YEREYMENTAU WIND POWER PLANT, Yereymentau, Kazakhstan

Supplementary Environmental and Social Impact Assessment Information Addendum to Project Pre-EIA Report

Final Report

November, 2014

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ABREVIATION LIST

EIA	Environmental Impact Assessment
EPC	Engineering, Procurement and Construction
EPRP	Emergency Preparedness and Response Plan
ESAP	Environmental and Social Action Plan
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESIA	Environmental and Social Impact Assessment
EU	European Union
IBA	Important Bird and Biodiversity Area
kV	KiloVolt
MEWR	Ministry of Environment and Water Resources
MW	MegaWatt
NTS	Non - Technical Summary
PIU	Project Implementation Unit
Project	Yereymentau Wind Farm Project developed by Samruk Green Energy LLP
SEA	Strategic Environmental Assessment
SEE	State Environmental Expertise
SES	Sanitary and Epidemiological Services
SGE	Samruk Green Energy LLP
SEP	Stakeholders Engagement Plan
WPY	Wind Power Yereymentau – project company set up to develop the Project
WTG	Wind Turbine Generator

1 INTRODUCTION

1.1 BACKGROUND AND PURPOSE OF THIS DOCUMENT

Samruk Green Energy LLP ("SGE") is in process of developing Yereymentau Wind Farm Project (the "Project") south-east of Yereymentau Town, approximately 130 km east of Astana, in Akmola Region, Kazakhstan. A project company, Wind Power Yereymentau ("WPY"), was set up by SGE to develop the Project.

The Project is a 50 MW wind farm and will consist of maximum 20 Wind Turbine Generators WTGs (depending on selected manufacturer and turbine type), hardstand pads adjacent to each WTG, internal roads, internal electrical grid, an electrical substation including a control building and grid connection. The project is currently in Feasibility Study Stage.

SGE is seeking financing for the Project from the European Bank for Reconstruction and Development ("EBRD" or the "Bank").

In accordance with paragraph 20 of the EBRD Environmental and Social Policy 2008, the Project has been categorized A, requiring an Environmental and Social Impact Assessment (ESIA), public consultation and information disclosure in accordance with EBRD Public Information Policy.

In line with national legislation, a pre-Environmental Impact Assessment (pred-OVOS, pre-EIA) has been prepared in 2011 for the Project. An environmental and social due diligence performed for the Project revealed that the Pre-EIA is to be supplemented with additional environmental and social assessment in order to meet Bank's Environmental and Social Policy requirements.

This document is an Addendum to the Project pre-EIA Report covering the aspects that have been insufficiently addressed in the Pre-EIA and which may result in potentially significant impacts. The following chapters are based on readily available information (secondary data). For this pre-EIA Addendum purposes the available information has not been supplemented by field surveys (primary data not acquired).

1.2 PROJECT ENVIRONMENTAL AND SOCIAL APPRAISAL PROCESS IN THE CONTEXT OF NATIONAL AND EBRD REQUIREMENTS

1.2.1 *Brief description of national environmental appraisal requirements*

Specific national requirements for Environmental Impact Assessment (EIA) procedures for all categories of economic activity are established by the "Instruction on Environmental Impact Assessment at the Development of Prior Planned, Planned, Prior Project, and Project Documentation".

Projects in Kazakhstan are classified by the Sanitary and Epidemiological Services (SES) according to five Danger/Sanitary categories:

- Category 1 & 2 projects have levels of severity/danger that trigger a full EIA;
- Category 3 projects are considered to have lower levels of severity/danger and as such a lesser assessment is undertaken, although still referred to as an environmental assessment; and
- Category 4 & 5 projects are considered to present considerably lower risks of severity/danger and generally do not warrant an assessment beyond the initial screening.

Environmental reviews are conducted at end of each stage in the process and before proceeding to the next stage. Reviews are conducted first at the oblast (region) level and then at government level. Starting August 2014, responsibility for environmental reviews of renewable energy projects lies with the Committee for Environmental Regulation, Control and State Inspection within the Ministry of Energy.

Under Kazakhstan regulations, the EIA process has three stages:

- preliminary Environmental Impact Assessment (pred-OVOS);
- preparation of the EIA (OVOS). EIAs are obligatory for large scale projects; and
- preparation of an "Environmental Protection Section". The Environmental Protection Section is prepared in the detailed design stage in the event that mitigation measures as defined in the EIA (OVOS) are required.

Public hearings or public consultations are required at all stages of EIA. The requirements for public participation are reflected in the Environmental Code, and the "Rules of access to environmental information related to EIA procedure and decision-making process on intended economic and other activity".

The process provides for a preliminary review period of two weeks and a final review period of up to 90 days after which the EIA authors are required to defend the EIA at a consultation session with the stakeholders. Once complete, the EIA is revised and a formal OVOS certificate is issued to the proponent, but usually only after another 30-day period allowing for any additional comments. This certificate allows the project to proceed with other approvals required.

For the Project a pre-EIA (pred-OVOS) has been prepared in 2011 in the feasibility study stage. The pre-EIA passed initial public consultation on 05.12.2011 and the conclusion of SES review was obtained on 28.02.2012.

A full Environmental Impact Assessment (OVOS) including stakeholder consultation will be performed in the technical design stage of the Project.

1.2.2 EBRD environmental and social appraisal requirements

The EBRD is committed to promoting "environmentally sound and sustainable development" in the full range of its investment and technical cooperation activities. This commitment to promote environmental and social sustainability is outlined in the Bank's Environmental and Social Policy (the "Policy").

Projects are screened by EBRD at an early stage and placed into one of the four following categories, depending on the level and type of environmental and social due diligence that is required:

- Category A projects are those with potentially significant and diverse environmental and social impacts, requiring detailed impact assessments;
- Category B projects are those with environmental and social impacts that are site-specific and can be addressed through readily available management and mitigation techniques;
- Category C projects have minimal environmental or social impacts; and
- FI projects are where the EBRD is investing in a Financial Intermediary, such as a bank or equity fund.

The project has been classified Category A due to its sensitive location and potential for cumulative impacts with other projects.

Therefore an Environmental and Social Impact Assessment (ESIA) and public consultation and information disclosure in accordance with EBRD Public Information Policy are required for the Project.

To achieve these requirements, the Project pre-EIA has been supplemented with additional environmental and social impact assessment information (this report). The potential significant impacts as well as the required mitigation have been identified and, following a precautionary approach, transposed into the Environmental and Social Management Plan (ESMP) appended to this document (Annex E).

Further surveys needed to confirm and refine mitigation considered have been defined and included in the Environmental and Social Action Plan (ESAP). The ESAP summarises the measures to avoid, reduce or otherwise control potentially significant environmental and social impacts identified.

The program for disclosure, consultation and engagement with Project stakeholders in line with EBRD Public Information Policy are summarised in the Stakeholder Engagement Plan (SEP).

The results of the environmental and social assessment performed for the project are briefly summarised in the Non-Technical Summary (NTS).

The Project pre-EIA, the pre-EIA Addendum (this document) including the ESMP, the NTS, the ESAP and the SEP constitute together the ESIA disclosure package of the Project.

In line with Category A requirements for public sector projects disclosure, the ESIA disclosure package is to be made publicly available for 120 calendar days prior to consideration of the Project by the Bank's Board of Directors.

Implementation of the ESAP; the ESMP and of the SEP is the responsibility of SGE through the project company, WPY, and the EPC contractor.

2 PROJECT DESCRIPTION

2.1 INTRODUCTION

The Project is a wind farm located south-west of Yereymentau Town with an installed capacity of 50 MW. The Project area is located in the Akmola Region, south-east of the town of Yereymentau, approximately 130 km east of Astana, Kazakhstan.

The Project will be implemented by Samruk Green Energy LLP (referred to as "SGE" or "the Project Developer"), a renewable energy subsidiary of the state owned power holding Samruk-Energo JSC. SGE will own, manage and operate the wind farm. The Project is the second SGE wind farm project in Yereymentau and will represent the second stage of an ambitious program to develop 300 MW wind power capacity in Yereymentau area. The first stage of this program, a 45 MW wind farm, is currently under construction in a distance of about 2.5 km west from the Yereymentau wind farm.

For the Project, a Feasibility Study was prepared by "Dar mühendislik müşavirlik a.s." and "Kazakh Research and Development Institute of Energy". Wind resources were investigated by Wind Prospect Ltd.

2.2 PROJECT ALTERNATIVES

The Feasibility Study (prepared by Dar mühendislik müşavirlik a.s, 2012.) considered four project alternatives:

- 17 WTG's each having a capacity of 3 MW
- 25 WTG's each having a capacity of 2.05 MW
- 34 WTG's each having a capacity of 1.5 MW
- 20 WTG's each having a capacity of 2.5 MW

The alternative, for which state authorities approval has been obtained, considers a layout of 20 WTGs of 2.5 MW capacity each (turbines type Fuhrlaender FL 2500).

According to a technical due diligence performed for the Project, (Technical Due Diligence Report, Lahmeyer International, 2014), given technical progress since the date of the Feasibility Study, alternative WTGs may be eventually used for the Project to increase its efficiency (the installed capacity of 50 MW will not be changed).

Main characteristics of the turbines to be potentially considered by the Project including the number of the turbines are summarized in the table below.

Table 2-1 ***Considered turbine types (Lahmeyer 2014)***

Manufacturer and Turbine Type	Rated Capacity	Number of Turbines	Rotor Diameter	Hub Height
Vestas V112	3,300 kW	15	112 m	84 m
Siemens SWT 3.0-108	3,000 kW	17	108 m	80 m
GE Wind Energy GE 2.85-103	2,850 kW	18	103 m	85 m
Fuhrlaender (now FWT) FWT 2.5-103	2,500 kW	20	103 m	85 m
Goldwind 2.5-109	2,500 kW	20	109 m	85 M

Whenever relevant, this report considered different turbine types and configurations for the assessments performed (e.g. for noise and shadow flicker modelling) in order to reflect worst case scenario situations.

2.3 PROJECT LOCATION

The wind farm is planned to be developed south-east of Yereymentau town on a site with a total area of 1,242 ha. The wider surrounding area is open steppe with scattered water bodies in the lowlands.

According to the Feasibility Study, the main criterion taken into consideration for the selection of the site is its location in proximity to public infrastructure:

- availability of public roads for site access;
- railway availability to facilitate equipment shipment to the site;
- availability of 35 kV, 110 kV, and 220 kV overhead power lines which facilitate Project connection to the grid; and
- availability of numerous internal roads (dirt tracks) within the site.

The site is located approximately 2 km south-east from the town centre of Yereymentau, with the closest residence to a wind turbine within a distance of approximately 600 m.

The site layout map is presented in Figure 2-1 and an overview on the wider project area can be found in Figure 2-3.

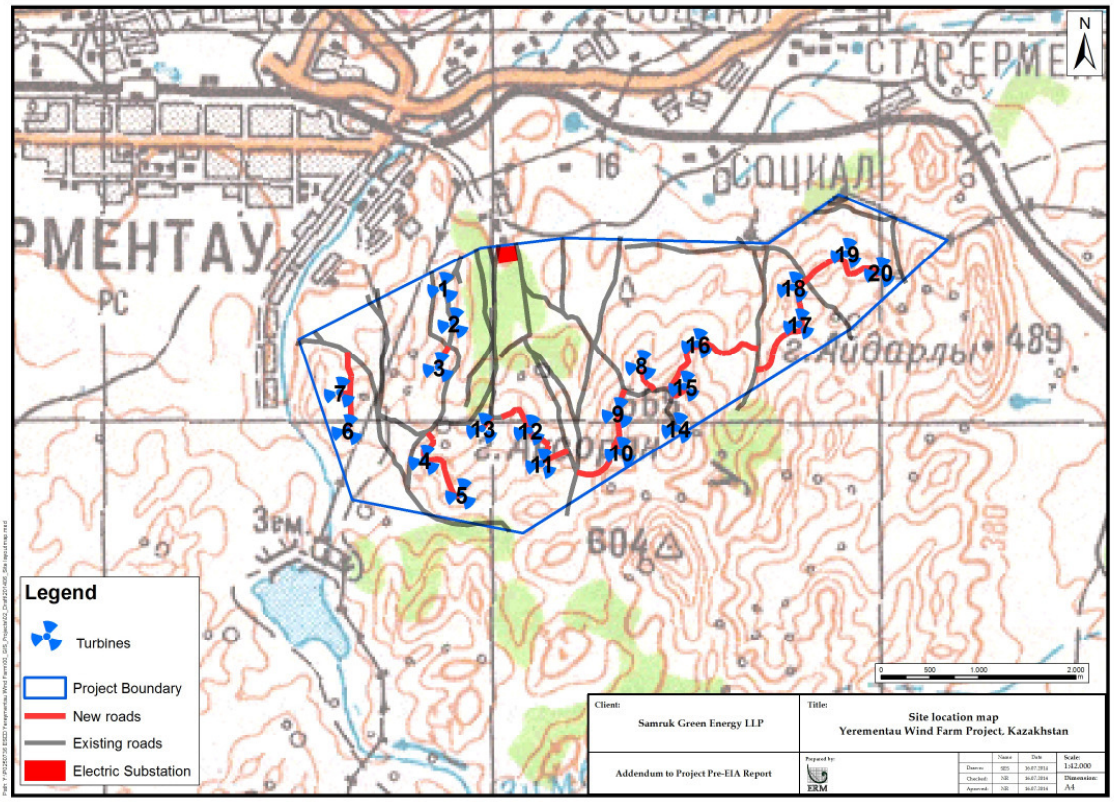


Figure 2-1 *Site layout map*

2.4 *BRIEF DESCRIPTION PROJECT ELEMENTS*

The feasibility study considered four layout options and different types of WTGs.

The Project (configuration for which authorities' approval has been obtained) consists of 20 WTGs of 2.5 MW each (or alternative layout, cf. Table 2-1), hardstand pads adjacent to each WTG, internal roads, internal electrical grid, an electrical substation including a control building and grid connection. The turbines will be installed at higher elevations within the site.

Alternative WTGs may be eventually used for the Project to increase its efficiency. In this case, number of turbines may decrease up to 15; while turbine rated capacity ranges between 2.5 and 3.3 MW (the overall installed capacity of 50 MW will not be changed).

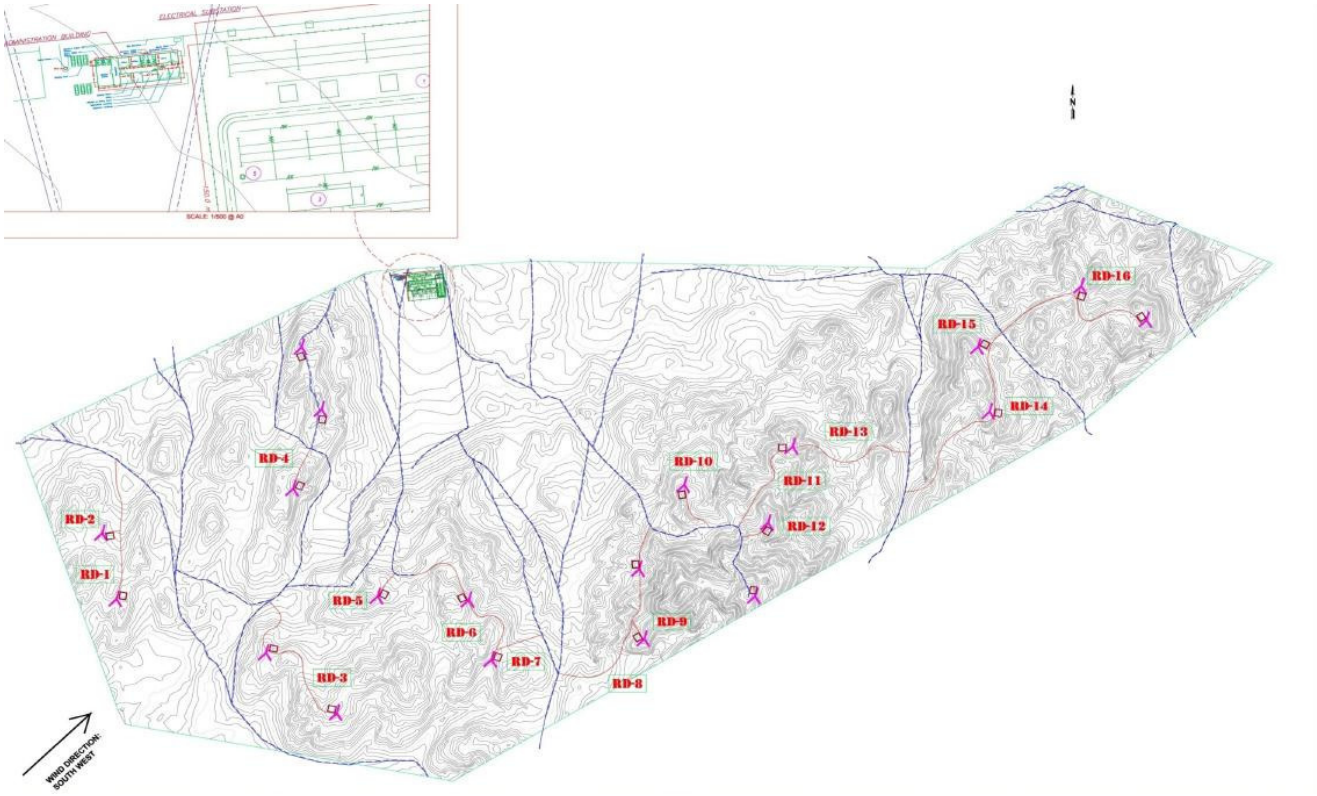
Crane pads with dimensions of 40 x 35 m (with and without reinforced concrete slabs) will be provided adjacent to each WTG.

For the Project it is envisaged to use existing roads within the site as far as practicable. New road sections in total length of approximately 9 km will however be needed to ensure access to all WTG locations. Existing road structure consists of natural pathways/dirt tracks which will have to be enhanced for Project purposes. The enhanced roads will have width of 5 m and will be provided with adjacent trenches for storm water drainage.

The internal electrical grid will consist of underground cables within radial display to connect WTGs, which is standard practice in the industry.

An administration building will be erected. An electrical substation will be provided at the northern site boundary which will also include a control building with social facilities.

As per the Feasibility Study, Project connection to the grid is foreseen by direct connection to the existing 220 kV overhead line which passes at the north-eastern site border. The project will be connected to the grid via overhead connection in length of approximately 800 m.



Source: Feasibility Study, Dar mühendislik müşavirlik a.s., 2012

Figure 2-2 ***Project layout***

2.5 *PROJECT SETUP AND ENVISAGED SCHEDULE*

The Project will be developed following an EPC (Engineering, Procurement and Construction) turnkey approach which is a common standard in the industry.

The EPC Contractor will be responsible for the complete installation of the Project, including complete procurement (WTGs, electrical and civil works) as well as commissioning of the Project and possibly the operation and maintenance of the Project during the warranty period.

During procurement and construction stages a Project Implementation Unit (PIU) will ensure EPC tendering and works supervision. The PIU will be supported by a Consultant (PIU Consultant).

The EPC tender is expected for June 2015. Start of construction work is expected for April 2016 and would be finalised in 2017.

2.6 *OTHER WIND FARM PROJECTS IN THE AREA*

Two other wind farm projects are proposed in the area around Yereymentau:

- A 30 – 50 MW Wind Farm Project developed by a Chevron company. The project is proposed at a site within a distance starting approximately 3.5 km north-west of Yereymentau Wind Farm and extending further to the north. This project is in planning stage, construction has not been initiated.
- First Wind Power Station Project: a 45 MW capacity wind farm project (Stage 1 of the SGE's 300 MW wind power capacity program), located approximately 2.5 km west from the Project. The project is developed by SGE's daughter company First Wind Power Station" LLP (ТОО "Первая ветровая электрическая станция") and is currently under construction.

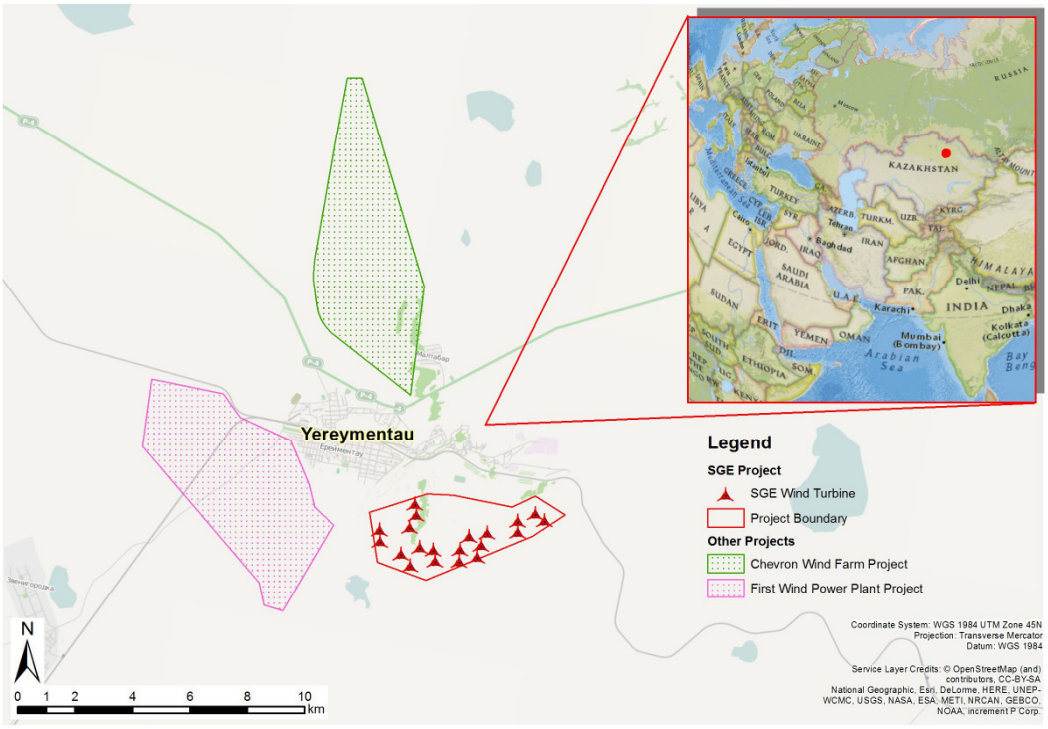


Figure 2-3 *SGE Project and the neighbouring wind farm projects*

2.7 *DECOMMISSIONING*

The following description is a generic description for the decommissioning of a wind farm. The projected operational lifetime of a typical wind farm is 25 years. After this period there are two options, repowering the site and replacing existing wind turbines or decommissioning the site, removing the wind turbines and other major structures and reinstating the site.

Prior to decommissioning, a decommissioning method statement, detailing how the site will be restored is usually prepared and approved by the relevant authorities.

Wind turbines and met masts are removed by crane and reused elsewhere if possible. In the case of the foundation works, upper sections are removed and the voids backfilled with appropriate materials to support the land use at that time. Underground cables and deep concrete foundations are usually left in place as removal is likely to cause more disruption than leaving them in-situ. However, if techniques allowing removal of underground cables with limited disruption and impacts will be available at the time of decommissioning these will be appraised and considered. Surface vegetation or soil make-up is also

to be restored. As with the turbines the electrical control building and internal equipment is removed and reused or recycled where possible.

Impacts caused by decommissioning activities are in principle comparable with impacts during the construction phase regarding noise and local disturbance.

3 SUPPLEMENTARY ENVIRONMENTAL BASELINE CONDITIONS AND IMPACT ASSESMENT INFORMATION

3.1 SOIL AND GROUNDWATER

3.1.1 Baseline Environment

The Project site is covered by a stratified, brownish humus-rich surface horizon of steppe soils (Kastanozem). These soils consist of 2-4 % humus and are used for grazing rather than for grain farming. Typical for Kastanozem is the accumulation of secondary carbonates within the first metre of the soil profile. The soil texture is represented by loams and thin sandy loams with clays (diluvium/colluvium-deposits) as a result of in–situ weathering and accumulations at the slope toes. Loam deposits are specific to the lowlands and are not present at higher altitudes of the site. The thickness of these superficial deposits is ranging from 1 to 12 m in places. Erosion represents a general risk for the Akmola region[1].

The underlying bedrock consists mainly of quartzite, sandstone alternations, limestone and conglomerate interlayer. The uppermost part includes weathered rock layers, blocks and boulders of fragmented sandstone. It outcrops on the hills or in–near surface (0.5 – 2m depths) and is extensively jointed, fractured and folded due to intense tectonics.

The meta-sedimentary formations including quartzite and sandstones are low permeable, presenting secondary permeability only along the bedding and fracture lines. In respect to groundwater, the site can be generally divided in two parts.

In the hilly areas with higher altitudes (mostly the southern part of the site) no principal aquifer is developed. The lowlands however are characterized by seepage and a water accumulation basin in the northern site area. A low recharge by rainfall and snow melting appears to be main source of groundwater in these areas. The permeability of quartzite – sandstone layers is in the range of 10^{-2} – 10^{-4} cm/s.

As part of the Project Feasibility Study, groundwater depth was encountered at 7 m below ground level in the boreholes drilled in lowland areas.

[1] Abdulla Saparov; 2014: Soil Resources of the Republic of Kazakhstan: Current Status, Problems and Solutions

3.1.2 *Impacts and Mitigation*

Construction Phase

The wind turbines will be located on the hills and gentle slopes at the higher altitudes. Turbines foundations will have depths of 0.5 to 2m and will be constructed on the hard rock layer after the removal of superficial soils and weathered layers.

To the extent possible the Project will make use of existing roads network to minimise length of new roads built. Approximately 9 km of new access road sections will however be required to ensure access to each turbine. The new wind farm roads will be 5 m wide and their construction will imply removal of the 10 - 15 cm thick topsoil layer. With consideration of expected length of the new roads section, approximately 4500 – 6700 m^3 of topsoil will be removed.

Compaction to soils can occur from the movement of heavy vehicles and machinery during construction, subsequently altering the soil structure. Stripped soil in storage alongside construction working areas will be vulnerable to degradation, wind and water erosion. Degradation may occur due to the breakdown of organic materials and biological structures binding the soils together.

Best practice soil handling techniques will be implemented as detailed within the Environmental and Social Management and Monitoring Plan in order to mitigate these potentially adverse effects.

Best practice soil handling techniques to be implemented will include the following measures:

- topsoil stripping will be limited to the footprint of the turbine, platform and pads locations and to the new access roads sections;
- avoid steep slopes, implement anti-erosion measures, and promptly re-vegetate cleared land with native species only;
- minimise disturbance on slopes and near water;
- repair ruts and other features caused by work in wet weather;
- topsoil will be segregated and separately stored to one side of the construction area, in such a way that it is not mixed with sub soil or trafficked on by vehicles;
- after the construction the stored soil and topsoil will be used as backfill and for landscaping at the construction site and unoccupied areas will be restored to their initial conditions;

- following reinstatement, any surplus (uncontaminated) soil will be transported and stored at locations indicated by local municipality for further reuse;
- stockpiles will have a maximum of 2 m height to avoid compaction due to weight; and
- the construction working areas will be reinstated as far as practicable to the same conditions as before.

Subsurface contamination during construction may occur through direct spillage of materials such as fuels and lubricants from vehicles and generators.

Potential groundwater impacts during construction may occur from leaks or spills of diesel or lubricants from equipment or machinery. Given the use of groundwater by local population, groundwater sensitivity (likelihood of contaminants released impacting sensitive receptors) is considered high.

In order to minimize any adverse impacts to groundwater from potential contaminants from construction activities, cut off ditches may be used to prevent water from entering excavations. Given local topography and the hydrogeology conditions as well as given that wind turbines will be located at higher altitudes where shallow groundwater is not present, groundwater is not expected to enter the excavations. It is expected that groundwater will not be encountered during foundation works.

In order to limit potential subsurface impacts associated with direct spillage of fuels and lubricants the following measures aimed at preventing harmful substances from reaching the subsurface will be implemented:

- refuelling of vehicles or equipment will be restricted to the construction camp which will be located on impermeable hardstanding. Any maintenance or re-fuelling will take place only with implementation of appropriate secondary containment and spill controls;
- transportation vehicles and construction equipment will be parked on paved surfaces during the night. The paved surfaces should be equipped with oil/water separators to treat storm water runoff, if possible;
- construction works will be executed in a way that subsurface contamination is avoided. Any oil or fuel spills will be immediately cleaned up, and any contaminated areas will be remediated and restored after construction;
- the contractor will develop procedures for emergency/spill response, and for the storage and handling of fuels, construction materials and wastes.

Contamination that may already be present in the soil from current or historical sources may potentially be encountered during excavation and this could impact the construction workforce through direct contact, or via surface run-off from stockpiles. However, given the rural nature and current land-use of the Project area, the presence of historical contamination is considered very unlikely and, if present, a historical contamination is likely to be limited to localised hotspots and characterised by low concentrations.

Implementation of above mitigation measures and of the ESMP will ensure that impacts on soil and groundwater during construction stage will not be significant.

Operation Phase

During the operation phase, potential impacts on soil may be associated with the minimal modification to run-off rates and drainage patterns due to the introduction of impermeable surfaces within the Project area.

Turbine foundations could create a preferential pathway for contaminants to reach groundwater resources. The use of potential contaminants during the maintenance of the turbines is limited and strictly controlled. Because of the way the rotor bearing works, grease may leak from the labyrinth seals in the rotor bearing. The grease flows directly into drip trays in the tower, which are regularly emptied during maintenance. Also, given that the concrete foundations depth will be limited to 0.5-2 m below ground level in areas without shallow aquifer, the groundwater contamination risk can be considered very low.

