Verkhnetagilskaya GRES CCGT Power Plant, Russian Federation

Environmental and Social Statement (ESS)

EBRD & Inter Rao

August 2013

Chapter

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A General Information

A1 General Introduction

This Environmental and Social Statement (ESS) has been compiled by WS Atkins International Limited ('Atkins') on behalf of Inter Rao and the European Bank for Reconstruction and Development (EBRD) in relation to the Verkhnetagilskaya GRES Thermal Power Plant (VTGRES) combined cycle gas turbine (CCGT) Project.

This Statement presents the findings of the Environmental and Social Impact Assessment (ESIA), which has been undertaken for the proposed Project for investment purposes. The ESS describes the main features of the development, identifies its significant impacts, together with appropriate management, mitigation and monitoring measures.

The EBRD intends to provide a corporate loan to Inter Rao, designated for the financing of the new CCGT power generation unit at Verkhnetagilskaya Thermal Power Plant. The proposed development will briefly comprise a new 445.6 MWe CCGT unit with all necessary infrastructure ("the Project").

In 2012 the Bank provided a corporate loan to Inter Rao and agreed a comprehensive Environmental and Social Action Plan (ESAP) with the Company, which, amongst other issues, addresses corporate environmental, health and safety (EHS) management and the application of the Environmental Impact Assessment (EIA) and Industrial Emission Directive (IED) on new projects.

In line with EBRD's 2008 Environmental and Social Policy and Procedures, the Project has been screened as category A, requiring an ESIA and development of a public disclosure package in accordance with EBRD's Public Information Policy. In the case of this project, a 60-day public disclosure and consultation period is required following EBRD notification of the project on its website. This document is a part of disclosure package. In addition to the ESIA and the disclosure package, Category A projects are required to provide:

- the evaluation of alternatives, including non-implementation;
- recommendations of mitigation or other measures to prevent or minimise potential impacts.

The Project is at an early stage of development.

A pre-feasibility study has been developed for the project.

As of July 2013, an environmental impact assessment (Russian: OVOS) for regulatory requirements has not been undertaken.

Siemens has been proposed as the supplier of the gas turbine.

Inter RAO Engineering has been appointed as Engineering, Procurement and Construction (EPC) contractor ("the contactor") for the Project. The contractor will be also responsible for development of environmental impact assessment study according to the requirements of Russian Law. OAO Power Machines («Силовые Машины») will supply the steam turbine.

This ESS presents the outcome of the assessment process at this particular stage of the investment process. The following sections describe the outcome of the assessment and the underlying regulatory (and other) mechanisms by which the impact assessment of the proposed Project has been assessed.

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A2 Project location

The proposed CCGT Project site is located within the borders of Verkhnetagilskaya GRES Thermal Power Plant (VTGRES) owned by Inter Rao. The site has historically been used for power generation since 1950's.

VTGRES is located at the south bank of Verkhnetagilsky Reservoir on the opposite bank to Verkhniy Tagil town. The existing site location is presented on the figure below as well as in Appendices AI.I and AI.II. The layout of the new plant is presented in Appendix AI.III.

VTGRES is a major supplier of electricity in the Sverdlovsk Region. The administrative centre of the region is Yekaterinburg, formerly known as Sverdlovsk. Most of the region lies on the eastern slopes of the Middle and North Urals and the Western Siberian Plain. Verhniy Tagil has approximately 13,000 inhabitants.

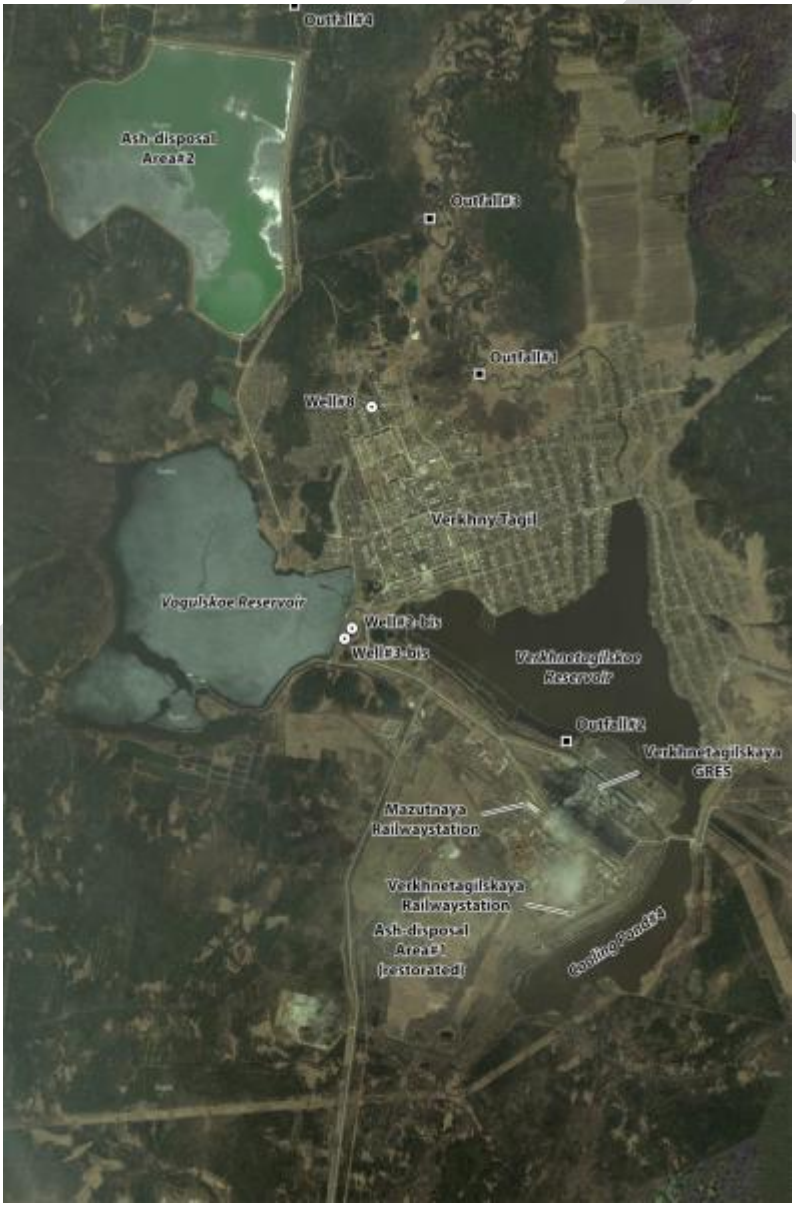

Figure A2-1 Location and key elements of VTGRES

A3 Outline of the Statement and Associated Documentation

A3.1 Contents of this Statement

This Statement contains the following sections:

- **Section A:** General Information: This section provides a general introduction to the Project, background to the ESIA process and the regulatory drivers, the scope of the assessment and the contents of the ESS.
- **Section B:** Technical Description: Provides a detailed description of the Project including the rationale, location, programme and design. This section also reviews the design against the European 'Best Available Techniques' (BAT) requirements for design and operation of the proposed plant. Section B also provides details of the Project alternatives considered. Where a detailed assessment of alternatives is required, this is discussed in more detail in the appropriate sub-section of Section D.
- **Section C:** The Existing Environment: Provides a background to the physical, natural, historic and social characteristics of the proposed Project area, and the surrounding areas, which may be impacted upon by the proposed development.
- **Section D:** Assessment of Impact: This Section describes the potential environmental impacts, both negative and positive, that are likely to result from the construction, operation and closure and decommissioning of the proposed CCGT.
- **Section E:** Summary of Impacts and Mitigation Measures. This section presents a summary of the potential impacts identified and assessed in Sections D, together with a summary of proposed management / mitigation / control measures, and a description and ranking of the resultant residual impacts.
- **Section F:** Monitoring Programme. Provides and outline of the monitoring proposed throughout the project.
- **Section G:** Further Information: This Section presents the Bibliography and References appearing through this ESS.

A3.2 Documentation Associated with this Statement (Disclosure Package)

The collection of documentation generated by the ESIA process is called the 'Disclosure Package'. In addition to this ESS, the ESIA process has also involved the production of the following documentation:

- Non-Technical Summary (NTS);
- Stakeholder Engagement Plan (SEP);
- Environmental and Social Action Plan (ESAP).

A3.3 Availability of the Impact Assessment Documentation

The documentation relating to the ESIA will be available at the following locations:

- ERBD offices in London and Moscow;
- Inter Rao office in Moscow;
- the OOO Inter RAO Electricity Generation site.

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A4 Impact Assessment Approach

A4.1 Introduction

This section describes the general approach to undertaking the ESIA and producing the ESS for the VTGRES CCGT Project. The approach has been informed by:

- the requirements of the EBRD;
- the nature of the Project;
- the current status of Project implementation;
- the environmental and socio-economic background of the proposed Project area;
- the expertise of the ESS team in undertaking similar projects.

Russian regulatory requirements related to EIA have not been taken into account at this stage. This document is not intended to be used directly in Russian EIA process (OVOS).

The EIA report (OBOC - Оценка воздействия на окружающую среду) according to Russian law will be developed in the beginning of 2014 as a part of the detailed design process. This report will go through the process of formal and public consultations.

The following sub-sections discuss the ESIA process and the regulatory and other requirements to which the assessment adheres.

A4.2 Applicable International Environmental and Social Standards

As described in Section A1, this project has been categorised as a Category A project. Since the developer associated with this project is seeking finance from the EBRD, the project is subject to the standards of international finance organisations. These standards, and how they apply to the Project and the assessment of impacts, are discussed in this section of the ESS.

Guidance on international investment requirements is provided within the EBRD Environmental and Social Policy (EBRD, 2008) and the International Finance Corporation (IFC) Performance Standards on Social & Environmental Sustainability (IFC, 2012). For the purposes of this description the EBRD process and its terminology has been referred to.

The main steps are:

- screening and Equator Principles (EP) categorisation;
- undertaking an ESIA Scoping Study;
- producing a SEP;
- producing an ESS (this document);
- development of an ESAP;
- public consultation on the ESIA Disclosure Package;
- management of grievances / objections;
- project monitoring.

For the purposes of this Project screening and scoping assessment reports have not been produced as it was clear to all parties, from the information available, that an ESIA would be required. The typical process for the assessment of a Project is summarised in Figure A4.1. For the sake of simplicity the ESIA process is represented as a single component of the overall process in Figure A4.1. However, the ESIA process itself can be split into the following stages:

- Baseline Assessment: Baseline data collection including surveys. Appraisal of current baseline conditions from data collected and surveys undertaken. Prediction and appraisal of how the baseline would be expected to change in future.
- Impact and Effects Prediction: Use of predictive techniques such as models or change indicators to identify likely impacts and to derive their potential effects.

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- Impact and Effects Assessment: Allocation of significance and severity levels using defined thresholds and criteria.
- Mitigation and Management: Identification of measures to mitigate adverse effects, and assessment of their effectiveness.
- Identification of Residual Impacts and Effects: Allocation of significance and severity levels (with mitigation in place) using defined thresholds and criteria.

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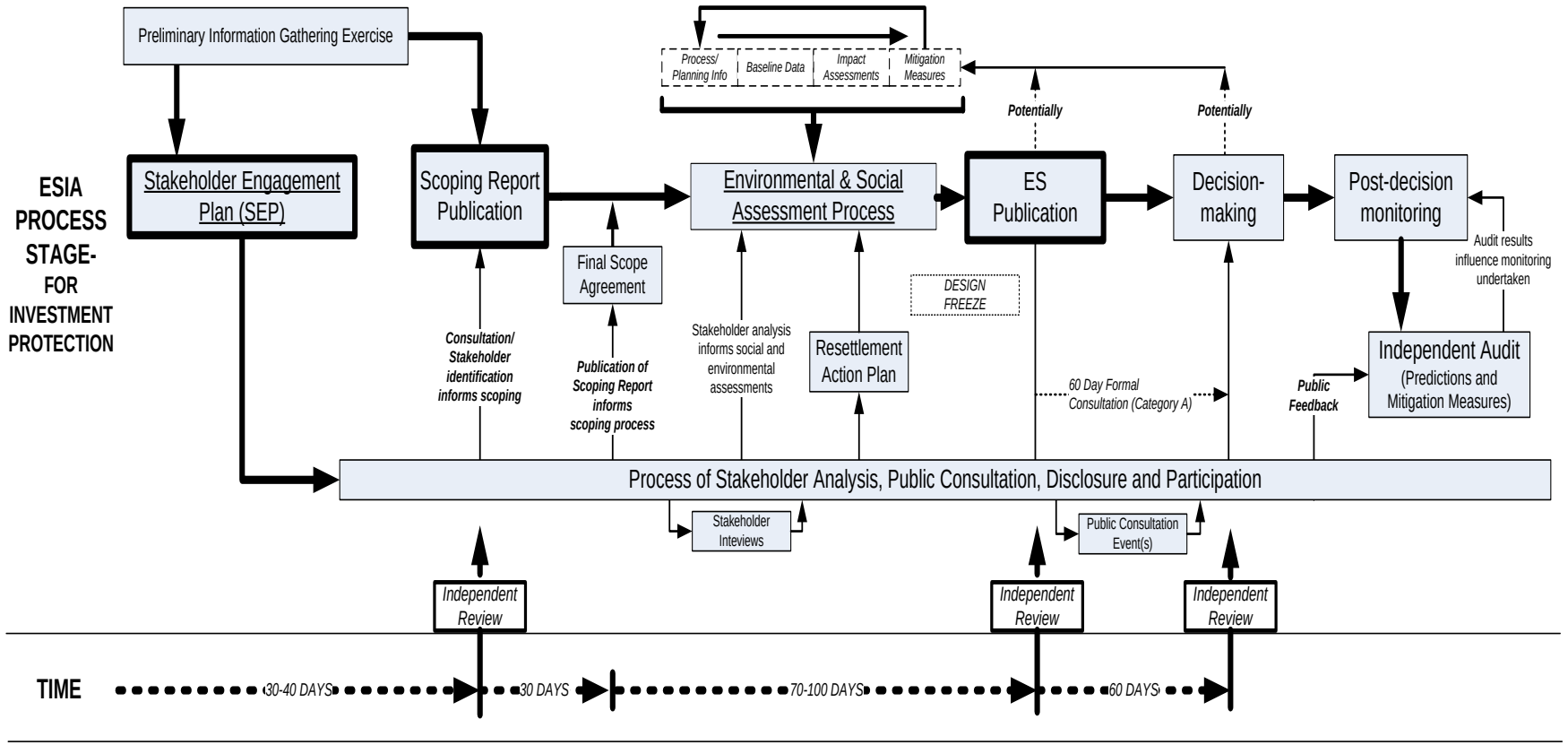


Figure A4-1 The ESIA Process (for mature projects development phase)

A5 Scope of the Environmental and Social Impact Assessment

A5.1 Overview of Scoping Study Process

The the scoping phase of the ESIA should be considered in conjunction with the Project SEP. The 'scope' of the assessment refers to the geographical and technical boundaries relating to the issues that need to be addressed in the ESIA process.

The scoping process considered four levels of assessment and was managed as follows:

- Level I: Detailed Assessment - Undertaken for important environmental and social issues that are directly associated with the Project, or issues relating to associated development which have the potential to significantly risk the viability of the Project.
- Level II: Indicative Assessment - Undertaken for important environmental and social issues directly associated with the project but where these are considered to be of lower significance than those identified for Level I assessments, or undertaken in relation to potentially significant issues associated with infrastructure development. Indicative assessments will also be undertaken where there is no information and / or data available to undertake detailed assessments.
- Level III: Cursory Assessment - Undertaken on issues which are directly associated with the project but have a low risk of impact, or potentially important environmental and social issues to which commonly used mitigation and management measures are applied, or undertaken for associated developments that are not expected to have significant environmental and/or socio-economic issues.
- Level IV: Screened Out Activities - Activities which are not associated with the Project site and also have a low risk of impact.

A5.2 Environmental and Socio-Economic Issues Identified

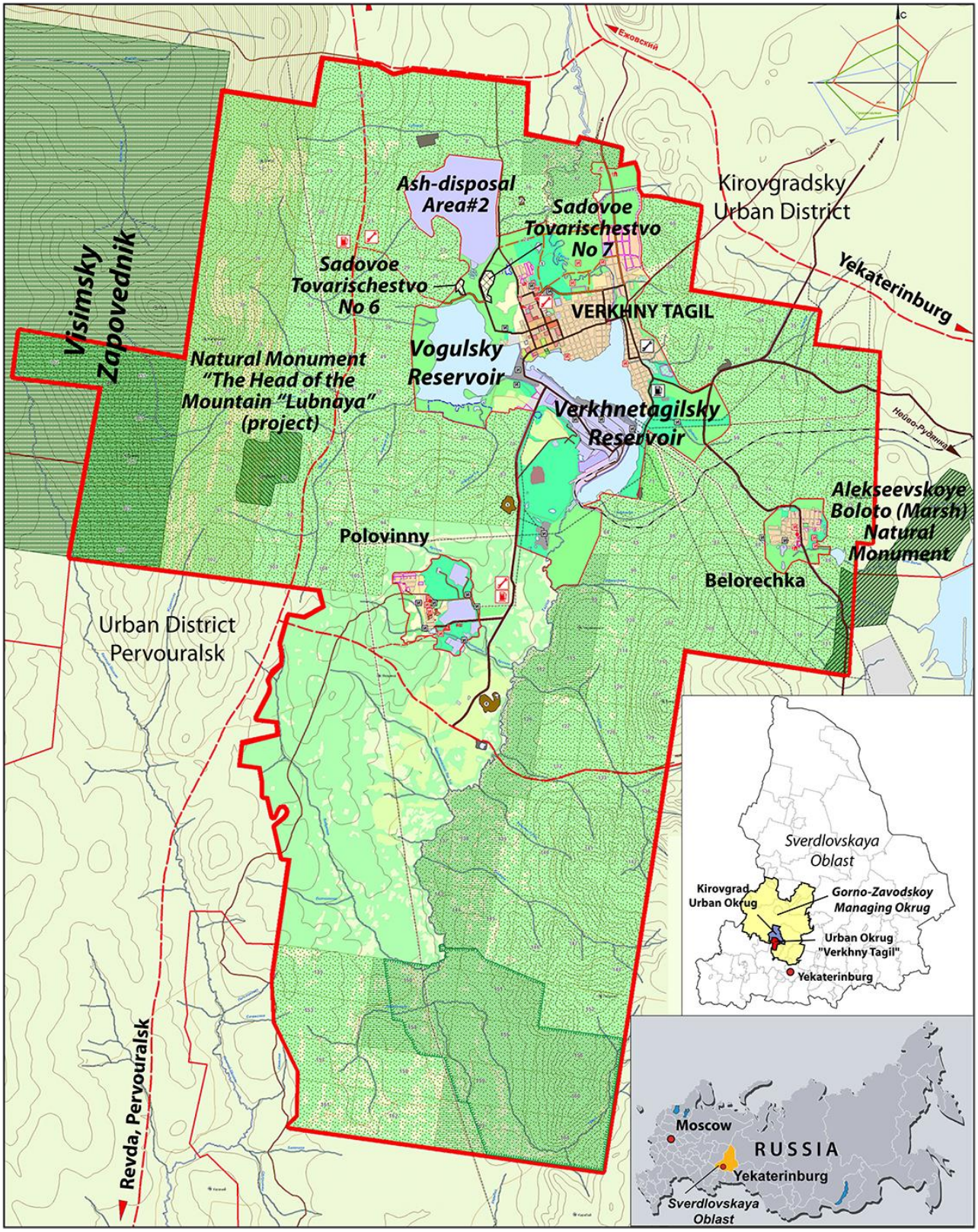
The following issues were identified in the Scoping Phase for inclusion in the ESS:

- Level I Assessments:
  - Plant Design and the Application of BAT.
  - Air Quality.
  - Noise Impact.
  - Surface Water and Effluent.
- Level II Assessments:
  - Traffic and Transport.
  - Ecology and Nature Conservation Effect.
  - Socio-Economic Effects.
  - Management Assessment.
  - Abnormal Operations and Accidents.
  - Archaeology and Cultural Heritage.
  - Waste Generation.
  - Landscape and Visual Impact.
  - Greenhouse Gas & Group Emissions Assessment.
  - Cumulative Impact Assessment.
- Level III Assessments:
  - Land and Groundwater Quality.
  - Safety Aspects.

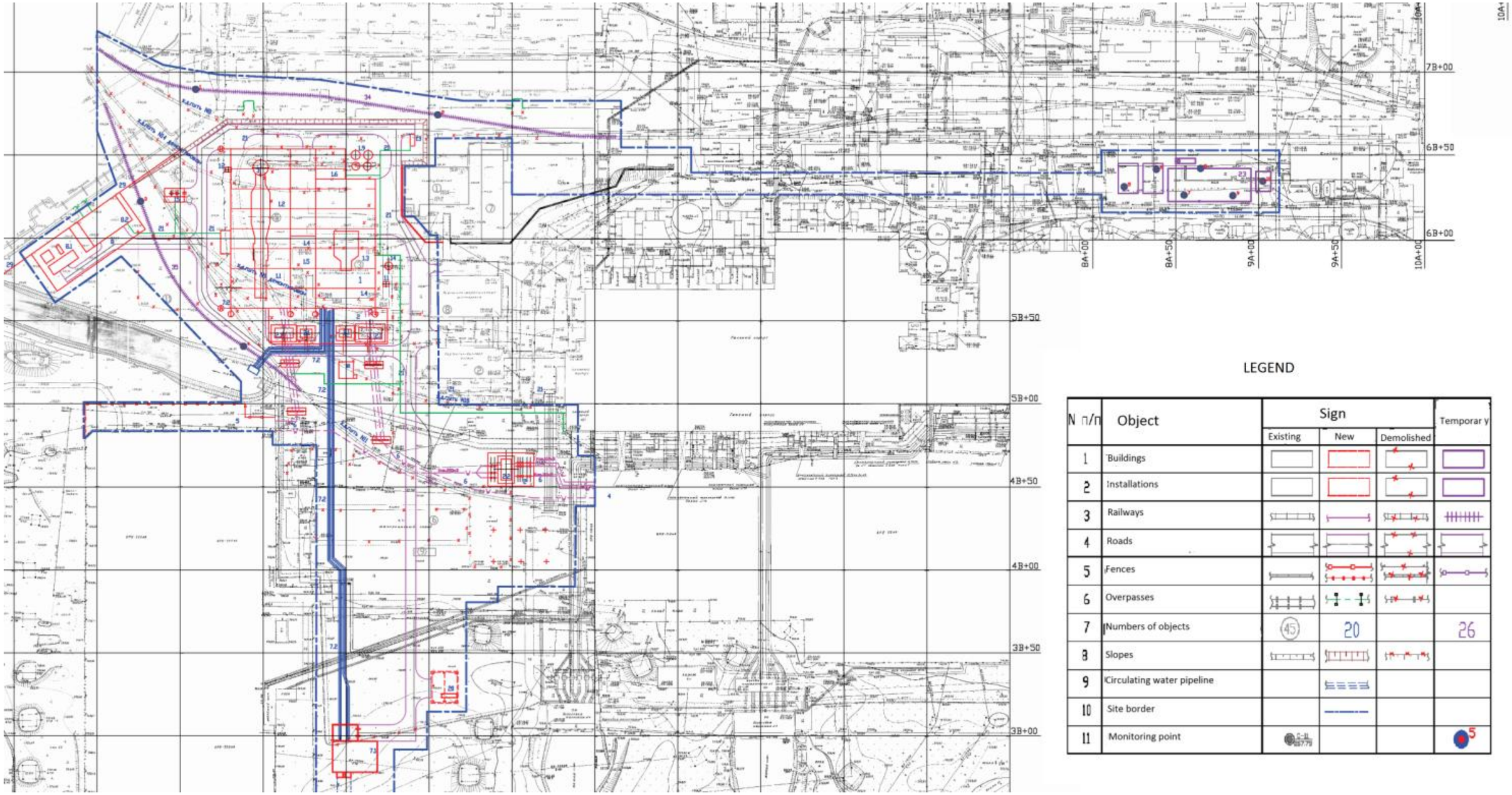
AI Appendices

AI.I Appendix: Site Location Plan

AI.II Appendix: Regional Context



AI.III Appendix: CCGT Unit Layout



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N п/п	Object	Sign			Temporar y
		Existing	New	Demolished	
1	Buildings				
2	Installations				
3	Railways				
4	Roads				
5	Fences				
6	Overpasses				
7	Numbers of objects	45	20		26
8	Slopes				
9	Circulating water pipeline				
10	Site border				
11	Monitoring point				5

B Project Technical Description and Project Alternatives

B1 Introduction to the Section

This Section provides an overview of the technical design and operation of the proposed CCGT Project together with an assessment of the how the design compares to international best available techniques. The Section also details the construction and decommissioning activities associated with the Project and presents an overview of the alternatives to the project design and location.

B2 Outline of the Project

B2.1 Project Rationale

To ensure the continued secure supply of electricity in Russia there is a need to replace those power stations which have reached the end of their operating life and will be closed down and to replace less efficient power stations. A significant portion of the coal-fired power plants in Russia are scheduled to close in 2015 and 2016. There will therefore be a significant gap between the electricity needs of Russian Federation, and the country's ability to meet these needs. The increase in energy transmission in Russian Unified National Electric Grid increases each year. In 2009 transmitted energy amounted to 452.7 bln kWh, in 2010 470.6 bln kWh, in 2011 484.7 bln kWh and in 2012 517.1 bln kWh. As a result there is necessity to build new CCGT plants for stability of the grid and as required for future industrial development of various regions.

New gas-fired stations should be distributed around Russia and be located close to major electricity load centres, such as the large conurbation Ekaterynburg-Chelabinsk, thereby avoiding the need to significantly enlarge national electricity grid and thus reducing electricity transmission losses. It is beneficial to have the ability to support the transmission system (both at 110 kV and 220kV) in Sverdlovsk region. In addition to assisting with meeting the need for additional generating capacity, the proposed CCGT plant will operate as spinning reserve, operating at low load ready to increase output to full load when other generating plant, already in operation, cannot maintain the stability. Spinning reserve plant (such as the CCGT unit) can supply additional power within very short time period. However, with the advent of new Russian regulation on energy efficiency in power plants, it is no longer an attractive option for the operators of old type coal fired plant to provide such a service.

B2.1.1 Why the CCGT is Needed

Investment for the Project will be based on the development of a new 445.6 MWe power plant. The Project is specific to a gas-fired CCGT power plant which has therefore fixed the selection of the generating technology for the site and consequently alternative plant types were therefore not considered. In addition, although a larger capacity plant has been considered, the grid and locations constraints presently allow only for a unit of this size. (Although in the future, further development of the VTGRES site could be considered when the older units have been decommissioned.) The proposed CCGT power plant has a higher efficiency and lower carbon dioxide emissions, shorter construction time, lower levels of atmospheric emissions, lower amounts of solid waste, area smaller footprint and lower water usage when compared to coal / heavy fuel oil fired power plants.

The high energy efficiency of the proposed CCGT will enable better usage of Russia's gas reserves in comparison with the old type gas-fired boilers that were built in 1960s and 1970s: This is important due to the fact that the costs of exploration and start-up of new gas deposits are much higher than in the past and, in parallel, the demand for gas has increased (and continues to do so).

B2.2 Site Layout

The new CCGT unit will be located in the southern part of existing plant, near to the main building of boiler - turbine department KTC-2.

In order to construct the proposed CCGT it will be necessary to demolish the following existing buildings:

- oily water treatment plant;
- warehouses;
- other concrete structures as well as underground infrastructure in the area.

Demolition of these existing facilities will not have a negative impact on the operational capability of the plant as these buildings are either obsolete, or their functionality can be easy transferred to other locations.

Demolition of the existing buildings provides a good opportunity to redevelop the area; however, appropriate waste disposal, as well as soil contamination monitoring and hazardous material inspection (for example in respect to asbestos or oil residues) will be required.

The design and layout of the proposed CCGT Project will ensure maximum efficient use of area as well as providing for all required service and emergency access paths, storage areas and distances required for safe operation.

The new CCGT unit will use existing facilities and infrastructure where possible. The chosen location provides the opportunity to use the existing cooling water channels, roads and provides favourable connections to the gas pipeline and high voltage power output line.

B2.3 Project Timetable

The main stages of the Project are:

- design and design approval / release;
- demolition of existing objects and structures;
- ground preparation and the creation of appropriate foundations for the power station;
- transport of heavy equipment to the site;
- construction of the new power plant and associated structures;
- construction of appropriate infrastructure;
- construction of a high pressure gas pipeline;
- decommissioning of the old boilers and associated structures;
- incorporation of CCGT plant in the existing power plant infrastructure (power evacuation, water treatment, information and control systems).

The Project timetable assumes effective project development with start up of the plant planned in 2015 and final commercial operation commencing by the end of 2015.

The construction timeline of new CCGT unit responds to the need to replace several technically degraded coal fired units, which will be decommissioned in between 2016 and 2022 due to implementation of federal law.

B3 Description of the Main Plant and Processes

B3.1 Technical Features of the Proposed CCGT

The new unit will be a CCGT fired by natural gas. In the gas turbine energy from combustion of gas with pressurised air is transformed by generator into electrical energy. Further thermal energy from the hot flue gases leaving the gas turbine (GT) will be utilised in the heat recovery steam generator (HRSG) producing hot steam. The energy from the hot steam is transformed into electricity by a steam driven turbo-generator. The cooled flue gases will be discharged to atmosphere by a dedicated stack.

The CCGT process allows maximum efficiency of primary energy use, which is 56.57% for the planned unit (instead of approximately 38% in case of operation of the gas turbine alone).

The unit is planned to work in electricity production mode providing electricity to the high voltage electricity grid.

The basic gas turbine package consists of following units and components:

- gas turbine (GT) with air compressor and combustion system;
- fuel feeding system GT;
- lubricants and hydraulic system;
- air intake system;
- anti-icing system;
- flue gas exhaust system;
- heat insulation with fire prevention system;
- turbo-generator with closed cooling hydrogen system for active parts with built-in water cooling system;
- turbine generator temperature control system;
- auxiliary constructions and buildings;
- regulation and control system;
- noise insulation.

The steam turbine pack consists of:

- steam turbine with steam distribution system;
- regulation and control system;
- oil supply system;
- condenser;
- electricity generator;
- noise and heat insulation.

For the construction of the CCGT the following devices have been chosen:

- gas turbine model SGT5-4000F (Siemens);
- GT generator Sgen5-1000A (Siemens);
- heat recovery boiler (no detailed information at this stage);
- condensing steam turbine K-130 (OJSC Power machines);
- ST generator TZFP-130 (ТЗФП-130) (OJSC Power machines).

OJSC “Power Machines” (ОАО «Силовые Машины») has been appointed as the EPC contractor.

Inter Rao-Engineering is the project coordinator and technical developer of the Project.

