Verkhnetagilskaya GRES CCGT
Non-Technical Summary

30 July 2013

INTER RAO UES
energy without borders

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1. Introduction

1.1. Background

This non-technical summary (NTS) is a concise presentation of the available information concerning the environmental and social issues of a project to build a combined cycle gas turbine [CCGT] within the area of Verknetagilskaya Thermal Power Plant (VTGRES) in Verkhniy Tagil, Sverdlovsk Oblast, Russian Federation. VTGRES is owned and operated by Inter Rao Company.

The Company has a corporate agreement with the EBRD to undertake new projects in accordance with EBRD requirements. The Project has been screened as a Category A project, requiring an Environmental and Social Impact Assessment (ESIA) and development of a public disclosure package. This NTS forms part of the disclosure package for this project as does an Environmental and Social Statement (ESS), Environmental and Social Action Plant (ESAP) and Stakeholder Engagement Plan (SEP).

2. The Project Outline

2.1. Overview of the Proposed Project

The proposed development will briefly comprise the following:

- 445,6 MWe CCGT (combined cycle gas turbine) unit;
- Associated electrical systems (transformers etc);
- 2,5 km of gas pipeline connection;
- Reconstruction of an access road;
- Demolition of buildings currently occupying the investment site;
- Construction of new plant for oil removal from waste water (inside VTGRES perimeter);
- Stand by fuel (diesel) tanks and pipe systems;
- Construction of new warehouses (inside VTGRES perimeter).

Combined Cycle Gas Turbines are a form of highly efficient energy generation technology that combines a gas-fired turbine with a steam turbine.

The design uses a gas turbine to create electricity and then captures the resulting waste heat to create steam, which in turn drives a steam turbine significantly increasing the system's power output without any increase in fuel.

The technology is typically powered using natural gas, but it can also be fuelled using coal, biomass and even solar power as part of solar combined cycle plants. In the case of the proposed plant the CCGT will be powered by natural gas.

The new CCGT 445,6 MW unit will consist of the following key elements:

- Gas turbine model SGT5-4000F, of 305,9 MW output to generator Sgen5-1000A, manufactured by Siemens;
- Heat recovery boiler (no detailed information at this stage);
- Condensing steam turbine K-130 of 139,7 MW output with TZFP-130 generator produced by OAO “Power Machines Company” (Силовые машины).

The new investment will be in full compliance with both European BAT and IED Directive. New unit will be equipped with continuous monitoring emission system (“CEMS”) and DryLowNOx combustion system which will assure low NO_X emission.

A schematic of the process is presented in Figure 2-1.

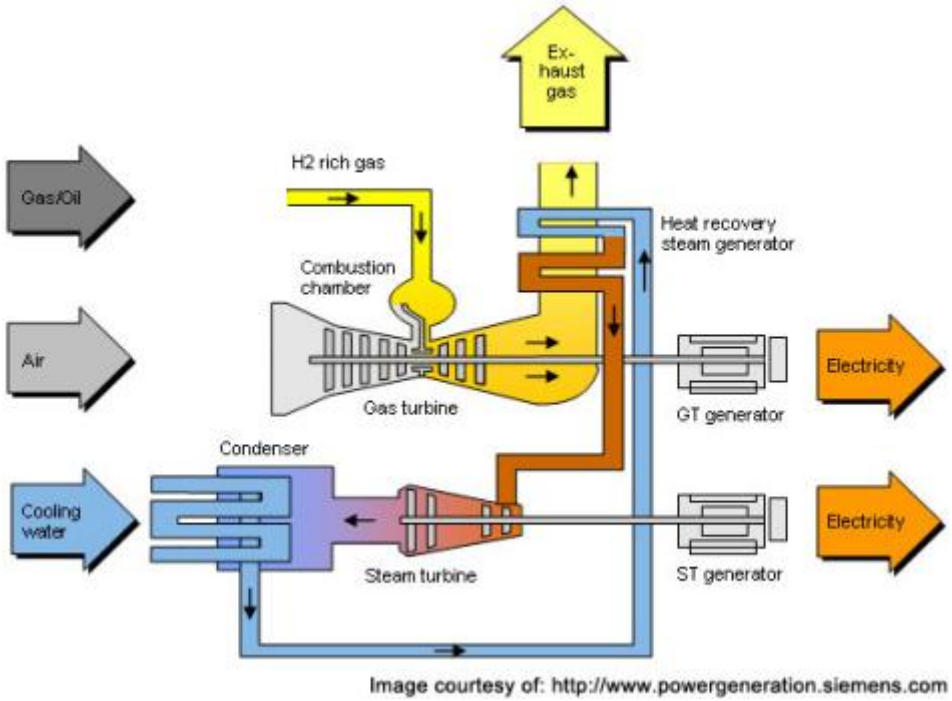

Figure 2-1 Diagram of the CCGT process

The main stages of the project development are:

- Design and design approval / release
- Demolition of existing objects and structures;
- Ground preparation and the creation of appropriate foundations for the power station;
- The transport of heavy equipment to the site;
- The construction of the power plant and associated structures;
- The construction of appropriate infrastructure;
- Construction of a high pressure gas pipeline;
- Decommissioning of the power plant and associated structures.
- Incorporation of CCGT plant in the existing PP infrastructure (power evacuation, water treatment, I&C information systems)

The overall effect of the project is closely related to shut down of 13 boilers currently operating at the VTGRES.

2.2. Project Alternatives

Project alternatives, including a “do nothing” option were considered. The do nothing option was rejected, due to the commitment for the company to close existing coal fired boilers.

Due to the existing industrial nature of the proposed site, 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 the most feasible alternative. The proposed Siemens gas turbine has been chosen because it is considered state of the art, based on a proven design and is highly efficient. Other options were considered but although they would have cost less, did not have the high performance desired by InterRao. The choice of CCGT technology is discussed further in Section 2.4 of this NTS.

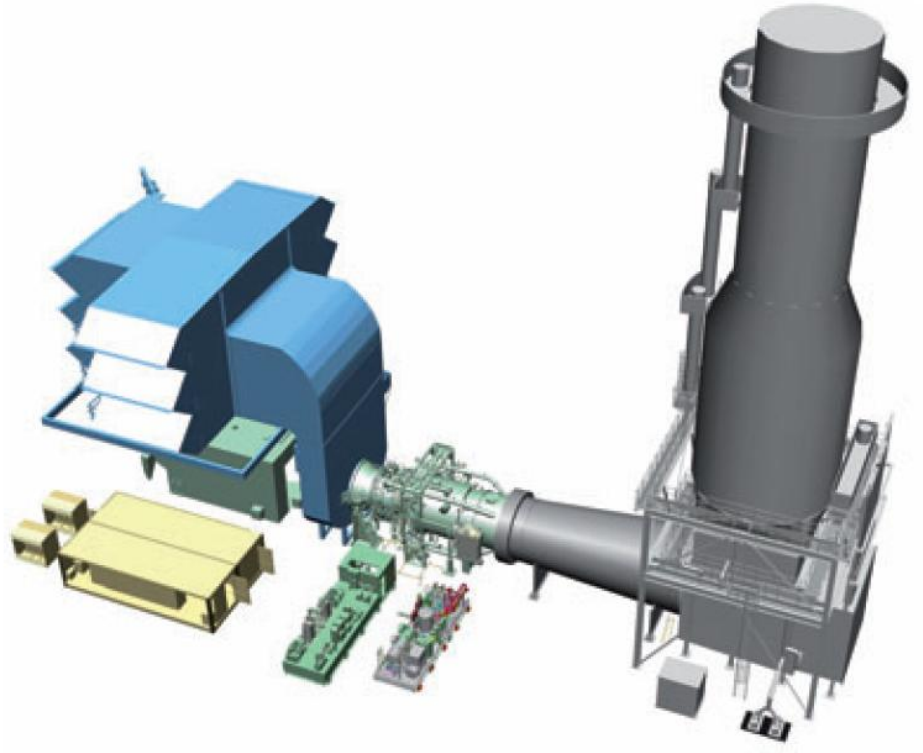

Figure 2-2 General layout of the turbine without heat recovery boiler

2.3. Verkhnetagilskaya Power Plant

Verkhnetagilskaya Thermal Power Plant (VTGRES) is a major supplier of electricity in Sverdlovsk Region of Russia. The VTGRES installed electric capacity as per 2013 is 1,497 MW, Installed thermal capacity — 327 Gcal/h.