The transformer is located outside the wind turbine in the transformer station. The transformer oil is usually not changed during the life time of the transformer. In case of an accident, any oil that emerges is collected in an impermeable concrete drip tray beneath the transformer.

Therefore no significant subsurface contamination is anticipated during operation.

Whilst some localized effects on groundwater infiltration into the underlying bedrock may occur, the overall impacts on groundwater recharge are predicted to be negligible considering the overall small size sealed footprint of the turbines. The impacts related to the operation of the wind farm on groundwater recharge are negligible.

No significant subsurface impacts are anticipated during Project operation.

3.2 SURFACE WATER

3.2.1 Baseline Environment

Yereymentau district is supplied with water abstracted from groundwater/ springs. There are a number of spring water sources. The most studied springs are three sources located near Yereymentau, where three artesian wells were drilled.

The district has more than 20 lakes. Closest to the project site are Korzhynkol lake, approximately 9 km east of the Project and Tamdykol lake, approximately 13 km north of the Project. Most of these lakes are supplied by snow melting in spring and become drier in the warm season some of them even disappearing at the end of summer season. The biggest reservoir in the region is Seletinskoe Reservoir. Altogether the district has more than 20 creeks and streams. The largest rivers of Yereymentau District are Shimbulak, Selety and Ulenty. Most tributaries of these rivers have the character of temporary water courses, some of them with high saline water.

No lakes are directly located on the Project site. An artificial accumulation lake is located south-east to the site (at approximately 1.5 km from closest Project turbine), on a small watercourse flowing in northern direction to the east of the site. The site landscape is undulated and along the fracture lines small creeks exist, most of them are only temporary and generally flowing in northern direction. Their upstream parts extend to the hilly peaks, present seasonal flows and limited catchment areas. Surface flows are observed as tree belts in the valley courses, small ponds and springs.

3.2.2 Impacts and Mitigation

Construction Phase

Only small creeks are located in the lowlands on the Project site. Excavation activities will be restricted during periods of intense rainfall to reduce the risk of sediment, oil or chemicals spilled into the natural drainage system. Full reinstatement of creeks disturbed during construction will be implemented.

Implementation of good site working practices described in Chapter 3.1.2 above will ensure that contamination of surface water bodies will be avoided. No significant impacts to surface water are predicted to occur in the construction phase.

Operation Phase

During operation, water demand and water discharge will be limited to those associated with the domestic/sanitary use at the office space within the transformer station. Sanitary wastewater will be collected into a septic tank which will be periodically emptied and content disposed of to the nearest public wastewater facility by an authorised contractor.

New access roads, turbine bases and other hardstanding areas will, however, increase impermeable areas on the site, and cause a reduced and localized, but still noticeable increase, in runoff rates and peak flood flows across the site. The proposed impermeable areas are small relative to the total site area.

In order to reduce the potential impact on the drainage pattern, roadside drains will be designed to avoid disturbance to the natural hydrology. The overall magnitude of modifications to the drainage pattern is predicted to be minor. The roadside drainage design will aim to ensure that runoff percolates to the underlying ground rather than concentrates as channel flow. Overall, no significant impacts to surface water are predicted to occur in the operation phase.

3.3 BIODIVERSITY

Biodiversity baseline data provided in this report is based on the following sources:

- pre-EIA (pred-OVOS) prepared for the Project by a licensed consultant in 2011;
- the conclusions report for the Project issued by the Kazakhstan Institute of Zoology in 2010;
- the EIA and field studies performed for the neighbouring 45 MW wind farm project developed by "First Wind Power Station" LLP, a daughter company of SGE;
- data acquired from other sources and consultation with relevant stakeholders including representative of the team performing ornithological field surveys of a wind farm project planned 3.5 km north-west of the Project; and
- regional/national data from the KazREFF[1] Report.

[1] Kazakhstan Renewable Energy Financing Facility: http://www.kazreff-ser.com/

3.3.1 *Baseline Environment*

3.3.1.1 *Habitat and Flora*

The site encompasses hill tops, gently rolling slopes, minor creeks generally flowing towards north. Their upstream reaches extend to the hilly peaks and present seasonal flows and limited catchment areas. Tree belts exist in the valley courses as well as ponds and springs. The steppe areas are used for livestock grazing and the majority is criss-crossed by livestock paths and access tracks.

The upper parts and the hills slopes are typical steppe grasslands while the lower parts and the valleys contain patches of forest and hydrophilic vegetation.

Vegetation cover in the region is characterized by high diversity of communities and rich flora, numbering according to various sources from 400 to 450 species of vascular plants belonging to 53 families.

Of these, the field surveys performed in July 2013 at the neighbouring 45 MW wind farm site identified 188 species of vascular plants from 115 genera and 34 families. This includes rare or endemic species and IUCN Red List species.

Species included in the Red Data Book of Kazakhstan identified at the neighbouring wind farm site are European Alder (*Alnus glutinosa*) (IUCN Least Concern (LC)), Yellowish Pasque Flower (*Pulsatilla flavescens*) and Spreading Pasque Flower (*Pulsatilla patens*)(1) .

Rare and endemic species on the upper parts of the site and on the hills slopes include pasque flowers *Pulsatilla flavescens, Pulsatillla patens, Pulsatilla multifida*. These are subject to grazing pressure and collection for use as medicinal plants.

The lower parts of the site accommodate patches of Aspen (*Populus tremula*) and Birch (*Betula pendula and Betula pubescens*) forest as well as Black Alder. The shrubs in the lower parts of the site include species such as Wild Rose *(Rosa acicularis)*, Spirea (*Spiraea hypericifolia),* Cotoneaster *(Cotoneaster uniflorus).* The herb layer includes Strawberry (*Fragaria viridis*), Fireweed (*Chamaenerion angustifolium*), and Steppe Medicago (*Medicago romanica)*.

(1) Both *Pulsatilla flavescenes* and *Pulsatilla patens* and all other plant species listed in this section have yet to be assessed by the IUCN.

3.3.1.2 *Terrestrial Fauna (excluding bats and birds)*

According to desk study data, nearly 41 species of mammals inhabit the Yereymentau area, a relatively rich terrestrial fauna that reflects the natural climatic conditions of the region.

During the spring surveys, 12 species of mammals were recorded at the neighbouring wind farm site on the basis of sightings or field signs, with ten recorded in the autumn, this reduction possibly reflecting declining activity associated with the hibernation period.

Mammals most encountered were Bobak Marmot (*Marmota bobak*) (IUCN LC) (1) , population stable) in summer, Siberian Roe Deer (*Capreolus pygargus*) (IUCN LC, population decreasing) and Corsac Fox (*Vulpes corsac*) (IUCN LC, population trend unknown). Marmots are abundant at the site, their average density being estimated at 248 individuals per km^2.

Argali (*Ovis ammon collium*) (IUCN Near Threatened (NT), Red Book of Kazakhstan Category III Rare (2)) has been recorded visiting the Yereymentau area in some years from the resident population supported by the Buiratau National Park to the south of the Project site (see *Section 3.3.1.5*.

Information on reptiles and amphibians in the Project area is confined to desk study data that indicates that Moor Frog (*Rana arvalis*) (IUCN LC) and the Green Toad (*Bufo viridis*) (IUCN LC) are both likely to be present, with the latter species potentially occurring some distance from water. Four species of reptiles are also likely to be present. These are Sand Lizard (*Lacerta agilis*), Grass Snake (*Natrix natrix*), Steppe Ratsnake (*Elaphe dione*), and Meadow Viper (*Vipera ursinii*). The meadow viper is listed as Vulnerable (VU) by the IUCN and the other species are LC.

For insects literature searches indicate the Yereymentau area may support eight insect species listed in the "Red Book" of Kazakhstan. However field surveys at the First Wind Power Station site found only two: Bush Cricket (*Onconotus servillei)* (IUCN VU) and the Apollo Butterfly (*Parnassius apollo*) (IUCN CU). The latter, although listed as vulnerable by the IUCN is common in Kazakhstan.

(1) For all fauna species, on first use the IUCN Red List status is given, as well as the Red Data Book of Kazakhstan status, where that species is included.

(2) The IUCN Red List assesses *Ovis ammon* at species level. The Red Book of Kazakhstan recognizes 5 sub-species of *Ovis ammon*. Those occurring within the Yereymentau area are considered to be *Ovis ammon collium*. This report uses *Ovis ammon collium* in order to assess impacts on the population as assessed in the Red Data Book of Kazakhstan.

3.3.1.3 *Bats*

During preliminary surveys conducted in the area in 2012, only one species of bat – Parti-coloured Bat (*Vespirtilio murinus)* (IUCN LC) was recorded. According to literature data four other bat species may potentially be encountered in the area during migration. Relevant species in the context of the Project include:

- Parti-coloured Bat (*Vespirtilio murinus*) (IUCN LC). This species is widely distributed and relatively numerous in north half of the country. Surveys in May-June 2012, identified habitat of this species at four points in the neighbouring site.
- Brandt's Bat – (*Myotis brandtii)* (IUCN LC). Several specimens of bats of this species were encountered in Kokshetau region.
- Pond Bat (*Myotis dasycneme*) (IUCN NT). This species was recorded in Yereymentau Mountains.
- Daubenton's Bat (*Myotis daubentonii*) (IUCN LC). Detected in the area of "Borovoye" resort and Kotyrkol and Zerenda lakes.
- Northern Bat (*Eptesicus nilssonii*) (IUCN LC) which inhabits the forested steppe areas and was recorded in the area of "Borovoye" lake, Petropavlovsk and Kokshetau cities.

3.3.1.4 *Birds*

Kazakhstan lies on two major migratory flyways; the East Africa/ West Asia flyway, and the Central Asia flyway. As a consequence the Project area is likely to experience seasonal birds migrations, in spring towards the Central and Northern Palearctic and in autumn to North-West Asia, Mediterranean, South-Indian and North-African wintering areas.

The Institute of Zoology concluded in their 2010 report that the Project area does not lie on a recognised migration route. The main bird migration corridors through central eastern Kazakhstan run to the west of the site through the Tengiz-Korgalzhyn depression (approximately 250 km southwest of the Project site) and to the east of the site along Irtysh River (approximately 250 km northeast of the Project site). Local smaller scale migration appears to largely avoid the Erymentau Mountains, instead following chains of lakes to the east and west of the proposed windfarm site.

Transect surveys performed during the spring 2012 at the wind farm project site located north to the project recorded 72 bird species. The most numerous were Passeriformes (29 species), Charadriiformes (18 species) and

Anseriformes (10 species). Bird usage of the steppe was low (only five species recorded), whilst forested areas in the lower parts of the site recorded 26 species either breeding or using the wooded areas.

The autumn (September and October 2012) surveys at same site identified 21 species of birds including Anseriformes (2 species), Falconiformes (6 species), Galliformes (2 species), Columbiformes (1 species) and Passeriformes (10 species).

The most numerous migrating species was White-fronted Goose (*Anser albifrons*) (IUCN LC), flocks typically flying above Aschikol lake 2-3 km westwards of Yereymentau but on one occasion crossing the named project area at 120-150 m (i.e. at collision risk height).

The most common breeding birds on site were Rook (*Corvus frugilegus*) (IUCN LC) and Jackdaw (*C. monedula*) (IUCN LC) and Calandra Lark (*Melanocorypha calandra*) (IUCN LC). All are common and widespread species in Kazakhzstan.

Among the birds of prey, Eastern Imperial Eagle (*Aquila heliaca*) (IUCN Vulnerable (VU), Red Book of Kazakhstan Category III Rare) was recorded regularly, typically at 50 - 200 m height (at collision risk height), and it is likely there is a pair breeding in an area north from the project site. A young Golden Eagle (*Aquila chrysaetos*) (IUCN LC, Red Book of Kazakhstan Category III Rare) was noted on one occasion, with single records also of Kestrel (*Falco tinnunculus*) (IUCN LC), Hobby (*Falco subbuteo*) (IUCN LC), Goshawk (*Accipiter gentilis*) (IUCN LC) and Sparrowhawk (*Accipiter nisus*) (IUCN LC).

Skylarks (*Alauda arvensis*) (IUCN LC) and Chaffinch (*Fringilla coelebs*) (IUCN LC) were the most common passerines recorded during autumn migration.

Parallel autumn migration observations were carried out at Tamdykol Lake (13 km north of Project site) in the autumn. This recorded large numbers of waterfowl, and the researchers suggested this indicated night time migration by these species through the Yereymentau project area.

At the lakes located at different distances from the site, five protected bird species were recorded:

- Whooper Swan (*Cygus cygnus*) (IUCN LC, Red Book of Kazakhstan Category II Declining) was spotted at two water basins;
- Pallid Harrier (*Circus macrourus*) (IUCN NT) was recorded two times at a lake;
- Demoiselle Cranes (*Anthropoides virgo*) (IUCN LC, Red Book of Kazakhstan Category V Recovered) were recorded at one of the lakes;

- Great Black-headed Gull (*Larus ichthyaetus*) (IUCN LC, Red Book of Kazakhstan Category II Declining) was noticed at three lakes; and
- Caspian Tern (*Hydroprogne caspia*) (IUCN LC).

A pair of Eastern Imperial Eagle and possibly Pallid Harrier nest in proximity to the wind farm boundary. Golden Eagle inhabits the main Yereymentau mountains ridge. Mute Swans (*Cygnus olor)* (IUCN LC) breed at large water basins near the Yereymentau area. Demoiselle Cranes have nests in steppe areas near the Project areas. Two other species, the Great Black-headed Gull and the Caspian Tern are probably not breeding but use the lakes in the area for foraging.

3.3.1.5 *Protected and designated areas*

The Project site lies within an Important Bird and Biodiversity Area (IBA), IBA KZ084 Ereymentau Mountains.A natural protected area, Buiratau National Park, is located approximately 6 km south of the site.

Buiratau National Park was established to preserve steppe ecosystems by the Committee of Forestry and Hunting, Ministry of Agriculture with IUCN support.

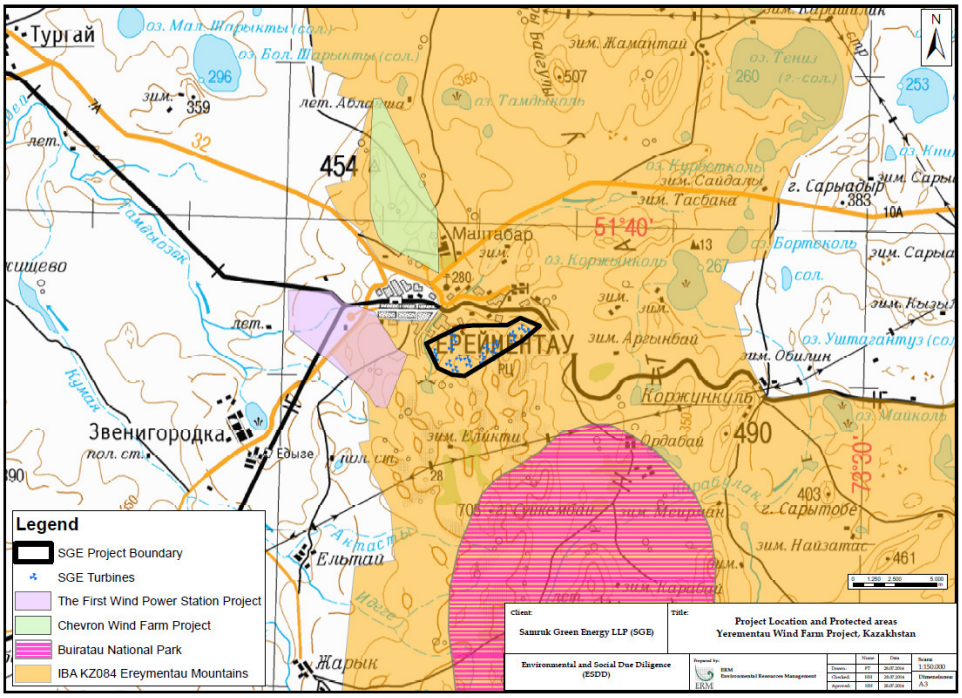


Figure 3-1 ***SGE Project location in relation to protected and designated areas***

A map showing the location of the Project in relation to protected and designated areas is provided as Annex B.

IBA KZ084 – Ereymentau Mountains

IBAs are areas recognized as being globally important habitats for the conservation of bird populations. The IBA Program is implemented by BirdLife International and aims at identifying, monitoring and protecting a global network of IBAs for the conservation of the world's birds and other wildlife. The IBA network identifies priority sites for conservation, and although many IBAs overlap with nationally or internationally protected areas, the IBA designation itself does not confer any protection on a site. Of 121 IBAs identified in Kazakhstan, 38 are wholly or partly under some form of protection by national law, with 83 sites unprotected (1).

At country level BirdLife International Partners take responsibility for the IBA Program. In Kazakhstan the Association for Conservation of Biodiversity of Kazakhstan (ACBK) is responsible for the program implementation including identification, monitoring and protection of IBAs.

IBA KZ084 Ereymentau Mountains covers an area of 364,588 ha. Being a combination of forest and steppe, the IBA supports an interesting mix of species. It accommodates a number of breeding species some of them globally threatened. Ereymentau Mountains is the southern boundary of northern breeding species such as Buzzard (*Buteo buteo)* (IUCN LC), Honey Buzzard (*Pernis apivorus)*, Goshawk and Ural owl (*Strix uralensis)* (IUCN LC), and the northernmost location for breeding for the Steppe Eagle (*Aquila nipalensis)* (IUCN LC, Red Book of Kazakhstan Category V Recovered). In the northern part of the IBA, the habitat is dominated by a flat steppic plain, with a number of lakes (Teniz, Korzhynkol and Ashchikol lakes) 11-23 km from the Project site.

The IBA is also important for raptors including Eastern Imperial Eagle, Golden Eagle, Pallid Harrier, Red-footed Falcon (*Falco vespertinus)* (IUCN NT), Eagle Owl (*Bubo bubo*) (IUCN LC, Red Book of Kazakhstan Category II Declining) and Scop's Owl (*Otus scops)* (IUCN LC).

(1) Sklyarenko, S.L., Welch, G.R. and Brombacher, M. eds. (2008) Important Bird Areas in Kazakhstan: Priority Sites for Conservation. ACBK. Almaty.

Table 3-1 ***Populations of IBA trigger species***

Species	Season	Population Estimate	IUCN Category	Red Book of Kazakhstan Category
Saker Falcon (*Falco cherrug*)	breeding	1-3 breeding pairs	Endangered	Yes – Category I Endangered
Red-footed Falcon (*Falco vespertinus*)	breeding	90-110 breeding pairs	Near Threatened	No
Lesser Kestrel (*Falco naumanni*)	breeding	25-45 breeding pairs	Least Concern	No
Steppe Eagle (*Aquila nipalensis*)	breeding	5-8 breeding pairs	Least Concern	Yes – Category V Recovered
Eastern Imperial Eagle (*Aquila heliacal*)	breeding	30-35 breeding pairs	Vulnerable	Yes Category III Rare
Pallid Harrier (*Circus macrourus*)	breeding	150-180 breeding pairs	Near Threatened	No

Source: http://www.birdlife.org/datazone/sitefactsheet.php?id=21986

The IBA is also important for other threatened or endemic species. Argali (*Ovis ammon collium*) occur, mainly within the Buiratau National Park while the Altai marmot (*Marmota baibacina*) (IUCN LC) is abundant.

Approximately 15% of the IBA area is used for agriculture (mainly grazing). The main anthropogenic pressures are fire, disturbance, communal waste disposal and unorganised recreational activities.

Buiratau National Park

Buiratau National Park is located 6 km south of the Project area. According to available information the national park is planned to extend to incorporate the Project site area as well.

The aim of the natural park is to preserve the unique steppe ecosystems of Central Kazakhstan Upland, found nowhere else in the country and Eurasia and to protected alder forests relics and birch forests found on southern boundary of the range. This protected area is located in the transitional zone between moderately arid and dry steppes making the natural park unique by combining steppe ecosystems and forests. The total area of the national park is

88,968 ha, of which 60,814 ha lie in Yereymentau District and 28,154 ha in Osakarovsk District.

Floristic diversity of the national park is represented by more than 450 species of vascular plants. One fifth of the unique steppe flora of Central Kazakhstan Upland is protected in the park. There are more than 30 rare and endangered species of flora and species with limited habitat: European Alder, Siberian Hawksbeard, Spleenwort Fern, Spring Adonis, Steppe Peony, Common Garden Tulip, Paris Herb, and Flower-cup Fern.

The national park supports 45 species of mammals (178 mammal species have been recorded in Kazakhstan). These include Kazakhstan argali, this population being the most northern and isolated from other populations in Kazakh uplands. The population inhabits the lowlands of the park with estimated 200 individuals.

Avifauna of the national park is represented by 227 bird species of which 127 are nesting birds. There are 13 bird species nesting in the park and listed in the Red Book of Kazakhstan: Eurasian Spoonbill (*Platalea leucorodia*) (IUCN LC, Red Book of Kazakhstan Category II Declining), Whooper Swan, Ferruginous Duck (*Aythya nyroca*) (IUCN NT, Red Book of Kazakhstan Category I Endangered), Common Scoter (*Melanitta nigra*) (IUCN LC), White-headed Duck (*Oxyura leucocephala*) (IUCN Endangered (EN), Red Book of Kazakhstan Category I Endangered), Steppe Eagle, Imperial Eagle, Common Crane (*Grus grus*) (IUCN LC, Red Book of Kazakhstan Category III Rare) Demoiselle Crane, Little Bustard (*Tetrax tetrax*) (IUCN NT, Red Book of Kazakhstan Category II Declining), Sociable Lapwing (*Vanellus gregarious*) (IUCN Critically Endangered (CR), Red Book of Kazakhstan Category I Endangered), Eagle Owl. The park also supports 17 species of Red book insects.

3.3.2 Potential Impacts and Mitigation

Potential impacts arise during construction and operation of the turbines. Indirect effects include increased access to the site through improved road networks. The key impacts are:

During construction:

- direct loss or degradation of habitat and flora species due to land take by wind turbine bases, tracks and other ancillary development; and
- indirect impacts including disturbance to fauna and their habitats, generated by construction activities such as noise and vibration, dust, traffic and leaks and spills.

During operation:

- disturbance and displacement of fauna from the habitats on the Project site as a result of indirect habitat loss or turbine operation, presence of a turbine close to feeding sites or nest or roost sites for birds;
- barrier effect to birds and bats caused by the location of the turbines on habitual flight routes;
- death or injury of birds or bats as a result of collision with turbines which may especially be an issue for migratory species, and
- disturbance arising from increased access due to improved road network.

In order to focus the assessment on those species or habitats where there could be a potential significant effect, a screening table approach has been adopted in *Table 3-2* below.

Habitats and fauna recorded on site, as well as those qualifying features of IBA KZ084 Ereymentau Mountains which may occur within the Project site are listed out in the following table and assessed to determine if there is a pathway for an effect from the Project. Where no pathway or potential effect is identified, this is stated in the table. Where it has been determined that pathway or potential effect may occur (as indicated in the table), statements on potential impacts based on available level of information have been provided below. Further surveys for these features will be performed at the site. A precautionary mitigation program has been also considered which will be refined in response to the survey results. Those features of the Buiratau National Park which are not also listed as qualifying interest features of the IBA, or have not been recorded on site are assumed to be restricted to within the National Park boundaries, and therefore have no pathway of effect and are not considered in *Table 3-2*.

Table 3-2 ***Screening for potential pathway and effect on receptors recorded on site and Ereymentau Mountains IBA KZ084 qualifying features***

Habitat/Qualifying Interest Feature	Impact				Pathway/Effect Possible.
	Direct Loss of Habitat	Disturbance During Construction and Operation	Barrier Effects to Species Movement	Collision Mortality	
Dry steppes	Yes	N/A	N/A	N/A	Yes
Bushes, thickets	No.	N/A	N/A	N/A	No
Birch forest	No.	N/A	N/A	N/A	No
Alder forest	No.	N/A	N/A	N/A	No
Bats	Yes.	Yes potential connectivity	Yes potential connectivity	Yes potential connectivity	Yes
Argali (*Ovis ammon collium*)	Yes – occasional use of site.	Yes – occasional use of site	No – site likely at edge of range for individuals from Buiratau National Park	N/A	Uncertain
Golden Eagle *(Aquila chrysaetos)*	No. No use of site by species	No. No connectivity	No. No use of site by species	No. No use of site by species	No
Eastern Imperial Eagle (*Aquila heliaca)*	Yes potential connectivity	Yes potential connectivity	Yes potential connectivity	Yes potential connectivity	Yes
Pallid Harrier (*Circus macrourus)*	Yes potential connectivity	Yes potential connectivity	Yes potential connectivity	Yes potential connectivity	Yes
Saker Falcon *(Falco cherrug)*	Uncertain	Uncertain	Uncertain	Yes potential connectivity	Yes
Red-footed Falcon (*Falco vespertinus)*	Uncertain	Uncertain	Uncertain	Yes potential connectivity	Yes
Lesser Kestrel (*Falco naumanni)*	Uncertain	Uncertain	Uncertain	Yes potential connectivity	Yes
Steppe Eagle (*Aquila nipalensis)*	Uncertain	Uncertain	Uncertain	Yes potential connectivity	Yes
Eagle Owl (*Bubo bubo)*	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain

The wind farm is located in habitat which is used for grazing livestock from Yereymentau and is crossed by a number of tracks. The majority of the site therefore qualifies as Modified Habitats as defined in EBRD Environmental and Social Policy 2008. The Policy requires that where modified habitats may be impacted, the project should aim to minimise any further degradation or conversion of habitat [(1)].

Areas of the project site which are not as heavily grazed qualify as Natural Habitats as defined in EBRD Environmental and Social Policy 2008. This states that in areas of natural habitat there must be no significant degradation or conversion of the habitat to the extent that (i) the ecological integrity and functioning of the ecosystem is compromised or (ii) the habitat is depleted to the extent that it could no longer support viable populations of its native species, unless:

- there are no technically and economically feasible alternatives
- the overall benefits of the project outweigh the costs, including those to the environment and biodiversity
- appropriate mitigation measures are put in place to ensure no net loss and preferably a net gain of biodiversity value in the habitat concerned, or, where appropriate, a habitat of greater conservation value [(2)] .

As can be seen from the screening table habitat effects are largely confined to the loss of dry steppe. There is also some land take associated with small areas of scrub and woodland where roads cross these. As far as possible such losses have been minimised by use of existing roads; however there will be land loss associated with the creation of maximum 20 turbine bases, electricity substation and creation of additional connecting roads, equating to approximately 8.9 ha. Effects to habitats and constituent flora can also arise from dust generated by traffic and through accidental spills and poor waste management. These can be managed through good construction practice.

As a proportion of the total habitat available within the IBA the Project footprint of 8.9 ha is approximately 0.002% of the IBA. The main loss is of steppe habitat, the most widespread habitat within the IBA. The effect in terms of habitat loss is therefore insignificant and will not result in a net loss of biodiversity value, with the implementation of mitigation measures set out below.

(1) EBRD May 2008. Environmental and Social Policy PR6, Para 11

(2) EBRD May 2008. Environmental and Social Policy PR6, Para 12

Impacts on mammals are mostly minor as the total habitat loss is small as a proportion of the IBA and there are pre-existing tracks and disturbance associated with the sites proximity to Yereymentau. Operationally there may be some potential for increased exposure to traffic collisions, but traffic movements are likely to be infrequent. Impacts on argali sheep may occur in some years when individuals move north from the National Park. They are known to avoid livestock and human disturbance and existing disturbance and land use at the site, which is only 2 km from Yereymentau is likely to limit their use of the site already. The increased disturbance from construction and potentially increased disturbance and illegal hunting pressure from the improved road network during operations could lead to additional displacement. However, the Project site is used infrequently by Argali and because of existing pressures is of low suitability. The core area for Argali within the Buiratau National Park will not be affected.

As can be seen from the table the main impacts are likely to arise in relation to avifauna, including on some qualifying interest features of the Ereymentau Mountains IBA. Construction and operation activity may result in the displacement of a pair of Eastern Imperial Eagle known to nest in proximity to the site. The IBA population is reported as 30-35 pairs, and therefore displacement would affect approximately 3% of the breeding population. A single pair of Pallid Harrier nests close to the project site, representing approximately 0.6% of the IBA population of 150-180 pairs.

No other IBA bird qualifying species have been recorded on site. The site does not lie on any major bird migration routes, and does not support high densities of resident IUCN Threatened or Red Book of Kazakhstan species. Consequently collision impacts with operational turbines, particularly taking into account collision avoidance behaviour[1] are unlikely to be a significant issue. .

Although bats do not form part of the reasons the IBA was designated they are known to be vulnerable to turbine collisions, and literature sources do make reference to bat migration in the Yereymentau area by a limited number of species.

In addition to the direct effects listed above there is the potential for indirect effects arising from use of the road network for recreational activity, including hunting, too occur.

1 SNH September 2010. Avoidance Rate Information & Guidance Note

As a consequence of these potential impacts the following mitigation is proposed:

- undertake check surveys for sensitive flora, fauna and sensitive habitats in relation to the final development layout;
- minimising land take and adopting best construction practice to control dust and waste;
- restoring as far as possible any temporary land take to its original state;
- a survey program to verify predicted bird (IBA breeding species, migratory species) and bat use of the proposed wind farm;
- verification of collision risk prediction; and
- use the results to inform and update the measures adopted in the ESMP through adaptive management.