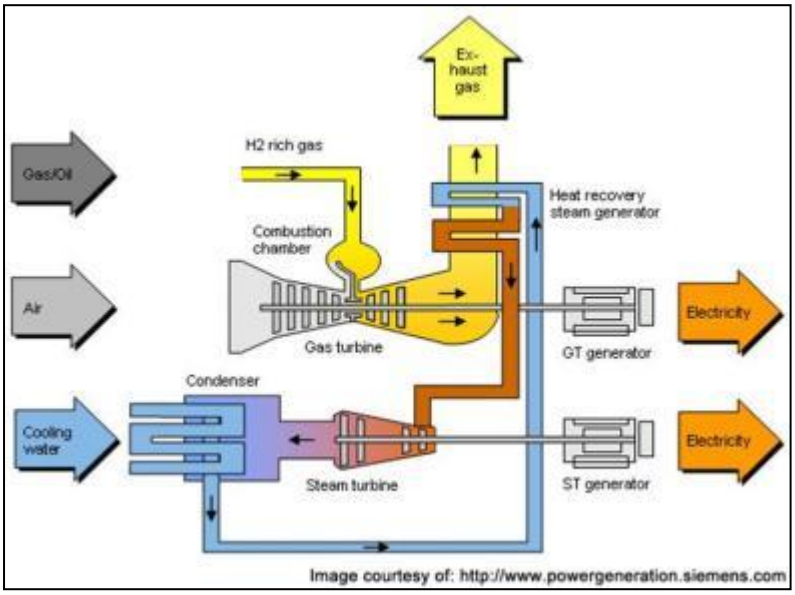


Figure B3-1 Diagram of the CCGT Process

Table B3-1 Key Parameters of the CCGT Unit

Item	Characteristics
Main fuel	Natural gas
Nominal capacity, MWe	445.6
Electric efficiency, %	56.67
Gases discharge, kg/s	693.1
Outlet gases temperature, °C	96.9
Pollutants in outlet gases at 15 % O_2 and at nominal output of GGGT unit, mg/m^3 - NOx - CO	 50 50
Equivalent noise emission, dB(A)	80 dB at the distance of 1 m from the turbine

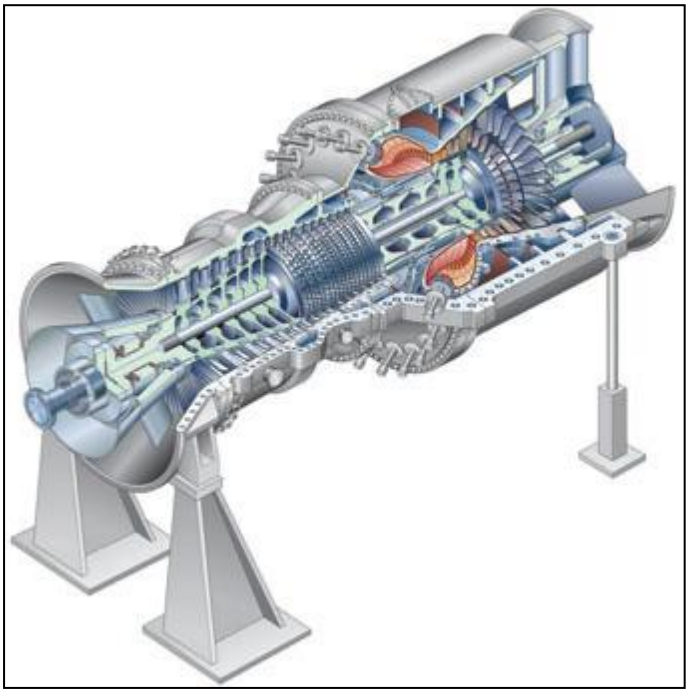


Figure B3-2 Profile of the SGT5-4000F turbine (www.energy.siemens.com)

B3.2 CCGT Operations

B3.2.1 Overview

Operation will commence on the completion of the construction and commissioning of the CCGT, which is presently planned to be by the end of 2015.

According to the pre-feasibility study (dated April 2012) the project will enable for:

- decrease of general water use by approximately 15%
- decrease of cooling water use

The above changes are based on the assumption that some coal-fired boilers will be operational until end of 2018 (or middle of 2019) to ensure the security of heat supply to the region (until new coal fired boilers will be built as a replacement to the existing units 1,2,4,8,9). VTGRES and Inter Rao have prepared the detailed timeline of all of the needed investments until beginning of 2020s in order to guarantee the stability of both heat and electricity supply to the region.

Assumed operational parameters based on pre-feasibility study are provided below.

Table B3-2 Key Operational Parameters of new CCGT unit

Item	Value
Gas turbine	
Air temperature, °C	+1.2
Number of units	1
Power, MW	305.9
Efficiency, %	38.83
Gas emission, kg/s	693.1
Outlet gases temperature, °C	586.8

Item	Value
Fuel use assuming 49414 kJ/kg	14.61
Fuel use, nm^3/h	77,920.0
Consumption of fuel CCGT - toe. / KWh	217.16
Steam utilisation boiler	
Number of units	1
High pressure: - pressure, MPa - temperature, °C - consumption, t/h	 11.5 551.8 275.05
Medium pressure: - pressure, MPa - temperature, °C - consumption, t/h	 2.63 310.2 57.33
Low pressure: - pressure, MPa - temperature, °C - consumption, t/h	 0.52 257.7 52.32
Temperature of outlet gases, °C	96.9
Steam turbine	
Number of units	1
Power MW	139.7
Yearly average cooling water temperature, °C	+12.5
Consumption of the steam by condenser, т/ч	362.42
Consumption of the condensate, т/ч	378.91
Brutto Power of CCGT unit, MW	445.6

The CCGT unit will work in 'condensing mode' and it will not be connected in any way to the existing district heating network.

B3.2.2 Electricity Production

The new CCGT unit will provide efficient and reliable electricity supply to the high voltage network.

In respect to the grid operator requirements full load can be achieved within the following times:

- from cold reserve (shut-down for over 120 hours) in times of 3 h 25 min up to 8 h 50 min;
- from hot reserve (shut down less than 8 hours) in times of1 h 25 min to 4 h.

Electricity will be produced in the highly efficient CCGT unit at a gross efficiency rate of 56.57%.

B3.2.3 Maintenance

Maintenance activities will be performed by trained staff according to directions of the equipment manufacturers and suppliers.

All wastes generated during the maintenance operations (mainly solid wastes, oils, and water contaminated by oil or chemicals) will be utilised and / or disposed of general procedures and legal requirements.

B4 Infrastructure

B4.1 Overview of Support Infrastructure

The following support infrastructure will be in provided:

- connections to both 110 kV and 220 kV grids (for output of electricity);
- connection to 110 kV for the internal requirements of the power plant;
- cooling water system (combined with the existing VTGRES units);
- demineralised water systems (operated by VTGRES);
- sanitary water, waste water, storm water and other systems (operated by VTGRES);
- gas supply pipeline (2.5 km length).

Existing infrastructure will allow for quick and cost efficient connection of the new unit. Due to the age and technical condition of some units, a general modernisation exercise is expected and/or the replacement of certain items.

B4.2 Associated Plant & Buildings

in addition to the main plant, the following associated plant and buildings will be required:

- electrical control building and substation;
- construction compound - a temporary site compound would be required during the construction period. This would be used for storage of materials, as well as containing office and social facilities. It would also include an area for worker and visitor parking;
- access tracks - mostly existing tracks would be used.

B5 Grid Connection

B5.1 Proximity to the Grid

The new CCGT unit will be connected to the grid through existing 100 kV and 220 kV transformer field currently servicing operations of VTGRES. No investment in this field is expected, except for internal connection between the unit and transformer field and the strengthening of various 110 kV lines in the region.

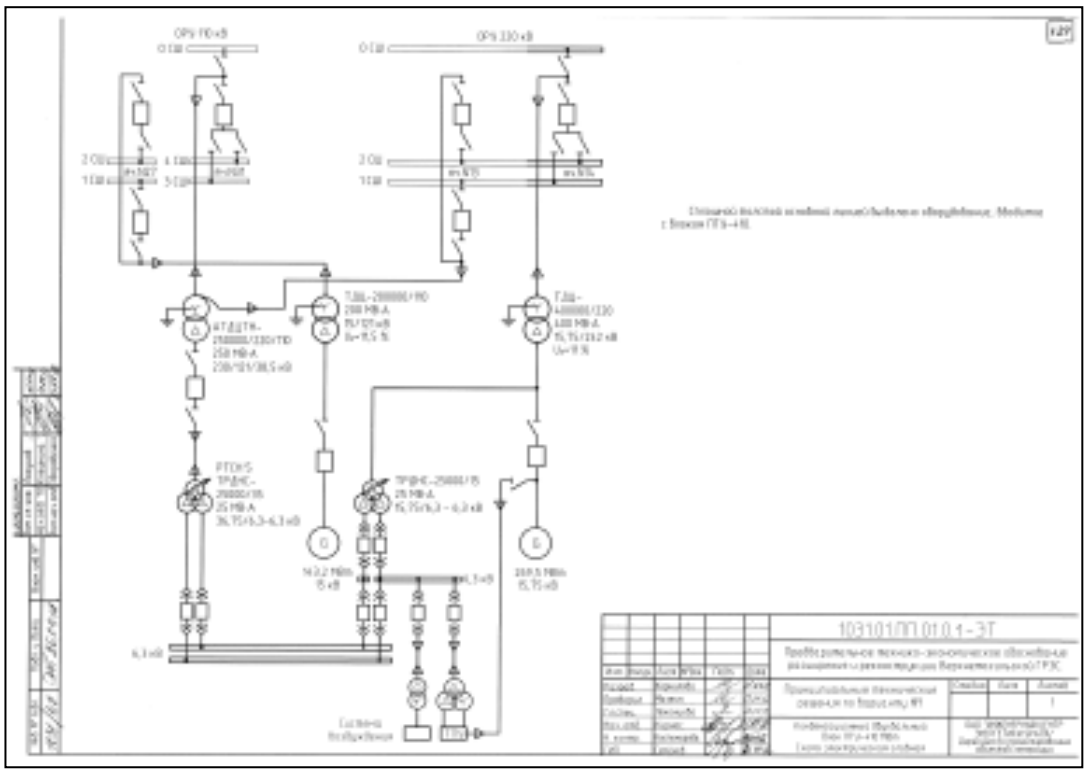


Figure B5-1 Electrical connection scheme of new CCGT unit

B5.2 Construction

B5.2.1 CCGT Construction

As is often the case with ESIAs of large scale development projects, the details of the main equipment enclosures and laydown areas, methods of construction (e.g. the balance of on-site and off-site fabrication) and the precise building programme cannot yet be established. Construction works, electrical equipment and turbine installation will be carried out by specialist companies. The construction of the CCGT unit will involve several teams that will work in parallel on construction, assembly and installations. The key components of the CCGT unit will be manufactured off-site and delivered to site by rail.

Construction activities will include:

- preparation of the site area for development;
- fill importing / exporting and site levelling;
- construction of site roads and construction pads;
- utilities and services connections to site;
- foundation piling / excavations and concrete footings pours;
- erection of building frames and cladding;
- installation of turbines;
- ancillary plant erection;
- services connections;
- building fitting-out;
- commissioning.

B5.2.2 Transport of Construction Materials and Equipment

The site has the advantage of a railway siding, which is currently used mainly for hard coal delivery. The railway siding passes through uninhabitated areas to the east of the site and adjoins main line between Novouralsk and Nevyansk.

Main road access is available from the state road Ekaterinburg - Nizniy Tagil via the local road passing the centre of Kirovgrad town. Optionally, other local roads can be used to reach Kirovgrad. The local road from Kirovgrad enters the Verkhiy Tagil from the east. There are two options of access to the site, through town centre of Verkhiy Tagil or via the road on the dam of reservoir No 4.

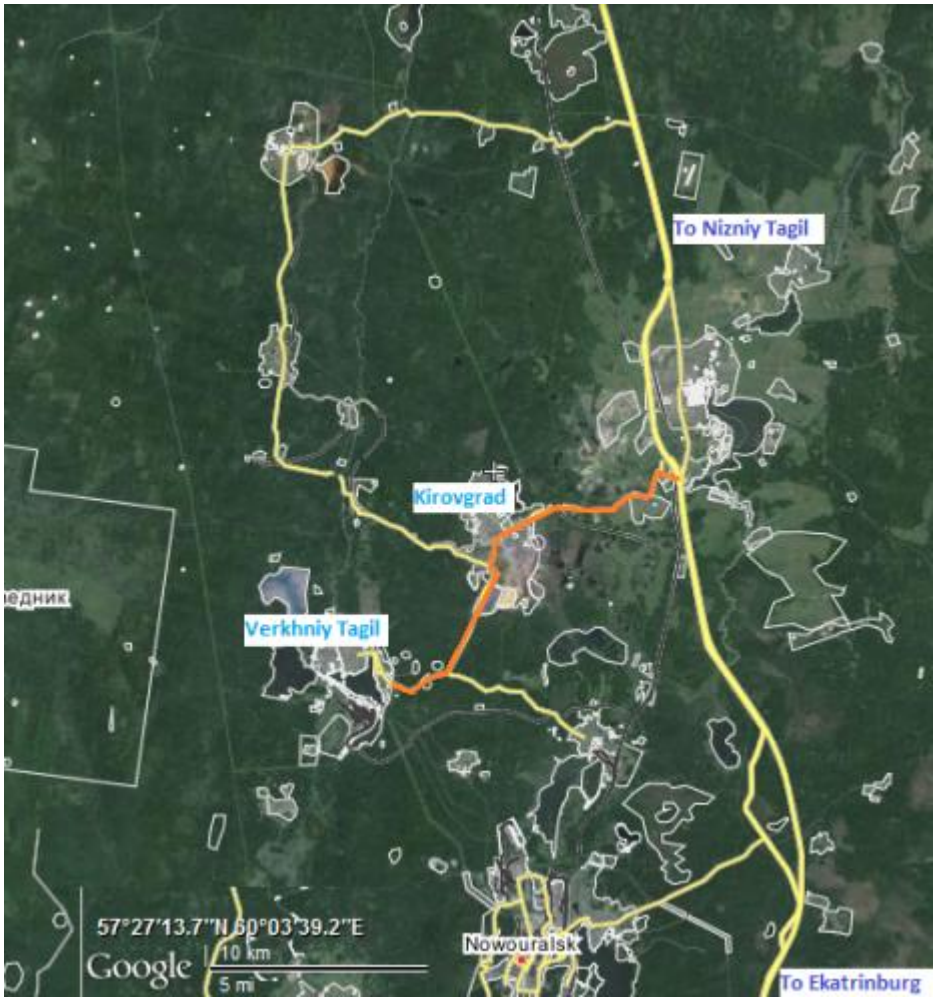


Figure B5-2 Local Roads

All heavy vehicles are expected to enter the VTGRES via the road on the dam of reservoir No 4. The suitability of the dam construction needs to be checked for use by heavy loads; if necessary strengthening works will be undertaken.

There is an existing road (Stepana Razine Street) that leads along borders of Sibirskaya district of Verkhiy Tagil town. This area consists mainly of single family houses.

Access to the site via the road leading through forest (on the eastern side of pond no. 4) is also possible; however, this road is un-made and the slopes along the road may mean that it would not be suitable for use by heavy vehicles. Use of this road would require it to be reconstructed.

Figure B5-3 Local Access Roads to VTGRES

B5.3 Decommissioning

The operational life of a conventional power station may be in excess of 40 years. During this time the plant can be upgraded, meaning that the power station could operate indefinitely as long as there is a fuel supply and it is economically viable to do so.

The decommissioning of a power station is a complicated process and comprises the dismantling of the many complicated structures. However, modern modular power station design facilitates relatively easy decommissioning and recyclability of materials. Further, appropriate design and management measures will minimise the potential for ground contamination and thus the need for any post-operation ground decontamination would be minimised.

B6 BAT Assessment

B6.1 Background

A requirement for all developments that are subject to funding by IFIs is to ensure that the design is in line with the requirements of the host country (or countries) of the financing institution, as well as with the home country where the development is proposed. In practical terms for IFIs this usually means that there is a requirement for the design to be in line with international best practice as far as is possible. The EBRD in particular requires assurance that their investments are designed to European standards.

The key documents drawn upon for this assessment are as follows:

- Reference Document on Best Available Techniques for Large Combustion Plants, European Commission, July 2006;
- Directive 2010/75/EU of the European Parliament and of the Council, of 24 November 2010, on industrial emissions (integrated pollution prevention and control).

Where other documents have also been drawn upon they are referenced in the text of this ESS.

B6.2 CCGT BAT

The main issues associated with the design and operation of CCGTs, for which a BAT demonstration is required, are considered to be:

- air emissions;
- visual impact;
- noise;
- energy efficiency.

B6.3 BAT Assessment

The following table presents the assessment of the project design and operation against the BAT requirements.

Table B.1: BAT Assessment Table

Environmental Aspect / Issues	Indicative Requirement	Summary of Control Measures for BAT	BAT Compliance
Management Systems	Environmental Management System.	Effective environmental management system in place for VTGRES which will be adapted to account for the proposed Project.	Environmental engineer for CCGT construction process need to be appointed. EMS needs to be developed and implemented.
In Process Controls	Process to be designed and controlled so as to prevent, or where not practicable, minimise emissions to air, water, sewer and land.	The design should ensure that processed can be controlled such that emissions to all media are prevented, or where not practicable, (e.g. where it is not technically and financially feasible) that they are minimised.	The process itself and process controls will be designed according to modern environment protection standards including BAT, local, international (IED) emission requirements and best practices.
Emissions Controls - Air	Prevention of emissions through treatment prior to release.	Application of primary emission reduction methods, technology and fuel (as necessary / possible).	The SGT5-4000F Siemens gas turbine is equipped with DryLowNOx system burners allowing achieving low NOx emission levels (50 mg/Nm^3). A ring burner system contributes to good combustion quality by keeping the CO emission level at 50 mg/Nm^3.
Emissions Controls - Water	Adopt measures in order to prevent accidents relating to oil storage and ensure that procedures and measures are in place to enable effective and efficient management of accidents. Adopt measures in order to prevent ground water pollution in relation to the light fuel oil (LFO) storage facility. Testing and neutralising the effluents from the process water before discharge.	Water management procedures shall be developed and implemented.	The new unit will use existing water supply and waste water systems. Sanitary waste water will be discharged via municipal waste water treatment plant (operated by Inter Rao). Storm water will be discharged through existing treatment facilities. Both facilities show deficiency in treatment. Both facilities require upgrading for compliance with BAT. Appropriate oil storage and spillage control procedures will be developed and implemented.

Environmental Aspect / Issues	Indicative Requirement	Summary of Control Measures for BAT	BAT Compliance
	Site drainage to use an efficient oil/water separation/interceptor system. Waste water treatment to meet discharge standards.		
Raw and Auxiliary Materials (including water)	Raw material, additives and consumables selection.	Raw materials, additives and consumables selected shall possess relevant certificates and approvals for the given application (as necessary).	The plant operation and maintenance plans will include a list of approved parts, materials, and consumables.
	Raw material, additives and consumables handling.	Raw material, additives and consumables shall be handled in manner assuring their safe storage, use and disposal in accordance with legal requirements and product specifications.	All maintenance activities as well as operational handling of material, additives and consumables shall be described in an operational and maintenance instruction including their storage and use requirements.
Waste Management, Storage and Handling	Store, handle and transport all waste streams to prevent the release of waste, dust, VOC, leachate or odour.	Appropriate storage facilities and waste handling and disposal procedures.	All wastes will be stored and disposed of according to the modified existing waste management plan for VTGRES. The CCGT plant will not generate ash or notable quantities of any other post-combustion waste.
Cooling water	Use closed cooling water systems. Optimisation of the chemicals‘ dosing regime for biocides in cooling water system	Closed cooling systems are preferred to to direct (open) cooling systems. However use of direct cooling systems, if a large stable water source is available, increases the overall plant efficiency.	The proposed CCGT will use an open cooling water system and use water from the nearby lakes. According to the current legal interpretation, if the cooling water flow significantly exceeds the flow of the river through this reservoir, such systems are as acceptable in Russia as closed water circuit with use of surface water bodies. This approach does not fully meet BAT expectations; however, it does allows for more efficient plant operation and takes advantage of the existing cooling system infrastructure at site.
Energy Efficiency	Demonstrate that the proposed or current	According to BAT the minimal CCGT efficiency shall achieve efficiency level at	The proposed CCGT unit will achieve 56.57%

Environmental Aspect / Issues	Indicative Requirement	Summary of Control Measures for BAT	BAT Compliance
	situation represents BAT	least 54%.	efficiency.
Monitoring	Continuous Environmental Monitoring Systems (CEMS)	-	Continuous emission monitoring systems will be installed on CCGT.
Closure & Decommissioning	Design to Promote Ease of Decommissioning	-	The plant will be constructed using typical materials, devices and common technologies. No asbestos will be used and excessive amounts of hazardous materials will be avoided. Standard decommissioning methods will be applied and reclaimed materials (for example steel, crushed concrete) will be recycled where possible and feasible.

B6.4 Conclusions

The new CCGT project will be fully compliant with current EU BAT requirements in relation to combustion technology selection and air emissions. There are however some areas where the plant falls below the requirements of BAT:

- sanitary waste water will be discharged through municipal treatment facilities that will require upgrading for compliance with BAT;
- storm water (however treated on site) will be discharged through company treatment facilities that will require upgrading for compliance with BAT.

The assessment of the cooling water system depends on local conditions and legal requirements. Water ponds (the reservoirs) were built to serve the existing power plant and therefore may not be considered in the same way as natural surface water bodies. Therefore their use for cooling purposes can be accepted.

Progressive upgrades of the existing water and waste water systems are feasible and will be included into the project as supporting activities.

B7 Project Alternatives

B7.1 Introduction

We have included an outline of the project alternatives in this section as much of this work has already undertaken as part of the early stages of the project planning process. It is not the purpose of this ESS to present a detailed assessment of the project alternatives, in particular site alternatives. However, where applicable throughout this document, the proposed impact of the chosen site and design has been discussed in terms of the potential alternatives.

B7.2 No Project Alternative

The Verkhnetagilskaya Power Plant was build in 1950's and still operates using basically the same technology (albeit upgraded). The current requirements of Russian law do not allow for the continuing operation of the existing low efficiency hard coal-fired units after 2015 (or with derogation, after end of 2017 as grid stabilising units). Consequently the old hard coal-fired boilers are planned to be shut down due to legal requirements (and also because of technical, business and emission requirements).

The possible 'no project' alternative in this case would be an upgrade of existing hard coal boilers and/or construction of new hard coal based power unit.

B7.3 Alternative Locations

No other locations than VTGRES have been taken into account because the need to replace the old boilers in this particular location is a basic justification of the Project.

Several locations were taken into consideration within VTGRES. The current location is considered to be optimal as it is the most distant from Verkniy Tagil town centre and it enables easy connection to the existing gas and electricity network.

B7.4 Alternative Project Technology

The choice of technology for the new plant was based on the pre-feasibility study, which presented an analysis of some practicable technological alternatives to be used for power and heat generation.

Arguments weighing in favour of implementation of a CCGT plant are listed below:

- with regard to the gas and steam turbine unit: this is a proven and available technology that meets requirements of best available techniques and best practice;

- CCGT plant are characterised by the high efficiency of the power generation process and high operational reliability;
- certainty of fuel supplies and low environmental impact (including a distinct reduction in emission of sulphur dioxide, dust and furnace waste material as well as a drop in emissions of nitrogen oxides).
- CCGT would provide an increase of operation flexibility with regard to electrical grid code requirements.

Several types of turbines and suppliers were taken into account during Project planning. The CCGT unit produced by Siemens was selected due to its high energy production efficiency and its applicability to local requirements and conditions.

B7.5 Greenhouse Gas Emissions Assessment

An assessment of the potential emissions of greenhouse gases from the proposed installation has been undertaken using the EBRD Methodology for Assessment of Greenhouse Gas Emissions (EBRD, 2010). The EBRD assessment methodology focuses on the following:

"… estimate the change in GHG emissions (ΔGHG) brought about by investments. This is the difference between the emissions following the implementation of the project investment and the emissions that would have occurred in its absence. "

Where 'GHG' is 'Greenhouse Gas'.

The Project will be beneficial in terms of Greenhouse Gases emission reduction only in liaison with shut down of old hard coal fired boilers. The new CCGT unit will provide power in place of the old units, therefore such approach is acceptable.

The summary of emissions reduction for entire VTGRES in three scenarios are presented in the table below.

The scenarios are:

- Scenario 1: Current status of VTGRES operations that will last until 2014 (No project alternative).

  In this scenario assumes operation of the VTGRES assets under a similar regime to the present day, keeping the annual electricity production level to approximately 7,638,700 MWh. In this scenario over 30% of the electricity is produced from the coal fired units 1-6 and the rest from gas fired units 7-11 (unit 7 and 8 can be also coal fired, but mainly operate on gas). In this scenario relatively high emissions of dust and SO2 are expected as the hard coal-fired boilers are in operation and there is no desulphurisation plant for flue gas cleaning. The expected total CO2 emission factor associated with electricity production is in the region of 0.679 tCO2/MWh due to high share of coal fuel and low efficiency of the facility as a whole.
- Scenario 2: Operation of VTGRES with a reduced number of hard coal boilers and without the proposed CCGT unit (technology alternative).

  This scenario assumes operation of the existing gas fired units at VTGRES (including the operation of units 7 and 8 as gas fired) and decommissioning of the coal fired units 1-6. The projected total electricity production in this scenario is ca. 4 535 500 MWh annually. Due to utilisation of natural gas only it is assumed that the SO_2 and dust emissions will effectively decrease to zero level. The expected total CO_2 emission factor associated with electricity production is ca. 0.529 tCO_2/MWh which is a decrease compared to scenario 1 and which would be achieved as a result of no longer using hard coal in the power plant.

  Scenario 3: Operation of VTGRES without hard coal boilers and with the proposed CCGT unit (technology alternative).

This scenario assumes operation of the existing gas fired boilers 7-11 along with the production of electricity from the new CCGT unit. In this scenario the units 7 and 8 would operate only on a minimum level, as reserve capacity (10% annually). This is to illustrate the situation (if the requirement arises) to also shut down these units, or to operate them at a minimum level (cold reserve), which is considered highly possible after 2016. In this scenario the annual electricity production is assumed at similar level as in scenario 2 (4 679 000 MWh). No SO2 and dust emissions are expected as no coal is utilised. The expected total CO2 emission factor associated with electricity production is approximately 0.459 tCO2/MWh, which is a significant decrease when compared to scenario 1 and scenario 2. This decrease is a result of the high energy efficiency of the proposed new CCGT unit.

Table B7-1 Summary of Expected Emission Levels for Scenarios 1 to 3

Scenario	Annual electricity production (MWh)	Annual SOx emission from coal (tonnes)	Dust emission from coal (tonnes)	Annual CO_2 emission (tonnes)	CO_2 emission factor (t/MWh)
Existing Operations Year 2014	7 638 720	16 751	15 828	5 182 902	0.679
Scenario 2 - Years 2015 and 2016+ without CCGT	4 535 490	-	-	2 398 463	0.529
Scenario 3 - Years 2016+ with CCGT	4 678 979	-	-	2 148 719	0.459

In terms of CO_2 emissions, for the scenarios where the old hard coal boilers are shut down, the overall target reduction will reach ΔGHG=3,034,183 tonnes CO_2 per year (59%). In terms of energy generation efficiency the CO_2 emission per 1 kWh will be reduced by 32%. The expected emission of 459 gCO_2/kWh for Scenario 3 is a combination of the emissions from the new CCGT unit and the existing gas fired boilers at VTGRES. CO_2 emissions from the new CCGT unit itself would be 355 gCO_2/kWh, in compliance with current BAT indicators.

B7.6 Conclusions

Project alternatives, including a “do nothing” option have been considered. The do nothing option was rejected, due to the commitment to shut down the existing hard coal-fired boilers.

Due to the existing industrial nature of the proposed site and the existing infrastructure (including the gas connection and grid transmission) the proposal for replacement of the existing coal-fired power boilers with a CCGT is considered to be the most feasible and suitable alternative. The proposed Siemens gas turbine has been chosen because it is considered state of the art, is based on a proven design and is highly efficient. Other options were considered and although they would have cost less these options did not have the high performance desired by Inter Rao.

An assessment of the potential emissions of GHG from the proposed development has been undertaken using EBRD methodology. The assessment has demonstrated the proposed Project will significantly offset greenhouse gas emissions from present sources.

C The Existing Environment

C1 Introduction

The following sections provide a detailed overview of the physical, natural (i.e. ecology), historical and social (i.e. socio-economic baseline) environment for the proposed project site and its surroundings. The information presented is based on available information from local and governmental sources, publically available databases and survey work and research undertaken by Atkins and its associates.

C2 The Physical Environment

C2.1 Geology, Hydrogeology and Seismology

Geologically, the Verkhniy Tagil area is part of a large structural section of the Ural's Tagil-Magnitogorsk Zone and represents a submeridional syncline. The core of the fold comprises the Upper Silurian/Lower Devonian rocks (trachyte porphyry, porphyrytic tuff, tuffite, tuff sandstone, limestone, sandstone, and lava breccias). The syncline's edges mainly comprise Silurian albitophyre and tuff, diabase, porphyrite, porphyroid, and quartz/chlorite/sericite schist. In the axial section of the fold between its core and eastern wing, the strata is pierced by the Middle and Late Devonian intrusive linear submeridional rock formations. These intrusions are formed of plagiogranite, quartz gabbro, dunite, peridotite, and serpentinite. The Quaternary deposits lying within the waterlogged valley of the Tagil River comprise lacustrine and marsh deposits (loamy clay, clay, silt and peat) whose thickness is up to 20 m.

A geological map of the area is presented in Figure C2-1.

According to the integral seismic zoning of the Russian Federation, earthquakes of magnitude 6 on the Richter scale occur in this area with a probability of once in 1,000 years and earthquakes of magnitude 7 on the Richter scale occur with a probability of once in 5,000 years.

The nearest known earthquakes to VTGRES occurred in: Solikamsk 19 years ago, magnitude 4.8, distance to Verkhny Tagil more than 400 km, Satka 28 years ago, magnitude 4.5 distance to Verkhny Tagilapp. 370 km and in Severouralsk more than three earthquakes have occurred with a magnitude of more than 4 in the last 10 years (distance to Verkhny Tagil app. 380 km).

According to the available data these small earthquakes occurred after almost 100 years period without any earthquakes in this area.

