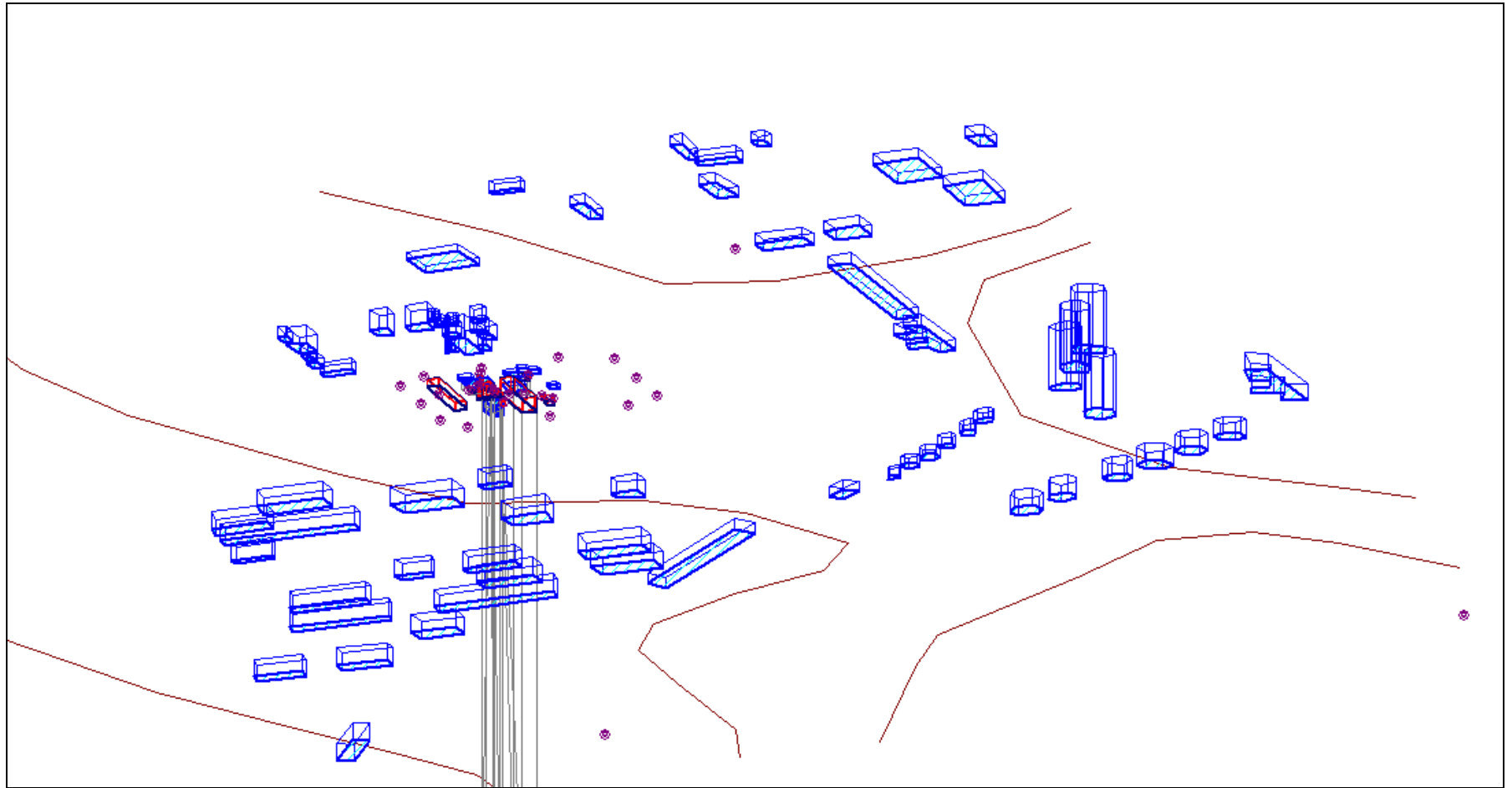


Figure 5-2: A geodatabase 3D view of the computational area

5.2 Setting the sound sources

The allocation of the sound emission to the various components of the plant was made in analogy to the technical specifications for the purchase of the various equipment, according to the designers' instructions according to the values reported in the Table 5-1.

Table 5-1: Sound pressure level of the most relevant sources considered in the model

Item	Source	Lp(A) (@1m) [dB(A)]
HRSG	Lateral Walls	71
	Roof	71
Air Intake GT	Intake	77
HRSG Diffusor	All surfaces	70
Main Machine Building (GT, ST)	All surfaces	60
Stack	External surfaces	75
	Mouth	80
Close cycle heat exchanger	All surfaces	75
Cooling Towers	All surfaces	80
Main Transformer	All surfaces	80
Units Transformer	All surfaces	75
Fuel Gas Booster Compressors Building	All surfaces	80
Auxiliary Boiler	All surfaces	60

Some sound sources have been modeled as areal sources and others as point sources.

The surfaces of buildings are acoustically considered as good reflectors (as is also indicated in ISO 9613-2). This is a typical assumption in the study of environmental noise propagation where 'natural screens' to be considered always have a significant thickness that, following the formulation proposed by ISO 9613-2 for the assessment of the sound pressure level loss at a reflection, is equivalent to the loss of 1 dB at every reflection.

The allocation of the sound power to the different components of the plant was made in analogy to the technical specifications for the purchase of the various equipment, according to the designers' instructions.

The following cautionary assumptions were made in the calculation model parameters setting:

- Continuous operation 24hours / day - 365 days / year (continuous operation both during the diurnal reference period and during the night reference period)
- Operating characteristics characterized by cautionary sound levels if compared to those guaranteed

5.2.1 Calculation settings

In order to obtain good accuracy results, the search angle method through which SOUND PLAN performs the calculation was set by initializing the relevant parameters with the following values:

- Incremental value of the search beam angle = 2°
- Maximum number of reflections (after which the contribution of the search radius is considered null) = 3

The settings made on the parameters of the calculation standard are as follows:

Table 5-2: Calculation settings

Environmental Conditions	Humidity	70%
	Temperature	10°C
	Atmospheric pressure	1013,25 mbar
Diffractions Calculations	Contribution limits due to diffractions	Single diffraction=20dB
		Double diffraction=25dB
	Values assumed for the parameters in the formulations of ISO 9613 for calculating the diffractions	C1=3
		C2=20
C3=0		

5.2.2 Sound pressure levels "ante-operam"

Sensitive receptors that could potentially be more impacted by noise were detected through a site survey. They are reported in the Figure below.

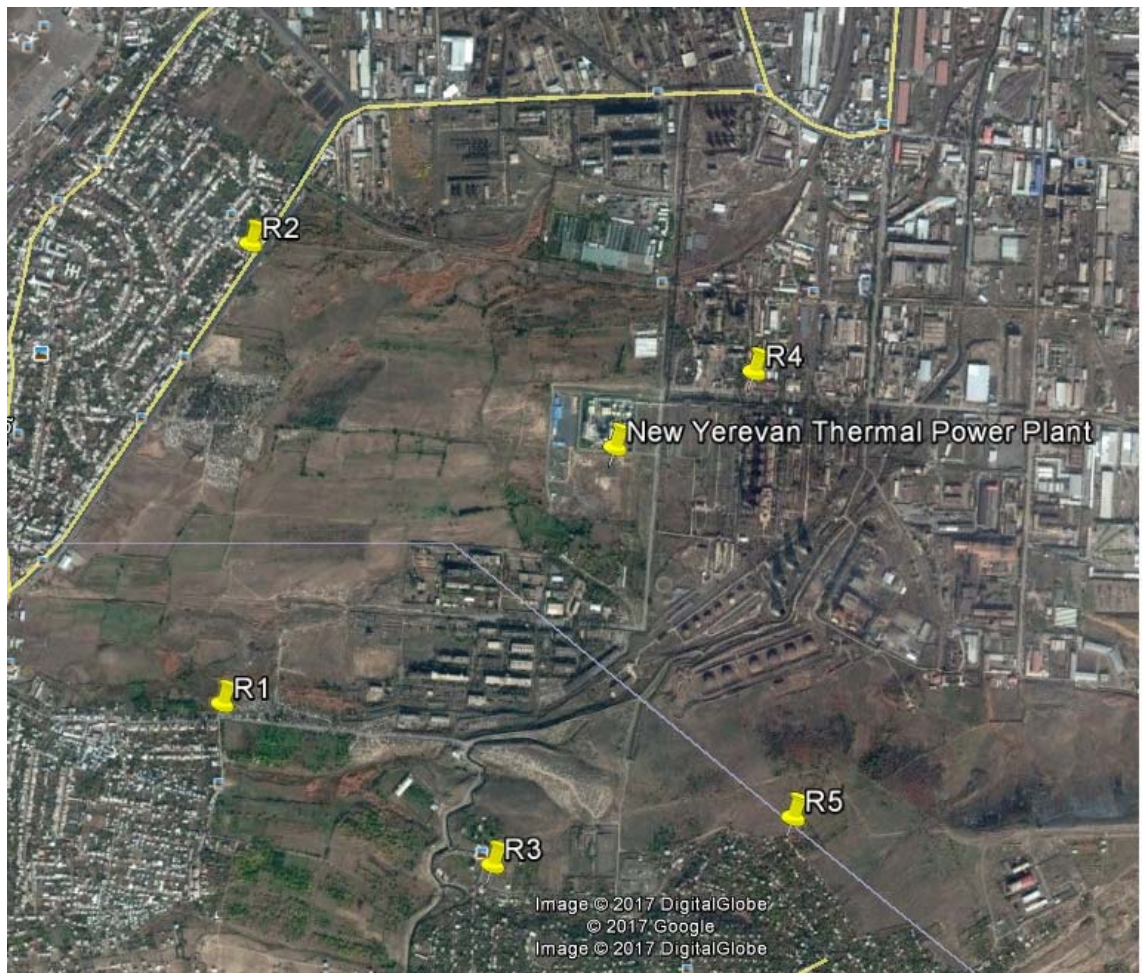


Figure 5-3: Sensitive receptors potentially impacted

According to The Sanitary Norms N2-III-11.3:

- the applicable noise limits In the residential areas are 45 dBA during the Night time and 55 dBA during the Day time

In the industrial areas the limits fluctuate from 50 dBA to 80 dBA depending on the category of works:

The said limits are referred to the total environment noise (the power plant contribution including the current sound pressure ("ante operam" sound pressure)).

The applicable limits to the sensitive receptors potentially impacted are shown in the Table below.

Table 5-3: Applicable limits to the sensitive receptors potentially impacted

Point of measurement	Time	TLV (equivalent to sound level), [dB(A)]
(Work-day and Weekend)		
R1	Day-time	55
	Night-time	45
R2	Day-time	55
	Night-time	45
R3	Day-time	55
	Night-time	45
R4	Day-time	70
	Night-time	70
R5	Day-time	55
	Night-time	45

In order to characterize the acoustic climate at the sensitive receptors, noise measurements were performed at each of them during the survey. For the measurement report, refer to the report “Noise and PM10 Baseline Study” rev.01 dated August 2017.

In the Table 5-4 the summary of the measurements outcome is reported.

Table 5-4: Current sound pressure (“ante operam”) at the sensitive receptors

Point of measurement	Wind speed (m/s)	Time of measurement	Leq(A) [dB(A)]
Work-day			
R1	<1.7	Day-time	49.8
	<1.8	Night-time	47.1
R2	<1.9	Day-time	72.6
	<2.3	Night-time	62.4
R3	<1.8	Day-time	48.1
	<1.7	Night-time	40.0
R4	<1.6	Day-time	53.6
	<1.9	Night-time	57.3
R5	<1.7	Day-time	36.2
	<2.0	Night-time	39.4
Weekend			
R1	<1.5	Day-time	43.4
	<2.1	Night-time	49.0
R2	<1.8	Day-time	72.8
	<2.5	Night-time	59.2
R3	<1.9	Day-time	43.9
	<2.0	Night-time	33.9
R4	<1.8	Day-time	56.4
	<2.0	Night-time	57.2

Point of measurement	Wind speed (m/s)	Time of measurement	Leq(A) [dB(A)]
R5	<1.5	Day-time	35.6
	<1.8	Night-time	34.2
<p>“Ante operam” Day-time noise evaluation Based on the noise measurement results conducted during work-days and weekend days, it can be concluded that noise equivalent levels in/near the residential areas were generally within the TLV except the point R2 (located in front of the highway), where the noise level exceeded the 55 dBA normative value. This can be explained by the movement of heavy vehicles and high traffic density along the highway</p> <p>“Ante operam” Night-time noise evaluation Equivalent noise levels during work-days and weekend days at measurement points R3 and R5 are within the 45 dBA TLV. Noise levels at point R1 during both work-days and weekend days were slightly exceeding the TLV (2.1 dBA and 4 dBA accordingly). This is due to the availability of background night noise from the facilities located in the vicinities. As a result of night-time measurements, the equivalent noise level at point R 2 (located in front of the highway) is above the 45 dBA TLV (see). The reason is high traffic density along the highway even at night-time.</p>			

5.2.3 Calculation of the sound contribution to the most exposed sensitive receptors

The calculation of the sound pressure level generated by the operation of the Power Plant towards the sensitive receptors has been performed by positioning the sensitive receptors in the model geodatabase. The calculation outcomes are reported in the Table below.

Table 5-5: Calculation outcomes: Sound Pressure generated by the Plant operation at the sensitive receivers

ID Receptor	Reference period (Work-day and Weekend)	Sensitive receptor applicability	Sound level contribution LAeq [dB(A)]
R1	<i>Day time</i>	Yes	32,5
	<i>Night time</i>	Yes	32,5
R2	<i>Day time</i>	Yes	38,0
	<i>Night time</i>	Yes	38,0
R3	<i>Day time</i>	Yes	34,9
	<i>Night time</i>	Yes	34,9
R4	<i>Day time</i>	Yes	42,7
	<i>Night time</i>	Yes	42,7
R5	<i>Day time</i>	Yes	31,8
	<i>Night time</i>	Yes	31,8

In addition calculation points along the Plant fence have been considered. The calculation outcomes are reported in the Table below.

Table 5-6: Calculation outcome: Sound Pressure generated by the Plant operation at the Plant fence.

ID Fence Point	Sound level contribution LAeq [dB(A)]
P East 1	51,3
P East 2	51,6
P East 3	51,5
P North 1	64,0
P North 2	57,3
P North 3	53,1
P South 1	54,2
P South 2	59,6
P South 3	60,2
P West 1	62,6
P West 2	67,9
P West 3	66,2

The calculation point along the fence have been positioned as shown in the Figure below.

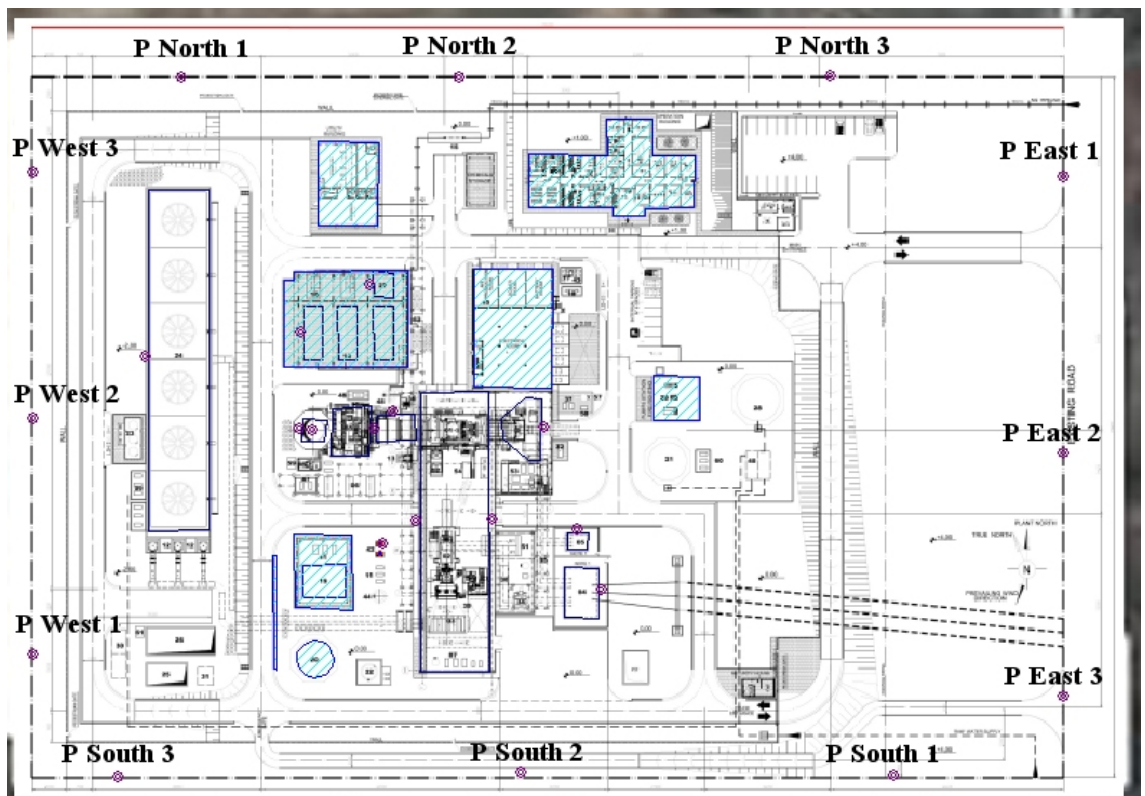


Figure 5-4: Position of the calculation points along the Plant fence

5.2.4 Calculation of noise maps

Through the calculation model also the noise maps have been generated.

The noise maps represent the sound pressure level curves, generated by the Plant during operation at the quotas of:

- +2 m from the ground level (Annex A)
- +10 m from the ground level (Annex B)

6. Predictive noise limit compliance check

The predictive noise pressure at the sensitive receptors has been calculated by adding the value of the background noise sound pressure to sound level contribution calculated by the model.

The formula used is the following:

$$Lpi_r = 10Log(10^{\frac{Lpe_r}{10}} + 10^{\frac{Lpf}{10}})$$

Where:

- Lpi_r is the predicted noise pressure value at the 'r' sensitive receptor
- Lpe_r is the Sound level contribution of the Plant at the 'r' sensitive receptor
- Lpf is the current back ground sound level

The calculation outcomes are shown in the Table 6-1.

Table 6-1: Predicted noise pressure at the sensitive receptors and “post – operam” noise limits compliance check

ID Receptor	Reference period	Applicable limit	“Ante operam” sound pressure LAeq [dB(A)]	“Ante operam” noise limits compliance check	Sound level contribution LAeq [dB(A)]	Predicted noise (“post operam”) pressure value LAeq [dB(A)]	Predicted (“post operam”) noise limits compliance check
Work-day							
R 1	Day time	55	49,8		32,5	49,88	
	Night time	45	47,1		32,5	47,25	+0,15 dB (A)
R 2	Day time	55	72,6		38,0	72,60	+0,00 dB (A)
	Night time	45	62,4		38,0	62,42	+0,02 dB (A)
R 3	Day time	55	48,1		34,9	48,30	
	Night time	45	40,0		34,9	41,17	
R 4	Day time	70	53,6		42,7	53,94	
	Night time	70	57,3		42,7	57,45	
R5	Day time	55	36,2		31,8	37,55	
	Night time	45	39,4		31,8	40,10	
Weekend							
R1	Day time	55	43,4		32,5	43,74	
	Night time	45	49,0		32,5	49,10	+0,10 dB (A)
R2	Day time	55	72,8		38,0	72,80	+0,00 dB (A)
	Night time	45	59,2		38,0	59,23	+0,03 dB (A)
R3	Day time	55	43,9		34,9	44,41	
	Night time	45	33,9		34,9	37,44	
R4	Day time	70	56,4		42,7	56,58	
	Night time	70	57,2		42,7	57,35	
R5	Day time	55	35,6		31,8	37,11	
	Night time	45	34,2		31,8	36,17	

7. Conclusions

The assessment of the acoustic impact associated with the New CCGT has been carried out applying a predictive mathematic model to the actual project data.

The calculation has been performed in accordance with the calculation models defined in the ISO 9613-2 standard. The calculation was performed through the SoundPlan software after setting the model parameters.

The sensitive receivers that are more exposed to the new Power Plant operation noise have been detected. The current noise level pressure at the said sensitive receivers have been assessed by an acoustic survey.

The applicable reference noise limit are prescribed by The Sanitary Norms N2-III-11.3.

The final calculation outcomes have shown the compatibility of the New CCGT operation with the applicable noise limits.

The New CCGT operation will not produce any significant increase of the noise pressure at the sensitive receptors. In particular:

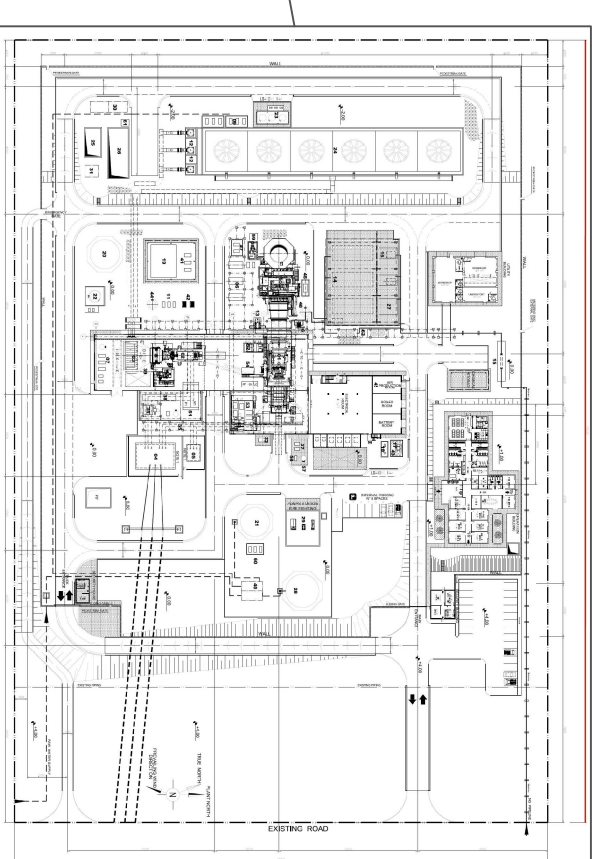
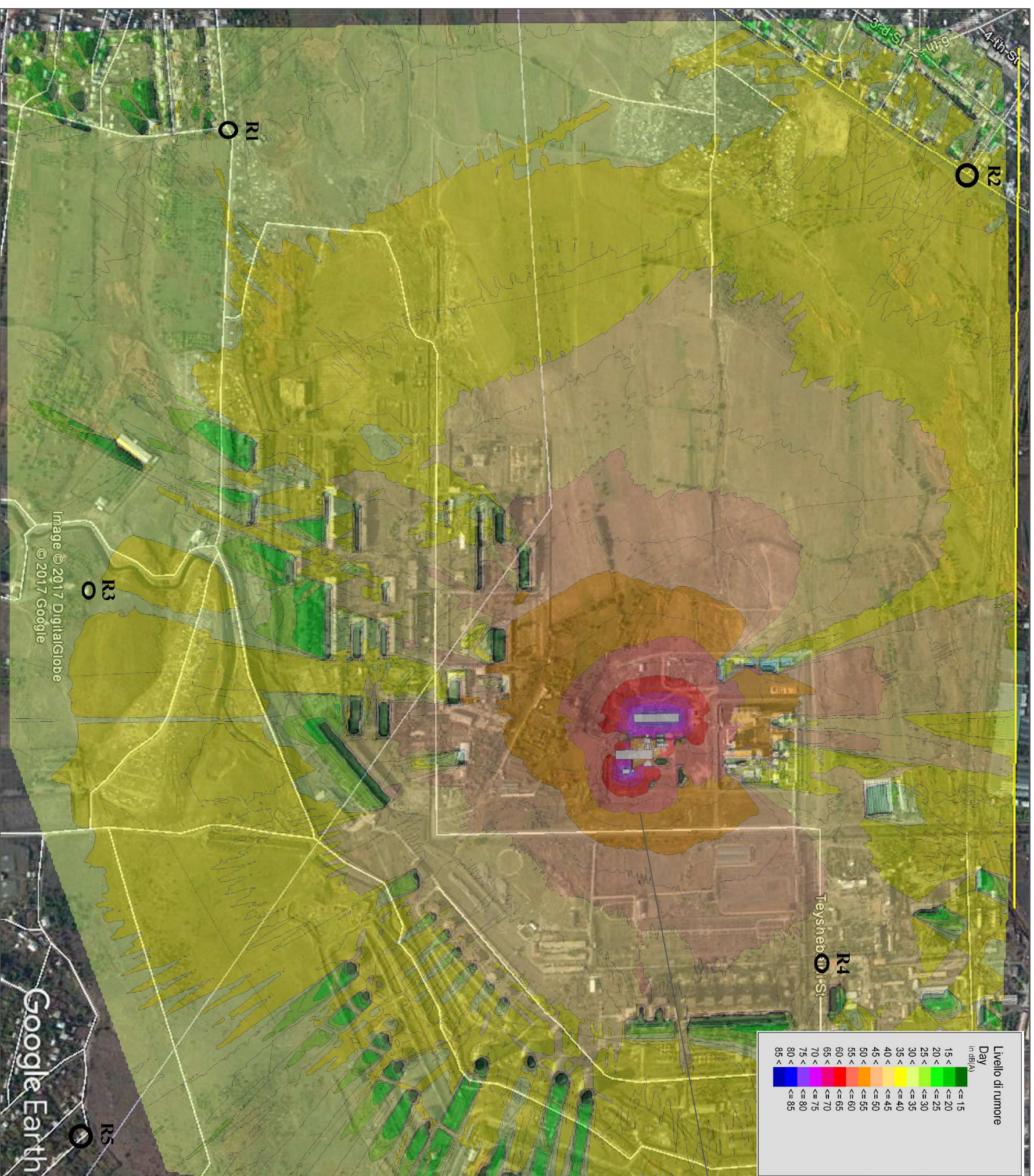
- where the current noise pressure is under the applicable limits, the New CCGT operation will not produce any exceedance of the said limit, either during the daytime or during the night time
- where the current noise pressure is already over the applicable limits, the New CCGT operation will produce a negligible contribution.

As last consideration, it has to be underlined that, although at the CCGT fence no sensible receivers are present, the Sound level contribution of the New CCGT operation will be significantly below the applicable industrial areas noise limits.

8. Annexes

Annex A – noise map at +2m

Annex B – noise map at +10m

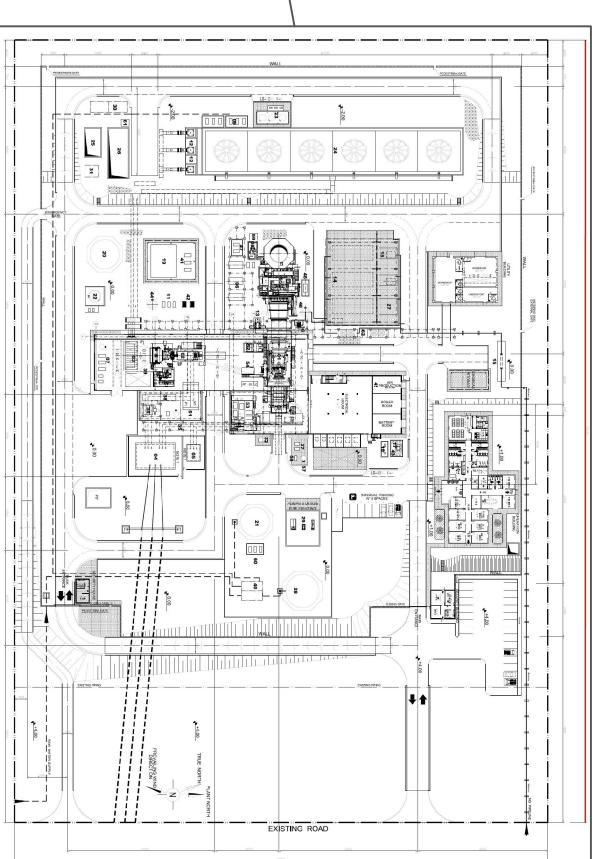
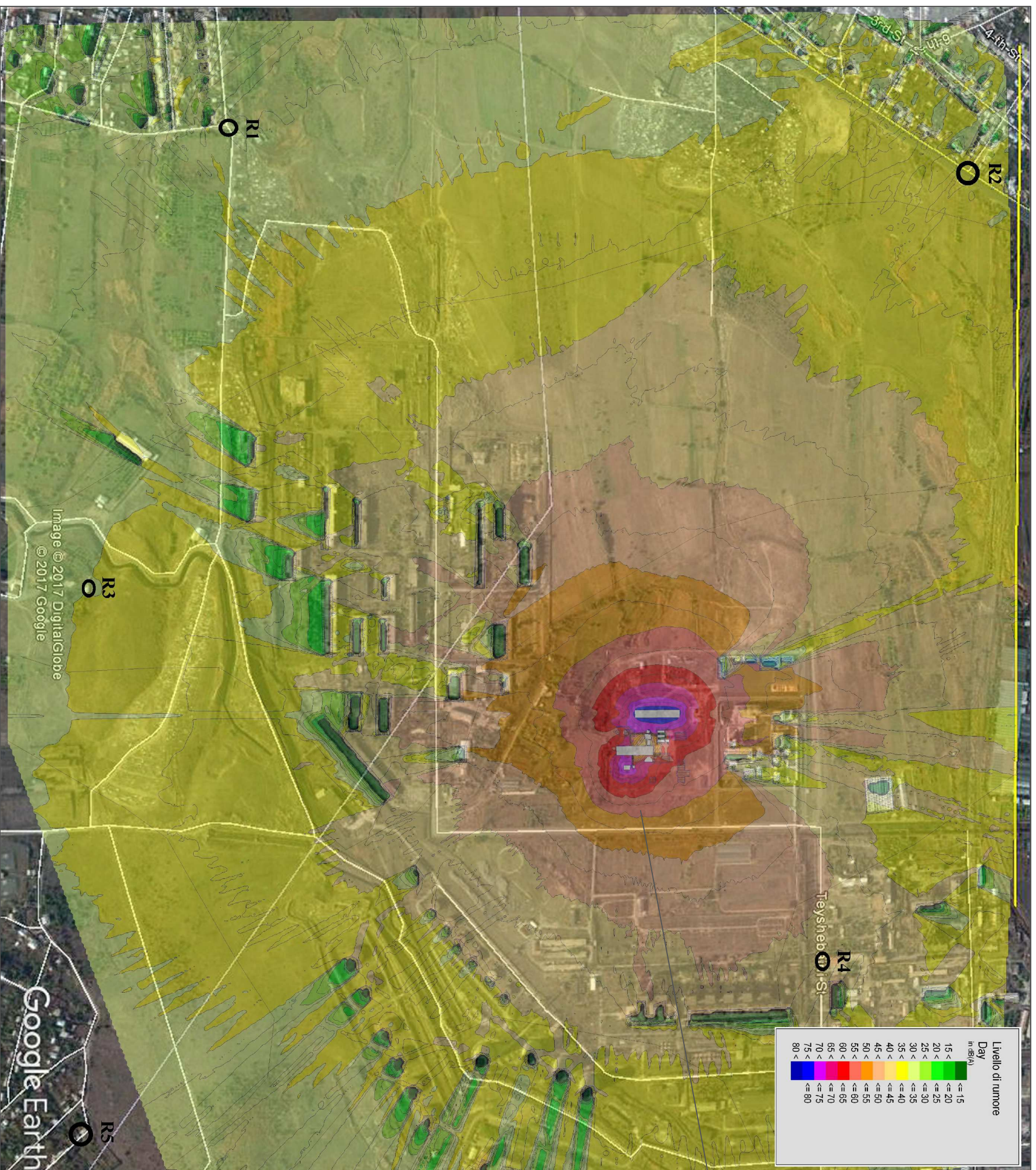


Plant layout

Item	Source	Lp(A) (@1m) [dB(A)]
HRSG	Lateral Walls	71
	Roof	71
Air Inake GT	Intake	77
HRSG Diffusor	All surfaces	70
Main Machine Building (GT, ST)	All surfaces	60
	External surfaces	75
Stack	Mouth	80
	All surfaces	75
Close cycle heat exchanger	All surfaces	75
Cooling Towers	All surfaces	80
Main Transformor	All surfaces	80
Units Transformor	All surfaces	75
Fuel Gas Booster Compressors Building	All surfaces	80
Auxiliary Boiler	All surfaces	60

Most relevant Noise emission items considered in the Plant project

Annex A	
Noise emissions - 2 m height noise map	



Plant layout

Item	Source	Lp(A) (@1m) [dB(A)]
HRSG	Lateral Walls	71
	Roof	71
Air Inake GT	Intake	77
HRSG Diffusor	All surfaces	70
Main Machine Building (GT, ST)	All surfaces	60
	External surfaces	75
Stack	Mouth	80
	All surfaces	75
Close cycle heat exchanger	All surfaces	75
Cooling Towers	All surfaces	80
Main Transformer	All surfaces	80
Units Transformer	All surfaces	75
Fuel Gas Booster Compressors Building	All surfaces	80
Auxiliary Boiler	All surfaces	60

Most relevant Noise emission items considered in the Plant project

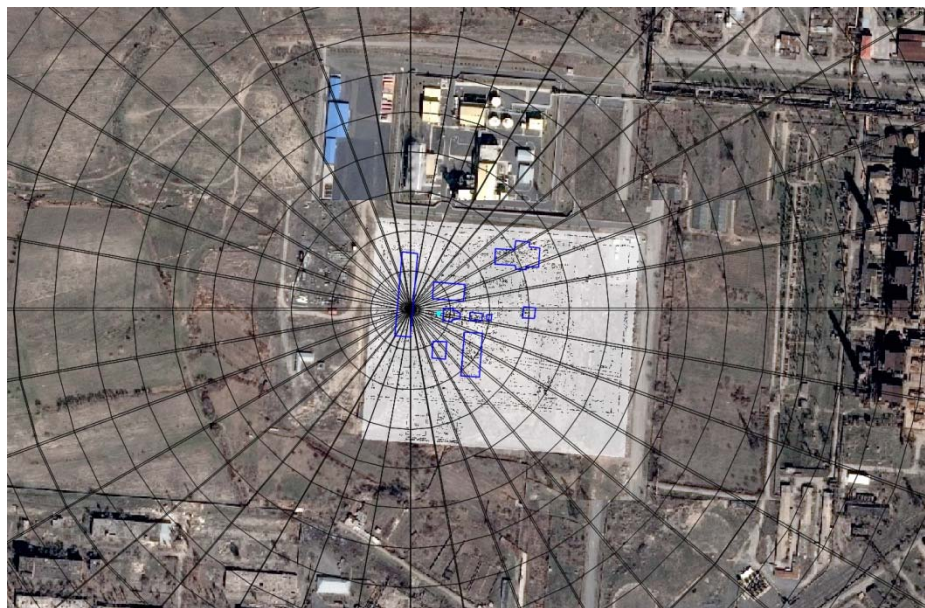
Annex B	
Noise emissions - 10 m height noise map	

12.6 Air Dispersion Calculation

Yerevan 2 CC Power Plant

Armpower CJSC

Air Dispersion Calculation



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2	20.11.2017	Draft Final Report for incorporation into the Draft Final ESIA	Sousa	Back
3	07.12.2017	Draft Final Report for incorporation into the Draft Final ESIA	Sousa	Paufsch

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List of abbreviations and acronyms

AQS = Air Quality Standard(s)
CAPEX = Capital Expenditure
CC = Combined Cycle
CO = Carbon Monoxide
ECD = European Council Directive(s)
ELV = Emission Limit Values
HRSG = Heat Recovery Steam Generator
IFC = International Finance Corporation
MAC = Maximum Allowable Concentration
masl = meters above sea level
NG = Natural Gas
NO₂ = Nitrogen Dioxide
PP = Power Plant
SCR = Selective Catalytic Reduction
UHC = Unburned hydrocarbon(s)
WB = World Bank
YCCPP = Yerevan Combined Cycle Power Plant

1. Scope of the Report

The Ministry of Energy (MOE) of the Republic of Armenia plans to improve the total output capacity of its electric energy production, complementing the power units of the existing Yerevan Combined Cycle Power Plant (YCCPP-1) with a more modern and efficient power plant. For this reason a new gas fired Combined Cycle Power Plant of 234 MWe (YCCPP-2) is planned to be built at the site next to the existing YCCPP-1.

In order to obtain financing from the International Financing Corporation (IFC), a bankable Environmental and Social Impact Assessment (ESIA) Report to the YCCPP-2 (“the Project”) on the basis of the relevant World Bank Group’s guidelines has to be delivered to IFC for review and approval.

Fichtner is providing Technical Advisory Services to Armpower CJSC (“Project Company”), including the elaboration of the bankable ESIA. The present report presents the Air Dispersion Calculation performed for the Project, and is part of the ESIA.

The objective of the study is to assess the contribution of the air emissions of the YCCPP-2 to the air quality in the area, and to indicate whether the national and international air quality standards are expected to be fulfilled or not. The assessment ultimately leads to the determination of the conditions required to fulfill these standards. The criteria pollutants CO and NO₂ are subject of analysis in this context.

The Air Dispersion Calculation is performed using the dispersion modeling software BREEZE AERMOD (version 8.0.0.39 from 2017), based on a U.S. EPA (United States Environmental Protection Agency) Regulatory Model.

2. Project Site

The YCCPP-2 will be located in the city of Yerevan, Armenia, nearby the existing YCCPP-1 in an industrial area (Figure 2-1 and Figure 2-2). The coordinates of the site center are approximately:

- Northing: 40° 6'48.06"N;
- Easting: 44°29'49.55"E;
- Zone: 38T (WGS 84).

Noragvit (a residential district of Yerevan) is located approx. 1,350 m to the west, Ayntap (a major village in the Ararat Province) is located approx. 1,500 m to the south west, Kharberd (another major village in the Ararat Province) is located 1,200 m to the south, and the nearest residential areas of the Erebuni District are located approx. 1,200 m north east of the proposed plant site. Right at the vicinity of the site there are some temporary houses, as well as former industrial buildings and a local Fire Service Training Center. There is no one living within the site.

Nearby the Project site, there is one non-operational power plant and many other active industrial plants:

- YCCPP-1
- “Plant of Pure Iron” OJSC
- “Armenian Molybdenum Production” LLC
- “Nairit 1” and “Nairit 2” Chemical Plants
- Others

Information about the air emissions of other active industrial plants in the area could only be obtained for the YCCPP-1, since this power plant is from the same complex as the new YCCPP-2. The other neighboring industrial plants belong to companies unrelated to the developers of the Yerevan power plant 1 or 2 who shared only some limited information with the Client. Such data did not have enough detail to be used in the ADC.

The site is located close to the Erebuni Airport, and the E 117 highway.

Although the present study focus on the impacts of the Yerevan - 2 PP on the air quality, it would be necessary to consider as well the emissions of the existing neighboring plants, road and airport for a complete analysis. Since there is a large number of air emission sources in the area, and it is not possible to obtain data for all of them, a baseline air quality assessment has been undertaken. Please see Section 4.5 for further details.

The future installation of other industrial plants in the area cannot be reasonably foreseen at this stage.



Figure 2-1: Location of the future Yerevan - 2 PP (source of the topographic map: URL 1)



Figure 2-2: Overview of the immediate surroundings of the Yerevan Power Plants 1 and 2

3. Air Emissions and Air Quality Legislation

In order to protect human health, vegetation and/or properties from the negative effects of air pollution, limits are imposed to:

- the concentrations of the pollutants that are emitted from various sources - air emission limits; *and to*
- the concentrations of the pollutants that are present in the atmosphere - air quality standards.

In several countries, these limits (or standards) are defined in the national laws/regulations, but there are also internationally accepted values like the ones from the World Bank Group Guidelines or the European Union Directives.

The air emission limits represent the maximum concentrations that are allowed in the flue gas coming out of the source (a stack, in this case) and are given in mg of pollutant per normal m³ of dry flue gas (mg/Nm³). The N stands for “Normal conditions”: temperature of 0°C and atmospheric pressure of 101.3 kPa.

The air quality standards (AQS) state the maximum concentrations that are allowed in the ambient air, in this case, in the airshed surrounding the power plant. The standards are presented in µg of pollutant per m³ of ambient (exterior) air (µg/m³). For gaseous pollutants, the results of the air quality monitoring shall be standardized at a temperature of 293 K (20°C) and an atmospheric pressure of 101.3 kPa.

This chapter presents the national and international standards for air emissions and for air quality that are applicable to the project.

3.1 Air Emission Limits

The International Finance Corporation (IFC, World Bank Group) defined emission guidelines (EG) for facilities with a power input larger than 50 MW_{th} using gas turbines (Table 3-1).

Pollutant	EG for combustion turbines; facilities > 50 MW _{th}
	Natural Gas
NO ₂	51 mg/Nm ³
Dry gas, excess O ₂ content	15%
Temperature flue gas	0°C

Table 3-1: IFC emission guidelines for facilities larger than 50 MW with combustion turbines (IFC, 2008)

There are no national air emission limits for thermal power plants. The specifications for Yerevan 2 demand the compliance with the performance

guarantee values for CO, NO₂ and Unburned Hydrocarbons (UHC) as shown in Table 3-2.

Pollutant	Performance Guarantees
CO	30 mg/Nm ³
NO ₂	50 mg/Nm ³
UHC	10 mg/Nm ³
Dry gas, excess O ₂ content	15%
Temperature flue gas	0°C
Load	From 70% to 100%

UHC: Unburned Hydrocarbons

Table 3-2: Performance Guarantees for YCCPP-2 - air emissions

The performance guarantee values for NO₂ comply with the IFC emission guidelines. No emission guidelines are defined by IFC for CO. For the project at hand, and based on the specific natural gas composition, the emissions of UHC may include pollutants such as methane (85 to 96% of the gas is composed of methane), ethane, propane, butane, and pentane. IFC does not define emission guidelines for UHC in general nor for any of the listed chemicals in particular.

3.2 Air Quality Standards

The Air Quality Standards are defined according to the different levels of danger that the pollutants pose depending on the exposition period. This way, the standards are defined for different time frames, allowing the protection against the short term acute impacts, the medium term impacts and the long term impacts.

IFC states that emissions from projects shall not result in pollutant concentrations in the ambient air that reach or exceed the relevant ambient air quality guidelines and standards by applying the national legislated standards or, in their absence, the World Health Organization (WHO) Guidelines or other internationally recognized sources like the U.S. EPA (United States Environmental Protection Agency) or the European Council Directives (ECD).

The IFC recommends, in addition, that the emissions from a single project should not contribute with more than 25% of the applicable ambient air quality standards to allow additional, future sustainable development in the same airshed. This implies that even when a ground level concentration (GLC) of a certain pollutant respects the air quality standard, it shall be evaluated whether it is below or above 25% of that standard. This is also assessed in the present study.

Table 3-3 presents the national ambient air quality standards, or MAC - maximum allowable concentrations (established by Governmental Decree

Nr. 160-N of 2 February 2006), and the standards defined by the European Council Directive 2008/50/EC that are applicable to the project.

