CRNI VRH WIND POWER PLANT, SERBIA

Environmental and Social Impact Assessment
Final Report
August 2022

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This document has 548 pages including the cover.

Abbreviations:

AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
AoI	Area of Influence
BACI	Before-After-Control-Impacts
BCT	Bat Conservation Trust
BGN	Background Noise
BWEA	British Wind Energy Association
CESMP	Construction Environmental and Social Management Plan
CHA	Critical Habitat Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
CLVIA	Cumulative Landscape and Visual Impact Assessment
CMS	Conservation of Migratory Species of Wild Animals
CRM	Collision Risk Model
CRTN	Calculation of Road Traffic Noise (UK)
CTMP	Construction Traffic Management Plan
CVP	Crni Vrh Power d.o.o.
DESMP	Decommissioning Environmental and Social Management Plan
EBRD	European Bank for Reconstruction and Development
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
EMS	Elektromreža Srbije a.d. (Serbian statutory electricity transmission operator)
EP	Equator Principle
EPFI	Equator Principle Financial Institution
ESIA	Environmental and Social Impact Assessment
ESHS	Environmental, Social, Health and Safety
ESMMP	Environmental and Social Management and Monitoring Plan
ESMS	Environmental & Social Management System
EU	European Union
EUROBATS	Agreement on the Conservation of Populations of European Bats
GDG	Guide Development Group
GHG	Greenhouse Gases
GIIP	Good International Industry Practice
GPG	Good Practice Guide
HGV	Heavy Goods Vehicle
IBA	Important Bird and Biodiversity Area
IEA	International Energy Agency
IFC	International Finance Corporation
IFIs	International Financial Institutions
IfNC	Institute for Nature Conservation of Serbia
IPA	Important Plant Area
IPCC	International Panel on Climate Change

IUCN	International Union for Conservation of Nature
LGV	Light Goods Vehicle
LOF	Landscapes of Outstanding Features
LVIA	Landscape and Visual Impact Assessment
m a.s.l.	meters above sea level
MoEP	Ministry of Environmental Protection of the Republic of Serbia
NGO	Non-governmental Organisation
NM	Nature Monument
NPC	Nature Protection Conditions
NT	Nearly Threatened (IUCN Red List category)
NSR	Noise Sensitive Receptor
OESMP	Operation Environmental and Social Management Plan
Off	Official
OHL	Overhead Electricity Transmission Line
O&M	Operations and Maintenance
PBR	Potential Biological Removal
PM	Particulate Matter
PPE	Personal Protective Equipment
PS	Performance Standard
RHMI	Republic Hydrometeorological Institute
RS	Republic of Serbia
SAC	Special Area of Conservation, a site designated under EU Habitats Directive and comprising Natura 2000 ecological network
SCADA	SCADA system (Supervisory Control and Data Acquisition)
SEP	Stakeholder Engagement Plan
SNH	Scottish Natural Heritage (now renamed as NatureScot)
SNR	Special Nature Reserve
SPA	Special Protection Area; a site designated under EU Birds Directive and included in Natura 2000 ecological network (set up under the EU Habitats Directive)
SRPS	Serbian Standard
SS	Scoping Study
VEC	Valued Environmental and Social Component (according to IFC's RCIA guidelines)
VP	Vantage Point (of bird flight activity surveys)
WHO	World Health Organisation
WPP	Wind Power Plant
WTG	Wind Turbine Generator
ZTV	Zone of Theoretical Visibility
ZPPS	Zavod za zaštitu prirode Srbije [Institute for Nature Conservation of Serbia]

1 Non-Technical Summary

Crni Vrh Power doo, Žagubica ("CVP") intend to develop a wind power plant in Eastern Serbia, Braničevo district. As CVP is likely to seek financial support for the Project from an International Finance Institute or a major commercial bank, they have chosen to adopt Good International Industry Practice in the assessment of the environmental and social impact of the Crni Vrh WPP project. This means that in addition to the regulatory requirements of Serbia, an Environmental and Social Impact Assessment was completed to ensure compliance with the requirements of the Equator Principles and the environmental and social guidelines published by the International Finance Corporation.

This Non-Technical Summary ("NTS") describes the key findings of the Environmental and Social Impact Assessment of the proposed Crni Vrh Wind Power Plant (referred to in this document as the "Project"). The NTS includes a description of the Project, its location and design, the benefits of the development to Serbia and the region, as well as the mitigation of any potentially significant negative environmental and social impacts identified during the impact assessment.

If you would like any additional information then please visit the project website (http://www.cvpower.rs/) or contact Ms. Marija Senić Andrić at Crni Vrh Power doo, Žagubica (the developer):

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1.1 Context of the Crni Vrh Wind Power Plant

CVP were initially attracted to Braničevo district as this part of Serbia has a significant wind resource; one of the highest in Serbia. After careful consideration, CVP selected a site that is sparsely populated and dominated by commercial forestry. The site is close to the 110 kV power grid which means that the overhead lines needed to connect the WPP to the national power grid will be short.

The site is about 12km east of the town of Žagubica and 17km northwest of the town of Bor (see Figure 1-1, below). The total area of the WPP site is about 2,700 hectares.

The Zoning Plan permits CVP to develop a wind power plant ("WPP") of up to 32 wind turbines. These turbines will be placed along two parallel ridges that run north-south across the site. The narrow valley between the ridges is crossed by a number of small streams and forest tracks.

Whilst the area around the WPP site is open and mountainous there are a number of developments that have caused the progressive industrialisation of the area. These developments include:

- The Lipe open cast copper mine is situated in the valley that lies between the rows of turbines the forest road that runs along the bottom of the valley may form an access road for the Project. The "Lipe" mine closed in 1967.
- About 500m from the southern boundary of the site is the ski resort of "Crni Vrh". The resort is very small and comprises two ski runs and one ski lift. Within the centre is a huge unfinished hotel complex partially built in the late 1990s and abandoned since 2000.
- The closest active open pit copper mine is Cerovo, about 6km east of the site. The Cerovo mine reopened in March 2020.
- About 7km south-east, in a valley below Crni Vrh Mountain is the Bor Jezero reservoir built in 1959 to provide water supply for the copper smelting plant. The reservoir has become a centre for local tourism and recreation.
- Bor is the regional industrial centre with a large copper smelting plant and several active open pit mines. It is hoped that the Zijin mining and smelting complex at Bor, which has a high electricity demand, would be an important customer for the WPP.

The Crni Vrh WPP is to be developed in a region where industrial mining is both intensive and extensive. Open cast mining has a devastating impact on the overall biodiversity and is considerably greater than any impacts from wind turbines. In addition, local forests are managed for timber production rather the protection of biodiversity. The biodiversity in the region is exposed to very pronounced negative impacts of mining and poor forestry practices.

Figure 1-1 Location of the Crni Vrh WPP

The boundary of the WPP is shown in red and includes the area below the new overhead line to the north east.

The development of Crni Vrh WPP will require:

- Lease or purchase of land plots for the siting wind turbines;
- Improvement of existing forest tracks to allow access of construction equipment and then maintenance technicians during WPP operation;
- Clearance of land required for the wind turbine foundations and maintenance platforms;
- Creation of appropriate foundations for the wind turbines;
- Transport of turbine components to the site;
- Installation of the wind turbines using large cranes;

- Construction of appropriate infrastructure including underground power and communication cables, a substation and connection to the main grid;
- Operation of the wind turbines for approximately 25 years; and,
- Replacement or decommissioning of the wind turbines once the WPP comes to the end of its operational life.

1.2 Why is Crni Vrh WPP Needed?

The purpose of the Crni Vrh WPP is to generate renewable electricity that will be supplied to the Serbian national grid. The Serbian energy sector is very dependent on fossil fuels and the use of reliable, renewable wind power will help Serbia to reduce its use of expensive, polluting fossil fuels. The Project will to the Government of Serbia's commitment to promote the development of renewable energy projects.

The proposed Crni Vrh WPP is needed as it will:

- Generate renewable energy that will contribute to national targets for reducing carbon emissions into the atmosphere;
- provide a valuable source of renewable energy for use within Serbia to support infrastructure development and the national building programme;
- strengthen Serbia's energy sector by helping to diversify its energy sources (which proved to be of great importance after the serious floods in May 2014);
- reduce the need for Serbia to import energy from neighbouring countries;
- providing enough electricity to power 110,000 homes;
- displace about 469,000 tonnes of carbon dioxide per year that would be emitted if the same amount of electricity was produced from a coal fired power station;
- reduce the annual emissions from existing coal fired power plant by 12,300 tonnes of sulphur dioxide, 1,425 tonnes of oxides of nitrogen and 495 tonnes of fine dust.

1.3 Project Alternatives

The conditions of the Project site are optimal for wind development and unfavourable for the majority of other renewable technologies. Solar energy could be exploited at the Crni Vrh site but this would mean the use of a much larger area of land and a significant increase in the loss of forestry land. The increased impact on biodiversity there would be significant negative change the character of the area. The Scoping Study concluded that a renewables project based on wind power generation was appropriate for the region and the site.

The initial layout was selected to take the greatest advantage of the wind resources and to keep away from residential properties. However, the Scoping Study indicated that a number of turbine locations would have a disproportionate impact on local habitats and species populations. The Scoping Study concluded that six turbines were to be located in important areas of natural habitat. The initial focus of the ESIA was therefore to consider if the WPP layout could be modified to avoid these areas. The assessment of turbine locations and numbers formed the basis of primary mitigation of the WPP impact. This analysis resulted in an alternative WPP design being agreed with CVP. The alternate design of the WPP then formed the basis of the subsequent ESIA.

1.4 Meeting Serbian Regulations

Serbian EIA regulations require WPP developments of 10 MW installed capacity or over to be subject of an environmental impact assessment procedure. An EIA for the Crni Vrh WPP was completed and was based upon the findings of the ESIA report. The Zoning Plan and SEA for the Crni Vrh WPP and OHL were approved in October 2021.

To initiate the Serbian EIA Study procedure, the local authorities, in this case the Town of Bor, Municipality of Žagubica and Municipality of Majdanpek, developed and adopted a Zoning Plan that includes a basic description of a new project. The approval of the Zoning Plan includes consultation with a series of national and regional statutory bodies that provide their conditions for the development of the Project.

The Zoning Plan is subject to a Strategic Environmental Assessment (SEA) that has to be approved by the local authority. While the Zoning Plan is approved by the local authority (municipality), the permits for WPP developments (Location permit, Building permit, Operation permit, Energy permit) are awarded by national authorities.

Once the Zoning Plan has been agreed, the Developer can proceed with a procedure for acquiring the Location permit (also called the Location Conditions). The Location permit provides specific conditions for connection of the project to the existing infrastructure onsite. The conditions included in the Location permit are provided by the same statutory stakeholders involved in the development of the zoning plan.

The following Table (Table 1-1) provides a summary of the E&S conditions in the development permits that directly regulate the construction, operation and decommissioning the Crni Vrh WPP.

Table 1-1 E&S Conditions in Permits

Permit	Date Obtained	E&S Conditions
Energy Permit	24th May 2021	No E&S conditions are set by the permit.
Location Permit	6th December 2021	**Design/ Pre-Construction:** • The final WTG layout should be defined based on results of the one-year pre-construction flora, habitat and fauna surveys. • All sensitive, relic and wetland habitats should be avoided to preserve habitat diversity within the site. • The maximum height to blade tip shall not exceed 206m. • Blades must be painted to be easily noticeable to wildlife. • The flashing obstruction lights should be used on wind turbines. Lighting of other structures must be minimised and directed downwards. • All installations must be grounded, secured and insulated to prevent or minimise animal electrocution and mortality. The substation 33/110kV, cabling network and other auxiliary structures must be designed to prevent bird nesting or bat roosting. **Construction:** • No construction work is allowed in areas with high concentration of birds and bats, particularly in areas of their roosts, and foraging and nesting areas. • Existing roads should be used as much as possible. Degradation of natural, semi-natural or agricultural habitats should be avoided. • Stockpiles of earthen material/ spoil must be protected from erosion and dust generation and finally properly disposed off-site. • New access tracks shall not cause instabilities or erosion. • Cable trenches and turbine foundations should be properly backfilled to keep out burrowing animals and prevent attracting raptors. • Upon completion of the construction, all degraded areas must be restored (excluding planting near the turbines and access tracks). • Only native plants should be used in restoration of degraded areas. Introduction of invasive species is prohibited. **Operation:** • Post-construction mortality monitoring is required for at least 3 years. The results must be reported to the IfNC on a regular basis. The report should include

Permit	Date Obtained	E&S Conditions
		photographs of carcass, location and time of the finding, distance to the nearest WTG and record on weather conditions. • Based upon the post-construction mortality monitoring results, in case of high fatality rates, curtailment of turbines should be considered. The causes of fatalities and related mitigation should be identified in consultation with the IfNC. • If regular concentration of birds or bats is recorded in the vicinity of turbines (e.g. due to the attraction to structures, trees or waste dumps), appropriate mitigation should be defined in consultation with the IfNC (including the removal of problematic structures or technical measures to prevent concentration). • Bird and mammal carcass shall be regularly removed from the site (following appropriate recording within the scope of the mortality monitoring). • To protect the migratory species, the WPP must be equipped for continual monitoring of bird and bat movements over the site area. • Shrub and weed growth shall be removed within a radius of 200m from the turbines and mowed at a height of 20cm, in particular at the turbine bases. • Operational noise should be monitored and controlled. In case of exceedance of legal noise limits, curtailment of turbines should be considered. If the noise level is increased due to turbine faults, the turbine must be stopped and repaired. • Disposal of organic or construction waste is prohibited at the site. If present, existing illegal landfills/dumps shall be removed. • Open wet areas at the site should be properly drained to minimise the concentration of insects which might attract birds and bats. **Decommissioning:** • Upon completion of the WPP operational phase, all structures and equipment must be removed, and the site must be completely restored.
Building Permit	Expected in September 2022	No E&S conditions are set by the permit. The EIA Study (unconsented) is included in the permit application.
Registration of Works	Expected in 2023	The EIA Consent is a prerequisite for the Registration of Works and requires implementation of mitigation measures listed in the EIA Study.

1.5 How Does a Wind Turbine Work?

Wind turbines consist of three main elements: a hollow steel tower, the nacelle, and the fibreglass rotor blades (which are attached to a rotor on the front of the nacelle). The nacelle houses the generator, gearbox, transformers and control systems (see Figure 1-2).

The five basic steps of electricity production from wind power plants are:

- Wind turbine blades are turned by the power of the wind;
- the blades turn a rotating generator in the nacelle which converts wind energy to electricity;
- a transformer in the base of the turbine tower increases the electricity voltage for transmission to the substation by underground cables;
- the substation increases voltage for transmission over long distances;

- the electricity is transferred to the grid and distributed to the power users.

The turbine nacelle is rotated by the yaw motor so that the rotor points directly towards the wind. This is in the same way that the sails on a boat are oriented towards the wind by the crew. The direction of the wind is sensed by the wind vane and the wind speed is monitored by and the anemometer. The WPP also has a tall mast where the meteorological sensors at mounted. This mast is typically much taller than the turbines.

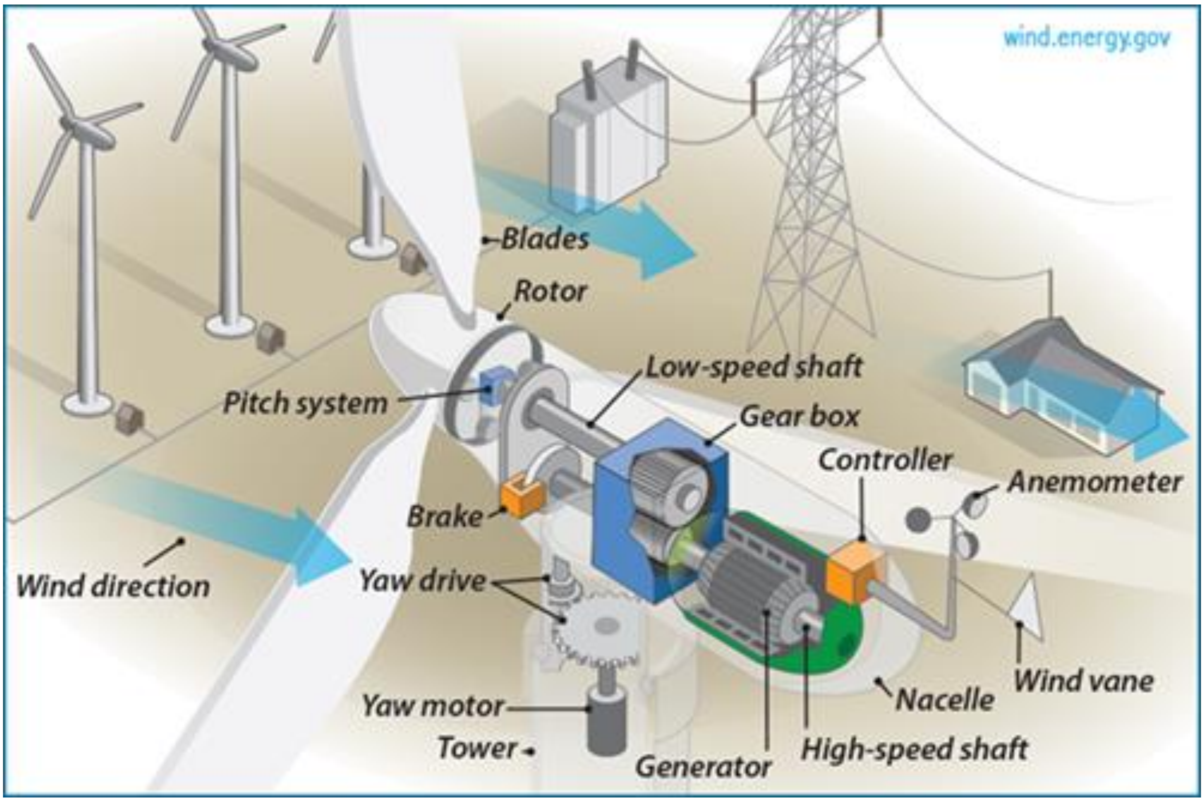

Figure 1-2 Generic Wind Turbine Design

The basic operation of each turbine is controlled by its' own computer systems. The operation of the turbines is monitored from the control room but all of the turbines can be monitored and managed remotely. It is normal for the wind turbine manufacturers to monitor each unit from a control room. This means that the turbines are monitored continuously, 24 hours per day, 365 days per year.

When the wind reaches and maintains constant speeds of over 3 m/s, the turbine blades will start to turn in a clockwise direction. The rotor shaft slowly drives the gearbox that converts the mechanical energy into electrical energy through an electrical generator (which spins at a much higher speed than the rotor).

At a constant wind speed of 3 m/s each turbine will generate about 20kW. At 6 m/s, the output is about 0.600MW but this rises sharply to the maximum power output at a wind speed of 10 to 12 m/s, when the turbine will generate the design or rated power, 6MW in this case.

At wind speeds above 25 m/s, the turbine blades are stopped by the control systems to prevent excessive wear and tear on the mechanisms. The blades are stopped by rotating the blades on the hub. This change of blade angle means that the blades are no longer driven by the wind; a process called "feathering" the blades.

Most of the electricity produced by the wind power plant will be transferred to the grid but a small amount of electricity is used by the turbines (e.g. the yaw motor and pitch controls) and on-site control facilities.

1.6 Description of the Crni Vrh WPP

The Crni Vrh WPP will include up to 32 wind turbines with a total capacity of 158.4 MW. The final number of WTGs to be installed will depend on the size and generation capacity of the turbines selected. For example, if a 6MW unit is used then only 25 turbines will be required to achieve the permitted installed capacity. This flexibility meant that the ESIA specialists, working closely with CVP, could develop the final layout of the turbines in order to minimise impact – the primary mitigation of the WPP.

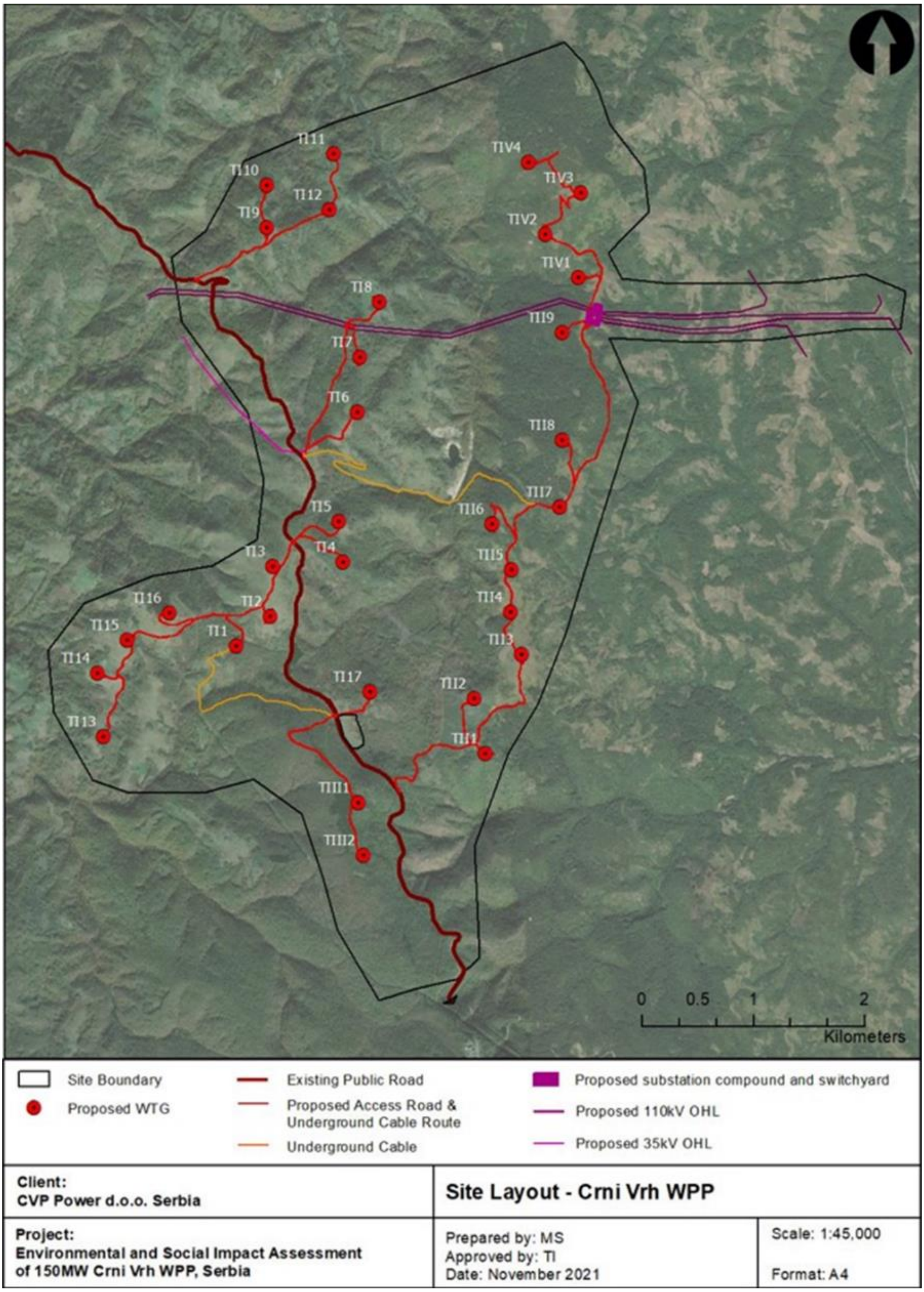

Figure 1-3 Conceptual Location of the WTGs, Site Access Tracks, and Sub-station

At the time of writing, the turbine supplier or model had not been selected. CVP are considering four suppliers, each company has been designing, installing and operating wind power plants for many years. The WTG suppliers currently under consideration are listed in Table 1-2, below.

Table 1-2 Potential WTG Suppliers and Models

Potential Supplier	WTG Generating Capacity (MW)	Overall Rotor Diameter (m)	WTG Hub Height (m)
GE 158 5.5MW	5.2	158	120.9
Nordex N149 5.7MW	5.7	149	105.0
Nordex N163 5.7MW	5.7	163	118
Vestas V150 5.6MW	5.6	150	105.0
Vestas V162 5.6MW	5.6	162	125.0
Siemens Gamesa SG 6.0-155	6.2	155	102.5

This table illustrates that the WTGs being considered for the Crni Vrh WPP vary in generating capacity and physical dimensions. The ESIA has been undertaken on an assumed 'worst case', i.e. the physically largest WTG, the Nordex N163. The overall height of this unit is 206m.

Due to the size of the turbines, it will be necessary to construct substantial foundations. Each WTG foundation is likely to be about 550 m^2 and at least 3m deep. Piling may be required for some of the WTG foundations depending on the local ground conditions. The location of the concrete batch plant that will provide concrete for the foundations has not yet been established but it is likely that it will be off-site.

The turbines will be connected by 33kV underground cables (about 36km) to a new 33 kV/110 kV power transformer station. The Crni Vrh transformer station will be connected to the electricity transmission grid by three x 110 kV overhead transmission lines; one at 1.6 km, one at 2.4 km and one at 4.0 km in length.

OHLs will consist of single circuit steel lattice pylons. The towers will be up to 39.1 m high to the top.

The new Crni Vrh sub-station will be located on the north-east corner of the site (marked in purple in Figure 1-3). This location has been chosen as it close to the 110 kV line that runs north-south to the east of the site. In addition, there is alternate route to the west of the substation and switch yard (connecting to OHL no.122 B). The existing KRST sub-station is located on central-west margin of the site, adjacent to the state road and close to the 110 kV line that runs north-south to the west of the site.

The WPP control room will be located in the electrical sub-station. This control room will be staffed from 08:00 to 16:00 from Monday to Friday. The sub-station will include welfare facilities for the WPP operators and the Operation & Maintenance ("O&M") Contractor.

1.6.1 Site Access

The Crni Vrh WPP will have a single entrance. This entrance will be from the state road No. 161 Žagubica-Brestovac which crosses the western part of the site.

The area is used extensively for commercial forestry and is already crossed by a large number of access tracks. Where possible, CVP have positioned the WTGs alongside these tracks. The tracks will need to be upgraded to allow construction vehicles, erection cranes and WTG component delivery. Once the WPP is completed, the tracks will be used by the maintenance teams. The WPP will be provided 25.5km of upgraded tracks.

1.6.2 Construction

It is CVP's current intention to appoint an Engineering, Procurement and Construction ("EPC") contractor to build the WPP on their behalf. It is likely that the EPC will appoint one or more separate contractors to undertake the civil work, including the turbine foundations, access roads and crane pads next to each turbine. Specialist contractors would be employed to construct the electrical sub-station and overhead power line to connect the WPP to the grid.

Construction activities will include:

- Surveying of the site.

- Clearance of vegetation for:
  - Construction compound, including equipment and material storage areas.
  - Lay-down areas.
  - New access tracks.
- Upgrading of the site tracks and construction of new access tracks to each WTG.
- Establishment of the construction compound (includes offices, welfare facilities, parking, and secure stores).
- Levelling and excavation (for turbine pads and foundations).
- Installation of electrical infrastructure.
- Cement pouring (mainly for the turbine foundations).
- Installation of the turbines.
- Installation of the new transformer.
- Commissioning the WPP and control systems.
- Landscaping the turbine bases.
- Final surfacing of the access tracks and maintenance pads.

The construction compound is temporary and will be removed following the completion of the construction. This compound will be used for storage of construction machinery, materials and wastes as well as the location for site office and welfare facilities. It will also include an area for worker and visitor parking.

Due to the size of the turbines, it will be necessary to construct substantial foundations. Each foundation is likely to be about 550 m^2 and at least 3m deep. Piling may be required for some of the turbine foundations depending on the ground conditions. About 1,000m^3 of concrete is required to complete the foundations for each WTG. The supplier of the concrete has not yet been established but it is likely that CVP will use it will be off-site. Steel reinforcement for the structural concrete is expected to be sourced from a local provider but this will be confirmed at a later date.

The turbine maintenance pads, which each cover an area of 2,000 to 2,500 m^2 depending on the terrain. Each pad will be surfaced with compacted, crushed stone. This crushed stone may be obtained during the levelling of the WTG maintenance pads or from borrow pits within the site.

The installation of the turbines requires two, or possibly three, large cranes. The biggest crane is transported to the site by truck and assembled on site. A construction pad (of compacted crushed stone) will be prepared at each turbine for the cranes. These pads will remain in place for the life of the WPP and will be available for use by access cranes should any major repair be required to the turbine. Where the terrain allows, the large crane will move under its own power (“crawling”) from one to the construction pad to the next. If the terrain is unsuitable (too soft, wet or steep), then the large crane may need to be disassembled and be moved along the service track and re-assembled at the next WTG location. The turbine components will be placed on the construction pad before being lifted into place. The base of the tower is bolted to the foundations. Each tower section is lifted into place and bolted to the section below. The blades may be bolted to the hub before being lifted to the nacelle or may be fixed once the hub is in place; this varies by turbine manufacturer.

The smaller, crawler cranes will be moved from one turbine location to the next along the site tracks. Existing tracks will be upgraded during the initial site preparation work and will connect the turbines and the substation compound. The roads will be constructed to a specification similar to the access road, including roadway preparation, stormwater controls, and placing gravel where needed. Roads connecting the compound to the turbines will be about 4 to 6 m wide, again similar to the access road.

A 33-kV underground power transmission line will be placed in a trench alongside each of the access tracks. These cables will be armoured with woven metal and buried to a depth of about 1m. Excavated material will be used to backfill the trenches.

The turbine supplier has not yet been confirmed but the turbines will be manufactured outside Serbia. It is likely that the turbine components will be brought to Serbia on the Danube River and off-loaded at the port of Prahovo. The likely route from the port of Prahovo to the site is c. 100km long and will include a trans-shipment area 20km from the site.