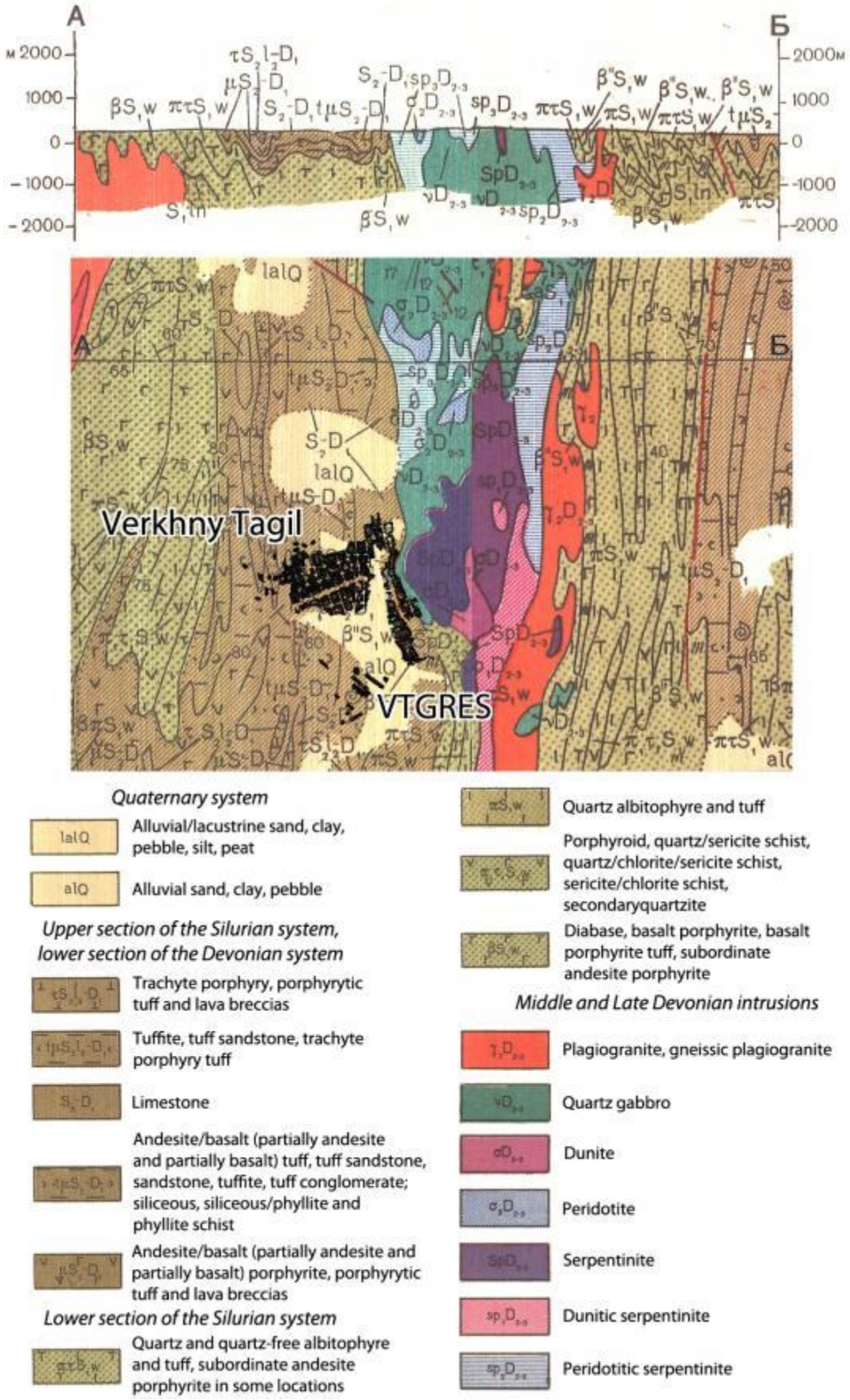


Figure C2-1 Geological map of the surroundings of Verkhniy Tagil town (fragment of the geological map of the USSR, 1968).

C2.2 Climate and Meteorology

The climate of the study area is generally typical of the southern part of the Sverdlovskaya Oblast and is directly influenced by the Ural Mountain Range acting as a barrier for air masses. The climate of the area is continental. Average air temperature is -14°C in January and +18°C in July. The wind pattern is dominated by southern and south western winds. Average precipitation is 500-550 mm; the major part (about 70%) of precipitation falls during the warm season; maximum precipitation occurs in July. The area has excess humidity. Floods occur in April. The thickness of snow cover during the winter season is up to 60 cm.

The distribution of temperatures in months from the period 1900-2009 are presented in the figure below. Source: University of East Anglia Climate Research Unit.

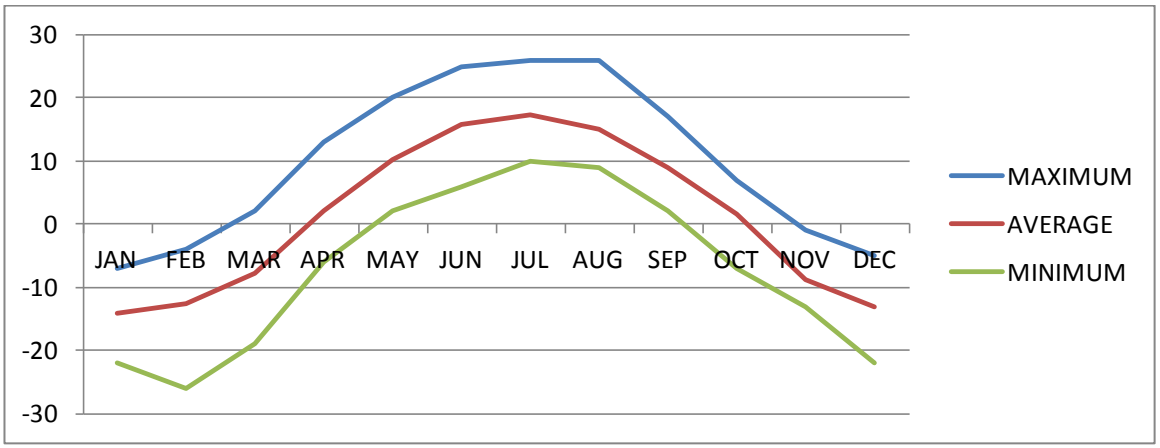


Figure C2-2 Average, Maximum and Minimum Temperatures for Visimski Natural Reserve (°C)

The distribution of precipitation in months from the period 1900-2009 are presented in the figure below. Source: University of East Anglia Climate Research Unit.

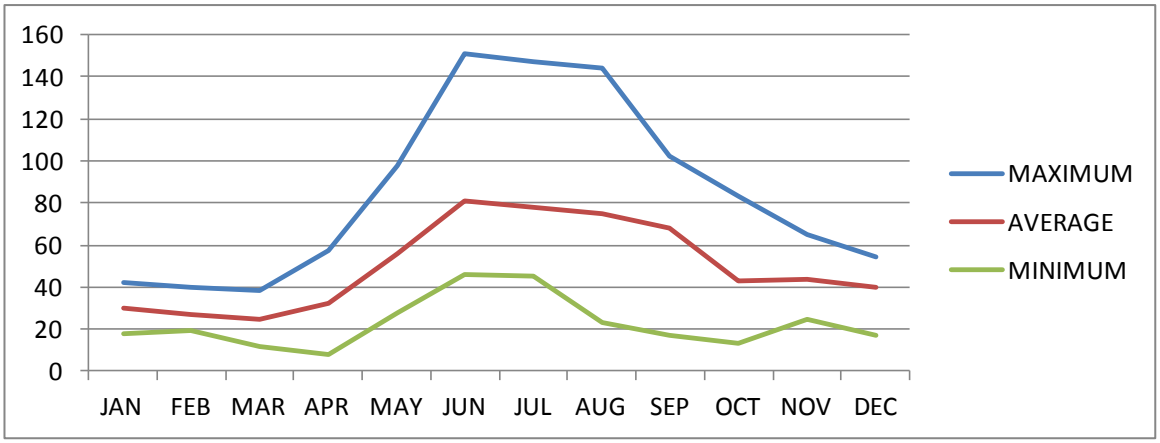


Figure C2-3 Average, Maximum and Minimum Precipitation for Visimski Natural Reserve (mm per month)

C2.3 Air Quality

In 2011, stationary emission sources located in the Gornozavodsky Administrative District (507 reporting enterprises) released 208,100 tonnes of pollutants (18.9% of total emission load generated in the Sverdlovskaya Oblast).

The major proportion of emissions is generated by industries producing iron, ferroalloys, steel and rolled products (31.5%), followed by power/gas/water generation and distribution industries (21.8%), iron ore mining industries (16.6%) and non-ferrous metal industries (15.0%).

The largest quantity of air pollutants is released by stationary sources located in Nizhniy Tagil (115,900 tonnes or 55.7% of the total emission load generated in the administrative district) and Verkhniy Tagil (43,000 tonnes or 20.7%). The list of major polluting industries located in the Gornozavodsky Administrative District (as of 2011) is presented in the Table below.

Table C2-1 Main Polluters in the Region (all reported pollutants)

Industry	Emission Load tonnes	% of Total Emission Load Generated in the District
EURAS Nizhnetagilskiy Metallurgical Plant JSC, Nizhniy Tagil	64.3	30.9
Verkhnetagilskaya GRES - the OGK-1 JSC Branch, Verkhniy Tagil	42.4	20.4
EURAS Vysokogorskiy Mining and Processing Plant JSC, Nizhniy Tagil	34.1	16.4
Polymetal Production Branch of the UralElectroMed JSC, Kirovgradskiy Urban District	27.6	13.3
Dzerzhnskiy's UralWagonZavod Scientific and Production Corporation JSC, Nizhniy Tagil	6.9	3.3
Nev'yanskiy Tsementnik Cement Plant CJSC, Nev'yanskiy Urban District	5.6	2.7

VTGRES share of reported emissions is composed mainly from dust, NOx, SO_2, CO emissions. A summary of VTGRES emissions is presented in the table below for the period 2003 to 2012.

Table C2-2 Summary of Main Emissions to Air

Year	NO_2, thousands tonnes	NO, thousands tonnes	SO_2, thousands tonnes	CO, thousands tonnes	Dust thousands tonnes
2003	8.891	1.460	18.538	0.651	19.118
2004	9.558	1.560	21.110	0.754	21.908
2005	8.492	1.380	13.957	0.485	13.809
2006	7.637	1.167	13.417	0.511	12.537
2007	7.906	1.285	12.551	0.492	12.847
2008	9.105	1.479	17.564	0.498	17.116
2009	5.450	0.885	16.026	0.457	16.081
2010	4.979	0.809	16.961	0.529	17.418
2011	6.150	0.999	16.984	0.547	16.807
2012	5.891	0.959	16.796	0.385	15.864

Manual sampling of ambient air quality was undertaken by Inter Rao at the borders of sanitary zone and in the residential areas between February and August 2012. The results for NO_2, CO, SO_2 and total suspended particulate are presented in Table below.

Table C2-3 Summary of Ambient Air Quality Status (mg/Nm3)

Measurement location	NO_2	CO	SO_2	Suspended dust
Sanitary zone border, point № 1	0.087	<0.6	0.38	0.25
Sanitary zone border, point № 3	0.030	<0.6	0.025	0.082
Sanitary zone border, point № 4	0.023	<0.6	0.033	<0.04
Residential area, point № 10	0.044	<0.6	0.067	0.086
Residential area, point № 11	<0.02	0.8	0.0175	0.13
Residential area, point № 12	0.044	0.7	0.013	0.088
Limit acc. to Russian Law, MAC (20 mins)	0.085	5.0	0.5	0.5
WHO air quality guideline (short-term exposure)	0.200 (1h)	30 (1h)	0.125 (1d)	0.05 (1d)

The limits stated in Russian Law for pollutants concentrations in ambient air are not exceeded.

It is not possible to make direct comparisons between the measurement data presented and the Russian Federation MAC limits and WHO guidelines, as the measurement period is unconfirmed at this stage. The limits and guidelines are therefore presented for information only.

C2.4 Surface Water

The Sverdlovskaya Oblast has a dense river network, many natural lakes and artificial water bodies (ponds and reservoirs). The hydrographic network comprises rivers draining the Ob/Irtysh and Volga/Kama River Basins. The majority of rivers (Tavda, Tura, and Iset) are part of the Ob/Irtysh River Basin (they belong to the Tobol River System emptying into the Irtysh River on its left bank). The rivers that are part of the Volga/Kama Basin, tributaries of the Kama River (Chusovaya and Kosova) and Belaya River (Ufa) flow across the southern and south western parts of the Oblast. The main watershed runs along the axial ridge of the Northern Urals, gradually shifting toward the eastern foothills in the southern section of the Middle Urals extending south of the Tagil River head. The Ufa and Chusovaya Rivers cut across the mountain range to the west.

There are over 2,500 lakes with a total water surface area of 1,100 km^2. The rivers are regulated by 122 reservoirs with over 1.0 million m^3 capacity each and whose total water volume is 2,445,000 m^3. There are over 400 ponds whose capacities range from 50,000 to 900,000 m^3. Their history dates back to the 18th century when the mining industry developed extensively in the region. Major water reservoirs (Beloyarskoye, Volchikhinskoye, Reftinskoye etc.) were constructed in the 1940s-1970s.

Marshes and swamps occupy about 15% of the Oblast area. These are mainly concentrated in the north eastern lowland sections with little or no drainage; and become progressively scarce to the south. Very few marshes occur in the mountain area though some depressions between mountains are waterlogged.

The VTGRES is located on the Tagil River, which is the right-bank tributary of the Tura River (the Tobol/Ob River Basin). It has a length of 414 km and drains a basin of 10,100 km^2. The River rises on the eastern slope of the Middle Urals; it has a stepped bed in the upper sections and meandering channel in the lower section. The river is fed from a number of sources with snowmelt water being the main of them. The water level variation over a year is 3.3 m and average flow discharge is 40 m^3/s. The river freezes up in early November and breaks up in mid-April. The river flow is regulated by the Verkhnetagilskoye and Nizhnetagilskoye Reservoirs. The water level variation over a year is 3.3 m and average flow discharge is 40 m^3/s; the average channel slope is around 1 m/km. Main tributaries include the Barancha, Salda, Mugai and Kyrtomka Rivers. The Verkhnetagilskoye, Lenyovskoye and Nizhnetagilskoye Reservoirs, and Verkhniy Tagil and Nizhniy Tagil cities are located along the Tagil River. The Tagil river has the following tributaries that run through the district: Polovinka, Belaya, Bobrovka, Sibirka, Vogulka.

Key water bodies located in the administrative district include the Neiva, Tagil, Tura, Barancha, Salda, and Kushva Rivers; and the Verkhnetagilskoye, Nizhnetagilskoye, Verkh-Neivinskoye, Neivo-Rudianskoye, Verkhne-Turinskoye and Baranchinskoye Reservoirs. There are 46 surface water intakes in the Gornozavodsky Administrative District, which account for 23% of total water consumption in the Sverdlovskaya Oblast. In 2011, water users in the Gornozavodsky Administrative District consumed 221.53 million m^3 of water (as compared to 231.30 million m^3 in 2010). The major water users accounting for about 80% of the District's total water consumption are EURAS Nizhnetagilskiy Metallurgical Plant JSC; Vodokanal NT LLC Nizhniy Tagil; VSMPO-AVISMA Corporation JSC, Verkhnesaldinskiy Urban District; Dzerzhnskiy's UralWagonZavod Scientific and Production Corporation JSC, Nizhniy Tagil; MUE Vodokanal, Novouralskiy Urban District; and Uralskiy Electrochemical Plant JSC, Novouralskiy Urban District.

The proportion of wastewater discharges generated in the District is 28.5% of the total wastewater discharges in the Sverdlovskaya Oblast. The general wastewater discharge pattern in the Gornozavodsky Administrative District can be broken down as follows: contaminated (untreated) wastewater (5.9%), contaminated insufficiently treated wastewater (89%), uncontaminated wastewater that meets water quality standards (4.2%), wastewater treated to standard (0.9%).

C2.5 Solid Waste

According to the official statistic reporting data submitted by enterprises located in the Gornozavodsky Administrative District of the Sverdlovskaya Oblast, these enterprises generated 24.2 million tonnes of waste..

According to the Sverdlovskaya Oblast Waste Register, there are 125 waste disposal sites in the Gornozavodsky Administrative District, including 8 sites of uncertain ownership and agricultural waste sites. Of the 50 existing municipal waste disposal sites, operator's responsibilities remain unclear for 20 of these sites. Ten companies were found to be engaged in the collection, reuse, treatment and disposal of waste of Hazard Classes 1-4 without license. For this purpose, they used 5 agricultural waste sites and 18 municipal waste disposal sites.

C3 Ecology and Landscape

VTGRES is located in the Central/Middle Urals Mountain Province within the Middle Urals Landscape Region, in the middle latitudes and moderate zone. The area is covered by the Middle and Southern Taiga fir/spruce and sometimes spruce/fir forests on podzolic and sod podzolic soil; these forests also include linden trees in the south western section. Dark coniferous forests are widely distributed and comprise vegetation communities dominated by spruce, fir and cedar. Spruce is a key forest species; a relatively minor proportion is accounted for by fir. Increased humidity and a more favourable temperature regime provide good conditions for the development of these water-loving and shade-tolerant tree species.

The Sverdlovskaya Oblast is among the oldest mining areas in Russia and a leading region in terms of confirmed and projected mineral reserves. This factor underpinned the intensive development of such economic activities as ferrous and non-ferrous metallurgy, construction, chemistry, and mineral resource extraction (including gold mining). Tagil River was one of the most polluted rivers in 1950s due to the mining activity in its basin.

The Sverdlovskaya Oblast has a rich and distinctive flora comprising about 1,600 wild vascular plant species. The Sverdlovskaya Oblast Red Data Book includes 100 plant species. In addition, local flora also comprises over 80 rare and endangered species that require special protection.

Local wildlife comprises 55 mammal species, 228 bird species, 37 fish species, 14 reptile and amphibian species. The mammal community comprises brown bear, wolf, lynx, sable, marten, fox, American mink, beaver, elk, roe, and boar. Key bird species include goose, duck, wood grouse, black cock, hazel grouse, partridge, wader, pigeon, rail, and quail. All these species are classified as hunting resources. The taiga fauna species occur widely in the area along with a number of acclimatised species (musk beaver, American mink, boar and beaver (re-acclimatised)). The following species are included in the Sverdlovskaya Oblast Red Data Book: river otter, European mink, European reindeer, flying squirrel, common hedgehog, 7 Chiropteran species and 22 bird species.

There are 1,634 protected areas occupying a total area of 1,367,400 ha (7.04% of the Oblast area). The most important of them are: the Visimskiy and Denezhkin Kamen (Money Stone) state nature reserves; the Pripyshmiskiye Bory national park; the Olen'yi Ruch'yi, Reka Chusovaya, and Malyi Istok natural parks; and the Rezhevskiy natural mineralogical site.

Verkhniy Tagil is located in the Tagil River valley running between the following mountain chains: Dolgaya, Malinovaya, Chaschinskaya and Kamenskiye, Krasnyie and Old Stone. The Tagil River rises on the south eastern slope of the Pereval Mount in the Krasnyie Gory Mountain Branch, characterised by mountainous and hilly terrain, five km west of the Novouralsk Town. The Tagil River is the right-bank tributary of the Tura River.

The following protected areas are located in the Project area:

- Visimsky Biosphere Reserve (appr. 9 km to the west);
- Alekseevskoye Boloto (Marsh) Natural Memorial (appr. 6 km to the east);
- Lubnaya Mount (appr. 6 km to the west).

The Visimsky Biosphere Reserve is the state biosphere reserve located in the Sverdlovskaya Oblast to the west of the Verkhniy Tagil Town and outside the immediate impact area of the VTGRES. The reserve is under protection of UNESCO. This site was established in 1946 within an area of 56,400 ha as the Visim Reserve. It was closed in 1951 and re-established on 6 July 1971 under its current name (Visimsky Reserve) and occupied 9,500 ha. In 1973, the area of the reserve was extended to 13,500 ha and a 66,100 ha protective zone was established. In 2001, the area of the reserve was further extended to 33,500 ha by converting part of its protective zone. This included establishing a biosphere pilot site occupying 7,750 ha and granting a status of biosphere reserve to this nature reserve. Currently, the area of the protective zone is 46,100 ha. The relief is low-mountain with prevailing southern-taiga fir-spruce forests with the pine, birch, aspen, and Siberian pine. The Zapovednik area is the south-western edge of the Siberian pine distribution range. The area is rich in rare species: 37 species if mammals (including the brown bear, wolf, wolverine, lynx, badger, Siberian weasel, ermine, mink, otter, European beaver), 130 avian species (including hazel grouse, wood grouse, black grouse); 4 amphibian, 3 reptilian species, 12 fish species (including European grayling, minnow, burbot, bullhead), many species of insects (including the Apollo listed in the Red Book of the Russian Federation).

The Alekseevskoye Marsh Natural Site is a lowland marsh located in the Kirovgradsky Urban District near the Neivo-Rudianka Settlement and occupying 512 ha. It has the status of the botanic and hydrologic natural site of Oblast significance. The site is rich in cranberries and medicinal plants.

The Lubnaya Mount is located near the Verkhniy Tagil Town. Its summit comprises unusual columnar rocks and rate plant species habitats. There are also the ancient camp site and the geomorphologic and botanic natural site.

The following natural memorials have been identified within the protection zone of the Visimsky Reserve: the Old Stone; the Small Stone; the Notikha River Cedar Forest; the Bolshiye Galashki Village Ancient Forest; the Sulyom River Outcrops; and the Shaitanskoye Marsh.

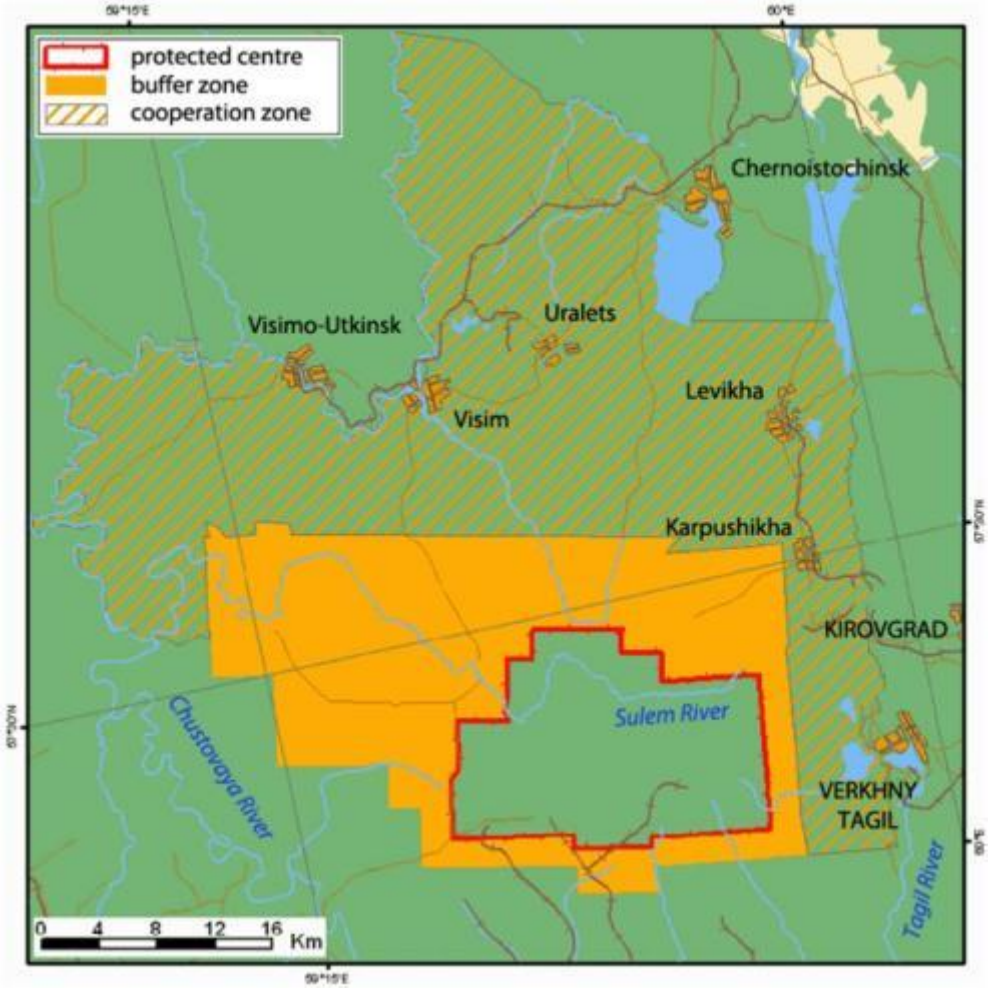


Figure C3-1 Protected areas in the Project area - Visimsky Protected Area

C4 Human Geography

C4.1 Socio-Economic Environment

C4.1.1 Area of Influence

The primary area of influence is the focus of the impact assessment and it encompasses all project impacts on local resources and receptors. It includes the areas within the boundaries of Verkhniy Tagil and Kirovgrad Urban Okrugs surrounding the Project site.

The secondary area of influence is a wider, regional level study area and includes larger scale economic and infrastructure impacts. This area can be identified as Gorno-Zavodsky Managing Okrug and the southern part of Sverdlovsk Oblast.

The tertiary area of influence considers the wider, national and international scale impacts of the Project.

C4.1.2 Administrative Division and Governance

A distinctive feature of the Sverdlovskaya Oblast governance structure is its four-tier architecture, which has been in place since 1996. To maximize the efficiency of state governance, the Oblast is divided into 5 administrative districts (Okrugs) that are not the same as the administrative and territorial units. VTGRES is located in the Gornozavodsky Managing Okrug. There are 94 municipalities in the Sverdlovskaya Oblast.

The Verkhniy Tagil municipality is located in the Verkhniy Tagil Urban Okrug whose administrative centre is based in the town of Verkhniy Tagil. The Okrug's administrative and governance division is illustrated in Figure below.

Figure C4-1 Administrative and Governance Division

The socio-economic environment is described below for the Sverdlovskaya Oblast and the Verkhniy Tagil Urban Okrug.

C4.1.3 Sverdlovskaya Oblast

The Sverdlovskaya Oblast is one of the largest constituent members in the Russian Federation by virtue of its population (4.3 million people), the scale of industrialized economy and being among the most urbanized regions in the country. Urban settlements account for 84% of Oblast's population. The capital city of Yekaterinburg is the largest urban settlement in the Ural Region with a population of 1.39 million people (including those settlements that are under jurisdiction of the Yekaterinburg City Administration), which is 32% of the total Sverdlovskaya Oblast population.

Among 46 other towns in the Oblast, only Nizhniy Tagil, with its population of 361,000 people, can be classified as a large city. Two other towns (Kamensk-Uralskiy and Pervouralsk) have populations of 100,000 to 200,000 people; nine towns have populations of over 50,000 people; and the remaining 70% of urban settlements are small towns with populations below 50,000 people.

The demographic indicators in the Sverdlovskaya Oblast, like the other neighbouring Oblast of the Ural and Trans-Ural Regions, are similar to the country averages (Figure C 4-1). Whilst the depopulation process began one year earlier than in other regions, population aging has occurred at a slower pace. As a result, the birth rates during the economic recovery were higher and death rates were lower than in the industrialized Oblasts in the Central Russia where depopulation processes were more intensive. There are however significant differences among various areas within the Oblast. For example, half of districts have death rates of 17% and higher as compared to the Oblast average (14%).

The age structure of the Oblast population is similar to the country's average but the aging process occurs at a faster pace.

Table C4-1 Age structure in the Oblast

	Year	Population Broken Down by Age (%):		
		Under working age	Working age	Above working age
Russian Federation	2003	17.3	62.4	20.3
	2011	16.2	61.6	22.2
Sverdlovskaya Oblast	**2003**	**16.6**	**63.0**	**20.4**
	2011	**16.0**	**61.1**	**22.9**

Until the mid-2000s, natural processes shaped the population change in the region whilst migration played a marginal role. In the late 2000s, the inflow of migrants to the Sverdlovskaya Oblast increased to 13-20 people per 10,000 people and almost completely offset the natural population decline. However, the most attractive destinations are the capital city and several medium-size industrial towns within the boundaries of the Yekaterinburg agglomeration (Berezovskiy, Verkhniaya Pyshma, Revda, and Pervouralsk) where leading industries have a more stable economic position and higher wage levels. In the majority of Oblast's districts (20 of 30) and in one third of towns for which published statistics is available, populations continue to decrease due to natural decline and migration outflow.

The Sverdlovskaya Oblast has harsh climatic conditions and agriculture therefore plays a secondary role in its economy, partially covering the regional demand for milk, meat and potatoes. The agricultural sector is subsidized from the Oblast budget. The food industry develops at a more rapid pace due to ever growing demand for food products in the city with more than one million residents. The Oblast ranks 5-6 in the country in terms of dairy and meat product outputs.

Despite all transformations, the structure of employment in the Sverdlovskaya Oblast remains more industrialized than the country average. This difference has become even more marked since 1990 when the proportion of the Oblast population employed in the industrial sector was 30% higher than the country average - the difference increased to 40% by 2010. This means that the heavily industrialized Ural Region has had slower employment decline rates than other regions in the country. Similar trends in the industrial employment rates are typical of the neighbouring Chelyabinskaya Oblast and Tyumenskaya Oblast. The concentration of economic activity in the regions specialising in the production and processing of exported natural resources is accompanied with the growth of industrial sector employment in these regions.

The population's living standards in the Sverdlovskaya Oblast have improved considerably during the economic recovery. Real cash income levels have tripled from 1999 to 2007 due to progressive growth of wage levels in key sectors, including metallurgy and defense industries. The Oblast has highest income growth rates not only in the Ural Region but also among other developed regions in Russia. In 2010, the Oblast ranked sixth among other RF constituent members in terms of the per capita cash income to minimum subsistence level ratio, even despite the fact that population income levels were not particularly high before the 2000s.

The Sverdlovskaya Oblast has high rates on social diseases (HIV, tuberculosis). As of 01.05.2013, 61,433 HIV-infection cases were recorded in the Oblast. The HIV prevalence rate reached 1,393.13 per 100,000 people, which is 2 times higher than the country average. In 2013, 2,230 HIV infection cases were recorded in the Oblast, which corresponds to 50.57 per 100,000 people. The Sverdlovskaya Oblast ranks first in the total number of HIV-infected people and third in the HIV prevalence rate in the Russian Federation.

The HIV has affected all social and age groups in the society. The highest HIV prevalence rates are recorded among the young working age people. For example, 1,859 (83.3%) persons diagnosed with HIV in 2013 are people in the age group of 18 to 39.

Tuberculosis is another pressing issue in the Sverdlovskaya Oblast and entire Ural Region. In 2009, the tuberculosis incidence rate in the Oblast was 105.8 per 100,000 people. The highest

incidence rates are recorded among people in the age group of 25 to 34; the age group of 45 to 54 has the highest mortality rates. The TB incidence rates and mortality rates among women are lower than among men by 2.9 times and 5.3 times, respectively.

Ethnography and Religion

The ethnic structure of the Sverdlovskaya Oblast population is dominated by the Russians (90.6% according to the 2010 census), followed by the Tatars (3.5%) and Bashkirs (0.8%) living in the south.

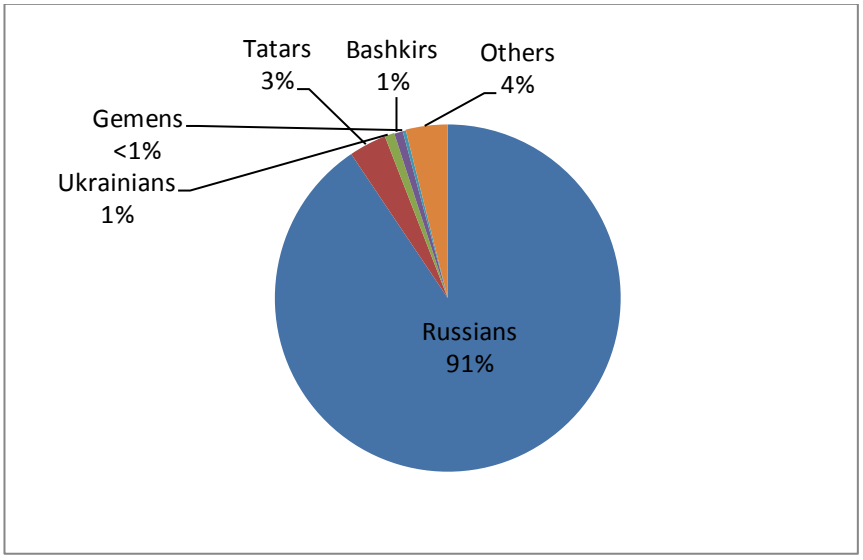


Figure C4-2 Sverdlovsk Oblast: Ethnic composition

In terms of religion the society is dominated by the Orthodox and Muslim communities. Other faiths are represented by limited number of believers.