Pollutant	Averaging period	Air Quality Standards [$\mu\text{g}/\text{m}^3$]		
		National MAC	ECD	
CO	Short-time	5,000	-	
	24 hours	3,000	-	
	Max. daily 8 hour mean	-	10,000	
NO ₂	Short-time	200	-	
	1 hour	-	200 <i>Not to be exceeded more than 18 times per year</i>	
	24 hours	40	-	
	1 year	-	40	
UHC	Methane	-	-	
	Ethane	-	-	
	Propane	-	-	
	Butane	Short-time	200,000	-
	Pentane	Short-time	100,000	-
		24 hours	25,000	-
PM ₁₀	Maximum	300	-	
	24 hours	60	50 <i>Not to be exceeded more than 35 times per year</i>	
	1 year	-	40	
SO ₂	Maximum	500	-	
	1 hour	-	350 <i>Not to be exceeded more than 24 times per year</i>	
	24 hours	50	125 <i>Not to be exceeded more than 3 times per year</i>	

Table 3-3: National and ECD Ambient Air Quality Standards

The ECD 2008/50/EC does not set a limit for the type of UHC that are expected from natural gas operation (methane, ethane, propane, butane, and pentane). The limits shown in Table 3-3 for butane and pentane are based on the national legislation, but seem to be overly permissive. In fact, the national air quality monitoring network does not measure hydrocarbons (WHO, 2003), for what there is not a real experience on the application of

the standards for UHC. Given this, these standards will not be used in the present ADC, and **focus will be provided on CO and NO₂**.

Although PM₁₀ and SO₂ are not expected to be emitted by the YCCPP - 2, these standards are mentioned as they are of importance for the air quality baseline assessment shown in Section 4.5.

It shall be noted that the national MAC for 24 hr NO₂ of 40 µg/m³ corresponds to the ECD limit for annual averages. This implies that the national MAC is very stringent when compared to the international standards.

4. Baseline Data

4.1 Affected area and receptors

The air quality standards considered in this study are defined for protection of human health. Given this, the study will focus particularly on the analysis of the air quality effects in areas where human presence exists. An area of 314 km² around the power plant is defined as the eventually affected area for air pollution impacts. This includes the neighboring settlements up to 10 km in all directions counting from the stack of the YCCPP-2 (Figure 4-1).

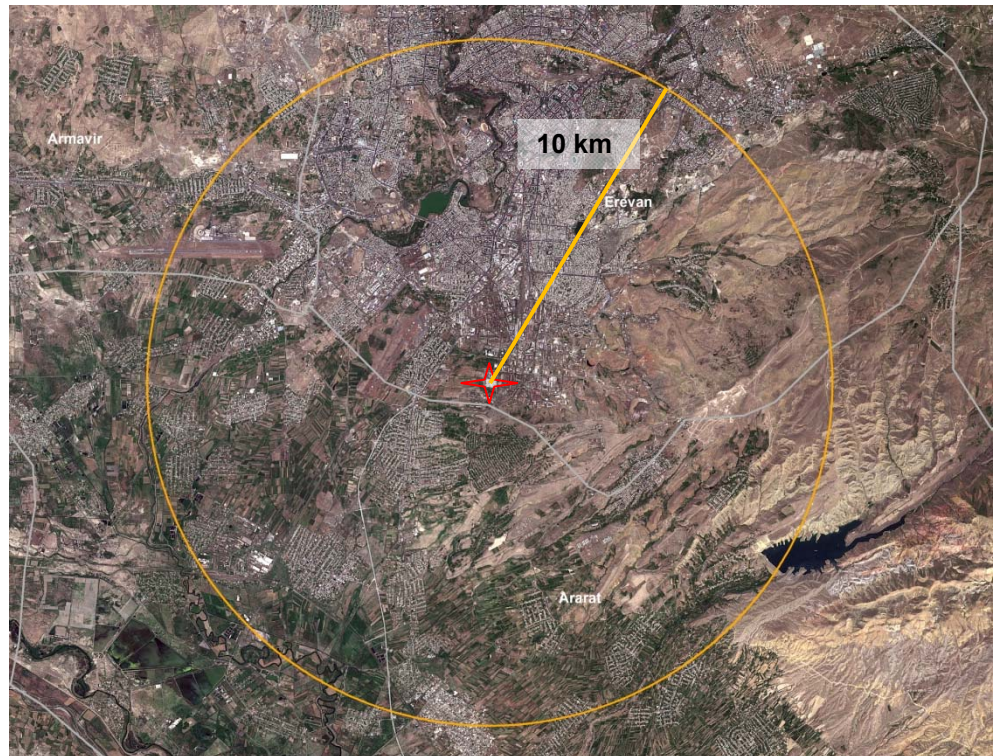


Figure 4-1: Location of the affected area

In the direct proximity of the power plant (up to 1 km), there are some temporary informal houses to the northeast and southeast, deactivated industries and the local Fire Services to the southwest, a non-operational power plant to the east and agricultural fields/pastures to the west and northwest (Figure 4-2).



Figure 4-2: Closer view of the affected area

4.2 Meteorological Data

In order to conduct the Air Dispersion Calculation, recent meteorological data from a monitoring station located nearby the project site (Zvartnots Airport) have been analyzed. The data set includes information such as wind speed and direction, cloud cover, temperature, sensible heat flux, surface roughness, etc.

Figure 4-2 presents the wind rose for the years 2014 to 2016. It shows that the prevailing winds blow from northeast (NE). The wind rose also indicates that the more frequent wind speeds are between 1.5 and 3 m/sec, which is equivalent, in the Beaufort scale, to the levels “light air” and “light breeze”.

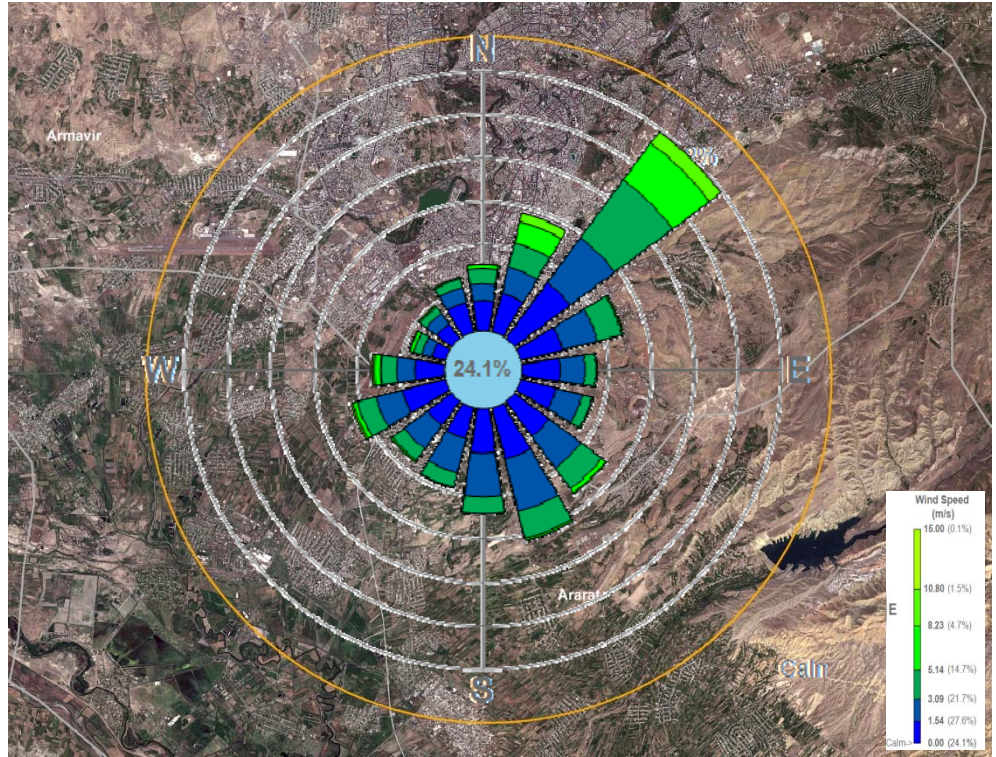


Figure 4-3: Wind rose for the years 2014-2016 (wind blowing from)

4.3 Terrain data

To account for the different heights above sea level of the sensitive receptors and the plants, terrain data were acquired. These allow a 3D representation of the terrain of the assessment area and a more accurate simulation of the pollutants' distribution. Figure 4-4 shows a representation of the area's terrain.

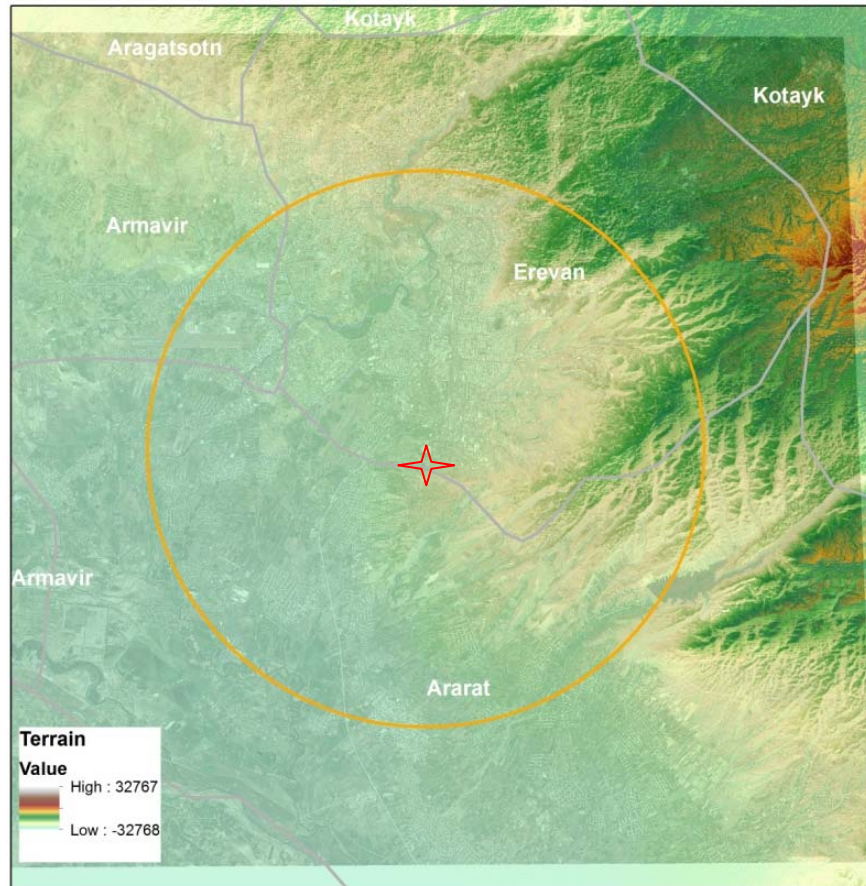


Figure 4-4: Representation of the terrain of the affected area

The project site is located at a height of ca. 930 masl. The terrain and the immediate surroundings are generally flat. Around 3 km to the east of the plant the terrain becomes more elevated where the Gegham mountains begin (Figure 4-5).







Figure 4-5: Landscape/terrain at the site and its surroundings (Fichtner, July 2017)

4.4 Emission Data

To the date of writing this report, emission data of YCCPP-1 and forecast emission data for YCCPP-2 could be obtained (see Table 4-1). Complete data for other neighboring plants could not be obtained, since these belong to companies unrelated to the developers of the Yerevan power plant 1 or 2, who shared only some limited information with the Client. Such data did not have enough detail to be used in the ADC.

Parameter	YCCPP-2		YCCPP-1	
	Value	Source	Value	Source
Number of stacks	1	Tender specifications/RENCO	1	Site visit
Location of stacks [m; WGS 84, Zone 38T]	Easting: 457,128		Easting: 457,150	
	Northing: 4,440,461		Northing: 4,440,617	
Height of stacks [m]	35 - 43 (TBD)		45	
Diameter of stacks (inner) [m]	6.23		6.7	
Flue gas exit temperature [K]	370		399	
Flue gas exit velocity [m/s]	20		19	
Actual* flue gas exit flow [m ³ /s] per stack	606		670	Calculated based on information collected during the site visit
Concentration CO [mg/Nm ³] dry, 15% O ₂	30		0.86	RENCO
Concentration NO ₂ [mg/Nm ³] dry, 15% O ₂	50		43.4	
Concentration UHC [mg/Nm ³] dry, 15% O ₂	10	-	-	
Emission rate CO [g/s] per stack	12.4	Calculated based on information provided by RENCO	0.4	Calculated based on information provided by RENCO
Emission rate NO ₂ [g/s] per stack	20.6		18.0	
Emission rate UHC [g/s] per stack	4.1		NA	

TBD = To be determined

* Actual means at the actual conditions of temperature, pressure, moisture and O₂ content of the flue gas

Table 4-1: Emission data for YCCPP-2 and YCCPP-1

4.5 Baseline Air Quality Data - Summer and Autumn 2017

A baseline air quality assessment has been undertaken in July/August 2017 (Summer) and October/November 2017 (Autumn) in the Project Area of Influence, including the specific areas where the highest pollution levels resulting from the operation of the YCCPP - 2 are expected.

The primary objective of this assessment was to determine if the Project's airshed is degraded or non-degraded. A degraded airshed is one where the applicable air quality standards are exceeded (IFC, 2007). With this objective, the ground level concentrations (GLC) of PM₁₀, SO₂ and NO₂ have been monitored in 5 different locations as shown in Figure 4-6.

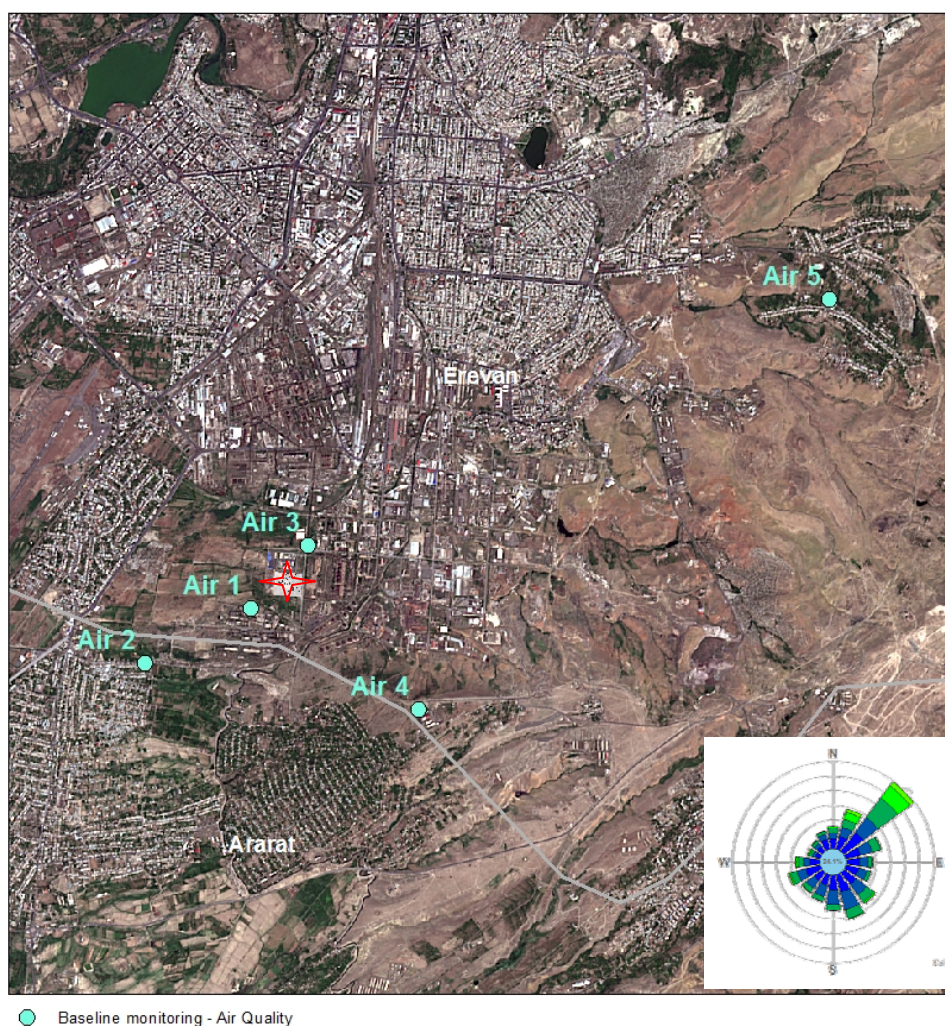


Figure 4-6: Baseline Monitoring Points - Air Quality

The measurement point Air 1 is situated in industrial area near the southeast border of YCCPP - 1, between the local fire service training center and an abandoned production facility. The measurement point Air 2 is placed approx. 1,700 m to the south-west of YCCPP - 2; it is located near the northeast border of Ayntap community between the cemetery and private cultivated gardens. Points Air 1 and Air 2 are located downwind the main wind direction. The measurement point Air 3 is placed in an industrial area

near the northern border of the YCCPP - 2. In points Air 1, Air 2 and Air 3 all pollutants (PM₁₀, SO₂ and NO_x) have been monitored. Although PM₁₀ and SO₂ are virtually not expected to be emitted by the YCCPP - 2, it is important to determine their concentrations to assess whether the airshed is degraded or not.

The points Air 4 and Air 5 have been defined after one test model run, being located in the areas where the highest GLC of NO₂ resulting from the operation of YCCPP - 2 are expected.

4.5.1 PM₁₀

The complete reports of the measurements of PM₁₀ can be found in Annex 1 to this ADC.

The dust concentration was measured by using the dust particle meter DT-96 in accordance with the GOST 17.2.4.05-83 - “Environmental protection. Atmosphere. Gravimetric method for determination of suspended dust particles”.

The equipment has collected 5 daily measurements of 5 minutes along 5 days between 27.07.2017 and 05.08.2017 (Summer), and between 28.10.2017 and 04.11.2017 (Autumn) The results are presented in Table 4-2. They show that the national and international air quality standards are presently respected in the area.

Point	PM ₁₀ [µg/m ³]		Air Quality Standards [µg/m ³]			
	Average 5 mins in 5 days	Average 5 mins in 5 days	National MAC		ECD	
	Summer 17	Autumn 17	Max.	24 hr	24 hr	1 yr
Air 1	11.4	17.7	300	60	50	40
Air 2	18.2	21.0				
Air 3	18.2	28.6				
Air 4*	N.A.	18.4				
Air 5*	N.A.	23.4				

* The points Air 4 and Air 5 have been defined after one test model run, being located in the areas where the highest GLC of NO₂ resulting from the operation of YCCPP - 2 are expected

N.A. = Not Available

Table 4-2: Baseline air quality measurement results - PM₁₀

4.5.2 SO₂ and NO₂

The baseline concentration of gases (SO₂ and NO₂) in the project area has been measured with diffusion tubes. The tubes have been placed in monitoring points Air 1 to Air 5 for 7 days in Summer and 10 days in Autumn. The resulting GLC has been determined in the Laboratory of Environmental Monitoring and Information Center of the Ministry of Nature Protection (Table 4-3 and Table 4-4). They show that the national and international air quality standards are presently respected in the area.

Point	NO ₂ [µg/m ³]	NO ₂ [µg/m ³]	Air Quality Standards [µg/m ³]			
	Average 7 days	Average 10 days	National MAC		ECD	
	Summer 17	Autumn 17	Max.	24 hr	1 hr	1 yr
Air 1	16.0	4.3	200	40	200	40
Air 2	11.9	4.7				
Air 3	21.3	4.5				
Air 4 *	20.1	4.7				
Air 5 *	9.2	4.7				

* The points Air 4 and Air 5 have been defined after one test model run, being located in the areas where the highest GLC of NO₂ resulting from the operation of YCCPP - 2 are expected

Table 4-3: Baseline air quality measurement results - NO₂

Point	SO ₂ [µg/m ³]	SO ₂ [µg/m ³]	Air Quality Standards [µg/m ³]			
	Average 7 days	Average 10 days	National MAC		ECD	
	Summer 17	Autumn 17	Max.	24 hr	1 hr	24 hr
Air 1	19.4	18.7	500	50	350	125
Air 2	22.1	26.7				
Air 3	28.4	19.7				
Air 4 *	N.A.	26.2				
Air 5 *	N.A.	33.5				

* The points Air 4 and Air 5 have been defined after one test model run, being located in the areas where the highest GLC of NO₂ resulting from the operation of YCCPP - 2 are expected

N.A. = Not Available

Table 4-4: Baseline air quality measurement results - SO₂

4.5.3 Conclusion and future work

The results show that the airshed surrounding the future YCCPP - 2 can be classified as **non-degraded** regarding the pollutants PM₁₀, SO₂ and NO₂. New monitoring campaigns will be undertaken in Winter 2017/2018 and Spring 2018 to capture the seasonal variations in the pollutant's GLC, and reinforce or adapt this conclusion. The Air Dispersion Calculation and the ESIA will be updated based on these results then. Special focus will be provided to the Winter results, as these are expected to represent the worse case scenario.

The results of the baseline monitoring, once completed over an entire year, will be used to accurately assess the “before-the-project” scenario (i.e., the Scenario A described in Section 5.2). In a later version of this ADC, the results of the simulation of the impact of YCCPP-2 will be added to the baseline monitoring results to obtain a realistic future scenario (i.e., a realistic Scenario C described in Section 5.2).

5. Air Dispersion Calculation

5.1 Air Quality Model

The Air Dispersion Calculation was performed using the dispersion modeling software BREEZE AERMOD, version 7.12 (January 2017), which predicts pollutant concentrations from continuous point, flare, area, line, volume and open pit sources. This steady-state plume model is a US-EPA Regulatory Model.

The simulations performed with BREEZE AERMOD for each of the pollutants CO and NO₂ result in worst case scenarios, that is, the software outputs the maximum concentrations expected to be found in the area due to the operation of the plants.

The simulation of NO₂ was made using the BREEZE AERMOD's ambient ratio method (ARM). The ARM assumes that the NO₂/NO_x ratio in ambient air is of 0.8 for 1 hour averages, and 0.75 for annual averages. These default ratios are based on U.S. EPA's recommendations.

One of the objectives of the ADC is determining the height that the stacks of the plant shall have so that the national and international air quality standards (AQS) are fulfilled at the next receptor points in every scenario. Three stack heights are considered: 35 meters (as planned by design), 43 meters (alternative design) and 66 meters (alternative design 2).

5.2 Calculation Scenarios

Altogether 3 scenarios are initially simulated:

- one with only YCCPP-1 is operating (indicative baseline scenario, or **Scenario A**);
- one with only YCCPP-2 is operating (**Scenario B**),
- and one with both plants are operating (indicative future scenario, indicative cumulative scenario, or **Scenario C**).

Each of the 3 scenarios is simulated for a stack height of 35 meters (design), for a stack height of 43 meters (alternative), and for a stack height of 66 meters (alternative 2).

As a result of some previous model iterations, the need to simulate an additional scenario has come up:

- **Future developments scenario:** reflects the inclusion of additional emission reduction measures, in case future projects are reasonably foreseen for the area.

5.2.1 Note on Scenarios A and C

In respect for international requirements, it is important to understand the quality of the airshed before the project is implemented (baseline - Scenario A). Only considering the baseline it is possible to understand the cumulative impact of the project (Scenario C). In simple terms, the following applies:

$$\text{Scenario C} = \text{Scenario A} + \text{Scenario B}^1$$

The baseline (Scenario A) can be determined in two alternative ways:

- a) Data regarding all surrounding industries is made available, and given as an input to the model; the model will then simulate the impacts of the existing industries in the air quality in the area; *or*
- b) An air quality monitoring campaign is undertaken at site.

The contribution of other surrounding industries (option a) could not be considered at this stage, due to a lack of important technical and emission data for these industries - only data for YCCPP-1 was made available. For this reason, Fichtner undertook a baseline air monitoring campaign in Summer 2017 and in Autumn 2017 (option b). However, additional data must be collected in other seasons (Winter and Spring) to complete the set of data and define a “before-the-project” scenario, i.e., a realistic Scenario A. Presently, the model considered an **indicative Scenario A** only.

In order to obtain one first indication about the cumulative effects of the Project (Scenario C), this ADC considered the contribution of the neighboring YCCPP-1 (indicative Scenario A) summed up to the contribution of the YCCPP-2 (Scenario B) in the model. Since Scenario A is only indicative, the simulated **Scenario C is an indicative cumulative scenario as well**. Scenarios A and C will be updated as soon as the baseline data collection is finalized for all seasons. Special focus will be provided to the Winter results, as these are expected to represent the worse case scenario.

5.3 Buildings and downwash effects

The term „building downwash“ describes the effect that wind flowing over or around buildings has on pollutant plumes released from nearby stacks. Essentially, buildings create a cavity of recirculating winds in the area near the buildings, and these building cavities cause increased vertical dispersion of plumes emitted from stacks on or near the buildings. Building downwash often leads to elevated concentrations downwind of affected stacks (Wanger, A., 2011).

For the present ADC, a 3D model of the main buildings of both power plants YCCPP-1 and YCCPP-2 has been set up and included in the model in

¹ It is important to note that in reality the model does not perform an arithmetic sum of both scenarios.

order to account for eventual downwash effects. Based on this, AERMOD calculated the Good Engineering Practice stack height - GEP stack height - following the recommendations of the IFC EHS guidelines. The GEP stack height is the one that avoids the creation of downwash effects. For the case of YCCPP-2, the GEP stack height is of 66 meters.

5.4 ADC Results

This Section contains the results of the simulations performed with BREEZE AERMOD for each of the pollutants CO and NO₂ for all the different averaging periods for which the standards are defined.

The results are presented in the form of:

- Tables showing the **maximum simulated ground level concentrations (GLC)** in the assessment area for all scenarios. The respective comparison with the Air Quality Standards is made. The tables show in addition the percentage of the AQS which the maximum GLC represent.
- **Plot maps** of the maximum simulated GLC for selected outputs of Scenario C.

It is **important to note** that the results shown represent maximum GLC. The maximum GLC are expected in different times and locations for each scenario. This implies that there is not a direct correlation between the maximum GLCs simulated for the three scenarios.

5.4.1 CO - Short-time and 1 hour AQS

The national legislation defines a short-time AQS/MAC for CO of 5,000 $\mu\text{g}/\text{m}^3$. There is not a definition of “short-time” in the national legislation, for what in this study the comparison is made with the simulated 1-hour values. The ECD does not define a 1-hour AQS for CO.

The comparison of the model results with the national MAC shows that the MAC is expected to be respected throughout the entire assessment area in all scenarios for both stack heights (Table 5-1). The contribution of YCCPP-2 represents less than 25% of the applicable AQS (i.e., 1.9% for 35 meters stack, 1.8% for 43 meters stack, and 1.1% for 66 meters stack), being in line with IFC’s recommendation for a future sustainable development in the area.

Time period	CO maximum modeled GLC [$\mu\text{g}/\text{m}^3$]			Air Quality Standards [$\mu\text{g}/\text{m}^3$]	
	Stack YCCPP-2: 35 m (original design)	Stack YCCPP-2: 43 m (alternative design)	Stack YCCPP-2: 66 m (GEP stack height)	National MAC	ECD
Indicative SCENARIO A - Only YCCPP-1					
1 hour / Short time	2.0	2.0	2.0	5,000	-
SCENARIO B - Only YCCPP-2					
1 hour / Short time	92.5	88.5	53.9	5,000	-
	<i>% of the AQS: 1.9%</i>	<i>% of the AQS: 1.8%</i>	<i>% of the AQS: 1.1%</i>		
Indicative SCENARIO C - YCCPP-1 + YCCPP-2					
1 hour / Short time	93.9	89.9	55.2	5,000	-

Standard is not exceeded
 Standard is exceeded

Table 5-1: Maximum simulated 1 hr CO GLC and comparison with the air quality standards

The concentration plots for the simulation of the Scenario C with a 35 meters stack (Figure 5-1 and Figure 5-2) show that the absolute cumulative maximum of 93.9 $\mu\text{g}/\text{m}^3$ is found in the industrial areas to the east and southeast of the power plants’ area. The plots for the 43 meters stack and the 66 meters stack are similar and therefore redundant, and are not represented in this report.

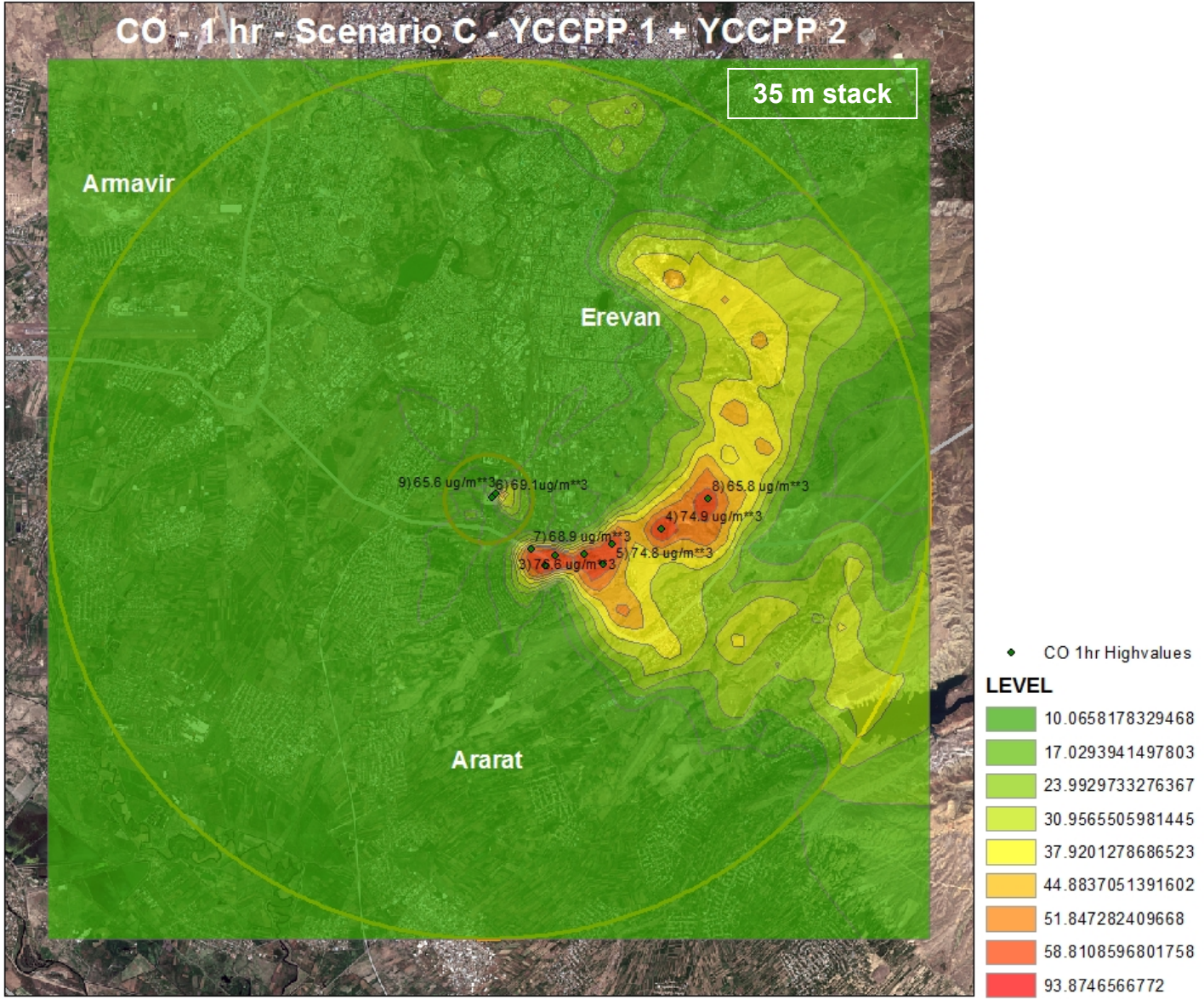


Figure 5-1: Maximum simulated 1 hr CO GLC - indicative cumulative effects - YCCPP-1 + YCCPP 2

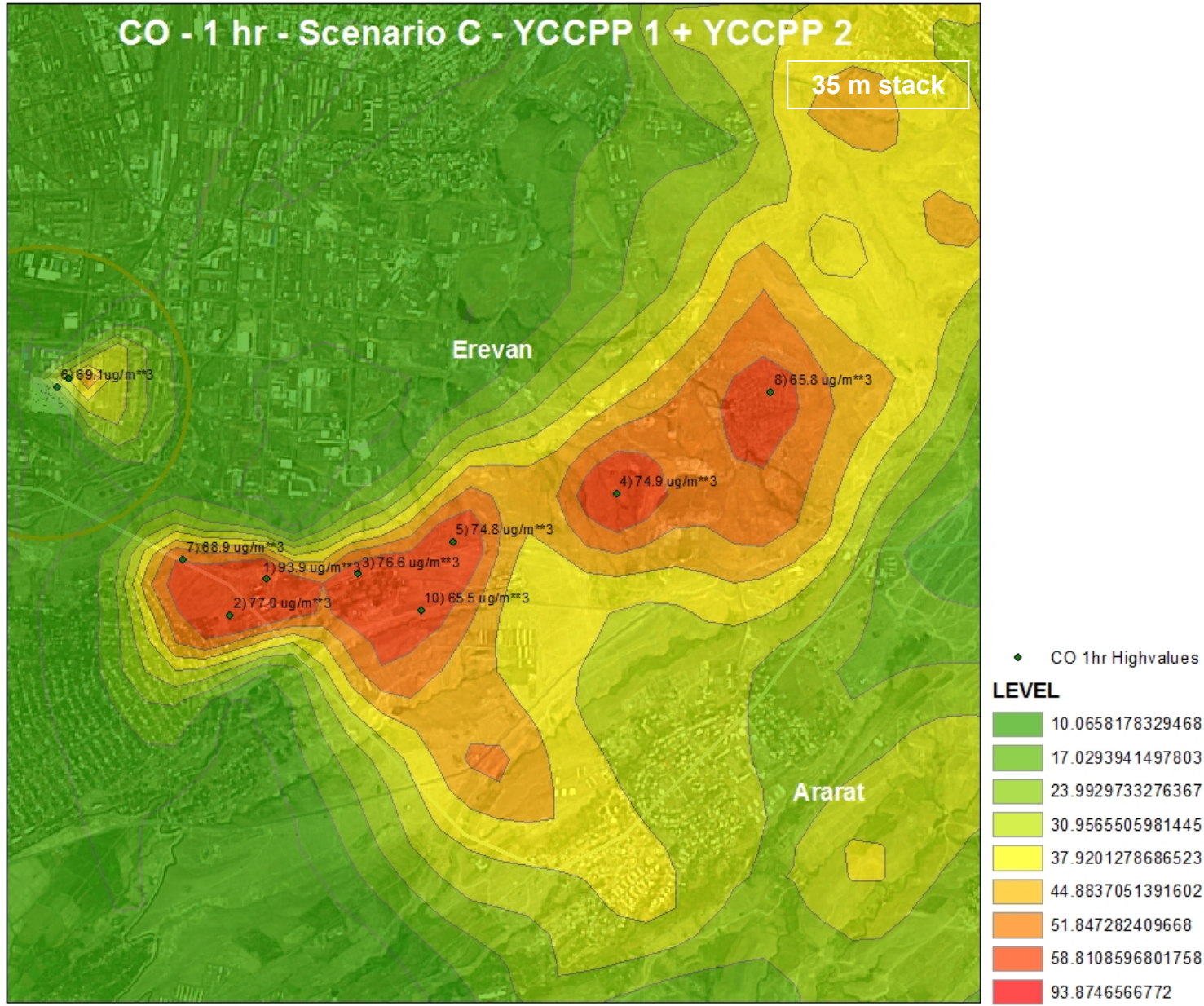


Figure 5-2: Maximum simulated 1 hr CO GLC - indicative cumulative effects - YCCPP-1 + YCCPP-2 - closer view of the higher values

5.4.2 CO - 8 hours AQS

The ECD defines an 8-hours air quality standard for CO, unlike the Armenian legislation. The model results (Table 5-2) show that no difficulties are expected regarding fulfillment of this standard in any of the scenarios.

The contribution of YCCPP-2 represents less than 25% of the applicable AQS (i.e., 0.6% and 0.3%), being in line with IFC's recommendation for a future sustainable development in the area.

Time period	CO maximum modeled GLC [$\mu\text{g}/\text{m}^3$]			Air Quality Standards [$\mu\text{g}/\text{m}^3$]	
	Stack YCCPP-2: 35 m (original design)	Stack YCCPP-2: 43 m (alternative design)	Stack YCCPP-2: 66 m (GEP stack height)	National MAC	ECD
Indicative SCENARIO A - Only YCCPP-1					
8 hours	0.98	0.98	0.98	-	10,000
SCENARIO B - Only YCCPP 2					
8 hours	59.5	57.8	30.9	-	10,000
	% of the AQS: 0.6%	% of the AQS: 0.6%	% of the AQS: 0.3%		
Indicative SCENARIO C - YCCPP-1 + YCCPP 2					
8 hours	60.3	58.6	31.8	-	10,000

Standard is not exceeded
 Standard is exceeded

Table 5-2: Maximum simulated 8 hr CO GLC and comparison with the air quality standards

The concentration plots for Scenario C (35 meters stack height) (Figure 5-3 and Figure 5-4) show that the absolute cumulative maximum of $60.3 \mu\text{g}/\text{m}^3$ is found in the industrial areas to the east and southeast of the power plants' area. The plots for a 43 meters stack and for a 66 meters stack are similar and redundant. Therefore, these are not shown in this report.

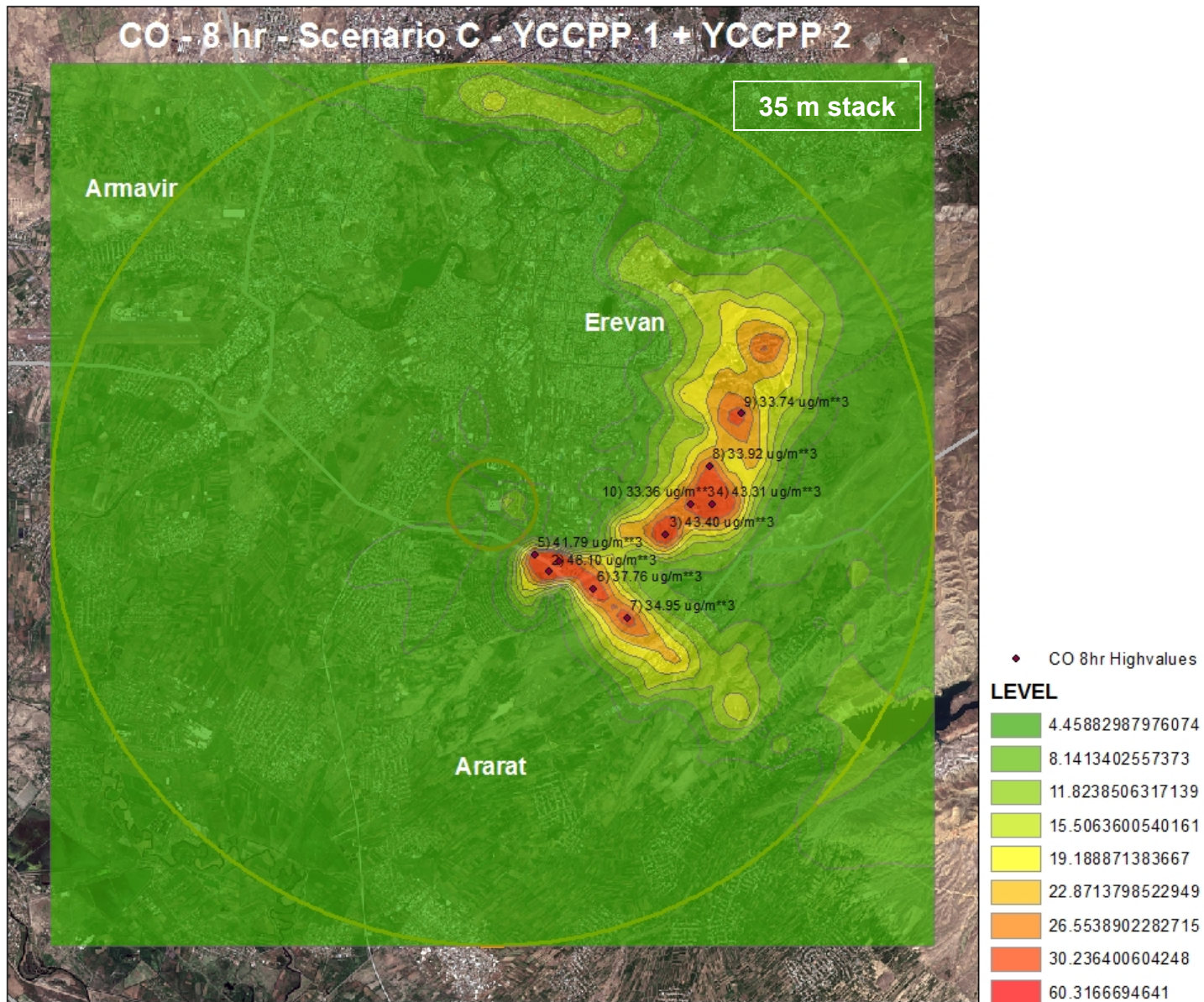


Figure 5-3: Maximum simulated 8 hr CO GLC - indicative cumulative effects - YCCPP-1 + YCCPP 2

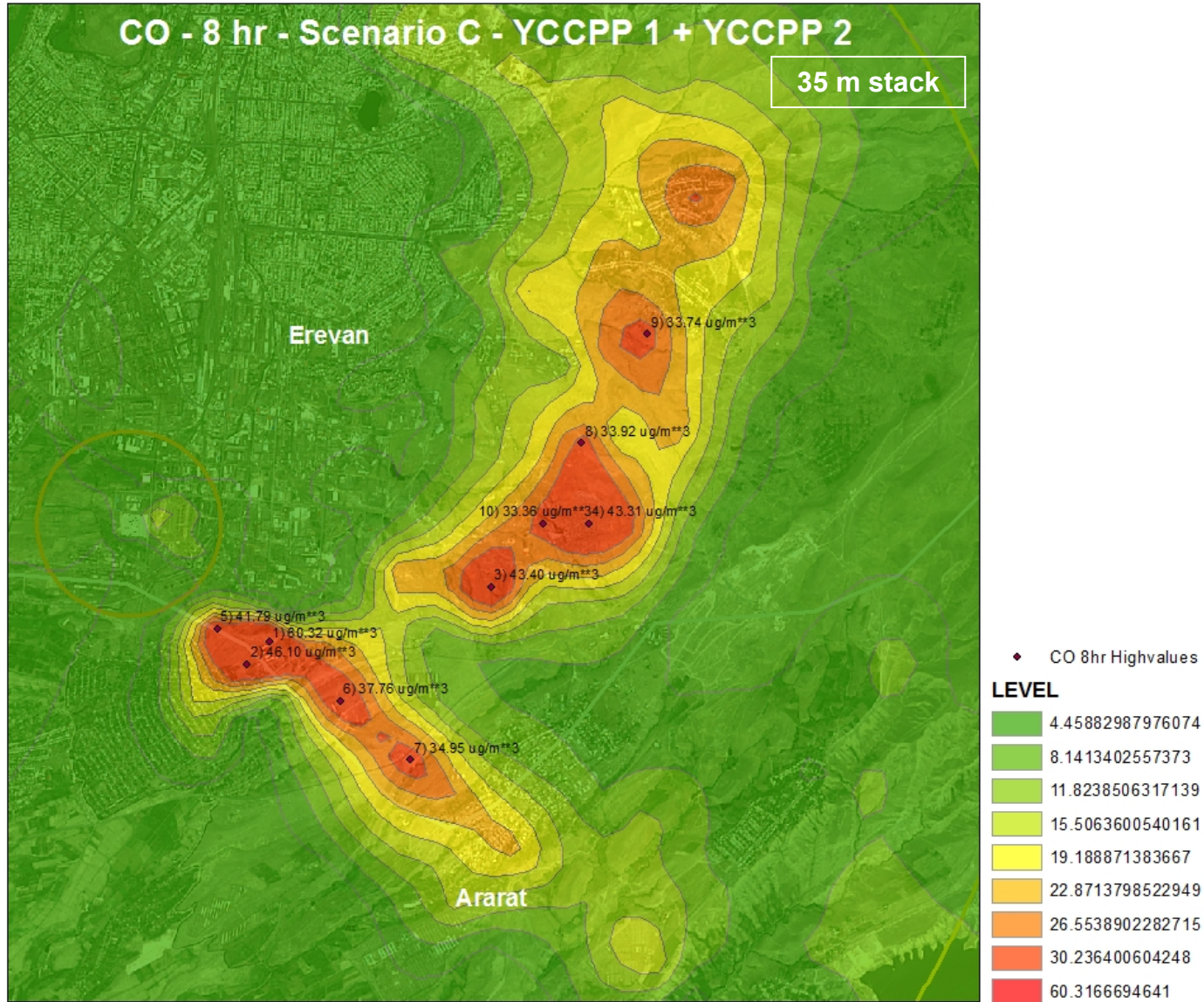


Figure 5-4: Maximum simulated 8 hr CO GLC - indicative cumulative effects - YCCPP-1 + YCCPP-2 - closer view of the higher values

5.4.3 CO - 24 hours AQS

The ECD defines no 24 hours AQS for CO. Regarding the national MAC, the results show that this standard is expected to be respected in the entire assessment area (Table 5-3).