It comprises of twenty one boilers (240-520 MW), four 88 MW T-88/100-90/2,5 turbines, two 100 MW K-100-90 turbines, two 165 MW K-165-130 power generating units, and three 205 MW K-205-130 power generating units each.

Construction of Verkhnetagilskaya TPP began in 1951. The first power generating unit was launched in 1956 and reached its maximum capacity in 1964. The plant has undergone a number of upgrades and changes in operation over last 50 years of operation.

Three types of fuel are in use at Verkhnetagilskaya TPP: hard coal natural gas and mazout.

The plant is located south from the Verhni Tagil town, by the Verhnetagilski and Vogulski reservoirs.

Figure 2-3 Verkhnetagilskaya GRES

2.4. Best Available Technique Considerations

The Verkhnetagilskaya Power Plant was build in 1950's and operates basically the typical technology (however upgraded) until now. Current requirements of Russian law do not allow continuing operation of majority of turbines after 2015.

Therefore 13 boilers, where hard coal is combusted, are planned to be shut down due to legal but also technical and emission requirements.

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

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

- in regard to the gas and steam turbine unit: a proven and available technology that meets requirements of best available techniques and practice,
- characterised by high efficiency of power generation process, 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 nitrogen oxides emission.
- Increase of operation flexibility with regard to electrical grid code requirements.

Plant key air emissions are expected to be not higher than (concentration of pollutants in outlet gases at 15 % 0_2):

- NOx – 50 mg/m^3

- CO – 50 mg/m^3

These values are compliant with the requirements of European Industrial Emission Directive. The installation will be equipped with DryLowNOx combustion system which will assure low NO_X emission. An automated Continuous Emission Monitoring system (“CEMS”) will be installed for control of unit operation and its emissions.

3. Local determinants

3.1. Location

The CCGT project site is located within the borders of Verkhnetagilskaya GRES. VTGRES is located at the bank of Verhnetagilski Reservoir on the opposite bank to Verkhniy Tagil town.

Site location is presented in the figure below.

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

It will be necessary to demolish the following existing buildings:

- Oily water treatment plant
- Warehouses.

Appendices A and B illustrate the layout and location of the proposed project.

Figure 3-1 Location and key elements of VTGRES

3.2. Present environmental conditions in the area of investment activity

VTGRES has a sanitary protection zone around it. The average results of pollutants concentrations in ambient air within the sanitary protection zone are presented in the table below.

Table 3-1 Ambient air pollution levels

Ambient air pollution	Indicator						
	Suspended dust	CO	NO2	NO	SO2	V2O5	B(a)P
Range of values, mg/m3	0.04-0.25	0.6-08	0.02-0.087	0.02-0.209	0.013-0.38	< 0.001	0.0000005-0.00000088
Limit acc. to Russian Law, mg/m3	0.5	5.0	0.2	0.4	0.5	0.002	0.000001

Ambient air quality is under significant pressure of emissions from the power plant and regional industrial activities; however current results do not show exceedances of the Russian standards. Comparison of the observed data from air quality around the sanitary protection zone with EU Air Quality standards (published at http://ec.europa.eu/environment/air/quality/standards.htm) indicate that the results are slightly below or around these standards for sulphur dioxide (EU 1 hour standard 0.35 mg/Nm3), dust (EU 1 hour standard for PM10 is 0.05 mg/Nm3). EU standard for CO is 10 mg/Nm3 (so the company is well below this standard) and EU standard for NO_2 is 0.2 mg/m3 (identical with Russian standard).

The River Tagil and three water reservoirs: Verkhnetagilski, Vogulski and Reservoir No 4 are important elements of local ecology. All three reservoirs were created to serve local industry, in particular VTGRES. The reservoirs serve as a source and recipient of cooling and industrial water from the power plant. Power plant activities significantly influence the quality of water in terms of temperature and associated phenomenon like algae and water plants blooms, as well as organic and mineral compounds sedimentation.

3.3. Nature protection

The following protected areas are located in the Project area of influence:

- 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 location of the protected areas is presented in Appendix B.

The Visimsky Biosphere Reserve is the state biosphere reserve located in the Sverdlovskaya Oblast to the west of the Verkhniy Tagil Town. 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. The ancient camp site, geomorphologic and botanic natural site.

3.4. Social and economical baseline

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 approximately 14,000 people.