3.4 CULTURAL HERITAGE ASPECTS

The following sources of information were used for the collection of baseline data regarding archaeology and cultural heritage:

- pre-EIA;
- decree of the local government (Akimat) of Akmola Oblast No. A-5/197 (2010); and
- archaeological investigations performed as part of the permitting process of the neighbouring 45 MW wind farm project (2013).

3.4.1 Baseline Environment

There is no registered cultural heritage within the Project site perimeter. According to SGE, this aspect was verified by authorities prior to issuing the pre-EIA approval for the Project.

The known cultural heritage objects in the Yereymentau district are registered in line with the law "On protection and use of historical and cultural heritage" of 2nd July 1992. These cultural heritage values are listed within the Decree of the local government (Akimat) of Akmola Oblast (No. A -5/197 of 01.06.2010 "*On the approval of state list of historical and cultural monuments of local importance*") (cf. Figure 3-2).

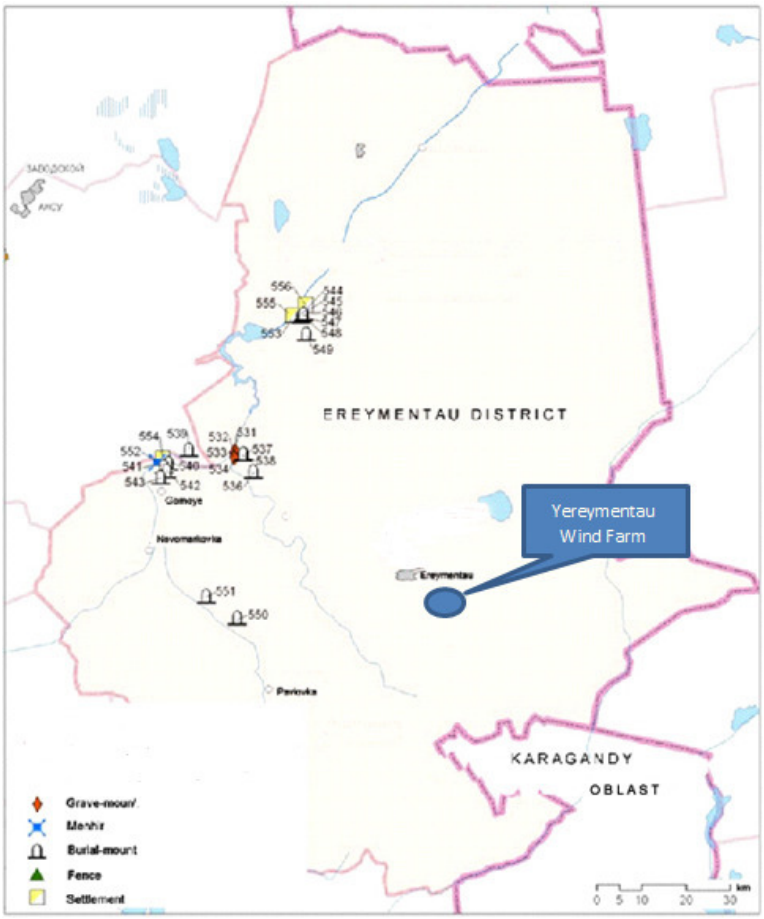


Figure 3-2 ***Historical and cultural monuments of local importance***

Source of information: Akimat of Akmola Oblast Decree No. A -5/197 of 01.06.2010 On the approval of state list of historical and cultural monuments of local importance

The Decree provides the list of cultural heritage elements and details of their location. According to the list, there are 25 registered archaeological objects in Yereymentau district. These include ancient graves, burial mounds, ancient settlements, old fences and a menhir (standing monolith stone/religious object). None of these registered archaeological objects is situated on the site of this Project.

Most of the registered archaeological objects are concentrated within two areas: north-west of Turgay (approximately 50 km north-west of the Project site) and near Seletinskoye (approximately 65 km north-north-west of the Project site). Two isolated burial mounds are located north of Pavlovka (approximately 35 km east of the Project site). None of these registered archaeological objects are located within the boundaries of the Project.

On the neighbouring 45 MW wind farm site archaeological investigations were performed in May 2013 as part of the permitting process and in line with applicable national regulations (Law on Protection and Use of Historical and Cultural Heritage) by licensed archaeologists. The work comprised an analysis of bibliographic sources of information and remote sensing imagery review, followed by a visual inspection of the site. Investigations on the neighbouring wind farm site identified a kurgan (tumulus) located approximately 4 km east of the easternmost Project WTG location and the remains of a settlement (approximately 4.7 km east of the easternmost Project WTG).

Following initial findings, archaeological discharge works were performed around the kurgan (tumulus). The place was manually excavated and cultural heritage objects were found. Based on these investigations the kurgan was dated early Iron Age. Archaeological investigations at the settlement nearby the kurgan on the neighbouring wind farm site revealed 18 rectangular buildings, most of these single-chamber residences, and other structures. Cultural heritage objects recovered during the archaeological excavation included coloured porcelain fragments and forged iron tools fragments and a well preserved knife blade. Based on the findings the archaeological site was identified as a Kazakh settlement dating from the end of XIX - beginning of XX century.

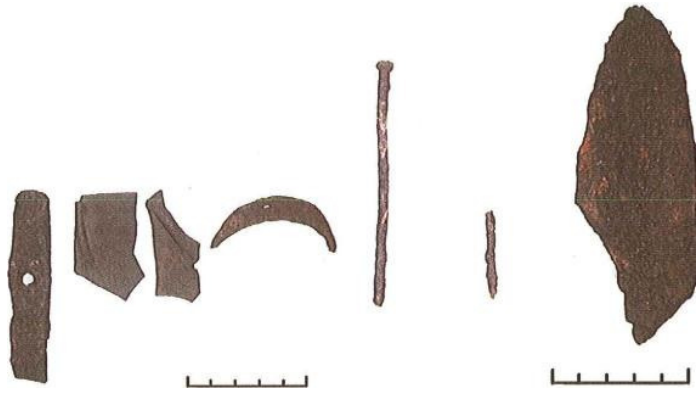


Figure 3-3 ***Sample objects recovered during archaeological investigations at the neighbouring wind farm site***

Source: Archaeological Report, Archaeological Expertise LLC, June 2013

3.4.2 *Impacts and Mitigation*

Potential impacts are related to the construction phase only.

There are no known cultural heritage objects at the site. No cultural heritage investigations of the site have been however performed to date. Given the findings at the neighbouring wind farm site, there appears to be a reasonable likelihood of similar cultural heritage objects at the Project site as well.

In order to confirm that no cultural heritage impacts will occur and to achieve alignment with national law and EBRD PR8, an archaeological field survey is to be conducted in the detailed design stage, with consideration of final Project layout. The scope of such a survey would be to:

- in case of any finds, identify known and unknown archaeological and historic sites in the Project area;
- identify their value (local, national or international);
- map the finds identified against the location of the Project components to confirm they do not overlap and that construction activities would not affect finds in proximity of Project elements; and
- in case of overlapping or potential impacts on finds during construction, ensure provision of expert advice and support with undertaking the actions required by law for preservation and if applicable, discharge of archaeological value.

If needed, discharge of cultural heritage in line with applicable requirements and best practice is to be performed.

A Chance Finds Procedure is to be developed prior to commencement of earthworks and implemented during the relevant stages of construction. Appropriate training of relevant contractors' staff will be necessary to ensure appropriate implementation of the chance finds procedure. If necessary, a licensed archaeologist may be employed for field supervision of earthworks execution at relevant site locations of potential cultural heritage interest.

3.5 *LANDSCAPE AND VISUAL ASPECTS*

The baseline information is mainly based on the field visit undertaken and of photographs taken during that site visit. The impact assessment is based on a verbal description of the anticipated visual impacts, whereas photomontages were not available.

3.5.1 *Baseline Environment*

General landscape in Yereymentau Town and Project area is characterised by slightly undulating foothill plains.

The hill tops have modest elevations and gently rolling slopes, intersected by minor streamlines (creeks). Tree belts are present along the valley courses, the ponds and springs, while the upper parts and the hills slopes are typical steppe grasslands. Typical landscape features are presented in figure 3-4 below.

Figure 3-4 ***Photographs presenting typical landscape features***

Top Left: Residential Houses (south-west Yereymentau)

Top Right: Steppe grassland on upper parts and hill slopes

Bottom left: Undulating Landscape

Bottom Right: Wetland habitat in lowlands

3.5.2 *Impacts and Mitigation*

Significant short term impacts are not expected to occur during the construction phase.

The most pronounced impact with respect to landscape is assumed to be the cumulative impact after construction of all planned wind farms and will be described in Chapter 4.6. This chapter of the report refers solely to the potential impacts associated with the Project.

The Project will comprise installation of maximum 20 WTGs depending on selected manufacturer and turbine type. Rotor diameter varies correspondingly between 103 and 112 m, and the hub height between 80 and 85 m (refer to Table 2-1). The turbines will placed at higher elevations at the site.

The introduction of the wind turbines, overall at maximum height of 140 m to tip and maximum 85 m to hub will contribute to the landscape and visual impacts. These will add man-made elements of considerable scale to the landscape establishing a new landmark feature and a point of reference in views from a wider area.

The introduction of new structures and activity around the site will have impacts upon the quality of views experienced by people living, working and visiting the surrounding area. The Project will be seen from fixed locations and as people move through the area on paths and local access roads.

Project elements will be mostly visible from southern area of Yereymentau town, i.e. from Zarechnaya street, Prirechnaya street and southern section of Zelenyi Khutor street.

Therefore the proposed Project has the potential to cause impacts on the landscape of the surrounding area as wind turbines are highly visible elements in the landscape. Such impacts may consist of:

- change to the landscape character of the area; and
- visual intrusion to sensitive receptors such as residents and recreational users.

The perception of such impacts is highly subjective and the residents of areas from where the Project is visible will play an important role in defining the effects of the landscape changes. Such opinions may be received and addressed during the implementation of the Stakeholder Engagement Plan.

The Project implies a clearly evident and frequent/continuous change in landscape characteristics affecting a relatively large area. However, the sensitivity of the landscape is not deemed high, as it would be the case for a landscape protected by a regional plan or national designation and/ or widely acknowledged for its quality and value as well as a landscape with distinctive character. For that reason the impact of the Project on the landscape is deemed moderate.

The following mitigation measures are proposed to mitigate elements of potential significant landscape and visual impacts.

- removal of vegetation to be minimised;
- signage to be provided only for health and safety (H&S) purposes at relevant locations at the site;
- no prominent or brand names will be placed on the turbines;
- turbines will be painted in a colour, typically matching the sky (e.g. light grey) to minimise visual impacts, if not stipulated differently by the Kazakh Aeronautical Authority; and
- enhancing local species of vegetation or tree planting at relevant locations.

The visual impact on the landscape by wind farms cannot be entirely mitigated. Planting of trees and other vegetation can only mitigate the visual impact to a certain degree and will come into effect only after years.

3.6 CLIMATE

3.6.1 Baseline Environment

The local climate is strong continental and characterized by seasons. The area is characterised by harsh winters due to free penetration of the arctic air masses, and by high temperatures in summer due to the influences of the dry air from the south leading to frequent droughts.

The average temperature of the hottest month is + 19.4 °C (in July) and the average temperature of the coldest month is – 18.8 °C (in January). Absolute maximum temperature is +41 °C (recorded in July) while the absolute minimum is -51 °C (recorded in January).

The area is exposed to penetration of Siberian anticyclone. First frost may occur in early October. The period with a stable snow cover lasts 125 - 140 days. The thickness of the snow layer is 16-35 cm. The winter months are

characterized by cold periods with snow alternating with short snow melting periods.

Summers are hot and dry characterized by clear weather and lack of precipitations.

Strong winds are typically in this area, primarily of south-western and western directions. In the summer the strong winds cause soil erosion, dust storms and overall contribute to drying the area.

The average wind speed at 51 m above ground level is approximately 7.89 m/s. The average wind speed at 80 m height is predicted to be between 8.5 and 8.9 m/s.

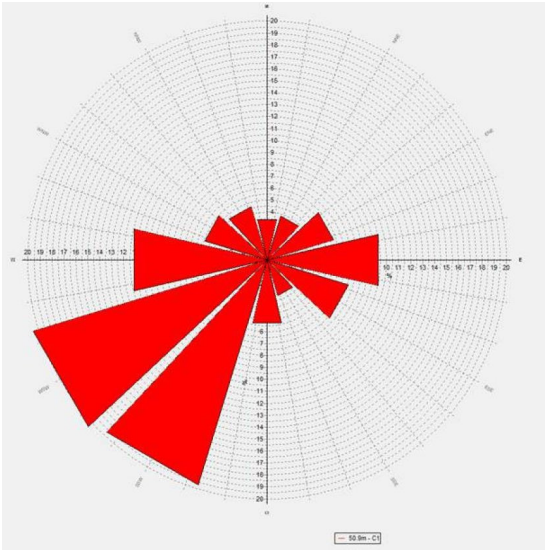


Figure 3-5 ***Wind rose of the Project site (Feasibility Study, Dar mühendislik müşavirlik a.s., 2012)***

The annual precipitation averages 300-350 mm. Average humidity varies between 57% in July and 80% in January. In the summer months the rain is often accompanied by thunderstorms.

The frequency of natural phenomena such as blizzards and dust storms is low.

3.6.2 Impacts

No impacts on climate are associated with the operation of a wind farm.

As a positive effect, the wind farm will result in significant carbon dioxide (CO_2) emissions reductions (Green House Gas GHG emission reduction), by

replacing electricity produced from power generation facilities emitting CO_2. Given an expected generation of net between 137 and 179 GWh electricity per annum (depending on turbine type and capacity), the average CO_2 avoidance will be between 205,500and 242,000 tonnes per year compared to electricity generation with the fuel mix in Kazakhstan. CO_2 avoidance calculation has been based on the expected energy yield of the project (Lahmeyer International, Technical Due Diligence Report, 2014) and EBRD Electricity Emission Factors for Kazakhstan[1].

3.7 SOCIAL

The following chapters are based on the review of published information and research concerning social and health conditions in the Project area (secondary data). The following sources of information were used for the collection of baseline information on the socio-economic environment, demographics, health and safety:

- the Pre-EIA Report;
- the EIA and field studies performed for the neighbouring 45 MW wind farm project;
- regional/national data from the KazREFF Report[2];
- information acquired through interviews with local residents; and
- data acquired from local authorities.

The collection of social baseline data enables the integrated social and economic assessment to achieve the following objectives:

- to develop an understanding of potential social impacts (both positive and negative);
- to develop appropriate mitigation and enhancement measures and incorporate them into the ESIA ESMP; and
- to develop a foundation for the Project to build long-term relations with local communities and other stakeholders.

[1] Electricity Emission Factors Review, EBRD, November 2009.

[2] Kazakhstan Renewable Energy Financing Facility: http://www.kazreff-ser.com/

3.7.1 *Baseline Environment*

3.7.1.1 *Local context*

Yereymentau Town is situated approximately 130 km east of Astana in the Akmola Region (oblast). The Project is located south-east of Yereymentau approximately two km from the town centre, with closest residence to a wind turbine within approximately 600 m distance.

Two other wind farm projects are proposed in the area (cf. Chapter 2.6).

Yereymentau District occupies the largest part of Akmola Region: 17,600 km² or 12 %. As of 1 January 2014, the population of this district was 29,914 people, of whom about 35% live in urban areas and 65% in rural areas. The population density was approximately 1.7 people per square km. Yereymentau District consists of 1 city (Yereymentau Town), 8 rural areas, 3 settlements and 3 villages. The administrative centre is Yereymentau Town.

3.7.1.2 *Demographics*

Population

The Yereymentau District is mainly populated by ethnic Kazakhs. Out of the total population of (rounded) 30,000 people, approximately 20,300 are Kazakhs (66.7 %) and 6,800 are Russians (22.3 %).

The population dynamic in Yereymentau Town is negative. The population size decreased between 2011 and 2013 by almost 8 %.

Table 3-3 Population dynamic in Yereymentau Town

Yereymentau Town	Total population	Men, aged				Women, aged			
		Total	< 16	16-29	> 63	Total	< 16	16-29	> 58
2011	11287	5536	884	927	725	5751	966	1209	1532
2012	10835	5339	874	1058	598	5496	948	1891	1203
2013	10446	5026	929	1594	526	5420	984	1659	1611

Employment

Unemployment is one of the social tension factors in Yereymentau, despite the unemployment rate decreased from about 15 % in 2011 to about 11 % in 2013.

In 2013 the average monthly salary in Yereymentau District was KZT 68,486 (approximately 270 €), which is 86.8 % of the average regional level.

Table 3-4 ***Unemployment in Yereymentau Town***

Yereymentau Town	Employed and self-employed people	Unemployed people
2011	5789	877
2012	5402	792
2013	5216	624

3.7.1.3 *Livelihoods, subsistence and economic activities*

Economic situation

The dominating sector in the region is agriculture, particularly the production of livestock products and grain crops. Pasture occupies 79.9 % of the total area of Yereymentau District (about 1.4 million hectares), arable land occupies 6.1 % (108,773 hectares), hay fields occupy 1.3 % (22,643 hectares) and fallow land 7.1 % (125,978 hectares).

The region's industrial potential consists of mining, processing industries, processing of agricultural products, heat energy, water production and water distribution.

Small entrepreneurship is on ascendant trend in Yereymentau District with 152 small business registered as of 1 January 2014 hiring 2,115 people. In 2013 small businesses created 381 new jobs.

Public infrastructure

The network of motor roads in the territory of Yereymentau District is 522 km, including 254 km of the national level, 140 km of the regional level and 128 km of the district level. The network of motor roads in Yereymentau Town is 95 km, including 45 km hard-surfaced roads. A bus service is operating in Yereymentau.

The water supply network is approximately 281 km long in Yereymentau District and 76 km long in Yereymentau Town. The sewerage system of Yereymentau District is 33 km long. Sewage water is collected at sewage pumping station and after precipitation and separation goes into the evaporator pond, which is located about 3 km west of the city center.

Housing

The housing stock of Yereymentau District consists of 7,526 houses, including 2,853 houses directly in Yereymentau Town. In Yereymentau Town there are 127 multi-storey apartment houses. Housing in the immediate vicinity of the Project site (south-eastern town border) is characterized by residential properties with single-level houses and buildings used for livestock farming (Figure 2-1).

Local residents, mainly from south-eastern part of Yereymentau, use the Project site for open range grazing (mostly cattle). According to residents interviewed during the field visit, cattle graze by moving through the area, typically crossing the Project site from Yereymentau Town further towards south early in the day and returning in the evenings.

Figure 3-6 ***Street and residential properties in south-western part of Yereymentau Town***

Tourism

Considering the heavy anthropogenic load on the Shchuchinsk-Borovoe Resort Zone (approximately 170 km north-west of Yereymentau), it has currently become necessary to develop other areas with recreation potential. Such areas in the Yereymentau Region include the widely-known mountains of Karagaily and the Sokolinski Mountains. The mountain landscape of Yereymentau District is rich in flora and fauna with many lakes, but still rarely visited by tourists.

Presently, the touristic infrastructure of Yereymentau includes 3 hotels with 67 beds in total and the children's health improvement camp "Zhuldyz" with 60 beds. There are 6 roadside cafes, 2 roadside camps with 20 beds and 5 roadside filling stations.

A museum named after Bogenbai Batyr can be visited in Yereymentau.

3.7.1.4 Social infrastructure

Education

8,748 children were registered at the beginning of 2014 in Yereymentau District. Therefrom 3,148 were of pre-school age (up to 6), 2,323 were from 6 to 10 years old, 1,787 aged 10 to 14 and 1,490 were over 15 years old.

Yereymentau has 6 schools, 1 club, 3 libraries, 1 stadium and 9 gyms.

Public organisations

Yereymentau District has 6 non-governmental organizations (youth policy, healthy lifestyle promotion, education, environmental protection).

Mass media

Four regional newspapers exist in Yereymentau District:

- Ereymen (public political newspaper);
- River (advertising information newspaper);
- Inforating (advertising information newspaper); and
- Mir Reklamy (advertising information newspaper).

3.7.2 *Impacts and Mitigation*

Land Acquisition, Involuntary Resettlement and Economic Displacement

During construction of the Project wind farm installations, a temporary construction camp will be erected within the Project site to host construction equipment and materials. It is assumed that construction workers will be accommodated on site. Information on workers conditions are provided in the chapter "Impacts to livelihoods and economic activities" below.

According to information from the Company, the Project will be developed exclusively on state-owned land. The Company owns a Decree issued by the local government (Akimat of Yereymentau) for the Project land allotment extended for a period of 2 years, with the option to purchase or to lease the land as the Project moves into the construction phase. As per verbal information provided by the Company representatives, the land was reserved and the right of land refers to the entire Project area of 1,242 ha. As the land is state-owned, land acquisition from individuals does not occur. No resettlement/ physical displacement of people will be associated with the Project. No homes or businesses will be displaced by the Project.

The Project land is currently used by local residents for open range grazing (mostly cattle) by individual owners. Grazing is performed based on agreements with the municipality, represented by a commission on grazing elected at the general meeting of the community. The agreements are set on yearly basis and define areas of land each individual can use for grazing and the due payments for use of land.

Of the total 1,242 ha right of land area, the Project footprint (i.e. the land required for the turbines and infrastructure) of approximately 0.089 km^2 is going to be rezoned to 'industrial use' and will represent a long-term loss of land currently used for grazing activities. This represents only a small part of the Project site (0.72% of the total wind farm area), so the actual grazing area loss will be minor. During the operation of the wind farm, grazing will be possible on the land within the Project site (outside the safety area of each turbine). Given the limited area occupied by Project elements, economic displacement (in the form of reduced access to grazing areas) is not expected to be relevant as the Project becomes operational.

Other constraints on land availability may be represented by the future extension of the National Park and which will have to be considered by the municipality (commission on grazing) in future allocation of grazing land. Given reduced land take associated, the Project is however not considered to pose relevant impacts on land availability.

Disturbance of access to grazing land and potential access safety issues due to construction activities will, however, occur temporarily during the construction stage which will extend over a period of approximately one year. Construction activities will not result in restricting access to land and appropriate construction management and communication with land users should minimise the temporary disturbance and allow safe access to land. Grazing will be possible on the Project site undisturbed again after construction of the Project wind farm infrastructure.

Other potential economic effects of a wind farm project, subject in recent times to specific research and media attention in UK and US, may be represented by potential impacts on nearby housing prices.

Existing research provide a mixed picture but no conclusive answer on wind farm projects' effect on nearby properties values. While some research indicate negative effects on housing prices due to wind farms visibility[1], others conclude no evidence of impact[2], or even increases of house prices after erection of a wind farm[3].
There are no studies specific to Kazakhstan. Effects on property value, if any would occur, would largely depend on local public subjective perception of the development. Such opinions may be received and addressed during the implementation of the Stakeholder Engagement Plan.

Impacts to livelihoods and economic activities

The Project will not require any physical resettlement. People from the local communes are currently using the land required for the Project for grazing cattle without any contract. Due to the small area to be taken out as grazing land, and the availability of other grazing land in the area, this is not a significant impact.

SGE will develop the Project through a project company (WPY) to be registered in Yereymentau and will therefore pay taxes to local budget.

[1] Gone with the Wind: Valuing the Visual Impacts of Wind turbines through House Prices, Stephen Gibbons (LSE & SERC), April 2014

[2] A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States, Ben Hoen†, Ryan Wiser, Peter Cappers
Lawrence Berkeley National Laboratory, August 2013

3 Impact of Wind Farms on Residential Property Prices - Crystal Rig Case Study, 2006

According to the International Labor Organization (ILO), the accommodation for workers from outside the area has to follow basic health standards and any employer should try to offer proper accommodation by creating sufficient space for people, adequate facilities and environment for resting and spending spare time. Furthermore, it is recommended that SGE follows the guidance note by EBRD and IFC on Workers' accommodation (2009) and the Voluntary Principles on Security and Human Rights (2013). It is assumed that 25-50 people will be employed during the construction phase, and approximately 20-40% of these jobs will require skilled people, which are unlikely to be filled by local residents. The remaining 60-80% of the jobs may be unskilled or semi-skilled positions, preferably occupied by locals. Therefore contractors will be encouraged to establish goals for local hiring. Indirect and induced employment might be created through employment in the Project supply chain: for example, in businesses providing the Project with goods and services (e.g. concrete and aggregate materials, transport services) and in businesses supplying the Project employees with goods and services (e.g. food and beverage, selling and mending clothes, barbershops).

Long term job opportunities during operation are presumably limited to employment in security services associated with the Project.

Given relatively reduced number of workers compared to the population of Yereymentau town (25-50 workers vs. 10,000 inhabitants) pressure on local social infrastructure from the Project during construction stage is not expected.

As SGE is also the developer of the neighboring wind farm it is recommended that lessons learned from the other wind farm project will be used to improve the performance and minimize impacts of the Project.

3.7.3 Information Disclosure and Stakeholder Engagement

A public hearing was held in Yereymentau town as part of the disclosure of the Pre-EIA on 5th December 2011. According to national legislation further stakeholder engagement will be performed in the environmental impact assessment stage of the Project.

A Stakeholder Engagement Plan (SEP) detailing further information Project disclosure and stakeholder engagement has been prepared to allow meaningful stakeholder engagement in line with best international practices.

The SEP considers the information disclosure and stakeholders engagement to be performed throughout all Project lifecycle including Project impact

assessment disclosure, and engagement during construction and operation stages.

SGE through the project company, WPY, and the EPC contractor are responsible for the SEP implementation during further stages of the Project as well as for updating and refining the SEP in response to stakeholders' feedback and experience gained as the Project develops.Community Health, Safety and Security

3.7.4 Environmental Noise

3.7.4.1 Introduction

General Aspects

Wind turbines produce noise during operation. The noise is generated primarily from mechanical and aerodynamic sources. Mechanical noise may be generated by machinery in the nacelle. Aerodynamic noise emanates from the movement of air around the turbine blades and tower.

Beside operation, also the construction of wind turbines may result in noise impact due to the construction noise from machinery and vehicle movements.

The Yereymentau town is located in the neighbourhood of the wind farm and residents may be affected by noise from both, its construction and operation phase.

About Sound Levels

Sound is a variation of air pressure affecting the ear. The measuring unit of sound pressure level is decibel (dB) which is the logarithm of the ratio of the actual air pressure over a reference air pressure. The human hearing perceives identical sound pressure levels of different frequencies with different strength. For the adaption to human hearing, it is therefore common to use a frequency weighted sound pressure level scale of such kind that the level will match the subjectively perceived level. This is commonly done by implementing the so-called A-weighting scheme indicated by the unit dBA. The strength of a noise source is characterized by the sound power level (LWA).

For better understanding of various noise levels **Error! Reference source not found.** provides some examples of noise sources with respective noise levels.

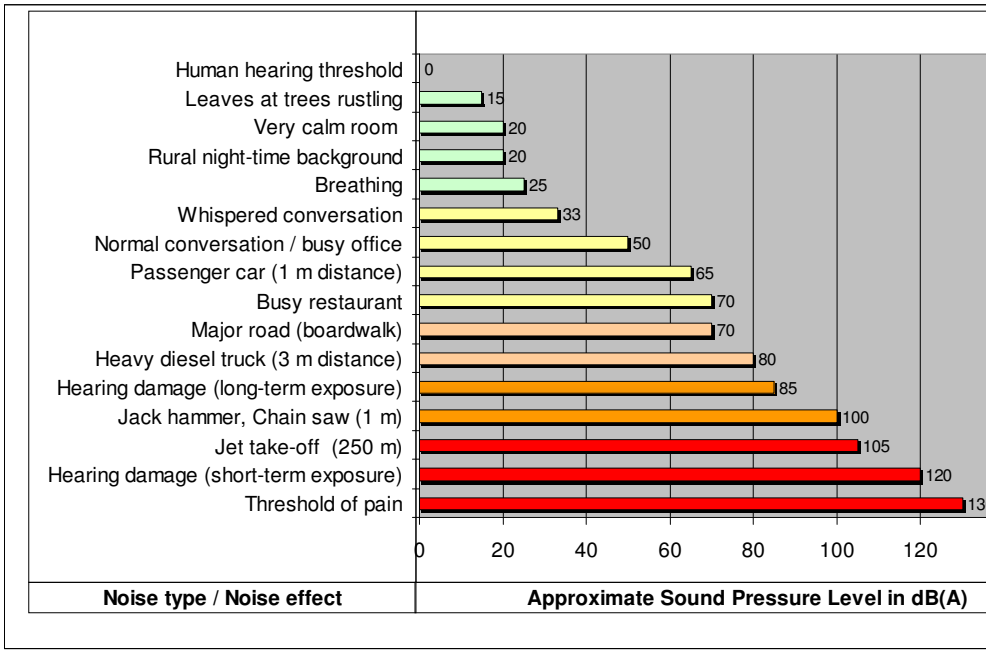


Figure 3-7 *Examples of noise source types/noise effects with associated sound pressure level*

Throughout longer time periods (e.g. several hours), monitored sound pressure levels may vary in a wide range. Therefore, average levels are commonly calculated as the so-called Equivalent Continuous Sound Pressure Level (L_{eq}) which is the energetic average over the time period of the measurements. The L_{eq} is the specific parameter used for evaluation of noise against noise standards.