Economy

The Sverdlovskaya Oblast is a major industrialized region in Russia. In 2007, it accounted for 2.9% of Russia's Gross Domestic Product (GDP) and ranked fifth in the country by GRP after the federal cities, Moskovskaya and Tyumenskaya Oblasts (with their autonomous Okrugs). During the period of economic growth, the per capita GRP in the Sverdlovskaya Oblast was close to the country average (98% after an adjustment was made to take account of the cost of living in the region). However, the regional industrialised economy was hard hit by crisis in the late 2000s; the 2009 GRP dropped by 11.6% relative to the previous year's level. The rate of decline was one of the highest among other regions in Russia.

The Oblast's economy is mainly based on industrial sector, which used to account for up to 40% of GRP during the period of economic growth in the 2000s. Of that, over 33% of GRP was contributed by processing industries (the country averages are 34% and 20%, respectively). The Oblast ranks third in the country after the Moscow Oblast and Khanty-Mansi Autonomous Okrug by value of industrial production (Table C4-2 below).

Table C4-2 Production Output Structure in 2010, %

Economic Activity	Sverdlovskaya Oblast	Chelyabinskaya Oblast	RF
Food production, including beverages and tobacco	6.6	8.8	17.5
Chemical production, rubber and plastic goods	4.8	1.8	10.3
Manufacture of other non-metallic mineral products	4	6.5	4.4
Metallurgical production, including metal fabrication	57.8	62.8	18.4

Manufacture of vehicles, machinery and equipment	15.5	11.8	19.7
Other production processes	11.3	8.3	29.7

Settlement and Land Use

The development of the Middle Urals began during the Peter the Great era and had an industrial focus from the very outset. Many towns, including the Oblast's capital city of Yekaterinburg founded in 1723, grew from small factory settlements.

Urban settlements account for 84% of Oblast's population. The capital city of Yekaterinburg is the largest urban settlement in the Ural Region, with a population of 1.39 million people. It is located at the intersection of the west-to-east road to the Siberia with other north-to-south roads and became the main centre in the Ural Region in the 18th century, and a millionaire city (by population) in the late 1960s.

Mono-sectoral economy is a typical feature of small and medium towns in the Oblast, with 33 of them continuing to function as the satellite towns of major industrial plants. In the past, there were about a hundred townships in the Oblast but many of them were reorganised as rural settlements in 2004. There are several former (closed) military towns in the Oblast such as Lesnoy and Novouralsk. Over 40% of Oblast's population live in the towns and settlements with a mono-sectoral economy, being completely dependent upon the main town's employer.

In the mid-1990s, the leading industries in the Sverdlovsk Oblast were privatised by major business groups. In this situation, the state of social infrastructure in the towns with mono-sectoral economy completely depends upon the corporate policies of industry owners.

The land use pattern in the Sverdlovskaya Oblast comprises various land use categories, being dominated by forest land (70.2% of Oblast's area) and agricultural land (21%). Residential areas occupy 736,000 ha (3.8%) and industrial land accounts for 2.2% of Oblast's area.

Employment and Labour Market

The Sverdlovskaya Oblast has a large labour market with over 2.3 million economically active people (69% of people aged 15 to 72), which is typical of urbanised and industrialised areas. In the 1990s, the number of people employed in the industrial sector decreased by one-third whilst the total employment decreased by only 15%. Generally, changes in the regional employment pattern were similar to those observed in other regions: a decline in the industrial employment was accompanied by an almost twofold increase in the number of people employed in the trade and budget-funded sectors. These trends continued throughout the 2000s, and the number of people employed in the trade and service sectors is now comparable with the number of people employed in the industrial sector (Table C4-3 below).

Table C4-3 Employment by Economic Activity, %

Economic Activity	Sverdlovskaya Oblast		RF
	2000	2010	2010
Agriculture and forestry	7.6	5.3	10.1
Industry	33.5	27.6	19.7
Construction	5.2	6.4	8.0
Trade, hotel services etc.	13.7	21.3	19.6
Transport and communications	7.2	6.6	7.9
Public governance, military security	4.6	5.3	8.2
Social services*	20.3	18.1	19.2
Other activities	7.9	9.4	7.3

* Education, healthcare, provision of municipal, social and personal services

The level of unemployment in the Oblast is slightly lower than the country average. The internal differences existing in the Sverdlovskaya Oblast labour markets are underpinned by several factors. Unemployment is minor in the large industrial cities of Yekaterinburg and Nizhniy Tagil with their diversified labour markets.

Labour markets are more vulnerable in the towns with a mono-sectoral economy, where unemployment rates are significantly higher. The vulnerability of local labour markets in numerous industrialised towns in the Sverdlovskaya Oblast can be illustrated by the notable increase in the registered unemployment rates from 1.6% in 2008 to 3.9% in 2009.

In the towns with mono-sectoral economy, population is less mobile because several generations worked at the same industrial plant, and any significant decrease in employment as a result of transition to market economy could lead to a social explosion. Despite difficulties faced by key industries in these towns, the growth of registered unemployment was relatively moderate because industry owners opted to use such arrangements as part-time employment, forced leave for workers, provision of temporary employment opportunities, and organisation of public works. As a result, the real level of unemployment (up to 9% of total number of employed people as of Q1 2009) was partially hidden.

C4.1.4 The Verkhny Tagil Urban Municipality

The Verkhniy Tagil Urban Municipality (Городской округ Верхний Тагил) includes the Verkhniy Tagil Town, Belorechka Settlement, and Polovinniy Settlement.

Demographics

The Verkhniy Tagil Urban Municipality occupies an area of 310.57 km^2 within the boundaries approved in 2002. The Verkhniy Tagil Town itself - the Municipality's administrative centre - occupies 31.26 km^2. The Municipality has a population of 14,000 people (as of 1 January 2009), 12,174 of which live in the Verkhniy Tagil Town itself.

Adverse changes have affected local demographic situation over the past few years. For example, the number of births recorded in the municipality in 2007-2009 was 460 against 712 deaths recorded over the same period. This means that the mortality rate is higher than the birth rate by more than 1.5-fold. In 2011-2012, the birth rates were at 11.9 (2011) and 9.8 (2012) whilst the death rates were 18.1 in 2011 and 16.6 in 2012. This illustrates that adverse trends in birth and death rates continue.

The age structure of population living in the Verkhniy Tagil Urban Municipality and its settlements is described in Table C4-4 below.

Table C4-4 Population Age Structure

Age Group	Urban Municipality	Including:		
		Verkhniy Tagil Town	Belorechka Settlement	Polovinniy Settlement
Below working age (0-15 years), %	15.0	14.9	10.7	16.6
Working-age population (16-59/60)), %	50.9	49.6	66.8	58.1
Above working age (60/65) and over), %	34.1	35.5	22.5	25.3

The current age pattern of the local population is dominated by elderly population group which is twice as large as the below working age group, which implies an upward average-age trend.

As of 01.01.2008, the sex structure of the population residing in the Verkhniy Tagil Town was 55% female and 45% male. No more recent data about the sex structure of the town and other settlements within the urban municipality has been identified to date.

The migration-related population decline was -67 people in 2010 and -111 people in 2011. Whilst no migration data for previous years has been provided to date, the figures are quite striking because the most active and mobile people are more likely to migrate. As a result, the VTGRES may be at risk of losing its potential workforce.

The population disease statistics is currently reviewed and will be included in the Final Report. It is however worth to note that the current rates of HIV/AIDS and other social diseases are high. The HIV/AIDS rates in 2011 and 2012 are presented in Table C-4-5[1]. As can be seen from the Table, current HIV/AIDS rates in the municipality are higher than the country average by about 3-fold.

Table C4-5 Number of infected per 100,000 People

	Number of Infected per 100,000					
	Verkhniy Tagil		Sverdlovskaya Oblast		RF	
	2011	2012	2011	2012	2011	2012
HIV/AIDS	1,474	1,503.90	1,208	1,343 (or 2057)[2]	300-4003	500
Tuberculosis	486	568	105 (2009)		85 (2008)	

Employment

According to data provided by the local Employment Centre, the economically active population that are living in the municipality totals 8,000 (as of 01.01.2009), while the total number of people actually employed in 2008 was 6,270, or 78% of total economically active population.

According to estimates produced by the Planning and Economic Department of the Urban Municipality Administration (as of 01.01.2009), the local employment structure is as follows:

- Industrial production sector: 26.2% (1,640 people);
- Agriculture, hunting and forestry: 17.5% (1,100 people);
- Transport and communications: 2.6% (160 people);
- Construction sector: 2.9% (180 people);
- Retail trade: 8% (500 people);
- Non-production (service) sectors (education, healthcare, recreation, culture and sports): 17.9% (1,120 people);
- Other sectors: 25.0% (1,570 people).

As of 01.01.2009, the number of officially registered unemployed in the urban municipality was 149 people, or 1.86% of the economically active population. Due to economic crisis and large-scale layoffs at the Verkhnetagilsky Structural Unit Plant LLC, the number of unemployed increased to 390 people by 25.05.2009, raising the unemployment rate to 4.93%. The situation stabilised further into 2009, with the number of unemployed being 385 people, or 4.53% of the economically active population, by 08.06.2009.

C4.2 Archaeology and Cultural Heritage

Currently, the Oblast has 293 archaeological monuments (including archaeological sites protected by the state), and 1,200 identified archaeological heritage sites. Many of them have been discovered in the recent years and only about 5% of them have been excavated. The major

[1] The HIV/AIDS statistics has been provided by the Company.
[2] Different sources provide different data
[3] Drawn from various sources (http://www.hospital-apteka.ru/digest/epidemiologia/3007-v-2012-godu-chislo-sluchaev-zabolevaniy-aktivnym-tuberkulezom-snizilos-na-5-a-boleznyu-vyzvannoy-vich-uvelichilos-na-125.html)

proportion of these sites (about 77%) are ancient settlements of various types. Among these sites there are: ancient metallurgical works (12), rock engravings (23), holy and cult sites (28) and burial mounds and graves (38).

The majority of sites comprise two and more historical layers, and it is sometimes difficult to disentangle these various layers due to the slow nature of sediment deposition and cultural layer development processes.

There are no cultural heritage facilities registered in the Federal Register in Verkhny Tagil Urban Okrug. There are 12 cultural heritage objects in Kirovgrad Urban Okrug.

C4.3 Baseline Noise conditions

The closest noise sensitive areas to VTGRES are:

- residential area “Sibirskaya”, located about 900 m to the east from the investment area on the opposite bank of Verkhnetagilskiy reservoir and consisting of single family houses;
- residential area “Sortirovka”, located about 800 m to the south west from the investment area and consisting of single family houses.

No noise measurements are available for these areas.

The results of noise modelling done as a part of Sanitary Zone documentation in 2011 are presented below.

Table C4-6 Noise modelling results

No	Location of calculation point	Equivalent noise levels dB(A) Height 1.5 m
1	Border of the Sanitary Protection Zone	36.75
2	Border of the Sanitary Protection Zone	34.11
3	Border of the Sanitary Protection Zone	34.87
4	Border of the Sanitary Protection Zone	36.72
5	Border of the Sanitary Protection Zone	33.52
6	Border of mazout storage area	44.21
7	Border of mazout storage area	40.92
8	Border of mazout storage area	38.72
9	Border of mazout storage area	40.05
10	Border of mazout storage area	41.28
11	Border of VTGRES main area	42.26
12	Border of VTGRES main area	42.47
13	Border of VTGRES main area	57.11
14	Border of VTGRES main area	54.27
15	Border of VTGRES main area	52.05
16	Border of gardens	40.79
17	Border of gardens	38.01
18	Residential Area, Nabereznaia 2 street	39.75
19	Residential Area, Frunze 13 street	39.67
20	Residential Area, Frunze 27 street	39.39
21	Residential Area, Nabereznaia 12 street	39.39
22	Residential Area, Nabereznaia 20 street	39.41
23	Residential Area, Voksalnaia 3 street	39.15
24	Residential Area, Voksalnaia 9 street	40.03

The noise levels calculated for residential areas do not exceed the limit of 45 dB(A) in the night-time.

The results of noise modelling for the existing VTGRES operations are presented on Figure C4-3 below.

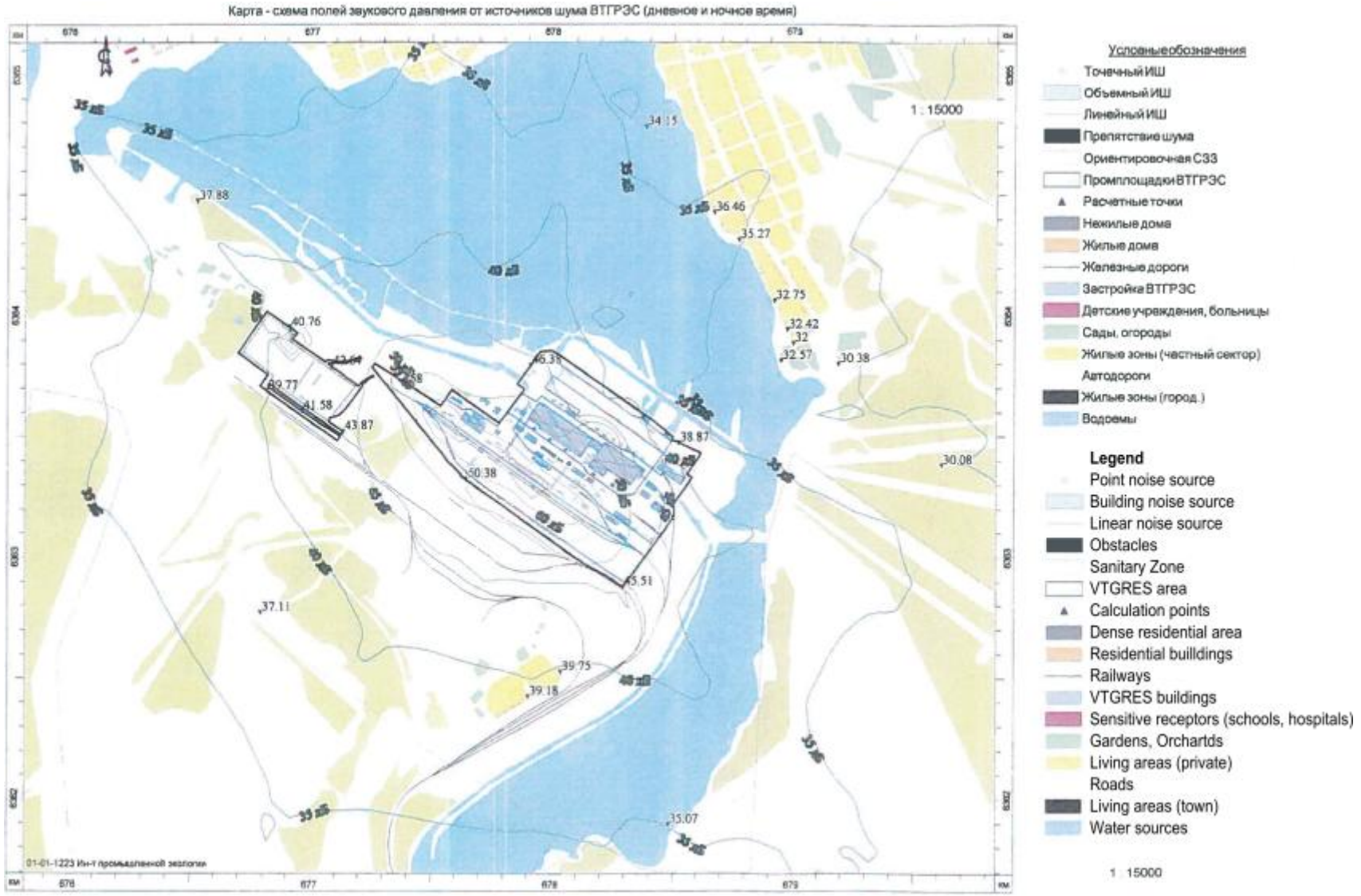
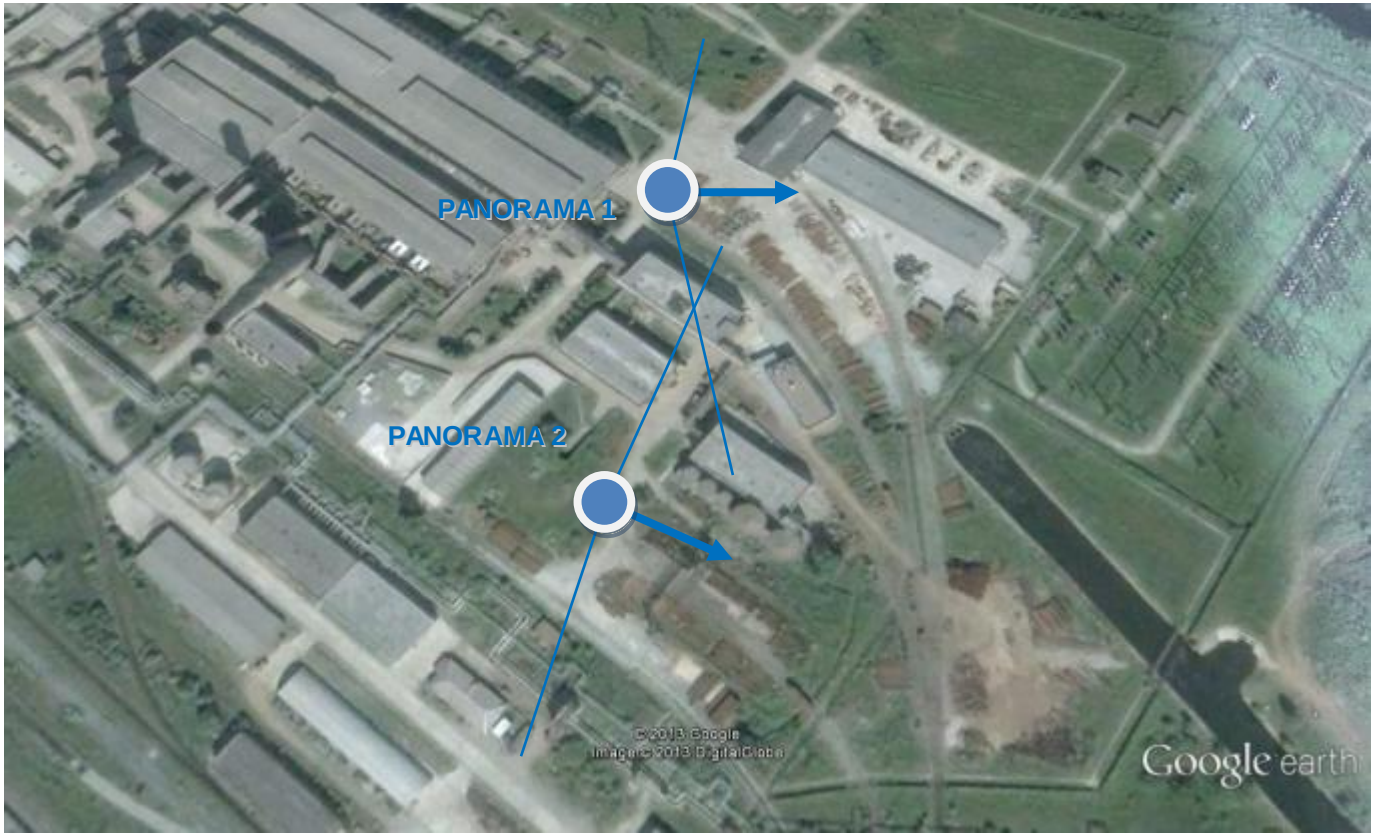


Figure C4-3 Current Noise Impact of VTGRES Based on the Modelling Results Provided by Inter Rao

CI Panoramas

CI.I Panorama View Points



CI.II Panoramas

Panorama A: Northern part of the site

Panorama B: Southern part of the site

D Assessment of Impact

D1 Introduction

This section of the report describes the potential environmental impacts, both negative and positive, that are likely to result from the construction and operation of the proposed CCGT unit at VTGRES. Further assessment of the key project issues will be necessary to support the findings of this assessment (as presented in the following Sections). Where there is a requirement for further assessment this is detailed in the Environmental and Social Action Plan (ESAP) for the project. The key issues associated with the proposed development were identified in the scoping phase, as discussed in Section A5.

Environmental and social assessments are complex processes; they are multi-faceted and with many overlapping elements and require experience, expert knowledge and expert judgement. Further, within each technical discipline (e.g. ecology, noise, air emissions impact, landscape, social, economic etc.), there are assessment approaches / methodology which are specific to that discipline. Where specific approaches to identify and assess impacts have been adopted, these are described in the introductions to the pertinent sections associated with impact assessment. The impacts, corresponding management and mitigation measures, together with the residual impact after management and mitigation have been applied are summarised in Section E of this report. The presentation of residual impact has adopted a common approach to communicate the impacts of the project during construction, operation and closure and decommissioning.

The following sections provide an assessment of the potential impacts of the project activities during the construction, operational and decommissioning phases of the project.

Presented assessment of impacts has indicative character and refers to the scale described in chapter E2. In the order fro the best to the worst impact: Substantial Beneficial, Moderate Beneficial; Minor Beneficial; Negligible Beneficial; No Change; Negligible Adverse; Minor Adverse; Moderate Adverse; Significant Adverse.

Management issues are discussed in separate Section as they usually apply to all stages of the Project.

D2 Management

This section provides an assessment of general management issues which are related to all stages of the CCGT project.

Inter Rao, its main management contractor (Inter- Rao Engineering), VTGRES and all main CCGT contractors shall establish and maintain the organisational structure which will determine the roles, limits of responsibility and powers to the implementation of ESAP for the Project. The ESAP will include the following aspects:

- determining senior heads who will bear the comprehensive responsibility and one or more managers who will bear executive responsibility for separate aspects or stages of ESAP, including controlling different subcontractors;
- statement in relation to the obligations of the top level of leadership to ensure consistent and efficient execution of the tasks and agreed commitments (including environmental, health and safety issues);
- informing the general public and all concerned parties (stakeholders) about the obligations and corresponding responsibility;
- development of the program of informing and training for the employees who participate in the Project (in relation to the social and ecological aspects of the Project);

- written confirmation for conducting internal training of the Project employees in relation to informing them about social and ecological aspects.

Inter Rao, represented by VTGRES, bears general responsibility for the Project and ESAP implementation. A substantial amount of the CCGT construction works will be carried by several independent contractors (and their subcontractors) engaged by all parties. As a result the Investor (Inter Rao plus VTGRES) will implement procedures within the framework of the Contractor Management Plan in order to provide full informing of contractors about corresponding matters in the ESAP.

The ability of bidders to fulfill the requirements of ESAP will be analysed (e.g. in terms of skills and experience). Every contract will include the requirements connected with: ecological and social risks, health check verification of all contractor's staff, required number of personnel qualified in ecology, safety measures, proper transport procedures, agreed procedures for oversize load transport, noise during night time conditions, location of the staff parking and living areas etc. Standard procedures (uniform for all the contractors) for chemical and mechanical risks, working at height, acceptance procedures for crane movement, lift sharing rules, works with high temperatures and in confined spaces will be agreed .

Due to the high percentage of temporary workers, this group will receive additional on site training (performed by VTGRES) for every subcontractor.

Inside the area designated as the construction site, the clear division between office/sanitary and rest areas and construction site will be defined. The minimum amount of toilets and cold water distributors will be located within the construction area. The area designated as office/sanitary and rest area will have the minimum space distributed between the contractors and the common area used by all of the staff.

The drug and alcohol policy will be clearly published and printed in all of the main points of the construction site.

Inner roads will be properly managed, and their integrity and safety will be supervised by VTGRES staff. Regular spraying and cleaning will be organized. Washing unit for trucks and cars leaving the construction site will be organised and maintained through the whole activity period.

Waste storage areas will be defined inside the main proper construction area and inside the office/sanitary areas. Waste collection activities will be organised by VTGRES.

Management of the construction site will take fully into account the following documents, and the standards and instructions will include, but will not be limited to the following:

- The EBRD Environmental and Social policy, 2008;
- International Labour Organisation Instructions - guidelines on occupational safety and health management in construction activity;
- Environmental Impact Assessment of the Project;
- Labour Code of Russia;
- Inner Inter Rao investment, environmental, occupational health and safety and emergency procedures and regulations.

The requirements and rules for each phase of the Project (construction, operation and decommissioning) will be summarised in the formal document: Environmental Management Plan.

Management of the Project will create and implement Public Communication procedures in order to ensure continuous information sharing with the public / concerned parties regarding key environmental and social aspects over the period of Project implementation.

According to the Advisor's experience, the above management rules and procedures provide the proper tools for good implementation of the main EBRD policy rules.

D3 Construction

The following sections provide an assessment of the potential impacts of the project activities during the construction phase. A summary of the impacts, management and mitigation measures and residual impacts is presented in Section E. The Monitoring Programme is presented in Section F.

The details of the main equipment enclosures and laydown areas, methods of construction (e.g. the balance of on-site and off-site fabrication) and the building programme have not yet been established. Since much of the manufacturing plant is specialised, a large proportion of plant will be manufactured off-site and delivered to site on large road vehicles. The construction process will consist of typical activities including:

- preparation of the site area for development;
- demolition of existing structures;
- fill importing / exporting and site levelling;
- utilities and services connections to site;
- foundation piling / excavations and pouring concrete footings;
- erection of building frames and cladding;
- installation of equipment;
- ancillary plant erection;
- services connections;
- building fitting-out; and,
- commissioning.

Due to the size and nature of plant it will be necessary to provide substantial foundations. Also, as is typical of this type of process, there will be a significant conveyance of materials in and around the installation.

Construction of external connections, in particular the new natural gas pipeline, is a part of the project. Overall impacts connected with this activity will be typical for linear investment.

There is also a potential for environmental impact connected with associated activities such decommissioning of the existing coal-fired boilers; however, this particular activity is considered to be independent to the CCGT project.

Construction of new facilities to replace those that will be demolished (e.g. oily water treatment plant, warehouses etc.) will be accomplished before start of CCGT unit construction and are regarded as independent from CCGT project.

D3.1 Ecology and Nature Conservation

The new CCGT plant is located in the fenced industrial area of VTGRES. The closest valuable natural areas are located about 6 km from the proposed plant.

The biodiversity of the construction area as well as its direct surroundings is very limited. There are no green areas or plants of any ecological value at the construction area, which is currently mostly covered with concrete.

The most important ecological features are the water reservoirs, which provide a basis for local wildlife (fish, amphibians, birds, insects etc.). However due to significant existing industrial impacts (high water temperature and related effects) the present day ecological value of water reservoirs is rather limited.

No further information on local ecology is available and at this stage in the Project no field surveys have been undertaken to determinate presence of the valuable habitats species, neither for the proposed CCGT location nor for the proposed gas pipeline route.

Construction of the new CCGT unit is not expected to have any adverse impact on protected areas like Visimsky Biosphere Reserve (~ 9 km to the west). The construction of the Project is not expected to have any impact on habitats or to cause any notable changes to scenic landscaping. Analysis of the Project shows there is neither the risk of any trans-boundary effects nor the need to establish a limited use area.

The main potential ecological impacts of the construction of the CCGT can be summarised as:

- limited dust emission at the construction period;
- increased long distance traffic that could be routed through ecologically sensitive areas;
- discharges of muddy water from excavations drainage to surface water;
- discharges of waste water (e.g. sanitary, with oil content) to surface water;
- entrapment of small amphibians / mammals in deep excavations where there is no opportuity for escape;
- contact of fauna with hazardous substances used during the construction process leading to death or harm.

Proper measures need to be applied to prevent adverse environmental effects. In particular heavy transport routing should be planned to avoid vehicles passing through valuable nature sites as well as populated areas. Drainage water should be cleaned up to avoid excessive discharged of suspended solids. Sanitary waste water from workers camp needs to be discharged to existing sanitary waste water system for proper treatment. Storage of hazardous materials need to be managed and controlled to avoid spillage.

Excavations, if kept open for a long time, should be properly fenced off (with netting) to prevent small animals falling in.

Additional potential impacts associated with the construction of the 2.5 km long natural gas pipeline include:

- removal of valuable species of plants or habitats during the preparatory works;
- operation of heavy equipment in green areas, damage to trees / shrubs and damage to small watercourses in the vicinity of the pipeline corridor.

At this stage the knowledge of the pipeline corridor area is limited, therefore a basic assessment of ecological value of this area should be undertaken prior to construction. Clear procedural rules of operation of heavy equipment should be developed for workers. In case of high risk of damage to the trees their trunks should be covered with protective material.

In the event that appropriate management measures are implemented we classify the residual impact on local nature as **minor adverse**, this may rise to moderate if appropriate plans are not implemented leading to disruption and nuisance.

D3.2 Landscape and Visual

Landscape effects include direct and indirect effects on the landscape as well as effects on the general landscape character. Potential visual receptors and their sensitivity to the type of changes proposed have been identified and impacts have been assessed, along with the identification of possible mitigation measures to avoid, reduce and compensate for these impacts.

This report assesses both the short-term impacts associated with the construction of the plant and the long-term impacts relating to the operational lifetime of the installation.

The main receptor for all visual impacts are:

- residents of Sibirskaya district of Verkhniy Tagil located on the opposite bank of Verkhnetagilskiy reservoir;
- travellers using the road to Kirovrad;
- residents of Sortirovka settlement located to the south from the plant.

Construction works are usually connected with a number of operations that influence the visual impression of the site, these include:

- heavy transportation on local roads and within the plant;
- tall equipment like cranes;
- storage of construction materials, often connected with fugitive dust emissions;
- construction of worker camps etc.

These impacts are however, temporary in nature. It is expected that visual aspects will be monitored and mitigated by proper supervision of materials storage and dust emission prevention, fencing of the construction area, periodical cleaning of the area etc.

Standard organisational measures will be applied to all participants of the construction process to avoid unnecessary visual impacts.

The above impacts would be both temporary and transient. The construction impacts on land cover at the main CCGT site will occur within relatively small and localised areas across the site. The construction of new 2.5 km long gas pipeline will result in adverse change in the land use of the site during construction due to the required construction activities within an agricultural and forest landscape. However these effects would only occur within a short time period and will have a limited degree of exposure on the wider area and as such, the effects on the landscape resources throughout the construction phases are expected to be **moderate adverse**.

D3.3 Traffic and Transport

The greatest potential for traffic and transport impacts is likely to occur during the construction phase. The construction phase will involve a large number of transport movements involving slow, long and potentially wide-load vehicles carrying the components of CCGT unit.

The principal environmental impacts resulting from development generated traffic will occur during the construction phase due to the need to bring construction staff, civil works traffic, mechanical works traffic and heavy and abnormal loads to the site.

It is expected that both railway and road transportation will be used for supply of the materials to the site. These activities will be connected with a number of nuisances for local community including:

- increased traffic on local roads and related traffic jams and extended travelling time;
- increased railway traffic;
- heavy loads on roads surface resulting in possible damage;
- noise nuisance along main transportation roads and railways;
- dust and exhaust gases emissions from car engines (NOx, CO).

The transport route covered by this assessment, as described in Section B5.2.2 will start from junction with Ekaterinbburg-Nizniy Tagil state road and will run to the town of Kirovgrad and then to Verkhiy Tagil. The elements of the installations, as well as construction materials, will be delivered via the local road passing by the Sibirskaya district and the dam on Water Reservoir No 4.

Construction of typical CCGT unit involves a relatively short period of transport activities. The period between the start of construction and the first commissioning tests of a CCGT can be as low as 7 months. The present timeline for the project proposes the period from early spring to late autumn 2015 for these activities. A detailed Transport Management Plan will be developed for this phase. The plan will govern vehicle movements in and out of the site and will be agreed with all institutional stakeholders prior to the commencement of the development.