The current age pattern of 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. The sex structure of the population residing in the Verkhniy Tagil Town includes 55% of female and 45% of male. According to data provided by the local Employment Centre, the number of employed people is at the level of 78% of total economically active population.

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

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

The number of officially registered unemployed in the urban municipality is at the level of below 5% of the economically active population.

4. Expected impacts on environment

4.1. Emissions to Air

The most important air polluters from CCGT process are nitrogen dioxides and carbon oxide. Both substances have negative impact on human health and environment. Therefore construction of the power unit ensures that the emissions will be limited to the level allowed both by Russian Law and European Union standards. Emission of sulphur oxides and dust is practically excluded because the use of natural gas as a fuel, which contains neither sulphur nor particulates.

Application of a combined cycle power plant producing simultaneously electric and heat energy and use of the gas fuel instead of coal allows limiting emission of essential pollutants into the air. The plant is designed to be able to use diesel as a reserve fuel also, but it is anticipated that this will be used only in the situation of gas supply problems.

4.2. Water resources

Operation of the CCGT unit involves consumption of water to be supplied to the main and auxiliary equipment cooling system, make-up water installation feeding the HRSG's circulation system, fire-fighting equipment and for social purposes. This means process and industrial waste water will be generated. Water feeding the existing cooling, process and fire-fighting systems is surface water drawn from the Verkhnetagilskiy reservoir. It is expected that consumption of water, in particular for cooling purposes will significantly decrease comparing to current status (shut down of 13 existing boilers). In long term it will lead to decrease of water temperature and overall improvement of environmental status of the reservoir.

In the past temperatures exceeding 30°C degrees were reported in Verkhnetagilsky reservoir in hot summer periods. Average temperature at the inlet to power plant cooling system in summer is about 28-29°C degrees. Operation of CCGT unit and stoppage of several coal-fired boilers will decrease maximum temperature to 24°C. In addition, due to the much lower evaporation losses, it is expected that the flow in Tagil river will increase by 1000 – 1500 m3/hour in next years.

Lower maximum temperature will allow for higher oxygen content in summer period and it will have indirect but recognizable positive impact on fish population in this reservoirs. Process waste water will be properly treated before discharge to surface waters. No chlorine or biocides will be used for biofouling protection of technological equipment (only mechanical cleaning methods).

4.3. Noise

New unit will be a source of additional noise emission. Acoustic power, due to installation of silencing equipment should not exceed 85 dB. It will be the responsibility of contractors to meet noise level specifications. As the new unit is located in the area, where no sensitive receptors (houses) are located in the vicinity, it is expected that noise nuisance will not be significant.

4.4. Solid waste

Use of a gas fuel for electric power generation complies with the rule to prevent forming waste materials constituting products of energy-generating fuel combustion; one of effects of putting the CCGT into operation will be significant reduction in quantity of produced boiler waste material (ash and dust) resulting from the fact that natural gas contains practically no particulates compared to ash content in hard coal.

4.5. Nature

Construction of the new CCGT unit is not expected to have any adverse impact on protected areas like Visimsky Nature Reserve. The Project will neither have any impact on flora habitats nor cause any changes to scenic landscaping. Analysis of the Project shows there is neither the risk of any transboundary effects nor the need to establish a limited use area.

Some impacts may be expected in relation to the construction of natural gas supply line and reconstruction of access road. These issues need careful assessment and supervision during the construction works.

4.6. Cultural heritage and archaeology

The project will have no direct impact on cultural heritage of Verkhniy Tagil region, due to its location on industrial area. However the area is known from industrial activities and settling since XVIII century (development of Nikita Demidov). Therefore the design documents for new CCGT unit and new gas pipeline will be agreed with the federal bodies responsible for cultural heritage protection.

5. Project Benefits

5.1. Environmental Benefits

The CCGT unit replaces 13 existing hard coal fired boilers with a new natural gas fired unit. As a result the emissions from VTGRES will significantly decrease. The summary of estimated emission levels before and after construction of CCGT unit are presented in the Table below.