Due to the logarithmic decibel scale, the doubling of a source means a sound pressure level increase of 3 dBA. However, the doubling of a source will not result in a doubling of the impression of loudness that people have. This is reflected in findings of physiological studies where the human perception was compared against noise levels. Based on this, increases in sound pressure levels (extent of noise change) of environmental noise are evaluated as follows:

Table 3-5 *Quality of noise level changes*

Noise level change	Qualitative acoustic perception of noise level change
< 1 dBA	Changes of less than 1 dBA are not noticeable to an individual even in a laboratory environment
1 - 3 dBA	Changes of less than 3 dBA are often not perceived by a community to be a noticeable or annoying modification of the environmental noise level

Noise level change	Qualitative acoustic perception of noise level change
3 – 5 dBA	The noise level change might be noticeable and slightly annoying
5 – 10 dBA	The noise level change will likely be perceived by a community to be annoying
>10 dBA	A change of 10 dBA is often judged by individuals as being a doubling of noise perception

Kazakhstan National Standards

For evaluation of the ambient noise situation, national and/or international noise standards are used. The Kazakhstan legislation on environmental noise standards is specified in the Regulation No. 841 on Hygienic Standards and Infrasound Noise Levels in Residential or Public Buildings and Residential Areas, dated 03.12.2004 (cf. Table 3-).

Table 3-6 ***Kazakhstan standards on environmental noise***

	Permissible limits for noise levels L_{eq} (dBA)	
Zone (outdoor)	**Day 7am-11 pm**	**Night 11pm-7am**
Directly adjacent to hotel, hostel	60	50
Directly adjacent to residential area, educational establishment, library	55	45
Directly adjacent to hospital, sanatorium	45	35
Modification for pulsating sound, if >7dBA	+5	
Modification for traffic noise	+10	
Low frequencies 2 – 63 Hz, residential area	74 dB	

Source: Regulation No. 841 on Hygienic Standards and Infrasound Noise Levels in Residential or Public Buildings and Residential Areas, 03.12.2004

International Standards

For evaluation of the environmental noise against international standards, the standards published in the IFC General EHS Guidelines are adopted[1]. These standards differentiate only between two area use categories: residential and industrial. The standards are provided in Table 3-. As can be taken from the tables, the standards for residential area are at the same level.

The sector specific IFC EHS Guideline on Wind Energy[2] states that noise impacts should not exceed the levels presented in the General EHS Guidelines, nor result in a maximum increase in background levels of 3 dBA at the nearest receptor location.

In this context it has to be noticed that background noise tends to increase with the speed of the wind due to the friction of air over landscape features and foliage. Noise generated by a wind turbine is also increasing with wind speed but also may be masked by the background noise. Furthermore, wind direction may affect the direction and extent of noise propagation. The IFC guideline on wind energy, therefore, stresses that application of the noise guideline values and the assessment of background levels should take these factors into consideration.

Table 3-7 *IFC Noise Standards*

	Permissible limits for noise levels L_{eq} (dB)	
Zone	**Day 7am-10 pm**	**Night 10pm-7am**
Residential, institutional and educational	55	45
Industrial and Commercial	70	70

Source: IFC General Environmental, Health & Safety Guidelines, 2007

Project-specific Information

There are several options for turbine types possible for the Project. For the evaluation of noise impact, the turbine type with highest noise emissions has been selected in order to model the worst case situation. The modelling report included in Annex C specifies the setup for this situation as follows:

[1] International Finance Corporation: Environmental, Health, and Safety (EHS) Guidelines - General EHS Guidelines, 2007
[2] International Finance Corporation: Environmental, Health, and Safety (EHS) Guidelines - Wind Energy, 2007

- 51 MW wind farm with 17 wind turbines of type Siemens SWT-3.0-108:
  - Rated capacity: 3.0 MW
  - Hub height: 79,5 m above ground
  - Rotor diameter: 108 m
  - Source sound power level: 107 dBA for the loudest situation with wind speed at 95% rated power meaning at hub level 11m/s.

The majority of the turbines are located in remote areas at larger distances to residential houses of Yereymentau. The closest residential houses are some buildings alongside southbound roads south of the major part of Yereymentau. These buildings are located north of the Project, close to turbines no 01 and 02 at distances of approximately 600 m and 700 m respectively[1].

Noise Modelling

The sound propagation from the Project's wind turbines has been modelled by employing the software WindPRO[2] (Version 2.9 as of March 2014) which provides a comprehensive package of modules for wind farm project design and planning. The software is worldwide recognized and used by turbine manufacturers, developers, engineering companies, as well as authorities.

The final calculations, which results are provided in Annex C, are based on the above turbine type and wind farm configuration which turned out to be the most relevant in regard to noise impact. In addition to the nominal sound power level, an additional safety margin of 2 dBA was included in the modelling to account for uncertainties in the measurement results obtained from reference turbine monitoring; meaning that calculations were performed with noise power levels of 109 dBA for each turbine at a wind speed of 10 - 11 m/s.

The noise levels were calculated for a receptor height of 1 m above ground level which is representative for a receptor at ground level.

The modelling considers the topography of the area; other structures causing attenuation of sound on the local scale near to receptors, like buildings or forest, are not taken into consideration.

[1] Based on satellite imagery analysis (google maps, image dated 4.8.2010)

[2] http://www.emd.dk/WindPRO/Introduction/ by EMD International A/S, Aalborg, Denmark

To some extent, noise received at a receptor location depends on the orientation of the turbine rotor versus the receptor. It should also be noted that sound power level of a turbine with low wind speeds is also reduced, e.g. by about 3 dBA at 5 m/s and 9 dBA at 4 m/s. Furthermore, at lower wind speed the enhanced atmospheric turbulence reduces the propagation of sound. Wind turbine sound can also be masked by sound generated from wind due to friction, particularly when the wind is streaming perpendicular to the line between turbine and receptor.

Overall, the modelling likely provides overestimate results by showing the worst-case situation.

3.7.4.2 Baseline environment

Yereymentau town is located north-east of the Project's area. The closest houses to a wind turbine (number 01 and 02) are situated at horizontal distances of about 600 m and 700 m. The centre of Yereymentau is located in a distance of about 2 km to the northwest. Majority of residential buildings of Yereymentau are at least 1 km away from any turbine. Since there are no other industrial activities or major traffic roads in the vicinity of the Project area, and Yereymentau is a more rural settlement with only few industries, no baseline noise measurements in the Project's area of influence were available or have been performed. For the noise background a range of 30 to 40 dBA can be expected. During a windless night, the levels may be as low as 25 dBA which may increase under windy conditions to 40 dBA or even more. Therefore, a baseline noise level of 35 -40 dBA is assumed for comparison with the modelled strong wind situation.

Planned developments of wind farm projects near Yereymentau include the First Wind Power Station project (45 MW project, stage 1 of SGE program) which is currently under construction. The wind farm is situated southwest of Yereymentau at distances of at least 650 m to residential buildings and west of the Project with a minimum distance between the closest wind turbines of approximately 2 km. There may be cumulative noise impact from these turbines on the Project's area of influence after operation of both wind farm projects commences. In order to consider the noise impact from these turbines, they have been included in the noise modelling exercise described in the next chapter.

The turbine types of First Wind Power Station project (45 MW project, stage 1 of SGE program) are:

45 MW wind farm with 22 wind turbines of type Fuhrlaender FL 2000-93:

- Rated capacity: 2.05 MW
- Hub height: 85 m above ground
- Rotor diameter: 93.2 m
- Source sound power level: 104.4 dBA for the loudest situation with wind speed at 95% rated power meaning at hub level 11m/s.

Another 30 - 50 MW wind farm is planned north of Yereymentau, north-west of the project's site at a minimum distance of approximately 3.5 km. Given this distance, a relevant cumulative noise impact on the project's area of influence is not to be expected.

3.7.4.3 *Impacts and Mitigation*

Construction Phase

During the construction of the wind farm, noise emissions will be generated due to the utilization of construction vehicles and machinery. The construction works will take place during day time. Noise generating activities, in particular, are related to excavating, loading, truck driving. Construction noise is a temporary event which duration and characteristics strongly depend on the activities carried out.

Typical machinery to be used during construction phase is as follows:

- for e.g. excavation and landscaping are: excavators, loaders, bulldozers, trucks;
- for construction of the wind turbine: concrete mixer, concrete pump, heavy load trucks;
- other common equipment: cranes, diesel generators, compressors.

The sound power levels (noise generation levels) of such construction equipment may range from below 90 dBA up to about 120 dBA for noisy or overage equipment. A number of 8 to 10 machines or vehicles can be assumed to operate at a wind turbine construction site during the various construction phases (i.e. excavation, construction). As a very conservative approach, it is assumed that all machines and vehicles are operating simultaneously and each at a sound power level of 120 dBA. Based on this, the overall sound power level for the construction site is 130 dBA. This, however, likely overestimates a real construction site. In **Error! Reference source not found.**, therefore, sound pressure levels for various distances from a construction site

are provided based on the worst-case 130 dBA estimate as well as on lower, more realistic, sound power levels for such kind of construction sites which often range between 110 and 120 dBA. The sound pressure levels are based on geometrical reduction only. Sound attenuation by landscape, structures, atmosphere, etc. is not taken into consideration here.

Besides requirements for machines, no standards for noise from construction works are available in Kazakhstan. Either no standard for construction sites is provided with the IFC guidelines. As a stringent reference the 55 dBA daytime standard can be adopted for residential areas. With reference to the table, this standard may be exceeded in the eastern part of Yereymentau for the 130 dBA maximum scenario if the turbine construction site is close enough. On the other side, at an overall sound power level of 120 dBA at the construction site, the IFC standard will be met in all residential areas. In order to achieve this, equipment with sound power levels below 110 dBA each shall be used on the construction sites.

Table 3-8 ***Maximum sound pressure levels for distances from an exemplary construction site with machinery causing overall sound power levels of 130, 120, or 110 dBA***

Distance between construction site and receptor	**Overall sound power level, in dBA**		
	130	**120**	**110**
	Result for sound pressure level, in dBA		
280 m	70	60	50
500 m	65	55	45
600 m	63	53	43
900 m	60	50	40
1600 m	55	45	35

In conclusion, under the worst-case scenario, annoyance due to construction noise may be possible in the eastern part of Yereymentau, which can be avoided by less noisy equipment. Major significant adverse impacts from construction area noise are not expected.

Beside the noise from the construction area, vehicle traffic along the transportation routes may be a noise issue when trucks passing through Yereymentau. The applicable noise standard for residential areas according to the Kazakh regulations is 65 dB(A) (regular standard with an increment of +10 dB(A), cf. Table 3-). The IFC guidelines do not address noise from construction site traffic.

For the Project's truck traffic, a number of around ten movements per hour can be assumed as peak situation. For the construction of a single wind turbine or a group of them, the routes will change several times during the entire construction phase which limits the duration of the impact. With the maximum number of truck movements, sound pressure levels of 60 to 63 dBA are possible at buildings along the roads. Therefore, the applicable noise standard for residential areas according to the national regulations will be met. However, some annoyance may be possible due to oversize transportation of wind turbine modules given the higher sound emissions from special trucks needed to be employed. As general conclusion, however, no major significant adverse impact from construction traffic noise is expected.

In order to limit potential annoyance during the construction phase, the following measures are to be implemented:

- no use of over age equipment;
- use of well-maintained equipment /perform regular equipment maintenance;
- implementation of appropriate management of construction traffic through residential areas (e.g. reduced driving speed); routing of truck transports should use main roads outside residential areas; awareness training for drivers (trained to recognize the villagers' interests on the least possible nuisance); inspections on driving speed and safety by the EHS manager; and
- implementation of a grievance mechanism allowing stakeholders to express concerns and complaints associated with annoyance caused by construction noise.

Operation Phase

During operation of the wind farm, vehicle movements from and to the site will be very limited. Only few light vehicle movements per week will be required for inspection. Maintenance of a turbine will also be a rare event a few times of the year or in case of malfunction. Therefore, road traffic noise during operation is not considered a significant issue.

The main sources of noise during operation of the wind farm are the blades when rotating. Standing next to a turbine, it is usually possible to hear a swishing sound generated from the rotating blades. However, as distance from the turbine increases, this effect ceases.

Given the neighbourhood of the residential areas of Yereymentau an evaluation of the residents' exposure to noise from the Project is required. The sound propagation model described above (refer to Chapter 3.8.1.1/Noise modelling) was employed to predict the noise impacts caused by the Project.

The results of the modelling for operation of the entire wind farm are shown in Annex C. Figure 3-8 below shows the excerpt for the wind farm and Yereymentau with the predicted noise pressure level contours. Figure 3-9 shows for the same area, the prediction of cumulative impacts due to simultaneous operation of the project and of the First Wind First Wind Power Station project (45 MW project, stage 1 of SGE program).

As can be seen in the figures below, during daytime the Kazakhstan (and IFC) standard (55 dBA) will be met for all residential areas (no significant effects).

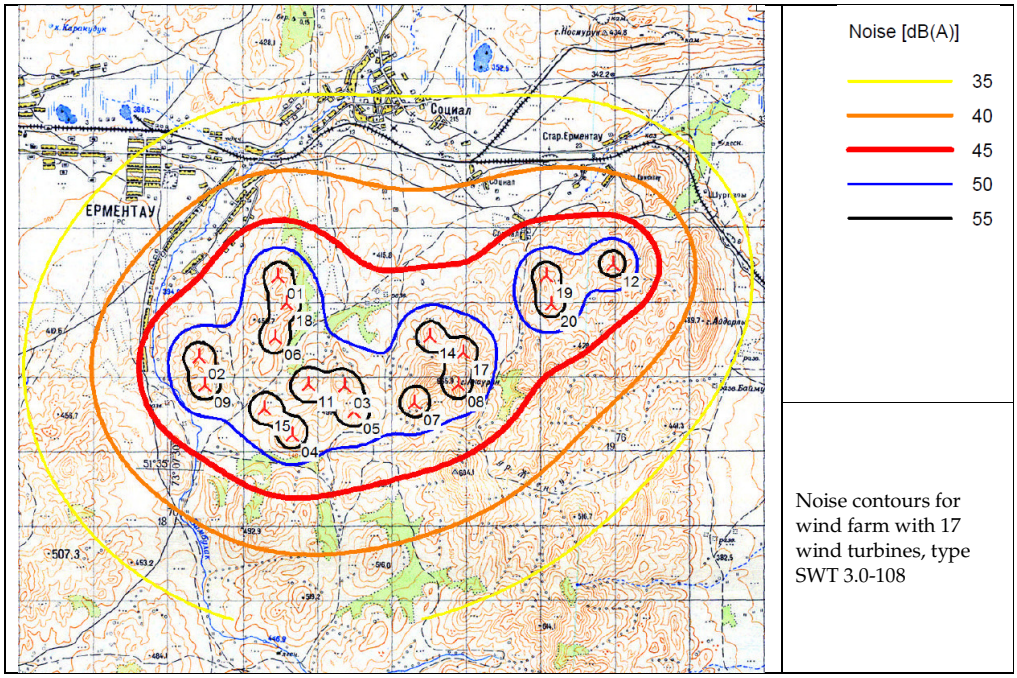


Figure 3-8 ***Noise pressure level contours for operation of the Project (Yereymentau wind farm) – worst case scenario***

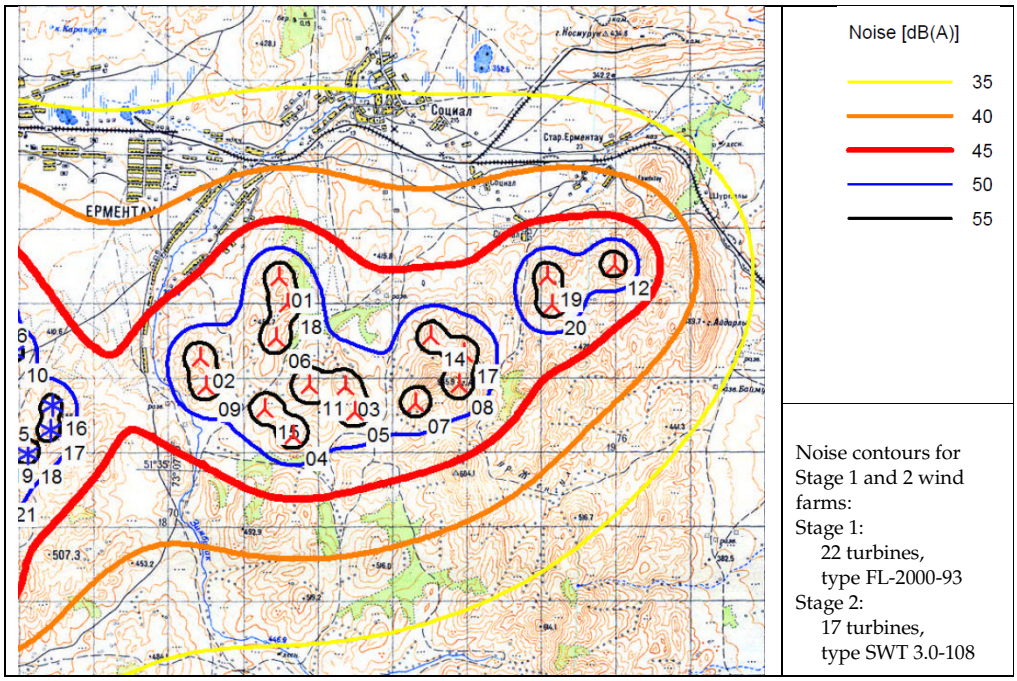


Figure 3-9 ***Noise pressure level contours for simultaneous operation of the Project and of the First Wind Farm project (45 MW wind farm/ SGE Program Stage 1) – worst case scenario***

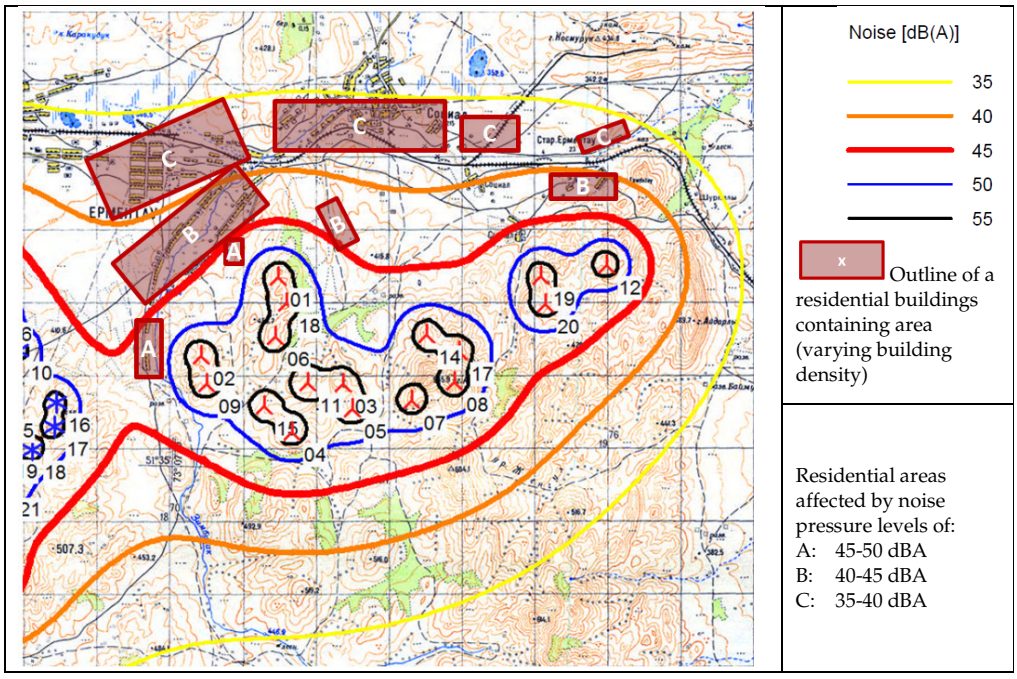


Figure 3-10 ***Yereymentau Residential areas and associated noise levels in cumulative operation context – worst case scenario***

During night time the 45 dBA Kazakhstan threshold level (as well as the IFC standard) for residential areas will be exceeded for the south-eastern part of Yereymentau, in the areas marked "A" in Figure 3-10. Only few (approximately ten) buildings are situated in these areas and levels are only slightly exceeding the 45 dBA threshold.

Areas with residential buildings indicated marked "B" in Figure 3-10 may face sound pressure levels between 40 and 45 dBA which can create nuisance to noise sensitive people. For this range, also an increase of more than 3 dBA against the baseline may be possible which is within the not-to-exceed threshold stipulated by the IFC EHS guidelines for wind energy. The "B"-areas comprise approximately 150 buildings.

For the areas indicated by the letter "C" in Figure 3-10, noise pressure levels between 35 and 40 dBA were calculated. This could be relevant in case of a hospital or sanatorium. The existence of a hospital or sanatorium within the 35 to 40 dBA area is, however, not disclosed. It is to be noted that the 35 to 40 dBA range represents also the baseline noise in case of strong winds and which has been considered for the worst-case modelling.

Wind turbines generate a pulsating, swishing sound that can be noticed close to a turbine. The Kazakh regulations require adjustment of the noise power level by adding an increment, if the modulation (difference in the levels) exceeds 7 dBA. At the distances to the turbines discussed here, the modulation will be below 7 dBA.

Further it should be noted that, as shown in Figure 3-10, the areas west and northwest of the Project are also under cumulative influence of the Project and First Wind Power Station project (45 MW project, stage 1 of SGE program).

In conclusion, only minor adverse impacts from operation of the wind farm are expected for the Yereymentau town areas labelled "C" in Figure 3-10. For "B"-labelled areas significance is considered moderate given a potential increase of noise levels by approximately 5 dBA. Only for few residential areas (those labelled "A" in Figure 3-10) relevant exceedance of IFC threshold level for night time has been calculated.

For "A"- as well as "B"-labelled areas, the evaluation indicates the need to perform noise monitoring during operation to confirm modelling result. In case monitoring results indicate that applicable threshold levels are exceeded, implementation of mitigation measures may be required.

However it is to be noted that the noise levels calculated based on performed modelling are potentially overestimated due to the following:

- the modelling utilizes the maximum sound power levels for strong wind situation;
- a general safety margin of 2 dBA to the sources' power levels has been added;
- no noise reduction due to existing structures has been considered;
- masking of turbine sound by wind friction in strong wind conditions has not been considered;
- reduction of noise by turbulences is not taken into consideration; and
- direction of wind is predominantly from the southwest, meaning that areas north-west and north of the wind farm are not facing the maximum sound emitting direction of the turbine rotor.

The modelled noise pressure levels of the Project predicted for Yereymentau slightly exceed or are close to the Kazakhstan (and IFC) night time standard for residential areas (45 dBA). Therefore, noise monitoring shall be carried out prior to operation and during operation in order to confirm compliance. Baseline measurements shall identify the background noise from other sources than the wind farm. Monitoring locations in the first instance should be selected in residential areas where the modelled noise level is around 45 dBA, but also additional, more distant, reference locations shall be considered. In case the results indicate that more distant areas are also affected, the monitoring shall be extended accordingly. Furthermore, the noise at Yereymentau hospital shall be monitored in respect to the lower threshold level applicable. In case the measurements reveal exceedance of applicable threshold levels, appropriate mitigation measures are to be taken.

Applicable mitigation measures can comprise the following but are not limited to:

- dimming of rotor speed of turbines located close to Yereymentau (turbines 1, 2 and potentially 18, 9, 12, 19);
- plantation of trees and shrubs in front of affected buildings facing a turbine;
- soundproof of windows of the affected residential buildings (windows facing a turbine); and
- regarding cumulative impacts: Implementation of a combined strategy regarding dimming the rotor speed for both the Project and the Stage 1 (45 MW) wind farm for particular situations. Monitoring performed shall also cover the areas where cumulative effects may arise.

3.7.4.4 *Operational Vibration and Low Frequency Noise*

Wind turbines are not typically a source of high level vibration. Vibration levels are reduced rapidly with distance to the source. A comprehensive study of vibration measurements in the vicinity of a wind farm undertaken in 1997[1] found that vibration levels at distances of 100 m were already at below 10% of the value recommended as exposure limit for critical buildings such as laboratories housing precision measurement instruments. Therefore, no vibration impacts are expected during operation beyond 100 m. It can be assumed that vibration from the Project's wind turbines will not be perceivable at the closest residential buildings located at approximately 600 m.

Comprehensive research on low frequency noise (infrasound) has been published by DEFRA[2]. There are no direct health effects at the levels of low frequency noise generated by wind turbines. It has been repeatedly shown by measurements of wind turbine low frequency noise undertaken over the past decade in the UK, Denmark, Germany, and the USA, and accepted by experienced noise professionals, that the levels of infrasonic noise and vibration emitted from modern, upwind configuration wind turbines even within the wind farm site itself are at very low levels below the threshold of perception.

In conclusion, adverse impacts from vibration and low frequency noise are considered to be negligible.

3.7.5 *Shadow Flicker*

Any moving object that comes between a viewer and a light source can cause a flicker effect. Wind turbines, like other tall structures will cast a shadow on the neighbouring area when the sun is visible. If people live very close to the wind turbine, it may be annoying if the rotor blades chop the sunlight, causing a flickering (blinking) effect while the rotor is in motion.

Three conditions must occur simultaneously to cause shadow flicker:

- the sun must be shining and there is no cloud cover;
- the moving object must be between the observer and the sun; and
- the observer has to be close enough to the object to be in its shadow.

[1] ETSU W/13/00392/REP 'Low frequency noise and vibrations measurement at a modern wind farm'. UK Department of Trade and Industry, 1997.

[2] "A Review of Published Research on Low Frequency Noise and its Effects" Report for DEFRA by Dr Geoff Leventhall. Assisted by Dr Peter Pelmear and Dr Stephen Benton. May 2003

Of course, shadow length can change depending on the angle of the sun in the sky, but even if the object is large and the sun is low in the sky, the shadow will only stretch a certain distance – after that, the light bends around the object and the shadow becomes diffuse (weak).

For a wind turbine to cause shadow flicker, in addition to the three conditions listed above, a fourth condition is also necessary. The blades have to be facing directly towards or away from the sun (so they are moving across the source of the light relative to the observer) which depends on the wind direction.

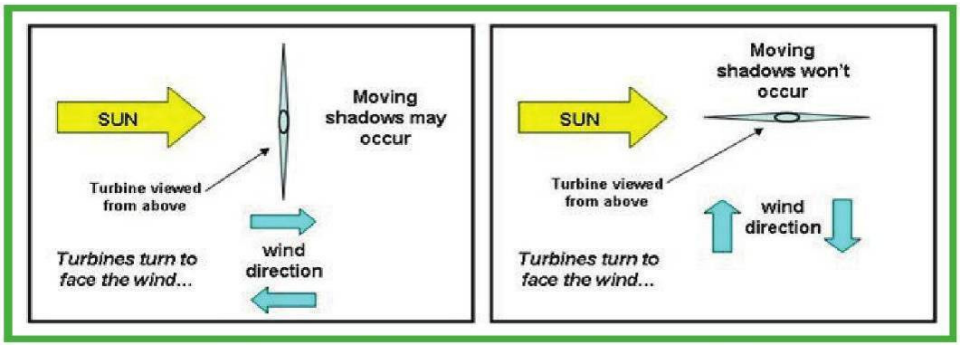


Figure 3-11 ***Relation between Position of Sun, Wind Direction and Occurrence of Shadows***

Modelling of shadow flicker was performed to calculate potential impacts on dwellings of Yereymentau using the software WindPRO version 2.9.277, March 2014. A worst case scenario was applied for the model, using the following assumptions:

- clear sky without cloud cover from sunrise until sunset;
- rotor plane is always facing the sun;
- turbines are always in operation; and
- given that at the time of modelling the exact turbine type was not selected yet, a turbine type was used for the calculations assuming a worst case scenario with the highest shadow effect (VESTAS V112-3.300; rotor diameter 112 m, hub height 84 m).

The turbine type used for shadow flicker modelling has a higher power rate and is larger in hub height and rotor diameter than turbines used in other assumptions of this study. Due to this fact the number of turbines was reduced to 15 for the modelling of shadow flicker to comply with the total installed capacity of the project and with requirements for distances between the turbines. However, this does not influence the outcomes for duration of shadow flicker at nearby houses.

The results of the worst-case modelling are presented in Figure 3-12 indicating the area where shadow flicker can be expected and the maximum number of hours this nuisance may last. The results of the shadow flicker modelling are also provided in Annex D of this report.

The figure shows that in some areas of Yereymentau town shadow flicker can occur. At the nearest dwellings in the northwest and west of the wind farm (approximately 600 - 1000 m) the effect can theoretically occur more than 30 hours per year. Effects of shadow flicker of less than 30 hours per year can be regarded as not significant, which complies with guidelines of other countries, such as Ireland[1]. The Irish planning guideline limits the duration of 30 hours per year to dwellings in 500 m distance to a turbine, as the effect decreases with higher distances.