According to preliminary data, the following amount of materials will be transported to or from the site during this period: approximately 150 various standard containers with the building contractors offices and light equipment, several cranes, trucks, excavators and similar machinery, ~35,000 m^3 of topsoil, ~5,000 m^3 of liquid cement, various steel constructions and some bulk pieces like turbine, transformers etc. Maximum daily passenger traffic is expected to be around 30 buses (not more than 700 workers) but the average number of construction staff on site per day during the whole 48 months period from start-up to commissioning is expected to be below 450 workers.

If required, abnormal loads would travel to site at night to limit the effects on local traffic flows. Up to 35 abnormal loads are expected for the transportation of the main generating CCGT plant. The contractor will make arrangements for these activities with the relevant road agency.

Traffic will go through the only access road to this region (Kirovgrad - Verkhny Tagil). This road will go through the town Verkhny Tagil. The existing temporary road through the forest on the eastern side of VerkhnyTagil reservoir cannot be used for such activities at present.

VTGRES will prepare the agreements with the local bodies responsible for road management. All vehicles will poses required permits and licenses for intended activity (for example trucks, busses) and oversize goods will be transported in accordance with special procedures. After the construction period (in the beginning of 2016) VTGRES will provide clearance of all temporary road facilities and repair any damage to the existing road infrastructure that occurs as a result of construction traffic.

During the summer months (June - August) VTGRES will regularly spray the road in the vicinity of, and inside, Verkhny Tagil city with water to keep the road clean from any dust and waste associated with construction transport activities. Additionally, at bulk storage areas, windblown emissions of dust will be prevented by spraying, covering or other measures.

Due to the fact that some chemicals will be transported (for anticorrosion activities etc.), VTGRES will supervise these transport activities in order to prevent any spillage or collision of the trucks that could endanger Verkhnetagilskiy Reservoir or local inhabitants.

A special parking area for delivery trucks will be organised at the western gate of the power plant. The parking area will possess all necessary sanitary facilities and a rest room.

A truck washing point will be organised near the gate for cleaning trucks before they enter the public road (if needed). The exact location of the necessary car parking and laydown areas has not as yet been determined.

Due to the significant number of crossings without traffic lights, the possibility of various collisions and for pedestrian protection; the traffic through the town (app. 1,400 meters) will be limited to a speed of below 40 km per hour

Transport of steel pipes and other equipment for the 2.5 km gas pipeline will be managed separately by a specialised contractor. Due to the fact that the gas pipe will be built through a forest area, and under part of the Verkhnetagilskyoe reservoir, additional equipment and specialist mobile cranes will be used. Access to the forest area will be agreed with relevant authorities prior to commencement of construction activities.

During any interruption to the piped gas supply it would be necessary to use gas-oil in the gas turbine. Assuming a worst case, that each day's requirement of oil is transported to site during a day, this would result in an average arrival of 3 - 4 tankers per hour.

The main components of the installation will be constructed off-site (at the manufacturers' sites) and transported to VTGRES. The transportation of the main, large - scale pieces of the CCGT unit will require detailed planning and agreement with local authorities. The plan of vehicles movements needs to be developed taking into account potential nuisance to local residents. Preferably railway transportation should be used to the extent possible. Truck transportation may result in exceedence of acceptable roads load parameters. If necessary, access roads will be reconstructed to meet safety requirements.

It is important that traffic nuisance mitigation measures cover not only Verkhniy Tagil but also Kirovgrad and other affected communities.

In the event that appropriate management measures are implemented we classify the residual impact as **moderate adverse**, this may rise if appropriate plans are not implemented leading to disruption and nuisance.

D3.4 Noise

Noise nuisance results from typical construction activities carried on site (steel construction assembly, construction machines operation like cranes, bulldozers, trucks etc.) and traffic on access roads to the site. These impacts have temporary character; however, the maximum noise level for some construction activities can be very high. In addition, vibration impacts may be a serious nuisance, in particular from certain ground works (like pilling / compacting) and from heavy traffic of trucks and construction machines. Vibration may cause health effects as well as damage to the buildings.

In order to construct the Project there would need to be significant volumes of materials transported to the site. Dependent on the routes that the vehicles take to get to the site, there may be increases in noise arising from the increase in traffic. Properties near the road side, like those in the Sibirskaya District, have the greatest potential of experiencing increases in noise due to construction traffic.

Properties within a few metres of a road with increased traffic flows may also be affected by an increase in groundborne vibration, particularly from heavy vehicles when there are irregularities in the road surface.

These issues need to be carefully studied on the basis of final construction design and local traffic patterns. Appropriate mitigation measures will be applied as necessary, potentially including operational practices, noise screens and reconstruction of roads surface.

In the event that appropriate management measures are implemented we classify the residual impact as **moderate adverse.**

D3.5 Socio-Economic Impacts

The following section describes the socio-economic impacts associated with the project construction activities. The significance of socio-economic impacts was determined based on the consideration of their direction, magnitude, geographic extent and duration.

Verkhiy Tagil town is inhabitated by approximately 13,000 people. The CCGT unit construction works will cause significant, temporary changes in the day-to-day life of the community. These will be caused by:

- increased levels of traffic causing temporary congestion and disturbance;
- disturbance to local residents from construction noise;
- perceived and real health impacts to local people;
- increased employment opportunities;
- increased economic activity;
- inflow of significant number of temporary workers from outside the regional area (levels could reach 700 workers in peak periods) who will need to interact with local community on many levels,
- promotion of the Verkhny Tagil area in the public media and other communities.

This brings several economical challenges for local community, including services (alimentation, rent of flats, local transportation, tourism etc.) as well as risks (conflicts, crime, diseases etc.). It can be assumed that some typical social issues may arise (conflicts between local staff / residents and external staff that could have quite different life experiences and tolerances against various types of behaviour).

The workforce needed during the construction phase of the Project will be sourced locally, nationally and internationally, through third party construction firms. Due to the technical nature of the Project and the low skill set in local communities, it is likely that skilled and semi-skilled labour will be sourced nationally and internationally.

Up to 700 construction workers may be required at the peak of construction. The construction phase will last for about two years, however not all workers will be employed all the time. The frequency at which workers will be employed and the duration of their engagement could not be estimated at the time of producing this ESS and will depend on the construction contractors'.

Employment of locals will have a significant effect on those who are employed; however, this will be a small portion of the total population. The employment of individuals from local communities will however be beneficial as it is expected to lead to improved relationships between the Project and local communities, improved local skill set (which may be valuable for future projects) and reduced influx of labour into the project area and the associated negative impacts. This impact has been assessed as low beneficial.

The creation of indirect employment opportunities is associated with:

- the project's supply chain (goods and services);
- spending of project employees in local communities.

Employment of non locals, as well as the increased incomes of local employees, may also bring in some minor benefits for local communities associated with increased spending in the Project area. Local communities surrounding the Project site have small shops, bars and restaurants, which may benefit from this.

There are no available data from which to estimate levels of indirect employment and the impacts will depend on the nature of the local economy, the availability of required goods and services in the Project area and ways in which employees choose to spend their earnings. The impacts related to indirect employment are assessed as minor beneficial.

The main task to protect local order and understanding between all the involved parties will be in the hands of local VTGRES staff.

The overall socio-economic impact associated with construction activities is difficult to predict, as various elements may become dominating. At this stage in the Project it has been classified as **minor adverse**.

D3.6 Health, Safety and Public Nuisance

There are several aspects of construction activities that need to be carefully planned in cooperation with local community.

These include:

- local traffic and safety measures to avoid accidents and difficulties associated with traffic movements. For instance additional traffic lights, change of signs, speed limitations etc. may be needed to prevent accidents / loss of life;
- local health care facilities may need additional training and to be strengthened to enable them to serve larger number of patients;
- local law enforcement services may need additional training and to be strengthened to enable them to compete with potential conflicts;
- waste water systems may need upgrading to prevent discharge of untreated waste to local surface waters;
- solid waste collection and disposal services may require upgrading to enable them to deal both with construction waste as well as domestic waste generated from the workers camp. The local community may need to upgrade its current solid waste landfill.

It is assumed that the appointed construction contractors will abide by the Russian Law on Labour and other relevant legislation, which is in agreement with EBRD's labour related

requirements. Similarly, it is assumed that all suppliers will have to comply with the same legislation.

The upgrading and widening of access tracks prior to construction will benefit local community as it will lead to improved travelling conditions. On the other hand, damages to road surfaces during transport of heavy machinery, leading to damages to motor vehicles, road accidents and the increase in costs for local government, are also possible. The investor is planning to make the necessary preparation of roads for heavy transport before construction and therefore this impact has been assessed as **minor adverse**. *However,* if roads used during construction are not restored, this could lead to tensions between Inter Rao and the local communities.

With careful planning and organisation of necessary infrastructure, the health, safety and public nuisance impacts of construction works on local community will be minimal.

D3.7 Land and Groundwater Quality

During the construction activities there will be no pre-planned direct discharges to ground. However, construction activities have the potential to release pollutants to the ground (topsoil, subsoil and natural strata) and groundwater as a result of accidental releases. Potential sources of pollution include:

- accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground - especially in the construction lay-down area, during delivery, material storage, handling and use (for example, re-fuelling, maintenance activities, etc.) with subsequent leaching to groundwater;
- accidental release of liquid wastes during waste storage, handling and removal, with subsequent leaching to groundwater;
- accidental discharge of sanitary wastewater to ground and groundwater from the workers domestic facilities; and
- accidental discharge of the water used for plant, equipment and vehicle washing (if contaminated) to ground and subsequent leaching to the groundwater.

The area required for construction is entirely within the ownership of VTGRES. Expected size is 3-4 ha for main CCGT unit, an additional 1-2 ha for auxiliary investments (including inner roads), a 4 ha temporary area used by construction contractor and approximately a 4 ha area of forest land taken for installation of the gas pipeline. The gas pipeline route will cross the forest areas east of the site. The procedure for changes to zoning characteristics has been already started (July 2013). The preliminary works stage includes the clearance and preparation of contractors' areas and the installation of services. The inner access road (from western gate to the site location) and/or repair of existing inner roads is planned. Main supplies, drainage works and all demolition works will be performed in this stage as well. Due to the tight schedule this preliminary stage (~5 months) is planned to start around summer 2014.

Due to the long industrial history of this site (1712 is the first known date of the construction of the oldest Verkhnetagiklskaya dam and reservoir), the land will be excavated with appropriate archaeological supervision and with a view of the potential presence of toxic chemicals, oils and asbestos. If there is any evidence of the presence of asbestos from 1950s construction activities, the proper precautionary measures will be applied.

The waste (potentially contaminated soil) from land reshaping and excavations will be properly selected and delivered to the appropriate locations. Clean overburden will be used for land shaping around the plant, building waste will be delivered to communal landfill and toxic waste will be delivered to licensed contractor. The estimated amount of excavated material is between 35,000 m^3 and 45,000 m^3 (in total less than 60,000 tonnes of material).

Contractors' areas will have drainage and storm water systems for protection of groundwater. The temporary storage of lubricating oils, chemicals, isolation materials, coolants and several other types of substances will only be allowed in designated areas which will be protected against spillage and against penetration of liquids into the reservoirs or groundwater.

There are three areas where the quality of groundwater it thought to have the potential to have been impacted as a result of past activities: the area around the landfill No 2 (used now by VTGRES), the area of mazout storage and grounds below (planned for rehabilitation and partial decommissioning) and the area around the main edifice of the VTGRES. Due to the necessity of a proper hydro geological and geotechnical review VTGRES will install at least 6 new observation wells around the site (for monitoring of groundwater quality, water levels and for observing the local and yearly changes etc.). Permanent monitoring of groundwater levels and quality is expected to start in 2014 and continue into subsequent years.

In 2015, due to the main foundation works, lowering of groundwater table in comparison with the current situation will be required (present situation 1- 2 m below the ground, the level around the construction site app 5 m below the ground). As a result, a temporary pumping station will be constructed by the contractor. Drainage water will be disposed to the industrial waste water system of VTGRES and will undergo appropriate treatment before being discharged to the reservoir. The drainage systems will be also used by the contractor responsible for drilling the underwater section of the gas pipeline (under the southern part of Verkhnetagilskyoe reservoir). An experienced drilling contractor will be selected with the proper qualifications for this type of works to ensure that the contractor has the technical capability to perform the works in a safe manner.

Due to the fact that the drainage activities performed during the construction stage may impact several other areas, a permanent hydrogeological review will be implemented during this phase of works.

VTGRES will organise a data base for groundwater quality all over the site and this will assist with the minimisation of the potential impact of construction activities on local water resources.

No drilling or piling to the artesian well level is expected (i.e. not more than 20 meters below the existing ground level). As a result there is no risk of contamination of any deeper groundwater strata.

Washing of the construction equipment will be performed in designated (paved) areas and will be undertaken with the minimum usage of detergents and chemicals. Only approved substances will be added to the washing water and daily limits on the usage of substances (less than 40 kg per day) will be strictly implemented for protection of both groundwater quality and river quality.

Good technical solutions will be implemented to ensure the full protection of both land and groundwater against any spillage or accidental contamination.

Measures will be employed to reduce the risk posed by the potential sources of pollutants discussed above. All possible steps will be taken to prevent materials being imported onto the site which are already polluted.

Potentially polluting materials, such as fuels, oils, chemicals and associated liquid waste materials, etc. will be stored in dedicated, segregated storage areas, with spillage protection and appropriate environmental security measures to prevent accidental release to ground during storage. In addition, appropriate working procedures will be adopted to minimise the risk of accidental release during transport of materials to or from the storage areas.

Working procedures will ensure that all materials (raw and waste) are handled correctly. Working procedures will seek to prevent accidental release during the use of these materials, for example, vehicle refuelling and plant maintenance, especially with regard to waste oil. Procedures will be adopted to minimise the potential for accidental discharge of pollutants during the washing down of plant, equipment and vehicles. Sanitary wastewater will not be discharged to either ground or groundwater.

In the event that the aforementioned measures are implemented, the residual impact to land should be **negligible adverse** and there should be **no impact** to groundwater.

D3.8 Surface Water and Effluent

During the construction activities, several potential impacts on local surface water can be identified. These include in particular:

- silty and contaminated water from de-watering of excavations;
- silty and contaminated water from rain water runoff from exposed ground, earth stockpiles, and muddy roads;
- silty water from vehicle/plant washing areas;
- leakage or accidental spillage of fuels, oils, chemicals etc, especially on the construction lay-down areas;
- washing down concrete mixing equipment;
- sanitary wastewater from the workers domestic facilities.

Areas of ground become exposed and disturbed during construction. This increases the potential for soil erosion and could potentially result in an increase in the sediment load of waters leaving the construction site. The site is relatively level and therefore the potential for water flowing across the site to cause significant soil erosion is low.

To prevent impacts from rain water runoff during land preparation and construction, the following measures are foreseen:

(a) the face of excavations' will be kept to a minimum to avoid the exposure of open surfaces to natural conditions.

(b) surface water runoff collection will be implemented through temporary drainage grooves and sedimentation ponds to avoid direct discharge to the reservoir, this is particularly important during wet seasons.

(c) hazardous materials such as oils, fuels and chemicals will be stored in dedicated storage areas, complete with spillage protection and working procedures, which will ensure that these materials are handled correctly. Furthermore, any hazardous materials will be stored in areas with secondary containment.

(d) domestic type wastewater will be discharged to plant's sanitary waste water system or collected at site and for removal from site for treatment at an appropriate treatment facility.

The discharge of additional sanitary waste water into the current system may lead to serious operational problems at the existing municipal waste water treatment plant (operated by Inter Rao). Current waste water flow is reported to be close to the treatment capability. This issue needs to be carefully studied and resolved before the start of construction works.

With application of proposed measures the overall risk associated with the impact on surface water can be classifies as **minor adverse**.

D3.9 Archaeology and Cultural Heritage

Verkhniy Tagil has experienced industrial development since eighteenth century. The most valuable pieces of cultural heritage also come from the eighteenth to nineteenth centuries (for example, the manor house and the Church of the Sign, both located nearby Verkhnetagilskiy Reservoir dam). Construction traffic is not planned to be routed via the Verkhnetagilskiy Reservoir dam or town centre, therefore no impact on cultural heritage is expected.

Construction works may have severe impact on potential archaeological sites; however, at this stage in the Project there is no information about potential valuable areas at the site or along planned gas pipeline route.

In the absence of further information, this area of the Project remains a risk which needs to be mitigated by a preconstruction study and investigations, as well as through archaeological supervision during the earth works and through the development of clear instructions for workers. With the application of proposed measures, the risk of loosing or damaging any valuable

archaeological / heritage features will be minimised. The overall impact can be classified as **minor beneficial** as valuable resources will be protected and revealed for scientific studies.

D3.10 Air Emissions

Construction activities have the potential to affect air quality mainly due to the dust created by ground works, storage of pilled materials and heavy traffic. These activities can significantly affect the health of workers and local inhabitants (including those living along access roads), the quality of water in the reservoirs and local wildlife etc. Clear instructions for dust emission mitigation techniques should minimise any impacts. These aspects needs to be carefully supervised during the construction works.

There are a wide range of dust control measures that are commonly used on construction sites. The measures will be incorporated into a Construction Environmental Management Plan (CEMP) and will include:

- water-spraying of roads / surfaces prior to being worked, and of material stockpiles to minimise dust raising, as required;
- sheeting vehicles carrying dusty materials to prevent materials being blown from the vehicles whilst travelling;
- enforcing speed limits for vehicles on unmade surfaces to minimise dust entrainment and dispersion;
- employing suitable measures to ensure that vehicles leaving the site do not entrain dust onto public roads.

With the above measures employed, any emissions will be of a temporary nature and at some distance from residential properties, thus minimising any potential for a nuisance to occur.

Air emissions will also be released from the exhausts of construction machinery and vehicles. These may lead to a negative impact particularly where the trucks pass or operate in the vicinity of occupational residences and if the number of vehicles is significant. However, since the main construction site is distant from residential areas and vehicle routings pass through residential areas on main roads, significant air emissions from these sources are not expected.

In order to ensure that emissions from all vehicles and plant are as low as possible, all vehicles and machinery shall be in a good state of repair, adhere to local emission limits (where they apply) and will be free from dark smoke with the exception of during start up and shut down.

There will be no on site burning of any materials; therefore there will be no atmospheric emissions as a result of these types of activities.

Information on the likely levels of construction traffic is currently available; therefore no specific assessment of the effects on air quality can be made at this time. It is, however, considered unlikely that construction traffic will have a significant effect on ambient air quality given the substantial emission sources currently active on site and the volumes of traffic that already enter and leave the existing plant daily.

The impact of emissions of vehicle / machinery exhaust gases on air quality is considered to be **negligible adverse**.

D4 Operational Impacts

D4.1 Introduction to Operational Impacts

The key topics assessed in detail for the operational phase of the project are:

- air emissions;
- noise impact;
- surface water and effluent.

Other topics which do not represent significant potential issues and which are addressed in less detail are:

- ecology and nature conservation;
- landscape and visual;
- socio-economic impacts;
- health, safety and public nuisance;
- traffic and transport;
- land and groundwater quality;
- solid waste management;
- abnormal situations.

The following sections provide an assessment of the potential impacts of the project activities during the operational phase.

A summary of the impacts, management and mitigation measures and residual effects is presented in Section E. The Monitoring Programme is presented in Section F.

D4.2 Air emissions

An air dispersion modelling study has been undertaken for the operation of the proposed CCGT project at the VTGRES. As described previously, other developments will be taking place such as the decommissioning of the existing coal-fired turbines and lower rating of gas fired boilers. At this stage, however, the modelling study addresses the emissions from the CCGT facility in isolation, as no detailed information on stack parameters for the existing plant is available.

It is important to understand that the results of this study, i.e. the incremental effects of the new CCGT facility, do not represent a future increase in ground level concentrations once the CCGT is operational. This is because, associated with the CCGT development, there will be a reduction in the operational hours of some of the existing gas fired boilers, as well as a separate commitment from the operator to cease the burning of coal after 2016, given the additional power generation available from the CCGT facility. This is anticipated to achieve an overall reduction in annual mass pollutant emissions from VTGRES as a whole and hence lead to an improvement in ambient air quality in comparison with the existing case.

The aim of the study is therefore to determine the changes to ground level concentrations of pollutants resulting from the CCGT facility alone and to demonstrate that in isolation it will not result in significant ambient air pollution. There are performance guarantees for the CCGT plant for the maximum concentrations of oxides of nitrogen and carbon monoxide in the exhaust gas, which meet the requirements of the IED. It is these pollutants that are the subject of this study.

The emissions to the atmosphere have been modelled using the US Environmental Protection Agency (EPA) atmospheric dispersion model AERMOD. This study uses the best available data in the absence of a complete detailed design for the facility. The CCGT characteristics were taken from the Siemens Technical Specification for the gas turbine; however, the stack height and diameter used at this stage are reasonable estimates.

Digital terrain data was used in the modelling to take account of local topography. Three years of hourly sequential meteorological data measured at Ekaterinburg were used.

The following sections describe:

- the emissions to air from the operation of the CCGT facility;
- the air dispersion methodology, together with the various meteorological and geographical / topography data inputs used;
- the results of the air dispersion modelling including concentrations at nearby sensitive sites; and
- a discussion of the modelling results in the context of air quality criteria.

D4.2.1 Methodology

The dispersion modelling was carried out using the US EPA model AERMOD version 12060. This model is the result of many years development by the US EPA and the American Meteorological Society. It has been developed as a regulatory model that incorporates the current understanding of atmospheric physical processes. This model is used by regulatory agencies, consultants and industries worldwide to assess the impact of air emissions from such industrial sources.

AERMOD simulates essential atmospheric physical processes and provides refined concentration estimates over a wide range of meteorological conditions and modelling scenarios. The modelling system[4] includes:

- an advanced meteorological pre-processor to compute site-specific planetary boundary layer (PBL) parameters;
- highly developed dispersion formulations that incorporate current PBL understanding and variables for both convective and stable boundary inversions;
- enhanced treatment of plume rise and plume penetration for elevated inversions allowing for effects of strong updrafts and downdrafts that occur in unstable conditions;
- improved computation of vertical profiles of wind, turbulence and temperature; a “dividing streamline” approach for computations in complex terrain.

AERMOD includes two data pre-processors for streamlining data input: AERMET, the meteorological pre-processor discussed earlier, and AERMAP, a terrain pre-processor, which simplifies the computation of receptor elevations and effective height scales for digital data formats, including the DEM format elevation data purchased from Trinity Consultants Inc. for use in this project.

AERMOD PRIME also addresses and building downwash effects. The building downwash algorithms in AERMOD PRIME, using parameters calculated by the Building Parameter Input Program (BPIP), distinguish this model from earlier versions of AERMOD, which used simpler procedures to address downwash. The model provides reasonable estimates over a wide range of meteorological conditions and modelling scenarios.

D4.2.2 Meteorological Data

Three years of hourly sequential meteorological data for the station at Ekaterinburg, approximately 60 km southeast of the facility, were used in the study. The years 2010 to 2012 were selected. The three-year meteorological data file contains over 26,000 hourly records, and is adequate to characterise local meteorology both in terms of extreme events and long-term average conditions. There is no significance in the actual years used.

A windrose for the site is provided in Figure D4.1 below. This indicates that there is a prevailing westerly wind while winds from the south east are also above average frequency. Winds from the south west, and north to east are relatively infrequent.

[4] AERMOD software provided by Trinity Consultants, http://www.breeze-software.com/

The hourly sequential meteorological data were processed using the data pre-processor AERMET. This software processes the meteorological data and estimates the necessary boundary layer[5] parameters for the site-specific dispersion calculations in AERMOD. The data were processed to take account of the location and surroundings of the meteorological station (56.833ºN, 60.633ºE), and of the modelled facility (57.354ºN, 59.966ºE) using the surface parameters specified below. The parameters calculated by AERMET, together with observed near-surface wind and temperature data, are used to model how pollutants disperse in the atmosphere.

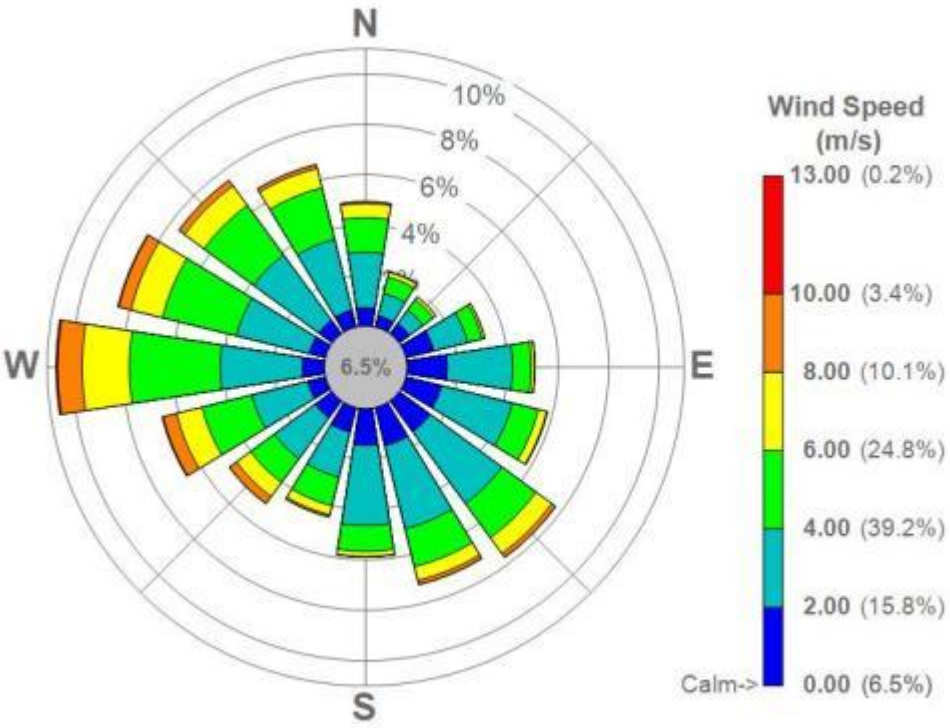


Figure D4-1 Windrose for Ekaterinburg, 2010 to 2012

Surface characteristics were specified to reflect the nature of the surroundings of the proposed CCGT. The pre-processor was used with annual average parameters for surface roughness[6], albedo[7] and Bowen ratio[8] respectively for these surfaces. According to latest US EPA guidance, the near-field land use within a one kilometre circle was evaluated to determine the surface roughness length. Land use may be specified by several directional sectors. In this case, the

[5] The atmospheric boundary layer is that region between the earth's surface and the overlying, free flowing atmosphere. The fluxes of heat and momentum drive the growth and structure of this boundary layer. The depth of this layer and the dispersion of pollutants within it are influenced on a local scale by surface characteristics, such as the roughness of the underlying surface, the reflectivity of the surface (albedo) and the amount of moisture available at the surface. From these inputs AERMET calculates several boundary layer parameters, which in turn influence pollutant dispersion, including surface friction velocity, sensible heat flux, Monin-Obukhov length, daytime mixing layer height and nocturnal surface layer height, and the convective velocity scale.

[6] Surface roughness length is a measure of the height of obstacles to wind flow. It is not equal to the physical dimensions of obstacles, but is generally proportional to them.

[7] Noon-time albedo is the fraction of incoming solar radiation reflected from the ground when the sun is directly overhead. Adjustments are made in AERMET to incorporate the variation in the albedo with solar elevation angle.

[8] The Bowen ratio is a measure of the amount of moisture at the earth's surface. This influences other parameters which in turn affect atmospheric turbulence.

surroundings were divided into three sectors representing water to the north, coniferous forest to the east and industrial land to the south and west.

The Bowen ratio and albedo were determined by the dominant land use categories within the far-field, a 10 by 10 kilometre square. A subjective determination of the percentages of each type of land use was made based on aerial photography. The land use proportions are simply averaged over the area and are independent of distance or direction from the site. The categories of coniferous woodland, urban, cultivated land and water comprised 68%, 10%, 8% and 14% respectively. Based on the land use information, the AERMET pre-processor generated the appropriate default annual average values for the surface parameters, as shown in Table D4-1.

Table D4-1 Surface Characteristics

Direction degrees	Land type	Albedo	Bowen ratio	Roughness length, m
340 - 30	Water	0.1843	0.861	0.0001
30 - 180	Forest	0.1843	0.861	1.0
180 - 340	Urban	0.1843	0.861	1.3

AERMOD was run with a single three-year meteorological data file. The model reports the highest hourly, daily and long-term average concentration found using this meteorological data. This may be regarded as a robust estimate of the result at each receptor.

Building Downwash

The BPIP programme can be used to calculate for each wind sector the direction specific building downwash parameters to be used by AERMOD PRIME in the dispersion calculations. The building closest to the proposed CCGT stack is 30 metres high and at less than 40% of the stack height, will not cause downwash effects. The BPIP programme was therefore not required to be run.

Receptors

The AERMOD software uses the UTM co-ordinate system for receptors and all model objects. This is necessary as receptor heights are read from the DEM format terrain data file which is also based on UTM co-ordinates. Ground level concentrations were modelled using three Cartesian receptor grids, a 20 by 20 km grid of 1681 receptors spaced at 500 metre intervals centred on the facility, and a grid of 360 receptors spaced at 250 metre placed to capture maximum concentrations within the closest residential areas.

Emissions

The stack discharges for the gas turbine and associated HRSG operating at full rated load, and at the guaranteed pollutant emission limits, are shown in Table D4-2. The flue gas characteristics were determined using information provided by the turbine manufacturer on thermal output and efficiency, and calculation of the fuel gas volume flow based on natural gas molecular composition. The emission rates were calculated on the basis of a 50 mg/Nm^3 emission concentration. The stack height and diameter are estimates based on Atkins' experience of similar facilities. All values are subject to change following the development of a detailed design for the plant.

Table D4-2 CCGT Stack Discharge Characteristics

Parameter	Value
Grid reference (UTM Easting, Northing)	678335, 6360445
Stack base elevation , m AOD	265

Stack height, m	80
Flue diameter, m (single)	7
Exhaust gas temperature, °C	97
Exhaust gas exit velocity, m/s	18.9
Actual exhaust gas flow rate, m^3/s	728.5
Oxides of nitrogen emission rate, g/s	32.8
Carbon monoxide emission rate, g/s	32.8

Results

The maximum modelled short-term and long-term increments to ground level pollutant concentrations are presented in this section. These results are shown graphically in the form of contour plots that demonstrate the pattern of ground level concentrations around the site. The plots also show the approximate boundaries of the site.

The results are also summarised in Table D4-3 showing separately the highest increment to pollutant concentrations beyond the site boundary, and the highest increment in a residential area. The relevant Russian Federation (RF) and WHO/European criteria are also reiterated in the tables for ease of reference. As the shortest modelled averaging period is 1-hour, only the 24-hour Russian standards are presented.

Note that the modelled oxides of nitrogen concentrations are reported in the table whereas the ambient air quality criteria relate to nitrogen dioxide. The potential degree of conversion of oxides of nitrogen in the discharged plumes to nitrogen dioxide at ground level is limited and this is discussed in the relevant section below.