Table 5-1 Summary of expected emission levels

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)
Year 2014	7 638 720	16 751	15 828	5 182 902	0.679
Years 2015 and 2016+ without CCGT	4 535 490	-	-	2 398 463	0.529
Years 2016+ with CCGT	4 678 979	-	-	2 148 719	0.459

According to the pre-feasibility study and later emission estimates the project will allow for:

- Decrease of average heat emission to cooling water for electricity production from 576 Gcal/h to 276 Gcal/h;
- Decrease in general water use of approximately 15% per /year;
- Decrease of average cooling water use from 64,000 t/h to 34,500 t/h;
- Dust and sulphur oxides emission reduction,
- CO2 emission reduction by 71%;
- NOx emission reduction by 74%.

5.2. Socio-Economic Benefits

Apart from advantageous ecological effects such as clear reduction in emission of pollutants into the environment and a guarantee of sustainable development consisting in fulfilment of the existing population's needs without any damage to potential for satisfying needs of the future generations, the Project enables:

- to hold on jobs necessary to operation of the new power plant as well as developing auxiliary activities related to it, like for example technical inspections and surveys, consulting and communications services, cleaning, green belt maintenance, etc.;
- to create new jobs for a construction period;
- to improve effectiveness of productive assets management.

Verkhnetagilskaya Power Plant is one of a key employers for the town and municipality of Verkhiy Tagil. Therefore the planned shutdown of some old boilers, which is required by the law, will significantly influence local community in terms of direct and indirect employment as well as taxes paid to the municipality. The new CCGT project assures long term operation and technical upgrade of the plant and will help to minimise above mentioned negative impacts.

The decommissioning of old inefficient coal-fired boilers is planned for the period 2015 – 2022. VTGRES prepared a detailed long term timeline of these activities and future investment in order to guarantee the stable heat supply to the region.

5.3. Health and safety benefits

Expected significant reduction of airborne emissions as well as water use will have significant impact on the quality of ambient air as well as the quality of water in local reservoirs.

6. Methods for reducing, limiting and preventing environmental impacts

6.1. Limitation of negative influence on the environment

Design documentation necessary to start the Project is under development. This includes also Environmental and Social Impact Assessment and obtaining the necessary environmental permits. Design documentation will include all legal requirements in Russian Law as well as good practice defined in European Union Directives, in particular Industrial Emissions Directive.

The company will implement an appropriate Environmental, Health and Safety (EHS) management system to ensure that the project is managed appropriately throughout construction and operation.

Construction of the plant will be managed taking into account environmental and social aspects. The requirements will be outlined in a formal Construction Management Plan. In addition, procedures to prevent environmental damage, dispose waste, treat waste water, prevent fugitive, dust emissions will be developed.

Consideration of special work requirements related to handling and wasting of asbestos during the following project phases:

- Demolition of existing objects and structures;
- Ground preparation and the creation of appropriate foundations for the power station;
- Decommissioning of the defined existing part of power plant and associated structures.

Proper procedures for period of operation will be developed before start-up of the facility.

The investor will not only meet all the obligations set down in issued administrative decisions and permits but also undertake many other actions deemed to be environmentally friendly or favourable in people's opinions or from health and safety point of view.

Such actions include:

- systematic disclosure and update of information about environmental issues related to the construction and operation of the plant;
- systematic communication on social and environmental issues with local community and undertaking necessary corrective actions;
- developing and implementing a plan of cooperation with the interested parties (i.e. associates and subcontractors);
- supervising of construction works by specialists in environment protection, health and safety and other fields (geology, hydrology, archaeology etc.) if necessary
- development of proper operational procedures.

The actions listed are expected to significantly limit potential both environmental and social nuisance connected with the Project realisation.

6.2. Control and monitoring

Apart from detailed requirements to be met during the construction and the implantation of an appropriate management system, InterRao will plan the monitoring of environmental factors for operation. Monitoring systems will be put in place in order to determine process parameters and will include properties of fuel and media, emissions of pollutants into the air, waste management consumption of surface water used for cooling and process purposes, noise emission and electromagnetic field generation. The Continuous Emissions Monitoring System (CEMS) for air emissions will monitor nitrogen dioxides and carbon monoxide. CEMS systems for emissions to air will also be placed on all other operation existing units.

Any other requirements set by Russian law in the permits will be fully implemented.