The turbine components will be transported from Prahovo using oversized road transporters and will comprise:

- Turbine tower sections – five loads per turbine (hub, top section, middle 1, middle 2, bottom section), each transported separately.
- Blades – three loads per turbine, each transported separately.
- Nacelle – one load per turbine.

These convoys will have a police escort and will pass through a number of villages on their way to site. Residents of each village will be given prior notifictation of the date and time of each convoly.

1.6.3 Operation

It is likely that the Energy Permit for the Crni Vrh WPP will require CVP to establish and maintain a seven strong team to operate and maintain the windfarm. The senior roles agreed under the Generating Licence are:

- General Manager;
- Operations Manager;
- Maintenance Manager.

The day-to-day responsibility for EHS matters lies with the Operations Manager (OM).

The WPP control room will be located in the new electrical sub-station. The operation and performance of the turbines will be managed by a specialist team provided by the O&M Contractor. The control room will be staffed from 08:00 to 16:00 from Monday to Friday. The control room team will also operate an out-of-hours standby system to manage breakdowns or emergencies.

The O&M Contractor will also provide continuous monitoring of the WTGs (including any fault or failure conditions) from an off-site Control Room. Should any operational issues arise then the O&M Contractor will try to resolve these from the Control Room and send an information email to their local team in Serbia.

The operation of the sub-station is the responsibility of CVP, while the Interconnection infrastructure is the responsibility of the Serbian statutory transmission Electricity Supply operator, Elektromreža Srbije ("EMS"). The Interconnection infrastructure includes a High-Voltage Switchyard and Overhead line 110 kV, as well as Interconnection facility.

1.6.4 Decommissioning or Re-powering the WPP

The operational life of the WPP is expected to be about 25 years; this is the typical working life of a wind turbine blade. As the wind power plant approaches the last few years of operation CVP will consider the closure or the continued operation of the WPP by replacing the wind turbines (called re-powering). Should CVP choose to re-power the Crni Vrh WPP then the turbines will be replaced with new, higher capacity turbines. Re-powering can add 5 to 20 years to the operational life of a WPP.

The decommissioning of a wind power plant is not a complicated process and largely comprises the dismantling of the turbines, removal of the turbine foundations and site clearance. Steel and other useful materials will be recycled. Inert materials that cannot be re-used or recycled will be taken to a suitable landfill.

It is unlikely that the turbine foundations will be removed completely. Instead, the concrete will be demolished and excavated down to a nominal depth of 1m. This will allow for agricultural activities to be undertaken safely once the excavation has been filled with top soil. All temporary roads, areas where the land has been compressed by heavy plant activities, and laybys and temporary platforms will be reinstated.

The sub-station may continue to be occupied, and the transmission line may continue to be used.

There will be no underground electrical cables laid less than 1m deep as, according to the local regulations and the conditions issued to CVP, the minimum depth for laying the cables must be 1.2m. All electrical cables laid more than 1 m deep will be abandoned in place and will not cause any long term significant environmental impact.

1.7 Project Timeline

At the time of writing, the construction timeline is expected to be:

- Start of construction: autumn 2022.
- Site tracks and roads construction: autumn 2022 to spring 2023.
- Foundations and WTG crane pad construction: summer 2023.
- OHL 110 kV and switchyard 110kV construction: autumn 2022 to autumn 2023.
- WTG installation: summer 2023 to spring 2024.
- WPP commissioning: autumn 2024.

1.8 Preparation of the ESIA

In line with Lender requirements, an ESIA Scoping Study was undertaken in 2020 to establish the most important environmental and social impacts and benefits of the Crni Vrh WPP and to plan the completion of the ESIA. The Scoping Study concluded that the ESIA should consider the following topics in detail:

- Ecology and Nature Conservation – woodland habitats of conservation concern, woodland plant species of conservation concern (orchids in particular), birds, bats, and other woodland fauna;
- Landscape and Visual;
- Socio-economic;
- Shadow Flicker;
- Traffic and Transport;
- Operational Noise;
- Ice Throw and Ice Fall Risk;
- Forest Fire Risk.

In addition, consideration would be given to:

- Noise during construction and decommissioning;
- Archaeology and Cultural Heritage;
- Surface Water and Effluent;
- Land and Groundwater;
- Aviation Safety and Radars Obstructions;
- Electromagnetic Interference and Telecommunication;
- Ecosystem Services;
- Air Quality;
- Community Health, Safety and Security.

1.8.1 Baseline Studies

A series of surveys and studies were planned to obtain the information that would be assessed during the ESIA. A summary of these surveys is provided in

Table 1-3, below.

Table 1-3 ESIA Surveys

Key Issues for the ESIA	ESIA Surveys Undertaken
Ecology and Nature Conservation - Birds	Extensive surveys of local and regional bird populations were completed over a one-year period. These included: • Vantage Point Surveys, • Breeding Raptor Surveys (walkover). • Breeding Nocturnal Species (Owls) Surveys, • Breeding Woodland and Farmland Bird Surveys (transects). The VP surveys are designed to quantify the level of flight activity and its distribution over the survey area. The VP surveys provide input data for the Collision Risk Model. Breeding Bird surveys allow the evaluation of occurring population numbers, site's importance and help quantify impacts from disturbance and displacement.
Ecology and Nature Conservation – Bats	Extensive bat survey work was completed over a one-year period. These included: • Investigation of roost sites. • Manual bat detector surveys at ground level (transects). • Automated bat detector surveys at WTG locations, • Automated bat detector surveys at height (if mast is available for installation of the equipment). • Mist-netting surveys.
Ecology and Nature Conservation – Woodland habitats of conservation concern and their plant species	Woodland habitat and flora surveys included: • Walkover surveys, • Phytocoenological sampling (to record species and phytocoenoses). • Habitat mapping.
Ecology and Nature Conservation – Woodland fauna other than birds and bats	Woodland fauna surveys included: • Walkover surveys (driven and walking transects, day and night), • Camera trapping. • Live trapping.
Socio-economic	A land acquisition survey was undertaken with a sample of landowners whose land was acquired for the project to determine if compensation was provided at full replacement cost and if livelihoods were affected, and if so, fully restored. During the survey interviews, people will be asked about general dependence of the local population on the affected land for livelihood related activities, including exploitation of timber/ firewood, mushroom or herb picking, etc.
Landscape and Visual Impact	The landscape and visual assessment were based upon a desk study and field observations. The study area of 45km was used. Zone of Theoretical Visibility models were calculated for the worst-case turbine model. Fieldwork was undertaken to select the relevant viewpoints and take viewpoint photographs as a basis for visualisations.
Shadow Flicker	A Study Area of ten rotor diameters (1,620m) around each proposed turbine was considered. The shadow flicker model was developed using WindPro software. A field survey was undertaken to inspect the receptors predicted to be affected by more than 30 hours of shadow flicker per year.
Ecology and Nature Conservation – Habitats other than woodland of conservation concern and their plant species	Targeted survey work was completed during the vegetation season. Habitat and flora surveys included: • Walkover surveys; • Phytocoenological sampling at the WTG locations along the site access tracks; • Habitat Mapping of the WTG locations and the routes of the site access tracks.
Traffic and Transport Impact	A desk-based assessment of transport and traffic impacts was completed to: • establish the baseline traffic conditions along the route, • estimate the traffic levels likely to be generated during the construction phase, • conduct qualitative assessment of potential impacts, and • propose control and mitigation measures.

Key Issues for the ESIA	ESIA Surveys Undertaken
Operational Noise	The location of the noise survey locations was based on an assessment of all noise-sensitive receptors within 2km of each WTG. Field work was undertaken to confirm the status of all receptors in terms of the current and future occupancy. A baseline noise survey was undertaken at key representative locations of noise sensitive receptors. The survey was undertaken in combination with anemometry measurements to determine the wind speed at the proposed turbine hub height. The survey considered the range of wind speeds and wind directions during both daytime and night-time periods.
Ice Throw and Ice Fall Risk	All potential receptors that might be affected by ice throw within the 500m-radius were identified: owners of the summer houses, users of roads and footpaths. A qualitative ice throw risk assessment was undertaken in line with the 2018 International Recommendations for Ice Fall and Ice Throw Risk Assessments by IEA Wind Task 19: Wind Energy in Cold Climates.
Forest Fire Risk	A desk-based analysis of the historical forest fire data for Crni Vrh (2000-2020) was undertaken. The vulnerability of the WPP project to climate change will be assessed, based on the regional models for Serbia. A qualitative forest fire risk assessment was undertaken.

1.9 Changes to the WPP Design as part of the ESIA

The Scoping Study was based upon the original design of the WPP that included 40 x 4.2MW turbines, more than was needed to meet the export capacity of 150MW (see Figure 1-3). The location of the 40 turbines was set to maximise the use of local wind patterns, ease of grid connection, topography, use of existing access tracks through the forests, and land availability. CVP were seeking flexibility in the conceptual design so that the design could be optimised once a preferred turbine had been selected.

The area in and around the Crni Vrh WPP site is characterised by woodland (both natural and cultivated), open meadow and low-grade agricultural land. Several of the woodland areas within the boundary of the WPP are considered to be near-natural forest habitats and some of the woodland flora and fauna species are of particular conservation concern. A number of WTGs were originally located, and some segments of the site tracks were routed, in mature near-natural woodland.

Following the completion of the Scoping Study it was clear that the siting of a small number of WTGs within or close to mature woodland would have a detrimental impact on these woodland habitats. The impact on these habitats, and the species dependant on them, would be permanent, detrimental and significant, i.e. a number of species could be displaced or suffer fatalities in nests, roosts and lairs. Following the completion of the Scoping Study it was agreed with CVP that these impacts could be mitigated by removing or relocating a number of turbines and by re-routing a some of the tracks; the objective being to avoid these habitats entirely. These changes were made prior to the start of the ESIA. Other impacts were investigated and design changes agreed with CVP during the ESIA.

It was agreed with CVP that eight turbines would be removed from the scheme and that three turbines would be re-sited to the areas of lower ecological risks. It was also agreed that the network of tracks could be significantly reduced (by about 30%) and in large part, only existing rough tracks will be developed into site tracks.

All these modifications were adopted within the Project Zoning Plans and were approved during 2021. This meant that the most significant adverse impact on sensitive forest habitats were avoided. The ESIA was undertaken on the basis of a WPP that would include no more than 32 WTGs. At the time of preparing the ESIA the developer was considering turbines with a capacity in excess of 5MW. This would allow a further reduction in turbine numbers. If a 5.6MW unit is used then only 27 turbines will be required to achieve the permitted export capacity. This meant that there was an opportunity for the ESIA specialists to consider the removal of other WTGs that might have a potentially significant impact on sensitive human receptors.

The consideration of the maximum capacity of the WPP allowed under the Zoning Plan and, in combination with the increasing capacity of the current generation of WTGs, CVP have been able to remove a number of the turbine locations suggested in the conceptual design from the final WPP design. Working with the ESIA consultants, CVP have settled on a final design that will include no more than 32 WTGs; eight of the high-impact WTGs have been removed. Specifically:

- CVP worked with the owners and occupants of properties that might be at risk of impact from noise and shadow flicker to reach mutually agreeable mitigations. This included the provision of financial compensation for any affected structures at full replacement cost, so that they may be taken out of use, or for any loss in amenity the owners may suffer.
- Agreement was reached with the owners of four properties that their affected structures would be purchased by the Developer and will be taken out of use.
- A string of four turbines would be removed from the scheme to reduce noise levels at two properties.
- Following the removal of turbine string IV the shadow flicker effect on the receptors in the north-east will be completely avoided. This means that only 4 weekend houses would be affected, all in the south-west. However, these houses are surrounded by vegetative screening which is likely to mitigate the flickering effects.

A plan of the final scheme, following the design changes listed in this Chapter, is shown in Figure 1-4. In addition, Figure 1-5 shows how the layout has changed due to the completion of the Scoping Study and the ESIA.

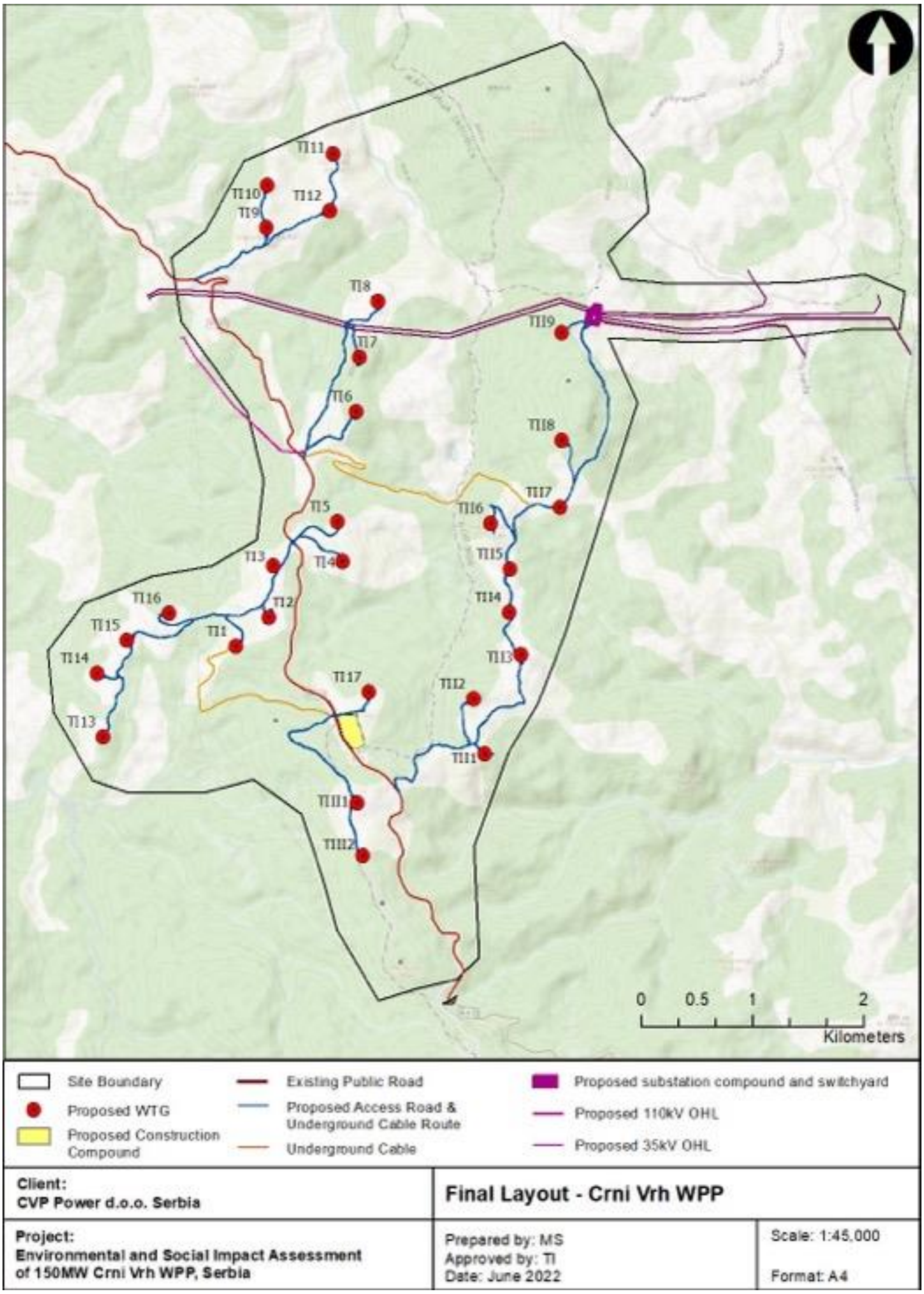

Figure 1-4 Final Layout of Crni Vrh WPP

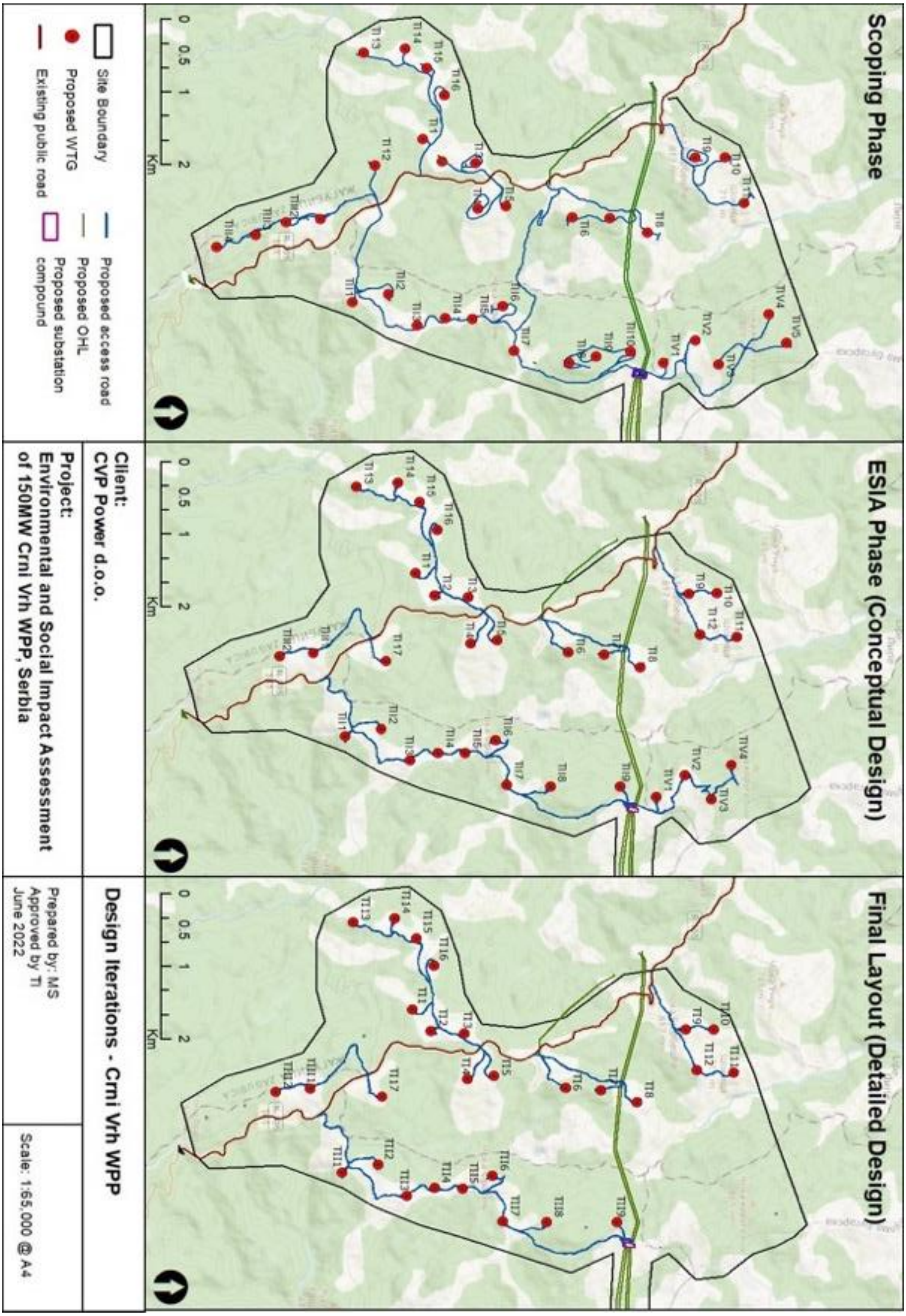

Figure 1-5 Layout Changes of the Crni Vrh WPP

1.10 Findings of the ESIA

The Scoping Study indicated that the development of the WPP could lead to a number of environmental and social impacts, both negative and positive. The ESIA considered each impact and proposed a series of design changes and control measures to mitigate the negative impacts.

The impact mitigations and management controls required by this ESIA are summarised in the Environmental and Social Management and Monitoring Plan, or “ESMMP”, and will be delivered within the framework of the Project Environmental and Social Management System. The ESMMP is very detailed and is included in the main ESIA report.

1.10.1 Habitats and biodiversity

The changes to the WPP design have ensured that almost all potential negative impacts of the Project on habitats and biodiversity have been avoided or significantly reduced.

The ESIA concludes that there will be **no significant** impact of construction on designated sites, habitats, birds and bats. There is the potential for negative impact on the habitats and populations of three plant and one insect species populations. None of these populations are susceptible to WPP operation but would be impacted if physically damage during construction. The Construction Environmental and Social Management Plan will include a requirement for the construction contractor to fence off the sensitive areas so that construction equipment can be excluded from the sensitive areas. The residual impacts on these species are **negligible** at most.

Some bird collision fatalities from WTGs are inevitable over the operational life of the WPP. The collision risk assessment indicates that there will be a **negligible impact** on the regional populations of at-risk species: Short-toed Snake Eagle, Western Marsh Harrier, Eurasian Sparrowhawk, Northern Goshawk, Common Buzzard, and Long-legged Buzzard. The remaining species observed within the WPP site are considered not susceptible to collision mortality or are of very low nature conservation value. Although incidental single collision fatalities of these species cannot be completely excluded, such a low (potential) additional mortality could not affect their populations at the site or regional level. Some bird collision fatalities from OHLs are inevitable, though site and project-specific collision risk from Project OHLs is considered **negligible**.

Some bat fatalities from operational turbines are inevitable. The impact on the majority of bat populations from mortality caused by operating turbines is assessed as **none** or **negligible**, and therefore **not significant**. The impact on the valued Western Barbastelle Bat resident population and Leisler’s Bat resident and migratory population is assessed as **negligible to minor negative regional** and **not significant**.

CVP intend to interpret the scrub management requirements set by the regulators in order to increase the area of Balkan-mountain hay meadows, a habitat of conservation value. The regulator requires that shrub and weed vegetation must be removed within a radius of 200 m from the turbines, by mowing or grazing, to a height of 20cm. The main reason for this requirement appears to be to prevent the growth of scrub that might attract insects, and then bats, to the turbines. Whilst much of the land within the 200m radius is not owned by CVP, the biodiversity management plan will consider how the land owned by CVP can be grazed in order to promote growth of Balkan-mountain hay meadow. Hopefully, this will lead to the restoration and maintenance of some of the Balkan-mountain hay meadows at the site. This impact on habitats as such is assessed as **positive moderate regional**, and **significant positive**. The habitat gains for flora and fauna, including bids and bats is expected to be positive but this must be assessed and confirmed following completion of the post-construction monitoring programme.

1.10.2 Socio-economic

Socio-economic impacts related to the construction phase are all assessed as having **minor significance**. Negative impacts include those in relation to land use, as up to 70 ha land will be occupied during construction, although close to 50% of it will be available for use again after construction is completed. Other negative impacts include possible economic displacement of users of land and person’s whose tourism-based livelihoods can be impacted by increased project traffic, as well as damages to road surfaces. All other impacts are **positive** and they are in relation to compensation for old and mainly unused structures and the creation of employment and procurement opportunities, causing further positive impacts on local livelihoods, as well as in relation to the upgrading of access tracks, enabling local land owners to access their land more easily. The positive impacts are mostly short term and of a local character.

Following proposed mitigation, the residual impact rating for the key construction related impacts identified are:

- Reduced amount of land for use by individual users, up to 70 ha in total. - Negligible adverse.
- Loss of 7 structures of four households - Negligible beneficial.
- Employment opportunities for local residents and procurement opportunities for local companies - No change.
- Involuntary economic displacement of users of land - Minor beneficial.
- Increased livelihoods of local households - No change.
- Impacts on tourism activities, further causing loss of livelihoods in the Bor lake and spa area - Negligible adverse.
- Enhanced land use for local land owners as a result of improved access tracks - Negligible beneficial.
- Damages to road surfaces on roads used by local residents - Negligible adverse.

Following proposed mitigation, the residual impact rating for the key operations phase impacts identified are:

- Land rehabilitated and available for use to individual users - No change.
- Employment opportunities for local residents and procurement opportunities for local companies - No change.
- Involuntary economic displacement of users of land - Negligible beneficial.
- Revenue generation for local government and communities - Minor to moderate beneficial.
- Support for local initiatives and development - Moderate beneficial.
- Regular maintenance of access tracks to enhance land use by local land owners - No change.

1.10.3 Landscape and Visual

The construction works would have a negative, but short-term, impact that would primarily affect the people living, working or visiting the local area. Due to the intervening landform and vegetation, the effects on the landscape character would be **moderate** (within 500m of each turbine) **to minor adverse** (as the distance from the site increases). The visual effects during construction would be **major to moderate** for local residents and visitors in the close site vicinity and minor for all other residents, local road users, people working in the open area and people involved in recreation.

The consideration of visual impact for wind turbines can be very subjective; people may like them, dislike them, or be indifferent to them. However, for the purposes of the ESIA it has been assumed that the observers will actively dislike them. With this in mind, the ESIA has concluded that the scale and topography of the local landscape is considered able to accommodate the proposed WPP. The turbines will be very noticeable at a distance of up to about 2km where they would dominate the landscape, creating **major to moderate adverse** impact significance. As the distance from the site increases, the turbines would appear in association with the broad-scale landform, reducing the impact significance to **minor adverse**.

The significant visual effects would be localised and confined to an area of up to 5km. The wind turbines will be clearly visible and prominent in the views of about twelve weekend and residential houses to the north-east and south-west of the site and to walkers in the mountain. The impact is considered to be **major adverse** impact significance. Beyond 5km of the site the views would be limited and intermittent due to the intervening landform and woodland, resulting in **minor to negligible adverse** visual effect.

Following proposed mitigation, the residual impact rating for the key impacts identified are:

- Impact on the medium sensitive landscape character and fabric during construction - Minor Adverse.
- Visual impact on local residents, road users, people working in the area and people involved in recreation during construction, including highly sensitive residential receptors in the vicinity of the site (NE, SW) - Moderate to minor adverse.
- Impact on the landscape character (medium sensitive receptor) - Moderate Adverse.

- Impact on visual receptors (highly sensitive) in the north-east and south-west, within 2km of the site - Moderate to Minor Adverse.

1.10.4 Shadow Flicker

The shadow flicker assessment concluded that the initially proposed 32 WTGs could exceed the recommended threshold of 30 hours per year at 15 properties in total, of which one is a residential house and 14 are weekend houses occupied in summer months.

Out of the 14 weekend houses, 3 are situated within the mandatory setback distance of the turbines. CVP have agreed with the owners of the 3 properties within the setback zone that they (the owners) will demolish these houses. In return, CVP have contracted to fully compensate the owners for this loss. As CVP have optimised the WPP layout to exclude the turbine string IV, the shadow flicker effect on the receptors in the north-east will be completely avoided. In that case 4 weekend houses in total would be affected, all in the south-west.

The assessment was based on a conservative estimate and no account was taken of existing screening features and limited weekend house occupancy. It is therefore considered that the actual amount of shadow flickering is likely to be much less.

For the affected residential house and weekend houses, the shadow flicker impact is considered to be **significant**.

For the affected agricultural buildings as receptors of low to negligible sensitivity, the impact is considered to be **not significant**.

Following proposed mitigation, it is expected that:

- Shadow flicker effects at one residential and 14 weekend houses in the vicinity of the proposed development site - Negligible Adverse.

1.10.5 Ice throw

The ESIA has concluded that the ice throw hazard zones could be up to 350m from the turbines. There are no residential properties within these ice throw hazard zones. However, there is a 900m-long section of the public road, proposed access tracks between the turbines and a car park near the substation compound.

The likely presence of pedestrians and vehicles in Crni Vrh during the icing period is considered to be limited as, weather during icing periods will be very unpleasant for pedestrians and vehicle drivers. CVP are considering the use of warning signage on the section of highway during icing conditions. The calculated ice throw risk levels are tolerable on the condition that risk reduction measures are implemented.

Following proposed mitigation, the residual impact rating for the key impacts identified are:

- Risk of fatality for general public or the WPP personnel due to turbine ice throw or ice fall - No Change.

1.10.6 Traffic and Transport

The construction of the proposed Crni Vrh WPP would contribute to a significant increase (1 to 3 times) in HGVs movements along the 5km-long section of the road No. 161 between Brestovac Spa and Bor Reservoir. The potential impact on traffic and transportation would be temporary and short-term, with medium magnitude of severance during summer months and moderate magnitude of driver delay. This would result in **moderate adverse** impact on visitors and residents in the area and **moderate adverse** impact significance on drivers.

The transport of large wind turbine components (blades, tower sections, nacelle) is subject to regulation on safe abnormal loads transport and requires mandatory involvement of police escort with or without successive stopping of traffic (depending on load dimensions). Given the strict procedure that has to be implemented, the potential impact of abnormal loads transport is not considered to be a significant traffic safety risk.

Residential areas are highly sensitive receptors in terms of the traffic safety. Along the road No. 161 which would be used for the most part of the construction traffic, there is one potentially sensitive section, 5km long. The road runs next to two summer house settlements – Brestovac Spa and Bor Reservoir (see Figure 13-1). Additional HGV traffic (especially in summer) may increase the risk of accidents for the local community.

The road is narrow (6m) but has many blind bends and a speed limit of 80km/h. There are no pedestrian crossings or traffic lights that would facilitate the road crossing. During the summer season, there is an increased tourist and visitor activity in the two settlements and potential frequent crossings of the road. The increased traffic flow during the construction has the potential to produce a medium magnitude effect with **moderate adverse** significance impact.

The winding character of the road No. 161 does not provide many suitable opportunities to overtake HGVs. The entire road stretch between the spa and reservoir is marked with a single solid white line. This can lead to driver frustration and taking of unnecessary risks, potentially affecting both driver and pedestrian safety. The magnitude of effect would be medium (given the low traffic level) and the impact significance is assessed to be **moderate adverse**.