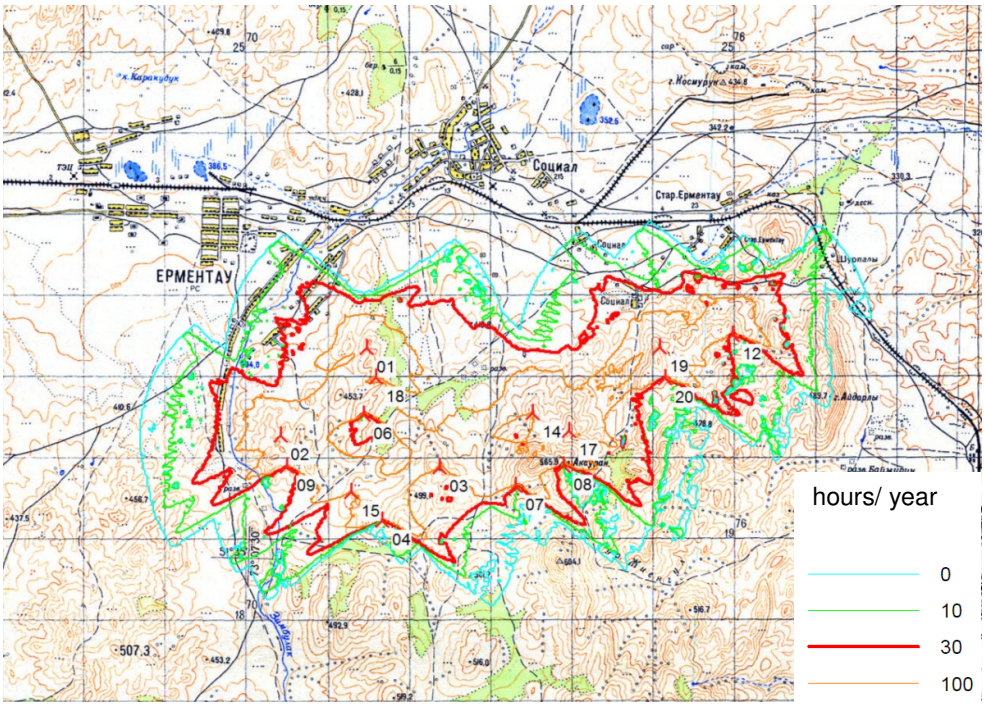


Figure 3-12 ***Spatial occurrence and duration of shadow flicker – worst case scenario***

The results of the modelling are based on a worst case scenario as explained above and a realistic shadow effect is expected to last about one third of the calculated worst case time, which would result in less than 30 hours per year

[1] Planning Guidelines Department of Environment, Heritage and Local Government (Undated); Ireland

of possible nuisance by shadow flicker at the nearest dwellings. The prevailing wind direction in the project area is from southwest, which means shadow flicker will mostly occur in northeast direction, where dwellings will not be affected. Shadow flicker will have the highest effect when entering through constraint openings such as windows and thus the direction of windows at nearby houses will also influence the perception of shadow flicker effects. Considering these circumstances the effect of shadow flicker can be considered as not significant.

Blade or tower glint (also called strobe effect) occurs when the sun strikes a rotor blade or the tower at a particular orientation. This can impact the community, as the reflection of sunlight off the rotor blade may be angled toward nearby residences. According to the IFC Guidelines on Wind Energy, blade glint is a temporary phenomenon for new turbines only, and typically disappears when blades have been soiled after a few months of operation. In addition, blade glint has largely been improved by the development of an industry standard for the colour and surface finish of turbine blades. Based on the location of the turbines in relation to residential housing and the only temporary occurrence (if occurring at all) the impact regarding blade glint is not significant.

3.7.6 Ice Throw

As with any structure, wind turbines can accumulate ice under certain atmospheric conditions, such as ambient temperatures near freezing combined with high relative humidity, freezing rain or sleet. Therefore, there are safety concerns that must be considered during project development and operation.

Any ice that is accumulated may be shed from the turbine due to both gravity and the mechanical forces of the rotating blades. An increase in ambient temperature, wind, or solar radiation may cause sheets or fragments of ice to loosen and fall, making the area directly under the rotor subject to the greatest risks. In addition, rotating turbine blades may propel ice fragments some distance from the turbine—up to several hundred meters.

Falling ice may cause damage to structures and vehicles, and injury to site personnel and the general public, unless adequate measures are put in place for protection.

The risk of ice throw must be taken into account during both project planning and wind farm operation.

According to a study performed by Finnish Meteorological Institute (Wind Energy Production in Cold Climate), it is recommended that for sites with high probability of icing to keep distance of 1.5 (hub height + rotor diameter) between the turbines and nearest objects, and to stop the turbines during the icing period and wind coming from unfavourable directions.

Considering the largest hub height and rotor diameter provided in Table 1-2 for the Project turbines potentially considered, the calculation based on above recommendation results in a safety distance of 237 m from a Project turbine.

The closest residences to a Project turbine is approximately 600 m, which is more than the double of the calculated safety distance.

The land use of the wind farm area is for grazing only. Given that in winter conditions land use for grazing is not possible, there will virtually be no public traffic within project area and therefore community risks associated to ice throw will be negligible.

Possible applicable mitigation measures include:

- equip turbines with ice sensors/ automatic shutdown of turbine in case of ice detection;
- curtail wind turbine operations during periods of ice accretion; and
- place warning signs at certain points at the wind farm site to alert the public of risk.

3.7.7 Electromagnetic Interference

Wind turbines could potentially cause electromagnetic interference with aviation radar and telecommunication systems (e.g. microwave, television, and radio). This interference could be caused by three main mechanisms, namely near-field effects, diffraction, and reflection or scattering.

Near field refers to the potential of a wind turbine to cause interference due to electromagnetic fields emitted by the turbine generator and switching components. Diffraction occurs when the wind turbine not only reflects but also absorbs a telecommunications signal. Reflection and scattering occur when a wind turbine either obstructs or reflects a signal between a transmitter and receiver[1].

[1] IFC (2007) Environmental, Health, and Safety Guidelines for Wind Energy

The nature and amount of electromagnetic interference from each three mechanisms depends on:

- the location of the wind turbine relative to the transmitter and receiver;
- the characteristics of the rotor blades;
- the signal frequency;
- receiver characteristics; and
- the radio wave propagation characteristic in the local atmosphere.

Expected electric and magnetic field levels directly beneath the overhead power line connecting the project to the grid will be in the range of 0.3 – 3 kV/m and 0.5 – 5 μT (5-50 mG) respectively and decrease significantly with the distance.[1]

Research on bats and EMF fields has mainly focused on the use of radar as mitigation to deter bats from interacting with turbines (Nicholls B, Racey PA (2007) Bats Avoid Radar Installations: Could Electromagnetic Fields Deter Bats from Colliding with Wind Turbines? PLoS ONE 2(3): e297. doi:10.1371/journal.pone.0000297). Critics have questioned both the validity of the conclusions (http://www.conservationevidence.com/actions/967) and the practicality of using radar to produce the high levels of EMF required to deter bats from wind farms.

The weak EMF fields associated with the Project will not have a significant effect on bat populations ability to use the site.

Other potential negative effects of interaction with electrical power infrastructure may be associated with cattle health, impaired reproduction and milk production decrease. Such effects may occur when animals are exposed to electrical stress over long periods of time. Vast research and studies on the topic indicate that such problems occur within livestock farming facilities due to electrical wiring and grounding deficiencies of farming buildings. It is considered that such effects are unlikely to occur in relation with the Project given limited potential interaction between Project infrastructure and cattle in the context of open range grazing performed, when animals move freely and are not constrained to locations subject to electrical stress exposure from Project elements.

[1] Electric and magnetic fields and your health: Information on electric and magnetic fields associated with transmission lines, distribution lines and electrical equipment – 2013 edition. Ministry of Health, New Zealand.

Aviation Radar

Wind farms located near an airport may impact the operation of aviation radar by causing signal distortion, which may cause loss of signal and / or erroneous signals on the radar screen. These effects are generally caused by tower and rotor component reflection and radar chopping.

There are no airports in the project area therefore risks associated with aviation radar interference are not considered relevant. Television and telecommunication systems

Interference to television signals in the wind farm area can be caused by either the reflection or obstruction of the signal by the turbine blades. With glass reinforced plastic blades, modern wind turbine generators will cause minimal television interference. It cannot however, be completely discounted for houses within a few kilometres of turbines.

Prevention and control measures to address impacts to telecommunication systems and television broadcast include the following:

- location of wind turbines to avoid direct physical interference of point-to-point communication systems;
- installation of higher quality or directional antenna;
- direct the antenna toward an alternative broadcast transmitter or relocate the antenna;
- install an amplifier to boost the signal; and
- if a wide area is affected, consider the construction of a new repeater station.

Prior to starting construction works approvals from the local communication operators will be obtained in order to avoid damages to any underground cables or telecommunication infrastructure.

Active interference is minimised or completely avoided by ensuring that all equipment complies with relevant electromagnetic compatibility standards.

3.7.8 Public Access

The project area is used for open range grazing (mostly cattle) by individual owners. Disturbance of access to grazing land and potential access safety issues due to construction works may occur during construction stage. Measures to allow safe access to grazing areas will be identified and implemented in communication with local authorities and residents.

Mitigation employed will comprise clear procedures to be implemented by contractors, including Construction and Traffic Management Planning (within construction site and on public roads) and fit for purpose Emergency Response Planning.

Appropriate public communication to allow timely notice of affected residents before major construction operations or traffic in areas open to public, appropriately trained security service to prevent unauthorized access to project locations, use of hazard notices/signs/barriers to prevent access to dangerous areas are measures also to be employed.

These aspects are addressed in the Project ESMP and considered in the Stakeholder Engagement Plan ("*SEP*") to be implemented by SGE.

During operation, safety issues may arise due to public access to wind turbines or to the wind farm substation facilities.

Prevention and control measures to manage public access issues may include:

- restriction of public access to turbines by use of locked doors, camera monitoring and movement sensors for surveillance;
- posting safety signs and information boards providing emergency contact information at entrance to the site area; and
- employment of qualified, specialised security contractor.

3.7.9 Emergency Preparedness and Response

Natural Hazards

Several natural hazards have been analysed in the feasibility study stage of the Project including rock fall, slope instability, landslide, flooding, erosion, seismicity and soil collapse, all being associated with marginal risks according to the Project feasibility study.

Analysis performed in the feasibility study stage included review of relevant documents including journals, books, geological maps, tectonic maps, seismic maps and earthquake catalogues with the purpose of defining morphological, geotechnical, tectonic, seismic and hydrogeological aspects of the project area. Furthermore intrusive investigations (drilling and laboratory tests) have been performed in order to define physical, mechanical and deformation characteristics of soil and rock formations.

Based on the above, the project avoids lower site areas including valleys with temporary water courses and increased seasonal soil moisture are avoided by the wind turbines locations. The higher site areas where the wind turbines will be located are considered to present reduced natural hazards to the Project infrastructure.

According to the feasibility study, the Project located is on a low-seismicity region, as indicated on the seismic zoning map of Kazakhstan. The zoning is based on historical records and location of tectonic faults. Geotechnical conditions at the site are considered favourable in terms of foundation conditions. Given favourable rock conditions at the site, there is no evidence of slope instability. The feasibility study considers the impacts of seismic events as being negligible and cannot result in slope instability.
Approval of the geological institute regarding seismic situation of the Project site has been obtained.

Site conditions will be further detailed in the detailed planning stage of the project, when site specific surveys will be further carried out including the calculation of masses of earth movements. These will be performed by the EPC contractor in the detailed design stage and will allow implementation of appropriate design solutions.

Lighting and strong winds may result in wind turbine fires.

Project design is to consider direct and nearby lightning strikes to reduce the potential for equipment ignition. Possible lightning damage risks cannot be completely eliminated though.

Mechanical friction among the multiple moving parts of the turbine assembly, gears, shafts, and other moving or rotating metal components may generate sparking or overheating which may also cause fire. The equipment is designed to turn the turbine to face the optimum direction, and the control system turn the turbine off at very high (or very low) wind speeds. Automatic fire detection and extinguishment systems allowing fast response will be provided which will need to be duplicated by reliable and constant supervision. The detection and extinguishing systems supervision in place should be able to clearly and concisely communicate complete information to allow appropriate emergency response.

A limiting factor to firefighting intervention at wind turbines are the height where the fire may occur and the limited access inside the wind turbine towers. Industry practice generally does not provide for physically fighting fires inside the turbine towers but relying primarily on the fixed installations. In addition, appropriate procedures and systems are needed to protect vegetation or structures near towers affected by fire events.

Emergency Response

An Emergency Preparedness and Response Plan is to be prepared prior the project implementation with consideration of the following principles and recommendations.

The Emergency Preparedness and Response Plan (EPRP) will define the measures to be taken to minimise the risk of an incident and the measures required to prepare for and respond in the event that an incident does occur during construction (such as a fuel spillage from vehicles or equipment etc.) or operation (such as fire at the electrical components etc.).

This EPRP will apply to all personnel (including SGE own staff and contractor personnel) involved, for the entire duration of the Project, starting with the mobilization phase until full completion and equipment and personnel demobilization. All contractors and subcontractors shall align their own emergency procedures in order to meet the principles and the lines of communications as set out in the EPRP.

While risks cannot be eliminated totally, the EPRP is to consider best practice in ensuring public safety. A list of potential hazards and response measures to be considered in the EPRP is provided in Table 3.9 below. The table is however not intended to provide an exhaustive list of potential risks, and the EPRP is to be based on a systematic approach to the identification of hazards and assessment of associated risk across the entire Project cycle. Regular review at each phase of the Project is to be performed as an iterative process to understand risks, followed by implementation of required measures to address these. The results of the assessment are to be disclosed to all relevant stakeholders in an easy to understand manner.

Table 3-9 ***Potential emergency situations and associated management and response measures***

Hazards	Potential Management/Response Measures
Construction Stage	
Transportation, site traffic hazards	Traffic management plan; Transport route planning; Speed limits; Traffic signs; Drivers training (own and contractor drivers),
Roads damage	Appropriate roads design; roads maintenance, reinforcement
Turbine element overturn, load drop	Route planning; transportation timing; appropriate onsite roads design (slope, curve radius etc.); Drivers training

Hazards	Potential Management/Response Measures
Borrow pits and excavations; Ground instability	Appropriately marked exclusion areas; Stabilization measures; Reinstatement of trenches/excavations
Wastes	Wastes management plan; Appropriate storage (on-site and in transportation vehicles)
Operational Stage	
Traffic hazards	Traffic management plan; Speed limits; Traffic signs; Drivers training (own and contractor drivers)
Roads damage	Roads maintenance, reinforcement
Electric shock	Equipment design; Quality assurance/Quality control; Appropriate underground cables depth; Equipment inspection; Operational procedures; Warning signs; Access control to restricted areas
Over speed of rotor	Control equipment; Turbine shut-down system
Equipment/structure failure	Appropriate design; Quality assurance/Quality control; Equipment control and monitoring system; Equipment maintenance; Turbine shut-down system
Fire	Lightning protection; Automatic fire detection and extinguishment systems; Procedures to intervene/protect vegetation near affected tower; Cooperation with local intervention authorities; Communication
Icing	Temperature monitoring; Turbine vibration monitoring; Blades de-icing system

The EPRP is to include provisions for training, incident reporting, root-cause analysis as support for EPRP update and improvement.

The EPRP is to be also reviewed on a regular basis and/or after major accidents and/or near misses, and/or after any changes (e.g. in personnel, equipment etc.) and updated when necessary. The lessons learned and changes in the nature of work will have to be taken into account in these updates.

Public emergency response services available in Yereymentau town include firefighting, medical emergency and police departments. Response time of public emergency services (4 to 15 minutes estimated pending on Project location) are to be taken into consideration in the EPRP design.

4 CUMULATIVE IMPACT ASSESSMENT

4.1 INTRODUCTION

The following assessment determines which other projects have been considered for cumulative assessment and what effects are likely to arise in combination with these projects.

Cumulative impacts that may arise from the operation of the Project in combination with other wind farms in the area and considered as part of this assessment include biodiversity, noise, shadow flicker and landscape aspects.

4.2 PROJECTS CONSIDERED FOR THE SCOPE OF THE CUMULATIVE ASSESSMENT

Yereymentau Wind Farm will consist of maximum 20 turbines located on an area of 12.42 km^2 of which the operational footprint (i.e. the land required for the turbines and infrastructure) will be approximately 0.089 km^2 (i.e. 0.72% of the total wind farm area).

The final selection of the type of turbines to be installed at Yereymentau has not been made. Several types of turbines are considered. For the purposes of this assessment the turbines with larger diameter (109 m) and highest hub height (85 m) have been considered.

Two other wind farm projects are proposed in Yereymentau area:

- A 45 MW capacity wind farm project (Stage 1 of the SGE's 300 MW wind power capacity program), located approximately 2.5 km towards west from the Project.
  The project is developed by "First Wind Power Station"LLP and is under construction to date. The project will be developed on a site covering a total area of approximately 26.6 km^2 located east of Yereymentau Wind Farm and will consist of 22 turbines with 93.2 m rotor diameter and 85 m hub height. The minimum distance between the westernmost Project turbine and easternmost turbine of the neighbouring wind farm is 2.5 km.
- A 30 - 50 MW wind farm planned at a site located at a distance starting approximately 3.5 km north-west of the Project. The project is in planning stage and will be developed by a Chevron company.
  The project will be developed on a site with a total area of approximately 25.2 km^2 located north to the Yereymentau Wind Farm. Number and location of the turbines of this wind farm project is not available. For the purposes of this assessment, it is considered that the project will

accommodate maximum 20 turbines of similar parameters with those of the Project turbines (109 m rotor diameter and 85 m hub height). The minimum distance between a turbine belonging to this project to a Yereymentau Wind Farm turbine is estimated at 1.8 km.

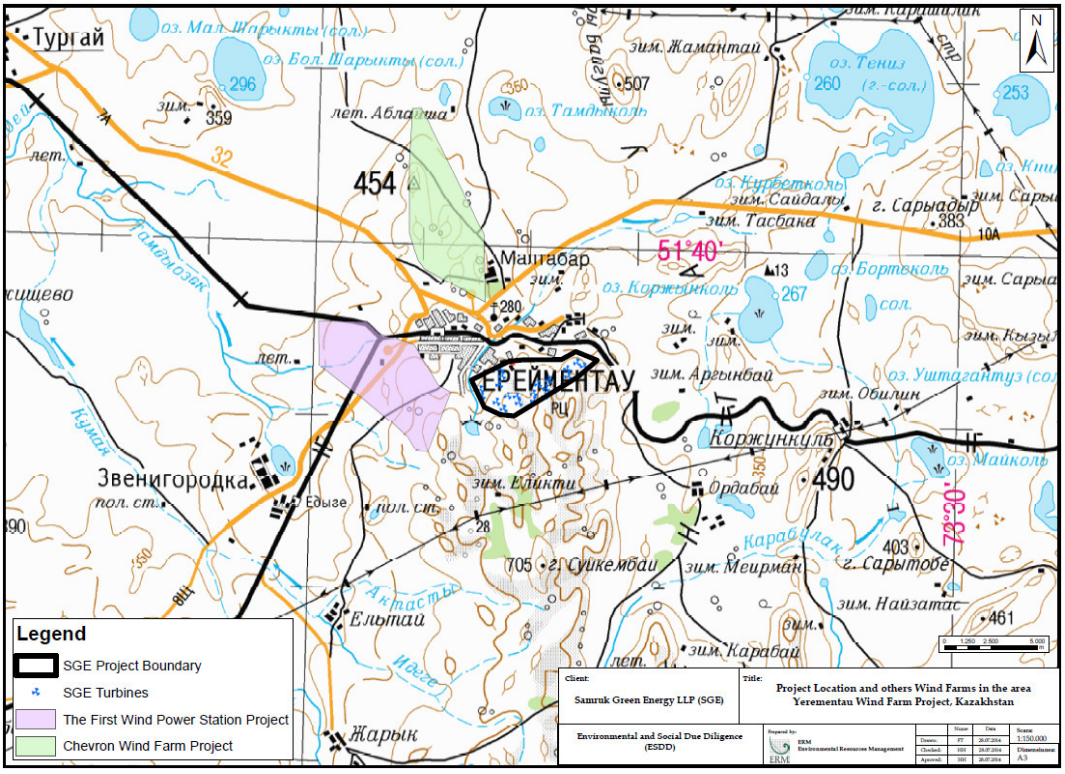


Figure 4-1 ***Project location in relation to Yereymentau Town and other wind farm projects in the area***

This means that within the cumulative impact area the maximum number of wind turbines will be 62 turbines.

The cumulative land take, based on the Yereymentau wind farm average, would equate to 0.39ha per turbine. This would give a total land take of approximately 24.18ha. In terms of loss within the IBA this is a worst case scenario as the First Wind project site is only partially within the IBA. The cumulative habitat loss from the 364,580ha IBA would therefore be approximately 0.006% of the total area available, all of it concentrated in the least remote and wild part of the IBA.

Detailed information on the effects of wind farms on mobile fauna such as birds and bats is not fully developed and this influences the level of detailed comment on cumulative effects that can be provided.

4.3 CUMULATIVE IMPACTS ON BIODIVERSITY

The requirement to consider cumulative impacts on biodiversity is set out in paragraph 8 of EBRD's Performance Requirement 6 *Biodiversity Conservation and Sustainable Management of Living Natural Resources.* This states:

"The assessment should also consider direct, indirect and cumulative impacts and evaluate the effectiveness and feasibility of the mitigation measures to be applied to the project. The assessment process should include consideration of potential landscape level impacts, as well as impacts on the ecological integrity of the ecosystems, independent of their protection status and regardless of the degree of their disturbance or degradation."

4.3.1 *Cumulative impacts*

As all the proposed wind farms currently lie outside the Buiratau National Park no impacts are predicted for the national park.

The land loss within the IBA in terms of area (0.006%) and location (on the edge of the IBA close to the main urban area) also indicate there will be no cumulative impacts on habitats, flora and sedentary fauna within the IBA.

In relation to the IBA as noted above there is some indication that the First Wind project may have an impact on a pair of Eastern Imperial Eagle and it is uncertain to what extent this pair or others use all or some of the wind farm areas including Yereymentau. It is estimated that the IBA holds 30-35 pairs of Eastern Imperial Eagle[1], so the loss or displacement of one pair is potentially significant.

There is uncertainty about usage of the wind farm airspace in relation to migration routes and the proximity of breeding key IBA species. Given the size of the IBA these risks are likely to be small but they require further survey effort if both the Yereymentau impacts in isolation, and the cumulative impacts of the three proposed developments in combination are to be fully understood and addressed.

There is little information on bat use at any of the proposed wind farms although turbines in open steppe habitat are unlikely to have the same effect as those in mountain ridges, particularly those that are well vegetated. Although not listed as IBA qualifying features experience elsewhere has

[1] Sklyarenko, S.L., Welch, G.R. & Brombacher, M. (eds) (2008). Important bird areas of Kazakhstan-priority sites for conservation. Almaty, Kazakhstan: Association for the Conservation of Biodiversity of Kazakhstan (ACBK).

indicated that bats can be potentially vulnerable to turbines, particularly if placed near roosts or migration routes[1]. Further work would be required if effects on bats are to be understood both in isolation and cumulatively.

4.3.2 *Conclusion*

Cumulatively the total footprint of wind farms in Kazakhstan is very small and overall impacts are likely to be low, particularly in relation to habitat, flora and sedentary fauna. The location of wind farms within the IBA does produce an increased risk of interactions with key bird populations, although evidence from Europe indicates that properly sited and appropriately assessed wind farms need not be incompatible with the conservation objectives of important biodiversity areas[2]. Effects on priority biodiversity features, if they either have no significant effects or can be properly mitigated for and comply with EBRD requirements on biodiversity, also do not preclude development within areas with priority biodiversity features. These conclusions support the need for additional survey work to better understand and mitigate for the potential impacts of the Yereymentau project. Good quality data and understanding of the effects of Yereymentau in isolation will improve understanding of cumulative impacts.

Assessment and appropriate mitigation, particularly in relation to location of turbines, is an important step in meeting the safe and sustainable development of renewable energy sources. Spatial planning can assist developers considerably and early production of such indicative biodiversity sensitivity mapping would be an important step in ensuring better planning, faster consenting and improved protection of biodiversity. Involvement in producing such spatial planning would be an important contribution to net gains for biodiversity.

4.4 *CUMULATIVE NOISE IMPACTS*

Cumulative impacts for noise are possible due to simultaneous operation of the project and of the First Wind Power Station project (45 MW project, stage 1 of SGE program). This may affect the residential areas in the overlapping areas of influence of both projects, to the north of the wind farm sites.

[1] Horn, J. W, Arnett, E. B, & Kunz, T. H. 2008. Behavioural Responses of Bats to Operating Wind Turbines. *Journal of Wildlife Management 72(1):123-132*.

[2] European Commission (2011). Wind Energy Developments and Natura 2000: EU Guidance on wind energy development in accordance with the EU nature legislation.

Details on the type, number and location of the turbines of the third wind farm planned north of Yereymentau town are not available at this stage. However given the large distance to this project, no cumulative noise impacts are expected as result of simultaneous operation of the Project and of this wind farm.

The cumulative noise impact aspects have been discussed in Chapter 3.8.1 Environmental Noise of this report.

4.5 CUMULATIVE IMPACTS SHADOW FLICKER

Shadow flicker was modelled for the Project and First Wind Power Station project using WindPRO version 2.9.277, March 2014.

The modelling was performed for the worst case scenario by considering the Project configuration based on the turbine type having largest hub height and rotor diameter (cf. Table 2-1).

Given the large distance to the third wind farm planned north of Yereymentau town, cumulative shadow flicker impacts are not expected as result of simultaneous operation of the Project and of this wind farm. Therefore the named project has not been considered by this assessment of cumulative shadow flicker impacts.

The results of the worst-case modelling in cumulative context are presented in Figure 4-2 indicating the area where shadow flicker can be expected. The affected area as indicated by the course of the isolines is identical with the one modelled for the Yereymentau Project solely (cf. Figure 3-12), indicating that no cumulative impact will occur.

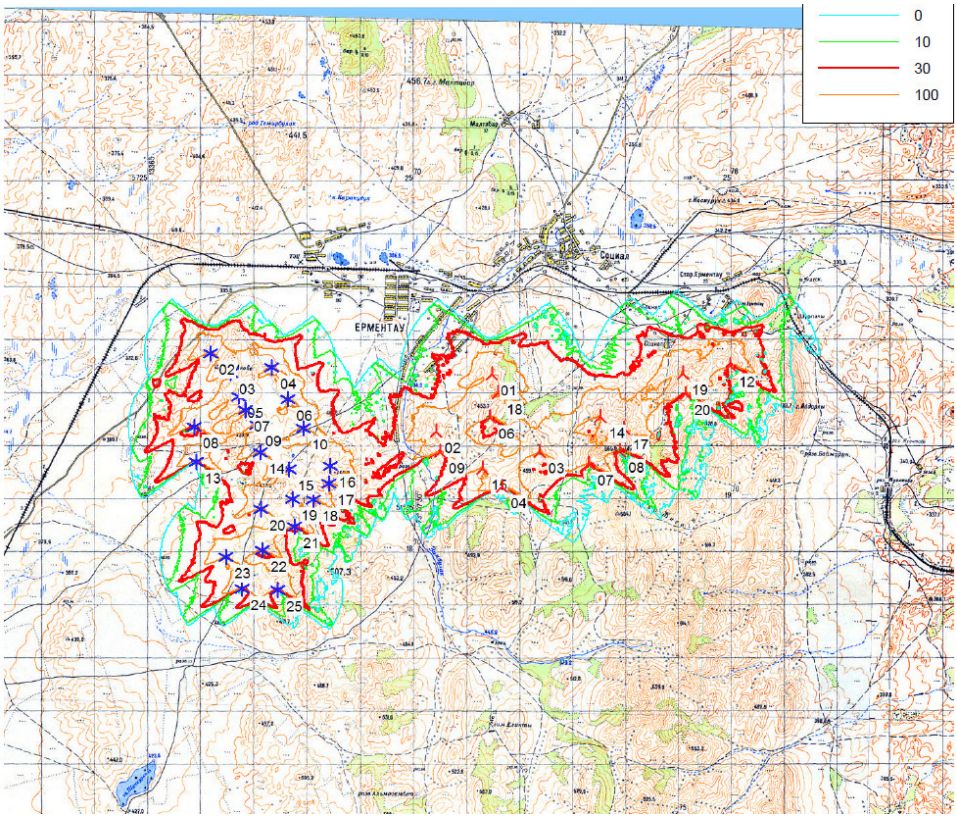


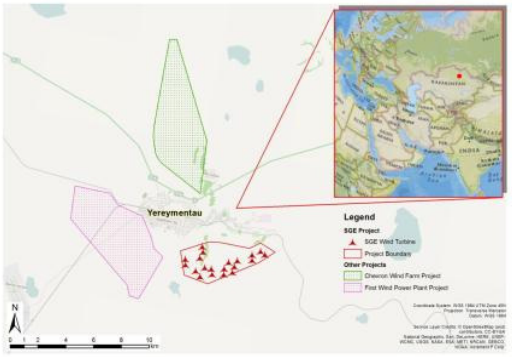
Figure 4-2 ***Spatial occurrence and duration of shadow flicker – cumulative situation, worst case scenario***

4.6 *CUMULATIVE IMPACTS ON LANDSCAPE*

The cumulative impact of wind farm development on landscape and visual amenity is a product of:

- distance between individual wind farms (or turbines);
- distance over which they are visible;
- overall character of the landscape and its sensitivity to wind farms;
- siting and design of the wind farms themselves; and
- the way in which the landscape is experienced.

In future, if the planned wind farm projects are realized, Yereymentau Town will be bordered by three wind farm clusters:



Chevron Wind Farm Project
(30 – 50 MW, 20 WTGs)
North of Yereymentau

First Wind Power Plant
(45 MW, 22 WTGs)
West/Southwest of Yereymentau

Yereymentau Wind Power Plant (50 MW, 15 to 20 WTGs)
South of Yereymentau.

Only east of Yereymentau landscape will not be changed.

For the residents of Yereymentau cumulative impacts will arise from these developments. The effect of having wind farms sited in three geographic directions may be to make the observer feel surrounded by development. The combined effect may be greater than the sum of the individual effects.