The contribution of YCCPP-2 represents less than 25% of the applicable AQS (i.e., 0.7% and 0.6%), being in line with IFC’s recommendation for a future sustainable development in the area.

Time period	CO maximum modeled GLC [$\mu\text{g}/\text{m}^3$]			Air Quality Standards [$\mu\text{g}/\text{m}^3$]	
	Stack YCCPP-2: 35 m (original design)	Stack YCCPP-2: 43 m (alternative design)	Stack YCCPP-2: 66 m (GEP stack height)	National MAC	ECD
Indicative SCENARIO A - Only YCCPP-1					
24 hours	0.6	0.6	0.6	3,000	-
SCENARIO B - Only YCCPP 2					
24 hours	21.2	20.4	17.2	3,000	-
	% of the AQS: 0.7%	% of the AQS: 0.7%	% of the AQS: 0.6%		
Indicative SCENARIO C - YCCPP-1 + YCCPP 2					
24 hours	21.6	20.7	17.7	3,000	-

Standard is not exceeded
 Standard is exceeded

Table 5-3: Maximum simulated 24 hr CO GLC and comparison with the air quality standards

The maximum 24 hr concentration plots for Scenario C - 35 meters stack (Figure 5-5 and Figure 5-6) show that the absolute cumulative maximum of $21.6 \mu\text{g}/\text{m}^3$ is found in the residential area east of center Yerevan (Verin Jrashen). This value is, as described above, far below the national MAC and is therefore no reason for concern. The plots for the 43 meters stack and for 66 meters stack are similar and therefore redundant, and are not represented in this report.

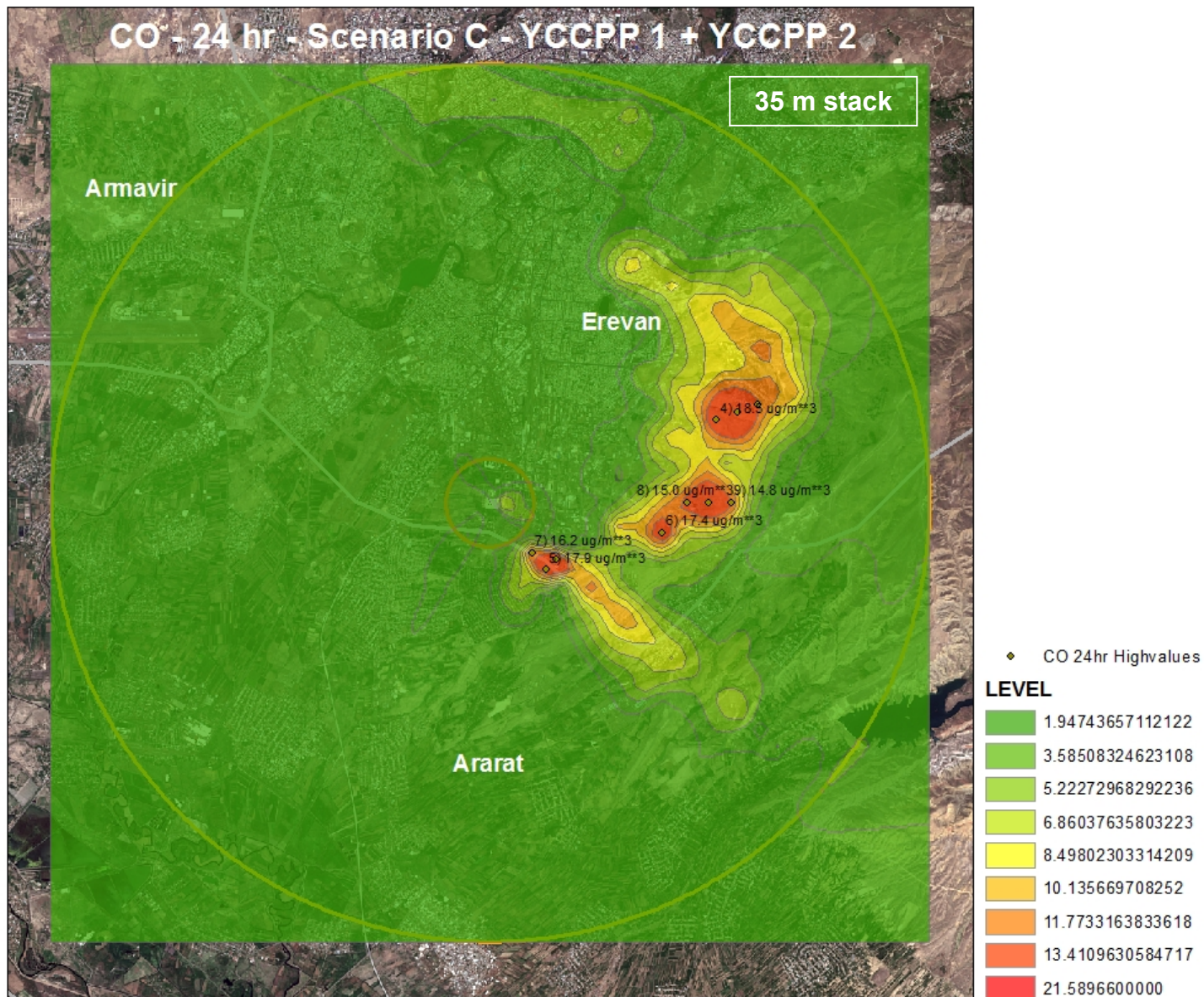


Figure 5-5: Maximum simulated 24 hr CO GLC - indicative cumulative effects - YCCPP-1 + YCCPP 2

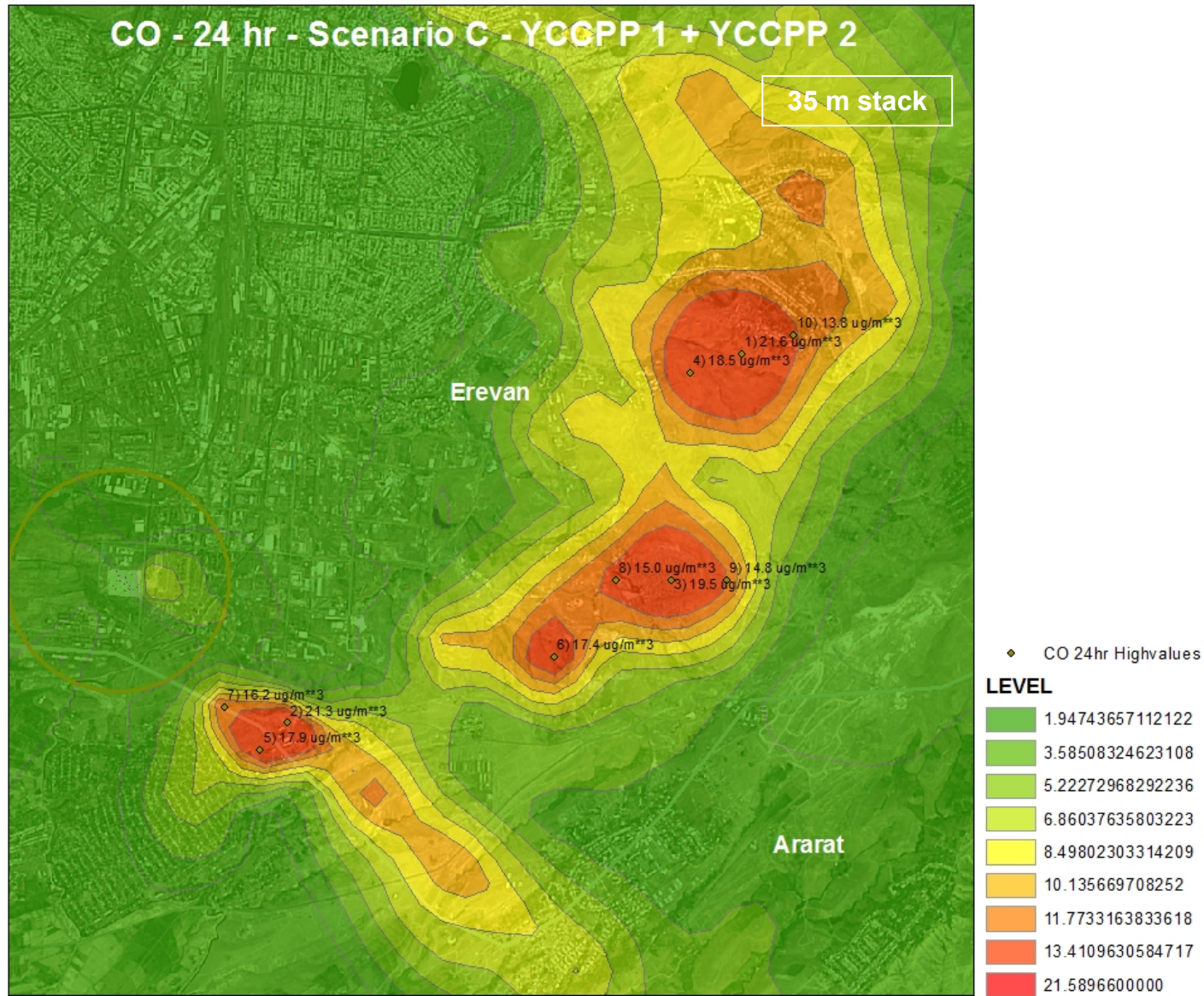


Figure 5-6: Maximum simulated 24 hr CO GLC - indicative cumulative effects - YCCPP-1 + YCCPP-2 - closer view of the higher values

5.4.4 NO₂ - Short-time and 1 hour AQS

The national legislation defines a short-time MAC for NO₂ of 200 µg/m³. A definition of “short-time” is not given in the national legislation, for what in this study the comparison is made with the simulated 1-hour values.

Table 5-4 shows that the maximum modeled 1 hr NO₂ GLCs are expected to be below the national and the international standards throughout the entire assessment area for all scenarios and all stack heights.

The results show, however, that the effect of YCCPP-2 is expected to represent more than 25% of the WHO GL (i.e., 61.5% for a 35 meters stack, 58.5% for a 43 meters stack, and 35.8% for a 66 meters stack), which goes against the IFC recommendation for a future sustainable development in the area. RENCO will implement additional emission reduction measures to overcome this issue, as described in detail in Section 5.5.

Time period	NO ₂ maximum modeled GLC [µg/m ³]			Air Quality Standards [µg/m ³]	
	Stack YCCPP-2: 35 m (original design)	Stack YCCPP-2: 43 m (alternative design)	Stack YCCPP-2: 66 m (GEP stack height)	National MAC	ECD
Indicative SCENARIO A - Only YCCPP-1					
1 hour / Short time	71.5	71.5	71.5	200	200 18 times/year
SCENARIO B - Only YCCPP 2					
1 hour / Short time	123	117	71.6	200	200 18 times/year
	<i>% of the AQS: 61.5%</i>	<i>% of the AQS: 58.5%</i>	<i>% of the AQS: 35.8%</i>		
Indicative SCENARIO C - YCCPP-1 + YCCPP 2					
1 hour / Short time	174	172	124.4	200	200 18 times/year

Standard is not exceeded
 Standard is exceeded

Table 5-4: Maximum simulated 1 hr NO₂ GLC and comparison with the air quality standards

Figure 5-7 (overview) and Figure 5-8 (close-up) show the maximum cumulative concentration plots for Scenario C with 35 meters stack height. The plots show that the higher values are expected to be found in the industrial areas to the east and to the southeast of the YCCPP-1 and 2. These higher values are, however, below the AQS. The plots for the simulations with a 43 meters stack height and 66 meters stack height are similar and are therefore not shown in this report to avoid redundancy.

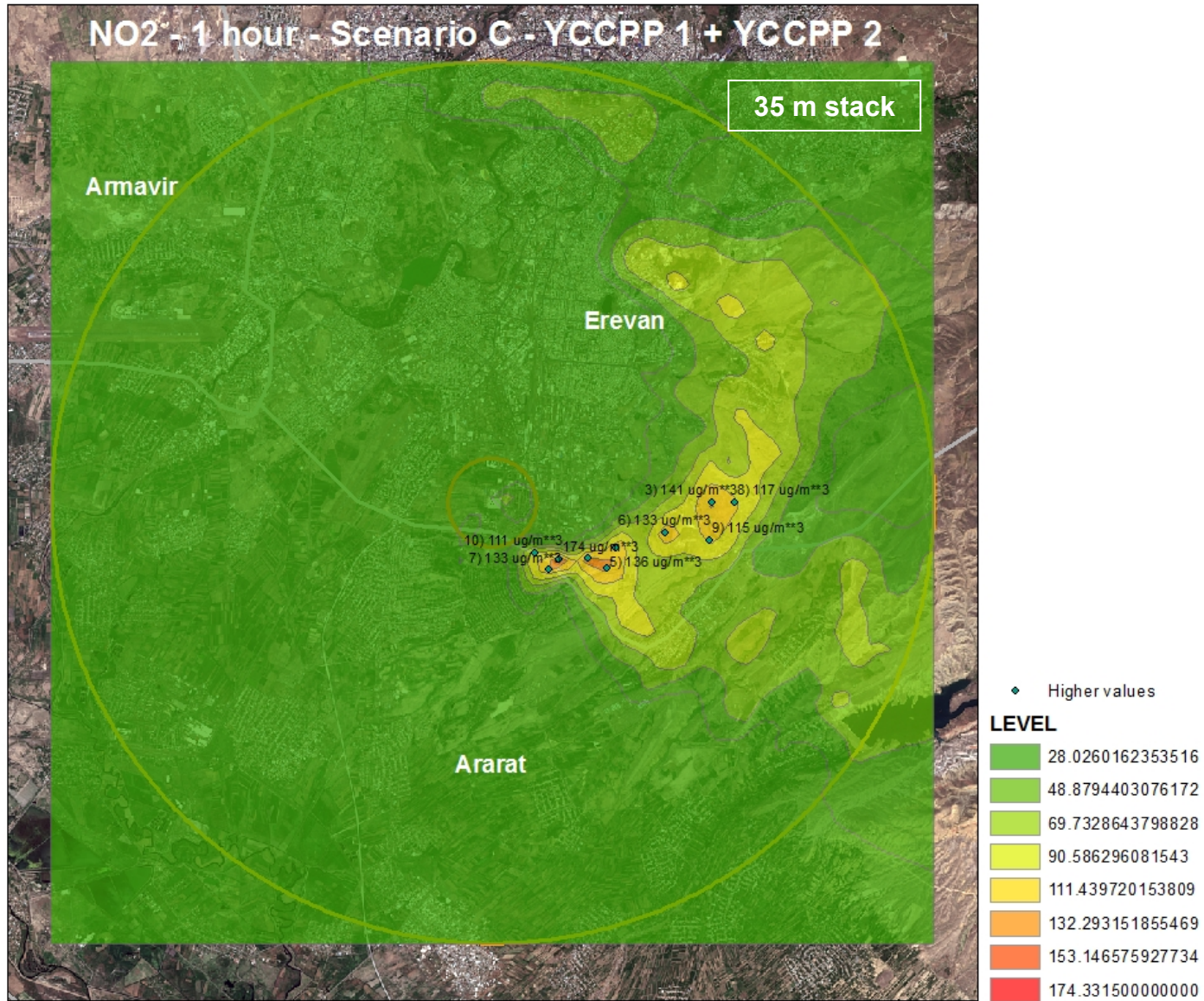


Figure 5-7: Maximum simulated 1 hr NO₂ GLC - indicative cumulative effects - YCCPP-1 + YCCPP 2

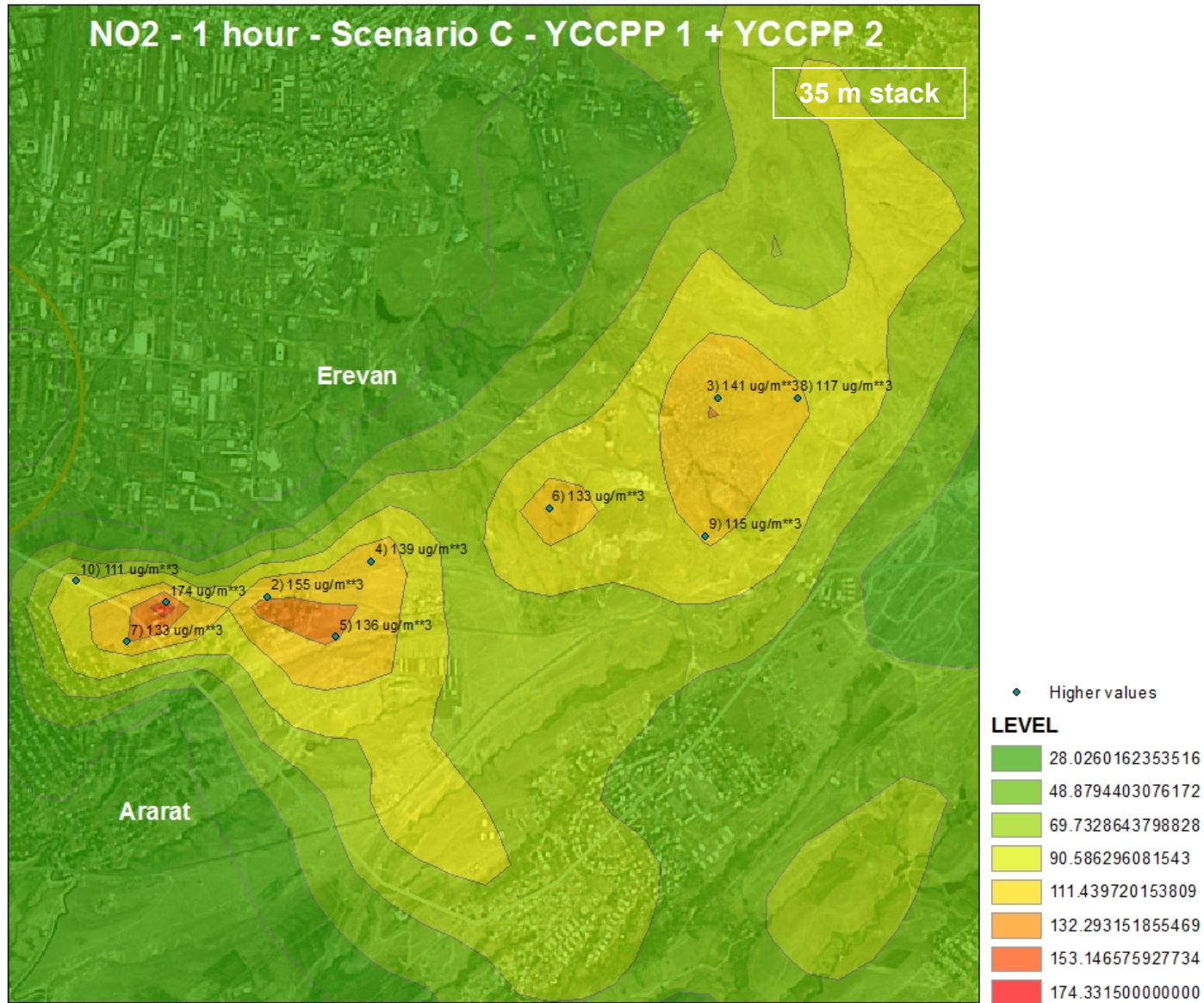


Figure 5-8: Maximum simulated 1 hr NO₂ GLC - indicative cumulative effects - YCCPP-1 + YCCPP-2 - closer view of the higher values

5.4.5 NO₂ - 24 hours AQS

There is no ECD standard for 24 hr NO₂ GLC. The results for the maximum 24 hr NO₂ GLC show that the national MAC is expected to be fulfilled in the area for Scenarios A and B. In Scenario C, the national MAC is not expected to be respected in the area (Table 5-5). It shall be noted that **Scenario C is indicative** at this stage, and will be updated as soon as more baseline information is available.

The maximum GLC as a result of the operation of YCCPP-2 (Scenario B) represents more than 25% of the national MAC, which does not allow respecting the IFC recommendation for a future sustainable development in the direct vicinity of the plant. This is the case for the three stack heights.

When compared to the EU legislation, which was defined based on the guidelines of the World Health Organization (WHO, 2006), the 24 hr national MAC of 40 µg/m³ corresponds to the EU's annual limit. This means that the national MAC for 24 hr NO₂ is **very stringent**. The difficulty to comply with the national MAC may be overcome in the future by implementing additional emission reduction measures (see Section 5.5 - Future developments scenario).

Time period	NO ₂ maximum modeled GLC [µg/m ³]			Air Quality Standards [µg/m ³]	
	Stack YCCPP-2: 35 m (original design)	Stack YCCPP-2: 43 m (alternative design)	Stack YCCPP-2: 66 m (GEP stack height)	National MAC	ECD
Indicative SCENARIO A - Only YCCPP-1					
24 hours	20.1	20.1	20.1	40	-
SCENARIO B - Only YCCPP-2					
24 hours	28.2	27.1	22.8	40	-
	% of the AQS: 70.5%	% of the AQS: 67.8%	% of the AQS: 57.0%		
Indicative SCENARIO C - YCCPP-1 + YCCPP-2					
24 hours	42.5	40.4	42.9	40	-

Standard is not exceeded
 Standard is exceeded

Table 5-5: Maximum simulated 24 hours NO₂ GLC and comparison with the air quality standards

Figure 5-9 (overview) and Figure 5-10 (close-up) show the maximum GLC plots for cumulative effects (Scenario C) for a 35 meters stack; Figures 5-11 and 5-12 show the plots for Scenario C for a 66 meters stack. The plots show that the higher values are expected to be found in the areas to the east, to the northeast and to the southeast of the YCCPP-1 and 2. These areas cover industrial sites, but also the residential areas of Verin Jrashen and Mushavan, located to the east of center Yerevan.

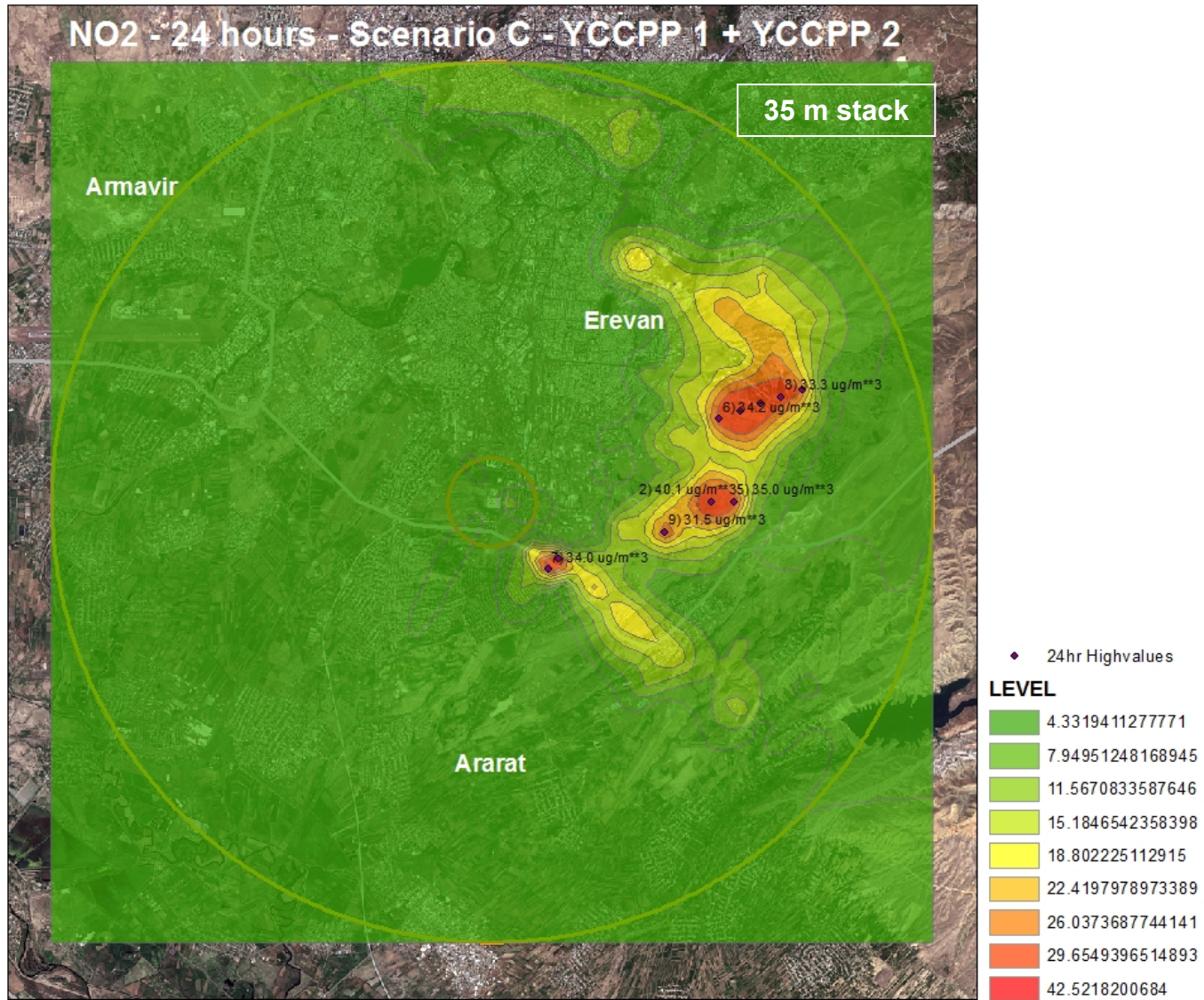


Figure 5-9: Maximum simulated 24 hr NO₂ GLC - indicative cumulative effects - YCCPP-1 + YCCPP 2

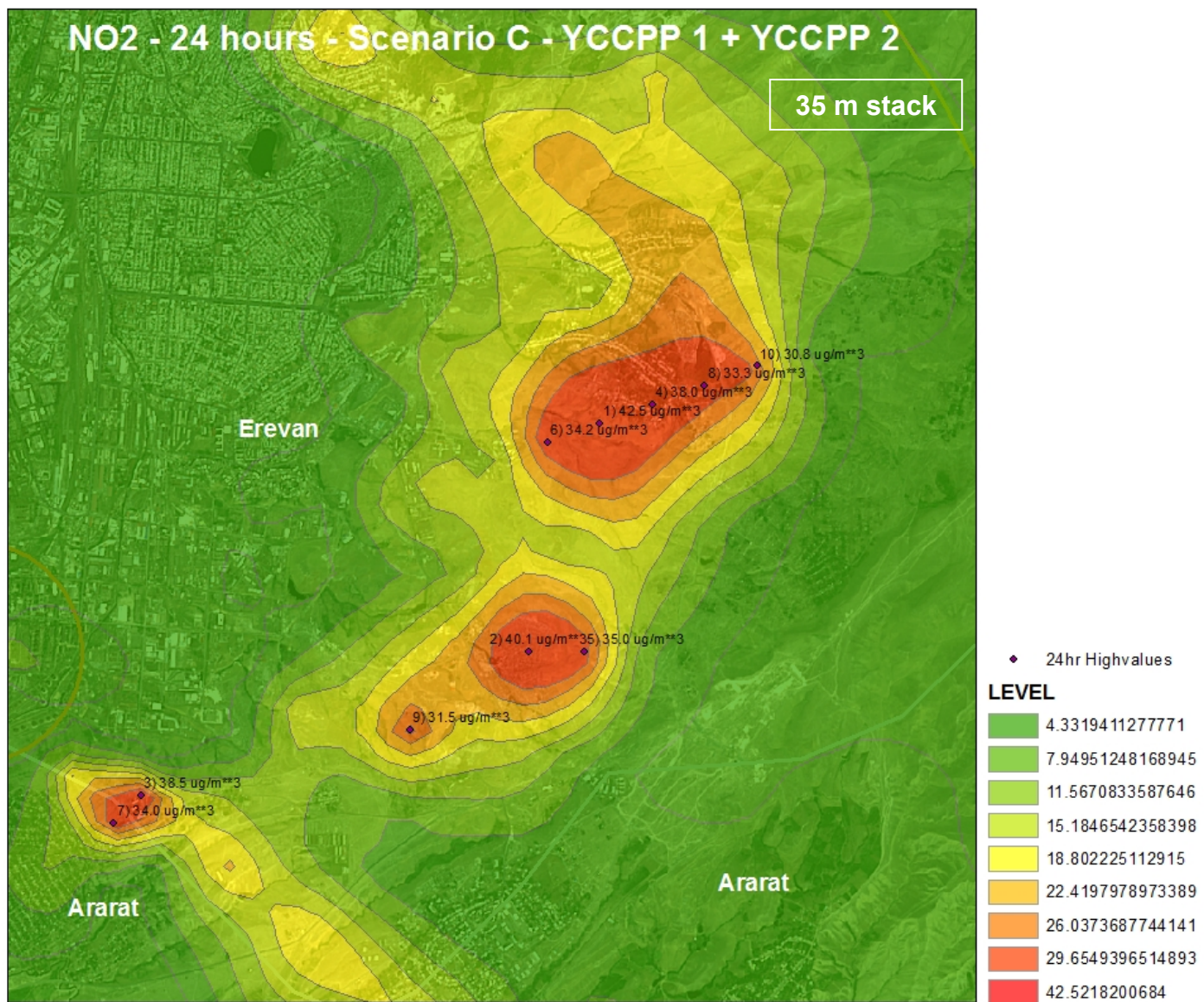


Figure 5-10: Maximum simulated 24 hr NO₂ GLC - indicative cumulative effects - YCCPP-1 + YCCPP-2 - closer view of the higher values

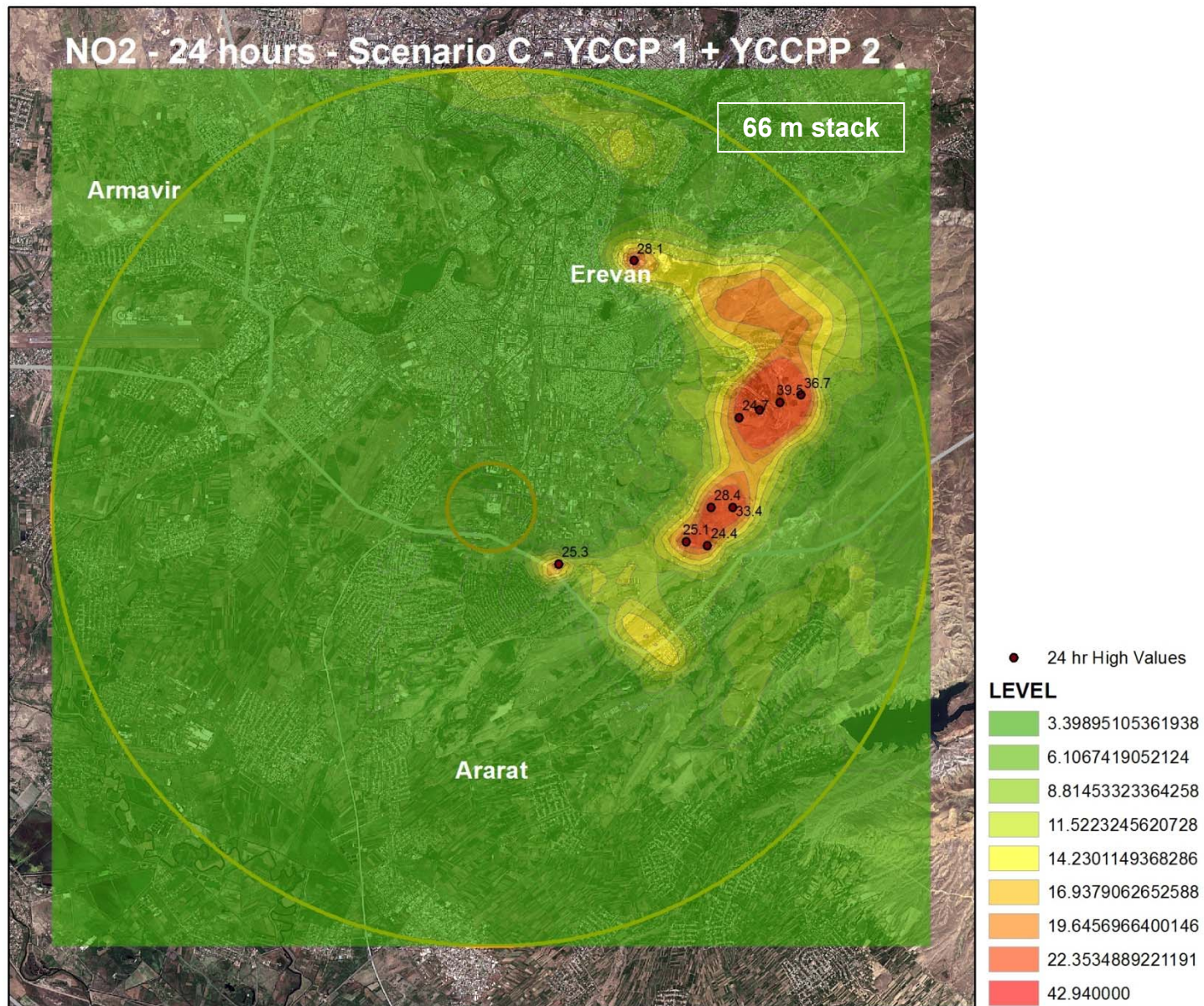


Figure 5-11: Maximum simulated 24 hr NO₂ GLC - indicative cumulative effects - YCCPP-1 + YCCPP 2 - 66 meters stack

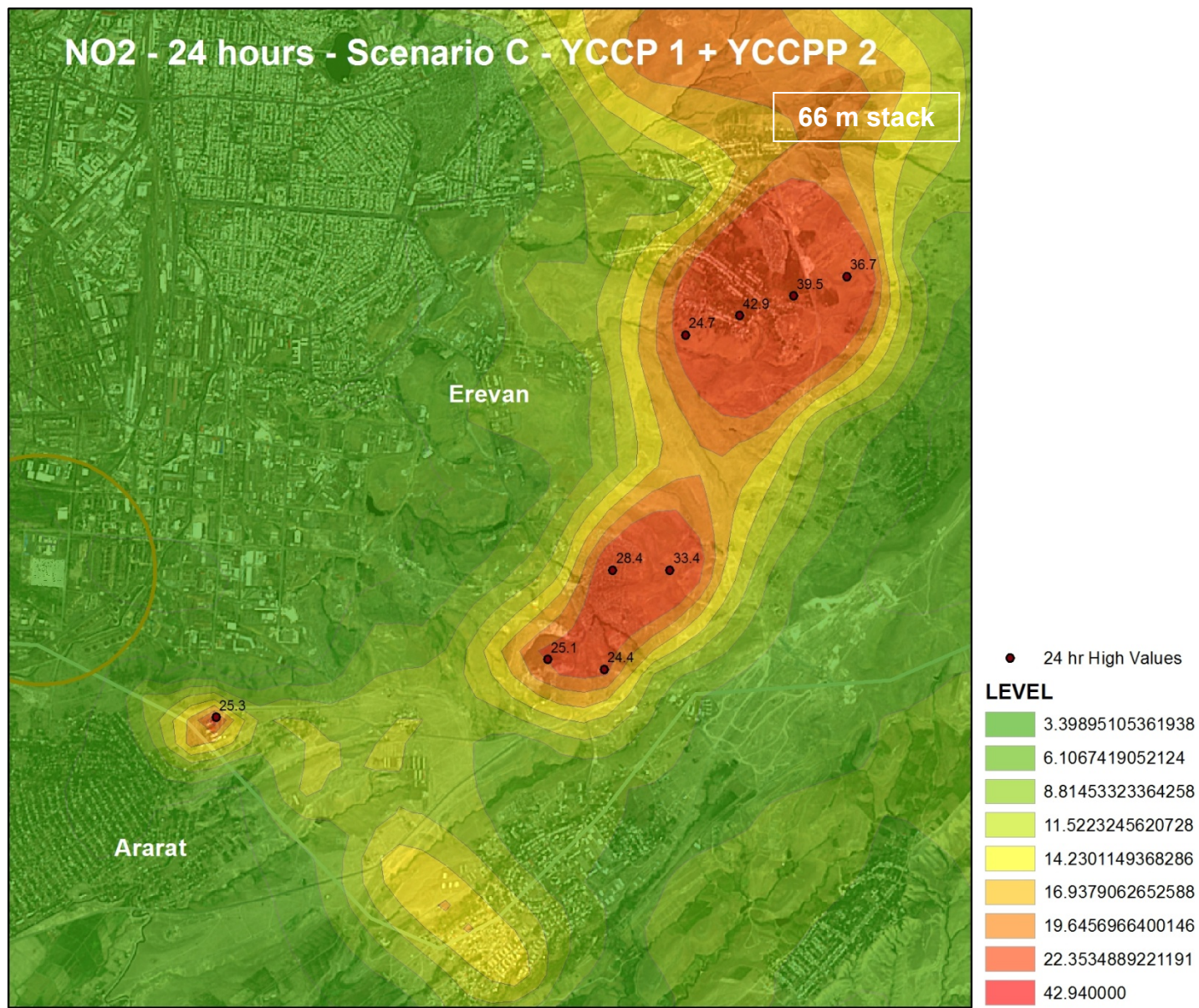


Figure 5-12: Maximum simulated 24 hr NO₂ GLC - indicative cumulative effects - YCCPP-1 + YCCPP-2 - closer view of the higher values - 66 meters stack

5.4.6 NO₂ - Annual AQS

The predicted annual NO₂ values in the project area are very low. The comparison with the applicable air quality standard (only ECD) reveals that this is not expected to be exceeded (Table 5-6).

The maximum increment in the NO₂ annual mean represents far less than 25% of the ECD AQS, which respects IFC's dispositions regarding future sustainable development in the area.

Time period	NO ₂ maximum modeled GLC [$\mu\text{g}/\text{m}^3$]			Air Quality Standards [$\mu\text{g}/\text{m}^3$]	
	Stack YCCPP-2: 35 m (original design)	Stack YCCPP-2: 43 m (alternative design)	Stack YCCPP-2: 66 m (GEP stack height)	National MAC	ECD
Indicative SCENARIO A - Only YCCPP-1					
1 year	0.5	0.5	0.5	-	40
SCENARIO B - Only YCCPP 2					
1 year	0.8	0.7	0.6	-	40
	<i>% of the AQS: 2%</i>	<i>% of the AQS: 1.8%</i>	<i>% of the AQS: 1.5%</i>		
Indicative SCENARIO C - YCCPP-1 + YCCPP 2					
1 year	1.2	1.1	1.0	-	40

Standard is not exceeded
 Standard is exceeded

Table 5-6: Maximum simulated annual NO₂ GLC and comparison with the air quality standards

Figure 5-13 and Figure 5-14 show the maximum GLC plots for Scenario C (cumulative effects) for a 35 meters stack. The plots show that the maximum GLC are expected very close to the power plants. The plots for the simulations with a 43 meters stack height and for a 66 meters stack height are similar and are therefore not shown in this report to avoid redundancy.