Table D4-3 Modelled Increments to Pollutant Ground Level Concentrations, $\mu g/m^3$

Pollutant and averaging period	Increment	Limit Value	Source
Oxides of nitrogen			
Field wide maximum			
Maximum 1-hour	224	200*	WHO/EU
Maximum 24-hour	29.2	40*	RF
Annual average	1.2	40*	WHO/EU
Residential maximum			
Maximum 1-hour	79.8	200*	WHO/EU
Maximum 24-hour	8.1	40*	RF
Annual average	0.37	40*	WHO/EU
Carbon monoxide			
Field wide maximum			
Maximum 1-hour	224	30,000	WHO
Maximum 8-hour	82.0	10,000	EU/WHO
Maximum 24-hour	29.2	3,000	RF
Residential maximum			
Maximum 1-hour	79.8	30,000	WHO
Maximum 8-hour	28.0	10,000	EU/WHO

Maximum 24-hour	8.1	3,000	RF

** limit value is for nitrogen dioxide*

Oxides of Nitrogen

Hourly Average

The increments to maximum hourly average oxides of nitrogen concentrations as a result of the CCGT operation are shown in Figure D4-2. The small red dot shows the approximate location of the proposed CCGT stack. The coordinates are UTM Easting and Northings. The concentration isopleths shown with hachure marks (ticks) indicate areas of lower concentrations.

The field-wide maximum result of 224 µg/m^3 is found on an area of high ground approximately five kilometres to the south south east of the stack. The increments to hourly oxides of nitrogen concentrations are elevated along the length of this ridge. The maximum ground level concentration in a residential area is 80 µg/m^3 - this is found just over four km to the south east of the facility, over the settlement of Belorechka. In the residential areas of Verkhniy Tagil to the north and east of the facility, maximum increments to oxides of nitrogen concentrations are much lower, less than 15 µg/m^3.

It is likely that approximately 20% of the modelled increments to oxides of nitrogen concentrations react in the atmosphere to form nitrogen dioxide at the residential areas close to the facility. On this basis, the results in Belorechka represent just 8 % or less, of the WHO and European hourly average criterion of 200 µg/m^3 for nitrogen dioxide, and the increments in Verkhniy Tagil are less than 2 % of the criterion.

Daily Average

The increments to maximum daily average oxides of nitrogen concentrations for the CCGT operation are shown in Figure D4-3. The field-wide maximum result of 29.2 µg/m^3 is found on high ground 7.5 km to the south of the proposed CCGT stack. The maximum ground level concentration in a residential area is of 8.1 µg/m^3, again this occurs over the settlement of Belorechka. In the residential areas closest to the facility in Verkhniy Tagil, increments to oxides of nitrogen concentrations are lower, at less than 6 µg/m^3.

On the basis of 20% of the modelled increments to oxides of nitrogen forming nitrogen dioxide, the maximum concentration within a residential area represents less than 2 µg/m^3 as nitrogen dioxide, or just 4 % of the stringent Russian daily average criterion of 40 µg/m^3.

Annual Average

The increments to annual average oxides of nitrogen concentrations for the CCGT operation are shown in Figure D-4. The absolute maximum annual result of 1.2 µg/m^3 is found on an area of high ground approximately five km to the south south east of the proposed stack. Beyond this location the increments to annual average oxides of nitrogen concentrations decrease rapidly as the terrain heights decrease. There is a secondary maximum around one kilometre to the east of the facility where concentrations are just over 0.7 µg/m^3, also on higher ground. In the vast majority of the surrounding area, concentrations are less than 0.4 µg/m^3 including the residential area of Belorechka, where the maximum increment is 0.37 µg/m^3. In the residential areas of Verkhniy Tagil maximum ground level concentrations are between 0.1 and 0.3 µg/m^3

On the basis of 20% of the modelled oxides of nitrogen concentrations forming nitrogen dioxide at ground level, the increments across the entire modelled domain are a negligible fraction - less than 1 % - of the 40 µg/m^3 EU/WHO criterion for nitrogen dioxide.

Carbon Monoxide

Hourly Average

The increments to maximum hourly average carbon monoxide concentrations as a result of the operation of the CCGT are the same as for oxides of nitrogen, shown previously in Figure D4-2. In the residential areas closest to the facility, maximum increments to oxides of nitrogen concentrations are less than 20 µg/m^3. To the south east of the facility, the maximum ground level concentration found over the settlement of Belorechka is 80 µg/m^3. These results negligible as they are less than one percent of the WHO/EU hourly criterion of 30,000 µg/m^3.

Eight Hourly Average

The maximum eight hour average concentrations are shown in Figure D4-5 for the CCGT case. These are the highest concentrations at each receptor for the three daily eight-hour block averages over the three year period modelled. The maximum field wide concentration of 82 µg/m^3 occurs on high ground 5 km to the south east of the facility. The highest result within Belorechka is 28 µg/m^3 whereas typical maximum hourly increments at residential properties in the immediate surrounding area of Verkhniy Tagil are less than 5 µg/m^3. All of these results are considered to be negligible as they are less than 1 % of the WHO/EU criterion of 10,000 µg/m^3.

Daily Average

The daily average concentrations are the same as those shown in Figure D.4 for oxides of nitrogen. The highest increment to daily average concentrations of 29 µg/m^3 occurs on high ground 7.5 km to the south of the facility. The maximum increment to daily average concentrations Belorechka is approximately 8 µg/m^3. These results for the increment to the daily mean are considered to be negligible as they are less than 1 % of the Russian Federation daily average criterion of 3,000 µg/m^3.

Comparison with background concentrations

Until more information is available on the ambient air quality measurement data, it is not possible to undertake further analysis of the modelling results in that context.

However, the results of the modelling demonstrate that the increment from the CCGT facility will be negligible and will, in any event, be accompanied by a reduction in emissions from existing coal and gas fired boilers.

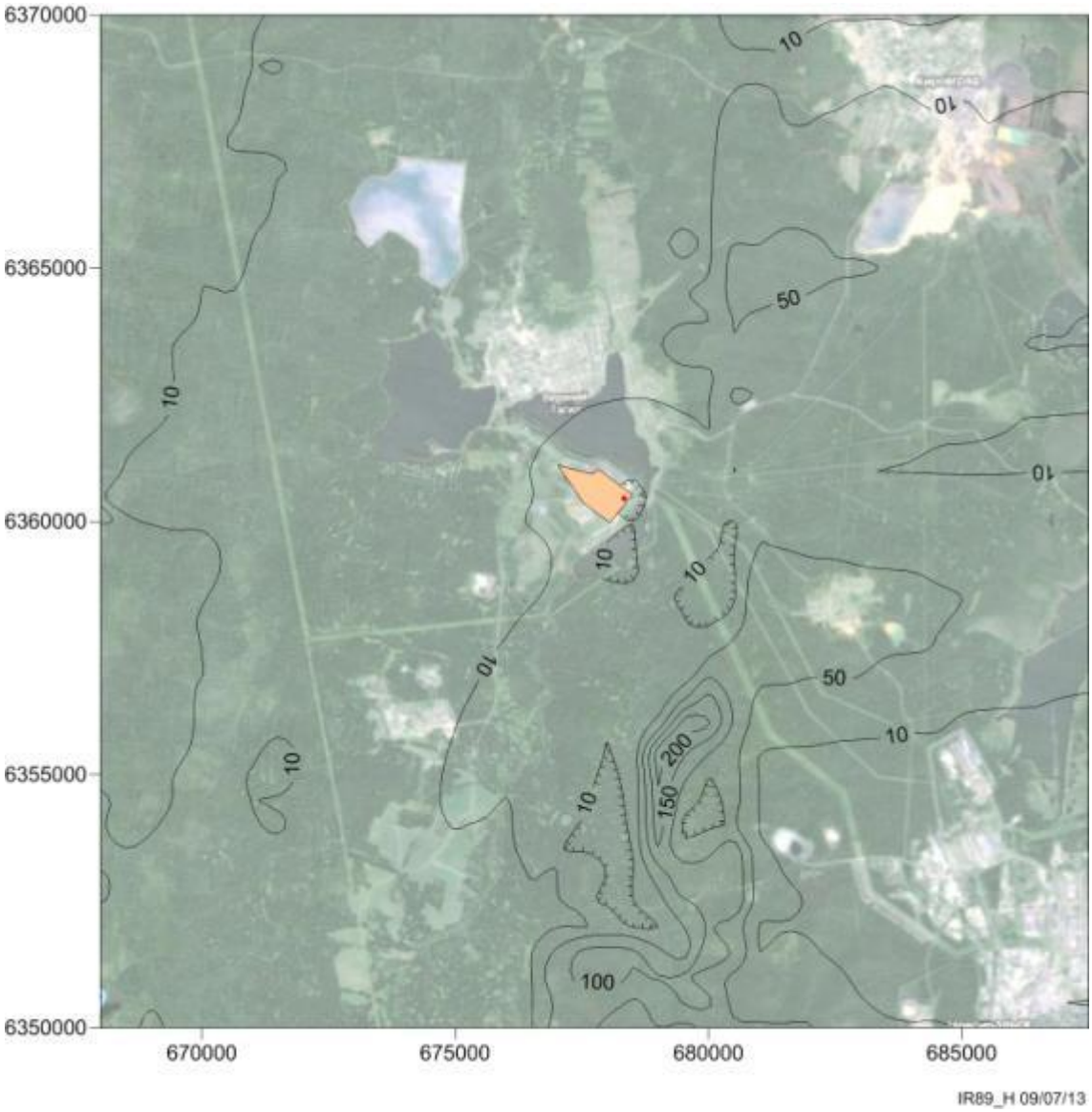


Figure D4-2 Hourly Average Oxides of Nitrogen Concentrations, µg/m^3

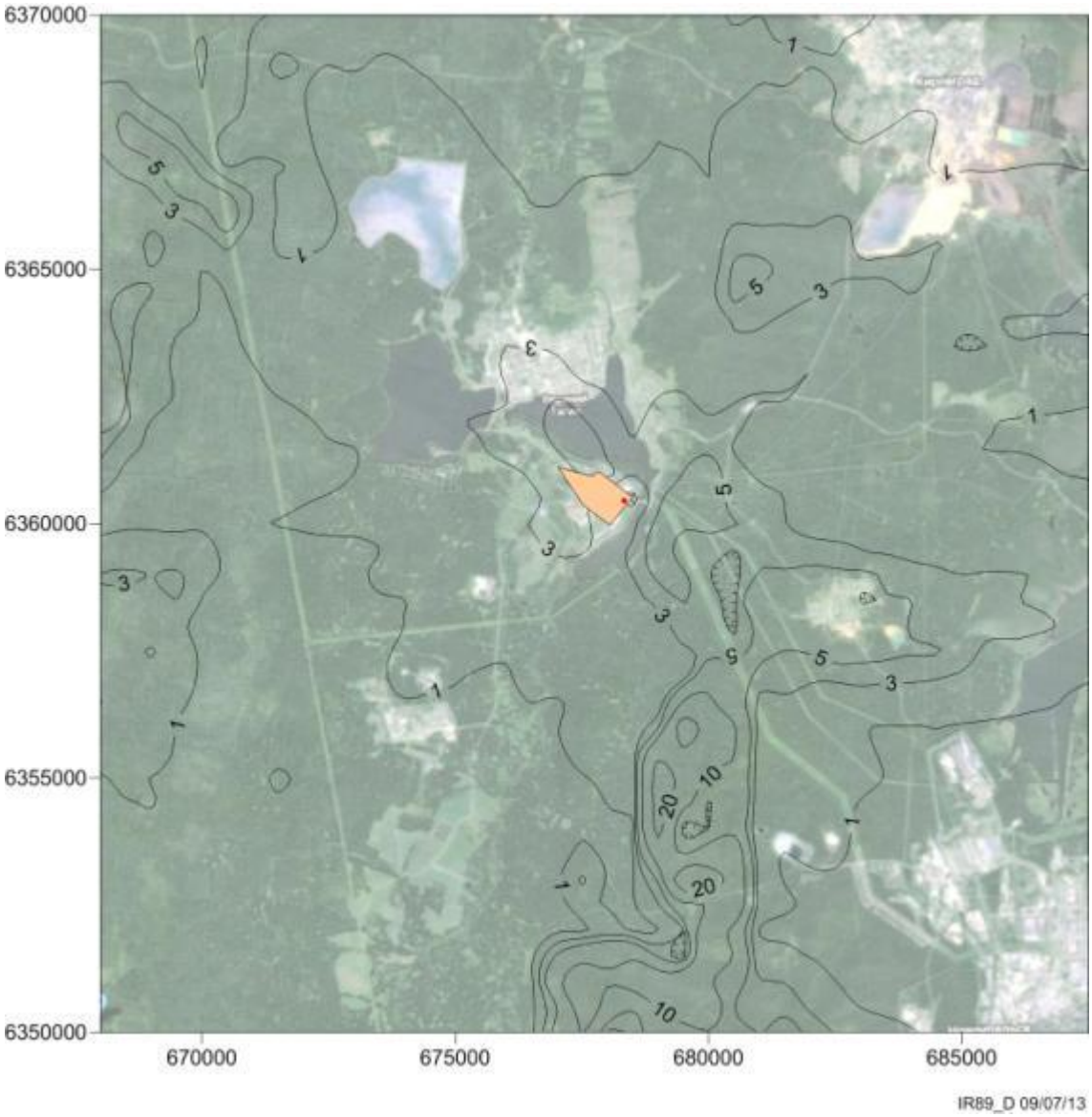


Figure D4-3 Daily Average Oxides of Nitrogen Concentrations, µg/m^3

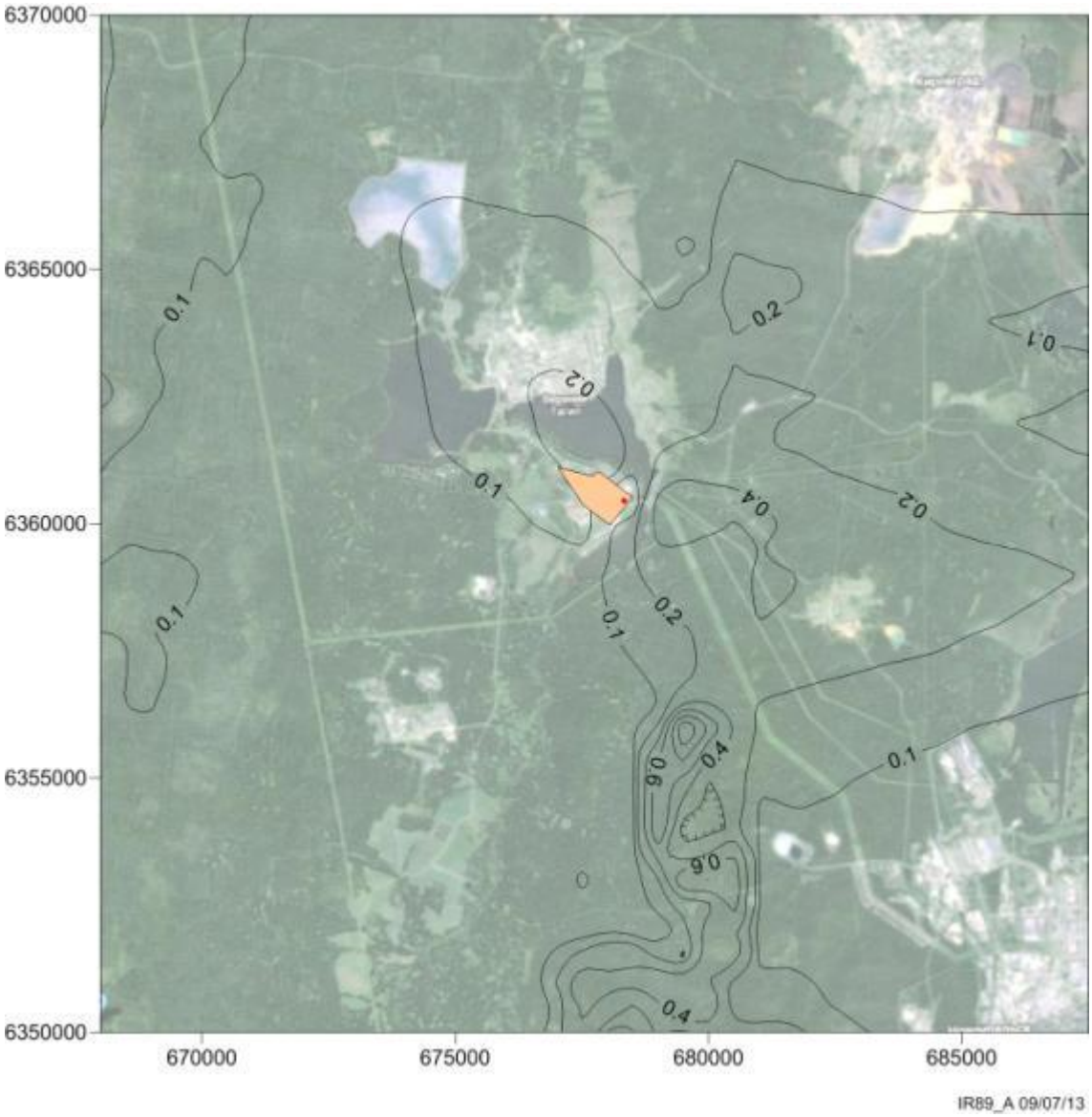


Figure D4-4 Annual Average Oxides of Nitrogen Concentrations, µg/m^3

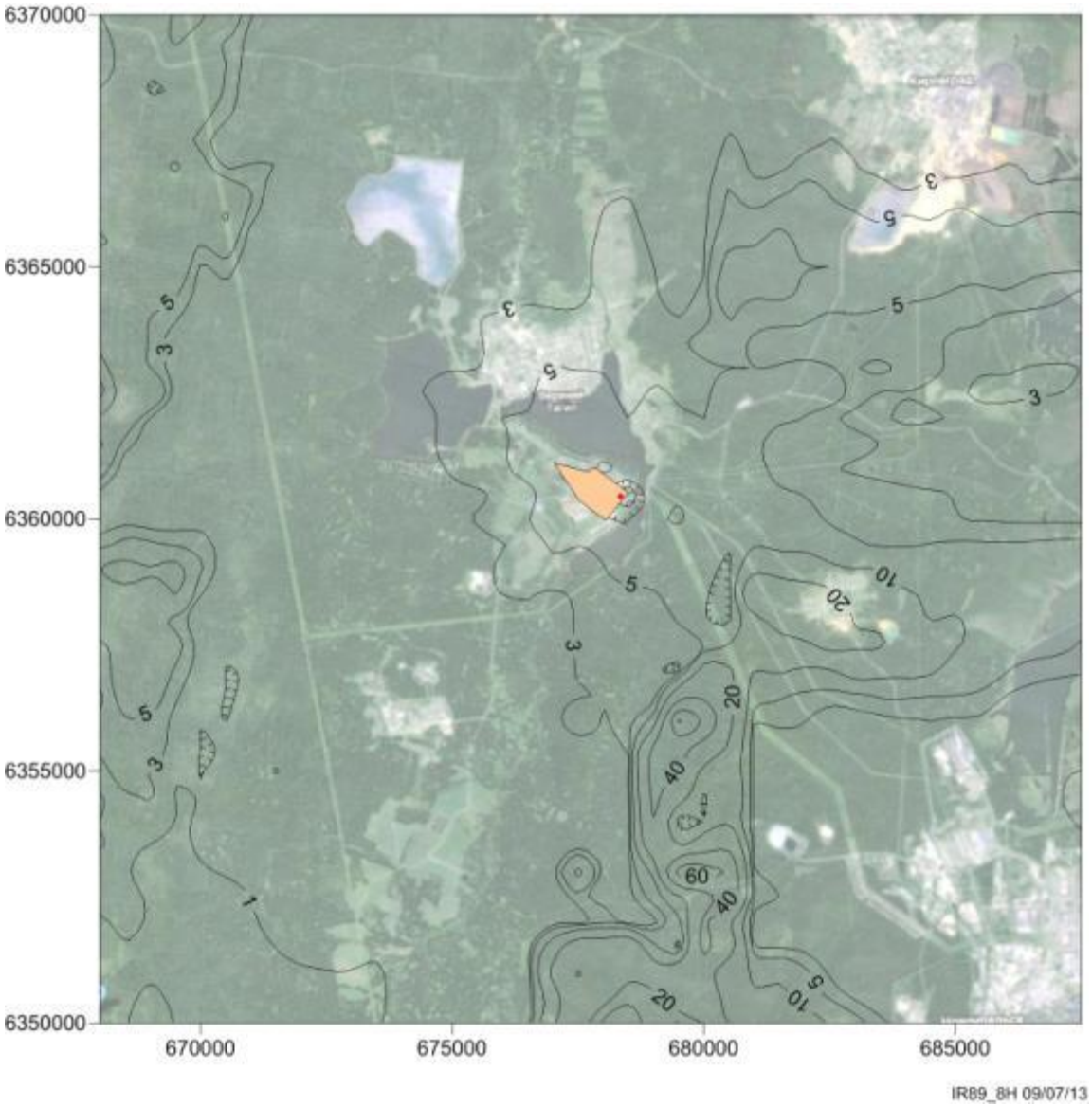


Figure D4-5 Eight Hourly Average Carbon Monoxide Concentrations, µg/m^3

D4.3 Noise Impact

D4.3.1 Approach

In order to assess the noise impacts from the operation of the power plant, noise levels from the operation of power plant (based on source data from similar units) have been calculated and compared with the permitted noise levels and the existing noise climate described in this Section.

D4.3.2 Requirements on the Noise Level

It was assumed that during CCGT Unit operation (and for construction works), the permissible equivalent acoustic levels (A) of noise penetrating the environment within the closest residential areas shall not exceed the following values:

- 55 dB (A) during daytime (06.00 - 22.00 hours)
- 45 dB (A) during nighttime (22.00 - 06.00 hours)

The location of the closest residential areas was identified on the basis of the noise modelling map of existing plant. These are “Sibirskaya” and “Sortirovka” settlements located at the distance of 800-900 m from the location of proposed CCGT unit.

D4.3.3 Noise Calculations

The noise levels from the CCGT unit have been calculated using SoundPlan 7.2 software, which implements the method of calculation given in the standard PN-ISO 9613-2 “Attenuation of sound during propagation outdoors. - General method of calculation.”

ISO 9613 provides an engineering method for calculating the attenuation of sound during propagation outdoors and for predicting the levels of environmental noise at a distance from a number of sources.

All noise-generating equipment and objects are represented in the model as point sound sources of appropriate directional characteristics. Objects of large dimensions are divided during data processing or during programmed calculations into sections represented by point sources. The division is done in such manner that the dimension of the section is at least twice smaller than the distance from the point at which noise level is calculated. In addition to these sources, appropriately localized image sources are defined to take account of sound reflected from walls of buildings.

The level of acoustic power of the sources is calculated as an equivalent value within a standardized period of time (8 most unfavourable hours during daytime, or one most unfavourable hour during night time) by averaging the energy emitted in the form of sound and referring its value to 1 pW.

The calculations take into account advantageous conditions of sound propagation - downwind and under moderate ground-based temperature inversion, such as commonly occurs at night during fine weather.

Calculations are made taking into account the frequency of the emitted sound or, in the case of a uniform frequency characteristics, A sound levels.

According to the standard, the equivalent sound pressure level at a receiver location, for the eight octave bands is calculated from equation:

$$L_{fT}(DW) = L_W + D_C - A$$

where:

L_W - is the sound power level of the sound source;

D_C - is the directivity correction;

A - is the sound attenuation that occurs between the source and the receiver.

Attenuation A is given by equation:

$$A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$$

A_{div} - is the attenuation due to geometrical divergence (6 dB to double the distance);

A_{atm} - is the attenuation due to atmospheric absorption;

A_{gr} - is the attenuation due to the interference of the direct sound wave with that reflected from the ground; this attenuation increases with increasing porosity of ground near the source and near the receiver, and with decreasing altitude of wave path over the ground;

A_{bar} - is the attenuation due to a barrier (screening);

A_{misc} - is the attenuation due to diffuse obstacles along the propagation path, such as vegetation or industrial installations.

The equivalent A-weighted sound level is determined by summing the contributing time-mean-square sound pressures calculated according to the above equations for each receiver, calculation noise source and all corresponding image sources, for each octave band, as specified by formula:

$$L_{AT}(DW) = \left\{ \sum_{i=1}^{n} \left[\sum_{j=1}^{8} 10^{0,1\left[L_{fT}(ij) + A_f(j)\right]} \right] \right\}$$

where:

n - is the number of sources and paths;

j - is an index indicating the octave frequency bands;

A_f - denotes the standard A-weighting.

Absorption of sound by ground between the source and the receivers and ground reflecting sound at the power plant site have been taken into account.

D4.3.4 CCGT Noise Levels

At the time of writing the design of the installation and final choice of the equipment has not been undertaken, except for the basic equipment i.e. Siemens CCGT turbine. The expected noise level at the distance of 1 m from the turbine is 80 dB.

The list of the noise sources and associated noise levels have been appointed on the basis of author experience and similar typical solutions for Siemens turbine based power generation installations.

The noise data have been used in the calculations are presented in the table below.

Table D4-4 Noise Sources Estimates

Name	Group	Source type	Lw dB(A)	KO-Wall dB(A)	Li dB(A)	R'w dB
Air intake	Default industrial noise	Point	110	3	0	0
Fan on HSRG blg.	Default industrial noise	Point	86	3	0	0
Fan on HSRG blg.	Default industrial noise	Point	86	3	0	0
Fan on HSRG blg.	Default industrial noise	Point	86	3	0	0
Fan on HSRG blg.	Default industrial noise	Point	86	3	0	0
Fan on GT blg.	Default industrial noise	Point	86	3	0	0
Fan on GT blg.	Default industrial noise	Point	86	3	0	0
Fan on GT blg.	Default industrial noise	Point	86	3	0	0
Fan on GT blg.	Default industrial noise	Point	86	3	0	0
Fan on GT blg.	Default industrial noise	Point	86	3	0	0
Fan on GT blg.	Default industrial noise	Point	86	3	0	0
Stack	Default industrial noise	Point	95	0	0	0
Tr2	Default industrial noise	Point	90	3	0	0
Tr 2	Default industrial noise	Point	90	3	0	0
HSRG transformer	Default industrial noise	Point	100	3	0	0
Gas turbine transformer	Default industrial noise	Point	105	3	0	0
Facade 1	Water Pump	Area	86	3	85	20
Facade 3	Water Pump	Area	83	3	85	20
Facade 4	Water Pump	Area	83	3	85	20
Facade 5	Water Pump	Area	83	3	85	20
Roof	Water Pump	Area	86	0	85	20
Facade 2	HSRG	Area	96	3	85	20
Facade 3	HSRG	Area	93	3	85	20
Facade 4	HSRG	Area	96	3	85	20
Roof	HSRG	Area	91	0	85	25
Facade 1	Gas turbine blg.	Area	93	3	85	20
Facade 1	Gas turbine blg.	Area	91	3	85	20
Facade 2	Gas turbine blg.	Area	94	3	85	20
Facade 3	Gas turbine blg.	Area	91	3	85	20
Facade 4	Gas turbine blg.	Area	94	3	85	20

Roof	Gas turbine blg.	Area	93	0	85	25

An explanation of the terms used in the table above is presented below.

Symbol	Unit	Explanation
Name		Name of source
Group		Group name
Source type		Type of source (point, line, area)
lorA	m, m²	Size of source (Length or area)
Li	dB(A)	Level inside
Rw	dB	Rated transmission loss
Lw	dB(A)	Sound power per unit
KO-Wall	dB(A)	Correction for directive propagation due to walls

No other noise sources(such as those from operation of the existing power plant) have been taken into account at this stage.

D4.3.5 Noise Impact Assessment

The results of the noise calculations (i.e. the equivalent A-weighted sound levels) are given in Figure D4-6.

The noise contours representing the equal sound levels at the height 4 m above ground were plotted on the map, starting from 45 dB towards the source of sound, with a 5 dB step.

The equivalent A-weighted sound levels calculated for points near the protected objects, 4 m above ground, are represented as white rectangles. The background noise levels as given by Inter Rao are represented as pale yellow rectangles.

The box on the left side of the figure shows the position of the main sources of noise.

These assessments show that noise levels from the CCGT unit are typically higher than the existing noise levels, and it is likely that the CCGT unit would be audible. Overall noise levels during the night would remain below the 45 dB(A) level at the nearest residential areas.

The calculations presented are preliminary, as the actual location of noise sources and final sound power of these sources is not yet known. These details will be worked out during the detailed design process. This assessment is therefore indicative; however, it shows the sound power levels of the likely sound sources should not cause significant nuisance to the nearest sensitive areas.

The noise calculations need to done when the detailed technical design is available. The noise assessment should also cover all other sources of noise in the power plant planned to be in use after 2015 as well as propose proper mitigation measures. If noise issues are properly taken into account in the engineering process the overall noise impact can be assessed as **negligible adverse**.

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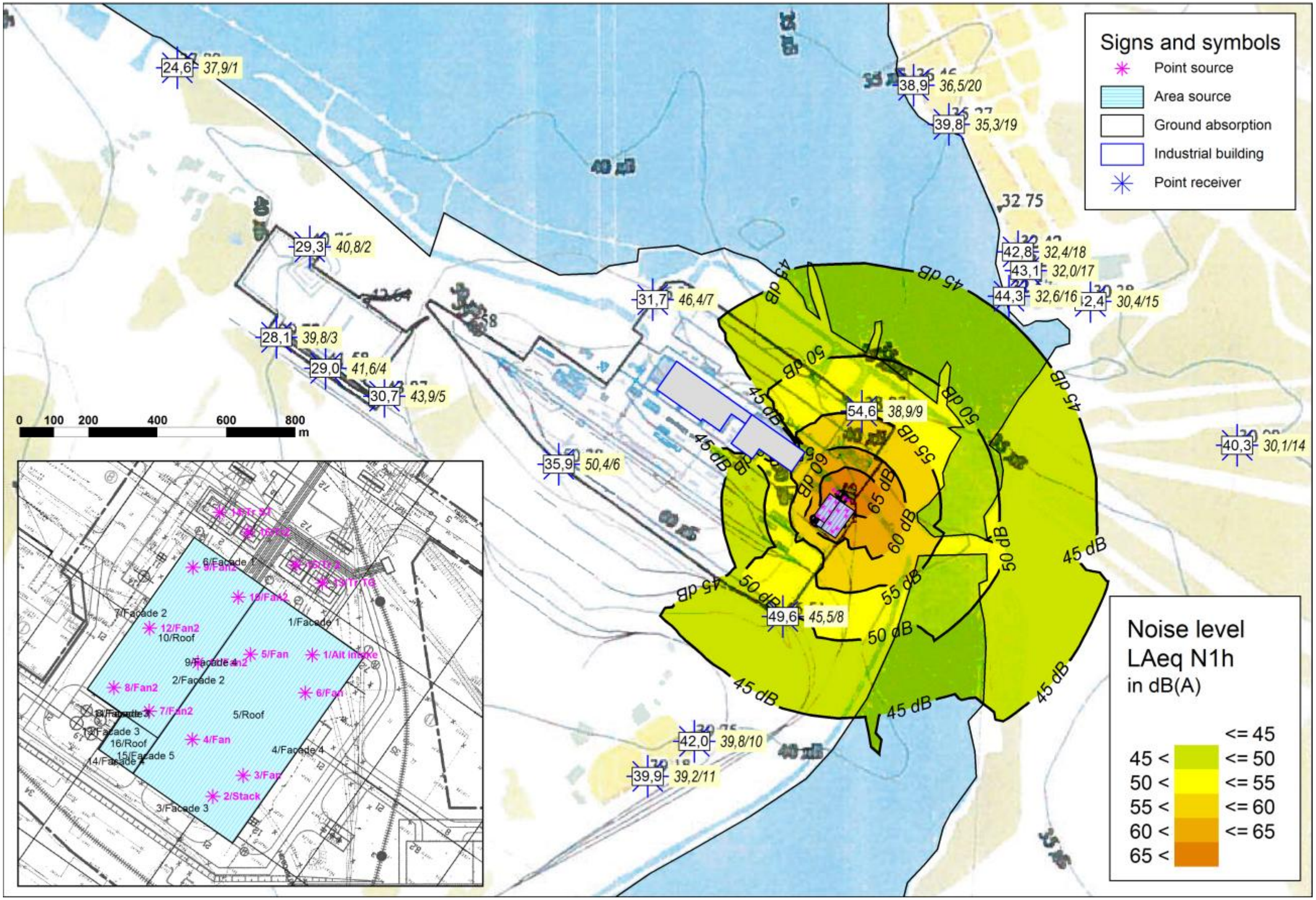

Figure D4-6 **Results of preliminary noise modelling**

D4.4 Surface Water and Effluent

D4.4.1 Water supply, cooling water

The operation of the CCGT unit will require the use of water for domestic and technical purposes. Water consumption requirements can be summarised as follows:

- desalinated water for feeding the steam generation system;
- water for cooling the condensers;
- general purpose industrial water;
- water for sanitary and potable purposes.