The road section within the development site has a very low traffic volume which some drivers take advantage of to speed. Numerous bends do not provide many opportunities for overtaking. During the construction phase and slow HGV traffic, some drivers might be tempted to overtake unsafely. This would increase the road safety risk to medium and result in **moderate adverse** impact significance.

Motorcyclists are present on the road No. 161. A traditional 2-day Motorcycle Meet takes place at Bor Reservoir each August, attracting both local and regional motorcyclists. The potential effect is assessed to be of a medium magnitude resulting in **moderate adverse** impact.

Following proposed mitigation, the residual impact rating for the key impacts identified are:

- Impact on community severance and driver delay along the road No. 161 between Brestovac Spa and Bor Reservoir (medium-sensitive communities), especially in summer months during tourist season - Minor adverse.
- Increased traffic of maintenance and repair vehicles along low-sensitive local roads during the windfarm operation - Negligible adverse.

1.10.7 Operational Noise

The assessment has indicated that two properties will exceed the Serbian night-time noise limits. However even if mitigation were applied to these locations so that the night-time limit was achieved, noise levels would still exceed the IFC noise limit which is set as the threshold for an impact of moderate significance. Discussion in regard to compensating these residents are on-going. The owner of one property has agreed to accept financial compensation for this potential disturbance. The owner is expected to install improved sound insulation. The owner of the second property has preferred to wait until the WPP is constructed and noise impact can be confirmed.

Note also that an impact of moderate significance is also predicted at two other properties even though the Serbian limits can be met at these locations.

Following proposed mitigation, the residual impact rating for the key impacts identified are:

- Without mitigation the WPP would exceed noise limits at several residential locations.

1.10.8 Forest Fire Risk

The development site is situated within an area of wildfire risk. The fire risk during the construction activity can result in **moderate to major adverse** impact and additional management and mitigation measures would be necessary, besides the routine ('best practice') fire prevention during construction.

Following proposed mitigation, the residual impact rating for the key impacts identified are:

- Increased fire/ wildfire risk during construction, especially during prolonged dry periods in summer - Negligible Adverse.
- Damage of the WPP infrastructure due to wildfire or spreading of fire from the WPP infrastructure to nearby areas, causing a forest fire - No change.

1.11 Stakeholder Engagement Plan

A Stakeholder Engagement Plan ("SEP") was developed by CVP with assistance from the ESIA consultants for the Crni Vrh WPP project during the scoping stage and the latest updated version is available to interested stakeholders on the CVP website (http://www.cvpower.rs/) for review and questions or comments.

The purpose of the SEP was to identify key stakeholders so that they can contribute their views and provide relevant information to the ESIA. A summary of these meetings is presented in the ESIA and the SEP.

The SEP will be reviewed and updated on a regular basis. The next revision is planned for after the completion of the draft ESIA. The SEP will then include further activities which will be implemented by CVP prior to and during construction, as well as the operation stage.

The SEP includes the following information:

- Public consultation and information disclosure requirements according to national legislation and international requirements;
- Identification of stakeholders and other affected parties;
- Overview of previous engagement activities carried out for the project;
- Future stakeholder engagement programme including methods of engagement and resources; and
- A community grievance mechanism that can be used by stakeholders to record and manage complaints, concerns, queries and comments.

The main identified stakeholders for the Crni Vrh WPP project include residents of affected municipalities (Žagubica and Bor), including particularly villages surrounding the project site, people affected by project related land acquisition or those using structures within noise sensitive locations, active hunting organisations and representatives of relevant municipal departments and institutions, as well as other statutory stakeholders.

2 Introduction and Context of the ESIA

Crni Vrh Power doo, Žagubica ("CVP" or "the Developer") intend to develop a new wind power plant in Eastern Serbia. The Crni Vrh Wind Power Plant will include up to 32 wind turbines with a maximum total installed capacity of 158 MW.

2.1.1 Need for the Project

The primary purpose of the Wind Power Plant ("WPP") is to generate renewable electricity that will be supplied to the Serbian national grid. The Republic of Serbia is party to the Energy Community between the EU and South-East European countries. Serbia is therefore obligated to adopt an implementation plan of the Directive 2009/28/EC (to be repealed by the Directive 2018/2001 on 1 July 2021) for the promotion of renewable energy sources.

The proposed Crni Vrh WPP is needed as it will:

- Generate renewable energy that will contribute to national targets for reducing carbon emissions into the atmosphere;
- provide a valuable source of renewable energy for use within Serbia to support infrastructure development and the national building programme;
- strengthen Serbia's energy sector by helping to diversify its energy sources (which proved to be of essential importance after the unprecedented floods in May 2014);
- reduce the need for Serbia to import energy from neighbouring countries;
- reduce the country's reliance on fossil fuel combustion;
- providing enough electricity to power 110,000 homes and displacing about 275,000 tonnes of carbon dioxide per year that would normally be emitted if the same amount of electricity was produced from a coal fired power station.

2.1.2 Project Location

The Crni Vrh WPP will be located in a mountainous region of Braničevo district in Eastern Serbia. The WPP site will be about 12km east of the town of Žagubica and 17km northwest of the town of Bor (see Figure 2-1, below).

The landscape is dominated by mountain ridges of moderate slopes and valleys. The connection to the national highway network is good.

CVP were initially attracted to Braničevo district as the eastern part of Serbia has a significant wind resource. The average wind power for the area is in excess of 300 W/m^2; one of the highest in Serbia.

After careful consideration, CVP selected a site that is sparsely populated and is covered by woodland and open meadow.

The site is close to the 110 kV power grid. This means that the overhead lines needed to connect the WPP to the national power grid will be short, and will provide a reliable transmission of electricity. The Zijin mining and smelting complex at Bor has a high electricity demand and the WPP is expected to improve the resilience of the local grid.

The total area of the WPP site is about 2,706 hectares and is used predominantly for commercial forestry.

Figure 2-1 Project Location

2.2 Project Outline

The Crni Vrh WPP will include up to 32 Wind Turbine Generators ("WTGs") with a maximum total installed capacity of 158.4 MW. The WTGs will be connected by 33kV underground cables (about 36km) to a new 33 kV/110 kV power transformer station. The Crni Vrh transformer station will be connected to the electricity transmission grid by three x 110 kV overhead transmission lines; one at 1.6 km, one at 2.4 km and one at 4.0 km in length.

The development of Crni Vrh WPP will require:

- Lease or purchase of land plots for the siting wind turbines;
- Creation of appropriate foundations for the wind turbines;

- Transport of turbine components to the site;
- Installation of the wind turbines using large cranes;
- Construction of appropriate infrastructure including underground power and communication cables, a substation and connection to the main grid;
- Operation of the wind turbines for approximately 25 years; and,
- Replacement or decommissioning of the wind turbines.

The turbines will be sourced from the international market and will be brought to site in sections. Delivery convoys will be escorted by traffic police as they typically comprise 10 or 12 large vehicles.

Reinforcing steel and concrete for the turbine foundations will be sourced locally.

2.3 Development Programme

At the time of writing, the construction timeline is expected to be:

- Start of construction: autumn 2022.
- Site tracks and roads construction: autumn 2022 to spring 2023.
- Foundations and WTG crane pad construction: summer 2023.
- OHL 110 kV and switchyard 110kV construction: autumn 2022 to autumn 2023.
- WTG installation: summer 2023 to spring 2024.
- WPP commissioning: autumn 2024.

2.4 Project Developer

CVP is a development company created specifically to construct and operate the Crni Vrh wind power plant. CVP was founded in Belgrade in August 2019, by Kodar Energomontaža doo Belgrade.

Kodar Energomontaža is an engineering design and construction company that was established in 1958. The Kodar group now employs over 400 people within twenty subsidiary companies. The group has significant experience in the design, procurement and construction of overhead transmission lines (10kV to 400kV), power substations, telecommunication facilities and development of mobile telephone networks. The Kodar group works across the Balkans, Central Europe, Scandinavia and Africa. Further information on the Kodar group can be found on the corporate website: http://www.kodar.rs/eng.

Further information on the Crni Vrh project can be obtained from Marija Senić Andrić by email to marija.senic@cvpower.rs. The Project website can be found at http://www.cvpower.rs/ .

2.5 Support from International Financial Institutions

As CVP is likely to seek financial support for the project from an International Finance Institute or a major commercial bank, they have chosen to adopt Good International Industry Practice in the assessment of the environmental and social impact of the Crni Vrh WPP project. This means that in addition to the regulatory requirements of Serbia, the impact assessment complies with the requirements of the Equator Principles. Whist the Equator Principles describe the general approach to the assessment, the International Finance Corporation Performance Standards and sector guidance notes will provide the assessment framework. In summary, the Equator Principles describe the main steps in any Environmental and Social Impact Assessment ("ESIA") as follows:

- Screening Study and Equator Principles Categorisation;
- Stakeholder Engagement Plan;
- ESIA Scoping Study;
- ESIA;
- Public Consultation on the ESIA Disclosure Package;
- Management of grievances / objections; and,
- Project Monitoring.

The Equator Principles, International Finance Corporation ("IFC") Performance Standards and subsidiary IFC guidelines are described in more detail in Chapter 3 of this report. In undertaking the ESIA, the consultant has adopted the methodology described within IFC Performance Standard 1 ("PS1").

2.6 Approach to the Delivery of an ESIA Acceptable to International Banks

This ESIA has been prepared in line with the methodology described within IFC Performance Standard 1. The EPs, IFC standards and subsidiary IFC guidelines are described in more detail in Chapter 3 of this report. In summary, the key steps of the ESIA are:

1. The completion of baseline studies to establish the state of the environment and socio-economic conditions prior to the implementation of the Project.
2. Consideration of alternatives to the Project.
3. Preparation of an impact assessment that considers the potential effects of the Project on the established baseline conditions.
4. Assessment of cumulative impacts to identify those combined impacts which may arise from other existing or planned developments in the area.
5. Mitigation design involving the development of measures aimed at reducing any negative impacts.
6. Assessment of residual impacts following the application of mitigation measures.
7. Preparation of an ESIA report detailing the findings of the Impact Assessment and the mitigations recommended.
8. Reporting public consultation performed during the ESIA.

The preparation of the impact assessment (items 3 to 6, above) is a very detailed activity and requires the:

- Identification of the legal framework for the Project and relevant guidance issued by the Lenders;
- determination of significance criteria to assess the level of any identified potential impacts arising from the proposed development;
- identification, prediction and assessment of the likely significance of the environmental and social effects, both positive and negative, of the proposed development (during construction and operation);
- identification of suitable mitigation, enhancement and monitoring measures to prevent, reduce or remedy any likely significant adverse environmental effects; and
- assessment of the significance of any residual impacts (i.e. those remaining following implementation of mitigation measures).

It is important to establish the project Area of Influence ("AoI") early in the assessment as this defines the extent of the baseline studies that need to be completed. The definition of the AoI for the Crni Vrh WPP project is described in Section 7.1 of this ESIA report.

Following the definition of the AoI the technical specialists who undertook the impact assessment were able to identify survey areas, stakeholders and Project Affected Peoples who would be consulted and considered as part of the impact assessment. The Project Affected Peoples include persons affected by land acquisition, relocation, or loss of incomes associated with change in land use due to a project.

In compliance with PS1, this ESIA Report contains the following Chapters:

- **Chapter 1**: Presents the **Non-Technical Summary** ("NTS") for the Crni Vrh WPP project. This NTS will be published separately but has been included at the beginning of the ESIA Report to provide an initial overview of the development.
- **Chapter 2 – Introduction and Context of the ESIA**: Includes a brief description of the project, the expected benefits, alternatives to the Project, the project company and how they may be supported by international banks. The background to the ESIA process and communication of the ESIA are also described.
- **Chapter 3 – Requirement for an Impact Assessment:** Describes the Serbian requirements for an Environmental Impact Assessment, the Lender requirements for an ESIA and the links between the EIA and the ESIA.
- **Chapter 4 – Findings of the Scoping Study**: Includes the consideration of EP Categorisation of the Crni Vrh WPP and sets out the key issues that were considered during the ESIA.

- **Chapter 5 - Technical Description of the Crni Vrh WPP**: Provides a detailed description of the project including the technology adopted, the design of the Crni Vrh WPP and how the turbines will be connected to the existing infrastructure. This Chapter also reviews the windfarm design against the IFC Guidelines for Wind Energy (considered to be GIIP) designed and in operation for similar windfarms. A brief description of the operation and maintenance of the windfarm is described.
- **Chapter 6 - Environmental and Social Policy, Legislative Framework and International Standards**: Summarises the Serbian regulatory requirements for the development and operation of the windfarm as well as the GIIP standards required by the Lenders.
- **Chapter 7 - Study Area, Surveys Methodologies and Data Modelling:** Defines the Project Area of Influence for each topic area. The survey methodologies adopted for each topic area are describes as well as the modelling adopted in the assessment.
- **Chapter 8 - Environmental Setting – Natural Geography**: Provides a background to the physical and natural history of the Project area.
- **Chapter 9 - Socio-Economic and Cultural Context – Human Geography**: Provides a background to the human geography of the proposed project area.
- **Chapter 10 – Project Wide Impacts**: Includes the consideration of potential impact of climate change on the project, GHG displaced by the project, and cumulative impacts.
- **Chapter 11 – Impact Significance and Mitigation Framework**: Describes how the impacts and opportunities identified in the scoping study were assessed and provides an overview of the mitigation framework that was adopted by the ESIA.
- **Chapter 12 – Primary Mitigation:** Describes mitigation through design change.
- **Chapter 13 – Construction: Impact Assessment and Mitigations:** Sets out the assessment of impacts during the construction of the Crni Vrh WPP. This chapter proposes how the impacts may be managed or mitigated. Residual impacts are also quantified and discussed.
- **Chapter 14 – Operation: Impact Assessment and Mitigations:** Sets out the assessment of impacts during the operation of the Crni Vrh WPP. This chapter proposes how the impacts may be managed or mitigated. Residual impacts are also quantified and discussed.
- **Chapter 15 – Decommissioning: Impact Assessment and Mitigations:** Sets out the assessment of impacts during the decommissioning of the Crni Vrh WPP. This chapter proposes how the impacts may be managed or mitigated. Residual impacts are also quantified and discussed.
- **Chapter 16 - Summary of Impacts, Mitigations and Control Measures**: Draws together the findings of the assessments in Chapters 13, 14 and 15.
- **Chapter 17 - Mitigation, Management and Monitoring of Environmental and Social Impact**: Describes the environmental and social management system that will be developed to deliver the Environmental and Social Management and Monitoring Plan.
- **Chapter 18** – Conclusions of the ESIA.

<u>The Appendices to the ESIA Report are presented in a separate document that should be referred to when considering the Assessment.</u>

2.7 Project Alternatives

The alternatives to the development of the Crni Vrh WPP considered are:

1. **No Project**: If the WPP is not built then Serbia will continue its reliance on fossil fuels for energy. The proposed WPP site would continue as a mix of commercial forestry and grazing.
    - Serbia is a signatory to the Energy Community Treaty. The Treaty requires countries' commitment to in implement EU energy legislation within fixed timeframes. If the Crni VRH WPP is not developed then Serbia is less likely to meet this Treaty commitment.
    - Under the Paris Agreement, Serbia has committed to reduce the GHG emissions by 9.8% below 1990 levels by 2030. If the Crni Vrh WPP is not developed then Serbia is less likely to achieve climate neutrality by 2050.
    - The negative environmental impacts associated with WPPs will not occur (noise, visual impact, flicker etc.).

- Many of the woodland habitats across the site would still be felled over time as they are managed as commercial forests.
- The positive financial benefits of the WPP to the local communities (jobs, tax income and social investment) will not be realised.
- The Scoping Study concluded that there is a legal framework that requires the development of renewables projects; this provides a presumption of development. The Scoping Study also concluded that the level of environmental and social impact was manageable and that there was no over-riding reason why the WPP should not be built.

2. **Alternative Technology**: The conditions of the project site are optimal for wind development and unfavourable for the majority of other renewable technologies.
   - Solar energy could be exploited at the Crni Vrh site but this would mean the utilization of a much larger area of land and a significant increase in the loss of forestry land. In addition to the increased impact on biodiversity there would be significant negative change the character of the area.
   - The Scoping Study concluded that a renewables project based on wind power generation was appropriate for the region and the site.
3. **Alternative Layout**: The initial layout was selected to take the greatest advantage of the wind resources and to avoid proximity to residential properties. However, the initial consideration of the environment impacts indicated that a number of turbine locations would have a disproportionate impact on local habitats and species populations.
   - The Scoping Study concluded that whilst there would be a negative environmental impact associated with the development of the WPP, alternative layouts should be investigated in more detail within the ESIA.
   - During the early stages of the ESIA it was confirmed that six turbines were located in at-risk areas of natural habitat across the site. The initial focus of the ESIA was to modify the WPP layout, turbine numbers and turbine locations. The assessment of turbine locations and numbers formed the basis of primary mitigation of the WPP impact. This analysis resulted in an alternative WPP design being agreed with CVP. The assessment of WPP layout is discussed in Chapter 12 of the ESIA. The alternate design of the WPP then formed the basis of the subsequent ESIA. In this process, turbines that were to be located on the territory of Majdanpek municipality, originally considered a stakeholder during the scoping stage, were all removed from the scheme and detailed socio economic data analyses referring to this municipality has not been included in the ESIA.

2.8 Project Stakeholders

A Stakeholder Engagement Plan (“SEP”) was developed by CVP with assistance from the ESIA consultants for the Crni Vrh WPP project during the scoping stage and the latest updated version is available to interested stakeholders on the CVP website (http://www.cvpower.rs/) for review and questions or comments.

The purpose of the SEP was to identify key stakeholders so that they can contribute their views and provide relevant information to the ESIA. A summary of stakeholder meetings held during the ESIA development stage is presented in Table 2-1 below. It should be noted that a meeting was held with representatives of the municipality Majdanpek, although since, the four wind turbines located on the territory of this municipality have been removed from the scheme and this municipality will no longer be affected. Meetings were also held by the Developer with individual households which may be impacted by noise levels exceeding permitted limits and/or shadow flicker and these are described in the relevant sections of the ESIA.

The SEP will continue to be reviewed and updated on a regular basis and will contain a plan for further activities which will be implemented by CVP prior to and during construction, as well as the operation stage.

The SEP includes the following information:

- Public consultation and information disclosure requirements according to national legislation and international requirements;
- Identification of stakeholders and other affected parties;
- Overview of previous engagement activities carried out for the project;
- Future stakeholder engagement programme including methods of engagement and resources; and

- A community grievance mechanism that can be used by stakeholders to record and manage complaints, concerns, queries and comments.

Stakeholders could be individuals and organisations that may be directly or indirectly affected by the project either in a positive or negative way, who wish to express their views. The initial Stakeholder Engagement Plan identified the stakeholder groups that may be affected by and/or interested in the Project, as well as the proposed communication methods and issues of interest for each group. During the ESIA development phase and related consultations, the list of external stakeholders has been further refined and now includes the following:

- Residents of Žagubica and Bor and, in particular, small villages surrounding the Project site (Laznica and Krivelj).
- People affected by land acquisition (owners and users of land acquired for Project components on a voluntary basis, owners and users of land that may be disturbed during construction and owners and users of land that will be acquired through expropriation).
- People occasionally occupying identified noise and shadow flicker sensitive receptors.
- People working and residing in areas potentially affected by project related transport and traffic impacts, in the Bor spa and lake areas.
- Hunting associations (“Bakar”, Bor, “Zlotske Šume – Crni Vrh” managed by Srbijašume, “Srna”, Majdanpek and “Jovan Šerbanović”, Žagubica).
- Local people engaged in herb, mushroom picking and people using areas near the future WPP for livestock grazing.
- Users of the affected area for recreational purposes (trekkers, mountain bikers, skiers, etc.).
- Organisations and citizens associations (Association of Young Researchers Bor) and others.
- Municipality representatives: Žagubica and Bor.
- Srbijašume (Serbia Forest).
- Elektromreža Srbije (EMS).
- Statutory stakeholders, for example, relevant Ministries, institutes, utility companies, directorates, etc..

Table 2-1 Summary of Stakeholder Meetings

Stakeholder	Meeting participants	ESIA stage	Date of the meeting	Main feedback
Municipality Majdanpek	Urban planning dept. Local economic development dept.	ESIA Scoping	20.10.2021	The municipality is looking forward to the implementation of the Project and is ready to contribute and support the Project. The number of turbines on the territory of this municipality is the smallest, but nevertheless any development opportunities are welcomed. Any employment opportunities are also important for the municipality. The affected land is on a higher altitude, while all arable land is lower, closer to the villages. The roads/tracks to access the affected land are in poor condition or non-existent. This is why the land is largely unused. There have been no negative comments in relation to the Project, either from citizens of any civil society organisations. The municipality is experiencing growth due to the recent restart of mining activities with the acquisition of the state-owned mines by the company Zijin Copper. Many young people are coming back to the municipality because of the employment opportunities and the standard of living is increasing. The tourism areas in this municipality are all along the Danube River and tourism is expanding.

Stakeholder	Meeting participants	ESIA stage	Date of the meeting	Main feedback
Municipality Žagubica	Urban planning dept. Local economic development dept.	ESIA scoping	21.10.2021	The municipality welcomes the Project as it will increase the municipal budget (local taxes, i.e. property tax) and open up some employment opportunities. The improvements of access roads are also significant. The main road going through the project site is used by people from Žagubica to travel to Bor where they work, and for recreation at the Bor lake, so traffic needs to be managed well and particularly people must be informed of any changes or increased traffic on time.
City Bor	Urban planning dept. Local economic development dept.	ESIA scoping	22.10.2021	The discussion held with the municipality was largely the same as the discussion in the other two municipalities, presented above. The municipality was interested in the status of planning documents and when the project is expected to start. The municipality is expecting the implementation of a state highway (Vožd Karađorđe) which will bring in many benefits for this region in Serbia and they hope that the WPP project has been aligned with this future, planned highway project.
9 owners of affected land	7 men 2 women	ESIA scoping	20, 21, & 22.10.2021	Many owners, especially those living in municipal tows, have inherited the land and do not use it; some don't even know its exact location. All owners were extremely satisfied with the amount of compensation that has been provided and hope that the arrangement will continue (i.e. that CVP will select their land for the WTG and/or that CVP will acquire more land from them for other purposes) and they will continue to receive compensation. The land almost has no value, as no one is interested in buying it. According to one land owner, owners of some of the nearby non affected properties are sorry that they could not benefit from the compensation and are hoping that a part of their land may be needed in the future. Land owners are excited about the Project because they also expect that the access roads will enable them to use their land more intensely, particularly to harvest wood (to the extent allowed by the law). However, it is possible that illegal loggers will also benefit from the access roads (CVP explained that there will be cameras on site, which should deter people from performing any such activities). Some owners have problems with property and legal issues (they did not register ownership in the Cadastre or had disputes with other owners) and CVP assisted them significantly to resolve all issues, to be able to benefit from the compensation arrangements. The owners in some cases had minimal expenses in relation to this, however they could easily offset these expenses with the compensation payments they received. One owner attempted to grow crops on the affected land crops, however wild hogs kept destroying it, so he gave up. He cuts the grass sometimes to use for animal feed. A few of the interviewed owners live from agriculture, but the affected land is not among the land they actually farm. None of the owners plan to acquire new land from the compensation; they all invested in other things, such as renovation of their houses, contribution towards buying apartments, investment into agriculture (repairs

Stakeholder	Meeting participants	ESIA stage	Date of the meeting	Main feedback
				of machinery), but also some investments into children (education). There is some mushroom picking, but no organised purchasing in the villages. It was something more frequent in the past, but now its individual households and they mainly pick on their land or in the vicinity of it, in accessible places, which are not so numerous. Some of the landowners are interested in Project employment opportunities and hope to benefit from them as well.
Hunting Association, Majdanpek (Srna)	4 individuals	ESIA scoping	20.10.2021	The affected area is used for hunting. However, the hunting association uses 60,000 ha in total, and the affected area is a very small part of it. Different game is hunted in different seasons, all year round. The association has 450 active members (2 women). They engage in well organised hunting tourism, including for foreigners. The benefit of the WWP may be improved fire protection, as fires pose a serious threat to the animals. The members of the association expect that animals may be disturbed during construction, but they hope that they will adapt once the WWP is complete and return to normal. The hunters should be aware of any field activities of CVP and other involved companies, to prevent any accidents. Hunting most often happens on weekends, but occasionally also on weekdays. The hunters provided the same feedback on mushroom picking and herb collection as the land owners, i.e. that there is no organised activity or purchasing any longer and some individuals engage it in only occasionally, more for household consumption and not for sale or income.
Hunting Association, Žagubica (Jovan Šerbanović)	2 individuals	ESIA scoping	21.10.2021	The discussion was largely the same as in Majdanpek, as presented above. This hunting association uses an even larger area of 72,000 ha and has more members (500). The hunting association feels that there should be some compensation for the disturbance that the project will cause during construction and hopes that CVP can finance some animal feeding facilities. In Žagubica, the wolf is their biggest attraction and they have tourists come from all over the region and western Europe to hunt it. Other than that, they hunt deer, rabbit, wild hogs, etc. as do the other associations.
Hunting Association, Bor (Bakar)	6 individuals	ESIA scoping	22.10.2021	The same topics were covered as with the previous two hunting associations. This association operates on 65,000 ha and has 400 members.
NGO Young Explorers, Bor	1 individual	ESIA scoping	21.10.2021	The organisation is very active in the city, however most of their activities are directed towards mining and the serious environmental impacts caused by it. The organisation welcomes the use of green energy and therefore the WPP is seen as positive, provided that any environmental impacts are mitigated. The organisation is ready to cooperate with CVP and can provide access to local NGO networks, for any information sharing or other activities. The Bor lake is an important local resource and people use it in the summer. There is a 'weekend' settlement

Stakeholder	Meeting participants	ESIA stage	Date of the meeting	Main feedback
				there, which probably has over 1,000 structures (weekend houses, private accommodation for rent, cafes, restaurants, organised beaches, etc.) and is continuing to grow. The nearby spa is also visited by many people in the summer.

2.9 Delivery Team and Limitations of the ESIA

This ESIA report was prepared on the behalf of Crni Vrh Power doo, Žagubica (“CVP” or “the Developer”) by a consortium led by Pepper Advisory Ltd, UK.

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- Mr. Gavin Irvine of Ion Acoustics, Bristol, UK.

The consortium led by PAL has based its conclusions and recommendations on the information made available during the ESIA. It should be recognised that the mitigation measures suggested / required by the ESIA may result in some modifications to the design of the facility.

None of the work performed during the ESIA shall constitute or be represented as a legal opinion of any kind or nature, but shall be a representation of the site visits findings and examination of records. No warranties or guarantees, expressed or implied, are included in or intended by the report. The report has been prepared in accordance with the current generally accepted practices and standards consistent with the level of care and skill exercised under similar circumstances by professional consultants or firms that perform the same or similar services.

3 Serbian EIA and Project Permitting

3.1 Serbian Requirement for an Environmental Impact Assessment

Serbian EIA regulations require WPP developments of 10 MW installed capacity or over to be subject of an environmental impact assessment procedure. The EIA for the Crni Vrh WPP was based upon this ESIA report. The baseline data sets and surveys used for the EIA and the ESIA were the same.

WPPs are listed in Annex II of a relevant EIA regulation meaning that a competent authority decides whether to proceed with a full EIA or conclude the process after the screening stage. Over the past 10 years it has been authorities' practice to require a full EIA for all windfarm developments of 10 MW capacity or over. An overview of the EIA process in Serbia is shown in Figure 3-1 below.

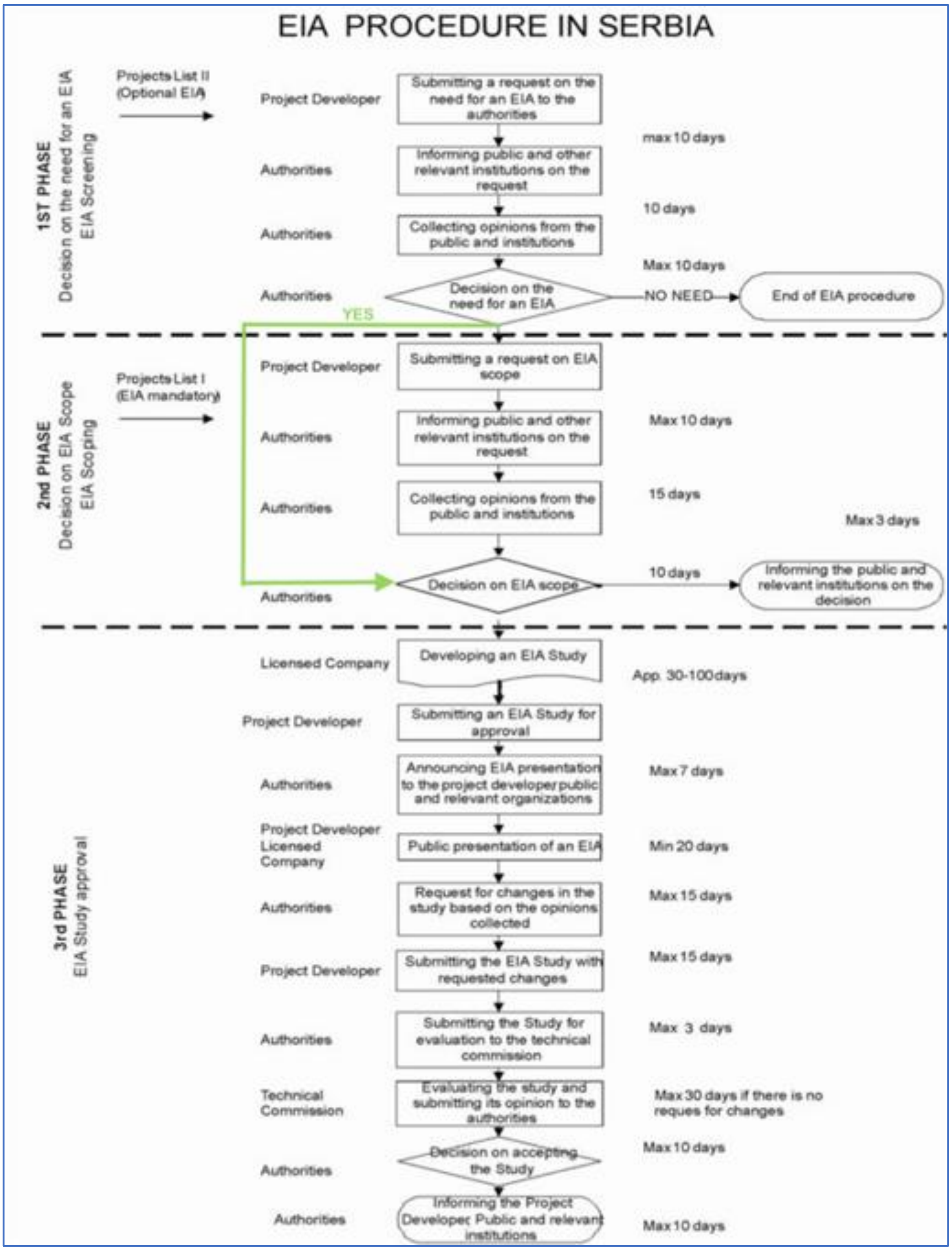


Figure 3-1 Serbian EIA Procedure

See Chapter 4 of this ESIA for further detail on the legal framework for the EIA.