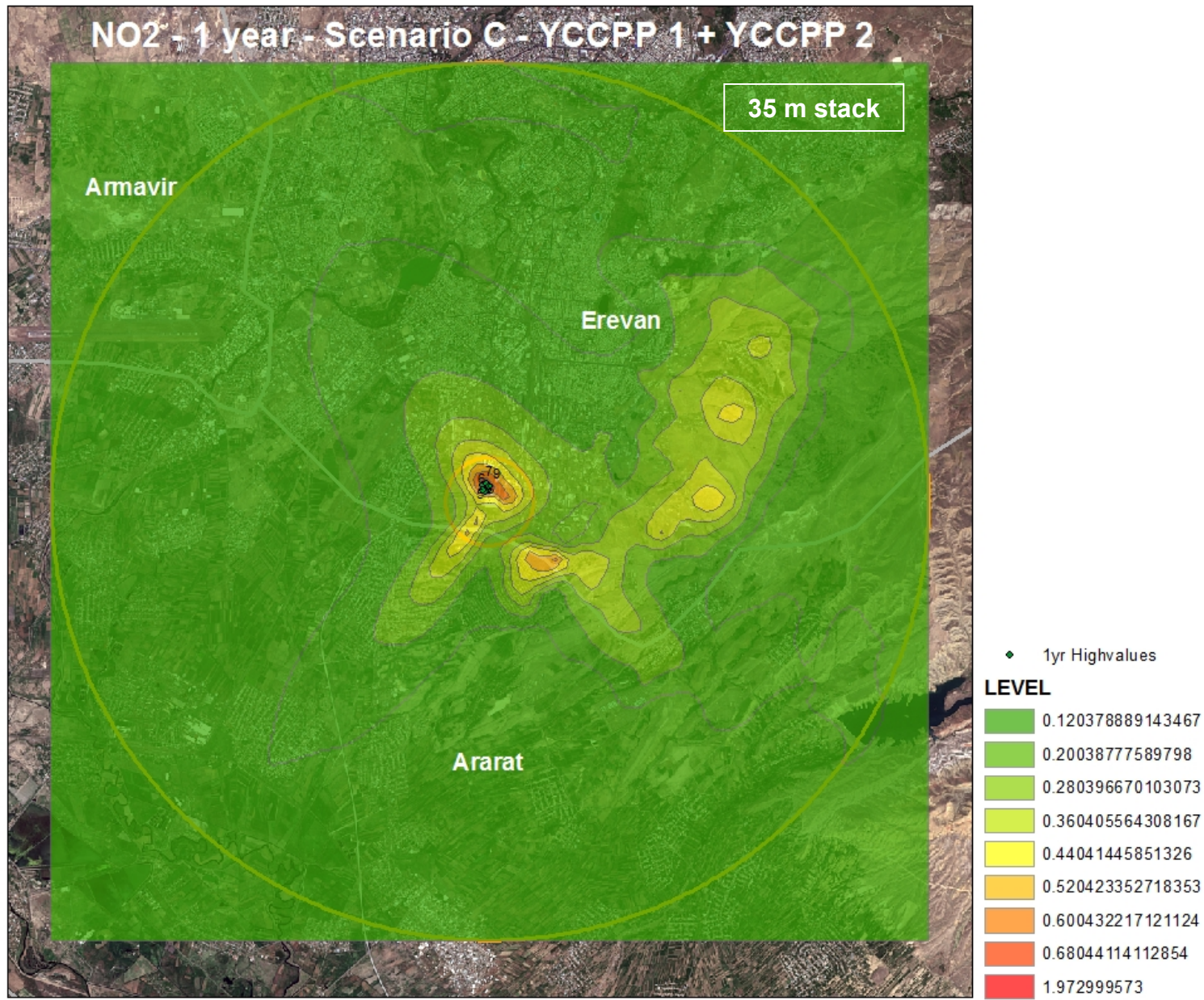


Figure 5-13: Maximum simulated 1 yr NO₂ GLC - indicative cumulative effects - YCCPP-1 + YCCPP 2

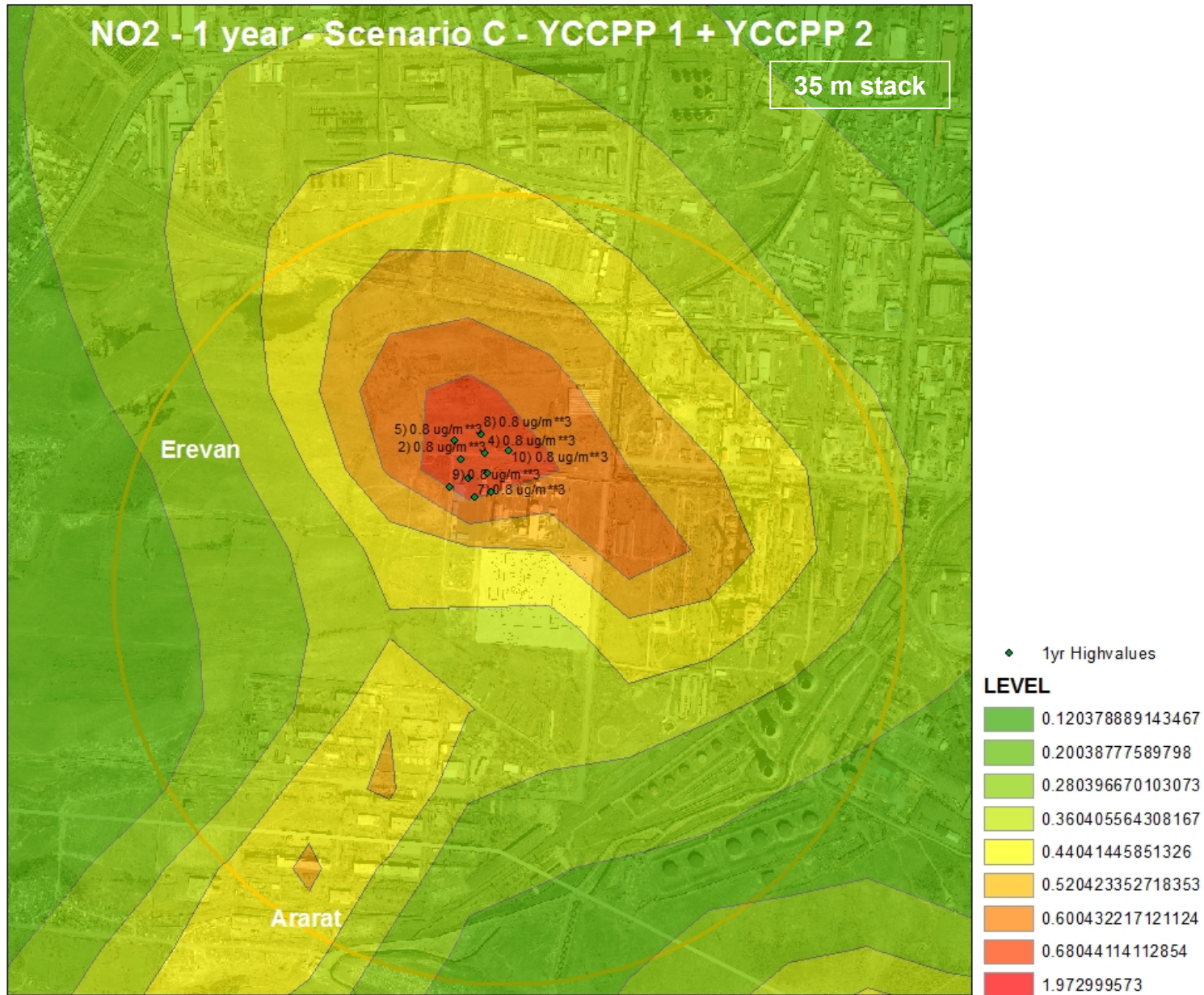


Figure 5-14: Maximum simulated 1 yr NO₂ GLC - indicative cumulative effects - YCCPP-1 + YCCPP-2 - closer view of the higher values

5.5 ADC Results - Future developments scenario

AERMOD calculated 66 meters as the GEP stack height, and this will be followed by the project's design. The effect of YCCPP-2 on the ground level concentrations of NO₂ is, however, expected to represent more than 25% of the national and international standards for this pollutant, even when the stack is raised to 66 meters. This goes against the IFC recommendation for a future sustainable development in the area. In addition, it is at this stage unknown what will be the real cumulative effect of the Project, because the existing pollution loads are only partly known. In case these are very high, the Project's emissions may need to be further reduced.

Taking both conditions as described above into consideration, RENCO will incorporate additional emission reduction measures in the design, going beyond increasing the stack height to 66 meters. These measures will be implemented by means of a two-stage procedure in such a way to optimize the CAPEX of the project:

- **Stage 1 (design and construction):** the new power plant will be designed and built considering the installation of a transition spool between the gas turbine's exhaust and the HRSG. This transition spool will allow installing a SCR (catalytic device) in Stage 2. In addition, there will be a space provided to install the catalyst system necessary to operate the SCR.
- **Stage 2 (implementation):** In case a development project which causes NO_x emissions in the same airshed of the new power plant can be reasonably foreseen, or in case the existing pollution loads are very high, the provision spool will be removed and replaced by the SCR and storage and distribution system of the chemical (ammonia) being installed in the space left unoccupied during Stage 1. The intervention works for Stage 2 will be short and the new facilities will immediately start operating to drop the emissions.

The measures as described above will allow reducing the emissions of NO₂ in 55% (Table 5-7).

Parameter	Performance Guarantees		Future development scenario	
	Concentration [mg/Nm ³] dry, 15% O ₂	Emission rate [g/s]	Concentration [mg/Nm ³] dry, 15% O ₂	Emission rate [g/s]
NO ₂	50.0	20.6	21.8	9.0
Stack height	66 m - GEP stack height		66 m	

Table 5-7: Future development scenario - NO₂ emissions

Stage 2 is preventive, i.e., it will be activated only in the following situations:

- The results of the baseline measurement (special focus on the Winter results) show that the existing pollution load is very high. This implies that YCCPP-2 needs to reduce its emissions to avoid a high cumulative impact; *and/or*
- a NO_x emission source (power plant or similar) is installed in the same airshed (up to 10 km). The future installation of other industrial plants in the area cannot be reasonably foreseen at this stage.

This section presents the results of the simulation of the contribution of the YCCPP-2 for the GLC in the area in the future developments scenario. Only Scenario B is shown.

5.5.1 NO₂ - Short-time and 1 hour AQS

Table 5-8 shows that the maximum modeled 1 hr NO₂ GLCs as a result of the operation of YCCPP-2 in a future developments scenario are expected to be below the national and the international standards throughout the entire assessment area.

The results show in addition that the effect of YCCPP-2 is expected to represent less than 25% of the standards (i.e., 15.7%), which respects the IFC recommendation for a future sustainable development in the area.

Time period	NO ₂ maximum modeled GLC [µg/m ³]	Air Quality Standards [µg/m ³]	
	Stack YCCPP-2: 66 m (chosen design - GEP stack height)	National MAC	ECD
SCENARIO B - Only YCCPP-2			
1 hour / Short time	31.3	200	200 18 times/year
	% of the AQS: 15.7%		



 Standard is not exceeded  Standard is exceeded

Table 5-8: Maximum simulated 1 hr NO₂ GLC and comparison with the air quality standards - future developments scenario

Figure 5-15 (overview) and Figure 5-16 (close-up) show the maximum concentration plots for Scenario B in the future developments scenario. The plots show that the higher values are expected to be found in the industrial areas to the east of the YCCPP- 2. These higher values are, however, below the AQS and the IFC recommendation for a future sustainable development in the area.

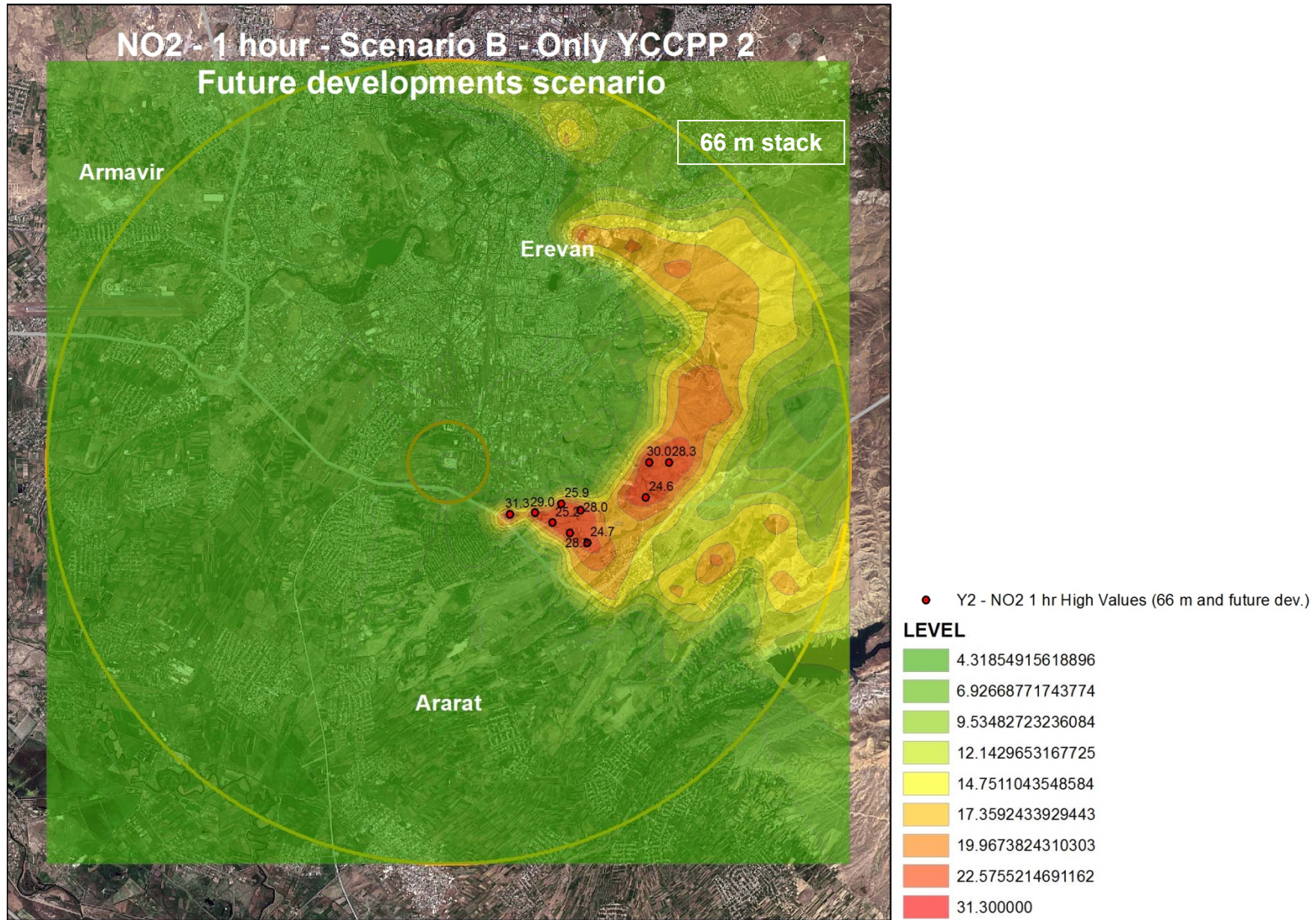


Figure 5-15: Maximum simulated 1 hr NO₂ GLC - Scenario B - Only YCCPP 2 - Future developments scenario

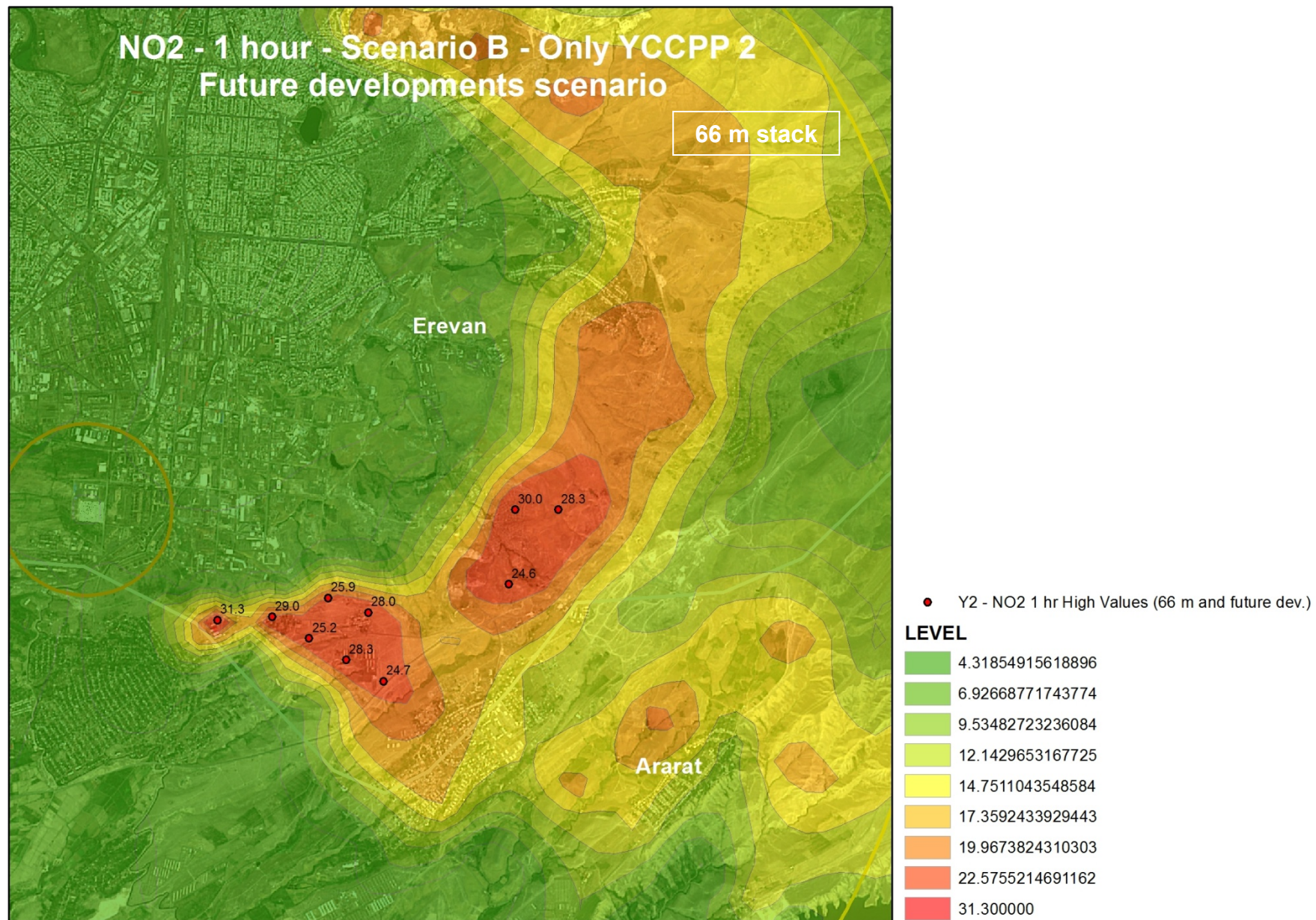


Figure 5-16: Maximum simulated 1 hr NO₂ GLC - Scenario B - Only YCCPP 2 - Future developments scenario - closer view of the higher values

5.5.2 NO₂ - 24 hours AQS

Table 5-9 shows that the maximum modeled 24 hr NO₂ GLCs as a result of the operation of YCCPP-2 in a future developments scenario are expected to be below the national standard throughout the entire assessment area.

The results show in addition that the effect of YCCPP-2 is expected to represent 25% of the national standard, which respects the IFC recommendation for a future sustainable development in the area.

Time period	NO ₂ maximum modeled GLC [µg/m ³]	Air Quality Standards [µg/m ³]	
	Stack YCCPP-2: 66 m (chosen design - GEP stack height)	National MAC	ECD
SCENARIO B - Only YCCPP-2			
24 hours	10.0	40	-
	% of the AQS: 25%		

 Standard is not exceeded  Standard is exceeded

Table 5-9: Maximum simulated 24 hr NO₂ GLC and comparison with the air quality standards - future developments scenario

Figure 5-17 (overview) and Figure 5-18 (close-up) show the maximum concentration plots for Scenario B in the future developments scenario. The plots reveal that the higher values are expected to be found in the industrial areas to the east and in the residential areas to the northeast of the YCCPP-2. These higher values are, however, below the AQS and the IFC recommendation for a future sustainable development in the area.

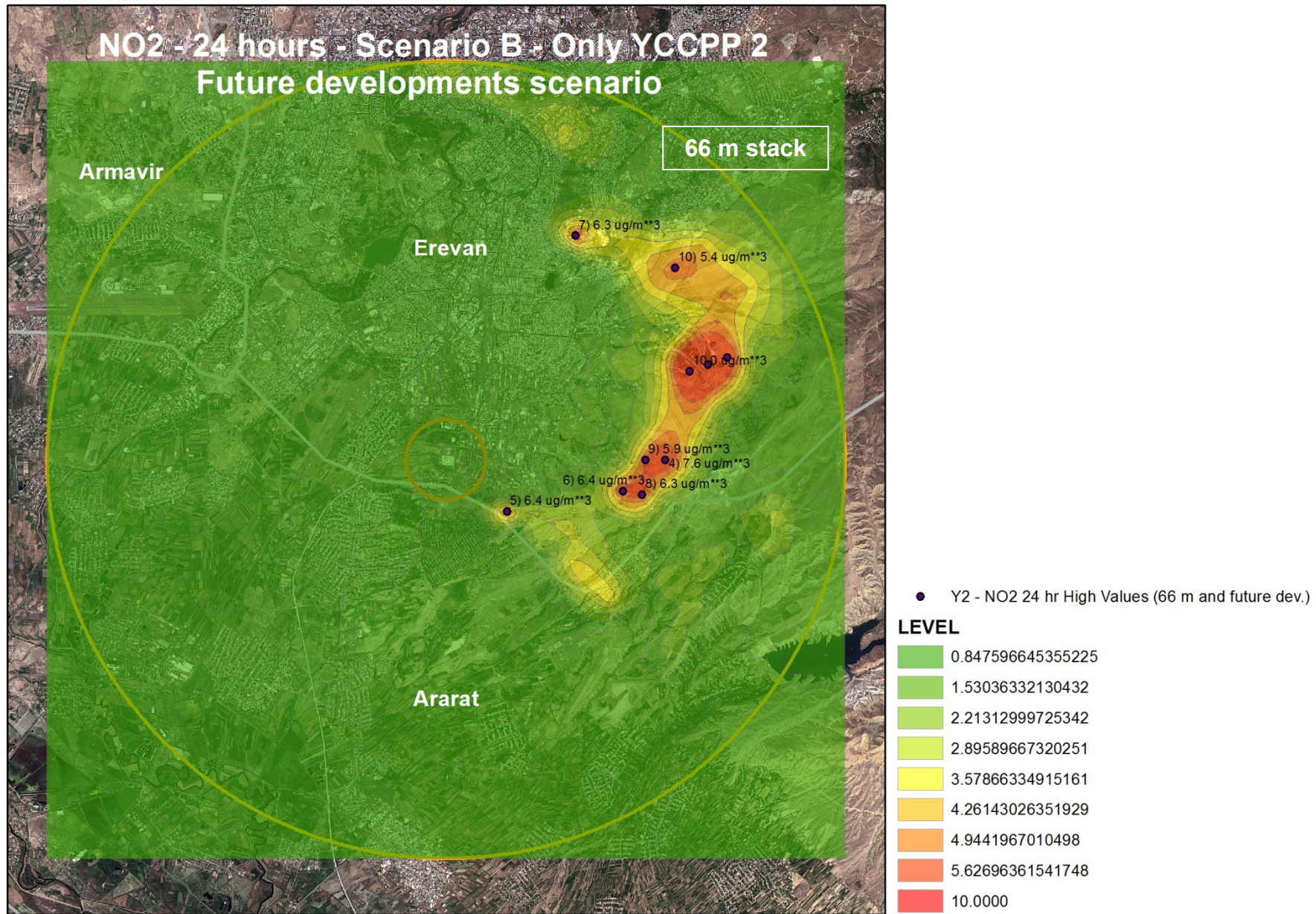


Figure 5-17: Maximum simulated 24 hr NO₂ GLC - Scenario B - Only YCCPP 2 - Future developments scenario

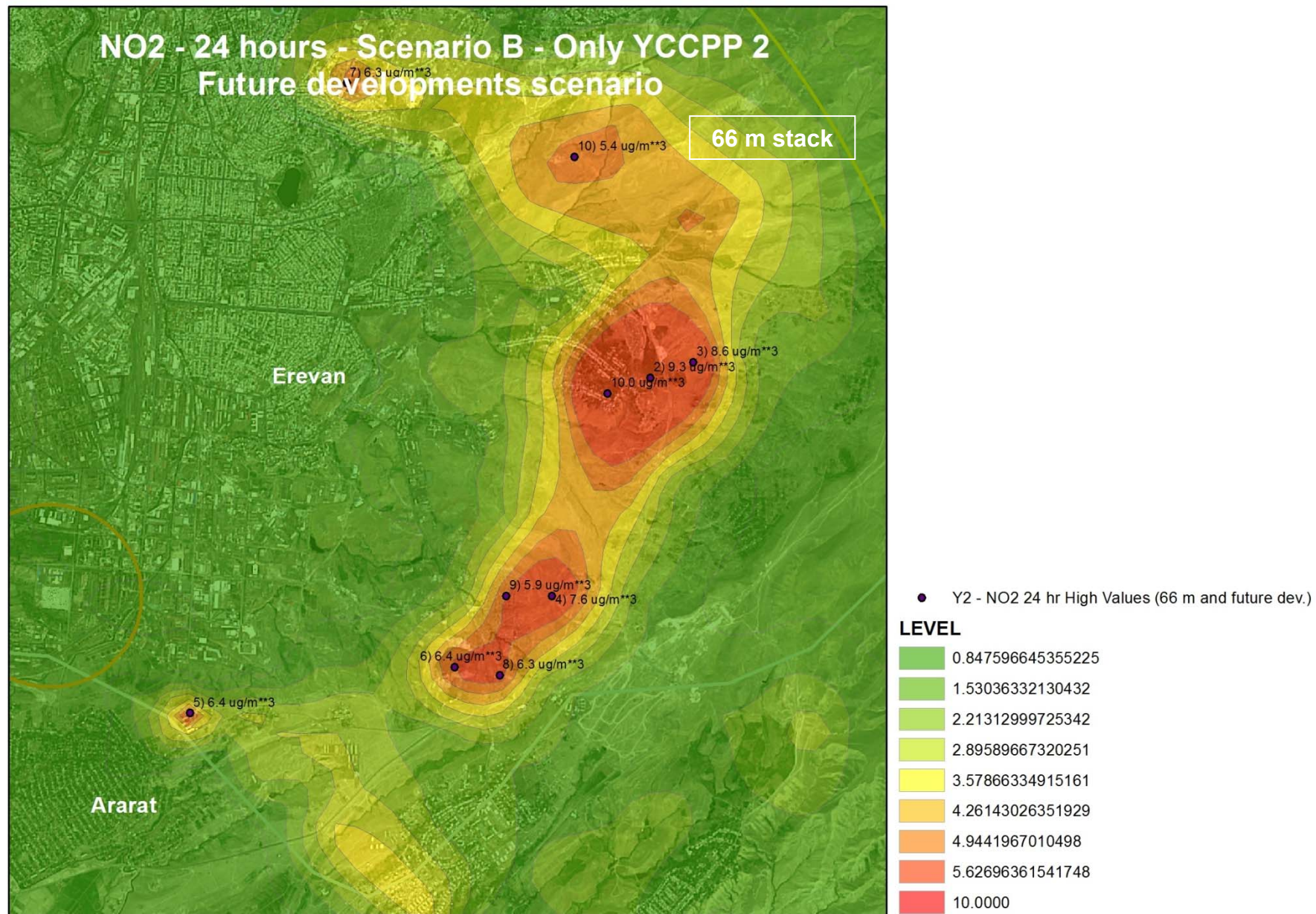


Figure 5-18: Maximum simulated 24 hr NO₂ GLC - Scenario B - Only YCCPP 2 - Future developments scenario - closer view of the higher values

6. Summary of the results

The present ADC allows understanding what is the expected impact of the YCCPP-2 on the airshed of Yerevan.

In respect for international requirements, it is important to understand the quality of the airshed before the project is implemented (**baseline**). Only considering the baseline it is possible to understand the **cumulative impact** of the project. Baseline data have been collected in Summer and August 2017 in the project area, and additional data will be collected in other seasons (Winter and Spring) to define a complete and realistic baseline scenario.

In order to obtain **one first indication about the cumulative effects** of the Project, this ADC considered the contribution of the neighboring YCCPP-1 in the model. For this reason, the simulated Scenario C is considered to be an **indicative cumulative scenario** only. Scenario C will be updated as soon as the baseline data collection is finalized, with special focus on the Winter data, expected to be representative of the worse case scenario.

Altogether **3 scenarios** were initially simulated:

- one with only YCCPP-1 is operating (indicative baseline scenario, or **Scenario A**);
- one with only YCCPP-2 is operating (**Scenario B**),
- and one with both plants are operating (indicative future scenario, indicative cumulative scenario, or **Scenario C**).

Each of the 3 scenarios was simulated for a stack height of **35 meters** (design), for a stack height of **43 meters** (alternative), and for a stack height of **66 meters** (alternative 2, or Good Engineering Practice (GEP) stack height).

As a result of some previous model iterations, the need to simulate an additional scenario has come up:

- **Future developments scenario:** reflects the inclusion of additional emission reduction measures, in case future projects are reasonably foreseen for the area.

The simulation of the 1 hour, 8 hour and 24 hours GLCs for **CO** shows that these are expected to be very low in all scenarios for all stack heights. All CO international and national air quality standards are foreseen to be fulfilled in the area.

The maximum **1 hr, 8 hr and 24 hr** GLCs of CO derived from the operation of YCCPP-2 represent less than 25% of all applicable air quality standards for all scenarios and for all stack heights investigated.

The maximum modeled **1 hr and annual NO₂** GLCs are expected to be below the national and the international AQS throughout the entire assessment area for all scenarios and for all stack heights.

The maximum modeled **24 hr** NO₂ GLC is expected to be below the national MAC for Scenarios A and B for all stack heights. However, in Scenario C (indicative cumulative) the maximum GLC is kept above/is equal to the national MAC for all stack heights. Even though, since 66 meters is the GEP stack height, **the design will consider a stack height of 66 meters**. Scenario C will be updated with the remaining results of the baseline monitoring. If deemed necessary, the emissions of YCCPP-2 will be further reduced to assure full compliance with the 24 hr national MAC for NO₂.

The maximum modeled NO₂ 1 hr and 24 hr GLC as a result of the operation of YCCPP-2 only (Scenario B) represent more than 25% of the applicable standards for all three analysed stack heights. To overcome this issue, RENCO will incorporate **additional emission reduction measures** in the design. The simulation of the effect of these measures together with the effect of a stack with 66 meters, shows that the contribution of the YCCPP-2 can stay then below the 25% of the applicable standards. Such measures are planned in the design, but would only be activated in case a future development in the area (a new emission source, i.e., power or industrial plant) is reasonably foreseen.

7. Conclusion

The ADC presents **indicative results** of the simulation of the individual impact and the cumulative impact of the YCCPP-2 on the surrounding airshed. These indicative results show that the standards for CO are expected to be fulfilled in all cases. On the other hand, the national air quality standard for 24hr NO₂, which is very stringent, is not expected to be fulfilled in the area in a cumulative scenario due to the existing pollution load. However, this conclusion is preliminary and will need to be confirmed once complete baseline air quality data for the area is available. The applicable international standards and the other national standards for NO₂ are expected to be respected in any case.

The future installation of other industrial plants in the area cannot be reasonably foreseen at this stage. However, to assure a future sustainable development in the area, RENCO will incorporate **additional emission reduction measures** in the design, going beyond increasing the stack height to 66 meters. Such measures are planned in the design, but will only be activated in case a future development in the area is reasonably foreseen, or in case the results of the baseline assessment point to the need to reduce the Project's emissions.

A baseline air quality monitoring was undertaken at the surroundings of the power plants' site, and will be complemented in the upcoming seasons. The results will be used as an input for an updated report and an updated cumulative scenario. Based on the results of the updated report, suggestions for **mitigation measures** to reduce the emissions of NO₂, if necessary, will be given.

8. References

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Wanger, A., 2011: *Dispersion Modeling: new downwash calculations change the playing field*, November 2011. Available at <http://www.trinityconsultants.com/Templates/TrinityConsultants/News/Article.aspx?id=3670>

WHO, 2006: *Air quality guidelines - global update 2005, Summary of risk assessment*, World Health Organization, Geneva, Switzerland, 2006

9. Annexes

9.1 Annex 1: PM₁₀ Baseline Studies



Project: Environmental and Social Impact Assessment for a Combined Cycle Power Plant - Yerevan 2

Project №: 8559P01

Noise and PM10 Baseline Study

Report

Rev01

Prepared for
Fichtner GmbH & Co. KG

Prepared by
"ATMS Solutions" Ltd.

August, 2017

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1. Introduction

Within the Main Contract between ARMPower SJSC (hereinafter - Client) and Fichtner GmbH & Co. KG (hereinafter - Employer) the latter has signed a subcontractor agreement with ATMS Solutions Ltd. (hereinafter - Contractor) to conduct the following tasks:

- Task I. Noise measurements
- Task II. PM10¹ measurements
- Reporting.

Noise and PM10 measurement points have been selected by the Employer and presented in [Annex 1](#). Quantities, durations and times (day-time / night-time) of noise and PM10 measurements were also defined by the Employer and presented below in [Table 1](#).

Table 1. Measurement pre-conditions

Measurement point	Measuring parameters	Time of measurement	Quantity, measurements	Duration	Total quantity, measurements
Noise measurements					20
Work-day					10
Noise 1	Noise, wind speed	Day-time/	1	1 hour	2
	Noise, wind speed	Night-time	1	1 hour	
Noise 2	Noise, wind speed	Day-time	1	1 hour	2
	Noise, wind speed	Night-time	1	1 hour	
Noise 3	Noise, wind speed	Day-time	1	1 hour	2
	Noise, wind speed	Night-time	1	1 hour	
Noise 4	Noise, wind speed	Day-time	1	1 hour	2
	Noise, wind speed	Night-time	1	1 hour	
Noise 5	Noise, wind speed	Day-time	1	1 hour	2
	Noise, wind speed	Night-time	1	1 hour	
Weekend					10
Noise 1	Noise, wind speed	Day-time	1	1 hour	2
	Noise, wind speed	Night-time	1	1 hour	
Noise 2	Noise, wind speed	Day-time	1	1 hour	2
	Noise, wind speed	Night-time	1	1 hour	
Noise 3	Noise, wind speed	Day-time	1	1 hour	2
	Noise, wind speed	Night-time	1	1 hour	
Noise 4	Noise, wind speed	Day-time	1	1 hour	2
	Noise, wind speed	Night-time	1	1 hour	
Noise 5	Noise, wind speed	Day-time	1	1 hour	2
	Noise, wind speed	Night-time	1	1 hour	
PM10 measurements					75
Air 1	PM10, temperature, RH ²	Day-time	5 x 5 ³	5 min ⁴	25
Air 2	PM10, temperature, RH	Day-time	5 x 5	5 min	25
Air 3	PM10, temperature, RH	Day-time	5 x 5	5 min	25

¹ Particle matters with 10 µm size

² Relative humidity

³ 5 measurements per day during the 5 days

⁴ 5 minutes for each measurement

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2. Objective of the Study

The objective of the Study is to conduct instrumental measurements of noise levels and PM10 concentrations at the points around the Yerevan 2 Power Plant, which are expected to be impacted during the construction and operation stages. The measurement points have been selected by the Employer (see [Annex 1](#)). The study results should be reported to the Employer.

This Noise and PM10 Baseline Study Report (hereinafter - Study Report) provides an overview of the measurement process and equipment, description of the measurement (sensitive) points, noise and dust (PM10) national sanitary standards, a quantitative analysis, assessment of measurement results and main conclusions. The instrumental measurements were conducted between the 27.07.2017-05.08.2017 at five 5 noise and 3 air sensitive points.

3. Measurement Methodology and Equipment

3.1 Measuring Equipment and Software

3.1.1 Noise Measurement

Instrumental measurements of noise levels are performed using a Sound Level Meter (SLM) "WS1361". The SLM consists of a microphone, electronic circuits and a readout display. The microphone detects the small air pressure variations associated with sound and transforms them into electrical signals. Afterwards, these signals are processed by the electronic circuitry of the instrument. The readout displays the sound level in decibels. The duration of each noise measurement is 1 hour.

The SLM has SLOW and FAST response options. The response rate is the time period over which the instrument averages the sound level before displaying it on the readout. Usually measurements of background noise are taken in the SLOW response mode.

Data on the State verification, as well as technical characteristics of the Sound level meter are listed in Verification certificate that presented in [Annex 2](#). The verification date of the device is 16.05.2017. It is valid until 16.05.2018.

The SLM has the following technical characteristics:

- Measurement range: 30÷130 dB (sub-ranges: 30÷80, 40÷90, 50÷100, 60÷110, 70÷120, 80÷130, 30÷130),
- Frequency Range: 31.5÷8500 Hz,
- Accuracy: ±1.5 dB.

In order to ensure continuous measurements over a certain period of time and further analysis of the results, the SLM WS1361 is connected to a tablet. The special software installed in the tablet allows to record noise levels with one second frequency and provides complete information on the noise level (both in digital imaging and as a graph), including the minimum, maximum and average values of the sound level.

The wind speed during the noise measurements have been determined by the Microclimate parameters measuring device "Meteoscop". Data on the State verification, as well as technical characteristics of "Meteoscop" are listed in Verification certificate (see [Annex 2](#)) and summarized below:

- Measurement range of wind speed: 0.1~20 m/sec,
Accuracy: ±(0.05+0.05V), if wind speed is up to 1m/sec and ±(0.1+0.05V), if wind speed is between 1÷20m/sec,

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- Measurement range of temperature: between -10 and +50°C, Accuracy: ± 0.2 ,
- Measurement range of relative humidity: between 3 and 97%, Accuracy: ± 3 ,
- The verification date of the device is 16.05.2017. It is valid until 16.05.2018.

3.1.2 PM10 Measurement

Dust concentration is measured by using of Dust particle meter DT-96. This device is equipped with 2.5um and 10um size channels to measure PM2.5 and PM10 simultaneously as well as air temperature and relative humidity. The duration of each PM10 measurement is 5 minutes. The obtained data is analyzed and compared with corresponding threshold limit value.

Technical parameters of the device are listed below:

- Concentration measurement: 0~2000 $\mu\text{g}/\text{m}^3$, resolution: 1 $\mu\text{g}/\text{m}^3$,
- Temperature range: 0~50°C, resolution: 1°C, accuracy: $\pm 0.1^\circ\text{C}$,
- Humidity Range: 0 to 100%RH, accuracy: $\pm 5\%RH$, 0~20%RH, 80~100%RH; $\pm 3.5\%RH$, 20~80%RH.

The verification of Dust particle meter is conducted by manufacturer on 08.08.2016 and valid till 08.08.2017 ([Annex 2](#)).

4. Normative Framework**4.1 Sanitary Norms for Noise**

Noise instrumental measurements, analysis and evaluation of results were carried out in accordance with the following regulations/standards:

- RoA Sanitary Norms №2-III-11.3 "Noise in the workplaces, in residential and public buildings and in residential construction areas" adopted by the order of RoA⁵ Minister of Health №138 on 06.03.2002,
- Guidelines for Community Noise, World Health Organization (WHO), 1999.

As criteria for determination of the conformity level of the actual noise in identified measurement points, the normative value of the equivalent (average) sound level is used, according to the RoA Sanitary Norms №2-III-11.3 "Noise in the workplaces, in residential and public buildings and housing in construction areas" as well as WHO's Guidelines for Community Noise (see [Table 2](#)).

Table 2. Threshold limit value (TLV) for noise

№	Premises and territories	Time	TLV (equivalent to sound level), dBA
1	Industrial and commercial areas ⁶	07:00-22:00 Day-time	70
		22:00-07:00 Night-time	70
2	Territories adjacent to residential buildings, clinics, ambulatories, rest houses, care homes, disabled persons homes, libraries,	06:00-22:00 Day-time	55

⁵ Republic of Armenia

⁶ Source: WHO's Guidelines for Community Noise

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Nº Premises and territories	Time	TLV (equivalent to sound level), dBA
kinder gardens, schools and other educational facilities ⁷	22:00-06:00 Night-time	45

4.2 Environmental Norms for Dust

The PM10 measurements were conducted and evaluated in accordance with the following normative documentation acting in the Republic of Armenia:

- GOST 17.2.4.05-83. "Environmental protection. Atmosphere. Gravimetric method for determination of suspended dust particles",
- RoA Government Decree №160-N. "Norms of maximum permissible concentrations (MPC) of atmospheric air pollutants in residential areas".

The maximum permissible concentrations of PM10, including daily average values are defined by the RoA Government Decree №160-N and summarized below in [Table 3](#).

Table 3. Daily average and maximum permissible concentrations (MPC) for PM10

Nº	Name of substance	MPC (mg/m³)	
		Max	Daily average
1	PM10	0.3	0.06

5. Description of Measurement Points

The given Study Report presents results of noise levels and PM10 concentration measurements for the points defined by the Employer (see [Annex 1](#)) and described below. Totally, 20 noise instrumental measurements were conducted at 5 points and 75 PM10 measurements were carried out at 3 points.

Noise 1, Air 2

Measurement points Noise 1 and Air 2 are placed approx. 1700m to the south-west from the CCPP Yerevan-2 site. These points are located near the northeast border of Ayntap community between the cemetery and private cultivated garden (see [Figures 1, 2](#)).

Noise 2

Measurement point Noise 2 is situated at the distance of approx. 1750m to the west from the CCPP Yerevan-2 site. The point Noise 2 is located on the eastern border of Noragavit settlement in front of the highway, connecting the capital Yerevan with the M2 roadway (see [Figure 3](#)).

Noise 3 and Noise 5

Measurement points Noise 3 and Noise 5 are located in Kharberd horticultural settlement. Both points are situated along the northern border of the settlement. Noise 5 is the closest point to the CCPP Yerevan-2 site, at the distance of approx. 1100m, while the distance between the point Noise 3 and Project site is 1500m (see [Figures 4, 5](#)).

Noise 4, Air 3

⁷ Source: Sanitary Norms № 2-III-11.3 "Noise in the workplaces, in residential and public buildings and in residential construction areas"

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Measurement points Noise 4 and Air 3 are placed in industrial area near the northern border of the CCPP Yerevan-2 site (see [Figures 6, 7](#)).

Air 1

Measurement point Air 1 is situated in industrial area near the southeast border of current Yerevan-1 thermal power plant, between the fire brigade and abandoned production facility (see [Figure 8](#)).

Figure 1. Measurement process at point Noise 1



Figure 2. Measurement process at point Air 2



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Figure 3. Measurement process at point Noise 2



Figure 4. Measurement process at point Noise 3



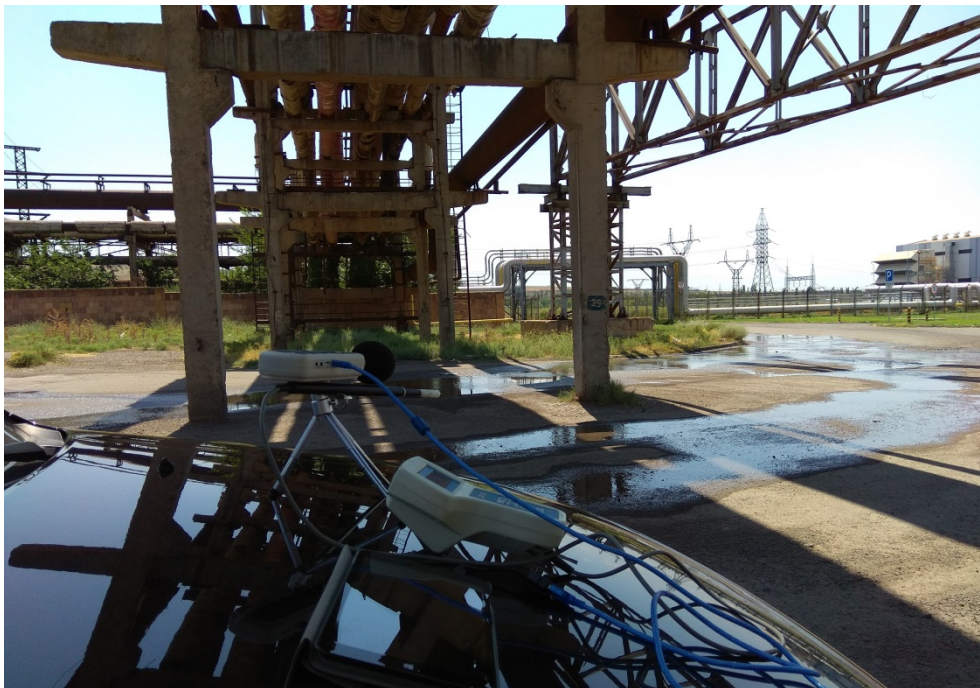
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Figure 5. Measurement process at point Noise 5



Figure 6. Measurement process at point Noise 4



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Figure 7. Measurement process at point Air 3



Figure 8. Measurement process at point Air 2



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6. Measurement Results and Evaluation

Noise and PM10 measuring results are summarized in Table 4 (for noise) and Table 5 (for PM10) correspondingly. Diagrams, demonstrating equivalent noise levels at measurement points compared with the TLV are shown in Figures 9-11. Diagrams of PM10 actual concentrations in comparison with the MPCs (maximum and daily average) are presented in Figures 12-14.