Combined visibility occurs where the observer is able to see two or more developments from one viewpoint as this will be the case for this Project (at least at certain viewpoints). Assessments should consider the combined effect of all wind farms which are (or would be) visible from relevant viewpoints. Combined visibility may either be in combination (where several wind farms are within the observer's arc of vision at the same time) or in succession (where the observer has to turn to see the various wind farms).

The sensitivity of the landscape is not deemed high, as it would be the case for a landscape protected by a regional plan or national designation and/ or widely acknowledged for its quality and value as well as a landscape with distinctive character. However, considering that in future three wind farm clusters will be located in three geographic directions from Yereymentau, the cumulative impact is deemed major due to the magnitude of change.

Enhancing a combined program covering the three wind farms for vegetation and tree planting is recommended. However, the visual impact on the landscape by wind farms cannot be entirely mitigated. Planting of trees and other vegetation can only mitigate the visual impact to a certain degree and will come into effect only after years.

5 CONCLUSIONS

The assessment performed identified the potential environmental and social impacts associated with the Project and also defined potential mitigation measures to be implemented in order to maintain these impacts at acceptable levels.

Relevant aspects include:

- potential impacts on soil and groundwater, mostly associated with the construction activities;
- potential biodiversity impacts including limited habitat and flora species loss or degradation during construction, barrier effect and collision impacts on birds and bats during operation, and fauna disturbance and displacement during both construction and operation;
- landscape and visual impacts;
- environmental noise during construction and operation;
- emergency preparedness and response, and
- potential social impacts including minor public grazing land loss and disturbance of access to grazing land during construction stage.

To facilitate implementation of recommended mitigation measures, the following tools will be used during project implementation:

- the Environmental and Social Action Plan (ESAP) which represents a roadmap for implementation of key environmental and social actions required for the Project;
- the Environmental and Social Management Plan (ESMP) which is a management tool transposing mitigation identified into actionable measures for implementation by contractors and by the developer during the various stages of the Project; and
- the Stakeholder Engagement Plan (SEP) which defines the means for communication between the Project and its stakeholders including the process for consideration of public feedback during Project lifecycle.

The key elements considered in the ESAP include:

- requirements for ensuring sufficient capabilities to address environmental, occupational health and safety, and social aspects including appropriate procedures and appropriate management of contractors;
- implementation of an occupational health and safety plan guiding all activities on project site during all stages of the Project;

- pollution prevention and abatement measures including implementation of appropriate wastes management plan, dust abatement during construction, erosion control;
- requirements for appropriate community health and safety procedures and enforcement of their implementation by developer and contractors;
- provisions for noise monitoring to identify mitigation needs if applicable;
- provisions for best practice biodiversity surveys during all Project stages to inform considered mitigation and allow update of the ESMP accordingly;
- provisions for prior cultural heritage survey and implementation of chance finds procedure during construction; and
- provisions for SEP implementation and periodic update during project lifetime.

The ESMP provides the actions to be taken for implementing the environmental and social mitigation measures identified in the course of assessment performed. The ESMP is envisaged as a management instrument and some of the considered actions may require additional detailing in the form of procedures for operational implementation as part of the Project management system. The ESMP also indicates responsibilities for implementation, training needs as well as recommended implementation auditing and control measures.

The SEP identifies key Project stakeholders and provides a framework for meaningful information disclosure and response to stakeholders' feedback. It defines public consultation and information disclosure process to be implemented, resources needed; it provides a mechanism for the public to convey questions, comments and grievances and also defines how the Project will address these.

The SEP refers to all Project stages and will be periodically updated as needed, in response to changes and stakeholders' feedback.

It is considered that implementation of the ESAP, ESMP and SEP will ensure Project compliance with EBRD Environmental and Social Policy.

6 REFERENCES

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CONTENTS

ANNEX

ERM has offices across the following countries worldwide

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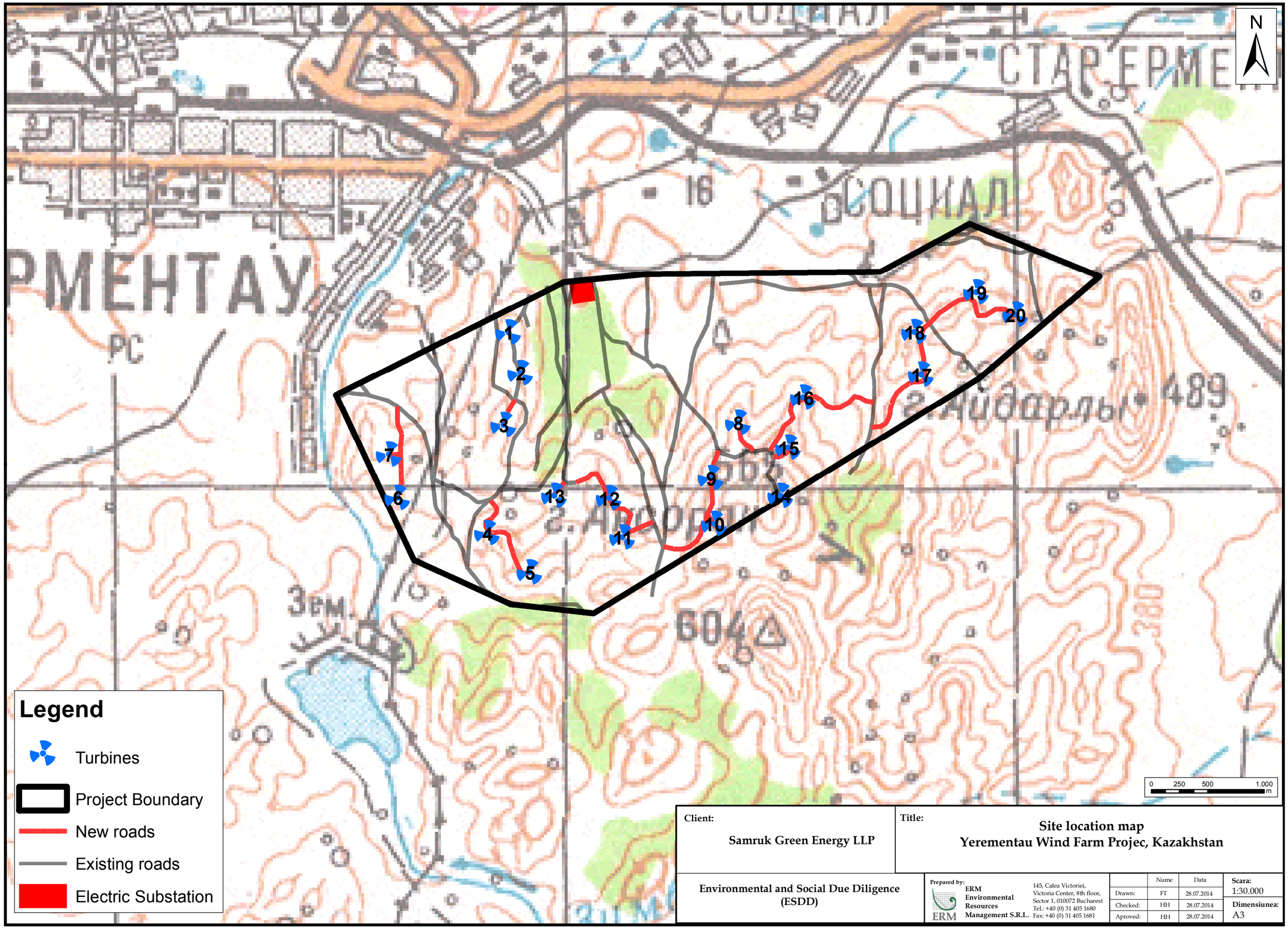
ANNEX A

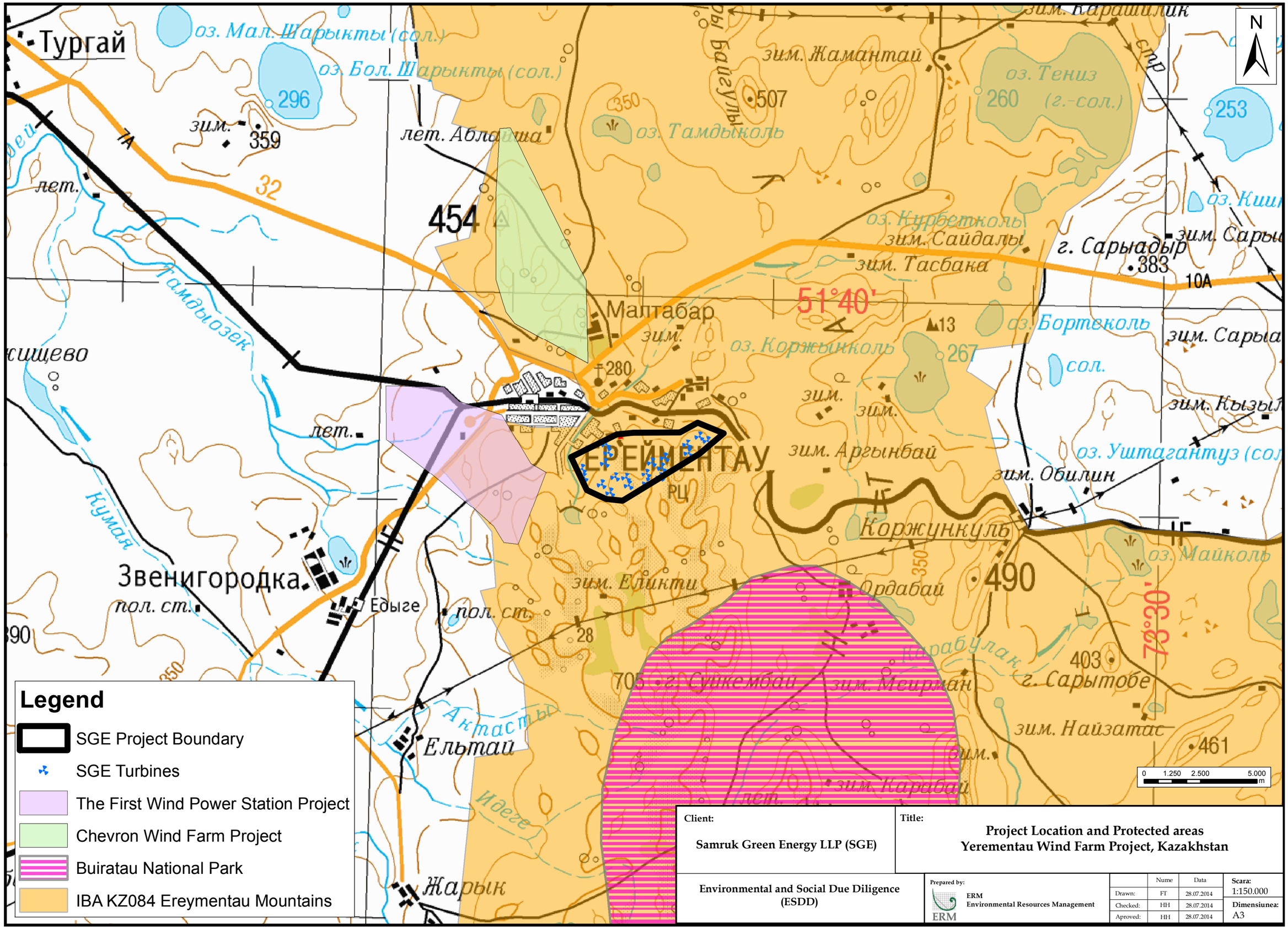
Project Layout Map



Client: Samruk Green Energy LLP	**Title:** Site location map Yerementau Wind Farm Projec, Kazakhstan		
Environmental and Social Due Diligence (ESDD)	Prepared by: ERM Environmental Resources Management S.R.L. 145, Calea Victoriei, Victoria Center, 8th floor, Sector 1, 010072 Bucharest Tel.: +40 (0) 31 405 1680 Fax: +40 (0) 31 405 1681	Drawn: FT 28.07.2014 Checked: HH 28.07.2014 Aproved: HH 28.07.2014	**Scara:** 1:30.000 **Dimensiunea:** A3

ANNEX B

Project Location in Relation to Protected Areas and Neighbouring Wind Farm Projects



Legend

- SGE Project Boundary
- SGE Turbines
- The First Wind Power Station Project
- Chevron Wind Farm Project
- Buiratau National Park
- IBA KZ084 Ereymentau Mountains

Client: Samruk Green Energy LLP (SGE)	**Title:** Project Location and Protected areas Yerementau Wind Farm Project, Kazakhstan
Environmental and Social Due Diligence (ESDD)	Prepared by: ERM Environmental Resources Management

	Nume	Data
Drawn:	FT	28.07.2014
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Aproved:	HH	28.07.2014

Scara: 1:150.000
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ANNEX C

Noise Modelling Calculations Output

- Modelling of sound pressure level contours for the Project
- Modelling of sound pressure level contours for the neighbouring wind farm (First Wind Power Station project)
- Modelling of cumulative sound pressure level contours of both projects

Project:
Yereymentau

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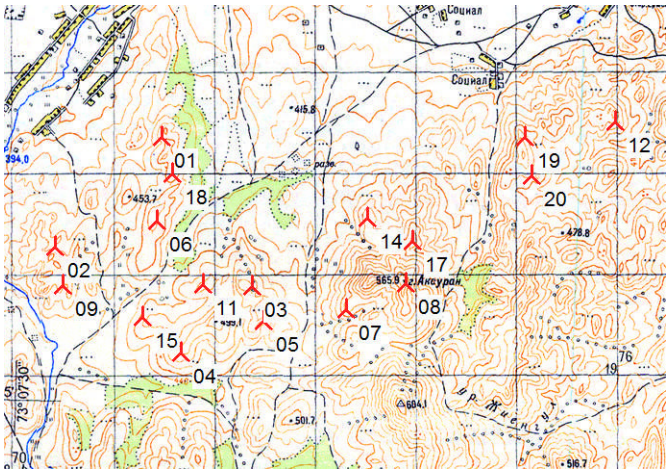
DECIBEL - Main Result

Calculation: Stage 2: 17 x SWT3.0-108 107dB(A) + 2 dB(A)

Noise calculation model:
ISO 9613-2 General
Wind speed:
Loudest up to 95% rated power
Ground attenuation:
None
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
0,0 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)



WTGs

	UTM (north)-WGS84 Zone: 43				WTG type						Noise data				
	East	North	Z [m]	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Creator	Name	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones
01	371.499	5.719.004	447,1	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
02	370.438	5.717.922	436,4	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
03	372.389	5.717.535	484,1	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
04	371.686	5.716.877	475,5	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
05	372.509	5.717.187	472,1	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
06	371.454	5.718.182	451,1	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
07	373.322	5.717.307	510,6	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
08	373.911	5.717.556	552,6	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
09	370.514	5.717.539	440,2	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
11	371.903	5.717.555	472,4	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
12	375.994	5.719.162	434,3	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
14	373.535	5.718.204	481,9	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
15	371.309	5.717.226	459,5	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
17	373.980	5.717.983	517,0	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
18	371.605	5.718.642	449,7	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
19	375.098	5.719.007	455,0	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
20	375.159	5.718.629	459,9	Siemens SWT-3.0-108 300...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB

Project:
Yereymentau

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DECIBEL - Assumptions for noise calculation

Calculation: Stage 2: 17 x SWT3.0-108 107dB(A) + 2 dB(A)

Noise calculation model:
ISO 9613-2 General
Wind speed:
Loudest up to 95% rated power
Ground attenuation:
None
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
0,0 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data not required
Air absorption: 1,9 dB/km

WTG: Siemens SWT-3.0-108 3000 108.0 !O!
Noise: Level 0 - Calculated - 107dB + 2dB

Source	Source/Date	Creator	Edited
Bindal	04.07.2014	USER	04.07.2014 14:08

Status	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones
From Windcat	95% rated power	109,0	No

Project:
Yereymentau

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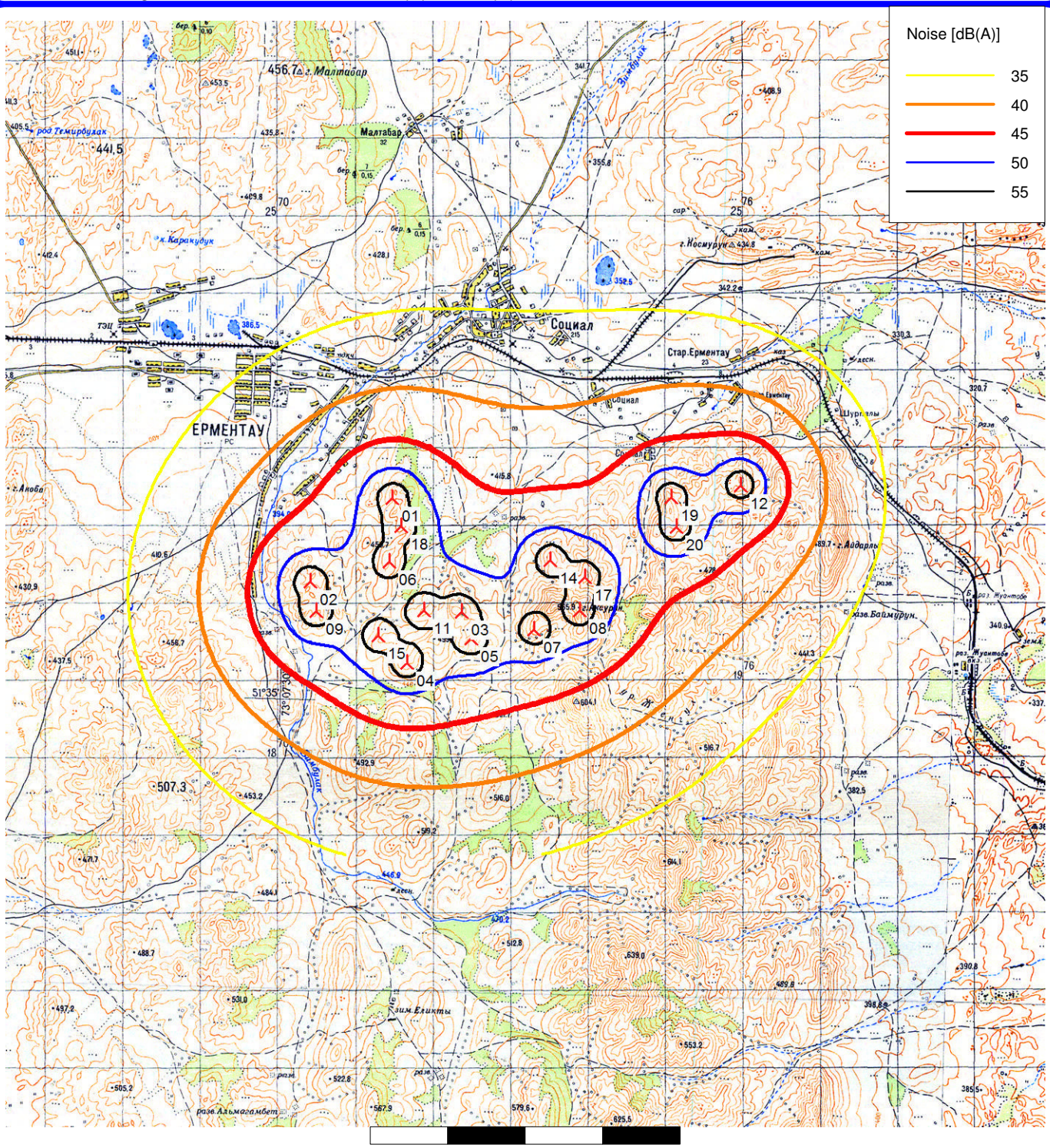
DECIBEL - Map Loudest up to 95% rated power

Calculation: Stage 2: 17 x SWT3.0-108 107dB(A) + 2 dB(A)



Map: Bitmap map: Yermentau_50k.tif , Print scale 1:75.000, Map center UTM (north)-WGS84 Zone: 43 East: 373.216 North: 5.718.019

New WTG

Noise calculation model: ISO 9613-2 General. Wind speed: Loudest up to 95% rated power
Height above sea level from active line object

Project:
Yereymentau

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Calculated:
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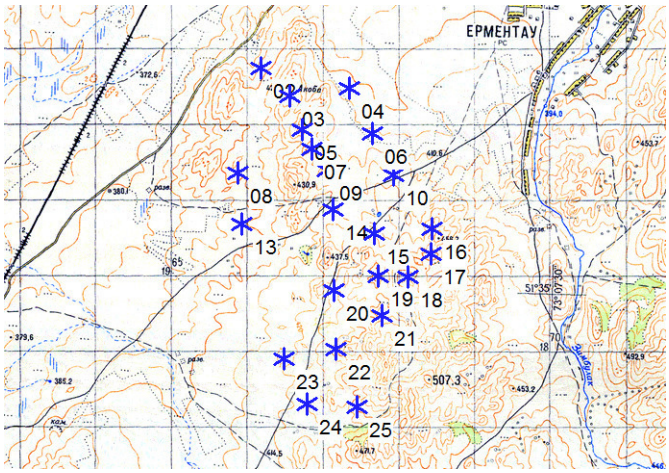
DECIBEL - Main Result

Calculation: Stage 1: 22 x FL2000-93 104,4dB(A) + 2 dB(A)

Noise calculation model:
ISO 9613-2 General
Wind speed:
Loudest up to 95% rated power
Ground attenuation:
None
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
0,0 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)



Scale 1:100.000

Existing WTG

WTGs

	UTM (north)-WGS84 Zone: 43				WTG type							Noise data				
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Creator	Name	Wind speed	LwA,ref	Pure tones
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]	
02	366.189	5.719.400	396,1	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
03	366.571	5.719.022	417,5	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
04	367.349	5.719.129	401,8	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
05	366.732	5.718.586	423,1	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
06	367.656	5.718.527	405,2	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
07	366.854	5.718.333	417,9	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
08	365.882	5.718.014	401,9	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
09	367.069	5.718.047	418,4	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
10	367.943	5.717.990	418,0	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
13	365.930	5.717.343	401,2	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
14	367.134	5.717.528	412,2	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
15	367.680	5.717.206	422,5	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
16	368.452	5.717.277	440,8	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
17	368.432	5.716.946	448,8	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
18	368.133	5.716.633	456,8	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
19	367.740	5.716.645	449,5	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
20	367.152	5.716.463	430,3	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
21	367.787	5.716.127	465,5	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
22	367.173	5.715.679	441,6	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
23	366.490	5.715.551	415,7	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
24	366.794	5.714.960	429,3	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
25	367.462	5.714.928	455,3	FUHRLÄNDER FL 2000-93 ...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB

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Calculated:
15.07.2014 15:52/2.9.277

DECIBEL - Assumptions for noise calculation

Calculation: Stage 1: 22 x FL2000-93 104,4dB(A) + 2 dB(A)

Noise calculation model:
ISO 9613-2 General
Wind speed:
Loudest up to 95% rated power
Ground attenuation:
None
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
0,0 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data not required
Air absorption: 1,9 dB/km

WTG: FUHRLÄNDER FL 2000-93 2050 93.2 !-!
Noise: Level 0 - calculated - 104,4 + 2

Source	Source/Date	Creator	Edited
Bindal	04.07.2014	USER	04.07.2014 14:13

Status	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones
From Windcat	95% rated power	106,4	No

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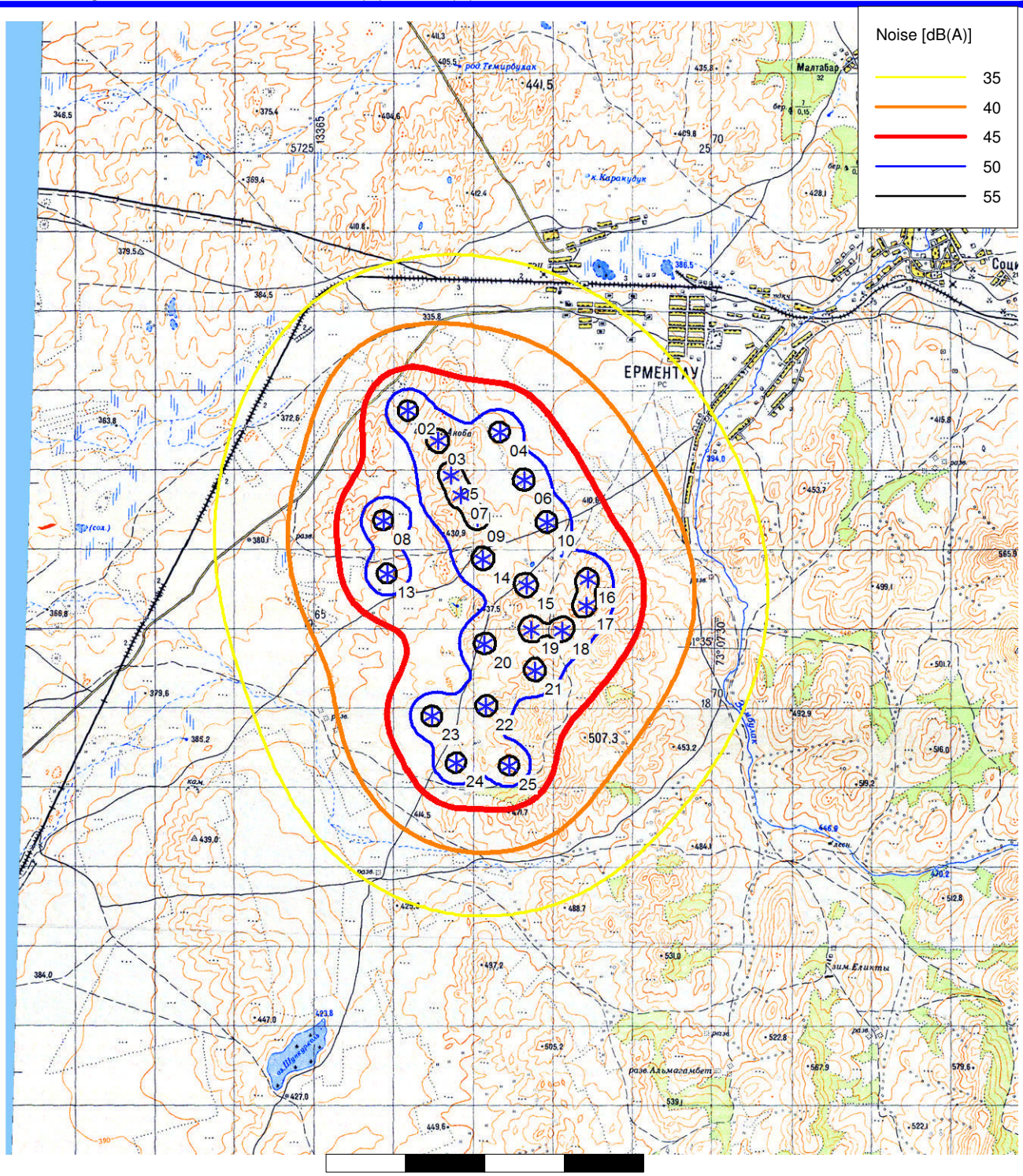
DECIBEL - Map Loudest up to 95% rated power

Calculation: Stage 1: 22 x FL2000-93 104,4dB(A) + 2 dB(A)



Map: Bitmap map: Yermentau_50k.tif , Print scale 1:75.000, Map center UTM (north)-WGS84 Zone: 43 East: 367.167 North: 5.717.164

✳ Existing WTG

Noise calculation model: ISO 9613-2 General. Wind speed: Loudest up to 95% rated power
Height above sea level from active line object

Project:
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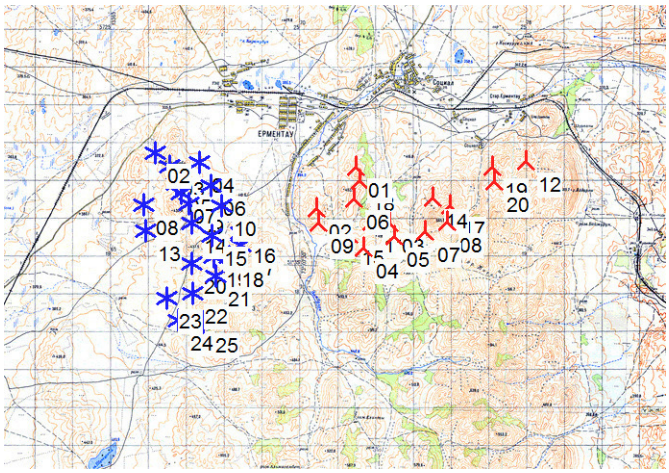
Calculated:
15.07.2014 15:54/2.9.277

DECIBEL - Main Result

Calculation: Stage 1 + 2

Noise calculation model:
ISO 9613-2 General
Wind speed:
Loudest up to 95% rated power
Ground attenuation:
None
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
0,0 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)