3.1.1 Zoning Plan and Location Permit

To initiate the Serbian EIA Study procedure, the local authorities, in this case the Town of Bor, Municipality of Žagubica and Municipality of Majdanpek, must develop and adopt a Zoning Plan that includes a basic description of a new project. The approval of the Zoning Plan includes consultation with a series of national and regional statutory bodies that provide their conditions under which a development is possible. They indicate potential conflicts with existing or planned infrastructure, may require pre-construction investigations or studies or describe technical and management measures that must be implemented as part of project development. The list of statutory bodies involved with the planning (including zoning, location permitting and the EIA) is provided in Table 3-1.

Table 3-1 List of Statutory Stakeholders involved in the Project Planning

Statutory Stakeholder	Role in Planning
Town of Bor, Municipality of Žagubica, Municipality of Majdanpek	Prepare the Zoning plan and Strategic Environmental Assessment for the project.
Ministry of Construction, Transport and Infrastructure	Awards the Location permit, the Building permit, the Operation permit.
Ministry of Environment	Awards the EIA consent.
Ministry of Mining and Energy of Serbia	Awards the Energy permit.
Institute for Nature Conservation	Provides nature conservation conditions.
Public Water Management Company "Srbijavode"	Provides wastewater management conditions.
Institute for Cultural Heritage	Provides conditions for protection of cultural heritage.
Republic Institute for Seismology	Provides information on seismological conditions.
Ministry of the Interior of Serbia, Department for Protection and Rescue	Provides fire protection conditions.
Ministry of Defence of Serbia	Provides conditions on potential conflicts with the national defence infrastructure.
Public Road Management Company "Roads of Serbia"	Provides conditions on local road network connections.
Public Gas Management Company "Serbia Gas"	Provides conditions on natural gas infrastructure and potential conflicts.
Public Energy Transmission Company "Elektromreža Srbije"	Provides conditions for connection to the national transmission grid.
Public Electricity Distribution Company "EPS Distribution"	Provides conditions for connection to the electricity distribution network.
Civil Aviation Directorate of Serbia	Provides conditions on aviation safety, related marking and lighting.
Serbia and Montenegro Air Traffic Services Agency	Provides information on potential interference with aviation radars;
Republic Hydrometeorological Institute	Provides information on potential interference with weather radars;
Public Broadcasting Company "Emisiona Tehnika i Veze"	Provides information on potential interference with radio and television broadcast transmitters.
Public Telecommunications Company "Telekom Srbije"	Provides conditions on connection to the telecommunication network.
Mobile network operators "Telenor" and "VIP"	Provide conditions on potential conflicts with existing or planned base stations.
Local public utility companies	Provide information on potential conflicts with local waste management infrastructure.

The Zoning Plan is subject to a Strategic Environmental Assessment (SEA) that has to be approved by the local authority. While the Zoning Plan is approved by the local authority (municipality), the permits for WPP developments (Location permit, Building permit, Operation permit, Energy permit) are awarded by national authorities.

Once the Zoning Plan has been agreed, the Developer can proceed with a procedure for acquiring the Location permit (also called the Location Conditions). The Location permit provides specific conditions for connection of the project to the existing infrastructure onsite. The conditions included in the Location permit are provided by the same statutory stakeholders involved in the development of the zoning plan.

The Location conditions represent key inputs for the preliminary design concerning the connections to the existing infrastructure. As for the environmental aspects of these conditions, they are similar to those issued at the zoning plan stage, i.e. no new requirements for additional studies or investigations are set at this stage. The Location permit and preliminary design constitute a statutory part of the EIA Study application.

The Zoning Plan and SEA for the Crni Vrh WPP and OHL were approved in October 2021.

3.1.2 Serbian EIA - Screening and Scoping

As the Crni Vrh WPP is an Annex II development under the Law on Environmental Impact Assessment, an initial screening judgement must be obtained from the national Ministry of Environment. Screening and scoping exercises are based upon the conceptual design of the project whilst the EIA Study is based on the preliminary design.

Once the scoping decision is issued, it remains valid for 12 months. If an EIA Study is not submitted within that period, the screening/ scoping decision expires and the procedure must be restarted.

The statutory format of Serbian screening report is comprehensive and is equivalent to an ESIA Scoping Study. It has become a regular practice of Serbian authorities to decide on the screening by directly issuing of the scoping decision. Such practice shortens the administrative time which usually results in a total of 40 days for the screening/ scoping stage.

The screening/ scoping document is publicly disclosed for 15 days before the authority makes the scoping decision. The interested public has the right to appeal to the government which then decides on the appeal within 30 days.

While the EIA is considered by a competent environmental authority (national Ministry of Environment), the Building permit is within the competence of the national Ministry of Construction, Transport and Infrastructure.

The Energy permit is not directly connected to the Location permit. It is part of a concurrent permitting procedure defined by energy regulations within the competence of the national Ministry of Mining and Energy of Serbia. The Energy permit is based upon the national energy development strategic and planning documents. In practice, the Energy permit can be acquired relatively early in the development process. As such, the Energy permit contains a rather general overview of environmental requirements that the windfarm development must comply with.

The Location permit, the Energy permit, and the EIA are prerequisites for the Building permit. The Registration of Works is a final step and a key result of the planning and energy permitting processes and requires submission of the Building permit and the EIA consent. Only when the Registration of Works is acquired, the windfarm construction can begin.

The permitting of overhead power lines for WPPs in Serbia is subject to an independent legal procedure, separated from a WPP permitting. A WPP developer has to liaise with a state-owned transmission grid operator "Elektromreža Srbije (EMS) to conduct the OHL permitting procedure on behalf of EMS. This includes the EIA procedure for OHL connection line where EMS is considered to be a formal developer and operator of the OHL connection line.

For the proposed 3 to 5km-long OHL connection lines (110kV) an EIA Screening application must be submitted to the national Ministry of Environment to decide whether the EIA is mandatory.

3.2 Lender Requirements for an Environmental and Social Impact Assessment

As CVP is likely to seek financial support for the project from an International Finance Institution or a major commercial bank they have chosen to apply Good International Industry Practice in the assessment of the environmental and social impact of the Crni Vrh project. This means that in addition to the regulatory requirements of Serbia, the impact assessment will comply with the requirements of the Equator Principles. A detailed explanation of the Equator Principles is provided in Chapter 6.3 of the ESIA Report.

A Scoping Study for the Crni Vrh Project was completed in January 2021. The findings of the Scoping Study are presented in Chapter 4 of this ESIA report. The Scoping Study concluded that the Crni Vrh WPP was a Category B project; having limited environmental and social impacts. In order to fully assess the environmental and social risks and impacts, the Scoping Study recommended that a formal ESIA be completed. The potential impact on biodiversity was considered to be medium to high and the surveys began in April 2021. A preliminary ESIA was prepared in November 2021 and the final ESIA published in June 2022.

The first draft of the Stakeholder Engagement Plan was prepared at the same time as the Scoping Study and the grievance mechanism was made available on the CVP website (https://www.cvpower.rs/žalbeni-mehanizam). One of the primary objectives of the SEP is to ensure that the project engages with local stakeholders at an early stage so that they can contribute their views and provide relevant information to the ESIA. The links between this ESIA and the SEP are discussed in Section 3.2.1 of this ESIA report.

Whilst the Stakeholder Engagement Plan ("SEP") feeds into the Scoping Study and then to the ESIA itself; the SEP and the ESIA are run in parallel. The ESIA Disclosure Package that is published by the EPFI includes the SEP, the ESIA report or Statement, and a Non-Technical Summary. It is noted that the Non-Technical Summary is presented in Chapter 1 of this ESIA report.

A more detailed description of the legal, policy and institutional framework for the ESIA, including the Equator Principles, IFC Performance Standards and subsidiary IFC guidelines, is provided in Chapter 6 of this ESIA.

3.2.1 Links Between the EIA and the ESIA

The Serbian EIA and EP ESIA processes are generally aligned in terms of the requirements for assessment of environmental impact. However, an EP ESIA is an integrated activity which considers a broad range of topics within the defined Area of Influence (see Section 7.1 of this ESIA Report). In Serbia, many of these topics are managed via the local 'planning process' and are outside the formal environmental impact assessment process. For example, issues associated with local grievances arising from land purchase for the project are managed locally by local regulatory authorities.

There are synergies between the requirements for an EIA under Serbian regulations and an EP compliant ESIA. The following Table 3-2 summarises these links and overlaps. The key difference between the two approaches is that Serbian environmental regulation does not recognise environmental management plans as a control and mitigation instrument. Consequently, the Serbian EIA requires detailed mitigation measures to be proposed already in the EIA. An EP compliant ESIA will include an Environmental and Social Management and Monitoring Plan ("ESMMP") that links to an Environmental and Social Management System ("ESMS") and its' subsidiary Management Plans, see section 17.2 of this ESIA Report.

Table 3-2 Links between the Serbian EIA and an EP ESIA

Activity	ESIA	EIA	Comments
Screening Study	✓	✓	The Serbian Screening Study is more detailed than a Screening Study under international standards and is equivalent to an ESIA Scoping Study. Windfarms of 10 MW power or over are subject to a Screening Study in Serbia.
Scoping Study	✓	✓	A Scoping Study is not required in Serbia if a Screening Study was submitted and the authority decided that an EIA Study is required. The authority can issue the Scoping Decision based on the Screening Study. The Serbian Scoping Decision does not scope out any impact, i.e. all impacts have to be considered in the EIA Study.
Stakeholder Engagement Plan	✓	X	A formal stakeholder engagement plan is not required under Serbian legislation. However, stakeholder consultation is part of the EIA process.
Consideration of alternatives	✓	✓	Both the impact assessment process for the purposes of investment and national regulatory requirements, require the consideration of other feasible approaches, including alternative locations, technologies, scales and 'no project' options.
Environmental Impact Assessment	✓	✓	The EIA requirements are generally aligned. The standards adopted in the environmental assessment undertaken for the purposes of the ESIA should be in line with European and other international best practice.

Activity	ESIA	EIA	Comments
			The requirements under the national EIA regulatory process need to ensure compliance with national legislation and not the regulatory requirements outside of the country.
Environmental effects in case of accidents	Limited	✓	The Serbian EIA legislation requires more detailed analysis of environmental effects in case of accidents which includes specification of hazardous substances used, emergency preparedness and response, remediation measures, etc.
Mitigation Measures and Monitoring	✓	✓	Serbian EIA requires detailed mitigation measures and environmental monitoring that will be implemented during construction and operation. This has to incorporate requirements issued by competent authorities. An ESIA provides detailed mitigation measures to be specified by appropriate construction/ operation management plans.
Socio-Economic Impact Assessment	✓	Limited	The impact assessment for banking requirements requires an integrated approach including full deliberation of the socio-economic effects. The national regulatory requirements for impact assessment are primarily focused on environmental requirements with other requirements encompassed in other regulatory (e.g. 'planning') mechanisms. A formal socio-economic impact assessment is not required under national legislation. However, local national legislation does require assessment of effects where impacts are associated with impacts to human health.
Non-Technical Summary (NTS)	✓	✓	NTS is required as a disclosure document for both the national procedure and banking requirements. The Serbian NTS has to incorporate complete sections on Mitigation Measures and Monitoring, as provided in the EIA Study.
Public Consultation & Disclosure	✓	✓	The public consultation process for both investment and national regulatory purposes is required. National public consultation has a more formal character and is led by the regulatory authority.
Management of Grievances and Objections	✓	*X*	A Grievance Mechanism is not a formal requirement under the national regulatory requirements. However, grievances are reported under the consultation process and are encompassed under other regulatory mechanisms (e.g. the local 'planning' process).

4 Findings of the ESIA Scoping Study

4.1 Project Categorisation

The Scoping Study determined that the Crni Vrh WPP project to be defined as a Category B. The EPs describe a Category B project as having "*potential limited adverse environmental and social risks and/ or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures*". The Scoping Study opinion was based on:

- The likely impact on project stakeholders of the WPP;
- the reversibility of the potential environmental impacts should the WTGs be removed at the end of the plants' operational life;
- the scale of the Project Area of Influence and the potential environmental and social impact of the WPP;
- engineering design and proposed site layout plans of the Crni Vrh WPP;
- the potential to reduce the environmental impact of the plant through revisions to the layout.

The EPs do not require every Category B project to have a detailed ESIA. However, to ensure the highest standards of openness, impact assessment, mitigation and management of the Crni Vrh WPP development, CVP will undertake a full ESIA in compliance with the Equator Principles as follows:

- EP 1 requires that the developers for all Category B projects conduct an Environmental and Social Impact Assessment;
- EP 4 requires that all Category B projects develop and maintain an Environmental and Social Management System (ESMS) and prepare an Environmental and Social Monitoring and Management Plan (ESMMP) that will be adopted during the construction, operation and decommissioning phases of the project;
- EP 5 requires that the developers of all Category B projects demonstrate "effective" Stakeholder Engagement as an ongoing process. This requires the identification of any specific Affected Communities;
- EP 6 requires that, if appropriate, Category B projects establish a Grievance Mechanism;
- EP 7 and EP 9 requires that the developers of all Category B projects appoint an Independent Environmental and Social Consultant, if appropriate, to carry out an Independent Review of the ESIA including the ESMPs, the ESMS, and the Stakeholder Engagement Plan and to review the progress of the project;
- EP 8 requires that the EPFI will covenant with the developer to deliver the ESMP on all projects that they finance (and other EP Action Plans) and ensure compliance with local regulations;
- EP 10 requires that the developers of all Category A projects, (and Category B projects if appropriate) prepare a summary of the ESIA (usually as a Non-Technical Summary) and make this available on their website.

The Project Area of Influence for the Crni Vrh WPP project is described in Section 7.1 of this ESIA.

4.2 Determination of the Key Issues for the ESIA

The Scoping Study established the key effects for the ESIA, both positive and negative, and the level assessment required within the ESIA. The Scoping assessment considered data availability, data gaps and recommends suitable survey and research methodologies.

The evaluation of the significance of impacts and opportunities includes consideration of:

- Sensitivity of receiving environment (i.e. the sensitive receptors identified by the technical experts);
- extent and magnitude of the impact;
- reversibility and duration of the impact;
- inter-relationship between impacts; and
- type and extent of cumulative impacts.

The assessment of each impact or opportunity is complex and the significance of impacts allocated within the Scoping Study report was based upon the judgement of the technical experts undertaking the Study.

The Scoping Study allocated a level of significance to each impact or issue against the following three categories. The level of significance relates to the seriousness of the potential impact and the data or information required to undertake an appropriate assessment:

- **Significance Level One: Detailed Assessment**: Undertaken on environmental and social issues which have the potential to create a major impact or could significantly risk the viability of the project. These detailed assessments usually require the completion of extensive survey work. These issues can be considered to be Red Risks to the delivery of the Project.
- **Significance Level Two: Indicative Assessment**: Undertaken on environmental and social issues which have the potential to create a moderate, or undefined levels of impact. These issues can be considered to pose a medium risk to the delivery of the project, i.e. Amber Risks. These indicative assessments often require additional data collection or limited survey work to fill any gaps in the existing data set.
- **Significance Level Three: Limited Assessment**: Undertaken on environmental and social issues which are likely to create a limited impact, i.e. Green Risks. These impacts are often readily mitigated and managed using well known techniques that will be described in the Project ESMS and the associated Management Plans.

The Scoping Study categorised the impacts of the Crni Vrh WPP as:

Significance Level One Issues

- Ecology and Nature Conservation – woodland habitats of conservation concern, woodland plant species of conservation concern (orchids in particular), birds, bats, and other woodland fauna;
- Socio-economic;
- Landscape and Visual;
- Shadow Flicker.

Significance Level Two Issues

- Ecology and Nature Conservation – habitats other than woodland of conservation concern and their plant species of conservation concern;
- Traffic and Transport;
- Operational Noise;
- Ice Throw and Ice Fall Risk;
- Forest Fire Risk;
- Cumulative Impact.

Significance Level Three Issues

- Ecology and Nature Conservation –non-woodland fauna species of conservation concern other than birds and bats;
- Noise during construction and decommissioning;
- Archaeology and Cultural Heritage;
- Surface Water and Effluent;
- Land and Groundwater;
- Aviation Safety and Radars Obstructions;
- Electromagnetic Interference and Telecommunication;
- Ecosystem Services;
- Air Quality;
- Community Health, Safety and Security.

The Scoping Study confirmed that there are no Indigenous Peoples within the Area of Influence and this topic has been screened out of the ESIA process.

The rationale behind these assessments is provided in Table 4-1,

Table 4-2, and Table 4-3, see below.

Table 4-1 Summary of Level One Issues

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
1	Ecology and Nature Conservation – Birds	Potentially significant direct impact on a number of protected species and in particular woodland species • Consideration will be given to potential cumulative impacts on bird populations with any other WPP planned within the region and operating along the relevant migration route.	Extensive survey work is required over a two-year period to ensure that a sufficient impact assessment and mitigation strategy can be developed within the ESIA. Bird surveys have already been undertaken for one year, and the ESIA surveys (over a second full year) will build up on those, ensuring full compliance with SNH Guidance (2000, 2012, 2017, 2018). The surveys will include: • Vantage Point Surveys, • Breeding Raptor Surveys (walkover). • Breeding Nocturnal Species (Owls) Surveys, • Breeding Woodland and Farmland Bird Surveys (transects). If woodland of conservation concern is not excluded from the development, the extent of all surveys will have to be much broader, and the effort needed will be greater. The VP surveys are designed to quantify the level of flight activity and its distribution over the survey area. Data can also be used to provide an overview of bird usage of the site, which will inform the overview of potential disturbance and displacement. The VP surveys will provide input data for the Collision Risk Model ("CRM"). The CRM used in the assessment has been developed by SNH and the British Wind Energy Association (BWEA) (Percival et al. 1999, Band 2001) and is currently considered the industry standard in this field. Breeding Bird surveys will allow the evaluation of occurring population numbers, site's importance and help quantify impacts from disturbance and displacement. CHA will be undertaken if triggered by occurrence of qualifying species. Consideration will be given to whether a suitable site can be found, and thus to enable control/ reference surveys, as recommended (SNH 201), or not. Control site surveys are prerequisite for the Before-After-Control-Impacts ("BACI") methods to be implemented within the scope of post-construction monitoring. • Following completion of surveys, an assessment will be carried out to determine impacts and their significance, following CIEEM (2016) and SNH (2018) guidelines. The significance will be based on the relationship between receptor sensitivity and impact magnitude. Cumulative impacts will be identified where they are likely to occur. Appropriate mitigation will be developed to reduce any adverse impacts and enhance the beneficial.
2	Ecology and Nature Conservation – Bats	Potentially significant direct impact on protected bat species	Extensive survey work is required over a one-year period to ensure that a sufficient impact assessment and mitigation strategy can be developed within the ESIA. Initial bat surveys have already been undertaken, and the ESIA surveys will build up on those, ensuring full compliance with BCT (Hundt ed. 2012, Collins ed. 2016), and/or

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
			EUROBATS' (Rodrigues et al. 2015) guidance. Since EUROBATS and BCT guidelines are not fully compatible (e.g. details of survey methodologies), during the initial stage of the ESIA a decision will have to be made which will be followed as a key guidance for the methodological design. Bat surveys will include: • Investigation of roost sites. • Manual bat detector surveys at ground level (transects). • Automated bat detector surveys at WTG locations, • Automated bat detector surveys at height (if mast is available for installation of the equipment). • Mist-netting surveys. If woodland of conservation concern is not excluded from the development, the extent of all surveys will have to be much broader, and the effort needed will be greater. In particular, the surveys at WTG locations should be conducted continuously and above the canopy. CHA will be undertaken if triggered by occurrence of qualifying species. Following completion of surveys, an assessment will be carried out as part of the ESIA to determine impacts and their significance, following CIEEM (2016), BCT (Hundt ed. 2012, Collins ed. 2016), and EUROBATS' (Rodrigues et al. 2015) guidance. Significance will be based on the relationship between receptor sensitivity and impact magnitude. Cumulative impacts will be identified where they are likely to occur. Appropriate mitigation will then be developed to reduce any adverse impacts and enhance any beneficial.
3	Ecology and Nature Conservation – Woodland habitats of conservation concern and their plant species	Significant direct impact on habitats of conservation concern • Potentially significant direct impact on protected plant species and in particular orchids.	Extensive survey work is required over a one-year period to ensure that a sufficient impact assessment and mitigation strategy can be developed within the ESIA. Initial habitat and vegetation surveys have already been undertaken, and the ESIA surveys will build up on those, ensuring full compliance with PS6 and relevant best practice and guidance. Woodland habitat and flora surveys will include: • Walkover surveys, • Phytocoenological sampling (to record species and phytocoenoses). • Habitat mapping. If woodland of conservation concern is excluded from the development, extensive habitat and flora surveys throughout these habitats will not be needed, and Indicative Assessment of potential impacts will be considered appropriate for all other habitats at the site. CHA will be undertaken if triggered by occurrence of qualifying species. Following completion of surveys, an assessment will be carried out as part of the ESIA to determine impacts and their significance, following PS6 Guidance Note and CIEEM

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
			(2016) guidance. The significance will be based on the relationship between receptor sensitivity and impact magnitude. • **Since neither mitigation nor offsetting is considered adequate and effective, avoidance of these habitats has been advised.**
4	Ecology and Nature Conservation – Woodland fauna other than birds and bats	Potentially significant direct impact on protected fauna species	Extensive survey work is required over a one-year period to ensure that a sufficient impact assessment and mitigation strategy can be developed within the ESIA. Full compliance with PS6 and relevant best practice and guidance will be ensured. Woodland fauna surveys will include; • Walkover surveys (driven and walking transects, day and night), • Camera trapping. • Live trapping. If woodland of conservation concern is excluded from the development, extensive fauna surveys throughout these habitats will not be needed, and Limited Assessment of potential impacts will be considered appropriate for all fauna at the site other than birds and bats. CHA will be undertaken if triggered by occurrence of qualifying species. Following completion of surveys, an assessment will be carried out as part of the ESIA to determine impacts and their significance, following PS6 Guidance Note and CIEEM (2016) guidance. The significance will be based on the relationship between receptor sensitivity and impact magnitude. Appropriate mitigation will then be developed to reduce any adverse impacts and enhance any beneficial.
5	Socio-economic	Any acquisition of privately owned land, including forest land, may have impacts on livelihoods of individuals and their households and needs to be thoroughly investigated in the ESIA process. Although some of the impacts may affect only a small number of people and in that sense may be considered negligible, the impact on any one individual and his/her household could be significant. This refers to both positive impacts (e.g. the importance of new employment for a household or income from land acquisition contracts) and negative impacts (e.g. project related accidents involving community members). These risks and impacts, if not addressed	A rapid land acquisition survey will be undertaken, taking into account IFC PS5 requirements, with a sample of landowners whose land was acquired for the project and whose trees were affected (cut down), to determine if compensation was provided at full replacement cost and if livelihoods were affected, and if so, fully restored. During the survey interviews, people will be asked about general dependence of the local population on the affected land for any livelihood related activities, including exploitation of timber/firewood, mushroom or herb picking, etc. Other identified stakeholders will be consulted during the development of the ESIA, to determine if any other impacts are likely to occur during the construction and/or operation stage of the project and how they should be managed, in accordance with IFC PS1 requirements. This includes the few occasional visitors of houses in the project area, community representatives, hunting organisations active in the area, as well as organisations involved in environmental protection. Engagement with stakeholders will be carried out in accordance with IFC PS1 requirements and the guidance note 'Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets' (2007). More details will be provided in the Project Stakeholder Engagement Plan.

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
		appropriately, could cause severe tensions between the project and the local communities. The importance of any project, in an underdeveloped region such as Eastern Serbia, and particularly the municipality Žagubica, and the associated generation of revenue as well as any other benefits, is extremely high for the local government and the local population.	
6	Landscape and Visual Impact	The proposed WPP will have a direct impact on the physical landscape elements on the site due to removal of land cover and introduction of new tall structures (up to 210m to blade tip) with moving elements into a confined vertical forest landscape. The WPP will create new visual effects for people in the area.	The landscape and visual assessment will be based upon a desk study and field observations; An initial study area of 45km will be used for the Crni Vrh WPP. Zone of Theoretical Visibility (ZTV) models will be calculated using the ArcGIS software for a selected (or worst-case) turbine model. ZTVs will include both hub height and blade tip scenarios, with and without woodland screening; • The LVIA will examine the potential effects of the Project on the landscape and visual amenity of the study area; • Fieldwork will be undertaken to select the relevant viewpoints and take viewpoint photographs as a basis for visualisations; A range of visualisations (up to 10) will be produced (photographs, photomontages and wirelines) using the WindPro software in accordance with SNH Visual Representation of Wind Farms (2017); Mitigation measures will be proposed if necessary.
7	Shadow Flicker	• The WPP project has the potential to affect the receptors by shadow flicker, given that a number of summer houses are situated within the established study area.	A Study Area of ten rotor diameters (1,620m) around each proposed turbine will be established to meet the requirements of international best practice and identify all potential receptors. The potential receptors positions will be identified by using the national GIS database GeoSrbija. The shadow flicker model will be developed using the commercial WindPro software. The predicted effects will be evaluated for each receptor. A field survey will be undertaken to inspect the receptors predicted to be affected by more than 30 hours of shadow flicker per year. • Mitigation measures will be proposed if necessary.

Table 4-2 Summary of Level Two Issues

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
8	Ecology and Nature Conservation – Habitats other than woodland of conservation concern and their plant species	Potentially significant direct impact on protected plant species and in particular orchids • Potential impacts on habitats other than woodland of conservation concern not likely to be significant except possibly at the local scale, possibly even beneficial.	Targeted survey work is required during the vegetation season to ensure that a sufficient impact assessment and mitigation strategy can be developed within the ESIA. Initial habitat and vegetation surveys have already been undertaken, and the ESIA surveys will build up on those, ensuring full compliance with PS6 and relevant best practice and guidance. Habitat and flora surveys will include; • Walkover surveys, • Phytocoenological sampling (to record species and phytocoenoses) at the WTG locations and along the routes of the site access tracks. • Habitat Mapping of the WTG locations and the routes of the site access tracks. CHA will be undertaken if triggered by occurrence of qualifying species. • Following completion of surveys, an assessment will be carried out as part of the ESIA to determine impacts and their significance, following PS6 Guidance Note and CIEEM (2016) guidance. The significance will be based on the relationship between receptor sensitivity and impact magnitude.
9	Traffic and Transport Impact	Transportation and delivery of the WTG components and construction materials may cause occasional disruption on local roads and may affect the safety of road users. Susceptibility of the area to fog increases the traffic hazards. • These issues will be at their most intensive during the period of several months and can be readily mitigated by appropriate management measures.	A desk-based assessment of transport and traffic impacts will: • establish the baseline traffic conditions along the route, • estimate the traffic levels likely to be generated during the construction phase, • conduct qualitative assessment of potential impacts, and • propose control and mitigation measures. • A route survey report for large WTG components will be considered in the ESIA.
10	Operational Noise	Operational noise can cause a loss in amenity and therefore operational noise levels must be controlled to acceptable limits	An operational noise impact assessment will be carried out for the WPP in accordance with the relevant national and international Guidelines. Separate noise limits will be applied for the consideration of day-time and night-time impacts. During the night the protection of external amenity becomes less important and the emphasis will be on preventing sleep disturbance. Before the assessment can be made, all noise-sensitive receptors within 2,000 metres of a turbine must be identified. The field work must identify the status of all receptors in terms of the current occupancy and the potential for future occupation. A baseline noise survey will be undertaken at key representative locations of noise sensitive receptors. The survey will be carried out in combination with anemometry measurements to determine the wind speed at the proposed turbine hub height. It will

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
			encompass the range of wind speeds and wind directions during both daytime and night-time periods. Noise limits will be determined with reference to the background noise levels and with reference to Serbian and international guidelines including the IFC EHS Guidelines and UNDP Guidelines on the Environmental Impact Assessment for Wind Farms. The impact of the Crni Vrh WPP will be assessed with noise levels determined using computer modelling software. The assessment will consider all relevant noise sources and their nature (levels and frequency spectrums). Noise propagation will be modelled in accordance with International Standard ISO 9613-2: 1996 Acoustics – Attenuation of Sound Propagation Outdoors – Part 2: General Method of Calculation. This will be implemented using a computer model. Input parameters and limitation for the ISO 9613-2 parameters will be chosen with reference to the recommendations of the UK Institute of Acoustics Good Practice Guide. The detailed analysis of measurement data, software model calculations and existing input data will provide sufficient information to estimate if mitigation measures are required. Any cumulative issues will be considered.
11	Ice Throw and Ice Fall Risk	The wider WPP area is prone to ice build-up. Due to the regional climate features (freezing winter temperatures combined with wind), icing events and icing on roads, and power lines is common in winter. There are summer houses within the recommended ice throw setback of 430m. Ice fall presents an OHS hazard.	The empirical approach suggested by the IFC EHS Guidelines for Wind Energy (2015) to determine a setback for ice throw will be followed. All potential receptors that might be affected by ice throw within the 500m-radius will be identified: owners of the summer houses, users of roads and footpaths. Receptors will include the WPP staff and maintenance contractors. A qualitative ice throw risk assessment will be undertaken in the ESIA. It will consult the 2018 International Recommendations for Ice Fall and Ice Throw Risk Assessments by IEA Wind Task 19: Wind Energy in Cold Climates. Based on the assessment, mitigation measures will be proposed, including an outline of an ice management plan.
12	Forest Fire Risk	The major natural hazard at the site are forest fires. Crni Vrh Mt. has a history of forest fires, with the most recent one in summer 2017. Climate change is considered in Serbia to be one of the driving factors in increasing the forest fire potential.	A desk-based analysis of the historical forest fire data for Crni Vrh (2000-2020) will be provided. Vulnerability of the WPP project to climate change will be assessed, based on the regional models for Serbia. A qualitative forest fire risk assessment will be undertaken; Subsequent consultation with Serbia Forests, aviation safety and fire authorities for the Location permit will be referenced in the ESIA. An outline of a forest fire prevention and response plan will be provided.
13	Cumulative Impact Assessment	The Crni Vrh WPP has the potential to generate cumulative environmental	Information on other proposed WPPs will be inquired from local authorities.