Table 4. Results of noise measurement

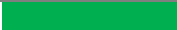









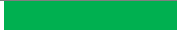



Point of measurement	Wind speed (m/s)	Time of measurement	Leq(A), dB(A)	TLV (equivalent to sound level), dB(A)	Compliance
Work-day					
Noise 1	<1.7	Day-time	49.8	55	
	<1.8	Night-time	47.1	45	
Noise 2	<1.9	Day-time	72.6	55	
	<2.3	Night-time	62.4	45	
Noise 3	<1.8	Day-time	48.1	55	
	<1.7	Night-time	40.0	45	
Noise 4	<1.6	Day-time	53.6	70	
	<1.9	Night-time	57.3	70	
Noise 5	<1.7	Day-time	36.2	55	
	<2.0	Night-time	39.4	45	
Weekend					
Noise 1	<1.5	Day-time	43.4	55	
	<2.1	Night-time	49.0	45	
Noise 2	<1.8	Day-time	72.8	55	
	<2.5	Night-time	59.2	45	
Noise 3	<1.9	Day-time	43.9	55	
	<2.0	Night-time	33.9	45	
Noise 4	<1.8	Day-time	56.4	70	
	<2.0	Night-time	57.2	70	
Noise 5	<1.5	Day-time	35.6	55	
	<1.8	Night-time	34.2	45	

Table 5. Results of PM10 measurement

Point of measurement	Temperature, °C	Relative humidity, %	PM10, mg/m ³	MPC max, mg/m ³	MPC daily average, mg/m ³	Compliance
30.07.2017						
Air 1	38	20	0.014	0.3	0.06	
	38	21	0.011			
	38	20	0.01			
	39	19	0.01			
	38	19	0.011			
Air 2	39	22	0.02	0.3	0.06	
	39	20	0.041			
	39	20	0.021			
	39	21	0.021			
	38	20	0.019			
Air 3	38	22	0.022	0.3	0.06	
	38	21	0.017			
	39	21	0.013			
	39	20	0.013			
	38	19	0.016			
01.08.2017						
Air 1	37	22	0.013	0.3	0.06	
	37	21	0.01			
	38	21	0.011			
	38	19	0.012			
	38	21	0.014			

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Point of measurement	Temperature, °C	Relative humidity, %	PM10, mg/m ³	MPC max, mg/m ³	MPC daily average, mg/m ³	Compliance
Air 2	38	20	0.02	0.3	0.06	
	39	19	0.016			
	39	19	0.018			
	39	20	0.019			
	39	21	0.02			
Air 3	37	23	0.027	0.3	0.06	
	38	21	0.023			
	38	20	0.011			
	39	20	0.016			
	38	21	0.025			
02.08.2017						
Air 1	38	20	0.014	0.3	0.06	
	38	21	0.011			
	39	21	0.017			
	39	20	0.01			
	37	22	0.009			
Air 2	39	20	0.02	0.3	0.06	
	40	18	0.018			
	39	19	0.017			
	40	19	0.017			
	39	21	0.02			
Air 3	39	21	0.042	0.3	0.06	
	39	22	0.037			
	39	20	0.031			
	38	19	0.023			
	38	20	0.027			
03.08.2017						
Air 1	37	20	0.013	0.3	0.06	
	38	21	0.009			
	38	21	0.01			
	39	20	0.011			
	39	19	0.009			
Air 2	38	23	0.013	0.3	0.06	
	39	22	0.01			
	39	19	0.011			
	39	20	0.012			
	39	20	0.014			
Air 3	38	19	0.009	0.3	0.06	
	38	20	0.011			
	39	20	0.012			
	38	19	0.013			
	38	19	0.012			
05.08.2017						
Air 1	38	20	0.012	0.3	0.06	
	39	21	0.01			
	39	20	0.012			
	39	18	0.011			
	38	19	0.011			
Air 2	37	22	0.011	0.3	0.06	
	38	21	0.019			
	38	22	0.013			
	39	19	0.036			
	38	19	0.01			
Air 3	37	23	0.009	0.3	0.06	
	39	22	0.008			
	39	19	0.014			
	39	19	0.012			
	38	20	0.012			

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Figure 9. Diagram of noise equivalent levels at measurement points located in/near the residential areas compared with the TLV in day-time

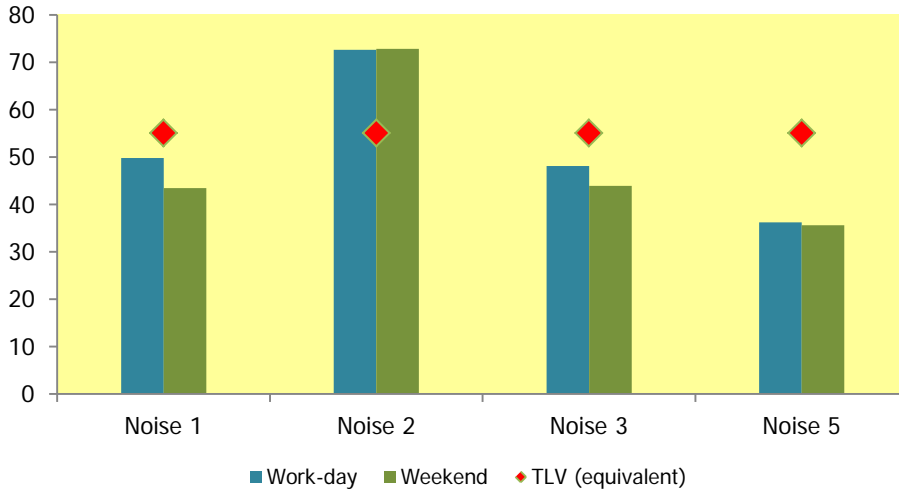


Figure 10. Diagram of noise equivalent levels at measurement points located in/near the residential areas compared with the TLV in night-time

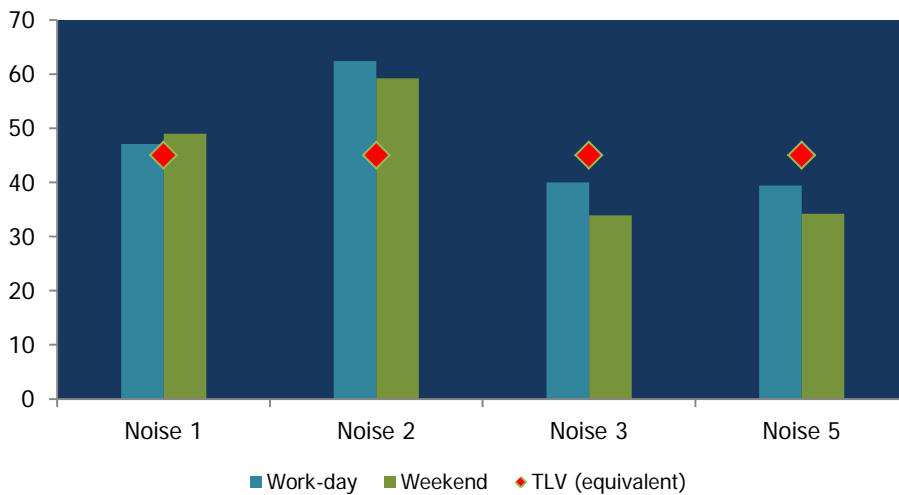
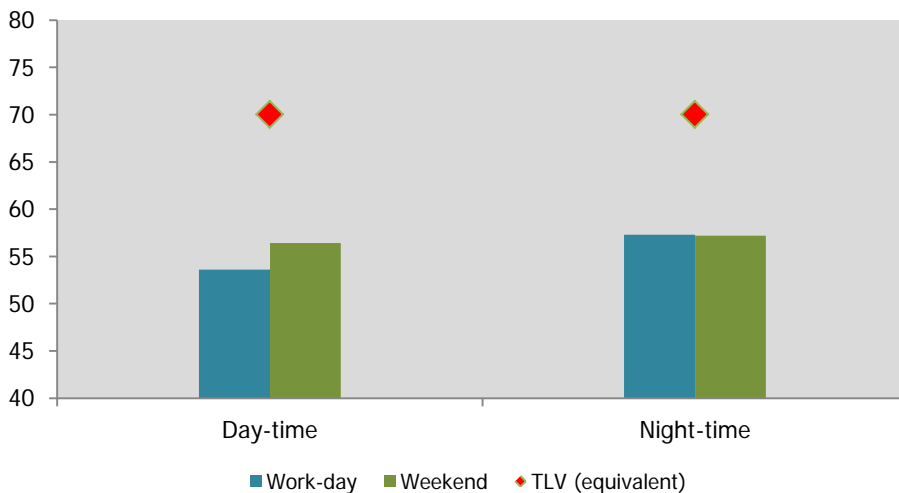


Figure 11. Diagram of noise equivalent level at measurement point Noise 4 (located in industrial area) compared with the TLV



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Figure 12. Diagrams of PM10 actual concentrations at point Air 1 compared with the MPC (max and daily average)

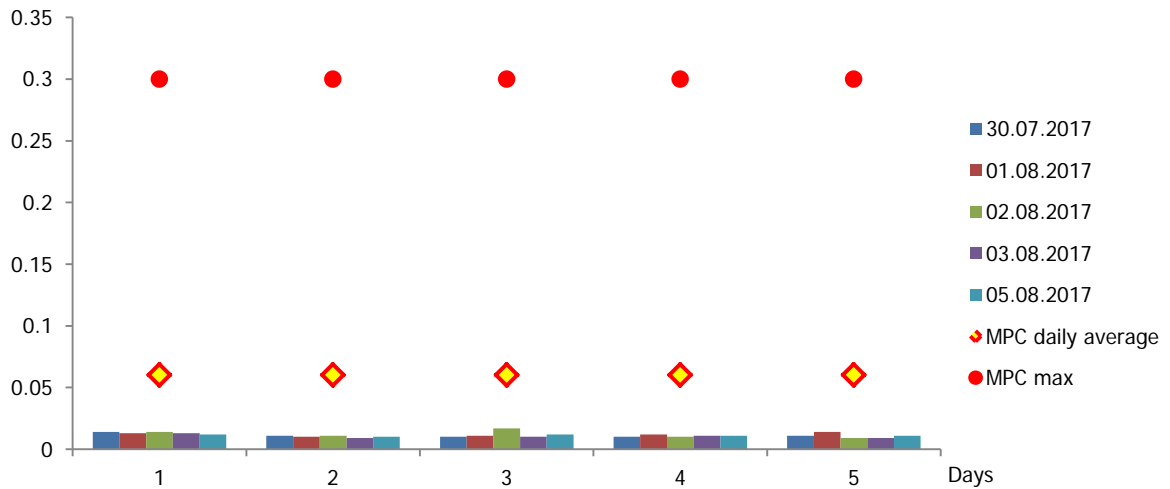


Figure 13. Diagrams of PM10 actual concentrations at point Air 2 compared with the MPC (max and daily average)

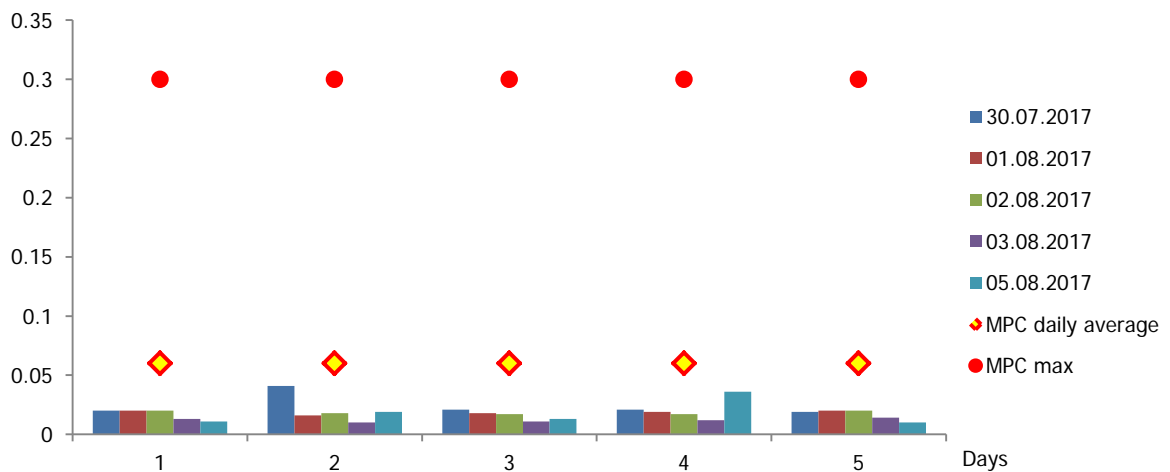
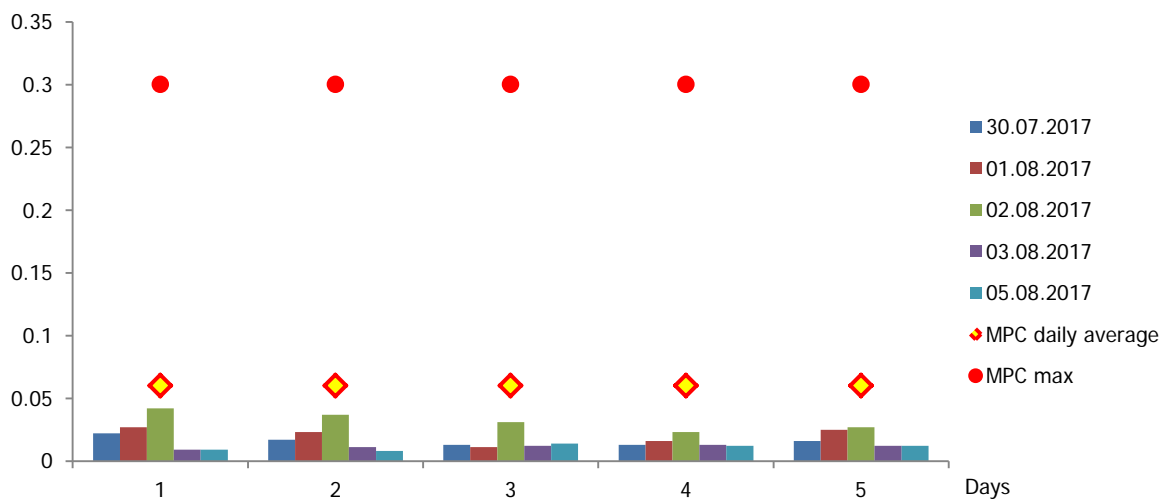


Figure 14. Diagrams of PM10 actual concentrations at point Air 3 compared with the MPC (max and daily average)



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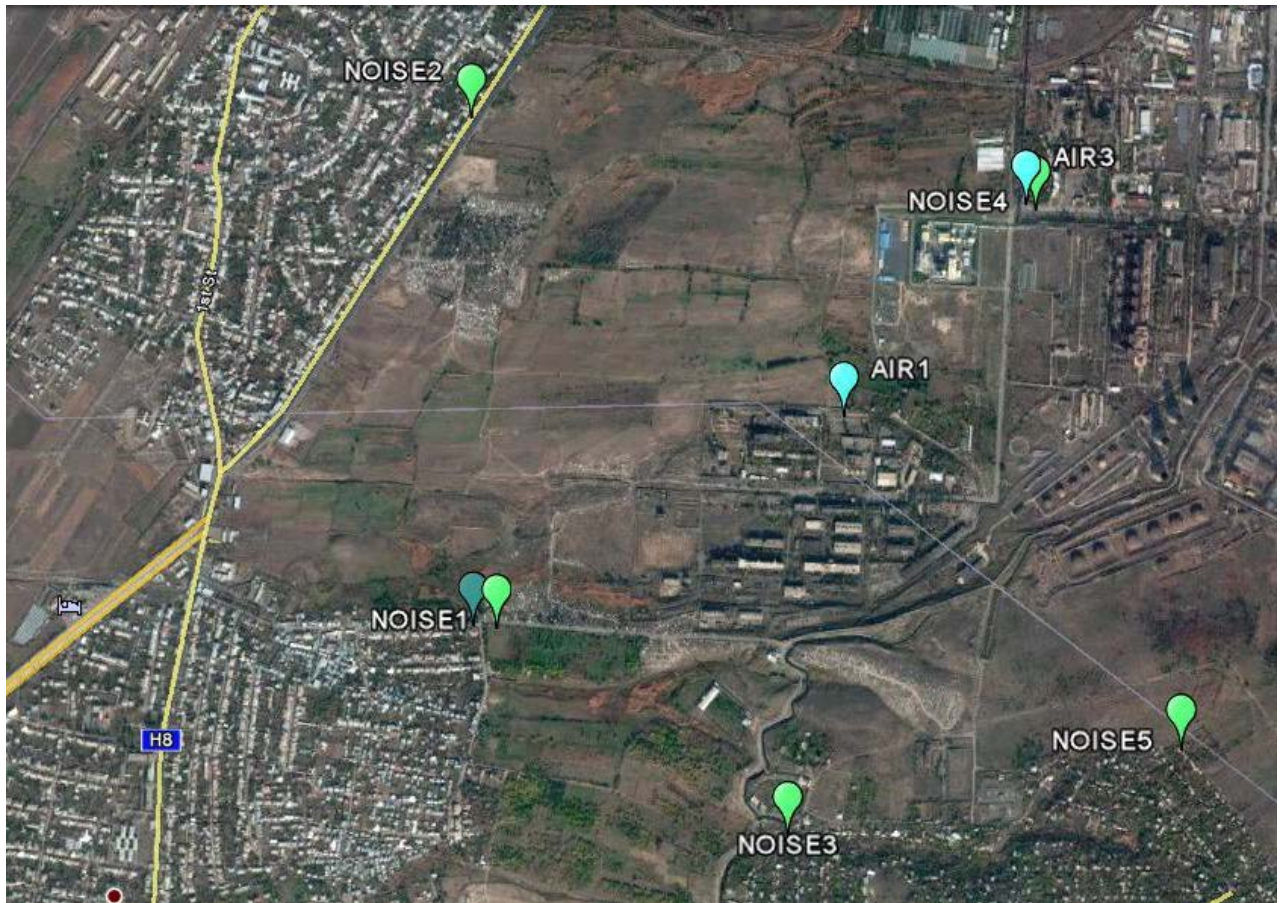
Main Conclusions

- 1) During the study totally 20 noise measurements were conducted at 5 selected points, which means that 4 measurements were carried out at each point, including work-day and weekend day measurements at day-time and night-time.
- 2) As TLVs for evaluation of noise actual levels at measurement points in/near the residential areas (points: Noise 1, Noise 2, Noise 3 and Noise 5) 55 dBA and 45 dBA as equivalent noise levels for day-time and night-time correspondingly have been applied. For the measurement point Noise 4 (located in industrial area) 70 dBA TLV is applied.
- 3) Day-time noise evaluation
Based on the noise measurement results conducted during work-days and weekend days, it can be concluded that noise equivalent levels in/near the residential areas were generally within the TLV (Noise 1, Noise 3 and Noise 5), except the point Noise 2 (located in front of the highway), where the noise level exceeded the 55 dBA normative value (see [Figure 9](#)). This can be explained by the movement of heavy vehicles and high traffic density along the highway (see [Figure 3](#)).
- 4) Night-time noise evaluation
Equivalent noise levels during work-days and weekend days at measurement points Noise 3 and Noise 5 are within the 45 dBA TLV. Noise levels at point Noise 1 during both work-days and weekend days were slightly exceeding the TLV (2.1 dBA and 4 dBA accordingly). This is due to the availability of background night noise from the facilities located in the vicinities, probably from the industrial area near the CCPP site. As a result of night-time measurements, the equivalent noise level at point Noise 2 (located in front of the highway) is above the 45 dBA TLV (see [Figure 10](#)). The reason is high traffic density along the highway even at night-time.
- 5) Noise equivalent levels in industrial area near the CCPP site during work-days and weekend days, measured at day-time and night-time, are below the 70 dBA TLV (see [Figure 11](#)).
- 6) 75 instrumental measurements were conducted in 3 sensitive points (Air 1, Air 2 and Air 3) during 5 days to determine the PM10 actual concentration. 5 measurements were conducted at each point per day, which means that totally 25 PM10 measurements were carried out at each point. The results of the study were compared with PM permissible concentrations (maximal is 0.3 mg/m³ and daily average is 0.06 mg/m³).
- 7) PM10 (dust particles of 10um size) actual concentrations at all sensitive points (Air 1, Air 2 and Air 3) in different daytime periods don't exceed the daily average and maximum permissible concentrations for residential areas set by the RoA Government Decree N^o160-N "Norms of maximum permissible concentrations of atmospheric air pollutants in residential areas" (see [Figures 12-14](#)).

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ANNEX 1. Map of measurement points



Noise and PM10 Baseline Study Report

Rev01

ANNEX 2. Verification documents of measuring devices

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԷՎՈԼՈՍՏԻԿԱՅԻ ՆԱԽԱՐԱՐՈՒԹՅՈՒՆ

ՉԱՓԱԳՈՒՅՈՒԹՅԱՆ ԱՅԳՎԱԹԻ, ԽԱՏՏՈՒՄ ՓԲԸ (ՉԱՓԱԳՈՒՅՈՒԹՅԱՆ ԱՅԳՎԱԹԻ, ԻՆՏԵՐՆԱԿ)

ՎԿԱՅԱԿԱՆ № 017243
ՍՏՈՒԳԱԶՎՓՄԱՆ ՄԱՍԻՆ

Ստուգաչափման օրվականը 2017թ. 01 «18»
Ուժի մեջ է մինչև 2018թ. 01 «18»

Վահագնյան
Հիմնական միջոցի նվազանումը և տեսակը
ՅՈՒՆԻՎԵՐՍԻՏԵՏԻ ԿԵՆՏՐՈՆ

Գործարանային հմ. 89670
Չափման տիրույթը $(-10 \pm 50)^\circ\text{C}; (3 \pm 5)^\circ\text{C}$ և $(20 \pm 110)^\circ\text{C}$
Շտապային դասը, կարգը (սխալանքը) $\pm 0,2^\circ\text{C}; \pm 0,3^\circ\text{C}; \pm 0,15^\circ\text{C}$
Արտադրողը *Վ. Մանյան (1 Քեմեկ 3 Ֆեյնմեյն)*
Պատկանում է *Էլեկտրոֆիզիկայի ԱՊԸ*

Ստուգաչափման արդյունքների հիման վրա չափման միջոցը ճանաչվել է պիտանի և թույլատրվում է կիրառման:

Ստուգաչափումը կատարվել է համաձայն *ՄՊ*

Ստուգաչափող *Վահագնյան*
Դրոշմի արտատվողը
Բաժնի (լաբորատորիայի) ղեկավար *Մանյան*

Քառասույգ է Էլեկտրոֆիզիկայի կախարարի 14.02.2013թ. թիվ 104-Ն հրամանով
Գրանցված է 37 Արդարադատության նախարարության կողմից 21.03.2013թ. թիվ 10313102

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԷՎՈԼՈՍՏԻԿԱՅԻ ՆԱԽԱՐԱՐՈՒԹՅՈՒՆ

ՉԱՓԱԳՈՒՅՈՒԹՅԱՆ ԱՅԳՎԱԹԻ, ԽԱՏՏՈՒՄ ՓԲԸ (ՉԱՓԱԳՈՒՅՈՒԹՅԱՆ ԱՅԳՎԱԹԻ, ԻՆՏԵՐՆԱԿ)

ՎԿԱՅԱԿԱՆ № 015617
ՍՏՈՒԳԱԶՎՓՄԱՆ ՄԱՍԻՆ

Ստուգաչափման օրվականը 2017թ. 05 «16»
Ուժի մեջ է մինչև 2018թ. 05 «16»

Վահագնյան
Հիմնական միջոցի նվազանումը և տեսակը
ՄՊ 1361

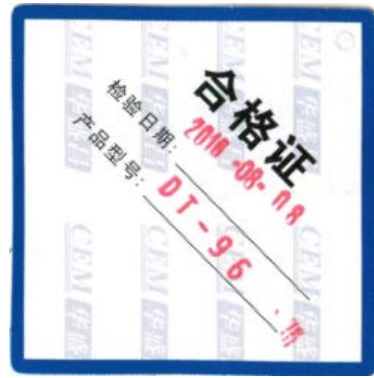
Գործարանային հմ. *ա/կ*
Չափման տիրույթը $(30 \pm 130)^\circ\text{C}; (345 \pm 8,5)^\circ\text{C}$
Շտապային դասը, կարգը (սխալանքը) $\pm 1,5^\circ\text{C}$
Արտադրողը
Պատկանում է *ՎՅ ԽՊ ԶՄ Արդարադատության ԱՊԸ*

Ստուգաչափման արդյունքների հիման վրա չափման միջոցը ճանաչվել է պիտանի և թույլատրվում է կիրառման:

Ստուգաչափումը կատարվել է համաձայն *ՊՈՒՏ 8.257-84*

Ստուգաչափող *Վահագնյան*
Դրոշմի արտատվողը
Բաժնի (լաբորատորիայի) ղեկավար *Վահագնյան*

Քառասույգ է Էլեկտրոֆիզիկայի կախարարի 14.02.2013թ. թիվ 104-Ն հրամանով
Գրանցված է 37 Արդարադատության նախարարության կողմից 21.03.2013թ. թիվ 10313102





Project: Environmental and Social Impact Assessment for a Combined Cycle Power Plant - Yerevan 2

Project №: 8559P01

PM10 Assessment Report

Rev01

Time Period: Autumn 2017

**Prepared for
RENCO ARMESTATE Ltd. and Fichtner GmbH & Co. KG**

**Prepared by
"ATMS Solutions" Ltd.**

November, 2017

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1. Introduction

Based on the service provision contract dated 27 of October 2017 between RENCO ARMESTATE Ltd. (hereinafter - Client) and ATMS Solutions Ltd. (hereinafter - Contractor) the latter has engaged to conduct PM10¹ measurements at the 5 points/sites during the 5 days and elaborate PM10 assessment report for the period autumn 2017.

PM10 measurement points/sites have been selected by the Client. The map with the indication of measurement points are presented in **Annex 1**. Quantities, durations and other parameters to be monitored in parallel with the PM measurements are given below in **Table 1**.

Table 1. Measurement specification

Measurement point	Measuring parameters	Time of measurement	Quantity, measurements	Duration, minutes ²	Total quantity, measurements
PM10 measurements					125
Air 1	PM10, temperature, RH ³ , wind speed	Day-time	5 x 5 ⁴	5	25
Air 2	PM10, temperature, RH, wind speed	Day-time	5 x 5	5	25
Air 3	PM10, temperature, RH, wind speed	Day-time	5 x 5	5	25
Air 4	PM10, temperature, RH, wind speed	Day-time	5 x 5	5	25
Air 5	PM10, temperature, RH, wind speed	Day-time	5 x 5	5	25

Besides, the Contractor also should provide the Client with the wind directions (rose of wind) for the region (should be extracted from the Republic of Armenia Construction Norms II-7.01-2011 "Construction Climatology").

2. Objective of the study

The objective of the Study is:

- To conduct instrumental measurements of PM10 concentrations and other relevant parameters (RH, temperature, wind speed) at the points around the Yerevan 2 Power Plant, which are expected to be impacted during the construction and operation stages,
- To assess the compliance of the PM actual concentrations to the national environmental norms,
- To elaborate PM assessment report.

This PM10 assessment report (hereinafter - Report) provides an overview of the measurement process and equipment, description of the measurement (sensitive) points, dust (PM10) national environmental norms, a quantitative analysis, assessment of measurement results and main conclusions. The instrumental measurements were conducted between the 28.10.2017 and 04.11.2017 at 5 sensitive points.

¹ Particle matters with 10 µm size

² 5 minutes for each measurement

³ Relative humidity

⁴ 5 measurements per day during the 5 days

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3. Measurement methodology and equipment

Dust concentration is measured by using of Dust particle meter DT-96. This device is equipped with 2.5um and 10um size channels to measure PM2.5 and PM10 simultaneously as well as air temperature and relative humidity. The duration of each PM10 measurement is 5 minutes. The obtained data is analyzed and compared with corresponding threshold limit value.

Technical parameters of the device are listed below:

- Concentration measurement: 0~2000 ug/m³, resolution: 1 ug/m³,
- Temperature range: 0~50°C, resolution: 1°C, accuracy: ±0.1°C,
- Humidity Range: 0 to 100%RH, accuracy: ±5%RH, 0~20%RH, 80~100%RH; ±3.5%RH, 20~80%RH.

The wind speed during the noise measurements have been determined by the Microclimate parameters measuring device "Meteoscop". Technical characteristics of "Meteoscop" are summarized below:

- Measurement range of wind speed: 0.1~20 m/sec,
Accuracy: ±(0.05+0.05V), if wind speed is up to 1m/sec and ±(0.1+0.05V), if wind speed is between 1÷20m/sec,
- Measurement range of temperature: between -10 and +50°C,
Accuracy: ±0.2,
- Measurement range of relative humidity: between 3 and 97%,
Accuracy: ±3,
- The verification date of the device is 16.05.2017. It is valid until 16.05.2018.

Data on the State verification, as well as technical characteristics of the device is presented in Verification certificate (see [Annex 2](#)).

4. Normative framework**4.1 Environmental norms**

The PM10 measurements were conducted and evaluated in accordance with the following normative documentation acting in the Republic of Armenia:

- GOST 17.2.4.05-83. "Environmental protection. Atmosphere. Gravimetric method for determination of suspended dust particles",
- RoA Government Decree №160-N. "Norms of maximum permissible concentrations (MPC) of atmospheric air pollutants in residential areas".

The maximum permissible concentrations of PM10, including daily average values are defined by the RoA Government Decree №160-N and summarized below in [Table 2](#).

Table 2. Daily average and maximum permissible concentrations (MPC) for PM10

№	Name of substance	MPC (mg/m ³)	
		Max	Daily average
1	PM10	0.3	0.06

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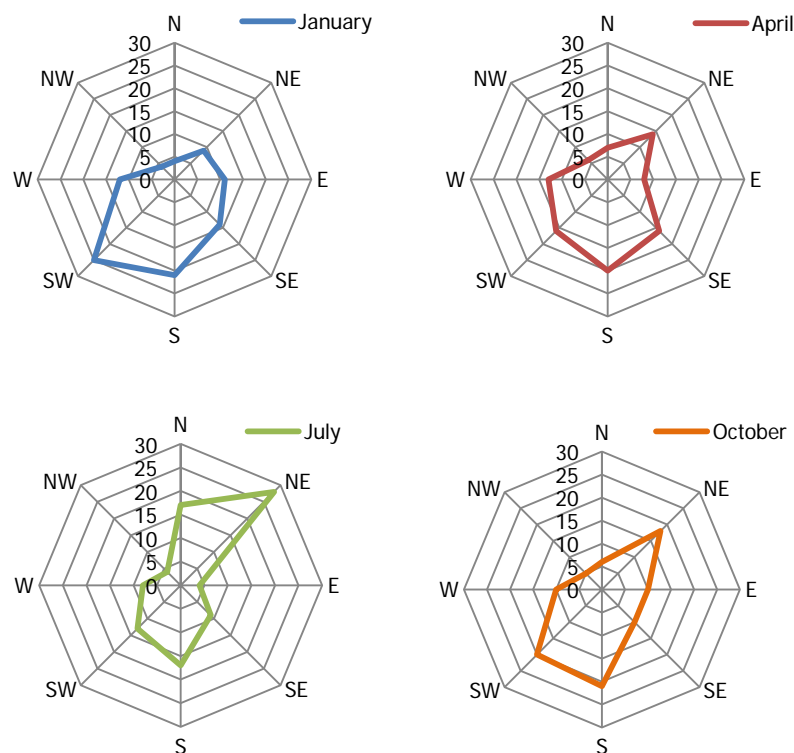
4.2 Wind directions

The climatic conditions of Armenia, including wind directions and speeds were monitored using meteorological stations located in most of the settlements in Armenia. The monitoring results of the last 30 years were summarized in Republic of Armenia Construction Norms II-7.01-2011 "Construction Climatology". The data on wind directions and average speeds from the Erebuni meteorological station (PM10 measurement points were located in Erebuni administrative district of Yerevan) are given below in Table 3, while rose of wind is presented in Figure 1.

Table 3. Daily average and maximum permissible concentrations (MPC) for PM10

Settlement / meteorological station	Average atmospheric pressure (hPa)	Months	Frequency, % by directions								Average monthly speed, m/sec	Average annual speed, m/sec	Days of strong wind (≥15m/sec)
			Average speed, m/sec										
			Northern	North-Eastern	Eastern	South-Eastern	Southern	South-Western	Western	North-Western			
Yerevan / Erebuni	912,1	January	4	9	11	14	21	25	12	4	0,7	1,5	29
			2,2	2,2	2,2	2,9	2,7	2,3	2,6	2,7			
		April	7	14	8	16	20	16	13	6	1,9		
			3,1	3,2	2,8	4,0	3,1	3,0	3,8	3,6			
		July	17	28	4	9	17	13	8	4	2,8		
			5,2	5,7	2,8	2,7	2,4	2,7	2,9	4,3			
		October	6	18	10	10	21	20	10	5	1,0		
			2,9	2,5	2,1	2,5	2,3	2,4	2,9	3,5			

Figure 1. Rose of wind



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5. Description of measurement points/sites

The given Report presents results of PM10 concentration measurements for the points defined by the Client (see [Annex 1](#)) and described below. Totally, 125 PM10 instrumental measurements were conducted at 5 points.

Air 1

X=456810.00 m E, Y=4440184.00 m N

Measurement point Air 1 is situated in industrial area near the south-east border of current Yerevan-1 thermal power plant, between the fire brigade and abandoned production facility (see [Figure 2](#)).

Air 2

X=455723.00 m E, Y=4439628.00 m N

Measurement point Air 2 is placed approx. 1700 m to the south-west from the CCPP Yerevan-2 site. This point is located near the northeast border of Ayntap community between the cemetery and private cultivated garden (see [Figure 3](#)).

Air 3

X=457405.00 m E, Y=4440835.00 m N

Measurement point Air 3 is placed in industrial area near the northern border of the CCPP Yerevan-2 site (see [Figure 4](#)).

Air 4

X=458540.00 m E, Y=4439142.00 m N

Measurement point Air 4 is located at the distance of approx. 1500 m to the south-east from the CCPP Yerevan-2 site, in front of the administrative building of "Food safety risk assessment research center" SNCO⁵ (see [Figure 5](#)).

Air 5

X=462777.00 m E, Y=4443372.00 m N

Measurement point Air 5 is located at the distance of approx. 5800 m to the north-east from the CCPP Yerevan-2 site, Jrashen residential block within the boundary of Erebuni administrative district (see [Figure 6](#)).

⁵ State Non-Commercial Organization

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Figure 2. Measurement process at point Air 1



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Figure 3. Measurement process at point Air 2



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Figure 4. Measurement process at point Air 3



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Figure 5. Measurement process at point Air 4



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Figure 6. Measurement process at point Air 5



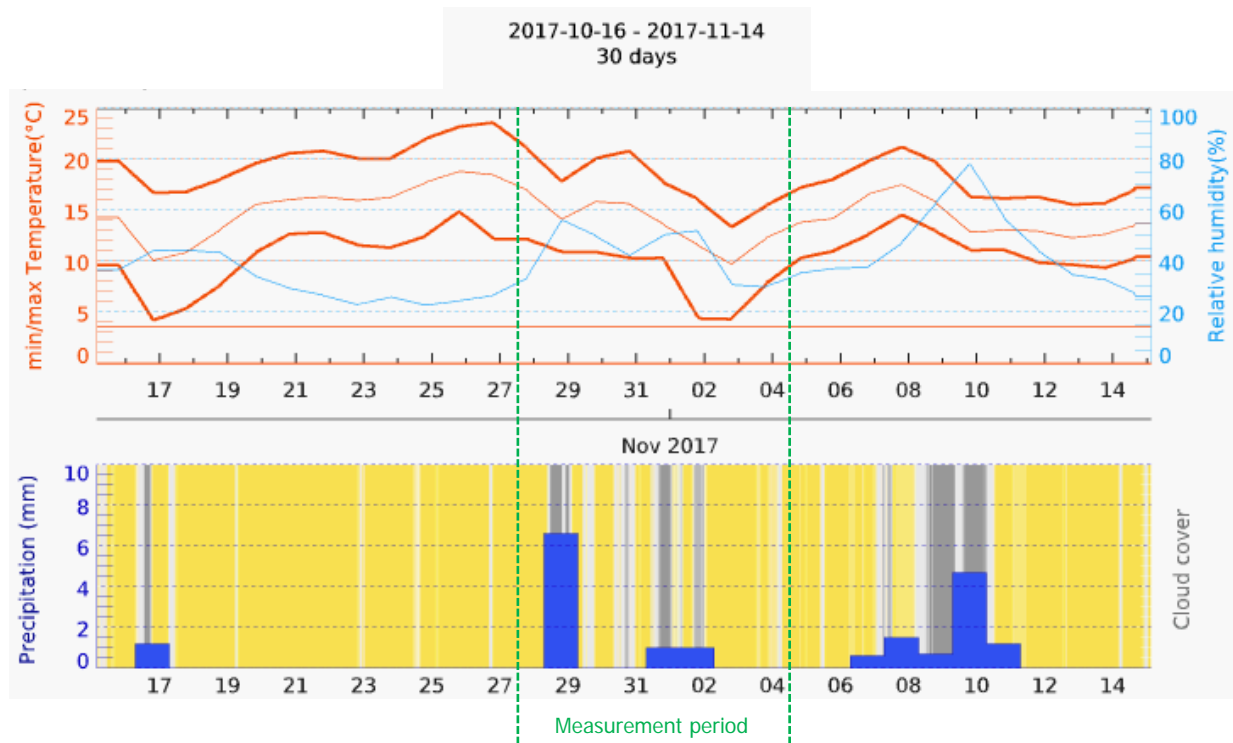
6. Weather conditions

The weather conditions during the measurement period (28.10.17-04.11.17) were presented in **Figure 7** (source: meteoblue.com):

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Figure 7. Whether conditions during the measurement period



7. Measurement results and evaluation

Measurement results of PM10 concentration and other relevant parameters are summarized in Table 4 (for PM10). Diagrams of PM10 actual concentrations in comparison with the MPCs (maximum and daily average) are presented in Figures 8-12.