Scale 1:200.000

New WTG Existing WTG

WTGs

	UTM (north)-WGS84 Zone: 43				WTG type							Noise data				
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Creator	Name	Wind speed	LwA,ref	Pure tones
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]	
01	371.499	5.719.004	447,1	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
02	366.189	5.719.400	396,1	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
02	370.438	5.717.922	436,4	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
03	366.571	5.719.022	417,5	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
03	372.389	5.717.535	484,1	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
04	367.349	5.719.129	401,8	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
04	371.686	5.716.877	475,5	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
05	366.732	5.718.586	423,1	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
05	372.509	5.717.187	472,1	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
06	367.656	5.718.527	405,2	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
06	371.454	5.718.182	451,1	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
07	373.322	5.717.307	510,6	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
07	366.854	5.718.333	417,9	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
08	373.911	5.717.556	552,6	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
08	365.882	5.718.014	401,9	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
09	370.514	5.717.539	440,2	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
09	367.069	5.718.047	418,4	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
10	367.943	5.717.990	418,0	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
11	371.903	5.717.555	472,4	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
12	375.994	5.719.162	434,3	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
13	365.930	5.717.343	401,2	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
14	373.535	5.718.204	481,9	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
14	367.134	5.717.528	412,2	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
15	367.680	5.717.206	422,5	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
15	371.309	5.717.226	459,5	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
16	368.452	5.717.277	440,8	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
17	368.432	5.716.946	448,8	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
17	373.980	5.717.983	517,0	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
18	368.133	5.716.633	456,8	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
18	371.605	5.718.642	449,7	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
19	367.740	5.716.645	449,5	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
19	375.098	5.719.007	455,0	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
20	367.152	5.716.463	430,3	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
20	375.159	5.718.629	459,9	Siemens SWT-3.0-108 3000 ...	Yes	Siemens	SWT-3.0-108-3.000	3.000	108,0	79,5	USER	Level 0 - Calculated - 107dB + 2dB	(95%)	109,0	0 dB
21	367.787	5.716.127	465,5	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
22	367.173	5.715.679	441,6	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
23	366.490	5.715.551	415,7	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
24	366.794	5.714.960	429,3	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB
25	367.462	5.714.928	455,3	FUHRLÄNDER FL 2000-93 2...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	USER	Level 0 - calculated - 104,4 + 2	(95%)	106,4	0 dB

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Calculated:
15.07.2014 15:54/2.9.277

DECIBEL - Assumptions for noise calculation

Calculation: Stage 1 + 2

Noise calculation model:
ISO 9613-2 General
Wind speed:
Loudest up to 95% rated power
Ground attenuation:
None
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
0,0 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data not required
Air absorption: 1,9 dB/km

WTG: Siemens SWT-3.0-108 3000 108.0 !O!
Noise: Level 0 - Calculated - 107dB + 2dB

Source	Source/Date	Creator	Edited
Bindal	04.07.2014	USER	04.07.2014 14:08

Status	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones
From Windcat	95% rated power	109,0	No

WTG: FUHRLÄNDER FL 2000-93 2050 93.2 !-!
Noise: Level 0 - calculated - 104,4 + 2

Source	Source/Date	Creator	Edited
Bindal	04.07.2014	USER	04.07.2014 14:13

Status	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones
From Windcat	95% rated power	106,4	No

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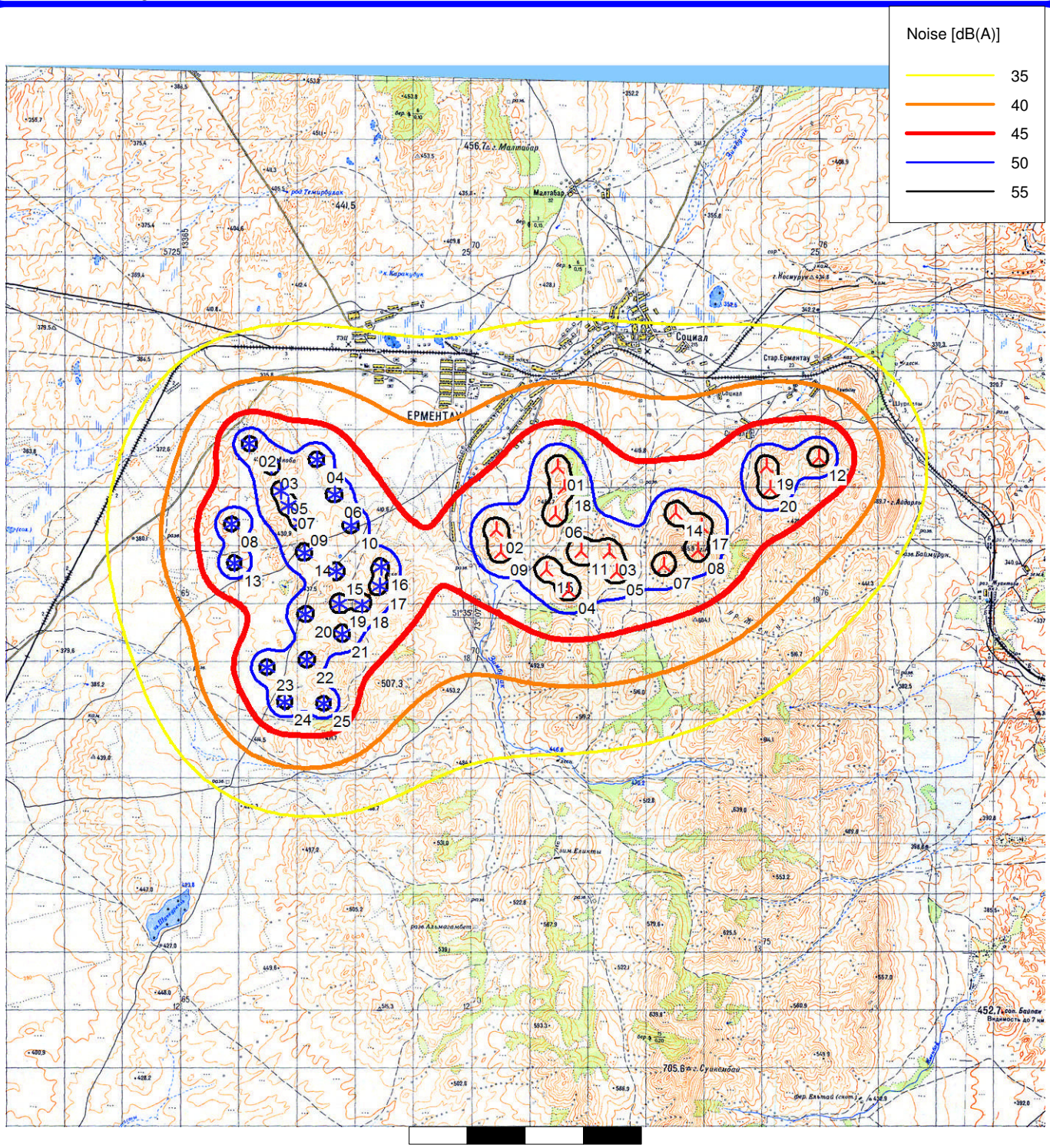
DECIBEL - Map Loudest up to 95% rated power

Calculation: Stage 1 + 2



Map: Bitmap map: Yermentau_50k.tif , Print scale 1:100.000, Map center UTM (north)-WGS84 Zone: 43 East: 370.938 North: 5.717.164

New WTG Existing WTG

Noise calculation model: ISO 9613-2 General. Wind speed: Loudest up to 95% rated power
Height above sea level from active line object

ANNEX D

Shadow Flicker Modelling Output

Project:
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07.07.2014 09:25/2.9.277

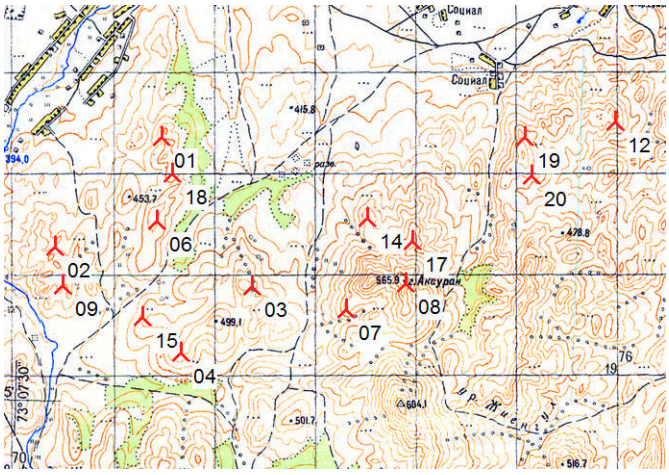
SHADOW - Main Result

Calculation: Stage 2: 15 x V112

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Höhenraster-Objekt: Ermentau_EMDGrid_0.wpg (6)
Obstacles used in calculation
Eye height: 1,5 m
Grid resolution: 10,0 m



Scale 1:75.000

New WTG

WTGs

	UTM (north)-WGS84 Zone: 43				WTG type						Shadow data	
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
01	371.499	5.719.004	447,1	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
02	370.438	5.717.922	436,4	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
03	372.389	5.717.535	484,1	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
04	371.686	5.716.877	475,5	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
06	371.454	5.718.182	451,1	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
07	373.322	5.717.307	510,6	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
08	373.911	5.717.556	552,6	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
09	370.514	5.717.539	440,2	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
12	375.994	5.719.162	434,3	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
14	373.535	5.718.204	481,9	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
15	371.309	5.717.226	459,5	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
17	373.980	5.717.983	517,0	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
18	371.605	5.718.642	449,7	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
19	375.098	5.719.007	455,0	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
20	375.159	5.718.629	459,9	VESTAS V112 3300 112.0 !O! N...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0

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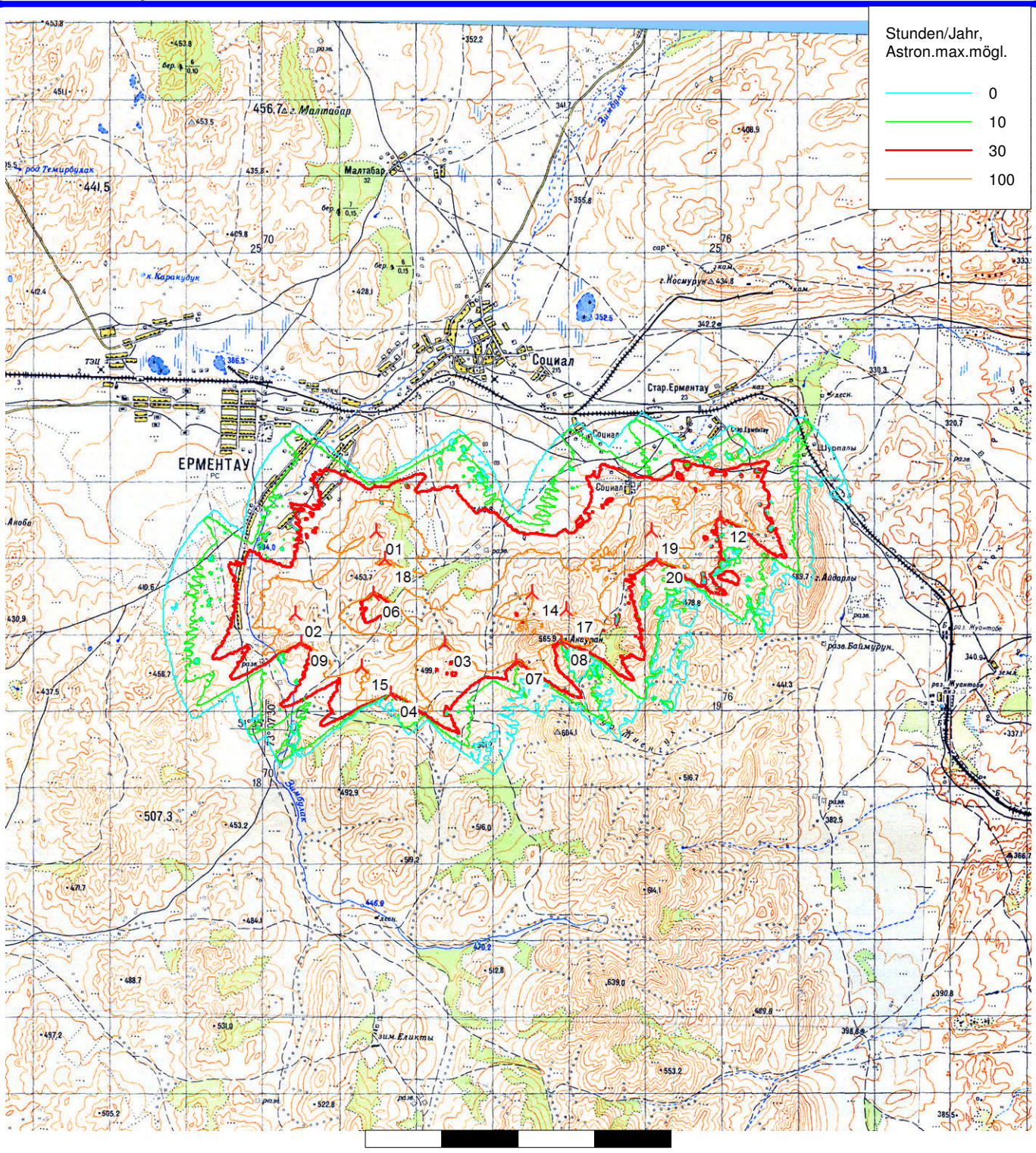
Calculated:
07.07.2014 09:25/2.9.277

SHADOW - Map

Calculation: Stage 2: 15 x V112



Map: Bitmap map: Yermentau_50k.tif , Print scale 1:75.000, Map center UTM (north)-WGS84 Zone: 43 East: 373.360 North: 5.718.420

New WTG

Flicker map level: Höhenraster-Objekt: Ermentau_EMDGrid_0.wpg (6)

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07.07.2014 09:44/2.9.277

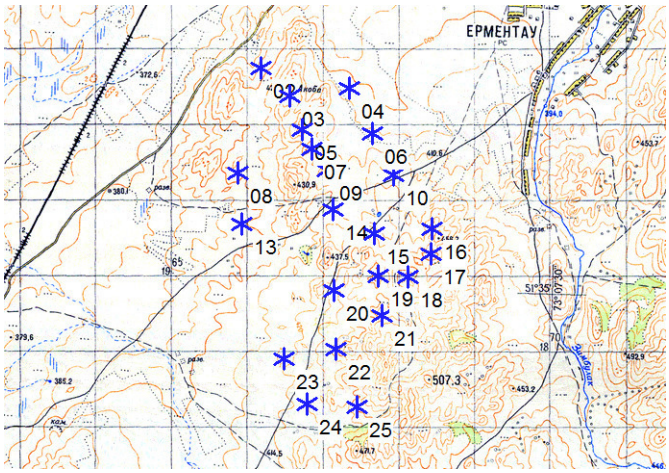
SHADOW - Main Result

Calculation: Stage 1: 22 x FL2500-93

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Höhenraster-Objekt: Ermentau_EMDGrid_0.wpg (6)
Obstacles used in calculation
Eye height: 1,5 m
Grid resolution: 10,0 m



Scale 1:100.000

* Existing WTG

WTGs

	UTM (north)-WGS84 Zone: 43				WTG type						Shadow data	
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
02	366.189	5.719.400	396,1	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
03	366.571	5.719.022	417,5	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
04	367.349	5.719.129	401,8	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
05	366.732	5.718.586	423,1	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
06	367.656	5.718.527	405,2	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
07	366.854	5.718.333	417,9	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
08	365.882	5.718.014	401,9	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
09	367.069	5.718.047	418,4	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
10	367.943	5.717.990	418,0	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
13	365.930	5.717.343	401,2	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
14	367.134	5.717.528	412,2	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
15	367.680	5.717.206	422,5	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
16	368.452	5.717.277	440,8	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
17	368.432	5.716.946	448,8	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
18	368.133	5.716.633	456,8	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
19	367.740	5.716.645	449,5	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
20	367.152	5.716.463	430,3	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
21	367.787	5.716.127	465,5	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
22	367.173	5.715.679	441,6	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
23	366.490	5.715.551	415,7	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
24	366.794	5.714.960	429,3	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
25	367.462	5.714.928	455,3	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0

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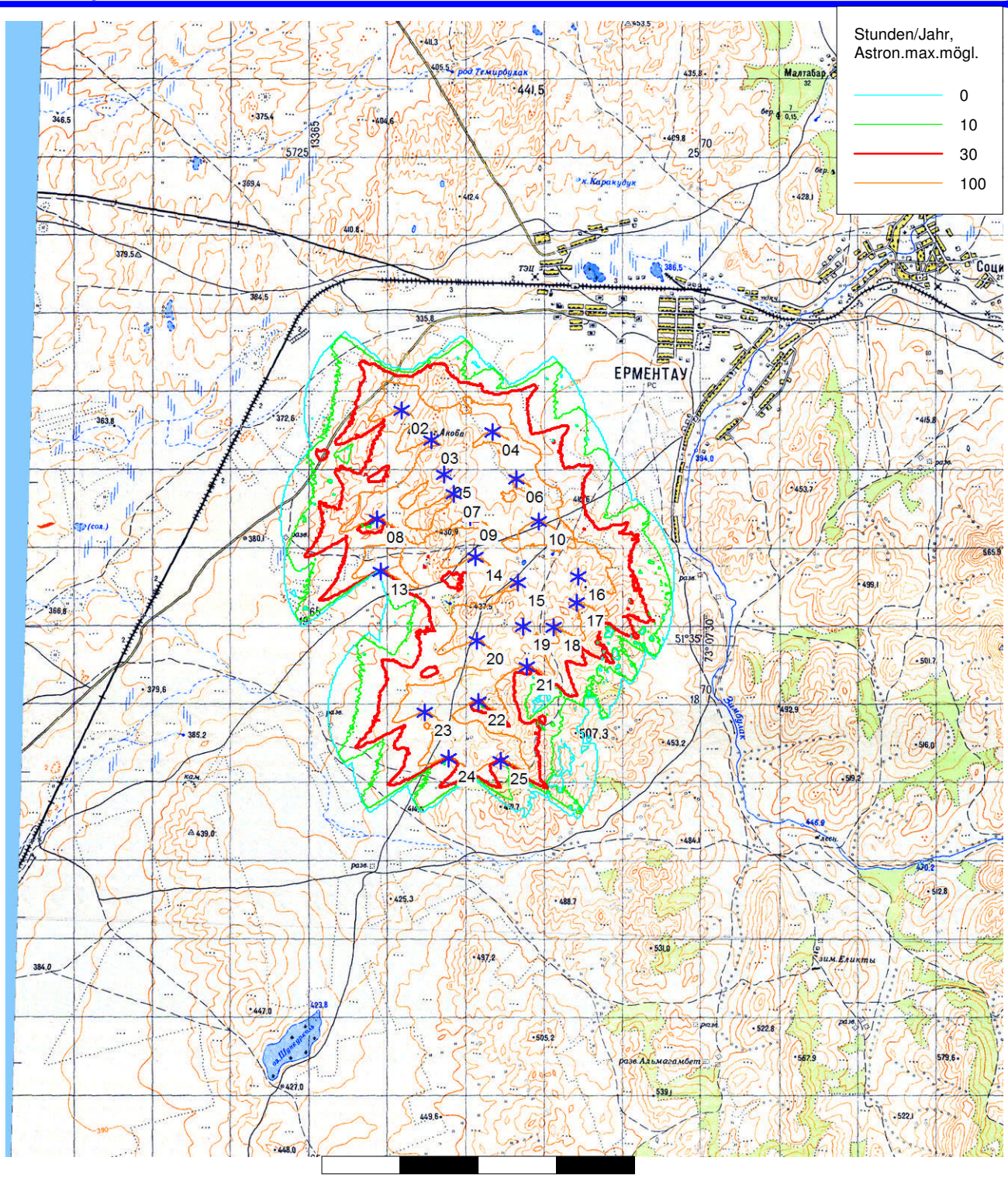
SHADOW - Map

Calculation: Stage 1: 22 x FL2500-93



Map: Bitmap map: Yermentau_50k.tif , Print scale 1:75.000, Map center UTM (north)-WGS84 Zone: 43 East: 367.180 North: 5.717.120

✳ Existing WTG

Flicker map level: Höhenraster-Objekt: Ermentau_EMDGrid_0.wpg (6)

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07.07.2014 10:43/2.9.277

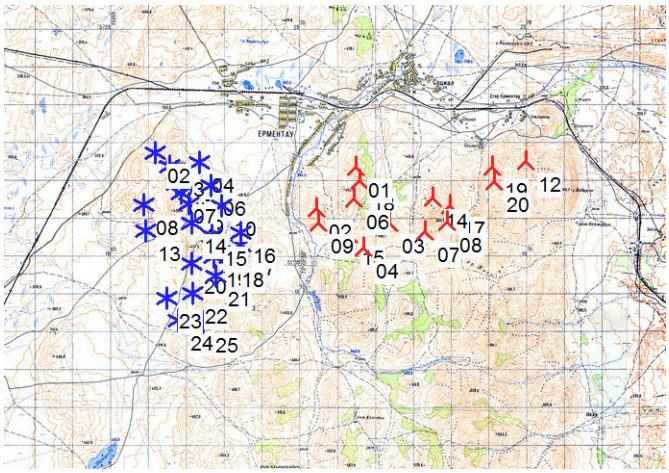
SHADOW - Main Result

Calculation: Stage 1 + 2

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Höhenraster-Objekt: Ermentau_EMDGrid_0.wpg (6)
Obstacles used in calculation
Eye height: 1,5 m
Grid resolution: 10,0 m



Scale 1:200.000

New WTG Existing WTG

WTGs

	UTM (north)-WGS84 Zone: 43				WTG type							Shadow data	
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
01	371.499	5.719.004	447,1	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
02	366.189	5.719.400	396,1	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
02	370.438	5.717.922	436,4	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
03	366.571	5.719.022	417,5	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
03	372.389	5.717.535	484,1	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
04	367.349	5.719.129	401,8	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
04	371.686	5.716.877	475,5	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
05	366.732	5.718.586	423,1	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
06	367.656	5.718.527	405,2	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
06	371.454	5.718.182	451,1	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
07	366.854	5.718.333	417,9	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
07	373.322	5.717.307	510,6	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
08	373.911	5.717.556	552,6	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
08	365.882	5.718.014	401,9	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
09	370.514	5.717.539	440,2	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
09	367.069	5.718.047	418,4	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
10	367.943	5.717.990	418,0	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
12	375.994	5.719.162	434,3	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
13	365.930	5.717.343	401,2	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
14	373.535	5.718.204	481,9	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
14	367.134	5.717.528	412,2	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
15	367.680	5.717.206	422,5	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
15	371.309	5.717.226	459,5	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
16	368.452	5.717.277	440,8	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
17	373.980	5.717.983	517,0	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
17	368.432	5.716.946	448,8	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
18	368.133	5.716.633	456,8	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
18	371.605	5.718.642	449,7	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
19	367.740	5.716.645	449,5	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
19	375.098	5.719.007	455,0	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
20	367.152	5.716.463	430,3	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
20	375.159	5.718.629	459,9	VESTAS V112 3300 112.0...	No	VESTAS	V112-3.300	3.300	112,0	84,0	1.712	0,0
21	367.787	5.716.127	465,5	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
22	367.173	5.715.679	441,6	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
23	366.490	5.715.551	415,7	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
24	366.794	5.714.960	429,3	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0
25	367.462	5.714.928	455,3	FUHRLÄNDER FL 2000-9...	No	FUHRLÄNDER	FL 2000-93-2.050	2.050	93,2	85,0	1.224	15,0

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Calculated:
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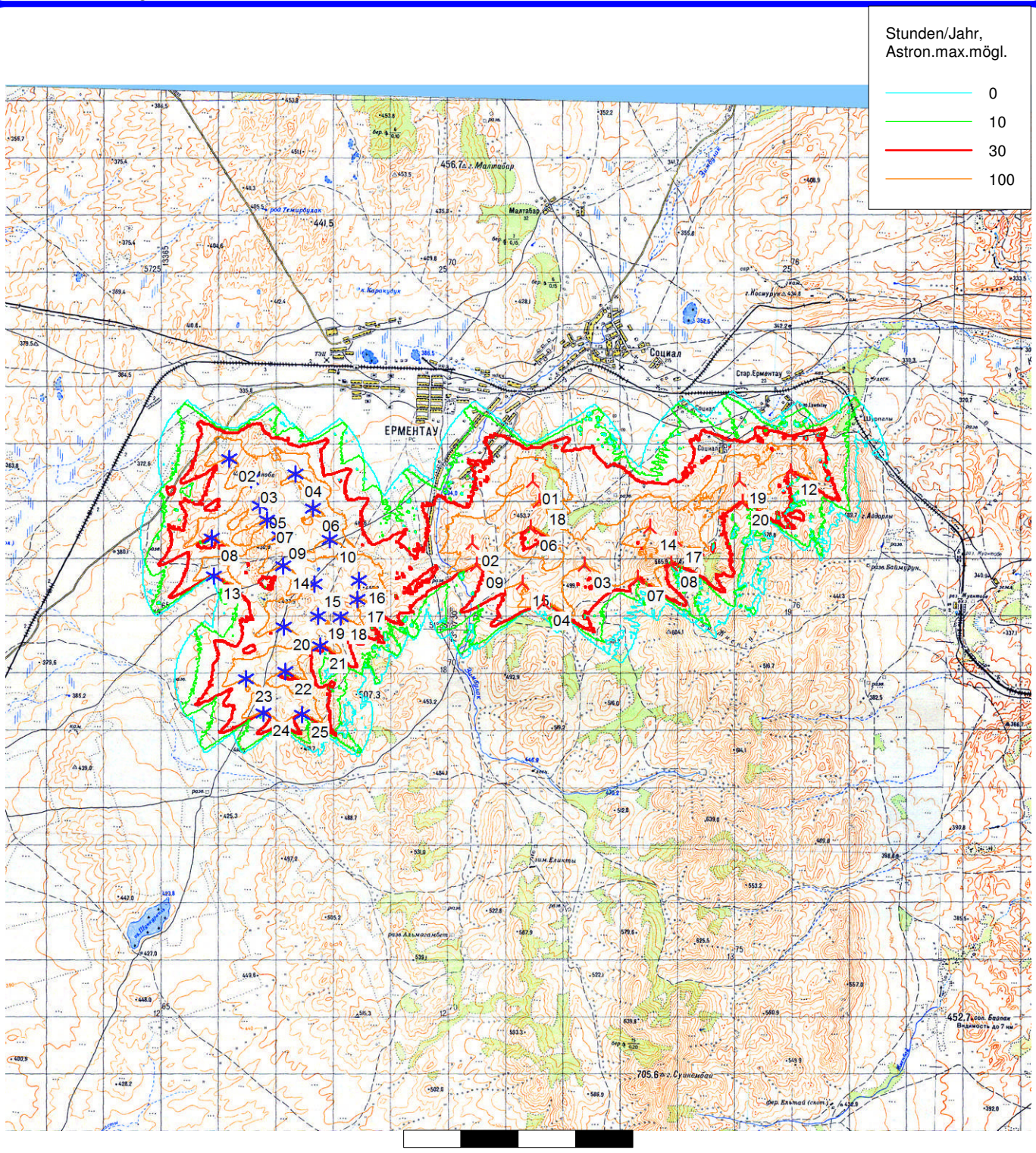
SHADOW - Map

Calculation: Stage 1 + 2



Map: Bitmap map: Yermentau_50k.tif , Print scale 1:100.000, Map center UTM (north)-WGS84 Zone: 43 East: 371.240 North: 5.717.360

New WTG Existing WTG

Flicker map level: Höhenraster-Objekt: Ermentau_EMDGrid_0.wpg (6)

ANNEX E

Environmental and Social Management Plan (ESMP)

Yereymentau
Wind Power Plant
Kazakhstan

Environmental and Social Management Plan (ESMP)

Samruk Green Energy LLP
010000 Republic of Kazakhstan Astana,
Kabanbai batyr ave., 15A, Block B

CONTENTS

1 INTRODUCTION

The Environmental and Social Management Plan (ESMP) in hand of Yereymentau Wind Farm Project in Kazakhstan ("the Project"), presents the actions envisaged for implementing the environmental and social mitigation measures.

The Project is developed by Samruk Green Energy LLP ("SGE/WPY" or the "Company") and comprises a 50 MW wind farm in Akmola Region, south-east of Yereymentau Town, approximately 130 km east of Astana. A project company, Wind Power Yereymentau ("WPY"), was set up by SGE/WPY to develop the Project. The Project will consist of maximum 20 Wind Turbine Generators WTGs with a capacity of 2.5 to 3.3 MW (depending on selected manufacturer and turbine type). The Project is currently in Feasibility Study Stage.

Part of the actions considered herein may require additional detailing in the form of procedures for operational implementation.

The ESMP is based on the studies and level of information available to date (i.e. as of July 2014), which are

- pre-EIA (pred-OVOS) prepared by a licensed local consultant in 2011;
- the EIA and field studies performed for the neighbouring 45 MW wind farm project;
- regional/national data from the KazREFF Report;
- data acquired from other sources and consultation with relevant stakeholders; and
- ESIA Addendum to Project pre-EIA Report.

Certain impacts will need to be assessed further based on actual Project site survey data. The elements of this survey program are provided within the Environmental and Social Action Plan (ESAP). Upon availability of this survey data, the precautionary mitigation measures program is to be reconsidered and the ESMP updated to reflect this.

Furthermore, a monitoring program during operation phases of the Project is to be performed to confirm impacts assessment and refine proposed mitigation and ESMP as needed. Elements of this monitoring program are also proposed within the ESAP.

2 *PURPOSE OF THE ENVIRONMENTAL AND SOCIAL MANAGEMENT*

The broad purpose of the ESMP is:

- to provide a mechanism for ensuring that measures to mitigate potentially adverse environmental impacts are implemented;
- to ensure that standards of good construction practice are adopted throughout the construction of the new wind farm;
- to provide a framework for mitigating impacts that may be unforeseen during construction and operation;
- to provide assurance to third parties that their requirements with respect to environmental performance will be met; and
- to provide a framework for compliance auditing and inspection to enable *SGE/ WPY* to be assured that its aims with respect to environmental and social performance are being met.

The primary objective of the mitigation measures and this ESMP is to avoid negative impacts of the Project where possible, or otherwise to minimise residual impacts to an acceptable level. Likewise, appropriate measures are suggested to maximise the potential for any benefits arising from the Project implementation.