The water management for new CCGT will be based on the existing water and waste water systems at VTGRES.

Water for steam generation will be provided from the existing Water Treatment Plant, which has a 200 m^3/h capacity. The water treatment plant consists of mechanical and ion-exchange treatment facilities. The plant provides water for the existing boilers.

The feed water consumption for the steam generation system will be 6.5 m^3/h and this water will need to be of a high quality. Therefore additional water treatment using mixed anionic/cationic filters is planned.

Additional treatment of turbine condensate is planned including ferrous compounds reduction (electromagnetic filter) and desalination using mixed anionic/cationic filters. The capacity of turbine condensate treatment will be 370 tonnes/hour.

The make-up water will be also corrected with the ammonia, hydrazine and phosphates solutions.

Water for cooling purposes will be taken from the existing power plant system, which uses Verhnetagilski reservoir at the Tagil River as a source. The current yearly intake of water for cooling purposes from the reservoir is 2,176 mln m^3; 248,600 m^3/h; 69.06 m^3/s.

The consumption of cooling water by the new CCGT unit is estimated at 34,499 m^3/h; 9.58 m^3/s.

It should be noted that above values cannot be simply added to get an overall predicted water usage as the existing hard coal-fired boilers are to be shut down no later than after start up of the new CCGT unit. The estimated water consumption for the CCGT project, following closure of the hard coal-fired boilers, is presented in the table below.

Table D4-5 Water Consumption Assumptions

No of energy block	Type of equipment	Water consumption, m^3/h
Block 1	T-88(100)-90	19,175
Block 2	Shut down	
Block 3	Shut down	
Block 4	T-88(100)-90	19,175
Block 5	Shut down	
Block 6	Shut down	
Block 7	K-165(200)-130	26,710
Block 8	K-165(200)-130	26,710
Block 9	K-205-130	26,710
Block 10	K-205-130	26,710
Block 11	K-205-130	26,710
NEW CCGT unit	SIEMENS turbine with other installations	34,499
Total		206,399/ 57.33 (m^3/s)

The water will be taken from and discharged to the system of water reservoirs consisting of .

- Verkhentagilski Reservoir (Верхнетагильский пруд) - area: 3.0 km^2, volume: 11.4 mln m^3, level: 257.50 m asl (above sea level); constructed in 1752 and reconstructed in 1958, located 383 km from Tagil river estuary;
- Vogulski Reservoir (Вогульский пруд) - area: 4.2 km^2, volume: 26.2 mln m^3, level: 275 m asl; constructed in 1962 on Vogulka river;
- Reservoir no 4 (Пруд-охладитель № 4) - area: 1.11 km^2, volume: 2.77 mln m^3, level: 259.35 m asl; constructed in 1966 on Tagil river above Verkhnetagilski reservoir.

The scheme of the reservoirs is presented below.

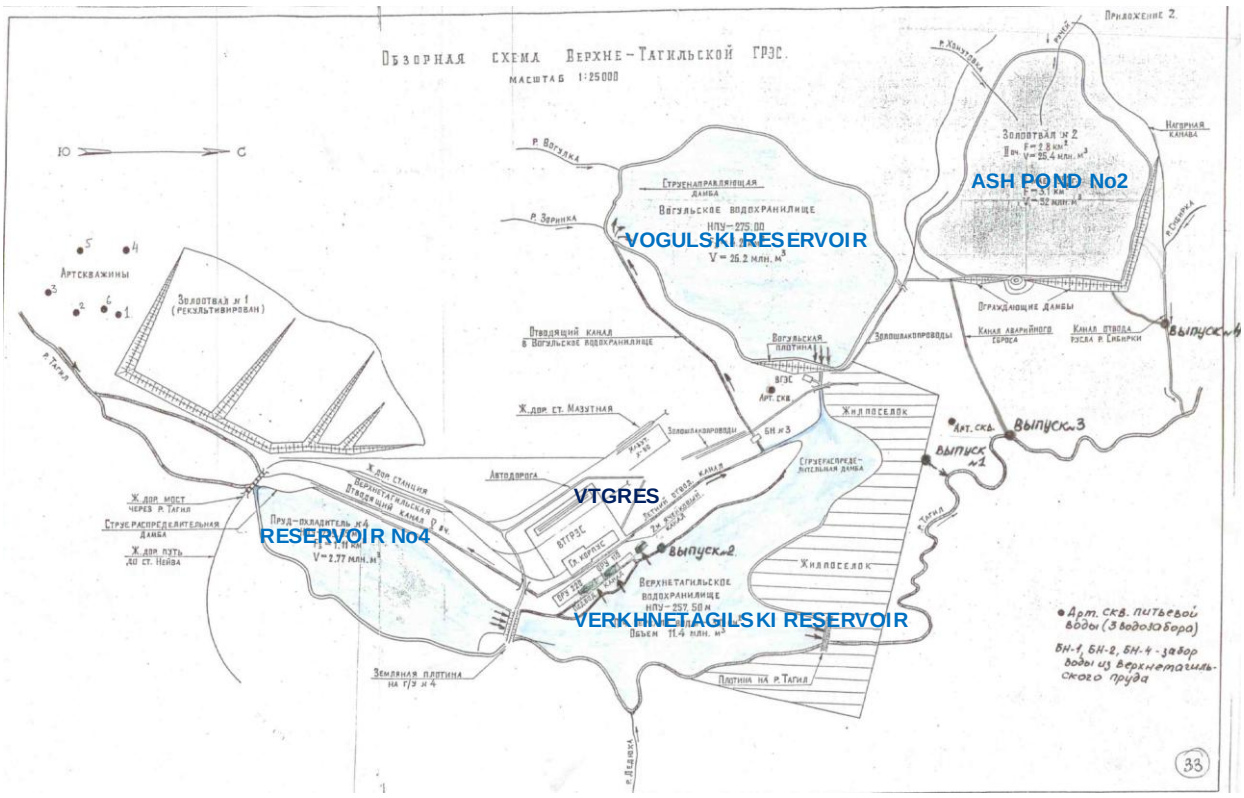

Figure D4-7 Water Reservoirs of VTGRES

Cooling water is taken from Verkhnetagilskiy Reservoir. Used cooling water is discharged via a channel to Reservoir no 4 and via a channel and pump station to the Vogulski Reservoir. Vogulski and no 4 reservoirs are elevated above the Verkhnetagilskiy reservoir and the water from these reservoirs flows by into Verkhnetagilskiy. All reservoirs have dams which are controlled for stability. The difference in water levels between the Vogulski and Verkhnetagilski reservoirs allows for installation of a small hydro power plant (2.4 MW). All reservoirs have some independent tributaries. The main outlet from Verkhnetagilski reservoir is to Tagil river.

The quality and temperature of the water in the reservoirs are key technological parameters for the operation of VTGRES. Temperatures exceeding 30°C degrees have been reported in Verkhnetagilski reservoir in hot summer periods. The average temperature at the inlet to the existing power plant in summer (July) is about 28°C degrees. The average water temperatures at the inlet to VTGRES are presented in the table below.

Table D4-6 Average Water Temperatures in Verkhnetagilskiy Reservoir

	Water temperature in °C				
Month	2008	2009	2010	2011	2012

January	5.3	5.1	4.2	5.1	6.4
February	8.5	6.5	4.5	7.2	8.3
March	12.6	10.2	8.6	10	11.5
April	17.4	13.4	15.2	15.9	17.3
May	21.7	16.9	21.1	21.5	20.5
June	23.1	23.8	24.1	23.3	25.3
July	28.0	22.7	28	26.9	27.9
August	23.9	21.7	26.5	24.5	26.1
September	19.5	22.2	22.3	21.9	21.2
October	17.6	15.1	17	19.2	18.6
November	13.3	9.7	12.2	9.8	13.4
December	7.6	4.8	17	8.1	6.1
YEAR	16.8	13.5	16.7	16.1	17

Temperature significantly influences the biology and ecosystem of the lakes. According to Russian law, the lakes are surface waters that are allowed to be used for industrial purposes. However all were engineered for industry - the oldest one - Verkhnetagilski was constructed in eighteenth/nineteenth century to support development of local metallurgical industry.

Algae blooms as well as intensive plankton and macrophytes growth periods are observed in reservoirs (mainly Verkhnetagilski and Vogulski). Moreover, a significant amount of sediment is reported to be present in Verknetagilski reservoir. According to results prepared by "Gidrobiologia" company, the current status of the sediments seems to be stable. The amount of sediment in main reservoir exceeds one meter. VTGRES undertakes activities to release grass carp (Ctenopharyngodon idella) into the reservoir to control amount of biomass in the water. It seems that the sediments gathered in the reservoir may contain hazardous substances (heavy metals) and mechanical removal of them may raise additional risk to the Tagil river. Detailed program for the removal of the sediments needs to be developed.

Another issue relates to organic substances and nutrients inflow in to the reservoirs. "Gidrobiologia" finds it as an important reason for biomass increase. There is a strong need to control this element of reservoir biological mass balance. Nitrate and phosphate ions are transported into these reservoirs from the various industrial and recreational activities in the catchment area (more than 3,000 km^2). According to geological data, there may also be impacts on the reservoirs from former mining activities. A detailed study of this issue is required and it is recommended that VTGRES should organise the constant monitoring of river water quality in all streams above the reservoirs and review of the activities upstream (along with providing verification of the potential threats to the whole cooling water system).

High quality water in the reservoirs is one of the main assets of VTGRES and any future investment decisions may depend on this. If water quality is reduced, several indirect problems could occur.

The Investor will not use any chemicals in the cooling water system for new CCGT unit. Protection of the systems against algae and/or mussels growth will be performed by mechanical methods only. This consists of the rubber sponge balls that are injected into circulating water (CW) flow at the inlet of a heat exchanger. The sponge balls will be circulated through the heat exchanger tubes, where they mechanically remove fouling debris and scale that builds up on the tube surfaces. Sponge balls are then collected at the condenser outlet by a ball strainer and re-injected at the inlet to continuously maintain the cleaning process. Such tube cleaning systems are designed for automatic and continuous operation and permanently eliminate the need for costly plant shut downs to conduct manual condenser cleaning and/or hydro-lancing.

Construction of the new CCGT unit and decommissioning of old boilers will lead to positive cumulative effect. Cooling water consumption will decrease after decommissioning of old hard coal-fired boilers. This will allow for decrease of heat load in the water reservoirs, consequently decreasing the average temperatures as well as improving biological conditions.

Estimated water balance in 2017 (after commissioning of new CCGT unit and decommissioning of all coal-fired boilers) is as following:

- average yearly precipitation in the region of: 704 mm;
- estimated 2017 losses at Vogulskoye reservoir - less than 2 mln m^3 per year (at present the losses through vaporization are around 3 mln m^3);
- estimated 2017 losses at Verkhnetagilskoye reservoir - less than 3 mln m^3 (at present the losses through vaporization are around 7 mln m^3)
- losses for wet ash transport and VTGRES cooling systems less than 1 mln m^3 (at present the estimated losses are above 5 mln m^3 and their decrease is planned due to the stoppage of part of the coil-fired boilers)
- catchment area of Tagil river - 2 km^2, catchment area of Vogulka river 258 km^2, 65 % covered by forests, catchment area of river Salda - 67 km^2, 55 % covered with forests and 16 % marshes, catchment area of Bobrovka river 3,120 km^2, 61 % covered by forests and 37 % covered by marshes, catchment area of river Reshetka - 101 km^2;
- volume of Vogulskoye reservoir approximately 23.6 mln m^3, used for commercial purposes only during the period of April - October each year. Vogulskoye reservoir has an important commercial role due to the fact that this volume is used as a reserve water volume for Verkhnetagilskoye reservoir in summer (so this reservoir has a very stable water level);
- estimated consumption for cooling purposes: new CCGT unit max. 34,500 m^3/hour, other units (TG-1, TG-4, boilers no 7 to No 11) maximum 172,000 m^3/hour, however the real consumption in summer period due to the other technical constraints should not be higher than 130,000 m^3/hour;
- estimated maximum temperature in Verkhnetagilskoye reservoir in summer period 24 °C (at present the average monthly temperature was between 23 and 28 °C for the 2008 - 2012 period). As a result of new investment and the decommissioning of older units, maximum temperature in Verkhnetagilskoye reservoir should decrease by 4 °C;
- increase of the flow in Tagil river due to the lower losses - at least 1,500 m^3/hour more.

Water for domestic purposes will be provided from the system of groundwater wells (currently nine wells are in use). Current water consumption is approximately 1.7 mln m^3 per year and is not expected to raise as a result of the investment. Underground water is taken not only for VTGRES purposes but it is also transferred through the system of water pipelines to supply housing and industrial sector of Verhni Tagil town (about 75% of the water used). The system is operated by VTGRES and its subsidiaries.

D4.4.2 Waste Water

The new CCGT unit will use the existing waste water systems at VTGRES. There are four main waste water streams and connected outlets (excluding cooling water):

- outlet no 1 into Tagil river: household wastewater from residential sector and industrial enterprises of the city is transferred to VTGRES, from where it goes to the biological wastewater treatment plant. The overall capacity of the wastewater treatment unit (constructed in 1955-1978) is 8,100 m^3/day (2,956.5 thousand m^3/year). In 2007, the wastewater discharge to the treatment plant was 2,887.4 thousand m^3);
- outlet no 2 to Verhnetagliski water reservoir: industrial waste water and storm water - undergo mechanical treatment in the existing power station's own facilities, the capacity of the facility is 2,164 m^3/day,
- outlet no 3 into Tagil river: water from the ash landfill (area of 3.5 km^2) without treatment
- outlet no 4 into Sibirka river: water from the ash landfill (area of 3.5 km^2) without treatment

Outlets no 3 and 4 will not be used by the new CCGT unit and are not discussed further.

It is not expected that the amount of sanitary waste water nor storm water will significantly change as a result of CCGT unit operations. At this stage it is not expected that the number of employees in the VTGRES will increase. Also the amount of hardened spaces will not increase (currently the area of planned installation is paved).

The oily water from the CCGT unit will be treated in the newly built oily water treatment plant for VTGRES. This water will be reused for internal purposes within VTGRES.

The quality of wastewater discharged via the outlets is presented in the table below.

Table D4-7 Quality of Waste Water [mg/l]

No	Indicators	Concentrations [mg/l]	Limit
	Outlet no 1 (WWTP)		
1	Suspended solids	2.32	+0.25 to background
2	Dry residue	230.4	1000
3	BOD20	*4.78*	3.0
4	P	1.52	0.2
5	SO4	25.6	100
6	Cl	19.0	300
7	NO2	3.14	9.2
8	Chloroform	0.0025	0.005
9	CCl4	0.000007	0.000014
10	NO3	*0.056*	0.02
11	NH3	0.26	0.39
12	Surfactants	0.047	0.5
13	Oil	0.04	0.05
	Outlet No 2 (Storm water)		
1	Suspended solids	4.78	+0.25 to background
2	Dry residue	133.9	1000
3	BOD20	*3.50*	3.0
4	Ca	27.57	180
5	Mg	8.69	40
6	Oil	0.054	0.05

The quality of waste water from the existing municipal waste water treatment and storm water treatment plant is not compliant with Russian requirements regarding Biological Oxygen Demand and Phosphorus (only outlet no 1). Yearly discharges of waste water are provided in the table below.

Table D4-8 Yearly Discharges of Waste Water

Yearly discharge of waste water	Outlet no 1	Outlet no 2
Limit	**2,956,500**	**790,000**
2012	2,951,311	515,962

The quantities of discharged water are very close to the limits (No 1, No 2).

Technical improvement programmes will be developed for both waste water treatment facilities (storm water and municipal) to assure that the water quality of discharges will not cause damage to the environment.

On the basis of the description of the proposed site operations herein, and assuming that appropriate measures are implemented, there should be no significant risk of surface water deterioration as a result of new CCGT unit operation. Overall impact after implementation of above discussed measures can be assessed as minor adverse. In long term improvement of surface water quality can be expected.

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D4.5 Ecology and Nature Conservation

This assessment of the potential impact of operation of the CCGT on ecological receptors is based on desk study and subsequent nature conservation evaluation.

The distance to the closest protected areas exceeds 6 km; the nearest receptors are:

- Visimsky Biosphere Reserve (appr. 9 km to the west);
- Alekseevskoye Boloto (Marsh) Natural Memorial (appr. 6 km to the east);
- Lubnaya Mount (appr. 6 km to the west).

Due to the distance from the site, no direct or indirect impacts to any of these sites are anticipated during the operational phase during the operational phase. Please refer to the expected air pollution levels presented in Air Emissions chapter.

The closest semi-natural ecological habitats are the water reservoirs used as a source of cooling water for the existing power plant, as well as Tagil river below the Verkhnetagilskiy Reservoir. The biological conditions in the reservoirs are not stable due to high average temperatures.

It is expected that the overall pressure on the environment will be significantly decreased as a result of replacement of old hard coal-fired boilers with a new natural gas fuelled turbine. In the long term, the overall decrease of industrial pressure should result in improvement of biological conditions for aquatic life in the reservoirs. This issue requires constant monitoring and planning of mitigation measures. A long term plan for the management of the water reservoirs, sediment removal and recultivation will be developed. This will limit the risk connected with water management to the minimal level.

During operation of the CCGT unit, maintenance of the installation, and associated infrastructure, will be undertaken so as to avoid direct discharges. The impacts to the protected natural or semi-natural habitats are anticipated during the operational phase can be assessed as **negligible adverse.**

D4.6 Landscape and Visual

This section addresses the nature and significance of the perceived alterations in landscape character and visual amenity that would result from the scheme during the operation of the CCGT unit. The prominence of the development proposals will be dependent upon a combination of land use and topographic factors relative to the position of the visual receptor and their sensitivity. The sensitivity of visual receptors is an important issue in the assessment of the significance of an impact. This sensitivity is based on the type of receptor, as well as the special nature of the view. For example, residential properties are considered to have a high sensitivity.

Verkhiny Tagil is located in Central Ural mountains. The landscape has a low mountains character with the peaks of 400-700 m and differences in elevation between valleys and peaks of about 100-300 m. Landscape in Verkhniy Tagil is also defined by the system of water reservoirs which extend visibility of the power plant and its stacks.

Figure D4-8 Landscape of VTGRES (view from the north-west towards the site)

Figure D4-9 Landscape of the VTGRES (view from the east towards the site)

The existing power plant and the system of the lakes (buit for industrial purposes) are the dominant features in the local landscape. In particular, the building housing the existing boiler and turbine rooms and the 5 stacks of over 100 m high are visible from the town and local mountains.

At this stage of the Project, the design of the CCGT unit is not available, however by comparison with other similar undertakings it may be assumed that total height of the building will not exceed 40-50 m and the height of the stack 80 m. The new building will be located in the line with existing boiler and turbine building and form an extension of their line. The new stack will be lower than the existing stacks.

Taking into account industrial character of the VTGRES, the new building will not create a significant new element in existing landscape. It is likely that potential decommissioning of the old coal-fired boilers in the future (after replacement of their power with new CCGT unit) would result in a significant positive change in local landscape.

A preliminary “block” visual presentation of the new plant is presented below.

Figure D4-10 Preliminary Visualisation of the New CCGT

The placement and operation of the CCGT unit in the landscape may result in a negative change to the landscape character of the site and its immediate surroundings. The existing site contains a number of tall elements (stacks) which are taller than the stack of the CCGT unit. Therefore introduction of the new tall element will significantly change current status, but it will be in keeping with the dominating character of power plant stacks in the local low mountains setting.

The architectural component of the design will include measures to soften visual impact of the new installation. The modern character of new buildings could be assessed as a positive element when compared with old installations.

As a result the changes to the site would predominantly cause a **minor adverse** impact on the landscape character on commencement of operation.

D4.7 Social-Economic Impacts

This review focuses primarily on the social effects that are likely to take place as a result of the operation of the proposed CCGT. The study area extends to cover the neighbour villages in order to assess the likely effects that may be caused within the local community. National or regional effects are not considered as the scale of the project is not large enough to warrant such a large assessment.

In order to predict what the probable impact of a development will be it is important to have a clear understanding of the current and past socioeconomic conditions of the area. This can be used as baseline against the predicted changes can be assessed for significance.

Socio-economic impacts at the operational phase are minimal. A small number of long-term permanent jobs will be created. Operational staffing levels are expected to be in the region of 55-60 workers. This would include various functions, with an indicative breakdown for the smaller figure being:

- power station Director;
- engineering and Production Managers;
- shift operators based with a total between 17 and 29 people (maximum 5 * 5 shifts + 4 dayshift)
- engineering team of 8 people;
- maintenance team of 8 people;
- cleaning team of 2 people;
- security team of between 4 and 10 people.

Periodically major maintenance activities will result in the support of up to 50 further jobs. However, in the context of the overall amount of employment in the area, the number of new permanent jobs created will be small and therefore the impact will not be significant.

The project will also have a minor positive impact in terms of injection of money into the local economy. The injection will consist of employee's wages, local purchases, goods and services and local expenditure. The operation and maintenance costs of the plant will be of the order of 2-3 million Euro per annum, a significant proportion of which will benefit the local economy.

Overall assessment of socio-economic impacts can be defined as **Moderate Beneficial**.

D4.8 Health, Safety and Public Nuisance

This section of the ESS details the direct potential health and safety impacts associated with the operation of the proposed CCGT. Key issues for consideration associated with the proposed project are as follows:

- high noise levels;
- potential for electrocution;
- high temperature microclimate;
- rotating elements of the machinery
- working at height;
- natural gas explosion risk;
- fire;
- emissions of pollutants to the air;
- chemicals management;
- historical ground contamination;
- issues associated unauthorised access and vandalism.

The issues above may be grouped into those which may primarily carry a physical risk to workers, those which carry a physical risk to members of the public but also possibly workers and those which may impact other stakeholders.

D4.8.1 Worker Health and Safety

Operation of the power unit is associated with a number of risks for workers, which may lead to injury and death during the operational phases of the project. In the case of long term exposure, operational activities may also lead to occupational damage / illnesses. Activities with the potential for occupational issues include:

- high noise levels;
- potential for electrocution;
- high temperature microclimate;
- rotating elements of the machinery
- working at height.

Although the activities described above may be classified as high risk, with a significant potential for incident, incidents are largely preventable through the implementation of appropriate management systems and the adherence to the management system requirements by the work force. It is expected that the permanent, operational phase workers associated with the project, including the management, will be familiar with appropriate safety measures for such projects ad will be properly trained and equipped with Personal Protective Equipment. Further, all personnel undertaking hazardous work should be certified to do so and implementation of specific international requirements will be in place for working at height and working in areas where there is risk of electrocution or high temperature.

In the event that the appropriate measures are implemented, the residual risk is classified as negligible.

D4.8.2 Public Health and Safety

Issues which may impact on public health and safety in operational phase of the Project, but which also may impact worker health and safety are associated with:

- high noise levels
- natural gas explosion risk;
- fire;
- emissions of pollutants to the air;

- chemicals management;
- historical ground contamination;
- issues associated unauthorised access and vandalism.

A number of noise mitigation measures will be incorporated into the design of the development to ensure that the noise levels from the plant are at acceptable levels for both workers and the public.

Consultation with the local community and local authorities will be ongoing and will address any concerns regarding the impacts of the proposed development on health and air quality in particular. BAT will be utilised to limit the emission of air quality pollutants. This includes ensuring that the exhaust system is sufficient to disperse atmospheric emissions and ensure that there are no unacceptable changes in local air quality. This will help to alleviate any fears of the effects of pollution to the local environment.

Issues which may impact on public health and safety, but which also may impact worker health and safety are associated with:

- movement of app. 35,000 m^3 of soil from and around existing power plant. Due to the past industrial activities from the beginning of eighteenth century it is possible that excavated soils could contain various toxic substances (heavy metals, mercury, asbestos, heavy hydrocarbons etc.);
- transport of various chemicals, detergents and oily substances that may have impact on the quality of groundwater and surface waters in case of accidents or spillage;
- fire and explosion risk connected with use of natural gas and other flammable substances. VTGRES will organise the procedures and training for staff involved in activities related to fire and explosion safety as well as chemicals storage and transportation in order to prevent occurrences that may result in a threat to the public. Emergency preparedness and action plans will be developed and agreed with local communities and fire fighting services.
- experience dictates that no matter what security is in place, determined persons could gain access to hazardous areas. However, information indicates that appropriate security measures to prevent access will be in place in accordance with industry standards. Issues associated with unauthorised access and vandalism also pose a risk to the operational work force. Assuming that appropriate design requirements will be in place and management systems will be implemented, we determine the risk of unauthorised access and vandalism as **negligible**.

The overall Public Health and Safety Impact can be defined as **No change-Moderate Adverse**.

D4.9 Traffic and Transport

The main traffic and transport impacts associated with the project will be during the construction phase.

The operational phase will typically be characterised by a low presence of workers on site, with occasional presence of maintenance services.

No significant impacts related to the transport of goods or persons are expected. It is considered that traffic levels associated with the operation of power station will be minimal and therefore mitigation measures are not required with respect to traffic and the road network for the operational aspect of the development. Compared to current situation, the number of cars accessing the site should not change significantly. Decommissioning of old hard coal boilers will result in elimination of hard coal supplies by rail and rail traffic will be much reduced.

Access to the site of any heavy vehicles needing to access the site should be along the routes established during construction for heavy vehicles.

Management measures to prevent disruption to road traffic and rail transport should be amended for the operational phase and adopted. As long as appropriate established routes are used and management measures are implemented, the residual impact during the operational phase of the project is therefore deemed to be negligible impact.

D4.10 Land and Groundwater Quality

During the operational activities, there will be no pre-planned direct discharges to ground. However, operational activities have the potential to release pollutants to the ground (topsoil, subsoil and natural strata) and groundwater as a result of accidental releases. Potential sources of pollution include:

- accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, especially associated with maintenance, chemicals storage areas and the transformer area with subsequent leaching to groundwater;
- accidental discharge of sanitary wastewater to ground and groundwater from the domestic waste water management system.

At the operational stage a limited amount of lubricating oils will be produced (see section on waste disposal). This waste lubricating oil will be produced above the main foundations of the CCGT plant. All liquid waste oil will be collected in closed containers and stored in designated areas. If needed, new gas-oil reservoirs for emergency supply of fuel for the CCGT turbine will be constructed within a safe distance from the plant. The design, management and operation of the new fuel reservoirs will implement best available techniques for protection of groundwater and will enable the highest protection of both soil/land and groundwater from future contamination.

Measures will be employed to reduce the risk posed by the potential sources of pollutants listed above. Potentially polluting materials, such as fuels, oils, chemicals and associated liquid waste materials, etc. will be stored in dedicated, segregated storage areas, with spillage protection and appropriate environmental security measures to prevent accidental release to ground during storage. In addition, appropriate working procedures will be adopted to minimise the risk of accidental release during material use and transport.

Storage of fuel oil used as reserve fuel will be designed with secondary containment and proper ground contamination measures to protect against spills.

In the event that the aforementioned measures are implemented, the residual impact to land should be negligible and there should be no impact to groundwater.

However the operation of new CCGT will be connected with the use of existing infrastructure of VTGRES, including the existing oil storage facilities and water treatment facilities.

In 2011 and 2012 soil investigations were conducted at areas of VTGRES. Exceedances of standards (given in Russian law) were found for the maximum permitted concentrations (PDK) for lead and for the estimated allowable amounts (ODK) for nickel, arsenic, copper and zinc. The background values for sulphates, chrome and hydrocarbons were also found to be exceeded.

The summary of findings of the investigation is presented in the table below.

Table D4-9 Soil Contamination Test in 2012

		Sanitary Zone of Main Plant							
No	Indi-cator	1600 m to the North-west		1600 m to the east		1600 m to the north		Limit [mg/kg]	Back-ground [mg/kg]
		Result [mg/kg]	Result/ Limit	Result [mg/kg]	Result/ Limit	Result [mg/kg]	Result/ Limit		
1	**V**	*101*	**0,7**	*94,2*	**0,6**	*97,7*	**0,7**	**150**	
2	**Cd**	*<1,0*		*<1,0*		*<1,0*		**2,0**	
3	**Cu**	*88,4*	**0,7**	*168*	**1,3**	*114*	**0,9**	**132**	
4	**As**	*11,8*	**1,2**	*21,8*	**2,2**	*28,0*	**2,8**	**10**	
5	**Ni**	*78,4*	**1,0**	*109*	**1,4**	*54,0*	**0,7**	**80**	
6	**NO2**	*16,8*	**0,13**	*29,5*	**0,23**	*66,7*	**0,51**	**130**	
7	**Sn**	*<2,0*		*<2,0*		*<2,0*			**22**
8	**Hg**	*0,07*	**0,03**	*0,15*	**0,07**	*0,17*	**0,08**	**2,1**	
9	**Pb**	*96,5*	**3,0**	*103*	**3,2**	*77,5*	**2,4**	**32**	
10	**SO4**	*1744*	**1,1**	*2504*	**1,5**	*3196*	**1,9**		**1647**
11	**F**	*3,6*	**0,4**	*7,7*	**0,8**	*4,8*	**0,5**	**10**	
12	**Cr**	*146*	**1,0**	*198*	**1,4**	*86,3*	**0,6**		**142**
13	**Zn**	*483*	**2,2**	*411*	**1,9**	*423*	**1,9**	**220**	

It is expected that detailed ground and ground water contamination tests will be performed within the VTGRES perimeter before the start of any excavation works to enable the planning of proper preventive and mitigation measures related to workers health and safety when dealing with contamination (if found).

Sources of past and present contamination need to be fully identified and proper actions undertaken to minimise the risk of public health threat (such as groundwater contamination) in particular in the mazout storage area, oils storage and treatment area, chemicals storage/unloading in water treatment facilities (HCl, NaOH).

A ground remediation programme should be undertaken where necessary.

D4.11 Solid waste management

Limited amounts of solid waste are expected to be generated during the operational phase of CCGT project. Small quatities of waste will arise from maintenance operations and repairs. Key hazardous wastes that will be generated are: used oils (turbine, gear etc.), oil contaminated maintenance materials, mercury containing lamps. Assuming decommissioning of old hard coal-fired unitsin 2022, it is not expected that overall amount of generated waste will increase when compared to current levels. The table below presents waste generated in 2012.