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
		impacts with other potential WPP developments in the region.	A desk-based qualitative assessment will consider all WPP developments that will be likely to use the same Danube River port, part of the route for delivery of large turbine components, or roads for the transport of construction materials (including the same borrow pits). Management and mitigation measures will be proposed where necessary. For the cumulative LVIA, the SNH guideline: Assessing the Cumulative Impact of Onshore Wind Energy Developments (2012) will be followed. A study area of 60km will be established. Depending on the identified cumulative WPPs, cumulative ZTV plans will be created and representative cumulative viewpoints selected. Cumulative visualisations will be produced (if relevant). A cumulative noise assessment for operational impacts will be carried out if there are any proposed schemes which are predicted to have noise levels within 10dB of those from Žagubica.

Table 4-3 Summary of Level Three Issues

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
14	Ecology and Nature Conservation – Non-woodland fauna other than birds and bats	Potential impacts not likely to be significant except possibly at the local scale	Limited survey work is required over a one-year period to ensure that a sufficient impact assessment and mitigation strategy can be developed within the ESIA. Full compliance with PS6 and relevant best practice and guidance will be ensured. Woodland fauna surveys will include: • Desk studies, • Walkover surveys (driven and walking transects, day and night). CHA will be undertaken if triggered by occurrence of qualifying species. Following completion of surveys, an assessment will be carried out as part of the ESIA to determine impacts and their significance, following PS6 Guidance Note and CIEEM (2016) guidance. The significance will be based on the relationship between receptor sensitivity and impact magnitude. Appropriate mitigation will then be developed to reduce any adverse impacts and enhance any beneficial, as applicable.
15	Noise during construction and decommissioning.	Construction noise can sometimes be audible but is generally for a limited duration and only takes place during normal working hours.	Construction noise impacts will be managed within the CESMP. This must include mitigation measures and procedures for dealing with complaints. Any especially noisy activities such as blasting must be identified. The need for out-of-hours working must also be considered. Noise effects from the transportation of construction materials and turbine components can be managed in the Traffic Management plan.
16	Archaeology and Cultural Heritage	During the construction phase there is a potential to have a direct and permanent impact on unknown archaeological features within the site. The wider site area has potential presence of archaeological features.	Pre-construction archaeological field survey will be undertaken by the Institute for Cultural Heritage in Niš which will set the terms and conditions for the construction phase. The survey findings will be referenced in the ESIA. Mitigation and management measures will be proposed to ensure that the Institute's requirements are properly implemented.
17	Surface Water and Effluent	The identified impacts of surface water can be readily managed and mitigated as an integral part of the design and construction process.	A desk-based qualitative assessment of surface water impacts will be undertaken to identify drainage patterns, areas vulnerable to erosion or sediment deposition and pollution risks. Where appropriate, additional mitigation measures will be identified prior to determining the likely significance of residual effects.
18	Land and Groundwater	The key impacts on land and groundwater may occur during the WPP construction. The impacts during the operational and decommissioning phases are considered to be less significant.	A desk-based assessment will be undertaken and the potential of the earth works to affect the local groundwater aquifer will be assessed. The need for additional water abstraction to service the construction of the WPP will be considered.

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
			A desk-based review of private water supplies or taped sources will be undertaken, followed by a field survey and risk assessment if necessary. Mitigation measures will be proposed for individual wells or taped sources identified to be under the risk.
19	Aviation Safety and Radar Physical Obstructions	Serbian civil aviation regulator confirmed that the Crni Vrh WPP will have no influence on flight safety (provided that turbines are lighted and marked). The national weather office required an impact assessment study on a nearby weather station radar.	Subsequent consultation with the statutory stakeholders will be followed and referenced in the ESIA.
20	Electromagnetic Interference and Radio Communication	Consultation with broadcast and telecommunication stakeholders has not identified any constraints for the project.	Subsequent consultation with the statutory stakeholders will be followed and referenced in the ESIA.
21	Ecosystem Services	Potential impact on ecosystem services will be limited and short-term, and readily mitigated by appropriate management measures and compensation.	Stakeholder consultations will determine the ecosystem service beneficiaries and the extent to which they benefit from the services provided. If any priority ecosystem services are identified, a range of measures will be proposed to minimise, compensate or offset potential adverse impacts on the affected people.
22	Air Quality	The measures to control dust and exhaust emissions during the WPP construction are part of the good construction practice commonly used at construction sites.	A desk-based qualitative assessment will be done in the ESIA and control and mitigation measures proposed.
23	Community Health Safety and Security	The WPP site is situated in an inhabited area with scattered individual summer houses and a local road frequented by less than 500 vehicles per day. Apart from the ice throw and traffic hazards, other issues are considered less relevant.	A qualitative risk assessment concerning the potential risks to the general public and workers associated with the construction and operation of the WPP.

5 Technical Description of the Crni Vrh WPP

5.1 Selection of the Crni Vrh Site

The proposed site was selected for the development of the Crni Vrh WPP as:

1. This eastern part of Serbia has a significant wind resource. A study undertaken by Vattenfall[1] for EMS confirms an average wind power for the area in excess of 300 W/m^2 (at 100m a.g.l). This is one of the highest in Serbia, see Figure 5-1 (the location of the site is circled in red).
2. The proximity to the 110 kV power grid, which allows the connection of significant power and the possibility of reliable and flexible transmission of electricity.
3. The area is sparsely populated and the connection to the national highway network is good.
4. Proximity to the Zijin mining and smelting complex at Bor. The complex has a high electricity demand and the current owner is expected to develop further mines in the area.

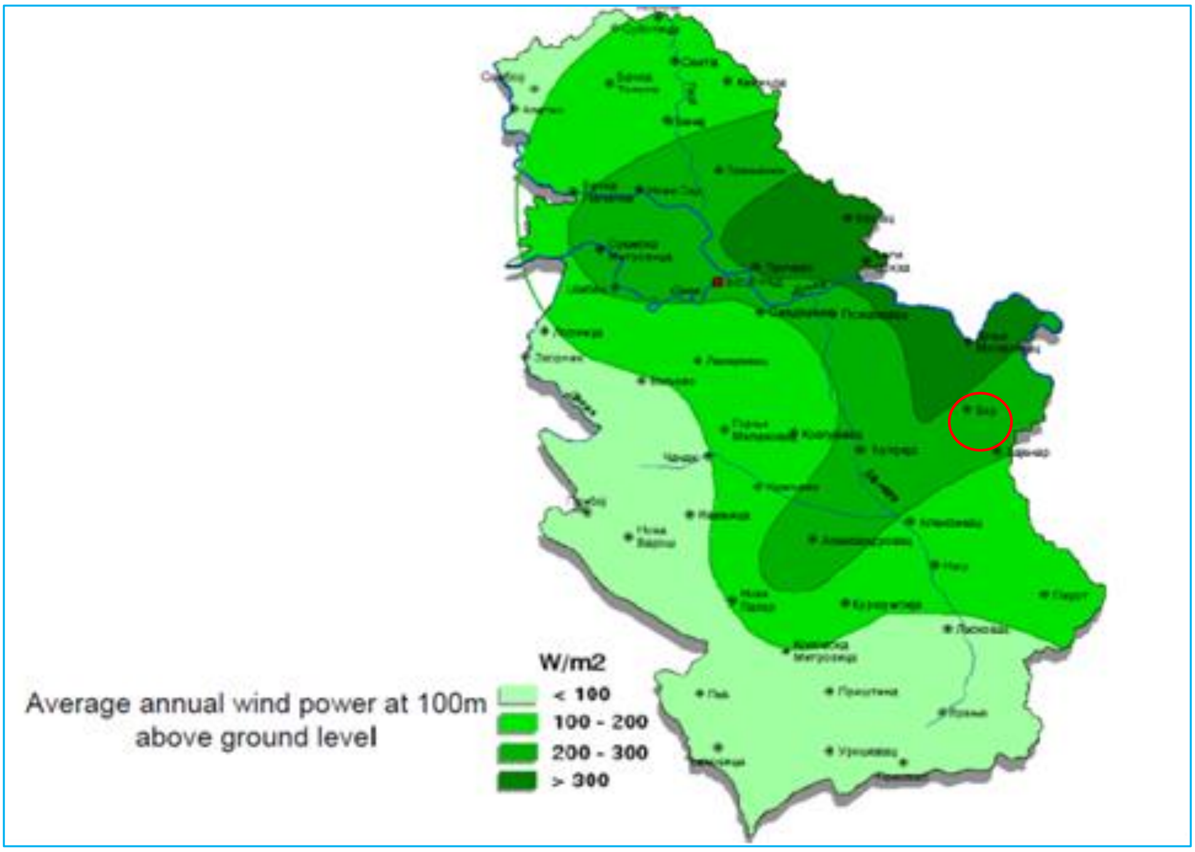


Figure 5-1 Wind Power Map of Serbia

5.2 WPP Location

The Crni Vrh WPP will be located in a of Eastern Serbia about 12km west of the small town of Žagubica and 17km north-west of the town of Bor in Eastern Serbia (Figure 5-2). The approximate centre of the site is North: 44° 10' 45.64", East: 21° 56' 37.83". The site is between 700 m and 900 m above sea level. The total development site area is c. 2,706 hectares.

[1] "Power network analysis for the integration of wind power in Serbia", developed by Vattenfall Europe Powerconsult GMBH

Figure 5-2 Project Location

The landscape is dominated by mountain ridges of moderate slopes and valleys. It is noted that the Crni Vrh Mountain forms part of the most significant metal mining area in the Balkans, known as Timok Magmatic Complex. The mountain is rich in metallic minerals and ore deposits (copper, gold, silver, etc).

The area in and around the project site is characterised by woodland (both natural and cultivated), open meadow and low-grade agricultural land. CVP propose to position the WTGs along the highest points of two parallel ridges extending in the south-north direction of the Crni Vrh Mountain (see Figure 5-3, below). The narrow valley between the ridges is crossed by a number of small, intermittent streams and forest tracks.

As discussed at the beginning of this Chapter it is expected that some of these WTGs will be dropped from the final scheme.

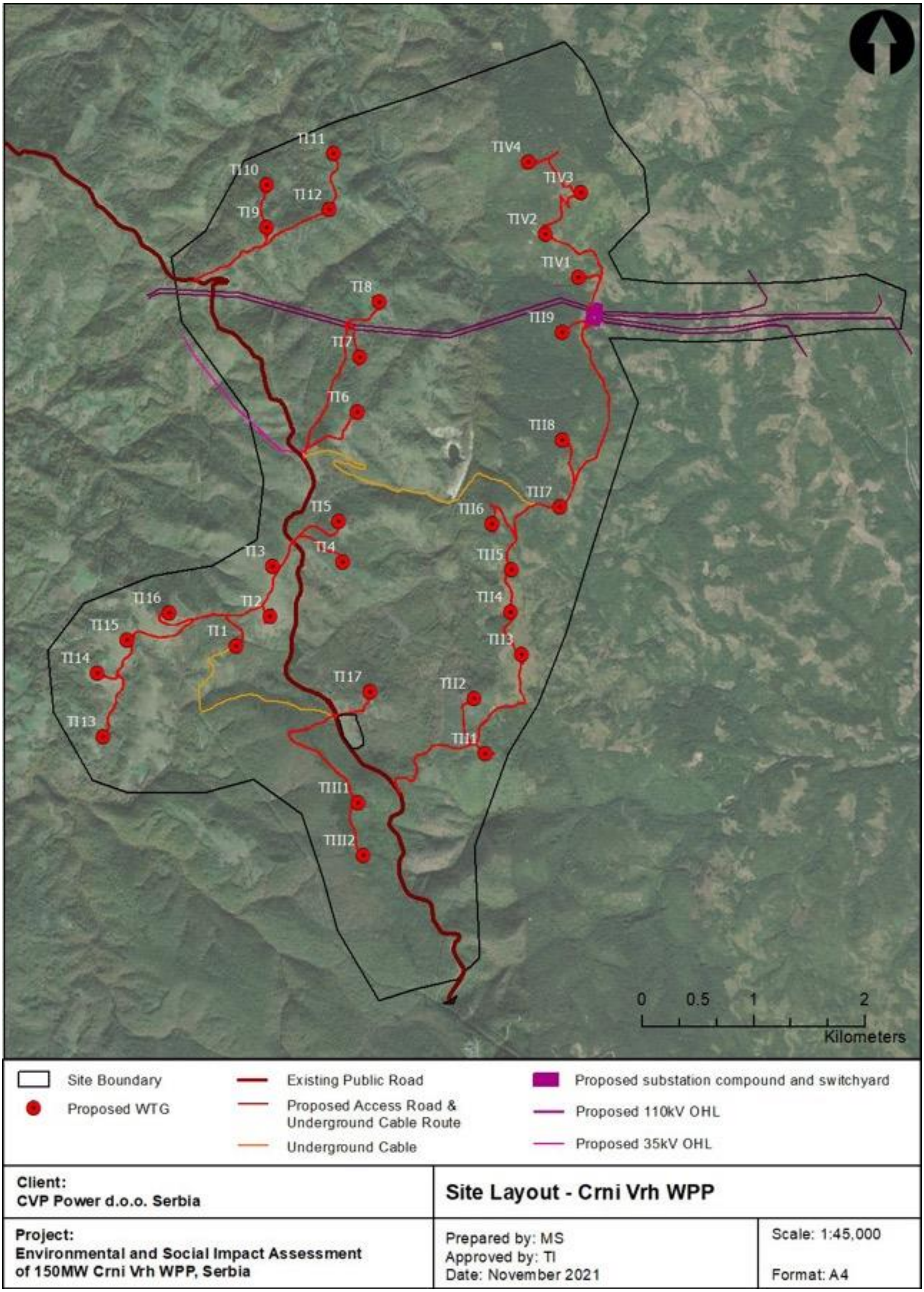


Figure 5-3 Conceptual Location of the WTGs, Site Access Tracks, and Sub-station

Whilst the area around the WPP site is open and mountainous there are a number of developments that have caused the progressive industrialisation of the area. These developments include (see Figure 5-4):

- An old, open cast copper mine is situated in the valley, adjacent to a forest road that may form an access road for the project. The "Lipe" mine closed in 1967. Further information about the Lipe mine is provided in the Surface Water and Drainage section.
- About 500m from the southern boundary of the site is the ski resort of "Crni Vrh". The resort is very small and comprises two ski runs and one ski lift. Within the centre is a huge unfinished hotel complex partially built in the late 1990s and abandoned since 2000.
- The closest active open pit copper mine is Cerovo, about 6km east of the site. The Cerovo mine reopened in March 2020.
- About 7km south-east, in a valley below Crni Vrh Mountain is the Bor Jezero reservoir built in 1959 to provide water supply for the copper smelting plant. The reservoir has become a centre for local tourism and recreation.
- About 17km to the south-east is the town of Bor. This is a regional industrial centre with a large copper smelting plant and several active open pit mines. Further information about the copper smelting plant is provided in the Air Quality section.
- About 12km to the west is the small town of Žagubica, the administrative centre of the municipality, and the closest town to the site.

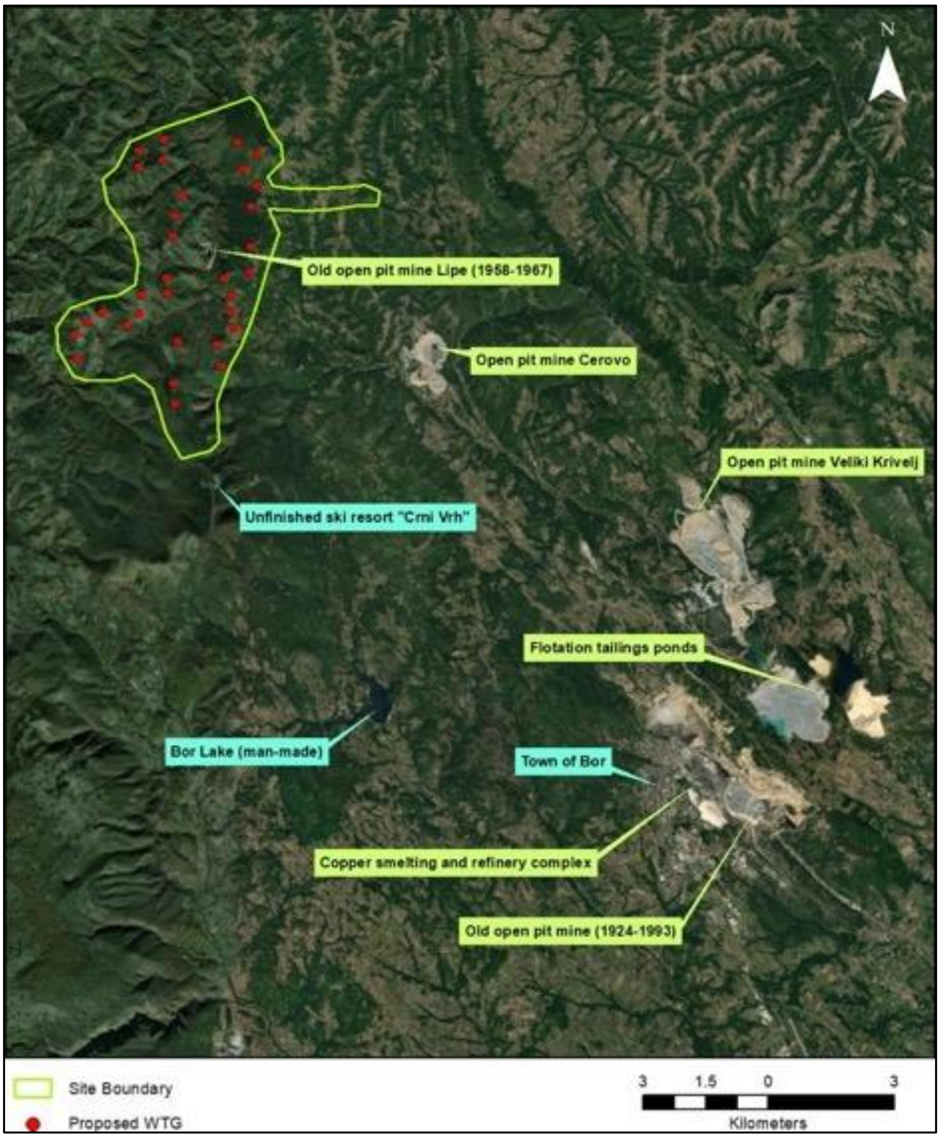


Figure 5-4 Notable Features in the Area Around the Development Site

5.2.1 Site Access

The existing road network is good and the regional roads provide connection to the motorway E-75 in the west and the Danube River in the east. Other roads away from the regional roads are class II state roads that pass through small towns and villages. The Project site can be accessed by the state road No. 161 via Bor or Žagubica.

The road network in the area around the Crni Vrh WPP is shown in Figure 5-5. The Crni Vrh WPP will have a single entrance. This entrance will be from the state road No. 161 Žagubica-Brestovac which crosses the western part of the site.

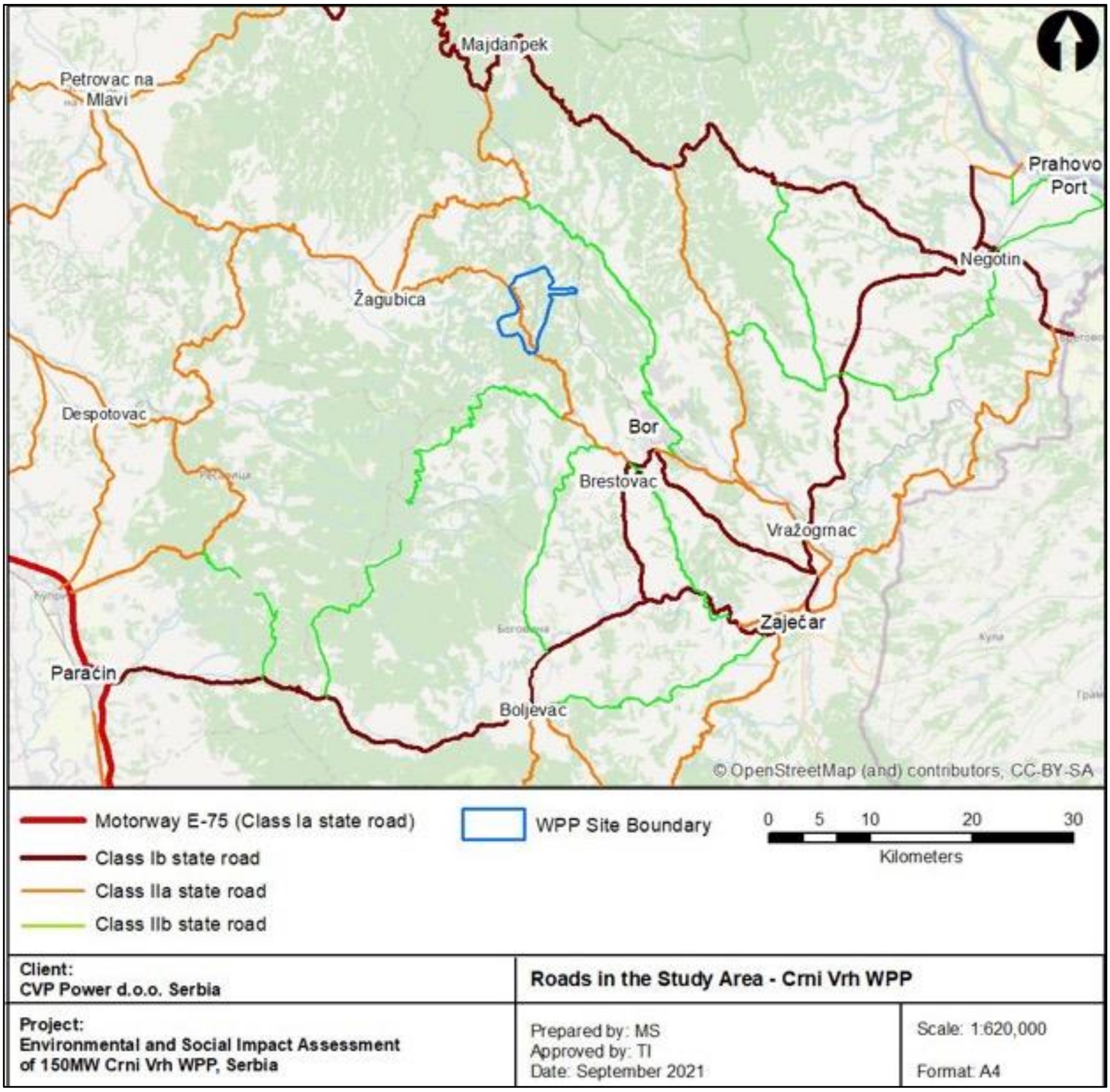


Figure 5-5 Road Network in the Study Area

5.3 WPP Design

The Crni Vrh WPP will include up to 32 Wind Turbine Generators ("WTGs") with a maximum total installed capacity of 158.4 MW. The final number of WTGs to be installed will depend on the size and generation capacity of the turbines selected. For example, if a 6MW unit is used then only 25 turbines will be required to achieve the permitted installed capacity. This flexibility meant that the ESIA specialists, working closely with CVP, could develop the final layout of the turbines in order to minimise impact – the primary mitigation of the

WPP. As this is such a significant activity, the development of the WPP design has been described in detail in Chapter 12 of this ESIA report.

At the time of writing, it had not been decided if an existing, commercial concrete batching plant will be used for the Project or if a plant will be constructed on or near the construction site. For the purposes of the ESIA it has been assumed that an existing, off-site plant will be used. The ESMMP includes actions for each option.

This Chapter (5) describes the basic design and operation of the WPP.

5.3.1 Main Plant and Equipment

The five basic steps of electricity production from wind power plants are:

- Wind turbine blades are turned by the power of the wind;
- the blades turn a rotating generator in the nacelle which converts wind energy to electricity;
- a transformer in the base of the turbine tower increases the electricity voltage for transmission to the substation by underground cables;
- the substation increases voltage for transmission over long distances;
- the electricity is transferred to the grid and distributed to the power users.

WTGs consist of a hollow steel tower topped with a nacelle and its rotating blades. The nacelle houses the generator, gearbox, transformers and control systems. The tower is bolted to substantial concrete foundations. See Figures 5-6, 5-7 and 5-8.

Commercial scale WTGs comprise a three-bladed rotor. Each blade is typically constructed from fibreglass reinforced epoxy resin. Lightning protection is generally incorporated into the blades, with receptors located at multiple points along the blade length.

A WTG tower typically comprises a number of tubular steel sections. Each section is transported to site separately. The bottom section of the tower is bolted to the foundation ring and each additional section is lifted into place using a large crane. Each section is bolted to the one below.

In principle, increasing the WTG tower height results in the WTG being exposed to higher wind speeds and will therefore result in increased energy generation.

Once the tower is completed the nacelle is lifted in to place. The hub, with its blades, are then lifted and attached to the nacelle.