The ESMP will continue to be developed as the Project proceeds through the detailed design, construction and operational and decommissioning (including reinstatement) phases, to reflect the results of any discussions with regulators and consultees and to include details of any conditions imposed by any other environmental consents and licences obtained for the wind farm.

3 *ROLES, RESPONSIBILITIES AND REPORTING*

3.1 *ROLE OF THE COMPANY DURING CONSTRUCTION*

As Project Developer, *SGE/WPY* has responsibility for:

- monitoring contractor performance;
- dealing with problems; and
- acting as a point of contact for consultation and feedback with the public and other interested parties.

3.2 *ROLE OF CONTRACTORS DURING CONSTRUCTION*

The contractors will be responsible for the following:

- ensuring compliance with all relevant legislation, as well as with the environmental controls and mitigation measures contained in the ESMP;
- training the construction staff to raise the environmental consciousness and assigning a responsible for health, safety and environment (HSE) in order to contribute to the project's environmental performance;
- ensuring the implementation of environmental or other codes of conduct required by SGE/WPY; and
- ensuring compliance with all applicable requirements related to the waste management.

This ESMP will be presented to the construction contractors.

The contractors' performance in complying with the ESMP will be monitored and audited by an independent auditor, following an audit program performed as part of the Environmental Management System.

4 *TRAINING*

SGE/WPY will provide training to all employees involved in day to day running of construction and operational activities and to all contractor personnel working at the site during construction and operation. This will aim to ensure that site personnel:

- understand the ESMP and how it will be implemented on site;
- understand the environmental sensitivities of the area in which the Project will be constructed and operated;
- know how to deal with unauthorised visitors to the site, and with enquiries by the public;
- know how to deal with unforeseen environmental incidents; and
- are aware of the roles of the contractors staff, the SGE/WPY Project Manager and the SGE/WPY Project Health and Safety Officer with respect to environmental and social issues.

SGE/WPY keeps records of the training given to individual staff. Assessment of the effectiveness of the training programme is included as part of the audit

procedures for the ESMP by *SGE/WPY*. It consists of interviewing a cross section of site staff throughout the duration of the contract.

The contractor is required to ensure that the personnel of the subcontractor take the environmental instructions and consider these.

5 INSPECTION AND AUDITING

As mentioned above, a programme of inspections and audits by *SGE/WPY* will be implemented during construction and will continue with operation of the plant. These are aimed to assure *SGE/WPY* that contractors are complying with the ESMP and consequently with all national and international HSE regulations during the lifetime of the project.

The audit will be based on the available information (requirements stipulated in relevant permits, technical studies prepared in the pre- construction phase) and observations and does not include additional sampling or data collection.

Where problems are identified by either *SGE/WPY* or contractors, corrective actions are identified by the *SGE/WPY* Project Health and Safety Officer and must be undertaken by the contractors or *SGE/WPY* as appropriate. This could take the form of, for example, further direct mitigation, changes to procedures or additional training.

6 CONTINGENCY PLANNING FOR EMERGENCIES AND ENVIRONMENTAL INCIDENTS

Although a serious incident is very unlikely to occur during the construction and operation of the Project, it is necessary to have procedures in place to deal with emergencies and incidents. Environmental incidents can be defined as unexpected events which lead to, or could lead to, adverse effects on people, property or environmental resources such as habitats or watercourses.

SGE/WPY will be developing an Emergency Preparedness and Response Plan which sets out the measures to be taken to minimise the risk of an incident and the measures to be taken to prepare for and respond in the unlikely event that an incident does occur during construction (such as a fuel spillage from vehicles) or operation (such as oil leaks from the gearbox or fire of the electrical components). The procedures will include provision for incident

reporting. *SGE/WPY* will make provision for keeping anti-pollution control/clean up materials on site in case of an incident.

While risks cannot be eliminated totally, the EPRP is to consider best practice in ensuring public safety. A list of potential hazards and response measures to be considered in the EPRP is provided in the table below. The table is however not intended to provide an exhaustive list of potential risks, and the EPRP is to be based on a systematic approach to the identification of hazards and assessment of associated risk across the entire Project cycle. Regular review at each phase of the Project is to be performed as an iterative process to understand risks, followed by implementation of required measures to address these. The results of the assessment are to be disclosed to all relevant stakeholders in an easy to understand manner.

Potential emergency situations and associated management and response measures

Hazards	Potential Management/Response Measures
Construction Stage	
Transportation, site traffic hazards	Traffic management plan; Transport route planning; Speed limits; Traffic signs; Drivers training (own and contractor drivers),
Roads damage	Appropriate roads design; roads maintenance, reinforcement
Turbine element overturn, load drop	Route planning; transportation timing; appropriate onsite roads design (slope, curve radius etc.); Drivers training
Borrow pits and excavations; Ground instability	Appropriately marked exclusion areas; Stabilization measures; Reinstatement of trenches/excavations
Wastes	Wastes management plan; Appropriate storage (on-site and in transportation vehicles)
Operational Stage	
Traffic hazards	Traffic management plan; Speed limits; Traffic signs; Drivers training (own and contractor drivers)
Roads damage	Roads maintenance, reinforcement
Electric shock	Equipment design; Quality assurance/Quality control; Appropriate underground cables depth; Equipment inspection; Operational procedures; Warning signs; Access control to restricted areas

Over speed of rotor	Control equipment; Turbine shut-down system
Equipment/structure failure	Appropriate design; Quality assurance/Quality control; Equipment control and monitoring system; Equipment maintenance; Turbine shut-down system
Fire	Lightning protection; Automatic fire detection and extinguishment systems; Procedures to intervene/protect vegetation near affected tower; Cooperation with local intervention authorities; Communication
Icing	Temperature monitoring; Turbine vibration monitoring; Blades de-icing system

7 *COMMENTS AND GRIEVANCE PROCEDURE*

As part of its stakeholder engagement process, *SGE/WPY* will implement a grievance mechanism to ensure that all stakeholder comments, suggestions and objections throughout the project lifecycle are captured and considered. *SGE/WPY* will base the grievance mechanism on an international best practice example and take full ownership of the process. It will allow the affected community and the workers to express their concerns and any complaints directly to *SGE/WPY*. Contact details and information on the procedure including grievance form will be distributed to the residents of Yereymentau town. Written comments can be sent to *SGE/WPY* via mail, email, fax and the grievance box in Yereymentau town. Comments can also be made orally via the Project hotline or the Community Liaison Officer. It is envisaged that in general, grievances, in relation to construction or operation, will be responded to within 20 working days after receipt.

All comments and complaints will be investigated by the *SGE/WPY* Complaints Manager and appropriate action taken as necessary. Records of all complaints and actions will be maintained on site.

The grievance procedure and general stakeholder engagement process are further elaborated in the Stakeholder Engagement Plan (SEP).

8 BEST PRACTICE MANAGEMENT (DURING CONSTRUCTION)

8.1 CONSTRUCTION IMPACTS

Best Practice Management addresses potential impacts which are not covered by one single environmental or social / socio-economic factor but may have an impact on different factors at the same time. That concerns, in specific, activities during construction time including infrastructure and transport. These activities require regular auditing prior and during the construction phase. Local authorities and land users will be continuously consulted in order to ensure the most efficient and effective way to accomplish the project.

8.2 MEASURES TO MITIGATE IMPACTS DURING CONSTRUCTION

The following measures will be implemented inter alia

- minimising the land take required for infrastructure, by using the existing road network as far as possible;
- dust may result due to transportation on unpaved roads and transportation of material without covering the top of truck and during loading and unloading material. These impacts on air quality, flora and fauna will be controlled by watering roads under dry, warm and windy conditions and by providing loads covers on trucks;
- clean-up plans will be implemented in order to minimise risks of spills of hazardous materials such as paints or oil;
- a Construction Traffic Management Plan will be developed to set out general measures to mitigate traffic-related environmental and social impacts associated to construction and include information on more detailed site specific measures as required;
- routes for oversized loads will be defined and agreed with the authorities, local police and emergency services. Where oversized vehicles require a police escort, local police dictate the timing of delivery. All oversized loads will be suitably marked to warn other road users;
- *SGE/WPY* will ensure a permanent consultation with the land users and safe access to grazing areas will be maintained at all times where required;
- *SGE/WPY* / principal contractor will hold regular consultations with the local authorities regarding the management of construction; and

- in order to identify whether any damage has occurred *SGE/WPY* proposes a joint site inspection with the Administration of Roads and Bridges prior and after the project's transport activities to survey the existing road conditions on the selected route. The procedures and actions to be taken in case of damage to the local road infrastructure by construction traffic will also be detailed in the transport management plan.

9 *ENVIRONMENTAL AND SOCIAL MANAGEMENT*

This chapter presents the Environmental and Social Management and Monitoring Plan ESMP for the project, setting out all environmental, health and safety and social commitments with which *SGE/WPY* will comply during construction and operation of the project. These are organised under seven main topics:

- Ambient Air
- Noise and Vibration
- Traffic Management
- Waste Management
- Soils & Groundwater
- Ground & Surface Water
- Landscape
- Biodiversity
- Social Aspects
- Cultural Heritage.

Topic/ Potential Impact and Management Plan Objectives	Mitigation Measure	Responsibility	Indicator	Monitoring and Frequency
Pre-Construction phase				
Best Practice Management	The EPC contractor will have to prepare and implement a Construction Site Management Plan and a Quality Assurance Plan including best practice management and measures from the ESMP. Best Practice measures are included in the measures for each environmental topic below and should be complemented as appropriate. The Construction Site Management Plan shall include at a minimum the following sub-plans: a Waste Management Plan, a Traffic Management Plan a Pollution Prevention Plan/ Clean-up plan and a Chance Find Procedure.	SGE/WPY and EPC Contractor and subcontractor	Site Specific Construction Site Plans	Not required Monitoring of specific measures from Construction Site Plans as detailed below
Minimise land take by Project infrastructure	Project design to consider use of existing roads network on site to the extent possible.	SGE/WPY and EPC Contractor	Detailed Design including maximised use of existing roads	Design, implementation, supervision as applicable
Construction phase				
Ambient Air				
Dust Generation	Dust may result due to transportation on unpaved roads and transportation of material without covering the top of truck and during loading and unloading material. These impacts on air quality, flora and fauna will be controlled by watering roads under dry, warm and windy conditions.	EPC Contractor and subcontractor	Confirmed by SGE/WPY site inspections reports	Monitoring through random site inspections
	Containers for dusty materials will be enclosed or covered by suitable tarpaulins to prevent escape of dust during loading and transfer from site. Lorries carrying dusty materials to or from the site will be sheeted.	EPC Contractor and subcontractor	Confirmed by SGE/WPY site inspections reports.	Monitoring through random site inspections
	Optimisation of transportation routes.	EPC Contractor and subcontractor	Confirmed by SGE/WPY site inspections reports.	Monitoring through random site inspections
	Set construction traffic speed limits to minimise abrasive disturbance of unpaved roads.	EPC Contractor and subcontractor	Confirmed by SGE/WPY site inspections reports.	Monitoring through random site inspections

Topic/ Potential Impact and Management Plan Objectives	Mitigation Measure	Responsibility	Indicator	Monitoring and Frequency
	Prevent deposition of mud and dirt on public roads.	EPC Contractor and subcontractor	Confirmed by SGE/WPY site inspections reports.	Monitoring through random site inspections
Emissions from equipment and vehicles	Use of equipment and vehicles in appropriate technical conditions. Provide emissions control equipment where applicable.	EPC Contractor and subcontractor	Confirmed by constructor through certificates	Inspection prior to starting construction works and each time new equipment is used at the site.
	Use of low sulphur content fuels, in line with legal provisions in force.	EPC Contractor and subcontractor	Confirmed by fuel Technical Specification Sheet	Random verification of supplied fuel FTS (Technical Specification Sheet)
	Ensure efficient usage of delivery vehicles; including use of alternative and/or more efficient delivery methods during construction to optimise the emissions to atmosphere per payload.	EPC Contractor and subcontractor	Confirmed by SGE/WPY site inspections reports	Random site inspections
	Switch vehicles and equipment off when not in use.	EPC Contractor and subcontractor	Confirmed by SGE/WPY site inspections reports	Random site inspections
Fire events	Provision of required fire-fighting intervention equipment, in line with applicable regulations.	EPC Contractor	Equipment in place. Confirmed by SGE/WPY through Taking-over Protocol	Regular site inspections

Topic/ Potential Impact and Management Plan Objectives	Mitigation Measure	Responsibility	Indicator	Monitoring and Frequency
Noise and Vibrations				
Noise and vibration impacts at the construction sites and from construction traffic	Working hours will be restricted to 07:00 to 19:00 Monday to Friday within areas which are located closer than 1600 m distance from residential houses.	EPC Contractor and subcontractor	Confirmed by SGE/WPY site inspections reports	Random site inspections
	For construction sites close to residential areas verify that the cumulative sound power level for all machines and vehicles stays below 120 dBA, by e.g. employing machines and vehicles below 110 dBA sound power level each and no more than 8 to 10 of them simultaneously.	EPC Contractor and subcontractor	Confirmed by SGE/WPY site and machine and vehicle inspection reports	Sound power calculation for construction site equipment, random site inspections
	Perform noise level measurements (to confirm compliance or trigger mitigation)	EPC Contractor / SGE/WPY and subcontractor	Confirmed by Noise Monitoring Reports	Random noise monitoring of equipment and at receptor locations.
	Ensure the use of modern and well-maintained equipment	EPC Contractor and subcontractor	Confirmed by SGE/WPY site inspection reports	Random site inspections
	Set construction traffic speed limits. Routing of truck transports outside residential areas Verify drivers' behaviour with respect to driving speed and safety.	EPC Contractor / SGE/WPY and subcontractor	Speed limits kept as confirmed through periodic/regular site inspections by SGE/WPY	Regular site and route inspections
Traffic Management				
Best Practice management	Routes for abnormal loads will be arranged and agreed with the authorities, local police and emergency services. Where oversized vehicles require a police escort, local police dictate the timing of delivery. All abnormal loads will be suitably marked to warn other road users.	EPC Contractor and subcontractor	Construction Traffic Management Plan	Monitoring through random site inspections
	In order to identify whether any damage has occurred the Project Developer	SGE/WPY / EPC	Inspection Protocol	Case to case

Topic/ Potential Impact and Management Plan Objectives	Mitigation Measure	Responsibility	Indicator	Monitoring and Frequency
	proposes a joint site inspection with the Administration for Roads and Bridges prior and after the project's transport activities to survey the existing road conditions on the selected route. The procedures and actions to be taken in case of damage to the local road infrastructure by construction traffic will also be detailed in the traffic management plan.	Contractor		
Waste Management				
Environmental contamination, nuisance generation	Segregated storage in appropriate containers (where applicable) by types of waste. Labelling provided at storage with indication of wastes codes in line with National legislation;	EPC Contractor	Confirmed through periodic/regular site inspections by SGE/WPY	Monthly Contractor Waste Management Reports
	Records to include wastes quantities generated, their final destination;	EPC Contractor	Confirmed through periodic/regular site inspections by SGE/WPY	Monthly Contractor Waste Management Reports
	Disposal through licensed waste contractors licensed for treatment/removal/recycling of each of waste types.	EPC Contractor	Confirmed through periodic/regular site inspections by SGE/WPY	Monthly Contractor Waste Management Reports
	Reporting to authorities in line with regulatory requirements.	EPC Contractor	Confirmed through periodic/regular site inspections by SGE/WPY	Monthly Contractor Waste Management Reports
	Ensure appropriate containment and disposal of construction wastewater, including sanitary water.	EPC Contractor	Confirmed through periodic/regular site inspections by SGE/WPY	Monthly Contractor Waste Management Reports

Topic/ Potential Impact and Management Plan Objectives	Mitigation Measure	Responsibility	Indicator	Monitoring and Frequency
Soil and Groundwater				
Best Practice Soil Handling	Best practice soil handling techniques will be implemented including the following measures: • Topsoil stripping will be limited to the footprint of the turbine, platform and pads locations and the access roads; • Topsoil will be stored carefully to one side of the construction working area, in such a way that it is not mixed with sub soil or trafficked on by vehicles; • After the construction the stored soil and topsoil will be used as backfill and the area will be restored to its initial condition; • Following reinstatement, any surplus (uncontaminated) soil will be spread over fields subject to agreement with the landowner/occupier and/or used for landscaping within the Project area; • Stockpiles will have a maximum of 2 m high to avoid compaction from the weight; and • The construction working area will be reinstated as far as practicable to the same condition as before.	EPC Contractor and subcontractor	Confirmed through periodic/regular site inspections by SGE/WPY	Periodic inspection by SGE/WPY
	The contractor will also develop procedures for emergency/spill response, and for the storage and handling of fuels, construction materials and wastes.	EPC Contractor and subcontractor	Confirmed through periodic/regular site inspections by SGE/WPY	Periodic inspection by SGE/WPY
Accidental oil/fuel spills, Protection of groundwater.	The following measures aimed at preventing harmful substances from reaching the subsurface will be implemented: • Refuelling and repairing works of vehicles or equipment will be restricted to the construction camp which will be located on impermeable hardstanding. Any maintenance or re-fuelling will take place only with implementation of appropriate secondary containment and spill controls; • Transportation vehicles and construction equipment will be parked on paved surfaces during the night. The paved surfaces should be equipped with oil/water separators to treat storm water runoff, if possible;	EPC Contractor and subcontractor	Number of spill events logged in Event Reports Confirmed through periodic/regular site inspections by SGE/WPY	Periodic inspection by SGE/WPY and the contractor

Topic/ Potential Impact and Management Plan Objectives	Mitigation Measure	Responsibility	Indicator	Monitoring and Frequency
	• Construction works will be executed in a way that subsurface contamination is avoided. Any oil or fuel spills will be immediately cleaned up, and any contaminated areas will be remediated and restored after construction; • The contractor will develop procedures for emergency/spill response, and for the storage and handling of fuels, construction materials and wastes.			
	Provision of absorbent and intervention materials in sufficient quantities and at relevant locations. Prompt intervention in case of oil/fuel leakages, on soil or concrete areas to avoid infiltration to subsurface.	EPC Contractor and subcontractor	Quantity of intervention materials on site (confirmed by contractor through invoices, conformity sheets, field inspections by SGE/WPY)	Periodic inspection by SGE/WPY
	Inspections of vehicles and equipment for leaks.	EPC Contractor and subcontractor	Confirmed through periodic/regular site inspections by SGE/WPY	Regular site inspections
Surface Water				
Water Quality, Hydrology	Excavation activities will be restricted during periods of intense rainfall, and temporary bunding will be provided to reduce the risk of sediment, oil or chemical spills to the receiving waters. In order to reduce the potential impact on the drainage pattern, roadside drains will be designed to avoid disturbance to the natural hydrology. The roadside drainage design will aim to ensure that runoff percolates to the underlying ground rather than concentrates as channel flow. Full reinstatement of land drainage features disturbed during construction.	EPC Contractor and subcontractor	Confirmed through periodic/regular site inspections by SGE/WPY	Periodic inspection by SGE/WPY
Excavations	Cut off ditches will be used to prevent water from entering excavations.	EPC Contractor and subcontractor	Confirmed through periodic/regular site inspections by SGE/WPY	Periodic inspection by SGE/WPY

Topic/ Potential Impact and Management Plan Objectives	Mitigation Measure	Responsibility	Indicator	Monitoring and Frequency
Landscape				
Visual impacts	The following mitigation measures are proposed to mitigate elements of potential significant landscape and visual impacts • Removal of vegetation to be minimised; • Signage to be provided only for health and safety (H&S) purposes at relevant locations at the site; • No prominent or brand names will be placed on the turbines; • Turbines will be painted in a colour, typically matching the sky (e.g. light grey) to minimise visual impacts, if not stipulated differently by the Kazakh Aeronautical Authority; and • Enhancing local species of vegetation or tree planting at relevant locations.	SGE/WPY and EPC Contractor	Turbine design including painting concept Confirmed through periodic/regular site inspections by SGE/WPY	Not required
Biodiversity				
Biodiversity impacts and/or disturbance	Based on information from additional studies as detailed in the ESAP and the pre-EIA-addendum additional measures are to be defined.	SGE/WPY	Survey team in the field. Biodiversity Monitoring Report available. Additional mitigation implemented as needed	Not required, monitoring of detailed mitigation measures tbd
	In case natural and semi-natural habitats that must be destroyed are located on the site, these habitats shall be restored.	EPC Contractor and subcontractor	Confirmed by SGE/WPY Biodiversity Monitoring Report	Reporting to the authority
	Perform one year biodiversity monitoring during construction period (to confirm compliance or trigger mitigation). Monitoring performed by qualified ornithologists.	SGE/WPY	Survey team in field. Biodiversity Monitoring Report available. Additional mitigation implemented as needed	One year survey

Topic/ Potential Impact and Management Plan Objectives	Mitigation Measure	Responsibility	Indicator	Monitoring and Frequency
Social Aspects				
Best Practice	The Project Developer/EPC contractor will hold regular consultations with the local authorities regarding the management of construction.	SGE/WPY / EPC Contractor	Minutes of Meeting	tbd
Impacts on private properties/ land used by local community	Construction works, materials storage and traffic will be limited to construction areas, camp, and access roads. Construction personnel access to land not directly affected by project is restricted. Measures to allow safe access to grazing areas will be identified and implemented in communication with local authorities and residents. Appropriate training and instructions will be provided to the construction personnel. A grievance mechanism to address any potential damages will be developed. The approach is described in the SEP.	Contractor/SGE/ WPY	Confirmed through periodic/regular site inspections by contractor and SGE/WPY	Periodic inspection by contractor and SGE/WPY
Road accidents due to construction traffic	Construction traffic speed limits set. Appropriate road safety training provided to drivers. Monitoring of drivers/construction personnel safety behaviour. Design routes for transport in the Traffic Management Plan avoiding areas with heavy pedestrian or child use.	Contractor/SGE/ WPY	Confirmed through periodic/regular site inspections by contractor and SGE/WPY	Periodic inspection by contractor and SGE/WPY
Accidents due to unauthorised personnel access to construction sites	Site premises provided with appropriate fencing (where applicable) and lighting. Sites surveillance provided by security contractor. Training for security guards should be provided. Use of hazard notices/signs/barriers to prevent access to dangerous areas.	Contractor	Confirmed through periodic/regular site inspections by contractor and SGE/WPY	Periodic inspection by contractor and SGE/WPY
Employment	Workers will be employed preferred locally, especially semi-skilled and unskilled staff.	SGE/WPY	Workers contracts	Inspection by SGE/WPY before hiring of workers
	Construction personnel will be trained by the construction contractor with regard to environmental, health and safety risks associated with the construction of wind farms and necessary measures to avoid incidents and increased the project's environmental performance.	Contractor	Confirmed through periodic/regular site inspections by contractor and SGE/WPY	Periodic inspection by contractor and SGE/WPY

Topic/ Potential Impact and Management Plan Objectives	Mitigation Measure	Responsibility	Indicator	Monitoring and Frequency
	Concrete and aggregate materials for the construction phase will be sourced from a local supplier.	SGE/WPY	Contracts	Periodic inspection by SGE/WPY
	A workers grievance mechanism should be installed.	EPC Contractor and subcontractor	Workers are aware of grievance mechanism	Reporting on grievances
Labor conditions	The contractor should be required to adhere to a policies and codes of conduct concerning employment and workforce behaviour. Measures to be incorporated into these policies in order to reduce or avoid social, health and economic impacts are: • Screen the health of possible employees (e.g. for Tuberculosis) as part of the recruitment process; • Ensure that the workers camp and construction areas are open only to formal employees; • Develop and implement strict code of conduct for workers to regulate behaviour in the local communities including road safety; • Provide traffic safety awareness to the workforce; • Built hygienic, adequate facilities for workers; • Ensure the workforce has access to primary healthcare on site, providing prescriptions.	EPC Contractor and subcontractor	Confirmed through periodic/regular site inspections by contractor and SGE/WPY	Periodic inspection by contractor and SGE/WPY
	The accommodation containers will provide housing conditions in accordance with all applicable health and safety regulations and norms (IFC PS 2).	EPC Contractor and subcontractor	Confirmed through periodic/regular site inspections by contractor and SGE/WPY	Periodic inspection by contractor and SGE/WPY
Cultural Heritage				
Damage of CH	Initial archaeological field survey. The scope of such a survey would be: • in case of any finds, identify known and unknown archaeological and historic sites in the Project area; • identify their value (local, national or international);	SGE/WPY to contract an archaeologist	Cultural heritage survey by a professional archaeologist	Performance before construction phase

Topic/ Potential Impact and Management Plan Objectives	Mitigation Measure	Responsibility	Indicator	Monitoring and Frequency
	• map the finds identified against the location of the Project components to confirm they do not overlap and that construction activities would not affect finds in proximity of Project elements; and • in case of overlapping or potential impacts on finds during construction, ensure provision of expert advice and support with undertaking the actions required by law for preservation and if applicable, discharge of archaeological value.			
	If needed, discharge of cultural heritage in line with applicable requirements and best practice is to be performed.	SGE/WPY to contract an archaeologist	Management by professional archaeologist	Performance before construction phase
	A Chance Finds Procedure is to be developed prior to commencement of earthworks and implemented during the relevant stages of construction. Appropriate training of relevant contractors' staff will be necessary to ensure appropriate implementation of the chance finds procedure.	EPC Contractor and subcontractor	Chance Find Procedure Training Protocol	Periodic inspection by contractor and SGE/WPY
	Any archaeological chance finds during excavation works will be reported to the competent authority immediately after discovery and fenced off from the area regulated by the construction permit to allow further investigation by the Competent Authority.	EPC Contractor and subcontractor	Training of Workers Training Protocol	Periodic inspection by contractor and SGE/WPY
Operation phase				
Noise				
Human Health	Noise monitoring at potentially affected receptor locations (as indicated in the EIA; including locations of potentially cumulative impact from the other wind farm) shall be carried out prior to operation and during operation in order to confirm compliance or trigger mitigation measures. Monitored situations shall comprise various operation modes; i.e. a variety of wind speeds and wind directions; including worse-case impact situations for the respective receptor location.	SGE/WPY	Noise monitoring reports	Prior to operation and several times (to be representative) after start of operation
	In case that the noise monitoring reveals exceedance of a national or IFC standard, appropriate mitigation measures shall be implemented: e.g. turbine management (night time rotor frequency reduction at closest turbines until the standards are met	SGE/WPY	Documentation of implemented measures and demonstration of	NA

Topic/ Potential Impact and Management Plan Objectives	Mitigation Measure	Responsibility	Indicator	Monitoring and Frequency
	OR installation of noise reduction windows) In case of potentially cumulative effects with the other wind farm consider implementation of a combined operation strategy for both wind farms.		efficiency through noise monitoring	
Wastes Management				
Waste handling	Any grease from the rotor bearing works, or oil that emerges from the oil cooling circuit are collected in the drip tray in the tower, which is regularly emptied during maintenance.	SGE/WPY	Inspection and documentation during maintenance	Periodic inspection by contractor and SGE/WPY
Biodiversity				
Biodiversity impacts and/or disturbance	Perform post-construction biodiversity surveys for two years (to confirm compliance or trigger mitigation). Carcass searches during peak migration periods will be performed in operation years 1, 2, 3, 5, 10 & 15.	SGE/WPY	Survey team in the field as per defined schedule. Biodiversity Monitoring Reports available. Additional mitigation implemented as needed	Field work as per methodology requirements
Social Aspects				
Accidents due to public/unauthorized personnel to project sites	Prevention and control measures to manage public access issues may include: • restriction of public access to turbines by use of locked doors, camera monitoring and movement sensors for surveillance; • posting safety signs and information boards providing emergency contact information at entrance to the site area; • employment of qualified, specialised security contractor.	SGE/WPY	Number of unauthorised access events. Warning signs and fencing in place. Security contract in place	Not applicable

Topic/ Potential Impact and Management Plan Objectives	Mitigation Measure	Responsibility	Indicator	Monitoring and Frequency
Environmental contamination, nuisance generation from wastes disposal	Segregate storage/handling of maintenance and intervention wastes. Wastes disposal/recycling through licensed.	SGE/WPY	Confirmed through periodic/regular site inspections by SEG - Contracts with authorized waste contractors available	Periodic field inspections
Human Health	Regularly maintain the wind turbine with regard to a failure in the rotor blade such as blade throw	SGE/WPY	Maintenance documentation	tbd
	To avoid accidents from Ice Throw possible applicable mitigation measures should be applied. Such measures include: • equip turbines with ice sensors/ automatic shutdown of turbine in case of ice detection; • curtail wind turbine operations during periods of ice accretion; • place warning signs at certain points at the wind farm site to alert the public of risk .	SGE/WPY	Documentation of measures	tbd
Employment	Unskilled and semi-skilled staff for maintenance and operation will be employed preferred locally.	SGE/WPY	Employment contracts	Inspection by SGE/WPY before hiring of workers
Decommissioning phase				
Environmental impact due to inappropriate project facilities decommissioning	Facilities decommissioning performed based on decommissioning design in line with the provisions of applicable regulations in force.	Constructor and subcontractor	Decommissioning design available and approved by regulator	To be defined by the decommissioning design
Emergency Planning and Response				
Impacts from unplanned events	Prepare and implement Emergency Preparedness and Response Plan (EPRP) addressing all Project phases.	SGE/WPY, EPC Contractor and subcontractor	EPRP available and implemented. Records of EPRP training provided	Periodic checks of EPRP trainings provision