Table 4. Results of PM10 measurement

Point of measurement	Temperature, °C	Relative humidity, %	PM10, mg/m ³	Wind speed, m/sec	MPC max, mg/m ³	MPC daily average, mg/m ³	Compliance
28.10.2017							
Air 1	16	47	0.02	<2.2	0.3	0.06	Compliant
	16	48	0.041	<2.7			
	18	48	0.021	<2.8			
	17	46	0.021	<2.8			
Air 2	16	45	0.019	<2.5	0.3	0.06	Compliant
	16	50	0.022	<2.3			
	17	51	0.029	<2.2			
	18	48	0.035	<2.5			
Air 3	18	48	0.038	<2.4	0.3	0.06	Compliant
	16	48	0.034	<2.4			
	15	50	0.038	<3.2			
	16	47	0.046	<3.1			
Air 4	17	48	0.053	<4.1	0.3	0.06	Compliant
	17	46	0.047	<3.8			
	16	46	0.045	<3.4			
	14	47	0.023	<3.4			
Air 4	15	47	0.03	<3.4	0.3	0.06	Compliant
	15	48	0.032	<4.2			
	16	46	0.033	<4.1			
	15	49	0.028	<4.0			

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Point of measurement	Temperature, °C	Relative humidity, %	PM10, mg/m ³	Wind speed, m/sec	MPC max, mg/m ³	MPC daily average, mg/m ³	Compliance
Air 5	13	49	0.028	<3.0	0.3	0.06	
	14	46	0.037	<3.2			
	16	45	0.049	<3.5			
	16	46	0.046	<3.4			
	15	48	0.036	<3.2			
31.10.2017							
Air 1	14	46	0.012	<0.8	0.3	0.06	
	16	45	0.012	<0.6			
	17	44	0.014	<0.9			
	17	40	0.015	<1.0			
	15	42	0.014	<0.5			
Air 2	13	48	0.016	<1.2	0.3	0.06	
	15	46	0.014	<1.1			
	16	43	0.018	<1.1			
	16	44	0.025	<1.0			
	15	44	0.02	<1.2			
Air 3	14	43	0.022	<1.2	0.3	0.06	
	16	42	0.028	<1.0			
	17	40	0.033	<1.2			
	18	40	0.042	<0.8			
	17	41	0.035	<0.9			
Air 4	14	45	0.015	<1.9	0.3	0.06	
	15	43	0.016	<2.4			
	17	42	0.016	<2.7			
	17	40	0.018	<2.5			
	16	41	0.014	<2.1			
Air 5	14	44	0.014	<1.1	0.3	0.06	
	16	42	0.017	<1.2			
	16	41	0.018	<1.4			
	17	40	0.019	<1.2			
	16	40	0.012	<1.1			
02.11.2017							
Air 1	8	47	0.01	<1.2	0.3	0.06	
	10	43	0.014	<1.1			
	12	44	0.014	<1.5			
	13	42	0.017	<1.6			
	12	43	0.012	<1.1			
Air 2	9	43	0.008	<0.7	0.3	0.06	
	11	41	0.01	<0.7			
	13	40	0.015	<0.8			
	13	41	0.017	<0.9			
	13	40	0.016	<0.9			
Air 3	9	43	0.02	<0.9	0.3	0.06	
	10	41	0.028	<0.8			
	12	42	0.027	<1.3			
	13	40	0.021	<1.2			
	13	42	0.015	<1.0			
Air 4	8	42	0.012	<0.7	0.3	0.06	
	10	42	0.012	<0.6			
	11	40	0.014	<1.0			
	13	41	0.012	<1.0			
	12	41	0.013	<0.8			
Air 5	8	43	0.013	<0.8	0.3	0.06	
	9	43	0.014	<0.8			
	11	40	0.016	<0.9			
	13	41	0.016	<0.6			
	12	42	0.014	<0.7			

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Point of measurement	Temperature, °C	Relative humidity, %	PM10, mg/m ³	Wind speed, m/sec	MPC max, mg/m ³	MPC daily average, mg/m ³	Compliance
03.11.2017							
Air 1	9	41	0.012	<0.8	0.3	0.06	
	11	40	0.015	<0.7			
	13	37	0.016	<1.0			
	14	34	0.017	<1.1			
	14	36	0.024	<1.1			
Air 2	8	42	0.018	<0.9	0.3	0.06	
	11	40	0.023	<0.7			
	14	40	0.028	<0.6			
	15	37	0.024	<0.8			
	14	39	0.02	<0.8			
Air 3	10	39	0.017	<0.9	0.3	0.06	
	11	37	0.027	<0.7			
	14	35	0.022	<1.1			
	14	34	0.015	<1.3			
	13	37	0.028	<1.1			
Air 4	9	37	0.011	<0.7	0.3	0.06	
	10	36	0.013	<0.6			
	13	33	0.015	<1.1			
	14	32	0.02	<1.2			
	14	34	0.018	<1.0			
Air 5	9	36	0.015	<0.8	0.3	0.06	
	11	33	0.019	<0.8			
	13	32	0.025	<0.7			
	15	31	0.024	<0.9			
	14	33	0.018	<1.1			
04.11.2017							
Air 1	10	37	0.015	<0.7	0.3	0.06	
	12	35	0.019	<0.7			
	15	34	0.025	<1.1			
	15	32	0.021	<0.9			
	16	33	0.022	<1.2			
Air 2	11	41	0.017	<0.8	0.3	0.06	
	14	39	0.031	<0.7			
	15	39	0.021	<0.9			
	16	38	0.025	<0.8			
	16	37	0.009	<1.1			
Air 3	11	38	0.021	<1.0	0.3	0.06	
	13	36	0.016	<1.1			
	15	36	0.025	<1.4			
	16	34	0.021	<1.3			
	16	33	0.022	<1.3			
Air 4	10	40	0.017	<1.2	0.3	0.06	
	12	38	0.019	<1.1			
	14	36	0.022	<1.2			
	16	36	0.017	<1.4			
	16	37	0.019	<1.3			
Air 5	10	38	0.032	<0.7	0.3	0.06	
	13	36	0.025	<0.9			
	15	36	0.026	<0.8			
	16	35	0.028	<1.0			
	15	34	0.023	<1.2			

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Figure 8. Diagrams of PM10 actual concentrations at point Air 1 compared with the MPC (max and daily average)

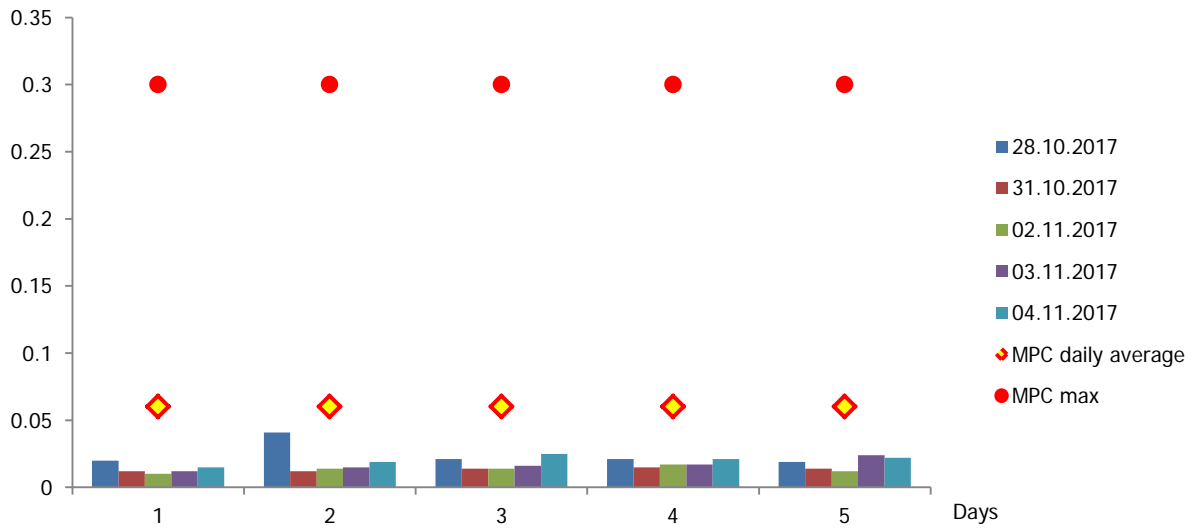
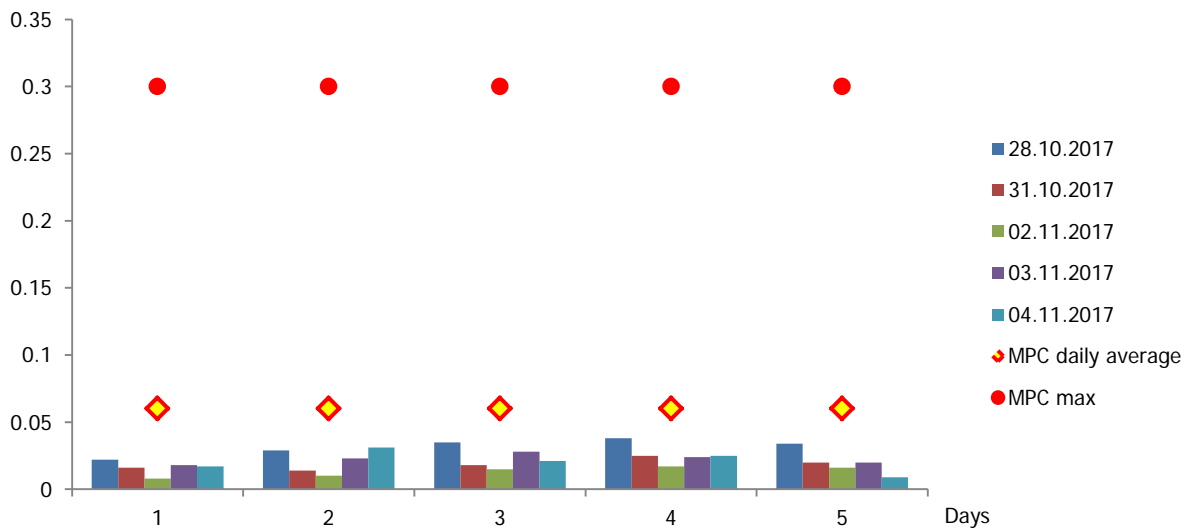


Figure 9. Diagrams of PM10 actual concentrations at point Air 2 compared with the MPC (max and daily average)



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Figure 10. Diagrams of PM10 actual concentrations at point Air 3 compared with the MPC (max and daily average)

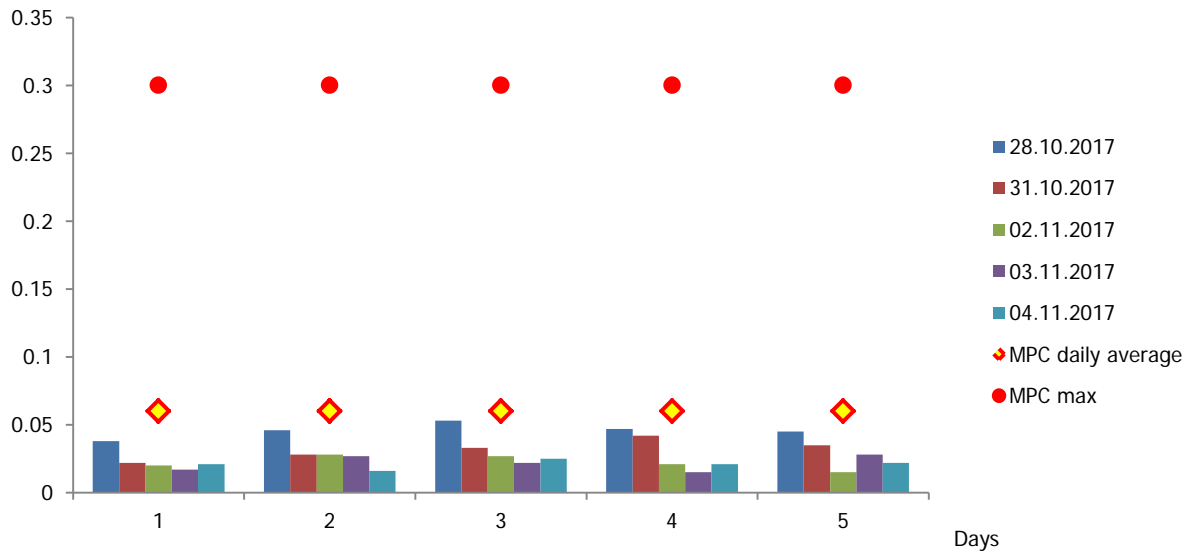
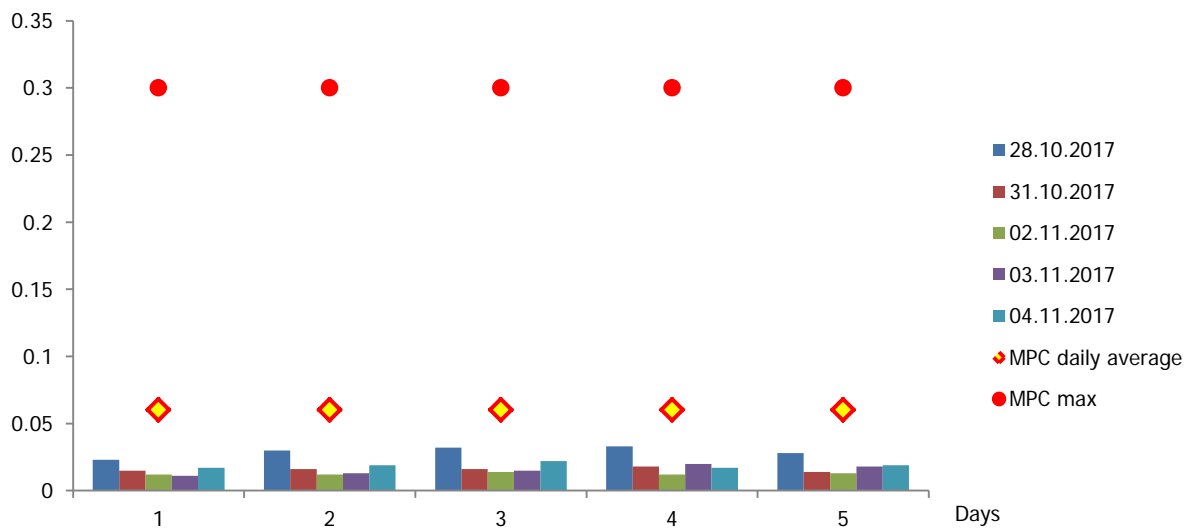


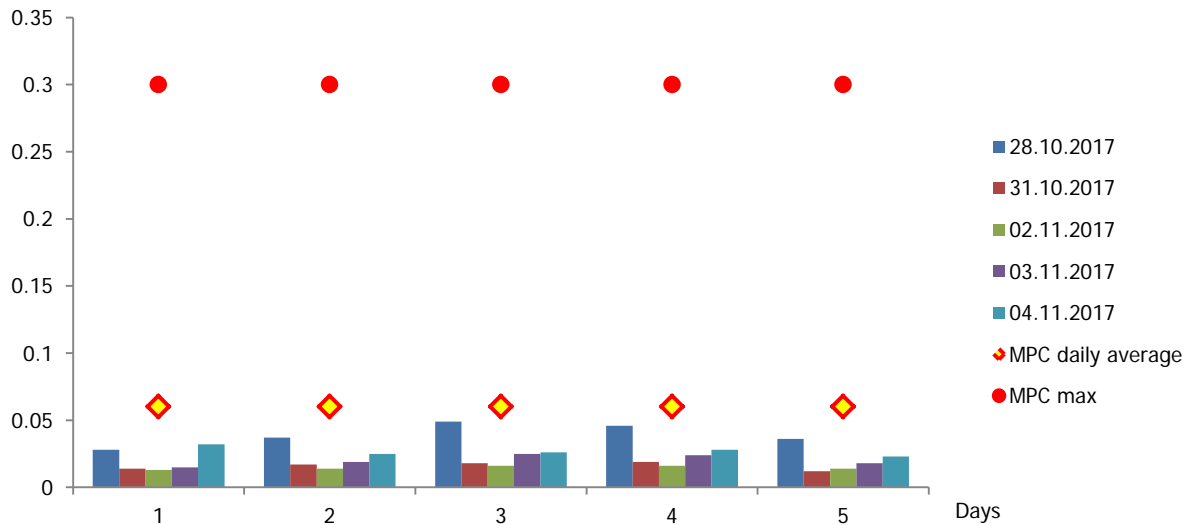
Figure 11. Diagrams of PM10 actual concentrations at point Air 4 compared with the MPC (max and daily average)



PM10 Assessment Report (for autumn 2017)

Rev01

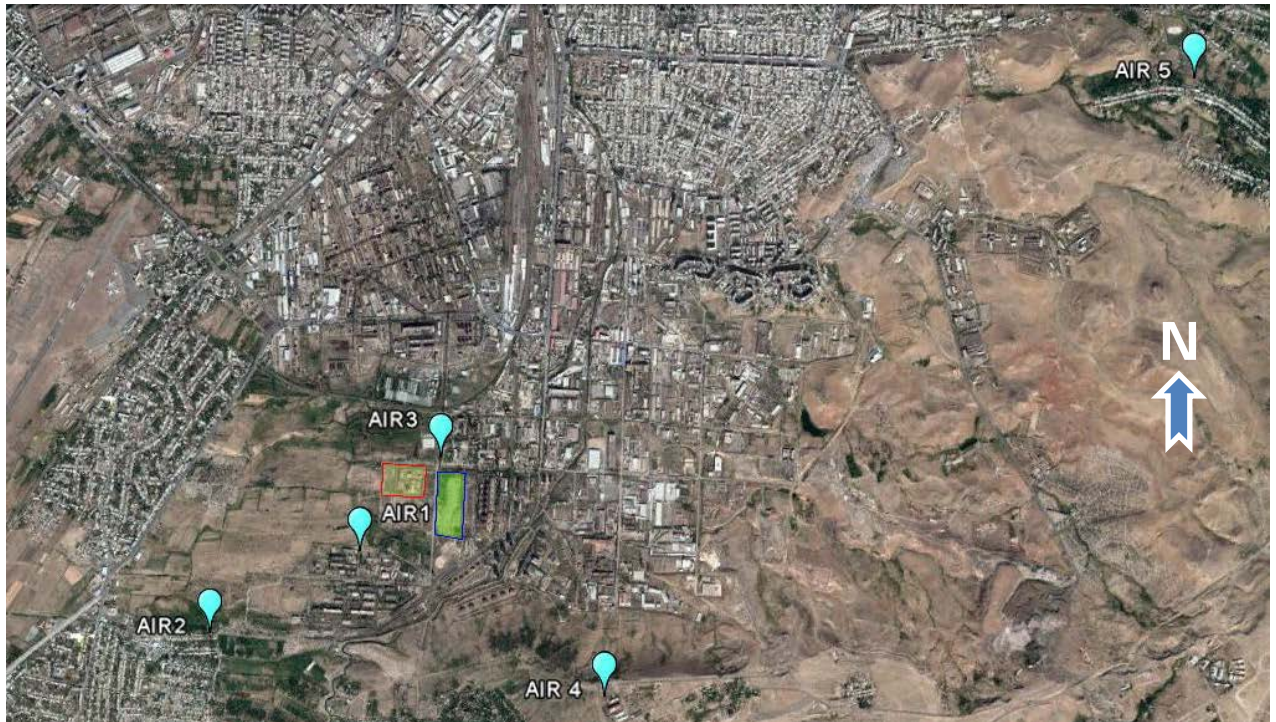
Figure 12. Diagrams of PM10 actual concentrations at point Air 5 compared with the MPC (max and daily average)



Main conclusions

- 1) 125 instrumental measurements were conducted in 5 sensitive points (Air 1, Air 2, Air 3, Air 4 and Air 5) during 5 days to determine the PM10 actual concentration. 5 measurements were conducted at each point per day, which means that totally 25 PM10 measurements were carried out at each point. The results of the study were compared with PM permissible concentrations (maximal is 0.3 mg/m³ and daily average is 0.06 mg/m³).
- 2) PM10 (dust particles of 10um size) actual concentrations at all sensitive points (Air 1, Air 2, Air 3, Air 4 and Air 5) in different daytime periods don't exceed the daily average and maximum permissible concentrations for residential areas set by the RA Government Decree N^o160-N "Norms of maximum permissible concentrations of atmospheric air pollutants in residential areas" (see Figures 8-12).

ANNEX 1. Map of measurement points




PM10 Assessment Report (for autumn 2017)

Rev01

ANNEX 2. Verification documents of measuring devices

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ
ԷԿՈՆՈՄԻԿԱՅԻ
ՆԱԽԱՐԱՐՈՒԹՅՈՒՆ



ԶՄՓԱԳԻՏՈՒԹՅԱՆ ԱԶԳԱՅԻՆ
ԻՆՍՏԻՏՈՒՏ ՓԲԸ
(ԶՄՓԱԳԻՏՈՒԹՅԱՆ ԱԶԳԱՅԻՆ
ՄԱՐՄԻՆ)

ՎԿԱՅԱԿԱՆ № 017243
ՍՏՈՒԳԱԶՈՓՄԱՆ ՄԱՍԻՆ

Ստուգաչափման թվականը 2017թ. 01 «18»
Ուժի մեջ է մինչև 2018թ. 01 «18»

Մ. Կարսեյան
Հախման միջոցի մեկանունը և տեսակը
ՃԾԵԿ. 431110.02 ՇԾ

Գործարանային հմ. **89610**
Չափման տիրույթը **(-10 ÷ 50)°C ; (3 ÷ 92) % Հ.Կ. (30 ÷ 110) քմ/ս**
ճշտության դասը, կարգը (սխալանքը) **±0,2°C ; ±3% ; ±0,13 քմ/ս**
Արտադրողը **Վ. Մուսխչյան (Վ. Խուսե - ՅՈՒՆԻՍԿՈՒՆԻՎԵՐՍԻՏԵՏ)**

Պատկանում է **Վ. Կարսեյան, ԱՄՊՇ**
իրավարանական (ֆիզիկական անձի) անվանումը (անունը)

Ստուգաչափման արդյունքների հիման վրա չափման միջոցը ճանաչվել է
պիտանի և թույլատրվում է կիրառման:

Ստուգաչափումը կատարվել է համաձայն **ՄՊՇ**
ստուգաչափման մեթոդիկայի անվանումը, նշագիրը

Ստուգաչափող **Վ. Կարսեյան Վ. Կարսեյան Վ.**
Դրոշմի արտատիպը

Բաժնի (լաբորատորիայի)
ղեկավար **Վ. Կարսեյան Վ.**

Պատասխանատվություն է կրող անձի նախարարի 14.02.2013թ. թիվ 104-Ն հրամանով
Գրանցված է ՀՀ Արդարադատության նախարարության կողմից 21.03.2013թ. թիվ 10313102

9.2 Annex 2: NO₂ and SO₂ Baseline Studies

REPORT

On Air Monitoring

In July-August 2017, air sampling from 5 points was carried out by the task presented by FICHTNER specialists.

Sampling was performed by natural diffusion method, through passive samplers.

The duration of all sampling was 7 days, the exact time of installation and removal was fixed for days, hours and minutes.

The samplers after removal were transported to the Laboratory of Environmental Monitoring and Information Center of the Ministry of Nature Protection, where the content of SO₂ and NO₂ were determined by the chemical analysis method.

Measurement results are given below.

Table 1. Point coordinates

Point	Latitude	Longitude
Air 1	40° 6'39.08"N	44°29'35.57"E
Air 2	40° 6'20.92"N	44°28'49.68"E
Air 3	40° 7'0.26"N	44°30'0.58"E
Air 4	40° 6'6.11"N	44°30'51.85"E
Air 5	40° 8'25.39"N	44°33'41.81"E

Table 2. Results of the analysis according to points

Name of pollutants	Allowed pollutant concentrations: ¹ , mg/m ³		Air 1	Air 2	Air 3	Air 4	Air 5
	Average daily	Maximum short term					
NO ₂	0.04	0.2	0.016	0.0119	0.0213	0.0201	0.0092
SO ₂	0.05	0.5	0.0194	0.0221	0.0284	0.0328	0.0317

¹ Maximum Permissible Concentration of Air Polluting Substances in Settlements and Maximum Permissible Norms of Hazardous Substances in Emissions from Vehicles Operated in the Republic of Armenia (Decree of the Government of Armenia No. 160-N dated 2 February 2006)

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REPORT N2 (Autumn)

On Air Monitoring

Yerevan, November 15, 2017

In November 2017, air sampling from 5 points was carried out by the task presented by FICHTNER specialists.

Sampling was performed by natural diffusion method, through passive samplers.

The duration of all sampling was 10 days because the rainy weather, the exact time of installation and removal was fixed for days, hours and minutes.

The samplers after removal were transported to the Laboratory of Environmental Monitoring and Information Center of the Ministry of Nature Protection, where the content of SO₂ and NO₂ were determined by the chemical analysis method.

Measurement results are given below.

Table 1. Point coordinates

Point	Latitude	Longitude
Air 1	40° 6'39.08"N	44°29'35.57"E
Air 2	40° 6'20.92"N	44°28'49.68"E
Air 3	40° 7'0.26"N	44°30'0.58"E
Air 4	40° 6'5.35"N	44°30'49.03"E
Air 5	40° 8'25.39"N	44°33'41.81"E

Table 2. Results of the analysis according to points

Name of pollutants	Allowed pollutant concentrations: ¹ , mg/m ³		Air 1	Air 2	Air 3	Air 4	Air 5	Average
	Average daily	Maximum short term						
NO ₂	0.04	0.2	0.0043	0.0047	0.0045	0.0047	0.0047	0.0046
SO ₂	0.05	0.5	0.0187	0.0267	0.0197	0.0262	0.0335	0.0250

Director

V.Tevosyan

¹ Maximum Permissible Concentration of Air Polluting Substances in Settlements and Maximum Permissible Norms of Hazardous Substances in Emissions from Vehicles Operated in the Republic of Armenia (Decree of the Government of Armenia No. 160-N dated 2 February 2006)

Պատվիրատուի անուն՝ «Քոնսեկտարդ» ՍՊԸ
 Նմուշառման ամսաթիվ՝ 02-13.11.2017թ.
 Արդյունքների տրման ամսաթիվ՝ 14.11.2017թ.

ՀԱՍՏԱՏՈՒՄ ԵՄ
 «Շրջակա միջավայրի մոնիթորինգի և
 տեղեկատվության կենտրոն» ՊՈԱԿ-ի
 կողմից



Գ. Շահնազարյան

[Signature]
 « 14 » « 11 » 2017թ.

ՋէԿ-ի մերձակա տարածքի մթնոլորտային օդի որակի երկրորդ ուսումնասիրության արդյունքները

Նմուշառման դիտակետի համար	Ուսումնասիրվող դիտակետում միջին կոնցենտրացիա, մգ/մ ³	
	ՍԹԿ _{մթջ.օր} = 0,05	ՍԹԿ _{մթջ.օր} = 0,04
	Ծծմբի երկօքսիդ	Ազոտի երկօքսիդ
PS1	0.0187	0.0043
PS2	0.0267	0.0047
PS3	0.0197	0.0045
PS4	0.0262	0.0047
PS5	0.0335	0.0047
Ուսումնասիրվող տարածքում միջին կոնցենտրացիա, մգ/մ ³	0.0250	0.0046

ՍԹԿ-սահմանային թույլատրելի կոնցենտրացիա

Օդի որակի ուսումնասիրության լաբորատորիայի վարիչ *[Signature]* Ա. Գաբրիելյան

12.7 Stakeholder Engagement Plan

Yerevan 2 CC Power Plant Armpower CJSC

Stakeholder Engagement Plan



Source: Fichtner (July 2017)

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Rev No.	Rev-date	Contents /amendments	Prepared/revised	Checked/released
0	18.08.2017	Stakeholder Engagement Plan - Draft Report	Sousa/Paulsch/ Martin	Heinold
1	05.10.2017	Stakeholder Engagement Plan - Draft Final Report	Sousa	Heinold
2	20.11.2017	Stakeholder Engagement Plan - Draft Final Report	Paulsch	Sousa
3	07.12.2017	Stakeholder Engagement Plan - Draft Final Report	Sousa	Paulsch

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1. Introduction

The present Draft Final **Stakeholder Engagement Plan** (SEP) is prepared within the context of the Draft Final Environmental and Social Impact Assessment (ESIA) of the Yerevan CCPP - 2 project.

The SEP describes the strategy and program to be implemented for engaging with the stakeholders of the Project in a culturally and timely appropriate manner. The goal is to ensure the timely provision of relevant and understandable information and to create a process that provides opportunities for stakeholders to express their opinions, aspirations and suggestions about environmental measures, eventual land acquisition and social impacts of the project, and that allows the Project Developer to consider and respond to them.

It is important to note that the Project has been in the past subject to a process of public consultation and that an Environmental Permit has been granted. The public engagement activities defined in the present SEP have as an objective to engage the public once more in a process that assures as well compliance with the requirements of the IFIs (International Financing Institutions) ADB (Asian Development Bank) and IFC (International Financing Corporation).

1.1 Brief Project description

The Ministry of Energy (MOE) of the Republic of Armenia plans to improve the total output capacity of its electric energy production, complementing the power units of the existing Yerevan Combined Cycle Thermal Power Plant (YCCPP-1) with a modern and efficient power plant. For this reason a new gas fired Combined Cycle Power Plant of 254 MWe (YCCPP-2) is planned to be built at the site next to the existing YCCPP-1, in an already industrialized region in the south of Yerevan.

The foreseen site location allows co-utilizing the existing auxiliary systems of YCCPP-1 such as water intake and discharge structures, fuel gas regulators, adjacent substation and devices. Possible alternative locations for the proposed new YCCPP-2 had been considered prior to opting for the foreseen site. On account to minimize the additional costs for newly developing such a site and modifying the transmission network to accommodate the new power plant, the foreseen site was selected together with MOE as a final option.

The Project has already been given national approval, which is documented in the following Conclusion: *RA Minister of Nature Protection (11.01.2017): State Expert Examination Conclusion on Expert Examination of Influence on the Environment BP 02. Report of evaluation of influence on environment of the new power station in Yerevan with combined cycle of steam and gas.*

The new CCPP will include a Gas Turbine (GT), a Steam Turbine (ST), and a Heat Recovery Steam Generator (HRSG) and all auxiliary equipment and systems that, at local condition with an ambient temperature of 15°C, will produce 254 MW. Interconnections to gas, water and electrical grid are already in place (the new CCPP will use interconnections of existing YCCPP-1).

RENCO SPA will be the EPC Contractor for this Project, which will be operated by ArmPower CJSC, a subsidiary company of RENCO SPA.

2. Public Consultation Regulations and Requirements

This Section provides a brief description of the national regulation of Armenia concerning the public participation in the process of ESIA. Also the IFIs' requirements in these matters are summarized.

The Project has been in the past subject to a process of public consultation and obtained the necessary environmental license. For this reason, the present SEP and the corresponding procedures are/will be undertaken with the main focus of respecting the standards of the IFIs.

2.1 National framework

The notification of stakeholders in the Republic of Armenia and the implementation of public hearings are regulated by the Law on Environmental Impact Assessment and Examination (Article 26).

The public hearings organization is carried out according to the procedure defined by the Decree N 1325-N dated 19.11.2014. Depending on the impact of the planned activity, 2 or 4 hearings are conducted. The first and third hearings are organized by the affected community and the customer, the second and fourth hearings by the affected community and the Expertise Center of the Ministry of Nature Protection with the participation of the client.

2.2 International framework

The SEP follows the IFIs requirements for public engagement, namely the ones depicted in the following documents:

- **ADB, 2012:** *Strengthening participation for development results - an Asian Development Bank guide to Participation*, ADB, Philippines, 2012
- **IFC, 1998:** *Doing Better Business through Effective Public Consultation and Disclosure - A Good Practice Manual*, IFC, Washington, D.C., October 1998
- **IFC, 2007:** *Stakeholder Engagement: a good practice handbook for companies doing business in emerging markets*, IFC, Washington, D.C., May 2007
- **IFC, 2012:** *Performance Standard 1 - Assessment and Management of Environmental and Social Risks and Impacts*, IFC, Washington, D.C., January 2012

The requirements of importance for the Project are summarized in the following sections.

2.2.1 Stakeholders

Stakeholders are those who will be or are likely to be directly or indirectly affected, positively or negatively, by a project (commonly referred to as project-affected people or project-affected communities), as well as those who might have an interest in, or may influence, the project (the “interested parties”).

Generally, stakeholders can be distributed in the following three groups (adapted from ADB, 2012 and IFC, 1998):

a) Civil society:

- General public: directly or indirectly affected population groups and subgroups (e.g., youth, girls, and women’s groups), and ethnic minority groups:
 - People owning land or assets impacted by the project, both on- and off-site.
 - People using agricultural land or natural resources, such as forests or rivers.
 - Squatters already on-site.
 - Immigrants attracted to the project and its potential labor benefits prior to implementation.
 - People’s organizations and institutions affected by the project, such as village development associations, recreational groups, women’s groups, farming and fishing cooperatives, and religious groups.
 - Locally disadvantaged and voiceless groups, such as the poor and women.
 - Indigenous or tribal peoples with special ties to land, or who have specific land, resource, and cultural rights that may be protected by national or international law.
 - People from surrounding villages who may be potential sources of labor.
- Civil society organizations: national and international NGOs, community-based organizations, foundations, labor unions, and independent research institutes.
- Informal representatives: scientific community, school teachers, religious leaders.

b) Government:

- Central Government: civil servants in ministries, cabinets, etc.
- Representative assemblies: elected government bodies (e.g., parliament, national and local assemblies, and elected community leaders)
- Bilateral and multilateral government institutions: international financial institutions, bilateral government donors, etc.

c) Private Sector:

- Private companies (including suppliers, customers, and contractors), umbrella groups representing groups in the private sector, and chambers of commerce.
- The media.

According to IFC PS 1 (2012), the stakeholders of the Project, including Affected Communities, shall be identified and a tailored SEP shall be prepared.

2.2.2 Information Disclosure

Disclosure is a formal-sounding term for making information accessible to stakeholders. Information is critical to the effective participation of affected citizens near the project. An informed public will better understand the trade-offs between project benefits and disadvantages; be able to contribute meaningfully to project design; and have greater trust in its new corporate neighbors. Communicating such information in a manner that is understandable to the stakeholders is an important first (and ongoing) step in the process of stakeholder engagement (IFC 2007; IFC 1998). Good practice principles in what concerns information disclosure are:

- **Early disclosure:** in order for the engagement process to be efficient, the disclosure of information about the project shall be undertaken early in the planning schedule, that is, before the decision-making has been finally undertaken and any impacts have been delivered. Only this way it is possible to include the stakeholders' visions and opinions on the decisions concerning the project.
- **Disclose objective information:** as far as possible, inform the stakeholders about numbers and facts (even if preliminary), so to avoid the creation of false expectations or unnecessary alarm.
- **Design disclosure to support consultation:** crucially, leave sufficient time between the provision of information about the benefits and disadvantages of the project (or changes to project operations and their implications) and the start of consultations.
- **Provide meaningful information:** transmit the information in a matter that is culturally adequate to the targeted public. Consider the local language, the access to information media, the literacy levels, etc.
- **Ensure the accessibility of information - adapt the disclosure techniques to the targeted public.**

2.2.3 Public Consultation

Consultation is a process of deliberation, discussion and dialogue. It is more than just disclosing information, although clear, transparent and timely information is the basis for any consultation process. The objective of the consultation is also to seek feedback, advice and opinion of the stakeholders in order to shape the project, to the extent possible, to their needs and concerns. In this sense, the vulnerable groups shall be given a particular chance of having their voice heard.

The IFIs require that the client undertakes a process of meaningful consultation in a manner that provides the interested and affected parties with opportunities to express their views on project risks, impacts, and mitigation measures, and allows the client to consider and respond to them. Meaningful consultation is the one that (based on IFC, 2012):

- is based on the disclosure of relevant and adequate information including, where appropriate and relevant, draft documents and plans, prior to decisions being taken when options are still open;
- is undertaken early in the environmental and social appraisal process;
- focus on the social and environmental risks and adverse impacts, and the proposed measures and actions to address these;
- is carried out on an ongoing basis as the nature of issues, impacts and opportunities evolves;
- is undertaken in a manner that is inclusive and culturally appropriate, i.e., tailored to the language preferences of the affected parties, their decision-making process, and the needs of any disadvantaged or vulnerable groups;
- is free of external manipulation, interference, coercion or intimidation;
- reports back in a timely way to those consulted.

There is a vast amount of reference literature and tool kits detailing the variety of participatory techniques and methodologies that can be employed as part of the stakeholder engagement process. However, as is the case with most aspects of the process, the choice of methods will depend on the aim of the consultation, the nature of those being consulted (language, literacy, location, exposure to issues), and the timescale/resources available. Using more than one method yields better responses - in quality and quantity. Different methods can also produce different results (IFC, 2007; ADB, 2012).

Table 3-1 presents some of the techniques that are commonly used for undertaking Public Consultation during an ESIA process.

Table 2-1: Different techniques for undertaking Public Consultation (ADB, 2012)

Technique	Description
Online and Written Consultation	This typically involves using a specific consultation web page to introduce the policy, strategy, or project and the aim of the consultation. The consultation structure varies. A draft document, broad topics, or open-ended questions can be used to guide comments or a survey style with closed questions. Public comments allow discussion between stakeholders. Social media can be used. Online consultation enables open public consultation, but it only reaches those who are literate and with internet access, and therefore not the most disadvantaged. Written feedback posted or e-mailed is also common.
Public Meeting	Meetings are an open accessible method of consulting with the public. They take place at any level (community, regional, national, etc.). Ensure they are fully accessible and give adequate notice to interested bodies. Also the meeting size affects participation. Groups of fewer than 20 people ensure everyone can speak. Breakout sessions and participatory methodologies (e.g., ranking, diagrams) can help capture all viewpoints.
Workshop	Workshops involve gathering a group to gain their feedback in a structured format. The face-to-face format allows for brainstorming and testing ideas. Preferable to a single workshop, a series produces greater output. Try different workshop types (e.g., open space, write shop, participatory methods). Facilitation is important, and a skilled neutral individual can help ensure group rules are clear, views are taken seriously, and no participant dominates.
Focus Group Discussion (FGD)	Semi-structured qualitative discussions with a small homogenous group (generally 5–12 participants plus 1–2 skilled facilitators). Open discussion explores people’s attitudes, concerns, and preferences toward a specific issue, with the range of viewpoints collated at the end. The mix of people depends on the purpose but numbers are typically restricted to 15 or fewer. Community members not used to formal meetings may feel more comfortable expressing themselves in a FGD (e.g., women, ethnic minorities, or disadvantaged groups; the disabled; or poor individuals and households).
In-Depth Interview	Qualitative phone or face-to-face interviews with individuals (e.g., community members, key informants, or civil society leaders) can get a sense of stakeholders’ perspectives. They can be structured (formal, and closely following a written interview guide), semi-structured (partially directed by an interview guide, but open and conversational to allow interviewees to introduce other topics of interest), or unstructured (organized around a few general questions or topics, but informal and open-ended) depending on the context. Structured interviews are likely to yield information that can be compared and generalized, while less structured ones can explore an issue in depth and permit related issues to be raised. Interviews with key informants possessing particular knowledge of an issue are especially useful.
Survey	Surveys provide specific responses on certain issues. They can rapidly show who is interested and why and provide quantitative data. They indicate the weight of different views. Conduct surveys by post, online, or face to face.

2.2.4 Grievance Mechanism

A Grievance Mechanism constitutes the process by which people affected by the project can bring their grievances to the sponsor, in a culturally appropriate manner for consideration and redress (IFC, 1998). It is good international practice to ensure access to grievance and remedy to both the workers and the public by means of separate grievance mechanisms.

Ideally, grievance procedures should be in place from the beginning of the social and environmental assessment process and exist throughout construction and operation until the end of the project life. The promoter will duly inform workers and community members of the existence of the grievance mechanism.

The same way as for the information disclosure and consultation procedures, also the grievance procedures shall be readily understandable, accessible and culturally appropriate for the local population. It shall not be overly complicated to use nor should it require legal counsel to complete. The following are desired characteristics of the grievance mechanism:

- legitimate and trusted;
- scaled to the risks and potential adverse impacts of the project;
- publicized and accessible, appropriately tailored to all potentially-affected persons and communities and other interested parties, irrespectively of their literacy and administrative capacity;
- free of cost for the stakeholders;
- includes the anonymity option, where feasible, and guarantee confidential handling of requests, if so requested by the complainant;
- fair, transparent and inclusive;
- guided by engagement and dialogue;
- predictable in terms of process;
- timely appropriate;
- not impeding access to grievance and resolution on grounds of one's financial ability to seek judicial remedy; and,
- a source of continuous learning for the promoter and the lending operation at large.

3. Summary of previous stakeholder engagement activities

During the preparation of the National ESIA (Ecobarik-Audit LLC 2016), consulting and information disclosure activities with some stakeholder groups have been undertaken.

Being nationally classified as a Category A Project, the YCCPP - 2 was subject to 4 public hearings in 2016. All hearings were held at RENCO Armenia's office.

The invitations for the sessions can be consulted in **Annex 1** to this report. Records of the hearings, the participants' lists with the signatures and the video clips were submitted to the Ministry of Nature Protection of the Republic of Armenia. They are not available for disclosure in this report.

4. Project Stakeholders

As stakeholders are identified, it is necessary to understand their level of interest and influence over the project, as well as the extent to which they are impacted (directly or indirectly).

The information obtained so far shows that there are some temporary informal houses nearby the project site (several families to the northeast and one woman to the south west). The land occupied by these temporary informal houses is not affected by the Project. All these residents are Armenian.

Table 4-1 lists these and other stakeholders identified so far for this project.

Table 4-1: Stakeholder Analysis List

Stakeholders	Stakeholder Interest	Perception of the problem/Issues to be discussed	Resources	Mandate in the project's context	Contact data
Civil Society					
Aarhus Center, NGO	Assist the public in exercising their rights granted by the international and national legislation	Environmental and social impacts of the project; Environmental and Social Management Plan	Internal budget and staff	The Centre's task is to promote the principles of the Aarhus Convention and work towards its implementation.	Silva Ayvazyan Head of Yerevan Aarhus Centre info@aarhus.am (+374) 91 81-60-55
Informal Residents	They can be directly affected by environmental and social issues	Environmental and social impacts of the project; Environmental and Social Management Plan	Public resources (air, water, soil)	Not applicable	Not applicable. People are involved through the local governments.
Inhabitants of surrounding areas	They can be directly affected by environmental and social issues; They can be potential sources of labor	Environmental and social impacts of the project; Environmental and Social Management Plan; Job opportunities	Work force Public resources (air, water, soil)	Not applicable	Not applicable. People are involved through the local governments.
Private Sector					
Media	Publication of information about the EIA process Publication of mandatory advertisements related to the project (e.g. public consultations)	Disclosure of project's information	Communication platforms (TV, radio, internet, newspapers)	The national, regional and local media fulfill the communication needs of the project.	Not applicable
Government					
Ayntap Village	Located in the Project Area; Residents can be directly	ESIA, Environmental and Social Management Plan,	Internal budget and staff	Governments give orders in accordance with the law on implementation of public consultations on the projects of	(+374 094) 722-222
Kharberd Village					(+374 093) 400-122
Shengavit District					(+374 11) 518-808

Stakeholders	Stakeholder Interest	Perception of the problem/Issues to be discussed	Resources	Mandate in the project's context	Contact data
Erebuni District	affected by environmental and social issues	SEP; Disclosure of project's information; Public consultation in order to collect comments and questions		local importance, which can have economic, environmental and social consequences (for life of the people, for culture, health and social protection for local communities and public services), as well as on other issues which are of interest for all population of the administrative/ territory unit or its part.	+ (374 11) 518-388
Nature Protection Department of the Municipality of Yerevan	Monitoring of noise/ air emissions and effluents; Waste Management	ESIA, Environmental and Social Management Plan, SEP	Internal budget and staff	The Nature Protection Department participates in the development of state programs for the nature protection and environmental management and ensure their implementation in the territory of Yerevan	Avet Martirosyan + (374 11) 514-264
Environmental Monitoring Center at Ministry of Nature Protection	Monitoring of noise/ air emissions and effluents	ESIA, Environmental and Social Management Plan, SEP	Internal budget and staff	The "Environmental Monitoring and Information Center" SNCO (Ecomonitoring) of the Ministry of Nature Protection of the RA monitors the atmospheric air, surface and groundwater, atmospheric precipitation, soil and sediment quality.	http://www.armmonitoring.am

Stakeholders	Stakeholder Interest	Perception of the problem/Issues to be discussed	Resources	Mandate in the project's context	Contact data
Ministry of Nature Protection	Its permission or agreement is necessary in order to construct YCCPP-2. This permission was already given (RA Minister of Nature Protection (11.01.2017): State Expert Examination Conclusion on Expert Examination of Influence on the Environment)	ESIA, Environmental and Social Management Plan, SEP Approvals: Application, ESIA Program/ToR, ESIA Documentation/ Report	Ministry's internal budget and staff	The Ministry of Nature Protection coordinated the process of national environmental impact assessment of the planned power plant.	min_ecology@ mnp.am

5. Information disclosure and consultation methods

The present Section describes the following main points:

- what information will be disclosed;
- in which formats will the information be presented;
- which methods will be used to communicate this information to each of the stakeholder groups;
- which methods will be used to consult with each of the stakeholder groups;
- how the results of the process will be captured, recorded, tracked, and disseminated.

The requirements of the Armenian law on Environmental Impact Assessment and Examination and of the international financing institutions (IFC and ADB) in respect to public engagement principles and scheduling are considered for the present SEP. Three phases are considered for the planning of the engagement activities:

1. ESIA preparation;
2. Construction;
3. Operation.

5.1 Engagement during the ESIA preparation

The engagement of the stakeholders during the preparation of the ESIA consists of the following actions:

1. Notification of the Project to the local authorities;
2. Disclosure of the Draft Final ESIA Report and respective Non Technical Executive Summary:
 - a) One Public Consultation Session
 - b) Online and written consultation

5.1.1 Notification of the project to the local authorities

During the site visit in July 2017, FICHTNER's environmental and social specialists performed stakeholder meetings with mayors of the adjacent villages Kharberd and Ayntap, with the Heads of Departments of Erebuni and Shengavit Administrative Districts, with the Environmental Monitoring and Information Center, and with the NGO Aarhus Center. The purpose of the meetings was to introduce the Project and to discuss issues concerning the presence of houses/ sensitive receptors in the vicinity of the Project area, environmental monitoring, concerns about the Project and the public consultation process.

5.1.2 Disclosure of the Draft Final ESIA and respective Non Technical Executive Summary

A national process of engagement has been undertaken during the elaboration of the previous ESIA.