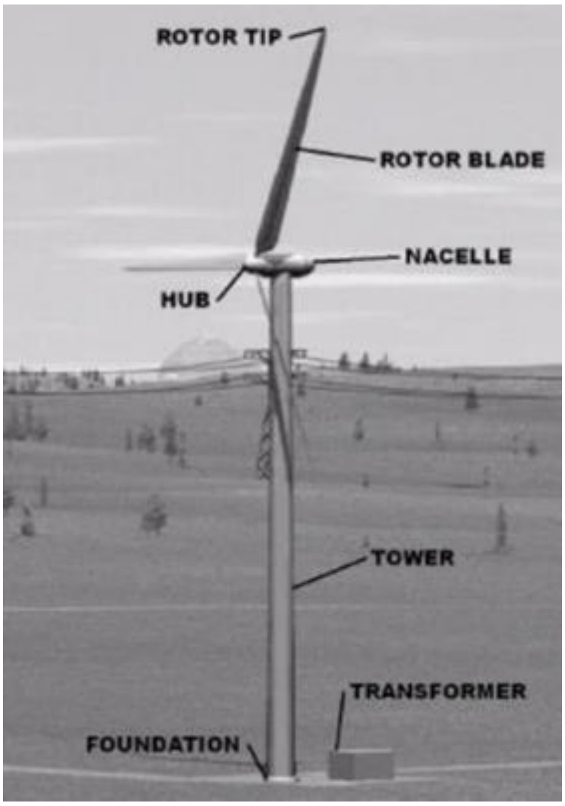


Figure 5-6 Main Elements of a Wind Turbine Generator

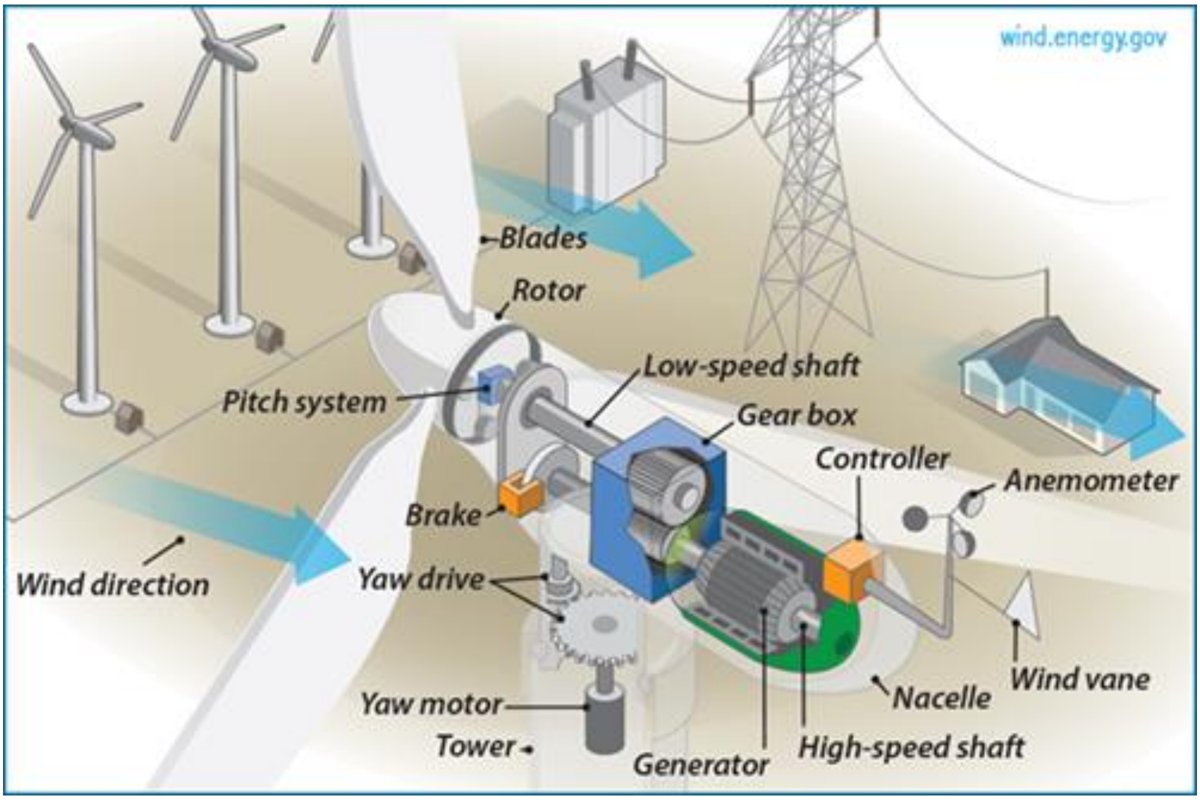


Figure 5-7 Generic Wind Turbine Generator

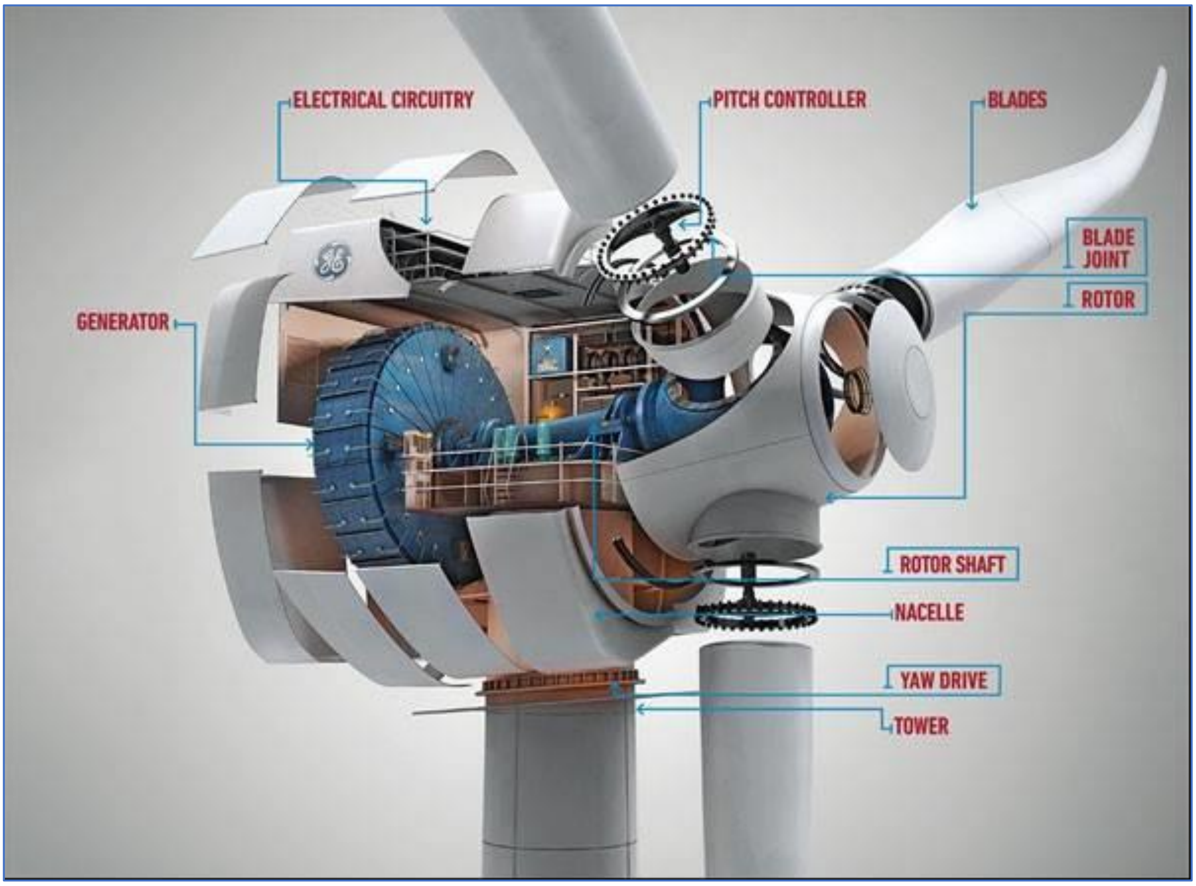


Figure 5-8 Elements of a WTG Nacelle (Source: GE)

The basic operation of each turbine is controlled by its' own computer systems. The operation of the turbines is monitored from the control room but all of the WTGs can be monitored and managed remotely. It is normal for the wind turbine manufacturers to monitor each unit from a central or regional control room. This means that the turbines are monitored continuously, 24 hours per day, 365 days per year.

The turbine nacelle is rotated by the yaw motor so that the rotor points directly towards the wind, see Figure 5-7 and Figure 5-8. This is in the same way that the sails on a boat are oriented towards the wind by the crew. The direction of the wind is sensed by the wind vane and the wind speed is monitored by and the anemometer. The WPP also has a tall mast where the meteorological sensors are mounted. This mast is typically much taller than the turbines.

When the wind reaches and maintains constant speeds of over 3 m/s, the turbine rotor will start to rotate in a clockwise direction. The rotor shaft slowly drives the gearbox that converts the mechanical energy into electrical energy through an electrical generator (which spins at a much higher speed than the rotor).

At a constant wind speed of 3 m/s each turbine will generate about 20kW. At 6 m/s, the output is about 0.600MW but this rises sharply to the maximum power output at a wind speed of 10 to 12 m/s, when the turbine will generate the design or rated power, 5 to 6MW in this case.

At wind speeds above 25 m/s, the turbine blades are stopped by the control systems to prevent excessive wear and tear on the mechanisms. The blades are stopped by rotating the blades on the hub. This change of blade angle (the pitch of the blades, see Figure 5-8) means that the blades are no longer driven by the wind; a process called "feathering" the blades.

Most of the electricity produced by the wind power plant will be transferred to the grid but a small amount of electricity is used by the turbines (e.g. the yaw motor and pitch controls) and on-site control facilities.

5.3.2 Turbine Selection

At the time of writing, the turbine supplier or model had not been selected. CVP are considering four suppliers, each company has been designing, installing and operating wind power plants for many years. The WTG suppliers currently under consideration are listed in Table 5-1, below.

Table 5-1 Potential WTG Suppliers and Models

Potential Supplier	WTG Generating Capacity (MW)	Overall Rotor Diameter (m)	WTG Hub Height (m)
GE 158 5.5MW	5.2	158	120.9
Nordex N149 5.7MW	5.7	149	105.0
Nordex N163 5.7MW	5.7	163	118
Vestas V150 5.6MW	5.6	150	105.0
Vestas V162 5.6MW	5.6	162	125.0
Siemens Gamesa SG 6.0-155	6.2	155	102.5

This table illustrates that the WTGs being considered for the Crni Vrh WPP vary in generating capacity and physical dimensions. The ESIA has been undertaken on an assumed 'worst case', i.e. the physically largest WTG, the Nordex N163 (the "Candidate" WTG). The dimensions of this unit are shown in Table 5-2, below.

Table 5-2 Worst Case Dimensions of the WTGs

N163 5.7 Dimensions	metres
Rotor diameter (max)	163
Hub height (max)	118
Overall height (max)	206

5.4 Wind Power Plant Design and Compliance with GIIP

The IFC Environmental, Health, and Safety Guidelines for Wind Energy (2015) do not provide a description of GIIP in relation to the design and mechanical performance of the WTGs. Rather, the Guidelines describe the potential impacts on WTGs on the natural environment. Specifically, the Guidelines require the ESIA for a WPP to consider environmental issues specific to the construction, operation, and decommissioning of wind energy projects such as:

- Landscape and Visual impacts;
- Noise;
- Biodiversity;
- Shadow Flicker;
- Water Quality.

These topics, which are considered in detail in other sections of this ESIA report.

The IFC EHS Guidelines have been used as a reference point for the management of the general environmental risks encountered during construction, operation and decommissioning of the Crni Vrh WPP. These basic requirements will be managed by the design and implementation of an Environmental and Social Management System ESMS). A project ESMS was developed for the Crni Vrh WPP, see Chapter 17 of this ESIA.

5.5 Summary of WPP Components

Table 5-3 provides a summary of the Crni Vrh WPP components and the equipment or materials that will be transported to site.

Table 5-3 Summary of WF Components

Component	Description	Materials required
Wind Turbine Generators	Each WTG requires a reinforced concrete foundation suitable to the size	The main electrical and control equipment is likely to be manufactured in Europe. The WTG

	of the turbine, the ground conditions, and the stresses that will be placed on the tower.	towers and the fibreglass blades can be sourced world-wide. The nacelle will include the rotor, gearbox, generator, yaw motors and control equipment. The sectional tower includes earthing/ copper rope, power and optical cable, SCADA control equipment, heating ventilation and air conditioning equipment, thermal insulation, lighting, and security equipment. The foundations will be constructed on site from concrete with reinforcement steel.
On-site substation - transformer station	The WTGs will be connected by 33kV underground cables (about 36km) to a new 33 kV/110 kV or a reconstructed existing power transformer station.	To be sourced from Serbia or Croatia depending on selected contractor.
OHL to connect the PP to the national grid	The Crni Vrh transformer station will be connected to the electricity transmission grid by three x 110 kV double parallel or (potentially) double circuit overhead transmission lines; one at 1.7km, one at 2.7km and one at 4.2km in length.	To be sourced from Serbia or Croatia depending on selected contractor.
Underground electrical cabling/ collection system	Medium voltage cables taking power to the sub-station will be buried in trenches running alongside the site access tracks. Communication links between each wind turbine, the meteorological mast and the control building/ substation will also be buried in trenches alongside the site access tracks.	To be sourced from Serbia or Croatia depending on selected contractor.
Site access tracks	A series of access tracks will be required to link the WTGs to the infrastructure on the site. Existing tracks will be upgraded wherever possible. A total of 25.5km of access tracks.	Constructed using sand, gravel, and crushed stone. It is intended that these materials will be obtained from facilities in Bor, Žagubica or Majdanpek. If the local materials do not meet the required standard, then alternative quarries will be materials identified.
WTG maintenance pads	Each turbine would require a work area to accommodate the crane and turbine components during construction. The majority of this construction area will be removed once construction is complete. A maintenance pad (about 50m by 30m) will remain next to the base of each turbine.	Constructed using sand, gravel, and crushed stone. It is intended that these materials will be obtained from facilities in Bor, Žagubica or Majdanpek. If the local materials do not meet the required standard, then alternative quarries will be materials identified.

It is intended that the concrete required during the construction of the Crni Vrh WPP is sourced from a commercial batching plant on the outskirts of Bor. Construction materials will be sourced from off-site locations as the quality of rock on-site is not suitable for stone aggregate required for the access roads and crane hardstandings. There is no requirement to create on-site quarries or borrow pits.

This means that the development of the Crni Vrh WPP does not require the development or construction of any associated facilities (as defined by IFC guidance). Associated facilities, are facilities that are not funded as part of the Project and that would not have been expanded if the Project did not exist and without which the Project would not be viable.

5.5.1 Site Entrance and Internal Access Tracks

The Crni Vrh WPP will have a single entrance. This entrance will be from the state road No. 161 Žagubica-Brestovac which crosses the western part of the site.

The area is used extensively for commercial forestry and is already crossed by a large number of access tracks. Where possible, CVP have positioned the WTGs alongside these tracks. The tracks will need to be upgraded to allow construction vehicles, erection cranes and WTG component delivery. Once the WPP is completed, the tracks will be used by the maintenance teams. The WPP will be provided 25.5km of upgraded tracks. The site tracks are shown in red in Figure 5-3.

5.5.2 Control Building, Cabling, Transformers, Sub-station and Grid Connection

The WTGs will be connected by 33kV underground cables (about 36km) to a new 33 kV/110 kV Crni Vrh transformer station and reconstructed existing Krst power transformer station (which is not operational at time of writing). The new Crni Vrh sub-station will be connected to the electricity transmission grid by three x 110 kV single overhead transmission lines; one at 1.7km, one at 2.7km and one at 4.2km in length. The reconstructed Krst sub-station will be connected by one 110 kV double parallel or double circuit (still to be decided) overhead transmission line at 1.6 km in length, roughly along the route of the existing medium-voltage line (Official Gazette of the City of Bor, no. 29/2021a, b, see Figure 5-3).

The OHLs will be constructed within the scope of the Crni Vrh Project, though handed over to EMS after the construction according to applicable legislation. This means that the management and maintenance of the OHLs during the operation will be the sole responsibility of the EMS, and only EMS will hold the right-of-way and any other access rights.

Along the routes of the OHLs two distinctive zones will be established (Official Gazette of the City of Bor, no. 29/2021a, b) according to applicable legislation:

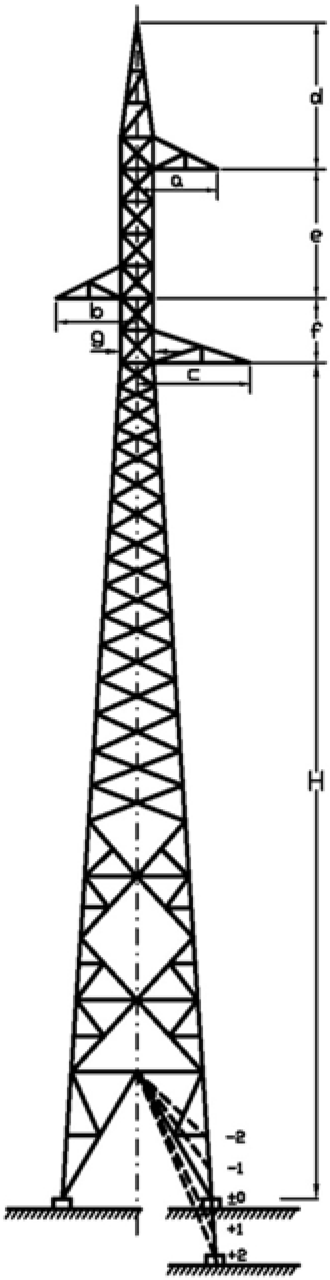
- The **construction zone**, with a total width of about 10.0 m (2 x 5.0 m), where OHL towers will be constructed and right-of-way applies for construction, supervision and regular maintenance.
- The **protective zone**, with a total width of about 60.0 m (2 x 30.0 m), with the aim of providing, above all, technical security, safe and efficient operation, and protection of the environment from possible impacts. The outer boundary of the protective zone is also the boundary of the planning scope for OHLs.

OHLs will consist of single circuit (possibly double circuit in one case) steel lattice suspension towers (commonly referred to as pylons). The key elements and technical parameters of the Project OHL main (support type) tower are shown in Figure 5-9. The towers will be up to 39.1 m high to the top. The towers will have vertical cable configuration, with cables at four levels – three bundled phase conductors and an earth wire on the top. Minimum clearance (distance between two different phase conductors or between a conductor and earth wire) will be 3.4 m.

The new Crni Vrh sub-station will be located on the north-east corner of the site (marked in purple in Figure 5-3). This location has been chosen as it close to the 110 kV line that runs north-south to the east of the site. In addition, there is alternate route to the west of the substation and switch yard (connecting to OHL no.122 B). The existing KRST sub-station is located on central-west margin of the site, adjacent to the state road and close to the 110 kV line that runs north-south to the west of the site.

The control room for the WPP will be located in the electrical sub-station. The sub-station will include welfare facilities for the WPP operators and the Operation and Maintenance Contractor.

The Crni Vrh WPP will have an on-site control room, although the basic operation of each turbine is controlled by its' own computer systems. The on-site control room will be managed by a specialist team provided by the O&M Contractor. The on-site control room will be staffed from 08:00 to 16:00 from Monday to Friday. The control room team will also operate an out-of-hours standby system to manage breakdowns or emergencies. The operation of the turbines will be monitored from the control room although all WTGs can be monitored and managed remotely. It is normal for the wind turbine manufacturers to monitor each unit from a central or regional control room. This means that the turbines are monitored continuously, 24 hours per day, 365 days per year.



TIP STUBA TOWER TYPE (SUSPENSION)	**SC-C**
NOMINALNI NAPON RATED VOLTAGE	**110 kV**
FAZNI PROVODNICI CONDUCTORS	3 X ACSR 240/40 mm²
NAPREZANJE PROVODNIKA TENSION OF CONDUCTORS	σ=9.0 daN/mm²
ZAŠTITNO UŽE EARTH WIRE	1 x E-AlMg1/Fe 95/55 mm²
NAPON U ZAŠTITNOM UŽETU TENSION OF EARTH WIRE	σ=15.0 daN/mm²
SREDNJI RASPON WIND SPAN	a_{sr}=390 m
GRAVITACIONI RASPON WEIGHT SPAN	a_{gr}=600 m
PRITISAK VETRA WIND PRESSURE	P_v=75 daN/m²
DODATNO OPTEREĆENJE ADDITIONAL LOAD OF ICE	DT=1.6x0.18$\sqrt{d}$ daN/m'
UGAO SKRETANJA TURNING ANGLE	α=0°

Dimenzije glave Head dimensions (m)	
a	2,800
b	2,800
c	3,750
d	3,400
e	3,400
f	1,700
g	1,062

Domen primene stuba Tower domain of use			
Pv (daN/m²)	75	90	90
a_{sr} (m)	390	325	325
K	1,6	2,5	4,0
a_{gr} (m)	600	450	319

(*)Napomena: Težina necinkovanog čelika

RASPON VISINA
HEIGHT RANGE H=9.60 - 30.60

Figure 5-9 Generic Design and Technical Parameters of the Project OHL Support Tower

Source: CVP, with modification by B. Karapandža.

5.6 Construction of the Crni Vrh WPP

It is CVPs current intention to appoint an Engineering, Procurement and Construction (“EPC”) contractor to construct the WPP on their behalf. It is likely that one or more separate contractors will also be employed to undertake the civil work including the construction of the WTG foundations, access roads and crane pads. Specialist contractors would be employed to construct the electrical sub-station and overhead power line to connect the WPP to the grid.

Construction activities will include:

- Surveying of the site.
- Installation of signage at the site entrance.
- Clearance of vegetation and/ or crops for:

  - Construction compound, including equipment and material storage areas.
  - Lay-down areas.
  - New access tracks.

- Upgrading of the site tracks and construction of new access tracks to each WTG.
- Establishment of the construction compound (includes offices, welfare facilities, parking, secure stores for hazardous materials and wastes, storage areas for recyclables and non-hazardous wastes).
- Storage of construction materials and equipment in laydown areas.
- Operation of construction plant along the access roads and on the project site.
- Levelling and excavation (for WTG pads and foundations).
- Storage of earthen materials.
- Installation of electrical infrastructure.
- Cement pouring (for WTG foundations).
- Installation of WTGs.
- Installation of the new transformer.
- Testing of the WTGs and new transformer.
- Commissioning the WPP and control systems.
- Landscaping the turbine bases.
- Final surfacing of the access tracks and maintenance pads.
- Removal of the construction compound and temporary lay-down areas (the land is to be restored to agricultural use).

The construction compound is temporary and will be removed following the completion of the construction. This compound will be used for storage of construction machinery, materials and wastes as well as the location for site office and welfare facilities. It will also include an area for worker and visitor parking.

The installation of the WTGs will require two, or possibly three, large cranes. The biggest crane is transported to the site by truck and assembled on site. A construction pad (of compacted crushed stone) will be prepared at each WTG location to support the weight of the cranes. These pads will remain in place for the life of the WPP and will be available for use by access cranes should any major repair be required to the turbine. If the terrain permits, the large crane will move under its own power ("crawling") from one to the construction pad to the next. If the terrain is unsuitable (too soft, wet or steep), then the large crane may need to be disassembled and be moved along the service track and re-assembled at the next WTG location. The WTG components will be placed on the construction pad before being lifted into place. The base of the tower is bolted to the foundations. Each tower section is lifted into place and bolted to the section below. The blades may be bolted to the hub before being lifted to the nacelle or may be fixed once the hub is in place; this varies by turbine manufacturer.

The smaller, crawler cranes will be moved from one WTG location to the next along the site tracks. Existing tracks will be upgraded during the initial site preparation work and will connect the WTGs and the substation compound. The total length of these tracks has not yet been determined and would be subject to final design and micro-siting by the EPC Contractor. The roads will be constructed to a specification similar to the access road, including roadway preparation, stormwater controls, and placing gravel where needed. Roads connecting the compound to the WTGs will be about 4 to 6 m wide, again similar to the access road.

A 33-kV underground power transmission line will be placed alongside each of the access tracks. These cables will be armoured with woven metal and buried to a depth of about 1m. Trenches will be approximately 1m wide. Excavated material will be used to backfill the trenches, with stockpiled topsoil and subsoil placed on the surface.

Due to the size of the turbines, it will be necessary to construct substantial foundations. Each WTG foundation is likely to be about 550 m^2 and at least 3m deep. Piling may be required for some of the WTG foundations depending on the local ground conditions. The location of the concrete batch plant that will provide concrete for the foundations has not yet been established but it is likely that it will be off-site.

About 1,000m^3 of concrete is required to complete the foundations for each WTG. The supplier of the concrete has not yet been established but it is likely that CVP will use it will be off-site. Steel reinforcement for the structural concrete is expected to be sourced from a local provider but this will be confirmed at a later date.

The WTG maintenance pads, which each cover an area of 2,000 to 2,500 m^2 depending on the terrain. Each pad will be surfaced with compacted, crushed stone. This crushed stone may be obtained during the levelling of the WTG maintenance pads or from borrow pits within the site.

The supplier of the WTGs has not yet been confirmed but they will be manufactured outside Serbia. It is likely that the WTG components will be brought to Serbia on the Danube River and off loaded at the port of Prahovo. The likely route from the port of Prahovo to the site is c. 100km long and will include a trans-shipment area 20km from the site.

For each WTG, a maximum of ten abnormal loads will be required to be transported to site on oversized road transporters from Prahovo Port to the trans-shipment area (20 total trips in and out):

- WTG tower sections – Five loads per WTG (hub, top section, middle 1, middle 2, bottom section), each transported separately.
- Blades – Three loads per WTG, each transported separately.
- Nacelle – One load per WTG.

The transport from the trans-shipment area to the site will require blade lifters (2 per WTG) and modular trailers for the other components.

Drivetrain (one load per WTG) will be transported directly from Prahovo to the site.

5.7 Operation of the Crni Vrh WPP

The control room for the WPP will be located in the electrical sub-station. The sub-station will include welfare facilities for the WPP operators and the Operation and Maintenance Contractor (“O&M”).

The operation and performance of the WTGs will be managed by a specialist team provided by the O&M Contractor. These individuals will be based at the on-site control room within the WF Control Building. The on-site control room will be staffed from 08:00 to 16:00 from Monday to Friday. The control room team will also operate an out-of-hours standby system to manage breakdowns or emergencies.

The O&M Contractor will also provide continuous monitoring of the WTGs (including any fault or failure conditions) from an off-site Control Room. Should any operational issues arise then the O&M Contractor will try to resolve these from the Control Room and send an information email to their local team in Serbia. The operation of the sub-station is the responsibility of CVP, while the Interconnection infrastructure is the responsibility of the Serbian statutory transmission Electricity Supply operator, Elektromreža Srbije (“EMS”). The interconnection infrastructure includes a High-Voltage Switchyard and Overhead line 110 kV.

The operation of the sub-station is the responsibility of CVP, while the Interconnection infrastructure is the responsibility of the Serbian statutory transmission Electricity Supply operator, Elektromreža Srbije (“EMS”). The Interconnection infrastructure includes a High-Voltage Switchyard and Overhead line 110 kV, as well as Interconnection facility.

It is likely that the Energy Permit for the Crni Vrh WPP will require CVP to establish and maintain a seven strong team to operate and maintain the windfarm. The senior roles agreed under the Generating Licence are:

- General Manager;
- Operations Manager;
- Maintenance Manager.

The day-to-day responsibility for EHS matters lies with the Operations Manager (OM).

The operational life of the WPP is expected to be about 25 years; this is the typical working life of a wind turbine blade.

5.8 Decommissioning or Re-Powering the Crni Vrh WPP

As the wind power plant approaches the last few years of operation CVP will consider the closure or continued operation of the WPP, i.e. will it be decommissioned or the wind turbines replaced with new units. The decommissioning of a wind power plant is not a complicated process and largely comprises the dismantling of the turbines, removal of the turbine foundations and site clearance. Steel and other useful materials will be recycled. Inert materials that cannot be re-used or recycled will be taken to a suitable landfill.

The sub-station may continue to be occupied, and the transmission line may continue to be used. Where not required, they will be dismantled, and metals recycled.

As the operation of the WPP does not involve the use of large volumes of hazardous materials it should not be necessary to conduct an extensive post-operational clean-up. The design of hazardous materials storage areas and the secondary containment placed around the transformers should ensure that no polluting materials enter the ground beneath the site. Basic operational control measures will be included in the design to ensure ease of decommissioning. Key difficulties associated with the decommissioning of a WPP are the removal of foundations (if considered necessary) and the disposal of turbine blades, if their design does not facilitate ease of recycling.

Foundations and other below ground inert structures may be buried and covered with soil. These areas and other land that is no longer going to be used will probably be returned to forestry plantation.

Decommissioning activities will be conducted under safety conditions and in consideration of environmental protection, under the relevant legislation in force at the time of decommissioning.

It is unlikely that the WTG foundations will be completely removed. Instead, the concrete will be demolished and excavated down to a depth to be determined prior to decommissioning. Nominally a depth of 1m is expected to be sufficient to allow for agricultural activities to be undertaken safely once the trench has been filled with top soil. Similarly, any ground associated with the windfarm which has been affected will be reinstated. This includes areas of temporary roads, areas where the land has been compressed by heavy plant activities, and laybys and temporary platforms.

There will be no underground electrical cables laid less than 1m deep as, according to the local regulations and the conditions issued to CVP, the minimum depth for laying the cables must be 1.2m. All electrical cables laid more than 1 m deep will be abandoned in place and will not cause any long term significant environmental impact.

Should CVP choose to re-power the Crni Vrh windfarm then it is possible to replace the older units with new, higher capacity turbines or retrofitting them with more efficient components. Re-powering this significantly increases windfarm production and extends WPP life; re-powering can add 5 to 20 years to the operational life of a WPP.

6 Environmental and Social Policy, Legislative Framework and International Standards

6.1 The Applicable Requirements

The Scoping Study determined that the ESIA for the Crni Vrh WPP would be undertaken in compliance with the Serbian regulations on EIA as well as the Equator Principles. These requirements are described in Chapter 3 of this ESIA Report. In essence, the Equator Principles and the IFC Performance Standards provide a framework and guidance as to how an 'acceptable' ESIA is to be undertaken.

In addition, the Scoping Study determined that the design, construction, operation and decommissioning of the Crni Vrh WPP would be completed in line with:

- All relevant Serbian laws, regulations and Project Permits;
- IFC Performance Standards on Environmental and Social Sustainability (2012);
- IFC Environmental, Health and Safety General Guidelines (2007); and
- IFC Environmental, Health, and Safety Guidelines for Wind Energy (2015).

Together, these documents are defined as the "Applicable Requirements" for the project.

On overview of the Applicable Requirements is provided in this Chapter of the ESIA Report.

6.2 Serbian Regulatory Framework

Serbia has been a candidate country for the EU membership since 2012. The national environmental legislation has been harmonised with the EU requirements since 2004, and to a large extent the EU environmental requirements have been transposed to Serbian legislation.

6.2.1 Territorial Organisation and Local Self Governments

The territorial organisation of the Republic of Serbia is regulated by the Law on Territorial Organisation (Official Journal of the RS No. 129/2007, 18/2016, 47/2018 and 09/2020 – other law). According to this Law, Serbia has two autonomous provinces – Vojvodina in the north and Kosovo and Metohija in the south. The country is divided into 150 municipalities, 28 cities and the City of Belgrade, which is a separate administrative unit. The territories of municipalities and cities are further defined by boundaries of cadastral municipalities within them.

The Law on Local Self Government (Official Journal of the RS No. 129/2007, 83/2014 – other law, 101/2016 – other law and 47/2018) defines the units of local self-government in Serbia - municipalities, cities and the City of Belgrade. Their bodies of government include: municipal (city) assembly, president of the municipality (mayor) and municipal (city) council. The municipal assembly is elected every 4 years in local elections, while the assembly and the president of the municipality are elected by the local assembly. Municipalities possess property, including local public communal companies, and have their own budget. Key responsibilities of the local self-governments include:

- urban and town planning,
- housing,
- communal services such as water, transport and heating,
- local economic development,
- use and protection of agricultural land,
- local roads,
- kindergartens and preschools,
- primary health care,
- public information,
- sport and cultural activities.