7. Access to information

Contact information for this project is as follows:

Sector for public relations and media - Repin Nadezhda - 8 (34357) 2-23-57;
nok@vtgres.ogk1.ru

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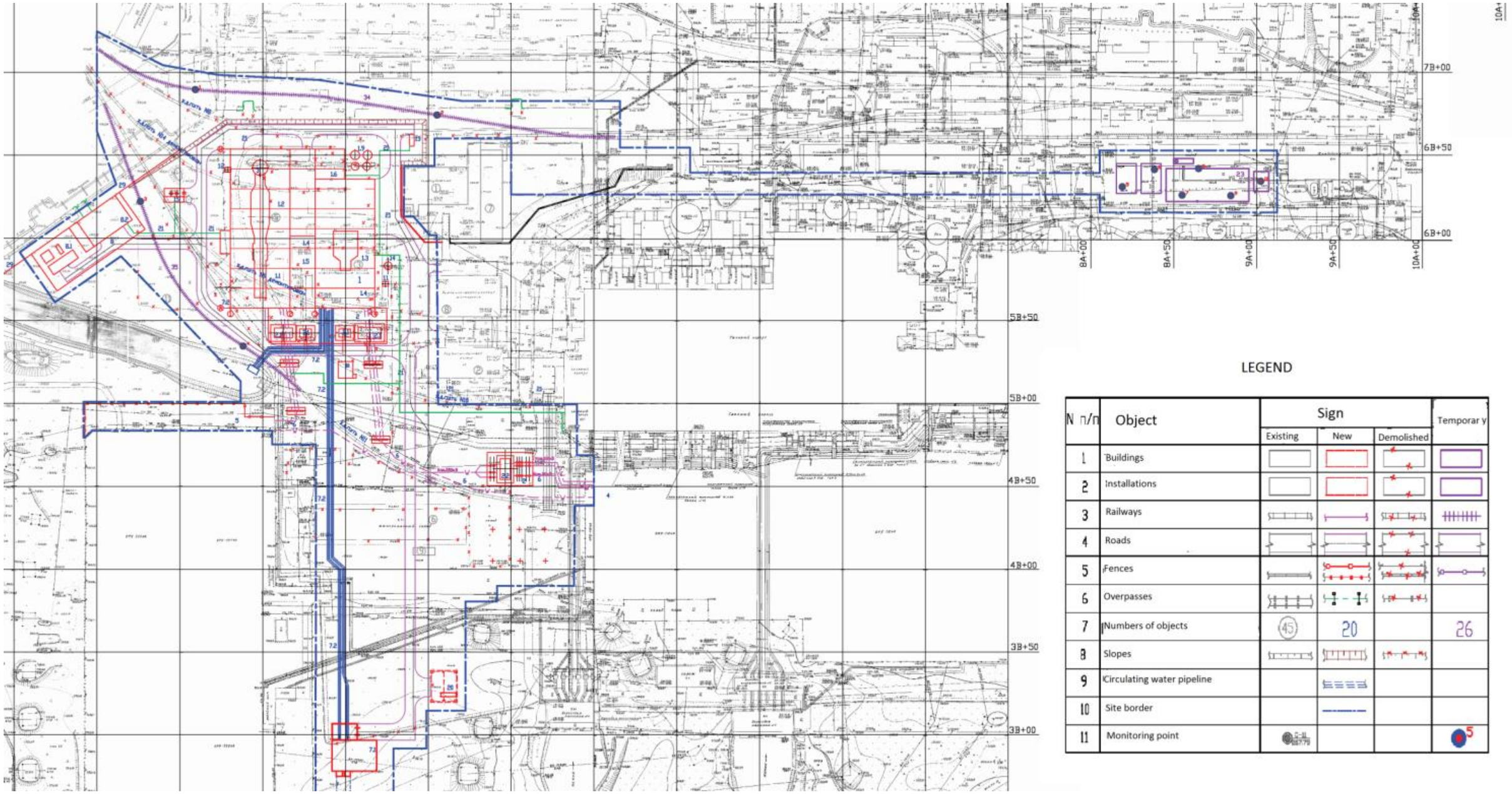
Project related information will be available on a dedicated page on the Inter Rao website as follows:

http://www.irao-generation.ru

Paper copies of this NTS and the associated ESIA Report are available for viewing at: InterRao VTGRES, 624162, Russia, Sverdlovsk region. Verkhny Tagil, Industrial Sector Passage 4.

Information will also be made available to the local community through distribution of information leaflets, posting information on bulletin boards in the residential areas, as well as on the official websites of local and regional authorities.

Appendix A. Site Layout



LEGEND

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

Appendix B. Site location