For the present ESIA, which aims at covering the gaps with the IFIs' requirements, this process will be complemented by making the new Draft Final ESIA and Non-Technical Executive Summary (NTES) publicly available and open to comments during a public consultation session. In addition, online and written consultation will be planned as described in the following sections.

a) Public Consultation Session

One Public Consultation Session will be planned and undertaken by RENCO/ARMPOWER with the support of Fichtner to present the ongoing results of the ESIA process and obtain feedback from the stakeholders concerning its content and the areas which may require more attention.

The Public Consultation Session will be conducted in Yerevan. All villages affected by the project will be invited to participate in the session. Transportation to and from the meeting shall be provided by the EPC Contractor to the community members and people living in the illegal houses in order to give all interested people the chance to participate in the Public Consultation Session. The following residential complexes are in the proximity of the site (Figure 5-1):

- the nearest residential area of Shengavit District (Noragvit village) is located approx. 1,350 m to the west;
- Ayntap, a major village in the Ararat Province is located approx. 1,500 m to the south west;
- Kharberd, another major village in the Ararat Province is located approx. 1,200 m to the south;
- the nearest residential area of Erebuni District is located approx. 1,200 m to the north east.



Figure 5-1: Project site and its vicinity

Theoretically, the Public Session could be organized at the YCCPP-1's building or at RENCO Armenia's office. However, since the YCCPP -1 is located far from the city and is difficult to reach, and the RENCO Armenia's office is small, it is more advisable to organize the Session in Yerevan's Aarhus Center, submitting a preliminary application to the center coordinator.

Before the Session

Before the Session takes place, publicity of the time and place will be made by the project's developer by putting out adverts in the mass-media or posting them on its official web-page. Local authorities (Ayntap and Kharberd villages; Shengavit and Erebuni districts) shall put up notices along with a copy of the Armenian version of the Non Technical Executive Summary of the Draft Final ESIA accessible for the public in their respective governmental buildings. The local governments may also post the advert regarding the conduct of the Session on their web-pages. The Aarhus Centre Yerevan agreed to assist with promoting the Public Consultation Session and with making the Draft Final ESIA and NTES available to the public.

During the Session

The meetings will be structured in two parts: presentation and Q&A (questions and answers).

The first part will consist of a presentation of the Project and the ESIA process. This will be supported with audiovisual resources (slides, pictures, videos) and will use straightforward, non-technical language. The second part of the meetings will consist of an open Q&A session and will be

coordinated in order to allow all stakeholders present to manifest their opinion.

A written record of all stakeholder grievances, criticisms and/or suggestions will be undertaken. Further to voiced manifestations, stakeholders will have the option to register their written opinion in a book to be made available until the end of the meeting. The language of the session will be Armenian.

After the Session

The findings of the public session will be entered in a minute, with the indication of the total number of participants, the list of questions and the objections and proposals put forth. The minutes will be drawn up within 1 week following the date of the conduct of the Session.

Should no answers be provided to the questions put forth during the conduct of the public session, the developer will deliver the answers within 15 days following the date of the conduct of the public session to the authors on the postal or email addresses indicated during registration.

b) Online and written consultation

The Draft Final ESIA in English and the NTES in Armenian will be made available for public access, with the possibility to deliver written comments in the following platforms:

- Hard copies placed in the Aarhus Center, and the local governmental buildings (Noragavit, Ayntap, Kharberd, and Erebuni District).
- Soft copy at the official web-page of the developer;
- Soft copy at the web-page of the IFIs;
- Soft copy at the web-page of Yerevan's municipality;
- Soft copy at the web-page of the Aarhus Center.

In each of the physical or online platforms where the Draft Final ESIA and NTES will be placed, forms will be made available in Armenian to allow the persons to write their comments, if desired anonymously. See **Annex 2** for a model of the comments form.

The physical and online platforms for consultation will be disclosed during the Public Consultation Session.

5.2 Engagement during construction

For the communities located near the project site the effects of noise, dust, vibration, traffic, and lighting associated with construction, as well as the presence of the sites themselves, can cause disturbances and stress, as well as pose a physical or health hazard. In addition, social conflicts with the workers may also arise in these villages. To avoid such situations, whether for large capital works or minor construction activities, it is advised to give the public notification of:

- the purpose and nature of the construction activities;
- the start date and duration of the overall construction works and of specific operations (blasting, terrain clearing, transport of heavy components, etc.);
- potential impacts;
- information on whom to contact if there are concerns/complaints related to the contractor.

Also recommended is the regular disclosure of information related to the management of the environmental and social matters (application of measures, monitoring efforts and results).

In the construction phase, it is not a common procedure to undertake public debates and discussions. Instead, the construction contractor shall keep functioning grievance mechanisms. This way it is possible for the interested and affected parties to make complaints or suggestions in relation to the project's activities (the mechanism shall be open for the public and for the workers). This is the project's phase where more grievances are expected to be received and the contractor and the Project Developer shall be ready to answer to them on time and efficiently. Please refer to Section 6 for guidance on the preparation of a grievance mechanism.

5.3 Engagement during operation

Typically during operation the number of grievances and frequency of engagement with stakeholders may decrease, along with a reduction in the overall employee and contractor workforce. The following shall be undertaken in this phase for the project:

- a) In case the operator prepares an Emergency Preparedness and Response Plan, this shall be disclosed to the employees and communities so that all stakeholders likely to be affected have a basic understanding of the risks involved and what the key elements of the plan are; and that individuals from within and outside the project know what their allocated roles and responsibilities are during an emergency. Consultations shall be conducted, and formalized agreements (e.g. joint emergency plans) shall be developed especially with emergency response service providers and the adjacent power plant. Disclose any important changes made to the Plan.
- b) Undertake a regular communication of the company's environmental and social performance;
- c) Maintain the grievance mechanism - there should always be a well functioning procedure for answering public concerns whenever they may arise throughout the life of the project.

In the operational phase, it is not a common procedure to undertake public debates and discussions. Instead, the operator shall keep functioning grievance mechanisms for the public and the workers. This way it is possible for the interested and affected parties to make complaints or suggestions in relation to the project's activities.

5.4 Documentation

Keeping track of the “who, what, when, and where” of consultation is key to effective implementation of the process. Any commitments made to stakeholders should also be recorded. Careful documentation can help to demonstrate to stakeholders that their views have been incorporated into the project strategies, and is a useful resource for reporting back to stakeholders on how their concerns have been addressed. For this, a Stakeholder Log needs to be developed and shall be maintained throughout the project's life cycle. The Log records:

- stakeholder organization;
- contact details;
- issues and concerns raised;
- actions for follow-up;
- responsibilities and deadline;
- confirmation of close-out.

Please refer to **Annex 3** for the model of the Stakeholder Log for this project. At present, no comment or grievance has been received.

Stakeholder consultation carried out during the course of the early stages of the ESIA studies will be recorded in the final ESIA report. This will include:

- The location and dates of meetings;
- A description of the project-affected parties and other stakeholders consulted;
- Presentations and communications;
- The minute of the sessions including:
 - Number of participants;
 - An overview of the issues raised (questions, objections and proposals);
 - How the project sponsor responded to the issues raised;
 - How these responses were conveyed back to those consulted;
- Project variations and impacts on the ESIA process;
- Details of outstanding issues and any planned follow-up.

6. Grievance Mechanism

This Section presents the grievance mechanism for the general public and the workers planned for the Project.

6.1 General public grievance mechanism

In the course of the construction process, Project Affected People (PAP) may feel treated unjustly. This might happen for various reasons such as: the contractor does not adhere to sound construction principles, misunderstandings have arisen, or disagreement with procedures of consultation or notification. If this happens people shall be encouraged to lodge their complaints in a timely and effective manner without directly addressing the court, i.e., through a grievance mechanism.

All PAP will be notified about the Grievance Redress Mechanism (GRM) of the YCCPP -2 Project during the Public Consultation meetings, as well as through the disclosed project information leaflets. Contact data of the **ArmPower's Grievance Coordinator (GC)**, part of the **Grievance Committee**, will be disclosed.

During consultation the PAP shall be notified orally or in a written form about their rights and the procedure of filing complaints. Local NGOs, e.g. the local Aarhus Centre, can inform communities about the possibility to raise complaints and how and where to address them. The grievance mechanism has to be locally implemented at the level of village institutions and local self-government, as well as bundled on national level at ArmPower.

Grievances can be addressed at the local community level ('marzpet'), where the grievance will be recorded and forwarded to ArmPower's GC. Grievances that are addressed to the EPC Contractor during the execution of civil works shall also be forwarded to ArmPower's GC. Even if the constructor decides to settle the grievance on the spot, the documentation of the grievance settlement procedure needs to be prepared by ArmPower's GC.

All project related complaints can in addition be directly addressed to ArmPower's GC via phone, e-mail or grievance form (the SEP presents an example of the public grievances form). A project grievance hotline shall be made available by ArmPower for direct complaints (at national level), and all received grievances shall be recorded in a grievance log-book.

The ArmPower GC then decides whether to settle directly, to arrange a meeting with the Grievance Committee, or go to court. The decision has to be taken within 15 days. In case of major grievances that cannot be directly settled, permanent and non-permanent members of the Grievance Committee will be called for a meeting.

In case of failure of the grievance redress system, the PAP can submit their case to the appropriate court of law.

The EPC Contractor is obliged to carry out the work in accordance with the contractual requirements that include:

- a) Nominate a person of staff responsible for the reception and handling of grievances;
- b) Preparation of regular monitoring reports including details of any complaints that arose and how they were handled;
- c) If vulnerable affected people are identified, then the contractor will appoint professional advocates (social workers/legal experts) to assist those people during the entire process, and to act as independent advocates for them should any grievances arise;
- d) Arbitration of grievances with ArmPower and PAP.

ArmPower will carry out works that include:

- a) Nominate a person of staff responsible for grievance procedure coordination, hereby referred to as Grievance Coordinator (including first contact, periodical site visiting of mitigation measure to be implemented by contractor);
- b) A telephone line, e-mail address and contact name on project boards;
- c) Arbitration of grievances with contractor and PAP.
- d) Liaison with court.

The PAP have the option to choose a different representative, or directly liaison with ArmPower' staff responsible for grievance redress. Vulnerable households will have the support of their individual social worker and legal support, if applicable.

NGOs, e.g. Aarhus Centre or local member organizations will monitor grievance redress negotiations, assist with grievance arbitration, and raise public awareness. PAP need to be informed that in case of conflict with the community leader they can address NGO staff to follow up their complaint. NGOs will monitor the relationship between PAP and the community leader.

The aggrieved person (PAP) is encouraged to proceed in the following way:

- a) Contact contractor's designated grievance staff in the following way: in person via the designated telephone number, via email, via regular mail. Alternatively, the PAP can contact their community leader, who would convey their grievance to the contractor's designated grievance staff.
- b) Lodge a complaint and provide information on the case. Each complaint will be registered and a tracking number will be assigned to it. Responses to all complaints should be provided within 15 days (or 25 days in cases where complaint resolution requires special efforts).

- c) Agree with the contractor on a mitigation measure.
- d) Agree with the contractor on time limit for grievance settlement. Grievances have to be settled within two weeks, or otherwise specified in scheduled agreement.
- e) Sign if the mitigation measure has been implemented as agreed
- f) Seek redress from ArmPower if not satisfied with the above mentioned procedure through the designated telephone numbers, in person, or via email or regular mail. ArmPower should register all grievances and provide response within 15 days.
- g) Involve appropriate NGOs
- h) Seek redress from court if all else fails.

Although the grievance mechanism is designed to avoid lengthy court procedures, it does not limit the citizen's right to submit the case straight to the court of law. As a last resource to be utilized in case the GRM is not effective, the citizens are recommended to utilize ADB' Accountability Mechanism.

ADB/ IFC are not directly a part of the Grievance procedure but shall receive reports about which complaints were received and how they have been followed up/ mitigated.

Special consideration has to be taken for vulnerable people as complaint mechanisms may be unusual and contact with legal procedures let alone courts of law may appear uninviting. This would prevent the most disadvantaged persons from addressing their grievance. A close monitoring on a village level by an independent social expert during the implementation of the project and a personal contact with PAP is therefore recommended.

Vulnerable PAP (all households below the poverty line) will be entitled to a legal aid/ social worker to support them with complaints procedures.

Annex 4 presents an example of the public grievances form that shall be made available in the developer's webpage.

6.2 Workers grievance mechanism

The EPC Contractor RENCO and the future operator of YCCPP-2 ArmPower are requested to implement an independent grievance management system to enable the workers (and their organizations, where they exist) to raise reasonable workplace concerns. This includes complaints related to non-compliance with Health & Safety matters, discrimination cases and non-consideration of equal opportunities.

The workers grievance mechanism shall follow the same principles as the one created for the general public: complaints must be answered in a timely and effective manner without fear of retribution; the access to the grievance mechanism shall not replace or impede the subsequent access to other redress mechanisms; the promoter will inform workers of the grievance mechanism at the time of hire and make it accessible to them.

The grievance management system shall consider the possibility to contact directly a member of the Site Management Staff. The contacted staff members must take a note of the reported complaint or non-compliance and must report it to the Site Manager.

The Site Manager is requested to solve the complaint or non-compliance within 3 working days. In case the problem cannot be solved an action procedure specifying the needed activities together with a predicted deadline for resolution of the problem must be prepared and submitted to the general manager.

The EPC Contractor and ArmPower are requested to provide as well the possibility for the workers to notify a complaint or non-compliance in a confidential way.

According to RENCO SPA a grievance mechanism for workers will be established for this Project, as it has been done in other international projects before. The system will allow staff and contractors to provide feedback on any element of the work via email or by hand delivery to a box placed on site. Grievances will be logged into a spreadsheet where they will be then delegated to the appropriate person for close out. Grievances will be confidential and staff and contractors will be in no way penalized for providing their feedback.

7. Timetable

Table 7-1 presents a preliminary schedule for the engagement of stakeholders during the ESIA Process. This schedule shall be continuously updated. Table 7-2 shows the schedule for the stakeholder engagement activities to be undertaken during construction and operation.

Table 7-1: Stakeholder Engagement and ESIA Schedule

Activity	Deliverables	Date
Disclosure of the Project to the local authorities	--	04.- 07.07.2017
Fichtner prepares the Draft ESIA Report in English	Draft ESIA Report in English Non-Technical Executive Summary in English	23.08.2017
RENCO/ARMPOWER and the IFIs review the Draft ESIA Report	--	27.08.2017
Fichtner prepares the Draft Final ESIA according to the review in English	Draft Final ESIA Report in English Non-Technical Executive Summary in English	06.12.2017
The NTES is translated into Armenian	Non-Technical Executive Summary in Armenian	20.12.2017
Preparation of a brief project/ESIA summary + public consultation invitations + official letter for the authorities	Project/ESIA summary Invitations for sessions (in English and Armenian)	05.01.2018
Request Aarhus Center Armenia for renting the venue for the session	--	08.01.2018
RENCO/ARMPOWER posts adverts in the mass-media and on its official web-page informing about the Public Consultation Session.	Adverts: brief summary of the project and invitation for the public consultation session	13.01.2018
The local governments post the advert regarding the conduct of the Session on their web-page, at their offices and in other public places.	Adverts: brief summary of the project and invitation for the public consultation session	13.01.2018
Public Consultation Session in Yerevan	--	10.02.2018 (Saturday)
The IFIs publicly disclose the Draft Final EIA Report	Draft Final ESIA Report in English Non-Technical Executive Summary in English Draft Final ESIA Report in Armenian Non-Technical Executive Summary in Armenian	07.12.2017 - 05.02.2018

Table 7-2: Stakeholder Engagement Schedule during construction and operation

Activity	Platforms	Content	Date
CONSTRUCTION			
The developer notifies the public of the construction works or a specific construction activity	Official web page of the developer	The purpose and nature of the construction activities The start date and duration of the overall construction works and of specific operations The potential environmental and social impacts	One month before construction works start
	Letters to local representatives Newspaper notice	Information on whom to contact if there are concerns/complaints related to the contractor Information related to the management of the environmental and social matters (application of measures, monitoring efforts and results). The results of the grievance mechanism	
The contractor and developer keep a functioning grievance mechanism	Nomination of community liaison personnel	Contact information for sending of grievances Time frame in which all recorded complaints will be responded to	During construction works
	Suggestion boxes in public locations		
	Visible billboards		
	Official web-page of the developer		
OPERATION			

Activity	Platforms	Content	Date
Inform the public of operation related issues (community and occupational health and safety; grievance mechanism; environmental and social monitoring)	<p>Official web-page of the developer</p> <p>Letters to local representatives</p> <p>Newspaper notice</p>	<p>Emergency Preparedness and Response Plan, if existent</p> <p>The project's environmental and social performance reports</p> <p>The results of the grievance mechanism</p>	Every 6 months during the life-time of the project
Keep a functioning grievance mechanism	<p>Official web-page of the Project Operator</p> <p>Visible billboards</p>	<p>Contact information for sending of grievances</p> <p>Time frame in which all recorded complaints will be responded to</p>	During the life-time of the project

8. Responsibilities

The implementation of the SEP will be the responsibility of:

- During the ESIA stage: ArmPower/RENCO;
- During Construction: RENCO SPA as EPC Contractor;
- During Operation: ArmPower/RENCO as Project Operator.

The responsibility to monitor the implementation of the SEP belongs to the IFIs until financial closure of the project.

This Section presents a review of the responsibilities and allocated resources for implementation of the SEP.

8.1 Developer - ArmPower/RENCO

The following is the summary of the responsibilities of ArmPower/RENCO as the Project's Developer.

- During the ESIA preparation:
 - a) Plan and undertake one Public Consultation Session (see Section 5.1);
 - b) Disclose the Draft Final ESIA Report and NTES (hard and soft copies) (see Section 5.1);
 - c) Create and maintain a grievance mechanism for the public (see Section 6.1);
 - d) Keep and update the Stakeholder Log (see **Annex 3**);
 - e) Nominate a Community Liaison Officer (CLO) (see Section 6.1).

8.2 EPC Contractor - RENCO SPA.

Within the SEP, RENCO SPA as EPC Contractor has the following summarized responsibilities:

- During construction:
 - a) Keep the public informed about the construction activities, environmental and social management at site, and contact persons (see Section 5.2);
 - b) Create and maintain a grievance mechanism for workers and the public (see Section 6);
 - c) Keep and update the Stakeholder Log (see **Annex 3**);
 - d) Nominate a Community Liaison Officer (CLO) (see Section 6.1).

8.3 Project Operator - ArmPower/RENCO

The Project Operator (ArmPower/RENCO) will have the following SEP-related responsibilities:

- During operation:
 - a) Keep the public informed about the environmental and social management at the plant (see Section 5.3);
 - b) Disclose the Emergency Preparedness and Response Plan and develop formalized agreements with emergency response service providers and the adjacent power plant (see Section 5.3);
 - c) Create and maintain a grievance mechanism for workers and the public (see Section 6):
 - d) Keep and update the Stakeholder Log (see **Annex 3**);
 - e) Nominate a Community Liaison Officer (CLO) (see Section 6.1).

9. Final remarks

The Draft Final SEP presents the suggested methodologies, timing, and responsibilities for engaging the public and the workers during the implementation of the YCCPP 2 Project. The main focus of the SEP is to assure conformity with the requirements of IFC and ADB. It includes activities during the ESIA preparation, during construction, and during operation.

The present SEP does not necessarily include a strict engagement with the national authorities because such process has been undertaken in the past. However, it is recommended that RENCO keeps an open door for collaboration with local and national agencies, when necessary and if required by these.

In order for the SEP to be successfully implemented, it is necessary to include its dispositions into the Developer's, EPC Contractor's and Operator's own Environmental and Social Management Systems (ESMS). In case such systems are not presently implemented in any of the companies, at least one team shall be nominated in each case that will handle the E&S management at the different stages, and implement and monitor the SEP.

Transparency is important to assure an acceptance of the project by the general public, for what the information disclosure activities suggested in the SEP will play an important role. Engaging the public from the beginning of the implementation of the project and continuously throughout its life cycle is expected to bring benefits and reduce eventual unfounded reasons for grievances.

10. References

ADB, 2012: *Strengthening participation for development results - an Asian Development Bank guide to Participation*, ADB, Philippines, 2012

IFC, 1998: *Doing Better Business through Effective Public Consultation and Disclosure - A Good Practice Manual*, IFC, Washington, D.C., October 1998

IFC, 2007: *Stakeholder Engagement: a good practice handbook for companies doing business in emerging markets*, IFC, Washington, D.C., May 2007

IFC, 2012: *Performance Standard 1 - Assessment and Management of Environmental and Social Risks and Impacts*, IFC, Washington, D.C., January 2012

11. Annexes

11.1 Annex 1 - Invitations for the previous public consultation sessions

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HAYASTANY HANRAPETUTIUN DAILY, ЕЖЕДНЕВНАЯ ГАЗЕТА «АЙАСТАНИ АНРАПЕТУТИОН», ՕՐԱԹԵՐԹ, ԼՈՒՅՍ Է ՏԵՄԵՆՄՄ 1990 ՀՈԿՏԵՄԲԵՐԻ 9-ԻՑ

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ՊԱՇՏՆԱԿԱՆ

ՀՀ նախագահի հրամանագրերով

ՀՀ նախագահ Սերժ Սարգսյանի հրամանագրով Արա ԱՅՎԱԶՅԱՆԸ նշանակվել է Սեֆիկայի Միացյալ Նահանգներում Հայաստանի Հանրապետության արտակարգ և լիազոր դեսպան (նստավայրը՝ Մեխիկո):

Նախագահի մեկ այլ հրամանագրով Արա ԱՅՎԱԶՅԱՆԸ ազատվել է Լիսվայի Հանրապետությունում, Լասվայի Հանրապետությունում և Էստոնիայի Հանրապետությունում Հայաստանի Հանրապետության արտակարգ և լիազոր դեսպանի պաշտոնից:

ՀՀ նախագահը հրամանագիր է ստորագրել նաև Արմեն ՀԱՐՈՒԹՅՈՒՆՅԱՆԻ Հայաստանի Հանրապետության դատական ակտիվ գլխավոր հարկադիր կատարողի ժամանակավոր պաշտոնակատար նշանակելու մասին:

ՀՀ նախագահի կարգադրությամբ Արմեն ՀԱՐՈՒԹՅՈՒՆՅԱՆԸ ազատվել է Հայաստանի Հանրապետության նախագահի ռեֆերենտի պաշտոնից:

ՀՀ նախագահի մամուլ գրասենյակ

Խորհրդակցություն Ասկերանում

ԼՂՀ նախագահ Բակո Սահակյանը երեկ այցելել է Ասկերանի բժշկական և անցկացրել աշխատանքային խորհրդակցություն, որի ընթացքում ֆինանսավորվել են ապրիլի 2-5-ը ադրբեջանական ազդեցության հետեմանով ստեղծված իրավիճակի և Ասկերանի բժշկաբժարանի ստորաբաժանումների կողմից այդ ոլորտում օպերատիվ լուծում պահանջող խնդիրների իրականացմանը վերաբերող հարցեր:

Ինչպես ժողովից հետո ԼՂՀ նախագահի աշխատակազմի ղեկավարության գլխավոր վարչությունից, ԼՂՀ նախագահը կոնկրետ հանձնարարականներ է սվել ֆինանսավորման հարցերի լուծման իրականացման ուղղությամբ:

Ըննարկել են առողջադաշտի հարցեր

ԼՂՀ նախագահ Բակո Սահակյանը երեկ ընդունել է «Հայաստան» համահայկական հիմնադրամի գործադիր սեփական Արա Վարդանյանին և հիմնադրամի Ֆրանսիայի մասնաճյուղի սեփական Պետրոս Թերզյանին:

Ինչպես ժողովից հետո ԼՂՀ նախագահի աշխատակազմի ղեկավարության գլխավոր վարչությունից, ֆինանսավորվել են Արցախի առողջադաշտի ոլորտում մի քանի ծրագրերի իրականացմանն առնչվող հարցեր:

Նախագահ Սահակյանը բարձր է գնահատել «Հայաստան» համահայկական հիմնադրամի դերակատարությունը մեր հանրապետության առջև ծառայող խնդիրների լուծման գործում այն համարելով Հայաստան-Արցախ-սփյուռք եռամիասնության վաղ դրսևորումներից մեկը: Հանդիմանում մասնակցում էին ԼՂՀ առողջապահության

Միասնականության և փոխօգնության դասեր

Երեխաները դաստիարակվում են այն ոգով, որով նրանց են ներկայանում մեծերը

Դժվար ժամանակներին մեծ միասնական ենք ու զորավոր ենք միշտ միասնական լինել: Պարտավոր ենք միասնականության և փոխօգնության դասեր տալ նաև մեր երեխաներին, որտեղ էլ որ նրանք գտնվեն՝ Հայաստանում, Արցախում, թե սփյուռքում: Այսօր սահմանը թափանցել է և մենք ինչպես նրանց թելադրելու կանգնած հասարակության օրինակով թեթև է մեծանան մեր զավակները: Քանզի վաղը նրանք էլ ստացան դասերի հանգույն են ծառայելու իրենց հայրենիքին՝ յուրաքանչյուր իր սեղանը:

Այս առումով կարևոր են այն միջոցառումները, որոնք հնարավորություն են ընձեռում օֆլայնով երեխաներին: Երեկ մայրաքաղաքում հյուրընկալվել էին զոհված ազատամարտիկների ընտանիքների սեփականակերտ 11 երեխա: Կազմակերպիչները հոգ էին տարել, որ թեթև արցախցի թասանիքների ու աղջիկների երեւանյան ֆառորյա հանգիստը հնարավորինս հագեցած լինի: Իսկ օրեր առաջ հայկական երկու թեատրոնների մայրաքաղաքներից 23 երեխա միասին մկրտվեցին Սուրբ Աստվածածին եկեղեցում:



Վերադարձ անցյալին չի լինելու

Առանց Արցախի մասնակցության հակամարտության լուծումն անհնար է

Առանց Արցախի Հանրապետության մասնակցության Լեռնային Ղարաբաղի հակամարտության լուծումն անհնարին է: Այս մասին արցախյան լրատվամիջոցներին զրույցում հարցազրույցում ասել է ԼՂՀ նախագահ Բակո Սահակյանը, ով անդրադարձել է ադրիյան ֆառորյա թասերգման, որ հետեմաններին ու հայկական կողմի հետագա անելիքներին:



«Չկա մի հավանական զարգացում, որ խնդիրը լուծվի առանց միասնականության»:

Կան բանակցային գործընթաց սկսելու դեմքում, որ Արցախը լինի այդ բանակցային գործընթացի լիարժեք կողմ: Այս դրույթով արցախյան մեծ ջանքեր են ստանում այդպիսի հնարավորություն, քանի որ այն, ինչ թույլ է սվել Ադրբեջանը, որտեղ կերպ է խոսում այն մասին, որ մոտ առաջիկայում վերադառնալու ենք բանակցային սեղանի շուրջ...», - նշել է Բակո Սահակյանը:

Արցախի նախագահն անդրադարձել է վերջերս ավելի

ԼՐԱՏՎՈՒԹՅՈՒՆ

Սահմանային միջադեպեր

Ապրիլի 28-ի լույս 29-ի գիշերը հայ-ադրբեջանական ռեզակային սահմանագոտու հյուսիսարևելյան հասկանում գրանցվել է հրադարարի խախտման 13 միջադեպ, հայտնում են ՀՀ ՊՆ ղեկավարության և հասարակայնության հետ կապերի վարչությունից: Ադրբեջանական կողմը սարքեր սրամաշակի հրաձգային և դիմումակառուցի զինամիջոցներով հիմնականում անկանոն բնույթի կրակահերթեր է արձակել հայ դիրքապահների ուղղությամբ: ՀՀ ՁՈՒ առաջադասի ստորաբաժանումները, ցուցաբերելով զսպարանություն, թասախառն գործողությունների են դիմել միայն խիստ անհրաժեշտության դեմքում և վստահորեն վերահսկում են սահմանային իրավիճակը:

ԼՂՀ ՊԲ-ից ստացված օպերատիվ ղեկավարության համաձայն՝ ապրիլի 28-ի լույս 29-ի գիշերը դարաբաղա-ադրբեջանական հակամարտության գործերի շարունակման գծի ողջ երկայնքով հակառակորդը շարունակել է խախտել կրակի դադարեցման պայմանագրերը: Ինչպես նաև արձակել է հրադարարի խախտման 13 միջադեպ, հայտնում են ՀՀ ՊՆ ղեկավարության և հասարակայնության հետ կապերի վարչությունից:

Իրենի է ծանոթանալ նաև HRADF-ի պաշտոնական

ՀՀ սննտական մրցակցության դաշտանության ղեկավար հանձնաժողովի 2015 թվականի սարեկան գործունեության հաշվետվությունը **սեղադրված է հանձնաժողովի ինտերնետային կայքում (www.competition.am):**

ՀԱՅՏԱՐԱՐՈՒԹՅՈՒՆ

Երեանի Վ. Բրյուսովի անվան ղեկավարական-գիտական համալսարանին 2015-2016 ուսումնական տարվա համար ՀՀ ԿԳ նախարարությունը հասկացրել է 1 /մեկ/ սեղ առկա ուսուցմամբ ասոցիանուրայի համար՝ հետեյալ մասնագիտությամբ.

1. Գերանական լեզուներ (անգլերեն) /Ժ.02.07/ - 1 սեղ
Փասաթղթերի ընդունումը մինչև սույն թվականի հունիսի 4-ը ժամը 17.00 ներառյալ: Լրացուցիչ տեղեկությունների համար գանգահարել 532239 հեռախոսահամարով:

Հայտարարություն

«Էդեստ-Էներգո» ՍՊԸ-ի պարտատերերի նախնական ցուցակ
ՀՀ Տրանսպորտի և կապի նախարարության ՀՀ Տրանսպորտային տեսչություն
-365.000 ՀՀ դրամ -82-րդ հոդվածի «Ը» հերթ:
Մնանկության գործով կառավարիչ Ս.Վարդանյան /հեռ.094 400 360/:

«Հրջակա միջավայրի վրա ազդեցության գնահատման ել փորձաքննության մասին» ՀՀ օրենքի /21.06.2014թ. 30-110-Ն/, ինչպես նաև ՀՀ կառավարության 19.11.2014թ. N 1325-Ն որոշմամբ սահմանված կարգով (առաջին փուլ) 2016թ. մայիսի 10-ին, ժամը 12.00-ին Երեան քաղաքի Վ. Սարգսյան 10 հասցեում տեղի կունենա «Ռենկո Արմեստեյս» ՍՊ ընկերության կողմից կառուցվող Երեանի ՋԷԿ ՓԲԸ-ի սարածում նոր էներգաբլոկի նախագծերի Երջակա միջավայրի վրա ազդեցության գնահատման հայտի վերաբերյալ հանրային ինքնակամներ:

Փասաթղթերին կարելի է ծանոթանալ «Ռենկո Արմեստեյս» ՍՊ ընկերությունում, Վ. Սարգսյան 10 հասցեում:

ՀԱՅՏԱՐԱՐՈՒԹՅՈՒՆ

ՀՀ Կոստյի մարզի ընդհանուր իրավասության դասարանի 20.04.2016թ. ԿԴ2/0057/04/15 որոշմամբ «Նոր Արեաթայ» ՍՊ ընկերության նկատմամբ սկսվել է լուծարման վարչապարտադիր հասցեն է՝ ՀՀ Կոստյի մարզ, Բերկաղ, Խանջյան 14, գրանցման վկայական 03Ա080737, 14.05.2008թ., գրանցման համար 80.110.01224, ՀԿԳԴ՝ 03312508/Մնանկության գործով կառավարիչ Վ.Ավագյան հեռ. 094 421 790:

ԿԱՏԱՐԱՐՈՒԹՅՈՒՆ Ե

Երեք հարկանի սեփական տուն Դիլիջանում: Ունի ղոհասու այգի, մեքենայի գե, անսառ: Մանրամասների համար զանգահարել 094 22-75-55, 0079165395558:

ԿՈՐԵԼ Ե

Չավեն Ռեիկի Մեյքոնյանի՝ Նոր Փեղիի գյուղատնտեսական-գացիայի եւ լեյնսահիկացիայի սովյազ-սեյնիկումից 1984թ. սաացված թիվ ՋՏ 005024 դիմոլոնը, գրանցման թիվ 4699:
Համարել անվավեր:

նախնական գնահատման արդյունքները պարզապես չեն համընդհանուր կիրառվում ստացածների համար՝ փաստաթուղթ նրանց կիրառյալ համարժեքության մասին):

2) ընտրված մասնագիտությանը հրատարակված առնվազն մեկ գիտական աշխատանքի պատճենը կամ գիտական ռեֆերատ՝ առնվազն 20 տպագրական էջի սահմաններում.


3) Օտար լեզվի և ինֆորմատիկա տեղեկատվաօրոգրագրական հիմունքներ առարկաների ատեստավորման վկայականը կամ դրան համապատասխան տեղեկանքը (սահմանված ներքին շնորհաբալային գնահատմամբ).

4) ինքնակենսագրություն և 3 լուսանկար (3x4 չափի):

5) Քաղվածք աշխատանքային գրքուկից (առկայության դեպքում):

Փասաթղթերն ընդունվում են հայտարարության հրապարակման օրից մինչև հունիսի 4-ը (ներառյալ):

Հասցեն՝ ք. Երեան -25, Լայրանյան 128, Հայաստանի պետական տնտեսագիտական համալսարան
 հեռախոս՝ 593-454
 Ռեկտորատ



«ՀՀ Արարատի և Վայոց ձորի մարզերի ընդհանուր իրավասության դատարանի վարչություն է գտնվում թիվ ԱԿԴ2/0552/02/16 քաղաքացիական գործն ըստ դիմումի Լիլիթ Հրաչիկի Հովհաննիսյանի Հայկ Արբերտի Մեղրույանին (ծնված 18.05.1972թ., վերջին հայտնի բնակության վայրը՝ Արարատի մարզ, քաղաք Արտաշատ, Մարթի 3-րդ շենք, 34 բնակարան) անհայտ բացակայող ճանաչելու պահանջի մասին:

Հայկ Արբերտի Մեղրույանի վերաբերյալ տեղեկություն ունեցող անանց ինքուում եմ այդ մասին հայտնել ՀՀ Արարատի և Վայոց ձորի մարզերի ընդհանուր իրավասության դատարան (ՀՀ Արարատի մարզ, ք.Մասիս, Շերացու 26/31) կամ գանգահարել (0236) 4-53-50 հեռախոսահամարով»:

ՀԱՅՏԱՐԱՐՈՒԹՅՈՒՆ

Վաճառվում կամ փոխանակվում է 2 սենյականոց սեփական տուն Երեանում: Մակերեսը՝ 41 մ²: Տունը քարից է, ունի 630 մ² սնամեք հողատարած: Նաեւ ունի գյուղատնտեսական նշանակության հողակտորներ:
Գինը՝ ղայմանագրային:

ԿԱՏԱՐԱՐՈՒԹՅՈՒՆ Ե ԱՌԱՆՋԱՏՈՒՆ

Ընդհանուր մակերեսը 800 մ², բնակելի՝ 120 մ², ղոհասու այգի, 2 նկուղ, 3 մեքենայի տարածք, կոմունալ հարմարություններ՝ սանը: Գինը՝ ղայմանագրային:
Հասցեն՝ Զ. Արվյան 6/11:
Հեռ.՝ (093)86-88-90, (093)55-52-78:

Beeline Արմենիայի տեղեկացում է

Փող, երկուր, սեղ հեռու

«Արմենիայի» ՓԲԸ-ն (Beeline ապրանքանիշ) տեղեկացում է այն մասին, որ ընկերությունը վաճառում է իր սեփականություն հանդիսացող քաղաք Երեանում և ՀՀ մարզերում գտնվող անշարժ գույքի օբյեկտներ:

Վաճառքի ենթակա օբյեկտների ցանկի և պայմանների վերաբերյալ մանրամասն տեղեկատվություն կարող եք ստանալ www.beeline.am կայքի «Նորություններ» բաժնում:

Արմենիա Տելեֆոն Կոմպանի

ՍՓՅՈՒՄ **ԱՆՎՃԱՐ ՏԵՂԵԿԱՏՈՒ** 24173

www.spyur.am

- աղրանքներ, ծաղայություններ
- կազմակերղություններ

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ՀԱՊԱՏԱՆՈՒ ՀԱՆՐԱՊԵՏՈՒԹՅՈՒՆ oruwpbr

Հիմնաղի՝ «Հանրաղեսություն» ՓԲԸ
 Գրանցման վկայական N 02Ա-050153, գրանցման ամսաթիվ՝ 22.03.2001թ.:

Երեան 23, Արսակունյաց ողղոհս 2, 13-14-րդ հարկեր:
 Գովաղը՝ 526974: Հեռաղասմենը (fax)՝ 548611: **www.hhpress.am: E-mail: hh@hhpress.am**

Գովաղիղիղ ղոհասաղխանասղվղությունը կրում է ղոհասղխանուն: Հղունը «ՀՀ»-ին ղոհասղաղիղ է: Նյղոթերն ընղղունղվում են մղիայն մեքենաղիղ վղիճակուն (5 մեքենաղիղ էջիղ ողչ ավելիղ): Խմբաղգրղությունը ղոհասղվղոր չէ գրաղխոսել, խմբաղգրել եւ վերաղղարճնել չղղոհասղխղրղված նյղոթերը: Բ տառղվ հղղղվածները գղղղաղղային են, որոնց համար խմբաղգրղությունը ղոհասղխանասղվղություն չի կրում: «Տղղգրան Մեծ» հրասարկղություն ՓԲԸ:
 Ծավղաղը՝ 4 տղղաղրական մամղլ: Գրանցման թղղը՝ 1113: Դասղիղ (index)՝ 69120:
Գղղը՝ 100 դրամ: Իղղեղղված է տղղաղղության ժ. 24.00-ին:
 ղոհասղխանասղու ֆարսղղղղար՝ Սամղղել ՍԱՐԳՍՅԱՆ:
 Համարղիղ ղոհասղխանասղու, գղղաղղոր խմբաղղիղ տեղակաղ՝ Արմեն ՀՈՎԱԿԻՄՅԱՆ:

Գղղաղղոր խմբաղղիղ՝ Տղղգրան ՀԱՐՄԱՆՀԱՆ

ISSN 1829-2097 16078 >
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HAYASTANY HANRAPETUTIUN DAILY,

30 April 2016, Saturday, N 78(6360)

According to the procedure established by the RA law on “Assessment and expertise environmental impact” /26.06.2014, H0-110-N/, as well as established by the N 1325-N decision of 19.11.2014 of the Government of the Republic of Armenia (first phase) at 10 V. Sargsyan st., Yerevan on 10.05.2016 at 12.00 public discussions on the application of primary assessment for the environmental impact of the projects of new power plant being constructed by “RencoArmestate” LLC in the area of Yerevan TPC CJSC, will be held.

Documents can be found at RencoArmestate LLC, 10 V. Sargsyan st..

ՌԵՆԿՈ ԱՐՄԵՏԱՏԵՑ ՍՊԸ
Գործող հասցե՝
Իտալիայի փ. 1,
0010 Երևան, ՀՀ
Հեռ.՝ + 374 10 590799
Ֆաքս՝ + 374 10 590798
email՝ rencoyerevan@renco.it

Իրավաբանական հասցե՝
Մ. Խորենացու փող.,
1-ին փակուղի, շենք 8,
0010 Երևան, ՀՀ

Երևանի քաղաքապետի առաջին տեղակալ
պարոն Կ. Արեյանին

02 05. 2016թ

Հարգելի պարոն Արեյան

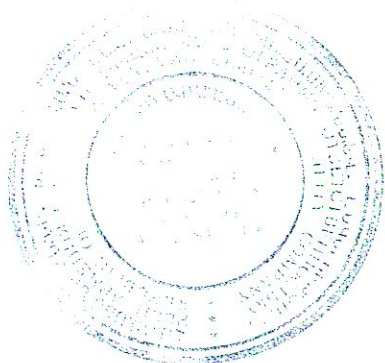
<<Շրջակա միջավայրի վրա ազդեցության գնահատման և փորձաքննության մասին>> ՀՀ օրենքի /21.06.2014թ. 20-110-Ն/, ինչպես նաև ՀՀ կառավարության 19.11.2014թ. N 1325-Ն որոշմամբ սահմանված կարգով (առաջին փուլ) 2016թ. մայիսի 10-ին, ժամը 12.00-ին Երևան քաղաքի Վ. Սարգսյան 10 հասցեում տեղի կունենա «Ռենկո Արմեստեյտ» ՍՊ ընկերության կողմից կառուցվող «Երևանի ՋԷԿ» ՓԲԸ-ի տարածքում նոր էներգաբլոկի նախագծերի շրջակա միջավայրի վրա ազդեցության նախնական գնահատման հայտի վերաբերյալ հանրային քննարկումներ:

Խնդրում եմ աջակցել և ապահովել մասնակցությունը հանրային քննարկումներին, դրանց արձանագրությունը, տեսաձայնագրությունը, ինչպես նաև արված առաջարկներն ու դիտողությունները <<Շրջակա միջավայրի վրա ազդեցության փորձաքննական կենտրոն>> ՊՈԱԿ-ին ներկայացնելու համար:

Տնօրեն՝



Ք. Կուկուրակի





ԵՐԵՎԱՆԻ ՔԱՂԱՔԱՊԵՏԱՐԱՆ

ՀՀ, 0015, ք. Երևան, Արգիշտիի 1

№ 17/20486

«11» 05 2016թ.

«ՌԵՆԿՈ ԱՐՄԷՍՏԵՑ» ՍՊԸ-Ի ՏՆՕՐԵՆ
ՊԱՐՈՆ Ք. ԿՈՒԿՈՒՐԱԿԻՆ

Հարգելի Ք. Կուկուրակի.

Ի պատասխան Ձեր՝ 02.05.2016թ.-ի գրության, հայտնում եմ, որ ա/թ մայիսի 10-ին մասնակցելով «Երևանի ՋԷԿ» ՓԲԸ-ի տարածքում կառուցվող նոր էներգաբլոկի նախագծերի շրջակա միջավայրի վրա ազդեցության նախնական գնահատման հայտի վերաբերյալ հանրային քննարկումներին՝ բնապահպանության վարչությունը տալիս է իր դրական եզրակացությունը նախատեսվող գործունեությանը:

Հարգանքով՝

Աշխատակազմի բնապահպանության

վարչության պետ՝

Ա. Մարտիրոսյան

Կատարող.

Ա. Հազարապետյան

Հեռ. 011.514-263

To the First Deputy of Yerevan Municipality

Mr. K. Areyan

02.05.2016

Dear Mr. Areyan,

According to the procedure established by the RA law on the “Assessment and expertise environmental impact” /26.06.2014, H0-110-N/, as well as established by the N 1325-N decision of 19.11.2014 of the Government of the Republic of Armenia (first phase) at 10 V. Sargsyan st., Yerevan on 10.05.2016 at 12.00 public discussions on the application of primary assessment for the environmental impact of the new power plant projects in the area of Yerevan TPC CJSC under construction by “RencoArmestate” LLC will be held.

I kindly ask you to support and ensure the presence in public discussions, for submitting the Minutes of meeting, video, as well as the proposals and observations to the “Center of expertise for environmental impact assessment” (State Non-Commercial Organization).