Some responsibilities are shared between central and the provincial government, such as education, social welfare, health protection, etc. Local Self-Governments are financed from three revenues streams: (i) own revenues, (ii) shared national taxes, and (iii) a share of revenues assigned to local government units and determined by unique criteria (grant funds).

Local communities formed on the territory of a municipality, are governed by the Local Community Council, whose members are directly elected by citizens. Members of the council vote amongst them for a Chairman (President). Local communities are legal entities and are financed from funds allocated by the municipality, donations and funds generated through own local activities.

6.2.2 Strategic Incentives Related to Wind Power Projects

Under the Paris Agreement, Serbia has committed to reduce the GHG emissions by 9.8% below 1990 levels by 2030. By accepting the EU Green Agenda for the Western Balkans in November 2020, the Government of Serbia committed to align with the European Climate Law and achieve climate neutrality by 2050.

Serbia is a signatory to the Energy Community Treaty with the European Union (EU) as part of the EU accession process. The Treaty requires countries' commitment in implementation and enforcement of the EU energy legislation within fixed timeframes. This includes the Directive 2009/28/EC on the Promotion of the Use of Energy from Renewable Sources. The Directive specifies national renewable energy targets for each EU country, taking into account its' starting point and overall potential for renewables.

Serbia negotiated its' target to be 27% of final energy consumption from renewable sources by 2020 (increased from the starting point of 21%). The most recent EUROSTAT data (January 2021) suggest that the country is unlikely to reach that target, achieving 21.4% in 2019. [2] Serbia has continued to develop and refine the strategic and regulatory framework for renewable energy sources, including the wind power sector. The initial regulatory framework was completed in 2016 by final adoption of three key decrees: "Incentive Decree", "Status Decree", and "Power Purchase Agreement [PPA] Decree".

The initial national capacity target for wind power was set to 500MW in 2016 and enabled seven wind power projects to sign power purchase agreements whereby the government subsidised the cost of renewable electricity. After the feed-in-tariff scheme expired in December 2019, the Government of Serbia decided to transition to a mechanism where WPP projects are selected on the basis of competitive auctions. This is a requirement under the EU Energy Community Treaty. The new regulatory framework defining the competitive tendering procedures was finalised in November 2021 and the first competitive auction will be held during 2022 for the initial 400MW of wind power. It is expected that similar auctions will also be held annually from 2023 until at least 2026.

6.2.3 Regulation of Decommissioning of Wind Power Plants

The new Law on Use of Renewable Energy Sources (Off. Journal of RS, No. 40/2021) requires privileged producers to pay a monthly security deposit for decommissioning of the WPP and restoration of the land. The Decree on Market Premium and Feed-in Tariffs (Off. Journal of RS, No. 112/2021) stipulates that the deposit of EUR 0.066 per kW per month must be paid during the validity of the market premium agreement. The deposit is mandatory, irrespective of arrangements that the producer might have with land owners. The deposit will be used only in case that the producer does not provide evidence on the WPP decommissioning and land restoration to the Ministry of Energy. Otherwise, the deposit will be refunded.

6.2.4 Environmental Impact Assessment of Wind Power Projects

The Serbian regulatory framework on Environmental Impact Assessment is largely harmonised with relevant EU Directives, including Directives 2011/92/EU and 2014/52/EU. The EIA procedure is set in the Law on Environmental Impact Assessment (Official Journal of RS, No. 135/2004, 36/2009) and the subsidiary bylaws (Official Journal of RS, No. 69/2005, 114/2008) which describe the requirements for screening, scoping, impact assessment and public consultation. The EIA process in Serbia is shown in Chapter 3.1 of this ESIA Report.

Windfarm developments of 10 MW power or over are listed in Annex II of the regulations meaning that a competent authority decides whether to proceed with a full EIA or conclude the process after the screening stage. As the Crni Vrh WPP is an Annex II development, a screening judgement has to be obtained from the national Ministry of Environment. It has become the normal practice of Serbian authorities that the scoping decision is issued directly after the submission of the screening application.

Screening and scoping exercises are carried out at the level of conceptual design while the Environmental Impact Assessment Study is based on preliminary design.

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[2] Eurostat News Release – Share of Renewable Energy in EU (January 2021)
https://ec.europa.eu/eurostat/databrowser/view/nrg_ind_ren/default/table?lang=en

6.2.5 Information Disclosure Requirements

Serbian legislation guarantees to its citizens the right to information, i.e. that everyone shall have the right to be informed accurately, fully and timely about issues of public importance. These provisions are included in the Constitution of the Republic of Serbia: (Official Journal of the RS, No. 98/2006), as well as in the Law on Free Access to Information of Public Importance (Official Journal of the RS, No. 120/2004, 54/2007, 104/2009, 36/2010).

The Law on Planning and Construction of the Republic of Serbia regulates the development and adoption of spatial and urban plans in Serbia, which are all subject to a public disclosure and consultation process. This is described in more detail in the Regulation on the Content, the Method and the Procedure for Developing Planning Documents (Official Journal of the RS No. 32/2019).

Serbia ratified the Aarhus Convention in 2009 and its provisions were then incorporated into the main laws in the area of environmental protection, including provisions governing public disclosure and consultation requirements.

6.2.6 Regulation of Construction and Operation of Wind Power Projects

In Serbia, the regulatory processes for the spatial planning (required for construction) and operation (energy production) of wind power plants are separate but run in parallel. Each procedure is the responsibility of a different group of regulators.

Regulation related to planning and construction of WPPs (the Law on Planning and Construction, Official Journal of RS, No. 09/2020) requires three types of permits: (1) Location Permit, (2) Building Permit and (3) Operation Permit. The authority in charge of issuing these permits for the Crni Vrh WPP is the national Ministry of Construction, Transport and Infrastructure.

An Energy permit is required by the Law on Energy (Official Journal of RS, No. 145/2014, 95/2018) for installation of energy generation facilities of capacity greater than 1 MW. An Energy Permit is not directly related to a Location Permit, meaning that it can be acquired before the Location Permit and the EIA consent are obtained. The application for an Energy Permit has to contain a general overview of environmental protection measures during construction and operation of the wind power plant. The authority in charge of issuing Energy Permits is the Ministry of Mining and Energy of Serbia.

The Zoning Plan (that includes the Plan of Detailed Regulation or “PDR”) and the associated Strategic Environmental Assessment are prerequisites for the Location Permit. The Location Permit is a prerequisite for the submission of the EIA Study to the environmental authority.

The Location Permit, the Energy Permit, and the EIA study are prerequisites for the Building Permit (the EIA consent decision is not required at this stage). The Building Permit is the primary outcome of the planning and energy permitting processes. To start construction of the wind power plant, a Notification of Works must be obtained for which an EIA Consent has to be granted.

Once the wind power plant is built, an operation (or “usage” in Serb) Permit must be obtained. This Permit is issued after the successful completion of a technical inspection. This inspection determines the compliance of the executed works with the Building Permit and other technical documentation.

6.2.7 Overhead Power Lines

The Serbian energy transmission system is managed by a state-owned operator “Elektromreža Srbije (EMS)”. The permitting of overhead power lines for windfarms is subject to an independent legal procedure, separated from a windfarm permitting. A windfarm developer has to liaise with EMS and to conduct the permitting procedure on behalf of EMS. This includes the EIA procedure for OHL connection line where EMS is considered to be a formal developer and operator of the OHL connection line.

The design and construction of overhead power lines is controlled through the Regulation on technical standards for construction of overhead power lines of nominal voltage between 1 kV and 400 kV (Off. Journal of SFRJ, No. 65/88, Off. Journal of SRY, No. 18/92) and the Regulation on construction of low voltage overhead power lines (Off. Journal of SFRY, No. 6/92). Besides the technical standards, overhead power lines are controlled similarly to other linear infrastructure projects, in accordance to planning and construction regulations.

An EIA study is mandatory for OHLs of 220 kV voltage (or higher) and longer than 15km (Annex I). Overhead power lines of 110kV voltage or higher are listed in the Annex II meaning that a competent authority decides whether to proceed with a full EIA or conclude the process after the screening stage.

6.2.8 Traffic and Transport

Serbian Law on Roads (Off. Journal of RS. No. 41/2018, 95/2018) is the key legislative document defining classification of public roads, their management and operation. The Law on Traffic Safety on Roads (Off. Journal of RS. No. 41/2009, as amended) also provides the framework for regulating road traffic safety.

Public Enterprise “Roads of Serbia” is a statutory stakeholder responsible for the management of public roads, including approval of works on roads and granting permits for abnormal loads transport. The Ministry of Interior (Traffic Police Department) is responsible for road traffic safety, including the provision of escort vehicles and successive stopping of traffic where needed.

The Regulation on Special Loads Transport (Off. Journal of RS, No. 6/19) sets out mandatory requirements for the abnormal transport including permitting, escorting arrangements, convoy size, and time of day. The regulation specifies requirements for technical and police escort, depending on load size.

Police escort is mandatory on regional and local roads for vehicles exceeding 25m in length or 3.5m in width. On motorways, police escort is required for vehicles exceeding 30m in length or 4m in width. Abnormal load vehicles are allowed to travel in convoy of three on motorways and regional roads (class I state roads). On municipal and local roads (class II) the allowed number of vehicles in convoy is two.

Abnormal loads transport is not allowed on Friday between 3pm and 12am, on Sunday, on a day before a national holiday and on the last day of a national holiday.

6.2.9 Land Use, Land Acquisition and Property Transactions

Land in Serbia is legally categorized as construction land or agricultural land depending on urban / agricultural plans and programmes in place at the time of classification. In accordance with the Law on Planning and Construction, agricultural land can be changed into construction land through the adoption of relevant urban plans (i.e. detailed regulation plans) by local self-governments.

Land needed for construction projects led by the state is typically acquired through the Expropriation Law of the Republic of Serbia (Official Journal of the RS No 53/1995, FRY No 16/2001, RS No 20/2009, 55/2013 and 106/2016). However, privately owned companies cannot be beneficiaries of expropriation and have to acquire land through voluntary transactions regulated by the Law on Obligations (Official Journal of the SFRY No. 29/1978, 39/1985, 45/1989, 57/1989, FRY No. 31/1993, SAM No. 01/2003, RS No.18/2020). This law regulates contracts in general, including land lease contracts.

The Law on Basic Property Relations (Official Journal of the SFRY No 06/1980, 36/1990, FRY No. 29/1996 and 115/2005) and the Law on State Surveying and Cadastral Registry (Official Journal of the RS 72/2009, 18/2010, 65/2013, 15/2015, 96/2015, 47/2017, 113/2017, 27/2018, 41/2018 and 09/2020) prescribe that in case of contractual transfers, real property is acquired only upon registration in the relevant registry.

6.2.10 Statutory Easements and Land Use Restrictions

The Law on Planning and Construction provides for certain statutory easements in relation to windfarms and other energy objects. These include over-sailing of wind turbine blades and power lines over adjacent land as well as the right of way through neighbouring land during construction. Affected users of land are to be compensated at market prices for any lost crops and damages.

Similarly, the Energy Law (Official Journal of the RS No. 145/2014, 95/2018 and 40/2021) provides for the right to access energy facilities for repair or maintenance through neighbouring land. Again, affected users of land are to be compensated at market prices for lost crops and damages, primarily through negotiation and if this fails, then through the courts. In addition, during operations, users of neighbouring land plots could become subject to certain use restrictions (e.g. planting trees).

6.2.10.1 Lease of Public Land

The Law on Agricultural Land (Official Journal of the RS No. 62/06, 65/08) states that the use of state-owned agricultural land is managed through the Ministry of Agriculture. This includes leasing of public land, which is carried out upon a municipal decision, with consent from the Ministry, through public announcements. Revenues acquired through lease, as per Article 71 of the Law, are divided between the state (30%), the province (30%) and the municipality (40%).

6.2.10.2 Land Acquisition and Involuntary Resettlement

The owners of land and assets (or restrictions on land use) that is acquired in the public interest, are to be compensated for their loss in line with the Law on Expropriation (Official Journal of RS No 53/95, 16/01, 20/09, 55/13,106/2016). The law focuses on the process of providing compensation for any affected properties and assets, rather than the subsequent costs associated with physical and economic displacement. However, the law indirectly addresses displacement where the affected people have formal legal rights or claims recognisable under Serbian law. The market value of land expropriated is determined by the tax administration authorities, based on the price obtained in the latest sale transactions of the nearest neighbouring land parcels to the one subject to expropriation. Compensation for other assets such as residential and business structures, orchards and vineyards, crops, forest land and timber should be at the current market price determined by court certified valuers.

The Law on Planning and Construction provides for certain statutory easements in relation to wind power projects and other energy generating plant. These include oversailing of turbine blades and power lines over adjacent land as well as the right of way through neighbouring land during construction. Affected users of land must be compensated at market prices for any lost crops or other damage. Similarly, the Energy Law provides for the right to access energy facilities for repair or maintenance through neighbouring land. Again, affected users of land are to be compensated at market prices for lost crops and other damage. If a negotiated settlement cannot be reached then the value is set by court decision.

In addition, during operations, a protection zone with use restrictions is established, for example, planting of trees or construction of structures, for which permission from the owner of the energy facility, has to be sought.

Table 6-1 provides an overview of Serbian legislation requirements in relation to land acquisition and involuntary resettlement relevant for the Project, as well as a summary of how land is being acquired for the Project and how these activities compare to IFC's PS5 requirements.

Table 6-1 Comparison of Serbian Land Acquisition and Resettlement Legislation with PS5

Topic	Provisions of Serbian legislation	Compliance with IFC PS5
Avoid or Minimise Displacement	There is no explicit requirement to avoid or minimise displacement in the Expropriation Law. Other laws require that planning documents (spatial plans, regulation plans) and projects (feasibility studies) must take into account social impacts, including resettlement. Displacement is often avoided in practice to reduce costs of expropriation and construction.	The Project has avoided physical displacement (formal and informal), while the potential for economic displacement is very low. Serbian legislation, in part, meets the requirements of PS5.
Compensation and Benefits for Displaced Persons	Under the Expropriation law, compensation for all assets is provided at market value (most often calculated thorough the comparable sales approach) (Articles 41, 42). Costs of the expropriation procedure are borne by the Beneficiary of Expropriation (Article 33). In the process of expropriation and determination of compensation all submissions (documents) and decisions are exempt from taxes (Article 68). Compensation for agricultural land can be provided in kind (replacement land), if requested by the affected owner (Articles 15, 16). If the expropriation of a part of the owner's property results in the owner having no economic interest in using or not being able to use the remainder of the property, that remaining part of the property will also be expropriated, at his/her request (Article 10). The request can be submitted within a period of 2 years after the completion of construction works (Article 30). Viability of the remaining part of the land plot is determined based on an assessment of a licensed appraiser). The Beneficiary of Expropriation acquires the right of accessing the property when the	Registration fees and taxes for properties which would be bought by people to replace their affected land do not apply for this Project, as the affected area of an individual plot is very small and it is unlikely that people would look to replace it. Use of land that does not belong to the owner (both formal and informal) is not widespread in the Project affected area as the land is generally of low quality. Affected users of land are to be compensated at market prices for lost crops and damages (based on reports from licensed appraisers), primarily through negotiations and if these fail, through the courts. During operations, users of neighbouring land plots are subject to use restrictions within the defined protection zone (e.g. planting trees, constructing structures), unless they receive approval for their activities from the owner of the energy facility. In the Project affected area, use restrictions will apply to agricultural land (crossed by OHLs), where in any case there is no construction and the likelihood of the owner wanting to plant

Topic	Provisions of Serbian legislation	Compliance with IFC PS5
	decision on compensation becomes legally binding (i.e. cannot be appealed against) or the day when an agreement on compensation has been reached. (Article 34). The Beneficiary of Expropriation can also request from the Ministry of Finance, urgent access to land / properties (before the decision on compensation becomes legally binding, but not before the decision on expropriation becomes final), in case of an urgent need to construct an object or carry out construction works (Article 35). The Expropriation law allows for increased compensation under certain circumstances, for persons whose sources of livelihoods are adversely affected by expropriation (i.e. who are economically displaced). Those who may be more adversely affected are determined by taking into account the number of household members, the number of household members capable of earning a living or who are employed, the health status of household members, the monthly income of the household. (Article 51). Informal users of land have no rights to compensation and/ or assistance for their affected assets (crops), under the Expropriation Law. Formal users of land (renters) have rights as specified in rent contracts. The Law on Planning and Construction and the Energy Law provide for the right to construct or access energy facilities for repair or maintenance through neighbouring land.	tall trees (which would be in the way of OHL lines) is very low. Serbian legislation, in part, meets the requirements of PS5.
Community Engagement	Stakeholder engagement is carried out as part of the process for adoption of planning documents and EIAs. Land acquisition requirements are also presented in these planning documents / public hearings. The Expropriation Law requires the following stakeholder engagement activities: Decision on Public Interest is made public Affected owners (and legal users) must be informed in writing that an expropriation request has been submitted and invited to a meeting by the municipal property administration Individual meetings are held as part of the procedure for determining compensation Informal users of land are outside of the expropriation procedure and not engaged with.	Serbian legislation, in part, meets the requirements of PS5. Information is disclosed however consultations do not fully comply with PS5 requirements. The Project has fulfilled legal requirements. Additional measures are included in Project SEP, to ensure full compliance with PS5.
Grievance Mechanism	The Expropriation Law provides affected people with the right to submit administrative and judicial appeals at various stages of expropriation.	Legislation only provides for formal, legal complaint mechanisms. No requirement for establishing a grievance mechanism as required by IFC PSs Additional measures are included in the Project SEP and ESMMP, to ensure full compliance with PS5.

Topic	Provisions of Serbian legislation	Compliance with IFC PS5
RAP/ LRP Planning and Implementation	The Expropriation Law does not require development / implementation of RAPs/LRPs.	Serbian legislation does meet the requirements of PS5. The Project requires land acquisition, however as there is no physical displacement, the potential for economic displacement is low. Additional measures are included in the Project ESMMP, to ensure full compliance with PS5.
Physical Displacement	The Project will not cause physical displacement.	Not applicable.
Economic Displacement	Discussed in section 'Compensation and Benefits for Displaced Persons' above.	Although the Project requires acquisition of land, due to the small area of land being acquired from an individual owner/ household, the current use of land and the compensation measures being provided under Serbian legislation, it is believed that the Project is not likely to cause economic displacement. Serbian legislation, in part, meets the requirements of PS5. Additional measures are included in the Project ESMMP, to ensure full compliance with PS5.
Private Sector Responsibilities for Govt. Managed Resettlement	No requirement under the Expropriation Law for Project Sponsors to collaborate with relevant government agencies or to complement government action.	Serbian legislation, in part, meets the requirements of PS5. Additional measures are included in the Project ESMMP, to ensure full compliance with PS5.
Monitoring	No requirement for monitoring of land acquisition and restoring of livelihoods in the Expropriation Law.	Serbian legislation does meet the requirements of PS5. Additional measures are included in the Project ESMMP, to ensure full compliance with PS5.

6.2.11 Nature Protection Legislation

Primary legislation is described within the Serbian Law on Nature Protection (Official Journal of RS, No. 36/2009a, 88/2010, 91/2010 –correction, 14/2016, 95/2018 – another law, 71/2021). This legislation regulates the protection of wild species and natural habitats, designation of protected areas, and established the Ecological Network of Serbia. The Law on Nature Protection is fully harmonised with relevant EU legislation: Directive on the Conservation of Wild Birds ("EU Birds Directive") (Official Journal of EU [2009/147/EC]), and Directive on the conservation of natural habitats and of wild fauna and flora ("EU Habitats Directive") (Official Journal of EU [1992/43/EEC]).

Strictly Protected and Protected wild species are listed under bylaw: the Code of Regulations on the Declaration and Protection of Strictly Protected and Protected Wild Species of Plants, Animals and Fungi (Official Journal of RS, No. 5/2010, 32/2016, 98/2016). Conservation Priority habitat types are listed under another bylaw: Code of Regulations on the Criteria for Designation of Habitat Types, on Habitat Types, Sensitive, Endangered, Rare and Conservation Priority Habitat Types, and on Protection Measures for Their Preservation (Official Journal of RS, No. 35/2010).

Protected areas are designated and regulated in details by specific subsidiary bylaws. However, once the Ministry publicly announces on its website that a protection procedure for a particular area has been initiated then from that moment the area is considered to be protected. It is not necessary to draft and adopt a specific bylaw to formally protect an area.

The Ecological Network of Serbia, which is to become a part of the Natura 2000 network at the accession of Serbia to the EU, is established and further regulated by the Regulation on the Ecological Network (Official Journal of RS, No.102/2010). Designation of the Ecological Network sites is an ongoing process and additional areas continue to be added to the Network ("Records in electronic form and a map of the Ecological Network are prepared and updated by the Institute for Nature Protection of Serbia" (Article 38)). The Law on Nature Protection was amended in July 2021 (Official Journal of RS, No. 71/2021) and this change now requires that an Appropriate Assessment ("AA")[3] is to be undertaken for any project that may directly affect an element of the Ecological Network. However, the bylaws necessary for the implementation of AA have not been established or adopted and it is not known when the amendment will be implemented.

The Law on Nature Protection prescribes that Nature Protection Conditions ("NPC") must be issued for all activities affecting the natural environment (Articles 8 and 9). Nature Protection Conditions are obtained from the competent authority, which is in this case the Institute for Nature Conservation of Serbia ("IfNC").

For projects whose construction might interrupt the regular daily commuting or seasonal migration routes of wildlife, cause fragmentation of habitats or other disturbance of their regular life cycle, the Law requires negative impacts to be reduced during construction and operation (Article 80). The Law specifically requires that the siting of a wind power project must be selected to avoid important habitats and migration routes of birds and bats (Article 81). The Law also requires that "*pylons and technical components of medium- and high-voltage electricity lines should be constructed in such a way as to protect birds and bats from electric shock and mechanical injury*" (Article 81). Implementation of technical and technological measures is required "*where tall structures (WTGs, electricity pylons...) are constructed in the vicinity of ecologically significant area*s" in order to avoid any negative impact (Article 81). Subsidiary bylaw (Official Journal of RS, No. 72/2010) further specifies that "[i]n order to protect migratory species, wind power plants above 50 MW of installed capacity shall be equipped to ensure continuous monitoring of bird and bat movements over the wind farm site" (Article 10), although ambiguously since not specifying what is meant under "equipped".

Serbia has ratified and implemented a number of international conventions regulating nature protection. Two of these the most relevant here are: The Bern Convention on the Conservation of European Wildlife and Natural Habitats ("Bern Convention") (Official Journal of RS, No. 102/2007a), and The Convention on the Conservation of Migratory Species of Wild Animals ("CMS" or "Bonn Convention") (Official Journal of RS, No.102/2007b). CMS also has special implementation instruments – international agreements, two of them being relevant here: Agreement on the Conservation of African-Eurasian Migratory Waterbirds ("AEWA"), and Agreement on the Conservation of Populations of European Bats ("EUROBATS") that Serbia has ratified more recently (Official Journal of RS, No.13/2018a, b).

Serbia does not have official obligatory guidelines related to nature protection and wind farms. However, there are unofficial guidelines developed by United Nations Development Programme (UNDP) and supported by relevant authorities and institutions (Safner *et al.* 2010, Simić *et al.* 2010), as well as national (also unofficial) guidelines for the consideration of bats in EIA (Paunović *et al.* 2011) that include a chapter on WFs. These documents provide basic guidance on the subject and refer to more comprehensive international documents commonly considered international best practice at the time.

6.2.12 Labour and Working Conditions

Serbia was a member state of the International Labour Organisation (ILO) between 1919 and 1992 and restarted its membership in 2000. The country has ratified 77 ILO International Labour Standards (Conventions) of which 62 are in force, including the eight fundamental Conventions.

Labour and human resource management in Serbia is primarily addressed through the Labour Law of the Republic of Serbia (Official Journal of the RS No. 24/2005, 61/2005, 54/2009, 32/2013, 75/2014, 13/2017, 113/2017 and 95/2018). Compliance with labour laws is monitored by the Labour Inspectorate of the Ministry of Labour and Social Policy of the Republic of Serbia.

Other applicable laws include:

- Law on Amicable Resolution of Labour Disputes (Official Journal of the RS No. 125/2004, 104/2009, 50/2018)
- Law on Strikes (Official Journal of the FRY No. 29/1996, 101/2005, 103/2012)
- Law on Mobbing (Official Journal of the RS No. 36/2010)
- Anti-Discrimination Law (Official Journal of the RS No. 22/2009, 52/2021)

[3]AA is a separate exercise from the EIA, although both are undertaken in parallel. AA relates only to particular Ecological Network site and particular habitats and species for which the Ecological Network site has been designated.

- Pension and Disability Insurance Law (Official Journal of the RS No. 34/2003, 64/2004, 84/2004, 85/2005, 101/2005, 63/2006, 05/2009, 107/2009, 101/2010, 93/2012, 62/2013, 108/2013, 75/2014, 142/2014, 73/2018, 46/2019, 86/2019)

There are a number of items of Serbian legislation that either fulfil or ensure part compliance with the labour and working conditions described in PS 2, these are summarised in Table 6-2.

Table 6-2 Comparison of Serbian Labour Legislation with PS2

Topic	Provisions of Serbian legislation	Compliance with IFC PS2
Human Resource Policies and Working Relationships	Labour and working conditions are regulated in line with international conventions, by the Labour Law, which states that the rights, obligations and responsibilities of workers are governed by collective agreements and labour regulations (employment contracts) (Article 1). Labour regulations and employment contracts must be aligned with the law and they can only provide more rights and improved working conditions compared to those stipulated by the law (Articles 4 and 8). Employers are obliged to present workers with their rights, obligations and responsibilities in writing and contracts must be signed by both parties (Articles 16, 27, 30, 32).	No requirement to adopt and implement a Human Resources (HR) Policy. Compliant in relation to issuing employment contracts.
Working conditions and Terms of Employment	Workers have the right to adequate wages (including paid overtime, expenses), health and safety at work, health protection, protection of personal integrity, dignity and other benefits in case of illness, reduction of the ability to work or old age, financial aid during temporary unemployment and other forms of protection (Article 12). The law sets out in detail employee rights in relation to hours of work, wages, overtime, compensation and benefits	Compliant
Workers Organizations	Employees have the right to form and join Labour Unions and freely express their views in relation to labour and working condition issues (Articles 13, 206 - 220).	Compliant
Non-Discrimination and Equal Opportunity	Discrimination is explicitly prohibited by law, both in relation to employees and those looking for employment (Articles 18 - 20) and the person who feels discriminated against can turn to the court (Article 23). Special protection of vulnerable groups, to give them equal opportunities, is allowed (Article 22). Harassment in any form is also strictly prohibited by law (Article 21). Women employees have the right to special protection during pregnancy and child birth. Employees have the right to special protection for child care. Employees below the age of 18 and those who have disabilities have the right to special protection (Articles 12, 89 – 102). Employers are not allowed to request data from employees on their marital status or family planning (Article 26).	Compliant

Topic	Provisions of Serbian legislation	Compliance with IFC PS2
	Employees are entitled to equal pay for the same work or work of equal value with an employer (Article 104).	
Grievance Mechanism	The law allows for establishing a mechanism for amicable resolution of disputes between employees and the employer (Article 194). Employees (or their authorised representatives) can turn to the courts for any breach of their labour and working conditions (Article 195).	No requirement to establish an internal grievance mechanism for workers (including to receive anonymous complaints or complaints from contractor/supplier workers), as per PS2.
Child and Forced Labour	Employment of minors (over 15) is allowed by law, under certain conditions – approval of parents, guardians and if the work does not jeopardise the minor's health and safety, moral or education (Articles 24, 25, 84 - 88). The law sets out in detail workers' rights in relation to working hours, leave, daily work break, termination of employment, etc. The law applies to foreign citizens working on the territory of the Republic of Serbia.	Compliant
Workers Engaged by Third Parties / Supply Chain	All employers, including contractors and suppliers are expected to comply with national legislation in the area of labour and working conditions. There is no requirement under the law to manage and monitor contractor/supplier performance in the area of labour and working conditions. Monitoring is carried out by the State Labour Inspectorate.	No requirement to manage or monitor contractor / supplier performance in fulfilling the requirements of Serbian labour legislation.

6.2.13 Occupational Health & Safety Law

The Law on Occupational Health and Safety (Official Journal of RS, No. 101/2005, 91/2015, 113/2017) is the main legislative document regulating occupational health and safety issues in Serbia. The Law incorporates the principles of the EU Workplace Health and Safety Directive (89/391/EEC).

The Law is based on general principles of prevention and requires: (1) avoiding risks, (2) evaluating the risks, (3) combating the risks at source, (4) adapting the work to the individual, (5) replacing the dangerous by the non- or the less dangerous, activities, (6) prioritizing collective protective measures (over individual protective measures), and (7) giving appropriate instructions to the workers.

Enforcement of the Law is provided by implementation of regulations and decrees. Occupational health & safety is the responsibility of the Ministry of Labour, Employment, Veteran and Social Affairs. The Directorate for Occupational Health and Safety is responsible for the preparation of legislation and the Labour Inspectorate is responsible for enforcement.

6.2.14 Noise

6.2.14.1 Serbian Noise Legislation

The Law on Environmental Noise Protection (Off. Journal of RS No. 96/2021) is the main legislation for the control of environmental noise in Serbia. The Law is harmonised with the EU Environmental Noise Directive (2002/49/EC). Compared to the previous Law (2009) the key change relates to delegation of responsibilities for strategic noise mapping from the Serbian Environment Agency to local authorities.

Article 10 of the Law stipulates that all legal entities whose installations generate noise above the permitted levels must monitor the noise, finance the noise mitigation and implement noise protection measures. Article 13 mandates the environmental impact assessment of a development to include noise prevention and mitigation measures. Article 18 requires the legal entity who is the owner or user of a noise source to conduct the initial noise measurement and implement noise control measures.