Table D4-10 Summary of Solid Wastes

Generated Waste in 2012	Annual Amount Generated (tonnes)	Disposal Method
Class I of hazard (Mercury containing lamps, thermometers)	1.714	Sold to another company
Class II of hazard (sulphuric acid)	0.707	Sold to another company
Class III of hazard (e.g. used oils, hydrocarbon/oils contaminated waste)	11.974	Sold to another company
Class IV of hazard (e.g. sludge waste, dust, used tyres, wastewater treatment sludge, asbestos waste)	745.2	Sold to another company or disposed at the ash landfill (sludge, ash) and municipal landfill.
Class V of hazard (e.g. municipal waste, paper waste, sludge from water preparation, ash from coal burning,)	629,235.6	Sold to another company or disposed at the ash landfill (sludge, ash) and municipal landfill.

Currently solid waste management is organised according to the requirements of Russian law. Solid waste storage areas are identified in the production departments. Hazardous waste is passed to external specialised companies. This rules will be applied also to the new site.

Planned decommissioning of hard coal-fired units will result in the elimination of important waste streams at the site - slag and ash from boilers which are currently transported by the hydraulic system to the company landfill (Ash Pond No2). Final closure and recultivation of Ash Pond 2 will be possible. Optionally, the conditions for reuse of stored material for construction (or other) purposes will be established.

Ash Pond no 2 is above ground wet storage. The landfill is limited with the embankments (dam) which have been progressively raised. Water is drained and discharged via canals to local rivers. This is presently the most serious waste issue for VTGRES. According to provided documentation, the capacity of Ash Pond No 2 is 4,280 thousand m^3 and the space available is sufficient for no more than next 4 years (raising of embankments may be necessary). The remediation plan for the landfill should be developed and progressively implemented. In case of continuation of hard coal boilers use beyond 2015 the upgrade of the existing landfill or the construction of the new landfill needs to be considered.

Information in relation to Ash Pond No 2 is provided below.

Table D4-11 Information about Ash Pond no 2

Owner	Recultivated area, ha	Capacity	Average yearly disposal of waste tonnes, thousands tonnes	Expect use time	Expected recultivation
VTGRES Code of the landfill - 685	-	4.28 mln m3	624,065	2017	No recultivation is planned.

Assuming that appropriate design requirements will be in place and management systems will be implemented, we determine the impact of solid waste management in relation to the new CCGT Project to be low.

CCGT power plants produce one of the lowest amount of waste in comparison with any other type of power production. It is the most clean and tidy method of electricity and heat production. The operational period will not need any unique (non-typical) hazardous waste contractors.

No solid waste is produced in the combustion process. Intermittent discharges to land are minimal and are restricted to the following:

- used gas turbine intake filters (typically replaced annually or in very rare situation each 6 months);
- used ion exchange resins (typically replaced at 5 years intervals, in VTGRES, due to the good preliminary water treatment unit in old facility, this exchange may be at 7 or 8 years intervals);
- compressor wash water;
- separated oil/sludge from oil/water separators;
- used oil or chemical containers;
- laboratory and general office waste;
- electronic equipment, cables, and other IT and/or security systems, control room crucial measurement units, safety switches etc. modernized each 5 or 7 years;
- limited amount of electrical equipment (capacitors, compensators, transformers etc.) - at 5 or 7 year periods;
- used mercury lamps;
- residues of maintenance materials like paints etc.

Waste will be segregated, the quantity, nature and origin recorder prior to treatment or disposal.

D4.12 Abnormal operations

Abnormal operations may occur if there is a mechanical breakdown, water cooling system failure, gas flow stoppage, or similar failure. In the event of a gas turbine (or other) equipment trip, the unit will shut-down. In the rare event of a steam turbine trip, a by-pass round of the steam turbine will open, steam will be dumped to the steam coolers, with the gas turbine normally remaining in operation. During this time, atmospheric emissions are unchanged however the unit's energy efficiency will decrease significantly.

Limited abnormal emissions can occur from emergency relief vents, however they will last less than 70 seconds. The CCGT plant operators will know when to react and how to proceed to abnormal operations. As a result they can anticipate plant response and secure power production. This ability often comes from years of experience - operating the plant in a variety of normal and abnormal operating conditions - as well as from a deep knowledge of the process and the control system. Training will be provided to all staff not experienced in CCGT operation. The CCGT operator training simulator (OTS) will provide on-the-job experience. In each shift at least two people will have a certificate in advanced procedures to handle the control system and plant equipment under normal and abnormal conditions to protect the investment as well as the safety of the work environment. In addition to training, the simulator can also be used to test new operational procedures before implementing them on the plant.

The Operator will also recognise the stack as an emergency emission point and understand the likely behaviour. Process upsets or equipment failure giving rise to abnormally high emission levels over short periods will be assessed.

Accidents in CCGT plants are very rare due to the high reliability of the systems and multilayer highly computerised control systems. Accidents can occur on gas lines (various type of ruptures, relocation of the pipes and/or slackening) and / or as a result of leakages at gas-oil reserve fuel system. If reserve fuel oil is stored in a main oil storage tank, its reserves should be sufficient for at least two (or seven) days operation. In such case several type of accidents can occur at the delivery stage, reloading, usage and cleaning of tanks. The feasibility of utilising the existing mazout storage facility is currently being investigated and would negate the need for an additional main fuel oil storage tank.

Hazards caused by flooding are not expected due to the technical stability of the existing dams and the proper water management at the reservoirs. Forest fire related accidents are prevented in each case through the safety zone around the main gas pipe. Accidents due to extremely low temperatures will be prevented through proper design of all water and steam pipelines. The air inlet will be protected by anti-icing system.

The installation will be protected against extreme high temperatures occurring in this region.

The plant operator, before the commissioning the new CCGT unit, will prepare and approve all of the necessary documents, with the relevant fire protection authorities, technical certification authorities, gas grid operator, high voltage grid operator etc. In each of these documents there will be a chapter on rights and obligations of both parties in the event of accidents and failures. Proper assessment of all risks, including domino effect risks between the existing coal units and new CCGT unit and all infrastructure connections, will be prepared in accordance with the insurance requirements.

Physical security and protection against unauthorised access to the site is an additional precautionary tool against any accidents. The fencing of the site and permanent CCTV systems will be installed as well.

D5 Closure and Decommissioning Impacts

D5.1 Introduction to Closure and Decommissioning Impacts

For the purpose of this assessment, no issues relating to closure and decommissioning of the proposed CCGT have been assessed in significant detail. The potential for impact during decommissioning is similar to those of construction activities. The key issues are potentially:

- noise;
- traffic and transport;
- socio-economic Impacts;
- health, safety and public Nuisance;
- solid waste management.

The following sections provide an assessment of the potential impacts of the project activities during the closure and decommissioning phase of the project. A summary of the impacts, management and mitigation measures and residual effects is presented in Section E.

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D5.2 Noise

Decommissioning Activities

Decommissioning activities are expected to generate similar noise levels to the construction activities, and similar noise significance levels would apply. The majority of plant expected to be used for decommissioning would be of sufficiently low noise levels not to significantly affect the nearby noise sensitive receptors.

Decommissioning Traffic

Similarly to the construction activities, there would be a number of vehicle movements associated with the decommissioning of each turbine, and dependent on the routes that the vehicles take to get to the site, there may be increases in noise arising from increased traffic.

Properties within a few metres of a road with increased traffic flows may also be affected by an increase in groundborne vibration, particularly from heavy vehicles when there are irregularities in the road surface.

D5.3 Traffic and Transport

Traffic and transport impacts during the decommissioning phase are likely to be very similar to the construction phase. As with the construction phase, appropriate management and mitigation measures should be implemented to prevent disruption or nuisance. If appropriate management and mitigation measures are implemented as detailed in the construction, then the residual impact should be **minor adverse**, rising to moderate if appropriate management and mitigation measures are not implemented.

D5.4 Solid Waste Management

Significant amount of solid waste including scrap metal, construction debris, used electric and electronic equipment, used oils etc. will be generated during closure and demolition works. A detailed waste management and disposal programme needs to be developed along with identification of place and methods of waste utilisation and/or landfilling. Reusable parts and materials need to be reused to the maximum extent possible.

Assuming that a proper waste management programme is developed and implemented an overall residual impact can be assessed as negligible.

D5.5 Socio-Economic Impacts

In summary, impacts on livelihoods and employment and procurement opportunities, include the following:

- reduction of pollutants emission due to plant closure - this impact is assessed as **beneficial**;
- loss of employment. In case that the installation is not replaced by a new one, the loss of locally important employment may have significant impact on local community and their ability to keep the stnadard of living unchanged. This impact is assessed as **adverse**;
- opportunity for decommissioning related works like demolition, disposal of materials and waste, etc. may occur for local enterprisers. This impact is assessed as **beneficial** however short term;
- loss of maintenance services opportunities. This impact is assessed as **adverse.**

D5.6 Health and Safety

In general, the health and safety risks to workers and the community from decommissioning activities will be similar to those during the construction phase.

The Project will be designed to reduce potential risks during its decommissioning. This is typically done by ensuring that a design risk register is kept and maintained through the design process, allowing potential risks that can arise during decommissioning to be identified and addressed in the design process. For example, the use of hazardous materials in construction that could lead to health and safety risks during decommissioning will be avoided wherever possible.

Upon closure of the site, inspections will be undertaken to ensure that contamination of the ground has not taken place during the operational phase, and that measures put in place during the design and construction phases have been successful for the protection of the ground, surface water and groundwater at the site.

It will be important that documentation is maintained during the operational phase that shows that any incidents or accidents have been managed and cleaned up to ensure that no significant contamination has been caused that could lead to health and safety risks during decommissioning.

E Summary of Impacts, Management and Mitigation

E1 Introduction

The following sections outline the management and mitigation requirements associated the potential and actual impacts identified throughout the project phases. The impact once management and mitigation measures are applied is termed the 'residual impact'.

The management and mitigation measures identified should be detailed in appropriate plans, applicable to the phase of the project. This is standard practice for all major projects. For example, in terms of 'environment' the appropriate plans would be as follows:

- construction - Construction Environmental Management Plan (CEMP)
- operations - Operational Environmental Management Plan (OEMP)
- closure and decommissioning - Decommissioning Environmental Management Plan (DEMP)

The plans should remain up to date and accurate based on the activities to be undertaken at the project site. The plans should encompass all of the issues described in the following sections, as well as any other requirements required by the local regulatory authorities. The plans should include detail of how management and mitigation shall be undertaken for each issue and should be approved by the appropriate regulatory parties and any other pertinent stakeholders, such as investment banks.

The implementation of the plans should be through a robust Integrated Management System (IMS), incorporating the requirements of environmental, health and safety, as well as any other requirements of the business and its stakeholders, including issues associated with members of the public. In terms of the requirements detailed in this Statement as well as other requirements delineated by the Investment Bank(s), the management system can be called an 'Environmental and Social Management System (ESMS)'.

E2 Impact Summary

The following Sections provide a summary of the impact assessment, the management and mitigation measures and the 'Residual Impact' once the management and mitigation measures have been applied.

The residual impact is summarised as a simple graduate scale from positive benefits down to negative impacts as follows:

- Substantial Beneficial
- Moderate Beneficial
- Minor Beneficial
- Negligible Beneficial

Ben

- No Change

- Negligible Adverse
- Minor Adverse
- Moderate Adverse
- Significant Adverse

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Where the summary of the impact is variable, such as where the impact is variable over a number of individual receptors, this can be expressed as a band of potential impacts. For

example, a air emission impact may be dependent on the position/location of individual receptors. In such a case, the impact may include:

- No change
- Negligible Adverse
- Minor Adverse
- Moderate Adverse

Rather than list each of the potential impact levels, the residual impact will be expressed as 'No Change - Moderate Adverse', where the impacts include would include *No Change, Moderate Adverse* and those in between (i.e. *Negligible Adverse and Minor Adverse*).

The following summaries are divided in to the three phases of the project; Construction; Operations; and, Closure and Decommissioning. Within each section the impacts, associated management and mitigation measures and residual impacts are presented in the same order as the impacts are presented in Section D. That is, with the key potential impacts associated with each phase of the project, followed by less significant issues.

E3 Summary of Construction Phase Impacts and Control Measures

Impact	Proposed Control Measure	Residual Impact	Residual Impact Rating
ECOLOGY & NATURE CONSERVATION			
Impact on valuable habitats and species during construction works at the CCGT location, along gas pipeline and access roads. Animals can be directly affected by construction works.	Field survey to identify valuable habitats and presence of valuable species will be undertaken.	Location of valuable pieces of local ecology is known and proper mitigation measures can be applied.	Minor Adverse
As above.	Biodiversity protection plan for construction works will be developed. It will include in particular: - protection of terrestrial habitats, protection of water reservoirs, prevention of small animals falling into the excavations etc. Biodiversity issues will be included into the CEMP.	Measures and procedures to prevent significant loss to local ecology are in place.	**Minor Adverse**
LANDSCAPE AND VISUAL IMPACT			
Construction works cause adverse visual impact connected with construction works, traffic, dusting, noise etc.	Visual aspects will be included into the CEMP. It will include both main CCGT site, pipeline construction area, workers camp and all operational areas outside the VTGRES.	View to construction area is limited, the site is well organised.	**Moderate Adverse**
TRAFFIC AND TRANSPORT			
Heavy vehicles can cause nuisance to local inhabitants due to noise and dusting. Traffic causes damage to material goods. Wildlife can be scared off. Local traffic can be paralysed by additional trucks on local roads.	Traffic plan for construction phase will be developed and agreed with local communities of Verkhniy Tagil and Kirovgrad. Roads restoration action after completion of the construction activities will be undertaken. Local communities will be informed and updated about changes in local traffic patterns. .	Additional traffic is visible in the town, but causes limited nuisance to inhabitants and does not cause significant limitations for local drivers.	**Moderate Adverse**

Impact	Proposed Control Measure	Residual Impact	Residual Impact Rating
As above	Reconstruction of access roads will be undertaken to provide possibly the least stressful routing of heavy transportation for local community and to improve load capacity of the roads and the dam. If necessary a new road to avoid sensitive receptors will be build.	As above	**Minor Adverse**
NOISE AND VIBRATION			
Noise impact from construction works and associated heavy traffic causes significant nuisance to local inhabitants including health deterioration.	A detailed noise model for construction works will be worked out. Construction works and heavy transportation routes will be planned in order to avoid direct noise or vibration impact on residential area. If necessary the works or transportation will be limited or not undertaken in the night time. Install noise screens and reconstruct the roads surface if necessary.	Noise and vibrations are at the acceptable level.	**Minor Adverse**
SOCIO-ECONOMIC IMPACTS			
Local community will face the opportunities connected with new investment as well as risk related to the inflow of significant number of workers to the town. This may lead to tension and conflicts.	Stakeholder Engagement Plan will be developed to inform local community about potential impacts, risk and opportunities. A program to support involvement of local community in project activities will be developed.	Local community is well prepared to face risks and use opportunities.	**No change - Negligible Adverse**
HEALTH, SAFETY AND PUBLIC NUISANCE			
Significant increase of number of people in the town and traffic, however temporary, may lead to problems with traffic jams, insufficient medical or law enforcement services.	In cooperation with local municipality, a program of adaptation of local infrastructure and services to the expected situation during the construction period will be developed and implemented.	No significant change to living condition in the town including access to the services.	**Minor Adverse**

Impact	Proposed Control Measure	Residual Impact	Residual Impact Rating
Amount of sanitary waste water will increase during the construction period. There are doubts whether current WWTP will be able to treat it to satisfactory level.	Municipal WWTP (operated by Inter Rao) will be upgrades to prevent discharge of excessive amounts of pollutants to Tagil river.	Sanitary waste water are treated in effective way and conform standards.	**No impact**
Significant amount of solid waste will be generated during construction works and connected demolition works of old installations. There is a risk that solid waste materials will not be effectively disposed or landfilled.	Waste management program for construction period will be developed. Upgrade of municipal landfill will be performed to provide additional place for the construction debris (if necessary).	Solid waste is effectively and legally disposed or landfilled. No threat to the environment is caused by the waste generated in construction period.	**No Change**
LAND AND GROUNDWATER QUALITY			
Soil excavated during construction works may occur to be contaminated by as a result of historical activities in the area and cause threat to workers and, if improperly disposed - to the community	Ground contamination tests will be performed prior to excavations. The procedure for dealing with contaminated soil will be developed and included into CEMP.	Ground if found contaminated is properly treated and disposed. No threat to human health or environment occurs.	**No Change**
Accidental release of hazardous substances to the ground may lead to serious ground and ground water contamination	Procedure for leakage prevention and removal will be developed and included into CEMP. This will include clear rules for storage and handling with hazardous materials.	Spills into the ground does not occur. If accidental release takes place it is properly treated and the ground remediated.	**Negligible Adverse**
SURFACE WATER AND EFFLUENT			
Runoffs of water from excavations (silty and contaminated) as well as storm water from construction area may cause significant contamination of surface water receiver.	All runoffs and storm water will be locally treated (sedimentation and oil separation). Proper control procedures will be included in CEMP.	Water discharges does not influence the quality of water is the reservoirs. Accidental releases are properly controlled and mitigated.	**Minor Adverse**
CULTURAL HERITAGE AND ARCHAEOLOGY			
Unknown valuable archaeological sites may be destroyed during construction works of CCGT and new pipeline.	Archaeology survey will be undertaken to check possible hot spot areas. Archaeology supervision will be appointed for ground excavation works.	Archaeological sites (if found) are properly assessed and explored.	**Minor Beneficial**

Impact	Proposed Control Measure	Residual Impact	Residual Impact Rating
AIR EMISSIONS			
Construction works and transportation can cause significant fugitive dust emission and serious nuisance both to workers and local inhabitants.	The procedure for fugitive air emission control including roads spraying and rules for dusty materials storage and transportation will be included into CEMP.	Fugitive dust emission do not cause any significant nuisance.	**Minor Adverse**

E4 Summary of Operational Phase Impacts and Mitigation Measures

Impact	Proposed Control Measure	Residual Impact	Residual Impact Rating
AIR EMISSIONS			
The new CCGT unit will cause exceedances of pollutants concentrations in ambient air and cause threat to the peoples health.	Detailed modeling of air emissions will be undertaken for final engineering design to confirm that acceptable emission levels are not exceeded. Only equipment in compliance with Best Available Technique requirements will be accepted for the construction of CCGT unit.	Air emissions do not cause any detrimental health effects to local communities.	**Negligible Adverse**
NOISE AND VIBRATION			
The new CCGT unit causes significant noise nuisance to local population.	The design of the CCGT unit will take into account noise modeling results. The sound power levels of the equipment as well as insulation of walls will be approved only if expected noise levels will be acceptable and compliant will legal requirements.	Noise emissions from the plant are acceptable to local community.	**Negligible Adverse**
SURFACE WATER AND EFFLUENT			
Discharge of storm water from new CCGT site will be treated in currently used storm water treatment facilities. The efficiency of this equipment is not satisfactory.	VTGRES storm water system and treatment facilities will be reviewed and upgraded to conform with current requirements.	Surface water quality is not deteriorated by storm water discharged from the plant.	**Minor Adverse**
Accidental oil discharges may significantly influence the quality of storm water discharges.	The new CCGT site will be equipped in local storm water treatment including oil separator.	Surface water quality is not deteriorated by storm water discharged from the plant.	**Minor Adverse**
Chemicals from cleaning of cooling water system can cause risk to surface waters.	Protection of the cooling water system against algae and/or mussels growth will be performed by mechanical methods with the use of rubber sponge balls that are injected into circulating	No chemicals are used for cooling water system cleaning.	**No change**

Impact	Proposed Control Measure	Residual Impact	Residual Impact Rating
	water (CW) flow at the inlet of a heat exchanger.		
Accumulation of organic substance in Verkhnetagilskiy Reservoir can lead to limitation of reservoir cooling capacity and influence local aquatic life.	The study and program of reservoir cleaning will be prepared and implemented.	The biological status of the reservoir is improved.	**Minor Beneficial**
ECOLOGY AND NATURE CONSERVATION			
No major impacts are expected.	-	-	**No change**
LANDSCAPE AND VISUAL IMPACT			
New tall structure will cause adverse visual impact for local inhabitants and tourists.	Technical design will propose a list of measures to soften visual impact of new installations.	The view of new installation is acceptable both for locals and tourists.	**Minor Adverse**
SOCIO-ECONOMIC IMPACTS			
New CCGT unit will provide new workplaces and opportunities for additional services.	-	-	**Moderate Beneficial**
HEALTH, SAFETY AND PUBLIC NUISANCE			
Operation of the new CCGT unit can be a source of accident and occupational disease risks.	All Occupational Health and Safety requirements of local law will be implemented. OHS management system including operating procedures for workers and subcontractors will be implements.	Occupational risk are controlled and mitigated. Proper preventive measures are implemented.	**Minor Adverse**
Local community can be affected by air emissions, noise or waste water discharges.	Technical design will include technical solutions necessary to reduce emissions to acceptable levels.	Nuisance to the community does not change comparing to current situation.	**No change**
Local community can be affected in case of fire or other emergency situation	Detailed fire, explosion and chemical emergency plans and procedures will be developed and agreed with fire fighting units and municipality.	In case of emergency proper actions will be undertaken and the community will be informed.	**Moderate Adverse**
TRAFFIC AND TRANSPORT			

Impact	Proposed Control Measure	Residual Impact	Residual Impact Rating
No significant impacts related to the transport of goods or persons is expected.	-	-	**No Change**
LAND AND GROUNDWATER QUALITY			
Accidental release of hazardous substances to the ground may lead to serious ground and ground water contamination	Procedure for leakage prevention and removal will be developed and included into CEMP. This will include clear rules for storage and handling with hazardous materials.	Spills into the ground does not occur. If accidental release takes place it is properly treated and the ground remediated.	**No Change**
SOLID WASTE			
Solid waste can cause serious impact to the environment if disposed improperly.	Solid waste management rules for workers and subcontractors will be included into company's OEMP.	No waste is disposed illegally.	**No Change**
Elimination of the stream of slag and ash from current operations will allow to close Ash Pond No 2.	Remediation program will be drawn up for Ash Pond No 2.	Current impacts will be reduced. Safe storage or reuse of materials will be ensured.	**No Change**
ABNORMAL OPERATIONS			
Fire or other emergency situation can lead to serious threat to the workers, local environment and community	Detailed fire, explosion and chemical emergency plans and procedures will be developed and agreed with fire fighting units and municipality.	In case of emergency proper actions will be undertaken and the community will be informed.	**Medium Adverse**

E5 Summary of Decommissioning Phase Impacts and Control Measures

Impact	Proposed Control Measure	Residual Impact	Residual Impact Rating
NOISE AND VIBRATION			
Noise impact from demolition works and associated heavy traffic causes significant nuisance to local inhabitants including health deterioration.	The noise model for demolition works and transportation will be developed. If necessary the works or transportation will be limited in the night time.	Noise and vibrations are at the acceptable level.	**Minor Adverse**
TRAFFIC & TRANSPORT			
Heavy vehicles can cause nuisance to local inhabitants due to noise and dusting. Traffic causes damage to material goods. Wildlife can be scared off. Local traffic can be paralyzed by additional trucks on local roads.	Traffic plan for demolition phase will be developed and agreed with local communities of Verkhniy Tagil and Kirovgrad. Roads will be restored after completion of the demolition activities.	Additional traffic is visible in the town, but causes limited nuisance to inhabitants and does not cause significant limitations for local drivers.	**Minor Adverse**
SOLID WASTE MANAGEMENT			
Significant amount of solid waste will be generated during demolition works. There is a risk that solid waste materials will not be effectively disposed or landfilled.	Waste management program for decommissioning period will be developed. Waste management procedures will be included into DEMP.	Solid waste is effectively and legally disposed or landfilled. No threat to the environment is caused by the waste generated in decommisioning period.	**No Change**
SOCIO-ECONOMIC IMPACTS			
Local community will face significant risk related to the loss of work places and other business opportunities. Opportunities related to demolition works itself will not balance the loss.	Stakeholder Engagement Plan will be developed to inform local community about potential impacts, risk and opportunities.	Local community is well prepared to face risks and use opportunities.	**Major Adverse**
HEALTH, SAFETY AND PUBLIC NUISANCE			
Icrease of number of people in the town and traffic, however temporary, may lead to problems with traffic jams, insufficient medical	In cooperation with local municipality, a program of adaptation of local infrastructure and services to the	No significant change to living condition in the town including access to the services.	**No Change**

Impact	Proposed Control Measure	Residual Impact	Residual Impact Rating
or law enforcement services.	expected situation during the construction period will be developed and implemented. It will be included into DEMP.		

Decommissioning waste will occur at the end of the technical age of CCGT plant (between 40 and 45 years). Typical costs of the decommissioning are expected to be around 15 % of the construction costs of the edifices. Due to the fact that materials from this process will be recycled, no significant impact on environment is expected. No asbestos waste will be generated.

F Monitoring Programme

F1 Air Emissions

The new CCGT unit will be equipped in Continuous Emission Monitoirng (CEM) system and the following substances will be monitored as minimum:

- NOx;
- CO;
- O_2.

The results of the monitoring will be regularly reported to company headquarters. Clear procedures for operators for how to react to abnormal situations will be issued. Personnel will be properly trained. CEM equipment will be regularly maintained and calibrated.

F2 Noise

It is not proposed to undertake noise monitoring during the construction phase of the project.

It is proposed to undertake post-construction monitoring. The aim of this will be to assess (before commissioning) the efficiency of noise reduction measures that are implemented and to confirm that the acoustic power level of installation and its parts are within prescribed limits.

Current calculations indicate that noise levels will fall well within the prescribed limits during operation and appropriate controls will be in place during construction. These assumptions will need to be checked / confirmed after start-up of operations.

It is also proposed to undertake regular monitoring in the sanitary zone and in the nearest area of housing during the operational phase of the project (at least once per two years).

In the event that noise appears to be causing a nuisance during operation, amendments to the noise management programme will be implemented.

F3 Traffic and Transport

We expect that the transport management procedures will include an audit process to ensure that construction traffic is using appropriate transport routes.

In cases where it will be necessary to use roads nearby living areas, it is proposed to undertake noise, vibration and dust measurements to assess the level of impact. The results will be used to determine and implement proper mitigation measures.

It is not deemed to be necessary to undertake any specific monitoring associated with the traffic and transport during operational phase of the project.

F4 Socio-Economic

Complaints and grievances submitted through the Project grievance mechanism will be regularly monitored. Feedback received from various Project stakeholders will alert Inter Rao of any problems or issues that need to be addressed, whether on an individual or community level. For example, frequent grievances regarding levels of traffic related noise at certain times of day or reoccurring difficulties in accessing land with agricultural machinery and equipment may indicate that the Transport / Traffic Management Plan needs to be re-adjusted.

Grievance management itself needs to be monitored to ensure that all received complaints are addressed as described in the Project SEP. This also pertains to workers' grievances.

Another key activity that requires monitoring is the reinstatement of roads and public areas after completion of construction activities, and later after decommissioning. Proper reinstatement is key to ensuring that people's livelihoods do not suffer. This needs to be monitored at the end of construction to ensure that all roads have been reinstated to pre-construction standards as a

minimum. The same principles apply for operation of the CCGT in relation to road repairs and maintenance.

F5 Landscape and Visual Impact

Further to a programme of advanced mitigation of visual impacts, all areas around the new unit should be suitably protected and maintained in line with good horticultural practice and monitored for a minimum of 5 years upon completion of the proposed development.

F6 Health, Safety and Public Nuisance

Specific monitoring associated with Health, Safety and Public Nuisance is not proposed. However, it is expected that the management systems implemented for construction and operation will incorporate the following:

- appropriate communications processes to receive communications from internal and external stakeholders;
- implementation of a non-conformance and corrective action process to record issues reported by internal and external stakeholders;
- audits to review the Health and Safety Performance during all phases of the project and encompassing work undertaken by all workers associated with the project, particularly those that are involved with site work;
- transport management procedures will include an audit process to ensure that construction traffic is using the appropriate transport routes and that health, safety and public nuisance issues are not being caused;
- senior management review of the health and safety performance and improvements where necessary to ensure international level best practice.

F7 Surface Water, Effluent and Land and Ground Quality

Monitoring activities related to water management will be undertaken at the level of CCGT installation itself and overall for VTGRES activities.

It is proposed that the following activities related to water supply and waste water discharges from CCGT unit are monitored:

- groundwater usage (social and potable purpose) - continuous;
- desalinated water usage for steam generation - continuous;
- surface cooling water usage - continuous;
- quality of groundwater - periodical (once per month);
- quality of surface water (desalinated and cooling) - periodical (once per day);
- temperature of the water at the inlet from Verkhnetagilskiy Reservoir - continuous;
- amount and quality of discharged waster water (CCGT and final outlet) - periodical (once per month); and
- amount and quality of storm water (CCGT and final outlet) - periodical
- Amount and quality of water at the outlet from Verknetagilskiy Reservoir.

G Further Information

G1 Abbreviations

CCGT	Combined Cycle Gas Turbine
VTGRES	Verkhnetagilskaya Thermal Power Plant
TPP	Thermal Power Plant
a.g.l.	Above Ground Level
b.g.l	Below Ground Level
BAT	Best Available Techniques
BREF	BAT Reference
WWTP	Waste Water Treatment Plant
CEM	Continuous Emission Monitoring
SPZ	Sanitary Protection Zone
CAPEX	Capital Expenditure
CCTV	Closed Circuit Television
CEMP	Construction Environmental Management Plan
CO_2	Carbon Dioxide
CSR	Corporate Social Responsibility
dBA	Decibels (Acoustic)
DEMP	Decommissioning Environmental Management Plan
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EIPPB	European Integrated Pollution, Prevention and Control Bureau
ESS	Environmental and Social Statement
EMS	Environmental Management System
EPFIs	Equator Principle Financial Institutions
EPs	Equator Principles
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
EU	European Union
GHG	Greenhouse Gas
GIS	Global Information Systems
Ha/ha	Hectare
HSE	Health, Safety and Environment
IED	Industrial Emissions Directive
IFC	International Finance Corporation
IFI	International Finance Institution
ILO	International Labour Organization
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control - a European Directive
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
km	kilometre(s)
kW	Kilowatt
LC	Local Community
LVIA	Landscape and visual assessment
m	meter(s)
m/s	meters per second
MTS	Main Transformer Station
MVA	Megavolt Amperes
MW	Megawatt
MWe	Megawatt Electricity
NGO	Non-Governmental Organisation
NTS	Non-Technical Summary

OEMP	Operational Environmental Management Plan
Off.	Official
OHL(s)	Overhead Power Line(s)
OPEX	Operating Expenditure
PMW	Precautionary method of working
PR	Performance Requirements - EBRD Environmental and Social Policy Requirement
Q	Quarter - as in quarter of the year
SEIA	Strategic Environmental Impact Assessment
SEP	Stakeholder Engagement Plan
SHE	Safety, Health and Environment
SME	Small and Medium Sized Enterprises
U.K.	United Kingdom
U.S.A	United States of America
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO-MAB	UNESCO Man and the Biosphere
VAT	Value Added Tax
ZTV	Zone of Theoretical Visibility
ΔGHG	Change in greenhouse gas

Notice

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Document history

Job number:			**Document ref:**			
Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
0	Draft for comment	PS, AK, HB, MK	NB	ES	JR	15.07.13
Final	Final	NB, MK, AK, PS, HB	NB	NB/RA/Интер РАО	AGI	05.08.13

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