Director C. Cucurachi

YEREVAN MUNICIPALITY

1 Argishti str., Yerevan-0015, RA

11.05.2016

To the director of “RencoArmestate” LLC

Mr. C. Cucurachi

N 17/26486

Dear Mr. C. Cucurachi,

In response to Your letter of 02.05.2016, I inform , that, on 10.05.2016 participating in public discussions on the application of primary assessment for the environmental impact of the new power plant projects in the area of Yerevan TPC CJSC , the Department of Nature Protection submits his positive conclusion on the planned activity.

Best regards

Director of the Department
of Nature Protection of Staff

A. Martirosyan

ՀԱՎԱՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ

HAYASTANY HANRAPETUTIUN DAILY, ЕЖЕДНЕВНАЯ ГАЗЕТА «АЙАСТАНИ АНРАПЕТУТИОН», ՕՐԱԹԵՐԹ, ԼՈՒՅՍ Է ՏԵՄԵՌԻՄ 1990 ՀՈԿՏԵՄԲԵՐԻ 9-ԻՑ

1 ՀՈՒՆԻՍ 2016, ԶՈՐԵՔՐԱԲԹԻ, ԹԻՎ 100 (6382)

ՊԱՏՏՈՒԿԱՆ

Ընդունել են Իրանի արդարադատության նախարարին

Մայիսի 31-ին Ն.Ս.Օ.Տ.Տ. Քարեգին Բ Ճայրագույն դատարար է Ամենայն հայոց կաթողիկոսը Մայր Աթոռ Սուրբ Էջմիածնում ընդունեց Իրանի Իսլամական Հանրապետության արդարադատության նախարար Մուսաֆա Փուրմոհամմադիի գլխավորած դատավարությանը, հայցնում են Մայր Աթոռ Ս. Էջմիածնի սեղեկակցական համակարգից:

Ողջունելով նախարարի այցը Հայաստան՝ Վեհափառ հայրադատը գոհունակություն հայտնեց, որ երկու ղեկավարությունների միջև գործակցությունն օրեօր բոլոր ոլորտներում ընդլայնվում է, եւ ՀՀ անկախության արեգության մեջ հայ-իրանական հարաբերություններում շեղանկի վերընթաց է նկատվում:

Նորին սրբությունը գնահատեց անդրադարձավ Իրանում հայ համայնքի նկատմամբ ցուցաբերվող հոգածու վերաբերմունքին, ինչպես նաեւ հայոց սրբավայրերի ու եկեղեցական կառույցների նկատմամբ դրսեւորվող առանձնահատուկ խնամքին:



Իր հերթին Իրանի արդարադատության նախարարն ուսուցում հայտնեց հանդիպման առիթով՝ նույնպես կարեւորելով միջդեպարտմենտական կապերի զորացումը եւ սարքեր ոլորտներում առկա սեւր գործակցությունը:

Շարունակությունը՝ էջ 2

Վարչապետ Ֆովիկ Աբրահամյանը երեկ ընդունել է Իրանի Իսլամական Հանրապետության արդարադատության նախարար Մուսաֆա Փուրմոհամմադիին, հայցնում են ՀՀ կառավարության սեղեկակցության եւ հասարակայնության հետ կապերի վարչությունից:



Տնտեսական ինստեգրում եւ անվտանգություն

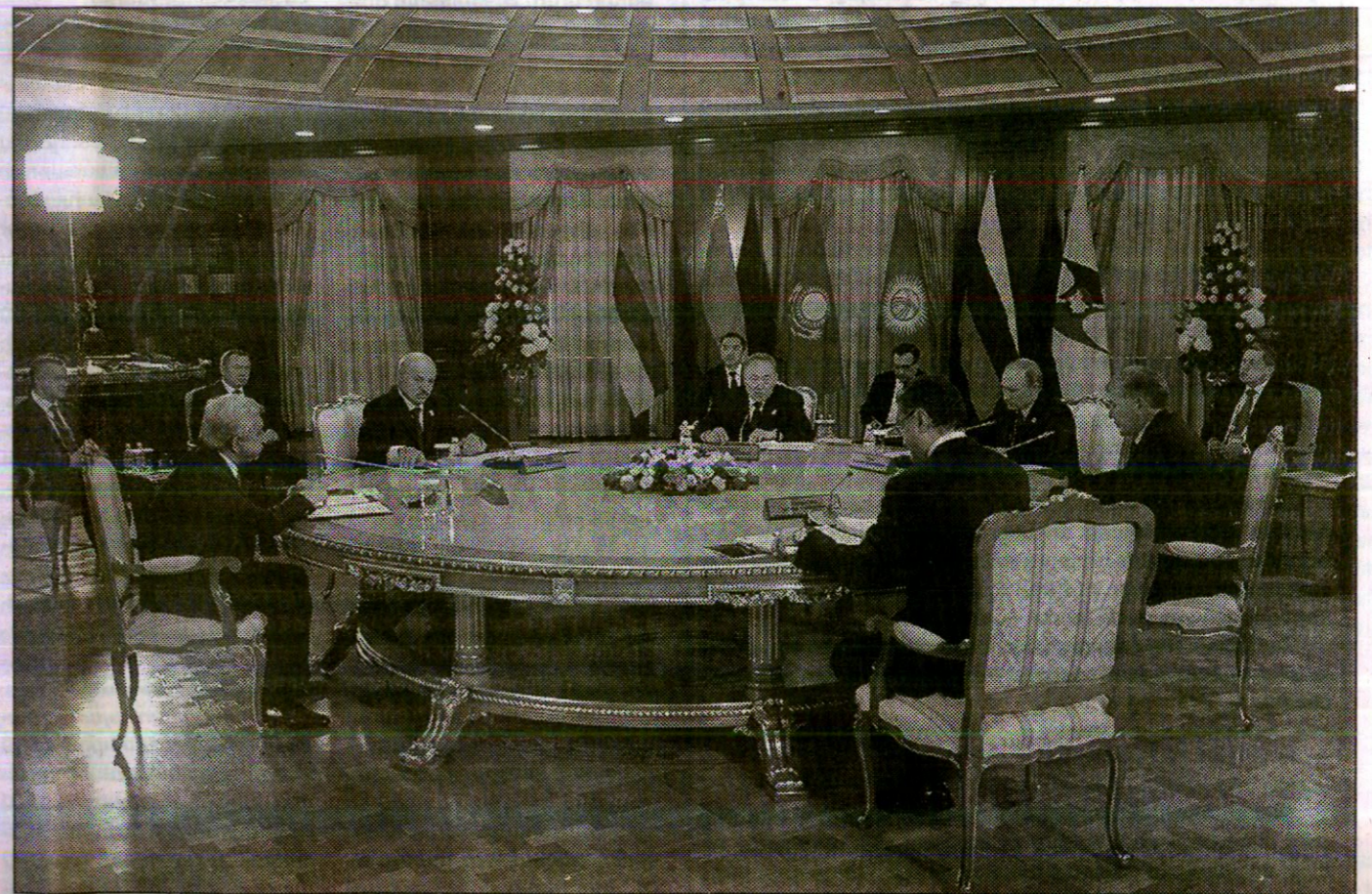
Եվրասիական տնտեսական բարձրագույն խորհրդի նիստը Աստանայում

Երեկ Աստանայում Եվրասիական տնտեսական միության անդամ ղեկավարությունների ղեկավարների մասնակցությամբ սեղի են ունեցել Եվրասիական տնտեսական բարձրագույն խորհրդի նեղ, ադա ընդլայնված կազմով նիստերը, որոնց ներկա էր նաեւ ՀՀ նախագահ Սերժ Սարգսյանը: Նիստերին մասնակցել է նաեւ Եվրասիական տնտեսական հանձնաժողովի (ԵԱՏՀ) կոլեգիայի նախագահ Տիգրան Սարգսյանը, ով խորհրդի անդամների բննարկմանն ու հաստատմանն է ներկայացրել նիստերի օրակարգը:

Ընդլայնված կազմով նիստի ավարտին նախագահները ստորագրել են ավելի քան մեկ տասնյակ փաստաթղթեր, այդ թվում՝ Եվրասիական տնտեսական միության նախագահի և նախնախորհրդի ընդհանուր շեղանկերի ձեւավորման մասին հայտեցակարգը:

ՀՀ նախագահ Սերժ Սարգսյանը ելույթ է ունեցել բարձրագույն խորհրդի ընդլայնված կազմով նիստում:

ՏԵՄ էջ 3



Գազի սակագինը նվազեց 9.3 դրամով

ՀԾԿՀ հերթական նիստում բավարարվեց ներկայացված դիմումը

ՀՀ հանրային ծառայությունները կարգավորող հանձնաժողովի երեկվա նիստում բննարկվեցին բնական գազի փոխադրման սակագնի, գազամատակարարման համակարգի օդերատորի ծառայության մատուցման եւ բնական գազի բաշխման սակագների, «Գազդրոմ Արմենիա» փակ բաժնետիրական ընկերության կողմից սղառողներին վաճառվող բնական գազի սակագների սահմանման մասին



«Սակագների վերանայնացման գազի գինը 2016թ. ապրիլի 1-ից կազմելու է 150 ԱՄՆ դոլարը»:

վել է ՀՀ-ի համար՝ 1000 խմ-ի համար 165 ԱՄՆ դոլարից ցածր գնի նվազեցումից: Սակագների հաշվարկներում, ըստ մասնագետի, հաշվի են առնվել նաեւ 2013-2015թթ. գազամատակարարման համակարգում իրականացված կառուցվածքային փոփոխությունների փոխհատուցման, դրամ-ԱՄՆ դոլար փոխարժեքի փոփոխության, ԵԱՀԿ-ի կողմից ներդրման եւ դաշնային մասնաբաժնի փոփոխման ծախսերի փոփոխման գործոնները: «Հիմք ընդունելով

ԼՐԱՏՎՈՒԹՅՈՒՆ

Շնորհավորական ուղերձ

Երեխաների դատապարտության միջազգային օրվա առթիվ

ՀՀ Ազգային ժողովի նախագահ Պալուս Սահակյանը շնորհավորական ուղերձ է հղել Երեխաների դատապարտության միջազգային օրվա առթիվ: Ուղերձում ասվում է. «Միջազգային երեխաների օրվա առթիվ, շնորհավորում եմ Երեխաների դատապարտության միջազգային օրվա առթիվ:

Երեխայի դերն ու նշանակությունը ղեկավարության համար նույնն է, ինչ յուրաքանչյուր ընտանիքի համար: Այդ դերն ու կարեւորությունը չարժեքները, զարգացմանը չնդադարձնող կնճառակի չմտածել ու ֆայլեր չձեռնարկել երկրի առաջընթացի համար: Խստադրու ու աղաքող մանկության, վատաբերի աղաքողի հոսանքի գրավակալը խաղաղություն արարող եւ այն դատապարտել կարողացող, իր ֆաղաքողների բարեկեցությունը անբեկանելի նուստանակեց համարող ղեկավարներն է:

HAYASTANY HANRAPETUTIUN DAILY,

1 June 2016, Wednesday, N 100 (6382)

According to the procedure established by the RA law on “Assessment and expertise environmental impact” /21.06.2014, H0-110-N/, as well as established by the N 1325-N decision of 19.11.2014 of the Government of the Republic of Armenia (second phase) at 10 V. Sargsyan st., Yerevan on 14.06.2016 at 11.00 public discussions on the application of primary assessment for the environmental impact of the projects of new power plant being constructed by “RencoArmestate” LLC in the area of Yerevan TPC CJSC, will be held.

Documents can be found at RencoArmestate LLC, 10 V. Sargsyan st., on the official Website of the RA Ministry of Nature Protection (mnp.am), 29 Komitas st., Yerevan (+374-22-02-18).



ԵՐԵՎԱՆԻ ՔԱՂԱՔԱՊԵՏԱՐԱՆ

ՆՆ, 0015, ք. Երևան, Արգիշտիի 1

№ 17/34356

«14.06» 2016թ.

ՀՀ ԲՆ «Շրջակա միջավայրի վրա ազդեցության
փորձաքննական կենտրոն» ՊՈԱԿ-ի տնօրեն
պարոն Վ. Սահակյանին

Հարգելի պարոն Սահակյան

Ի պատասխան Ձեր՝ 03.06.2016թ. հ. Վ/Ս-33/283 գրության, հայտնում եմ, որ ս/թ հունիսի 14-ին մասնակցելով «Երևանի ՋԷԿ» ՓԲԸ-ի տարածքում կառուցվող նոր էներգաբլոկի նախագծերի շրջակա միջավայրի վրա ազդեցության նախնական գնահատման հայտի վերաբերյալ հանրային քննարկումներին՝ բնապահպանության վարչությունը տալիս է իր դրական եզրակացությունը նախատեսվող գործունեությանը:

Հարգանքով՝

Աշխատակազմի բնապահպանության

վարչության պետ՝

Ա. Մարտիրոսյան

Կատարող.

Ա. Հազարապետյան

Հեռ. 011.514-263

YEREVAN MUNICIPALITY

1 Argishti str., Yerevan-0015, RA

14.06.2016

To the director of
“Center of expertise for environmental impact assessment”

State Non-Commercial Organization of RA NP

Mr. V. Sahakyan

N 17/34356

Dear Mr. Sahakyan,

in response of Your h. V/S-33/283 letter of 03.06.2016, I inform, that, on 14.06.2016 participating in public discussions on the application of primary assessment for the environmental impact of the projects of new power plant being constructed in the area of Yerevan TPC CJSC, the Department of Nature Protection submits his positive conclusion on the planned activity.

Best regards

Director of the Department

of Nature Protection of Staff

A. Martirosyan

Հայաստանի Հանրապետություն

HAYASTANY HANRAPETUTIUN DAILY, ЕЖЕДНЕВНАЯ ГАЗЕТА «АЙАСТАНИ АНРАПЕТУТИОН», ՕՐԱԹԵՐԹ, ԼՈՒՅՍ Է ՏԵՄԵՌՈՒՄ 1990 ՀՈԿՏԵՄԲԵՐԻ 9-ԻՑ

23 ՀՈՒՆԻՍ 2016, ԸԱԲԱԹ, ԹԻՎ 138 (6420)

ՊԱՇՏՈՆԱԿԱՆ

Նախագահը դասախրավական բարեփոխումներին նվիրված խորհրդակցություն է անցկացրել

Երեկ նախագահ Սերժ Սարգսյանը հանրապետությունում իրականացվող դասախրավական բարեփոխումներին նվիրված խորհրդակցություն է անցկացրել: Պատասխանառու մարմինների ղեկավարների մասնակցությամբ քննարկվել է հանրապետության նախագահի կարգադրությամբ հաստատված 33 իրավական և դատական բարեփոխումների 2012-2016թթ. ռազմավարական ծրագրի կատարման վիճակը:

Ռազմավարական ծրագրի նպատակն է Հայաստանի Հանրապետությունում ձեռնարկել ժամանակակից ժողովրդավարական դատական չափանիշներին համադասախրավող իրավական համակարգ և դատական իշխանություն:



Երկրի ղեկավարը նշել է, որ ռազմավարական ծրագիրը մեր իրավական և դատական համակարգի զարգացման համար էական նշանակություն ունեցող փաստաթուղթ է, և դրա դասախրավական գործունեությունը խիստ կարևոր է բարեփոխումների արդյունավետության ապահովելու համար:

Զննարկման արդյունքներով արձանագրվել է, որ ծրագրի կատարման շուրջ չորս տարիների ընթացքում եղել են ինչպես դրական ձեռքբերումներ, այնպես էլ լուրջ թերացումներ և բացթողումներ: Խորհրդակցության ավարտին հանրապետության նախագահը դասախրավական մարմինների ղեկավարներին հանձնարարել է մինչև տարեվերջ գործունե միջոցներ ձեռնարկել չկատարված ծրագրային գործողություններն առավելագույնս արդյունավետ իրականացնելու համար:

33 նախագահի մամուլ գրասենյակ

3Բ դատարանի կառուցման հետ կապված ծրագրի ընթացքը

33 գյուղատնտեսության նախարար Սերգո Կարապետյանը ընդունել է Համաեվրոպային բանկի դատարանի կառուցման, որի կառուցում էին 3Բ ծրագրի մասնակցություն. Համայնքների գյու-

Հայաստանում բռնի ուժով հարցեր չեն լուծվելու

Չինված խումբը ղեկ է սրափվի և օգսվի հետքայլ կատարելու հնարավորությունից

Երեկ Հայաստանի Հանրապետության նախագահի մոտ տեղի է ունեցել խորհրդակցություն ազգային անվանագրության ծառայության, ոստիկանության, դատախազության և բնապահ մարմինների ղեկավարների մասնակցությամբ, հայտնում են 33 նախագահի մամուլ գրասենյակից: Երկրի ղեկավարին ներկայացվել է 2016թ. հուլիսի 17-ին 33 ոստիկանության դատախազարտերազմի գնդի սարածում տեղի ունեցած զինված հարձակման և դրան հաջորդած իրադարձությունների մանրամասները, ինչպես նաև իրականացվող միջոցառումների արդյունքները:

Հանրապետության նախագահին զեկուցվել է նաև, որ դատախազարտերազմի գնդի սարածում դատախազարտերին ազատ արձակելու, զինված խմբի անդամների կողմից զենք վայր դնելու և իշխանություններին հանձնվելու նպատակով արտահանված վարձով են ակտիվ բանակցություններ, ձեռնարկվում են իրավիճակից թելադրվող այլ անհրաժեշտ գործողություններ:

Հանրապետության նախագահին ընդգծել է, որ ստեղծված իրավիճակին խաղաղ հանգուցալուծում սալու համար ղեկ է ձեռնարկվել հնարավոր բոլոր միջոցները, կարևոր է ենթադրյալ բոլոր իրավախախտումների համակողմանի և անաչառ քննությունը, ինչպես նաև մեղավորների համար դատարանի անխուսափելիության ապահովումը: Խորհրդակցության արդյունքներով իրավապահ մարմինների ղեկավարներին սրվել են անհրաժեշտ հանձնարարականներ:

«Մինչև մեր հերթական խորհրդակցությունը սկսելը մեկ անգամ ես փաստեմ, որ մեր երկիրն այս օրերին աղոթում է դժվարին և դատախազարտ օրեր: Պատճառներին, իհարկե, այս դեպքին չեն անդրադառնալու: Հիմա դրա ժամանակը չէ: Կասեմ միայն, որ բոլորս ղեկ է սրանից դասեր քաղենք»:

Մեկ անգամ ես ցավակցում եմ զոհված զինադատ Լրբուր Վանոյանի ընտանիքին և հարազատներին: Բոլորս դատարանում ենք մեր առաջ: Մենք ղեկ է անենք ամեն ինչ, որ դատարանն այս բարդ իրավիճակը կարգավորվի, և մեզնից օրերը լուրջ աշխատանքի:

Այս վիճակի ակունքում է մեր իրողության մեջ ամենավատագրավոր մտայնությունը՝ հարցերը լուծել բռնությամբ և ուժի կիրառմամբ: Այս մտայնության հետագա զարգացումը հղի է լուրջ վստահավոր հետևանքներով հենց մեր երկրի և դատախազարտության համար:

Հայաստանում բռնի ուժով, հարձակումով և դատախազարտ վերցնելով հարցեր չեն լուծվելու: Եվ դա երբեք մենք թույլ չենք սալու: Այս իրավիճակի հանգուցալուծումը ղեկ է լինի Հայաստանի և մեր հասարակության, դատախազարտության հասարակության կարևորագույն ֆունկցիոն:

Ոստիկանության դատախազարտերազմի գնդի սարածող զրաված զինյալներին կոչ են անում ցուցաբերել զստվածություն և իրենց սաղորիչ գործողություններով չվստահել ուրիշների կամքը:



անի Հանրապետության Սահմանադրության և օրենքների խստիվ դատախազարտ:

Անձնական վերաբերման բոլոր փորձերը կատարվելու են օրենքի ուժով:

Այո, Հայաստանում դժգոհներ լուրջ կան: Սակայն թող ոչ ոք չսխալվի և չմտածի, որ կարող է որևէ առիթ կամ դատախազարտ արտահանվել մեր դատախազարտության հիմքերը քայքայելու համար:

Զորքում եմ մեր հանրության բոլոր ներկայացուցիչներին իրենց քաղաքական և քաղաքացիական իրավունքները իրացնելու բացառադատ խաղաղ և օրենքի արժանակներում: Զորքում եմ նաև, որ սուր չսան ծայրահեղ քայլեր և սաղորտներ իրադարձում անձանց առաջարկներին և զաղափարներին: Դա հղի է մեր մարդկային կրթությանը լուրջ վստահություն:

Զորքում եմ, որ յուրաքանչյուր ոք զիսակցի այդ սաղորտներին և ծայրահեղ քայլերից բխող իրական վստահություն:

Հանձնարարում եմ ձեզ՝ իրավապահ մարմինների ղեկավարներին, որդեգրիք մեր գործունեությունը արդյունավետ

զոցները իրավիճակին վերջնական խաղաղ հանգուցալուծում սալու համար:

Կրկին կոչ են անում զինված խմբին՝ ժամ առաջ վայր դնել զենքը:

Մենք գործում ենք և գործելու ենք համբերաբար: Մեր երկրի յուրաքանչյուր քաղաքացու կյանքը և առողջությունը քանի է մեզ համար:

Մենք չենք գնացել այսպիսի իրավիճակներում դատախազարտ համարվող ձանադարով: Մասնով մենք հնարավորություն ենք սվել զինված խմբին հետքայլ կատարելու համար: Հուսով եմ, որ մասն կսրափվեն:

Բայց մենք իրավունք չունենք թույլ սալու, որ մեր ողջ հանրությունն այս լարվածության դատախազարտ:

Կարծում եմ, որ այս իրավիճակն արդեն ավելի երկար է տևում, քան մենք կարող ենք մեզ թույլ սալու: Աղոթի ամսից դեռ այնքան լուրջ ժամանակ չի անցել, որդեգրի մեր հասարակությունն իրեն թույլ սա մոռանալու տեղի ունեցածի մասին:

Մեկ անգամ ես բոլորիս զոցնության և զստվածության կոչ են անում հանում Հայաստանի Հանրապետու-

ԳՈՎԱԶԳ ԾԱՆՈՒՅՈՒՄ

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ՆԱԽԱԶԵՆՈՒԹՅՈՒՆ

Գիրք՝ նաեւ էկրանին

Դա ոչ թէ «դավաճանություն», այլ կյանքը երկարացնել է

Ժամանակակից «լեզուն» փոխում է գրի մասին դասկերպումները: Եթե, ասենք, օրինակ՝ 30 տարի առաջ գիրք միայն թղթից գիրք էր, ադա այսօր այն նաեւ փոքրիկ էկրանի տեսքով է: Ու դեռ չենք կարող ասել, թե 30 տարի հետո գիտությունն ընթացանության համար ինչ նորություն կառաջարկի:

Ոմանց կողմից որդես «դասական» գրի հանդեպ «դավաճանություն» ընդունվող էլեկտրոնային տարբերակը, եթե չասենք, որ փրկեց գրի «ֆիզիկական» կյանքը՝ կրկնակի որդես դավաճանություն գիտության ու նորարարության նկատմամբ: Ահա թե ինչու՝ միտք չէ, որ գիրքն ընթացվում է միայն ընթացանության համար: Հասկալու է կրթական ծրագրերում ներառված գրականությունը սերտել է դեռ: Իսկ դա ենթադրում է գրի դարբերաբար թերթում: Եվ որքան կարող է զոյատեւել աղբն ընդհան, հնացած, երբեմն նաեւ զրեթե փոքրիկ թուղթ: Ի վերջո այդօրինակ էջի ձակասագիրը կլինի արտատրանսպորտային միջոցով կաղը գրի հետ:

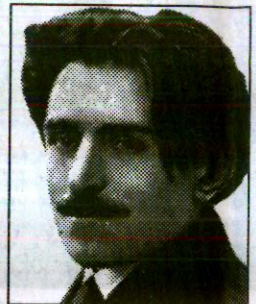
Եվ ինչու չօգտվել ժամանակի թելադրանքից՝ դասիականելով, այսպես ասած՝ բնօրինակը: Հասկալու է որ այդդիսի հնարավորություն ընձեռող կայքերի թիվը վերջին տրջանում կարծես շատանում է: Օրինակ՝ «garamol.am»-ն առաջարկում է բազմաժամր գրականություն՝ ինչպես օնլայն ընթերցանության, այնպես էլ ներքեռնան համար: Այդ հասցեից օրական կատարվում է միջինը շուրջ 320, ամսական ավելի քան 9100 բեռնում: «Գրամոլ» նախաձեռնության հիմնադրներից Հասմիկ Մելիսեթյանը «ՀՀ»-ի հետ զրոյցում ԸՇԵԶ՝ քանի որ կայրում էլեկտրոնային գրերի քանակն առայժմ այդքան էլ շատ չէ, եւ ընթերցողն ընտրելու լայն հնարավորություն չունի, ուսի տեղադրված բոլոր գրերն էլ հավասար քանակով են ներքեռնվում: Իսկ վերջին ժամանակներում ամենաշատը ներքեռնվել են էրիս Մարիա Ռեմարկի եւ Վարդգես Պետրոսյանի գրերը:

Գրերն էլեկտրոնային դարձնելը բավականին ժամանակասար եւ աշխատասար գործընթաց է: «Պատկերացրե՛ք լրատրատածնահանվում է յուրաքանչյուր էջ, այնուհետեւ դրանմ մակվում են, համադասասխանեցվում մեր կայքի համար մակված հատուկ չափանիշին, ադա մի քանի ֆորմատով դասիականվում եւ հետո միայն տեղադրվում կայրում: Մի գիրք թվայնացնելու համար 10-20 օր ժամանակ է դասիանցվում», աշխատանքները ներկայացնում է Հասմիկը:

Կայրում հիմա տեղադրված է մոտավորադես 50 էլեկտրոնային գիրք: Բայց էլեկտրոնայնացման աշխատանքները շարունակական են: Նշանակում է՝ գրերի բազան շարունակում է թարմացվել: Միայն թե հայալեզու գրականությունն էլեկտրոնային տարբերակով ավելի քիչ է: Դա դասձանդերը, ըստ «Գրամոլ» նախաձեռնության հիմնադրի, բազմաթիվ են՝ սկսած հրամանագից. հնչո ենթադրում է հեռիմանակին հրավումնցնել:

ՀԱՅՏԱՐԱՐՈՒԹՅՈՒՆ

2016 թ. հուլիսի 31-ին, ժամը 13-ին, ՎԱՀԱՆ ՏԵՐՅԱՆԻ ծննդավայրում՝ Վրասանի Լինոսմինդայի քաղաքի Գանձա գյուղում, տեղի կունենա «ՏԵՐՅԱՆՎԱՆ ՕՐ» ավանդական տոնահանդեսը, նվիրված մեծանունը դոնեին:



«Տերյան» մշակութային կենտրոն «Ջավախ» հայրենակցական միություն

Տոնահանդեսին մեկնող ավտոբուսները կարծվեն «Տերյան» մշակութային կենտրոնին հարող տարածից (հասցեն՝ Երեւան, Տերյան փ. թիվ 72), հուլիսի 31-ին, ժամը 07.00-ին:

Տոնահանդեսից հետո ավտոբուսները կմեկնեն ՎԱՀԱՆ ՏԵՐՅԱՆԻ տուն-թանգարան եւ Փարվանա լիճ:

«Հրջակա միջավայրի վրա ազդեցության գնահատման եւ փորձաքննության մասին» ՀՀ օրենքի /21.06.2014թ. 30-110-Ն/, ինչպես նաեւ ՀՀ կառավարության 19.11.2014թ. N 1325-Ն որոշմամբ սահմանված կարգով (երրորդ փուլ) 2016թ. օգոստոսի 2-ին, ժամը 11.00-ին Երեւան քաղաքի Վ. Սարգսյան 10 հասցեում տեղի կունենա «Ռեմկո Արմեստեյս» ՍՊ ընկերության կողմից կառուցվող Երեւանի ՋԷԿ ՓԲԸ-ի տարածման նոր էներգաբլոկի նախագծերի հրջակա միջավայրի վրա ազդեցության գնահատման հայտի վերաբերյալ հանրային քննարկումներ:

Փաստաթղթերին կարելի է ծանոթանալ «Ռեմկո Արմեստեյս» ՍՊ ընկերությունում, Վ. Սարգսյան 10 հասցեում, ՀՀ բնադասիականության նախարարության դասձոնակակ կայրում (mnp.am), Բ. Երեւան, Կոմիտաս 29 հասցեում: +374-22-02-18

ՀԱՅՏԱՐԱՐՈՒԹՅՈՒՆ

2016 թվականի օգոստոսի 25-ին ժամը 11.00-ին Գեղարունիի մարզի Վարսի գյուղադեսարանում տեղի կունենա համայնի վարչական տարածում գնվող ՀՆՏ 1 05-086-0128 ծածկագրով 0,10 հա բնակավայրերի հասարակական կառուցադասման հողակտրների աձուրդ վաձառմ: Հասարակական կառուցադասման հողակտրի 1 հի-մեկնարկային գինը 380 դրամ է Աձուրդի մասնակցության գումարը՝ 1000 դրամ, նախավաձարը՝ մեկնարկային գնի 5%-ը Աձուրդի դրված հողերի նկատմամբ սերվիտուսներ եւ այլ սահմանափակումներ չկան Աձուրդի մասնակցության հայտերը ընդունվում են մինչեւ 2016 թվականի օգոստոսի 19-ը ժամը 17.00 Լրացուցիչ տեղեկությունների համար դիմել Վարսի գյուղադեսարան: Հեռ. 0261-2-74-63 Վարսի գյուղադեսարան

ՀԱՅՏԱՐԱՐՈՒԹՅՈՒՆ

ՀՀ Արմավիրի մարզի ընդհանուր իրավասության ստացին աջայնի դասարանի 30.05.2016թ. թիվ ԱՐԴՊ04004/16 վճռով Արթուր Վաձիկի Վարդանյանը /անձնագիր՝ AG0688010, օրված՝ 11.04.2006թ. 057-ի կողմից ժամայնել է սնանկ-միտոն օրինական ուժի մեջ է մեջ 30.05.2016թ.է. նույն դասարանի 04.07.2016թ. որոշմամբ Արթուր Վաձիկի Վարդանյանի սնանկության գործով կատարելի է նշանակել Կարեն Ասատրյանը: Պատասերն իրեն դասիանցելը ներկայացնում են ՀՀ Արմավիրի մարզի ընդհանուր իրավասության դասարան՝ «Անմեկության մասին» ՀՀ օրենքի 46-րդ հոդվածի կարգով՝ սնանկության մասին հայտարարությունը հետ օնկայնա ժամկետում: Պատասերի առաջին ժողովը նշանակված է 12.09.2016թ. ժամը 12.00-ին, ՀՀ Արմավիրի մարզի ընդհանուր իրավասության ստացին աջայնի դասարանի ժամում է Արմավիր, Հանրադեսության 41:



«ԳԱԶՊՐՈՄ ԱՐՄԵՆԻԱ» ՓԲԸ 3AO "ГАЗПРОМ АРМЕНИЯ"

0091, Երեւան, Թիֆլիսյան խձուղի 43 Հեռ.: (374 10) 294728, 294933, Ֆաքս 294728
0091, Ереван, Тбилиское шоссе 43 Тел.: (374 10) 294728, 294933 Факс 294728

HAYASTANY HANRAPETUTIUN DAILY,

23 July 2016, Saturday, N 138(6420)

According to the procedure established by the RA law on “Assessment and expertise environmental impact” /21.06.2014, H0-110-N/, as well as established by the N 1325-N decision of 19.11.2014 of the Government of the Republic of Armenia (third phase) at 10 V. Sargsyan st., Yerevan on 02.08.2016 at 11.00 public discussions on the application of primary assessment for the environmental impact of the projects of new power plant being constructed by “RencoArmestate” LLC in the area of Yerevan TPC CJSC, will be held.

Documents can be found at RencoArmestate LLC, 10 V. Sargsyan st., on the official Website of the RA Ministry of Nature Protection (mnp.am), 29 Komitas st., Yerevan (+374-22-02-18).



ԵՐԵՎԱՆԻ ՔԱՂԱՔԱՊԵՏԱՐԱՆ

ՀՀ, 0015, ք. Երևան, Արգիշտիի 1

№ 17/16676 կ

« 02 » 08 2016 թ.

«ՌԵՆԿՈ ԱՐՄԷՍԵՅՏ» ՍՊԸ-Ի ՏՆՕՐԵՆ
ՊԱՐՈՆ Ք.ԿՈՒԿՈՒՐԱԿԻՆ

Հարգելի Ք. Կուկուրակի.

Հայտնում եմ, որ ս/թ օգոստոսի 2-ին մասնակցելով «Երևանի ՋԷԿ» ՓԲԸ-ի տարածքում կառուցվող նոր էներգաբլոկի նախագծերի շրջակա միջավայրի վրա ազդեցության գնահատման հայտի վերաբերյալ հանրային քննարկումներին՝ բնապահպանության վարչությունը տալիս է իր դրական եզրակացությունը նախատեսվող գործունեությանը:

Հարգանքով՝

Աշխատակազմի բնապահպանության

վարչության պետի ժ/պ՝

Ս.Մաքսապետյան

Կատարող.

Ա. Հազարապետյան

Հեռ. 011.514-263

YEREVAN MUNICIPALITY

1 Argishti str., Yerevan-0015, RA

02.08.2016

To the director of “RencoArmestate” LLC

Mr. C. Cucurachi

N 17/16676

Dear Mr. Cucurachi,

I inform, that, on 02.08.2016 participating in public discussions on the application of assessment for the environmental impact of the projects of new power plant being constructed in the area of Yerevan TPC CJSC, the Department of Nature Protection submits his positive conclusion on the planned activity.

Best regards

Temporary executor of the Department

of Nature Protection of Staff

S. Maksapetyan

ՏԵԽՆԻԿԱԿԱՆ ԱՌԱՋԱԴՐԱՆՔ

/նախատեսվող գործունեության/

SU 37

<< 23 >> 06 2016թ

Սույն առաջադրանքը կազմված է <<Շրջակա միջավայրի վրա ազդեցության գնահատման և փորձաքննության մասին>> ՀՀ օրենքի (այսուհետ՝ Օրենք) դրույթների համաձայն և հիմք է հանդիսանում նախատեսվող Ա կամ Բ կատեգորիայի գործունեության փորձաքննության հիմնական փուլին ներկայացվող շրջակա միջավայրի վրա ազդեցության հիմնական գնահատման հաշվետվության մշակման համար՝ ըստ ստորև ներկայացվող պահանջների.

- 1. Ձեռնարկողի անվանումը և հասցեն՝ <<Ռենկո Արմեստեյտ>> ՍՊԸ /ք. Երևան, Մ. Խորենացու փող. 1-ին փակուղի, շենք 8/
- 2. Նախատեսվող գործունեությունը և նրա կատեգորիան՝ <<Համակցված շոգեգազային ցիկլով էներգաբլոկի>> կառուցման նախնական գնահատման հայտ <<Ա>> կատեգորիա
- 3. Ազդակիր համայնքը (ներք)՝ Քաղաք Երևան
- 4. Շրջակա միջավայրի վրա ազդեցության գնահատման գործընթացում դիտարկվող օբյեկտները և բնութագրերը նախատեսել համաձայն Օրենքի 7-րդ հոդվածի 1-ին մասի 1-ից 13-րդ կետերի՝ Անհրաժեշտ է դիտարկել կետերում նշված բոլոր օբյեկտները և բնութագրերը:
- 5. Շրջակա միջավայրի և մարդու առողջության վրա ազդեցության գնահատման հաշվետվության բովանդակությունը և նրան կից ներկայացվող փաստաթղթերը նախատեսել համաձայն Օրենքի 18-րդ հոդվածի 2-րդ մասի 1-ից 15-րդ և 3-րդ մասի 2-ից 6-րդ կետերի՝ Շրջակա միջավայրի վրա ազդեցության գնահատման հաշվետվությունում անհրաժեշտ է ներառել նշված բոլոր կետերի ցուցանիշները և փաստաթղթերը:
- 6. Համապատասխան ոլորտի պետական լիազորված մարմնի եզրակացության կամ կարծիքի վերաբերյալ աահանօր

7. Գործընթացի մասնակիցները համաձայն Երևանի քաղաքապետարան, հանրություն: Օրենքի 4-րդ հոդվածի 1-ին մասի 22-րդ կետի
8. Հանրության ծանուցումը և Գնահատման ընթացքում քննարկումների իրականացումը կատարել քաղաքապետարանը ձեռնարկողի հետ համատեղ պետք է իրականացնի համատեղ պետք է իրականացնի հանրության ծանուցում և հանրային քննարկումներ: Արձանագրությունները, տեսաձայնագրության կրիչը, հանրության դիտողությունների հիմնավորված պատասխանների ամփոփաթեթը պետք է ներառել շրջակա միջավայրի վրա ազդեցության գնահատման հաշվետվությունում և ներկայացնել ՀՀ բնապահպանության նախարարություն՝ փորձաքննության:
9. Պետական տուրքի չափը՝ 500.000 (հինգ հարյուր հազար) դրամ՝ Ա կատեգորիայի համար
10. Ստացողը և հաշվի համարը՝ ՀՀ ֆինանսների նախարարության գանձապետարան՝ 900005000196
11. Վճարման նպատակը՝ Նախատեսվող գործունեության փորձաքննության գործընթացի իրականացման համար
12. Փորձաքննության հիմնական փուլի սկիզբը համաձայն Օրենքի 19-րդ հոդվածի և համապատասխան կազմված ՇՄԱԳ հաշվետվությունը՝ ՀՀ բնապահպանության նախարարություն՝ շրջակա միջավայրի վրա ազդեցության փորձաքննություն և ներկայացնելը:

<<Շրջակա միջավայրի վրա ազդեցության փորձաքննական կենտրոն>> ՊՈԱԿ-ի տնօրեն



Վ.Սահակյան

<<Շրջակա միջավայրի վրա ազդեցության փորձաքննական կենտրոն>> ՊՈԱԿ-ի փոխտնօրեն

Ս.Փահլևանյան

<<Շրջակա միջավայրի վրա ազդեցության փորձաքննական կենտրոն>> ՊՈԱԿ-ի մասնագետ

Ա.Մինասյան

TECHNICAL SPECIFICATION

/of the planned activity/

TS 37

23.06.2016

The present specification is made according to the RA law clauses on the “Assessment and expertise environmental impact” (hereinafter referred to as Law) and is taken as a base for the planned A or B category activity for the processing of the report of main assessment of environmental impact being submitted to the expertise general phase, according to the following specifications:

1. The name and address of undertaker:	“RencoArmestate” LLC / 8 M. Khorenatsi St., 1st Blind Alley, Yerevan/
2. The planned activity and its category:	Primary assessment application, “A” category for the “Combined cycle power plant”
3. The affected community (communities):	Yerevan city
4. To foresee the objects and characteristics being observed during the process of the Environmental impact assessment according to the Law 1-13 points of the 1 st part of the 7 th article:	It is necessary to observe all the objects and characteristics indicated in the points.
5. To foresee the content of report of the human health and environmental impact assessment and the attached documents according to the Las 2-6 points of the 3 th part and 1-15 points of the 2 nd part of 18 th article:	In the reports of the environmental impact assessment is necessary to include all the indicated documents and indicators of the points.

6. The requirement on the opinion or conclusion of state licensed body of the relevant field:	
7. The participants of the process according to the Las 22 nd point of the 1 st part of the 4 th article:	Yerevan municipality, society
8. To execute the public notice and the implementation of discussions according to the 7 th and 8 th parts, 1 st and 2 nd points of the 5 th part, 3 th part, 2 nd and 3 th points of the 2 nd part of the Law 26 th article and according to the N1325-N decision of 19.11.2014 on the “Establishment of the public notice and discussions implementation procedure”:	During the assessment the municipality should realize public notice and public discussions with the undertaker. The minutes of meeting, the video flash, the answers summary sheet based on public remarks should be included in the report of the environmental impact assessment and should be submitted to the expertise of the RA Ministry of Nature Protection.
9. The amount of state fee:	500.000 (five hundred thousand) AMD for A category
10. The recipient and the account:	treasury of RA Ministry of Finance – 900005000196
11. Payment purpose:	For the implementation of the planned activity expertise
12. The beginning of the expertise general phase according to the Law 19 th article and to the decision of the Government of the Republic of Armenia on the “Establishment of procedure of the implementation of the environmental impact expertise”:	The submission of the environmental impact assessment report made according to the technical specification to the expertise of environmental impact – to the RA Ministry of Nature Protection .

Director of “Center of expertise for
Environmental impact assessment”
State Non-Commercial Organization

V. Sahakyan

Deputy director of “Center of expertise for

Environmental impact assessment”

State Non-Commercial Organization

S. Pahlevanyan

Specialist of “Center of expertise for

Environmental impact assessment”

State Non-Commercial Organization

A. Minasyan

11.2 Annex 2 - Form for comments

Gender:				
Title:				
Name: <i>(Please do not fill this field if you would like to remain anonymous)</i>				
Please mark how you wish to be contacted	<input type="checkbox"/> Post	<input type="checkbox"/> Telephone	<input type="checkbox"/> E-mail	<input type="checkbox"/> Others
	Address:	Contact number:	E-mail address:	Please specify:
Preferred language for communication	<input type="checkbox"/> Armenian	<input type="checkbox"/> Russian	<input type="checkbox"/> English	<input type="checkbox"/> Others
				Please specify:
Comments to the Draft Final ESIA Report				
<input type="checkbox"/> I request you not to disclose my identity to third parties without my previous written consent				
Signature: <i>(Please do not fill this field if you would like to remain anonymous)</i>				
Local:				
Date:				

11.3 Annex 3 - Model for the Stakeholder Log

Entity	Representative	Communication media	Comment	Answer and Action for follow-up	Responsibility	Deadline	Confirmation of close-out

11.4 Annex 4 - Public Grievances Form

Gender:				
Title:				
Name: <i>(Please do not fill this field if you would like to remain anonymous)</i>				
Please mark how you wish to be contacted	<input type="checkbox"/> Post	<input type="checkbox"/> Telephone	<input type="checkbox"/> E-mail	<input type="checkbox"/> Others
	Address:	Contact number:	E-mail address:	Please specify:
Preferred language for communication	<input type="checkbox"/> Armenian	<input type="checkbox"/> Russian	<input type="checkbox"/> English	<input type="checkbox"/> Others
				Please specify:
Description of Incident or Grievance (What happened? Where did it happen? Who did it happen to? What is the result of the problem?)				
Date of Incident/Grievance:				
<input type="checkbox"/> One time incident/grievance?		Date:		
<input type="checkbox"/> Happened more than once?		How many times?		
<input type="checkbox"/> On-going (currently experiencing problem)				
Do you have suggestions on how to solve the problem?				
<input type="checkbox"/> I request you not to disclose my identity to third parties without my previous written consent				
Signature: <i>(Please do not fill this field if you would like to remain anonymous)</i>				
Local:				
Date:				