The permitted noise levels are defined in the Decree on Noise Indicators, Limit Values, Noise Indicators Assessment Methods, Annoyance and Harmful Effects of Environmental Noise (Off. Journal of RS No. 75/2010). The noise level limits are shown in Table 6-3 and Table 6-4 below.

The units are assumed to be set in terms of the L_{Aeq} parameter as this would bring many of the limits in to line with World Health Organisation guidance. [4]

Table 6-3 Serbian Noise Level Limits in Open Areas

Zone	Purpose of the area	Maximum permitted noise rating level [dB (A)]	
		Day and evening	Night
1	Recreation, health institution, cultural and historical sites, large parks	50	40
2	Tourist areas, schools, camps	50	45
3	Residential areas	55	45
4	Commercial, residential, children's playgrounds	60	50
5	City centre, workshop, commercial, administrative with apartments, zones along highway, regional roads and city streets	65	55
6	Industrial areas, warehouse and service areas, transport terminals with no residential buildings	Noise level at the boundary of this zone shall not exceed the limit value defined for the zone it borders	

Table 6-4 Serbian Noise Level Limits for Indoor Areas

Zone	Purpose of the room	Maximum permitted noise rating level [dB (A)]	
		Day and evening	Night
1	Bedroom and living room in residential building with windows closed	35	30
2. 2.1 (a)	Public and other buildings with windows closed Hospital sickroom	35	30
2.2	Students' dormitory, retirement home bedrooms	35	30
2.3	Schools, movie cinemas and libraries	40	40
2.4	Theatres and Concert halls	30	30
2.5	Hotel rooms	35	30
Note 1: 24-hours period is divided in three referent time intervals: 12-hour day (6 AM to 6 PM), 4-hours evening (6 PM to 10 PM) and 8-hours night (10 PM to 6 AM). Note 2: Rating level is predicted or measured acoustic level to which an adjustment has been added as described in SRPS ISO 1996-1 and SRPS ISO 1996-2			

Article 31 of the Law on Environmental Protection (Official Journal of RS No. 135/04, 36/09, 43/11 and 14/16) describes a series of prescribed conditions and mandatory noise mitigation measures. Article 39 introduces the term of unique permitted values of pollutants (including noise) that will be delivered by the Government in appropriate regulations.

[4] Berglund, B., Lindvall, T., Schwela, D & World Health Organization (WHO). Occupational and Environmental Health Team. (1999). Guidelines for Community Noise. WHO

The Law on Environmental Noise stipulates that an individual or a company which is the owner or the user of a noise source is obliged to have noise measurements with related noise measurement reports, performed by authorised institutions. Noise measurement and reporting must be performed in accordance to Rulebook on The Methods of Noise Measurement, Content and Scope of the Noise Measurement Reports (Official Journal of RS No 72/10).

Noise measurement and reporting must be performed in accordance to the Rulebook on The Methods of Noise Measurement, Content and Scope of the Noise Measurement Reports (Off. Journal of RS, No. 72/10). Noise from construction equipment is regulated by The Rulebook on Noise Emitted by the Equipment Used in the Open Space (Off. Journal of RS, No. 01/13).

6.2.14.2 UNDP Guidelines on the Environmental Impact Assessment for Windfarms

In June 2010, the Serbian UN Development Programme ("UNDP") team produced Guidelines on the Environmental Impact Assessment of Wind Farms for projects in the Western Balkans.

These Guidelines state that the noise impact of wind farms should be assessed by reference to the nature and character of noise sensitive locations and in accordance with the laws and regulations in the field. It quotes a "Rulebook on Permitted Noise Levels in the Environment" as permitting a maximum noise level of 35 dB(A) at night-time and 40 dB(A) during the day outside public buildings but this is much lower than the Serbian guidelines above and most other guidelines for external noise levels and is possibly an error.

It also states that "*where the noise level is less than allowed, a maximum increase of 5 dB(A) above the existing noise is considered acceptable in ensuring protection of inhabitants in the area*" and furthermore "*Generally, noise is unlikely to be a significant problem where the distance from the nearest turbine to any noise sensitive property exceeds 500 metres*".

The latter statement is not always correct for sites with multiple turbines, nor for the increases in turbine size since 2010 and the noise limits are at odds with other Serbian and international guidelines. Compliance with this document is not a legislative requirement.

6.2.14.3 WHO Environmental Noise Guidelines for the European Region

The World Health Organisation ("WHO") have published noise guidelines for Europe[5]. Various environmental sources are discussed including wind turbines. The recommendations of the Guide Development Group (GDG) for wind turbines are summarised below:

- For average noise exposure, the GDG conditionally recommends reducing noise levels produced by wind turbines below 45 dB L_{den}, as wind turbine noise above this level is associated with health effects;
- No recommendation is made for average night noise exposure L_{night} of wind turbines. The quality of evidence of night-time exposure to wind turbine noise is too low to allow a recommendation;
- To reduce health effects, the GDG conditionally recommends that policy-makers implement suitable measures to reduce noise exposure from wind turbines in the population exposed to levels above the guideline values for average noise exposure. No evidence is available, however, to facilitate the recommendation for one particular type of intervention over another.

The noise limits are set in terms of the L_{den}. This is a year-average L_{Aeq} level but with a +5dB penalty applied to the evening noise levels and an 10dB penalty applied to the night-time values. For a source of constant level, the L_{den} is 6.4dB higher than the steady dB(A) level due to the evening and night-time penalties. However, to be properly calculated, the likely wind speed and direction conditions over the entire year should be evaluated and noise levels weighted accordingly.

As such, it is a difficult limit to design to as the wind conditions and directional characteristics of the wind turbines have to be known and will vary across days and across the year.

Note that the recommendations are given a "conditional" strength in terms of the recommendation, meaning there is less certainty owing to a lower quality of evidence. For this project, it is not proposed to design to or adopt these guidelines but they are provided for reference and the 45 dB L_{den} limit is adopted in some European countries.

6.2.14.4 Construction Noise Legislation

Following EU requirements, limits on noise emissions on construction equipment is described in The Rulebook on Noise Emitted by the Equipment Used in the Open Space (Off. Journal of RS, No 01/13 of 04.01.2013).

[5] WHO Regional Office for Europe Environmental Noise Guidelines for the European Region 2018

The construction plant used will be required to meet these limits. In addition, a Construction Environmental Management Plan (CEMP) will be developed with a section on noise control to ensure any construction effect is mitigated.

6.2.15 Landscape Planning and Designation

Serbian legislation related to landscape planning and designation has not been harmonised with EU standards.

Serbia is a signatory to the European Landscape Convention ("ELC") since 2011, committing to recognise landscapes in law, establish and implement landscape protection, management and planning policies and establish procedures for public participation.

Since the ratification, introduction of the ELC obligations into Serbian legislation has been slow. The Action Plan for Implementation of the ELC was drafted in 2014 but has not been developed further. Similarly, a by-law document necessary for establishing criteria for landscape identification and character assessment was drafted in 2014. Formal introduction and passing of these drafted documents remain uncertain, as well as the amendment of related regulation (e.g. the Law on Environment).

It should be noted that the approach taken in the preparation of the drafted by-law was largely based on the UK methodology set in the Landscape Character Assessment – Guidance for England and Scotland, Countryside Agency, Scottish Natural Heritage, 2002. The methodology has already been used by Serbian landscape specialists in the past and with adjustments is considered to be appropriate for Serbia.

Until the relevant legislation is passed, Serbian regulatory requirements related to landscape protection remain rather basic. The Law on Spatial Plan of Serbia (2010) states that landscape characterisation is a strategic priority. The Law on Nature Conservation (2010) stipulates that identification of landscapes and criteria for their assessment shall be defined by a by-law.

6.2.16 Wildfires

Wildfire risk assessment is not a statutory part of land use planning in Serbia. Serbian legislation does not include obligations related to wildfire risk assessment during the design and permitting process in wildfire prone areas. The primary focus of the fire safety legislation are internal fire hazards within a facility while consideration of external fire hazards is not required.

The Decree on Classification of Buildings, Activities and Land in Fire Hazard Categories (2010) defines three categories of developments and requires the 1st and 2nd category developments to implement a documented Fire Safety Plan. Wind turbines are not among the three categories, but substations and switchyards fall within the 2nd category. The Decree classifies "designated and high-quality forest areas (e.g. national parks)" as the 1st or 2nd category, depending on the forest area size. However, there is no reference to woodland areas that are not designated (like Crni Vrh).

The Law on Fire Safety (2009) requires that fire safety measures are implemented during any work performed in nature which may pose a fire hazard, especially if an open flame is used (Article 46). Burning an open fire in the forest and at a distance less than 200m from the forest boundary is prohibited, except in specially designated areas (Article 47). Fire watch personnel with appropriate equipment must be involved if hot works (welding, cutting, brazing) are performed at a distance less than 200m from the forest boundary (Article 51). Open air burning of stubble or waste is prohibited (Article 50).

The Law on Game and Hunting (2010) prohibits burning of weed, stubble, grass and other vegetation in hunting areas (Article 22).

The Law on Forests (2010) requires a company in charge of forest management to develop and implement a 10-year Forest Fire Protection Plan (Article 46). In the case of Crni Vrh, the public company "Serbia Forests" are in charge of the forest management including fire protection. "Serbia Forests" must establish and maintain fire protection infrastructure (e.g. fire breaks, lookout points, water sources, etc.) in the forest that they manage.

By law, "Serbia Forests" must have a Forest Guard Service in charge of forest watch, equipped and trained to supress a forest fire before the nearest fire brigade arrives. During fire season, a continuous 24h-forest watch is organised where necessary. In practice, understaffing of the forest guard service and lack of equipment have been reported as issues for many years.

The Ministry of Interior – Sector for Emergency Management is in charge of firefighting through local fire brigades. The Ministry' Helicopter Unit is involved in aerial firefighting.

6.2.17 Ice Throw and Ice Fall

Ice throw from wind turbines is not regulated in Serbia in terms of the setback or risk assessment that would be required. Serbian legislation does not stipulate operational strategies to mitigate the ice throw (e.g. shut down of turbines when icing is detected, etc.). Ice fall from stationary structures broadly falls within general health and safety regulatory requirements but is not specifically addressed in the regulations.

6.2.18 Cultural Heritage and Archaeology

The Law on Cultural Property (Off. Journal of RS, No. 71/94, 52/2011, 99/2011) regulates protection and use of cultural heritage and sets conditions that have to be met for the protection of cultural heritage. The Law stipulates that construction activity has to be immediately halted if an archaeological artefact is found during the course of the works. Developer is obligated to immediately inform a competent institute for cultural heritage and take measures to protect the findings before they are excavated.

The Republic Institute for Cultural Heritage is an expert institution under the Ministry of Culture and Information. The Institute has local branches organised by territory. Local branches of the Institute in charge for the Crni Vrh WPP are seated in Niš and Smederevo. The local institutes are statutory stakeholders involved in the planning and permitting process of the Crni Vrh WPP.

According to the Law on Cultural Property, Developer is obliged to hire a local institute to undertake an archaeological site survey (if deemed necessary). If archaeological supervision is required during the construction phase, the same local institute must be engaged. The competent institute for cultural heritage has the authority to suspend the construction activity if risk of damage of an archaeological artefact is present.

6.3 Equator Principles

The Equator Principles are benchmarks for the financial industry to manage social and environmental issues associated with projects that they sponsor or finance. The Equator Principles (EPs) have been designed to ensure that adverse social and environmental impacts resulting from the development are appropriately identified and managed throughout construction and operation. The Equator Principles Financial Institutions ("EPFIs") are institutions who have publicly adopted the Equator Principles and they commit to only provide loans to projects that conform to the EPs. The majority of the large, international banks are EPFIs.

In summary, the Equator Principles require:

- EP 1: A scoping assessment to categorise the development in terms of the magnitude of its potential impacts and risks.
- EP 2 & 3: A social and environmental assessment based on the impacts and risks identified in the scoping assessment, taking into account predefined social and environmental standards.
- EP 4: Preparation of an action plan to effectively manage the impacts and risks.
- EP 5 & 6: Undertake appropriate consultation and discourse with affected communities and set up a grievance mechanism to facilitate resolution of concerns and grievances raised.
- EP 7: Undertake an independent review of the process.
- EP 8: Establishment of covenants in financing documentation to ensure compliance with applicable laws and other requirements.
- EP 9: Establishment of a programme of independent monitoring and reporting to ensure appropriate social and environmental performance is maintained.
- EP 10: Annual reporting by the EPFI on experiences concerning the implementation of the Equator Principles

Equator Principle 1 requires an initial Screening Study and EP Categorisation of the project; the screening criteria are set by the IFC. The EP Categorisation is conducted to determine the potential nature and scale of impacts and the requirement, if any, for further in-depth assessment.

Projects are classified by the expected scale of social or environmental impacts; Category A (significant impacts), Category B (limited impacts) and Category C (minimal or no impacts). It is normal for Category A and B projects to be the subject of an ESIA although a greater level of detail is expected for Category A projects. Category C projects may simply require a high-level E&S study.

The main steps in the completion of an EP compliant ESIA are:

- Screening Study and EP Categorisation;
- Stakeholder Engagement Plan;
- ESIA Scoping Study;
- ESIA;
- Public Consultation on the ESIA Disclosure Package;
- Management of grievances / objections; and,
- Project Monitoring.

Whilst the Stakeholder Engagement Plan (SEP) feeds into the Scoping study and then the ESIA itself, the SEP and the ESIA essentially run in parallel. Both the SEP and Scoping Study describe the works that must be undertaken to complete the ESIA Disclosure Package. The balance of each technical and social investigation is agreed with the client (as well as the Serbian authorities and the EPFI if appropriate) before the ESIA is completed.

The requirements of the Equator Principles are summarised in Table 6-5, below.

Table 6-5 Summary of the Equator Principles

Equator Principle	Requirements
# 1: Review and Categorisation	Review and categorisation of a project based upon the magnitude of its potential environmental and social risks and impacts. The screening is based upon the environmental and social categorisation process of the International Finance Corporation (IFC) and places a project into one of three categories: Category A – Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented; Category B – Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; or, Category C – Projects with minimal or no adverse environmental and social risks and/or impacts.
# 2: Environmental and Social Assessment	For all Category A and B projects, conduct an Assessment Process to address the relevant environmental and social risks and impacts of the project, and propose measures to minimise, mitigate and offset adverse impacts. For all Category A, and as appropriate, Category B projects, undertake an Environmental and Social Impact Assessment (ESIA) – see further below.
# 3: Applicable Environmental and Social Standards	Address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. Evaluate compliance with applicable standards as follows: For Projects located in Non-Designated Countries, evaluate compliance with Applicable IFC Performance Standards on Environmental and Social Sustainability (Performance Standards) and World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) For Projects located in Designated Countries, evaluate compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. Host country laws meet the requirements of environmental and/or social assessments (Principle 2), management systems and plans (Principle 4), Stakeholder Engagement (Principle 5) and, grievance mechanisms (Principle 6).
# 4: Environmental and Social Management System and Equator Principles Action Plan	For all Category A and B projects, develop and maintain an Environmental and Social Management System (ESMS). Prepare an Environmental and Social Management Plan (ESMP) to address issues raised in the Assessment Process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, develop and agree an Equator Principles Action Plan (AP) to outline gaps and commitments to meet EPFI requirements.

Equator Principle	Requirements
# 5: Stakeholder Engagement	For all Category A and B projects, undertake effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, conduct an Informed Consultation and Participation process. Make available to the Affected Communities, and where relevant Other Stakeholders, the appropriate Assessment Documentation in the local language and in a culturally appropriate manner.
# 6: Grievance Mechanism	For all Category A and, as appropriate, Category B Projects, establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance.
# 7: Independent Review	For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance. The Independent Environmental and Social Consultant will also propose or opine on a suitable Equator Principles AP capable of bringing the Project into compliance with the Equator Principles, or indicate when compliance is not possible. An Independent Review by an Independent Environmental and Social Consultant is required for Projects with potential high-risk impacts including, but not limited to, any of the following: Adverse impacts on indigenous peoples; Critical Habitat impacts; Significant cultural heritage impacts; Large-scale resettlement.
# 8: Covenants	For all Projects, the client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects. For all Category A and Category B Projects, the client will covenant the financial documentation: To comply with the ESMPs and Equator Principles AP (where applicable) during the construction and operation of the Project; To provide periodic reports that: document compliance with the ESMPs and Equator Principles AP (where applicable) and provide representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits; To decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.
# 9: Independent Monitoring and Reporting	The EPFI will, for all Category A and, as appropriate, Category B Projects, require the appointment of an Independent Environmental and Social Consultant to verify its monitoring information which would be shared with the EPFI.
# 10: Reporting and Transparency	For all Category A and, as appropriate, Category B Projects: A summary of the ESIA must be accessible and available online. GHG emission levels will be reported during the operational phase for Projects emitting over 100,000 tonnes of CO_2 equivalent annually.

6.4 IFC Performance Standards

How the EPs are applied to a project varies a little between the EPFI's. The majority of the EPFIs have adopted either the EBRD Environmental and Social Policy (EBRD, April 2019) or the International Finance Corporation Performance Standards on Social & Environmental Sustainability (IFC, January 2012). The EBRD E&S Policy describes Performance Requirements rather than the Performance Standards described by the IFC. For the purposes of this description reference is made to the IFC process and terminology as described in the IFC Performance Standards on Environmental and Social Sustainability.

The IFC have also published a series of subsidiary Environmental, Health and Safety General Guidelines and these are outlined in Section 6.5 of this ESIA Report.

The Performance Standards on Social & Environmental Sustainability describe the eight performance standards that must be met throughout the lifetime of a project, see Table 6-6, below.

Table 6-6 Summary of the IFC Performance Standards

Performance Standard	Requirements
# 1: Assessment and Management of Environmental and Social Risks and Impacts	The PS establishes the importance of: Integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and The client's management of environmental and social performance throughout the life of the project. The client must conduct a process of environmental and social assessment, and establish and maintain an ESMS appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts. The ESMS must incorporate the following elements: (i) Policy; (ii) Identification of risks and impacts; (iii) Management programmes; (iv) Organizational capacity and competency; (v) Emergency preparedness and response; (vi) Stakeholder engagement; and (vii) Monitoring and review.
# 2: Labour and Working Conditions	The purpose of the performance standard is to: Promote the fair treatment, non-discrimination, and equal opportunity of workers; Establish, maintain, and improve the worker-management relationship; Promote compliance with national employment and labour laws; Protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain; Promote safe and healthy working conditions, and the health of workers; and, Avoid the use of forced labour.
# 3: Resource Efficiency and Pollution Prevention	The purpose of the performance standard is to: Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. Promote more sustainable use of resources, including energy and water. Reduce project-related GHG emissions. Technically and financially feasible resource efficiency and pollution prevention principles and techniques applied by the project are to be consistent with good international industry practice (GIIP) as reflected in various internationally recognized sources, including the WB EHS Guidelines (see below).
# 4: Community Health, Safety and Security	The purpose of the performance standard is to: Anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. Ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

Performance Standard	Requirements
# 5: Land Acquisition and Involuntary Resettlement	The purpose of the performance standard is to: Avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs. Avoid forced eviction. Anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by: providing compensation for loss of assets at replacement cost, and ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. Improve, or restore, the livelihoods and standards of living of displaced persons. Improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.
# 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	This Performance Standard addresses how clients can sustainably manage and mitigate impacts on biodiversity and ecosystem services throughout the project's lifecycle in order to: Protect and conserve biodiversity. Maintain the benefits from ecosystem services. Promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.
# 7: Indigenous Peoples	The purpose of the performance standard is to: Ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. Anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts. Promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. Establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle. Ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples. Respect and preserve the culture, knowledge, and practices of Indigenous Peoples
# 8: Cultural Heritage	The purpose of the performance standard is to: Protect cultural heritage from the adverse impacts of project activities and support its preservation. Promote the equitable sharing of benefits from the use of cultural heritage.

The ESIA has established that seven out of the eight performance standards apply to the Crni Vrh Project. Performance Standard 7 does not apply as there no Indigenous People in Serbia.

6.5 IFC Environmental, Health and Safety Guidelines

The IFC Environmental, Health and Safety Guidelines (April 2007) ("IFC EHS Guidelines") are technical reference documents with general and industry-specific examples of GIIP. The IFC use the EHS Guidelines as a technical benchmark during project appraisal. The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology.

The IFC EHS Guidelines provide clear guidance on emissions standards that apply to the most polluting of industrial processes, e.g. conventional power plants and do not relate specifically to lower impact facilities such as windfarms. The IFC EHS Guidelines will be used as a reference point for the management of more general environmental risks (e.g. the storage of hazardous materials and wastes), emergency preparedness and the Occupational Health & Safety standards that will be required.

Examples of GIIP are provided in the IFC Environmental, Health, and Safety Guidelines for Wind Energy (2015). The description of GIIP provided in these Guidelines does not relate to the design and mechanical performance of the WTGs themselves but rather to the management of the potential impacts on WTGs on the natural environment. Specifically, the Guidelines require the ESIA for a windfarm to consider environmental issues specific to the construction, operation, and decommissioning of wind energy projects such as:

- Landscape and Visual impacts;
- Noise;
- Biodiversity;
- Shadow Flicker;
- Water Quality.

Much of the IFC Wind Energy Guidelines provide qualitative advice on the assessment and management of these issues. However, the IFC Wind Energy Guidelines do present a protocol for the assessment of noise impact and the standards that must be achieved. In particular, the following principles are identified for assessing noise impact:

- Receptors should be chosen according to their environmental sensitivity (human, livestock, or wildlife);
- Preliminary modelling should focus on sensitive receptors within 2,000 metres of any of the turbines;
- If the preliminary model suggests that turbine noise at all sensitive receptors is likely to be below an LA90 of 35 dB at a wind speed of 10 m/s at 10m height during day and night times, then this preliminary modelling is likely to be sufficient to assess the noise impact; otherwise, it is recommended that more detailed modelling be carried out, which may include background ambient noise measurements.
- All modelling should take account of the cumulative noise from all wind energy facilities in the vicinity having the potential to increase noise levels.
- If noise criteria based on ambient noise are to be used, it is necessary to measure the background noise in the absence of any wind turbines. This should be done at one or more noise-sensitive receptors. Often the critical receptors will be those closest to the wind power plant, but if the nearest receptor is also close to other significant noise sources, an alternative receptor may need to be chosen.
- The background noise should be measured over a series of 10-minute intervals, using appropriate wind screens. At least five of these 10-minute measurements should be taken for each integer wind speed from cut-in speed to 12 m/s.

The latter requirement for background noise measurements to include wind speeds up to 12 m/s is no longer important as large pitch-controlled turbines with high hub heights reach rated power at lower wind speeds, typically 8 – 10 m/s. Wind turbine noise levels do not increase above rated power at the turbine blades are pitched to ensure that the rotational speed does not increase. However, background noise levels do increase with wind speed, so an assessment up to rated power is all that is required to demonstrate compliance with a noise limit.

Although the IFC Wind Energy Guidelines raises the possibility of noise criteria based on the ambient noise, there are no specific criteria identified other than the 35 dB L_{A90} threshold above which more detailed assessments need to be carried out. In contrast, the IFC EHS Guidelines state that the operation of an energy facility must not result in the exceedance of the noise levels shown in Table 6-7 or a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

Table 6-7 IFC Guidance on Noise Limits

Receptor	One Hour L_{Aeq} (dBA)	
	Daytime (07:00 – 22:00)	Night time (22:00 – 07:00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Where host country regulations differ from the levels and measures presented in the EHS Guidelines, the IFC expect that developers will achieve the tighter standard. If less stringent levels or measures are appropriate, due to specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment. This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment.

IFC Wind Energy guidelines explicitly require that “where robust in-country guidelines are not yet developed, international guidelines should be used” and refer to Scottish Heritage’s (“SH” – previously Scottish National Heritage or SNH) guidelines regarding birds, and EUROBATS’ and Bat Conservation Trust’s (“BCT”) guidelines regarding bats. EBRD (2019) ESP requires that “in planning and carrying out biodiversity-related baseline and impact assessments, the client will refer to relevant good practice guidance”.

There are also World Bank Group’s EHS Guidelines for Electric Power Transmission and Distribution (World Bank Group 2007) that, inter alia, give basic guidance on bird and bat issues regarding OHLs and refer to US guidance (APLIC & USFWS 2005) that was only available at that time and that only relates to birds.

The SNH guidelines are considered referential by IFIs (SNH 2000, 2012, 2014b), and in particular their updated versions (SNH 2017, 2018a), supported with recommendations for their application (Chamberlain et al. 2005, Band et al. 2007, SNH 2014a, 2018b), and also BirdLife International’s latest report for the Bern Convention and the Council of Europe (Gove et al. 2013), in mutual compliance, are commonly considered today as European and international best practice regarding birds and WPP and have been adopted in this ESIA.

The EUROBATS the 2nd edition of BCT guidelines, are considered referential by IFIs, alongside the latest BCT edition which is widely accepted as current European and international best practice regarding bats and WPPs. Whilst the two sets of guidelines are not fully compatible regarding details of survey methodologies, consistent implementation of any of them provides for a robust impact assessment. Latest EUROBATS guidelines (Rodrigues et al. 2015), having broader geographical scope and are better adapted and applicable to Serbian situation, have been followed in the Crni Vrh ESIA bat surveys, taking cognisance of the BCT guidelines.

Widely accepted European and international best practice regarding birds and OHLs are BirdLife International’s report for the Bern Convention and the Council of Europe (Haas et al. 2003) and the most up-to-date CMS/AEWA guidelines (Prinsen et al. comp. 2012). However, CMS/ AEWA guidelines (Prinsen et al. comp. 2012), mentioned US document (APLIC & USFWS 2005) Lenders refer to, as well as relevant Lenders’ guidelines itself (World Bank Group 2007) does not provide any guidance on pre-construction surveys, focusing on impacts, mitigation, and post-construction monitoring. The only guidance on bird survey methodologies for OHLs in recognised best practice documents is given in BirdLife International’s report for the Bern Convention and the Council of Europe (Haas et al. 2003), though very few. Some more survey guidance for OHLs is provided within the most relevant WPP related document (SNH 2017). Furthermore, Scottish Natural Heritage has also produced specific and detailed guidelines for assessment and mitigation of impacts of power lines on birds (SNH 2016), based on their earlier WPP guidelines (SNH 2014b) and covering all relevant aspects of the subject. Although still only becoming internationally accepted as best practice, this document is considered the most comprehensive as well as complete with respect to survey methodologies.

There are no recognised international best practice standards related to bats and OHLs whilst EUROBATS’ guidelines give only general recommendation that the entire WPP supporting infrastructure including grid connections should be considered in pre-construction surveys (Rodrigues et al. 2015). Moreover, there is even very few information on this topic and only one relevant comprehensive evidence-based study, published by EirGrid plc (Irish statutory electric power transmission operator), providing, inter alia, some very basic guidance on surveys (McCrory et al. 2015). However, Bat Conservation Trust’s guidelines (Hundt ed. 2012, Collins ed. 2016), as well as national unofficial guidelines (Paunović et al. 2011), provide generic guidance for impact assessment of any proposed activities on bats.

The EHS Guidelines contain details of occupational health and safety (OHS) matters typical to general construction projects. Mitigation and management measures are specified within each set of guidelines. In addition, IFC PS2 contains requirements for managing the health and safety of the Project workforce including those workers directly employed by the borrower, workers engaged through third parties to perform work related to core business processes of the Project for a substantial duration (contracted workers), and workers engaged by the borrower’s primary suppliers (supply chain workers). The main OHS elements of PS2 are:

- Identification of potential hazards to workers;
- Provision of preventive and protective measures;
- Training of workers;
- Documentation and reporting of occupational accidents, diseases, and incidents;
- Emergency prevention, preparedness, and response arrangements;
- Incorporation of mitigation measures to ensure that primary suppliers are correcting any life-threatening situations within the primary supply chain.

In addition to the community health, safety and security elements of the Project-relevant EHS Guidelines, IFC PS4 contains requirements for safeguarding the health, safety and security of affected communities. The key aspects are:

- Infrastructure and equipment design and safety;
- Hazardous materials management and safety;
- Ecosystem services;
- Community exposure to disease;
- Emergency preparedness and response;
- Security personnel.

6.6 Meeting and Delivering the Applicable Requirements

This Chapter provides an overview of the Serbian regulation and international standards (required by the IFIs and MLDBs) that the developers and operators of the Crni Vrh WPP must comply with; the Applicable Requirements.

A register of EHS legal requirements applicable to the Crni Vrh WPP has been developed by the ESIA consultant, see Table 6-9. This register will form part of the Project Environmental and Social Management System (ESMS). It will be maintained and updated by the project management team.

The IFC Guidelines provide more detail regarding the identification and management of a range of environmental and social impacts. The ESMMP and the ESMS Management Plans will be designed to meet the requirements of the IFC Guidelines.

6.7 Permit Conditions

Table 6-8 provides a summary of the E&S conditions in the development permits that directly regulate the construction, operation and decommissioning the Crni Vrh WPP. These form part of other project permits and there are no specific environmental permits within Serbia (see section 3.1.1 for further information).

It is noted that E&S conditions within the Location Permit (issued by the IfNC) are very general in nature and are considered to be 'standard' conditions. None of the conditions required by the IfNC within the Location Permit are specific to the Crni Vrh project.

Table 6-8 E&S Conditions in Permits

Permit	Date Obtained	E&S Conditions
Energy Permit	24th May 2021	No E&S conditions are set by the permit.
Location Permit	6th December 2021	**Design/ Pre-Construction:** • The final WTG layout should be defined based on results of the one-year pre-construction flora, habitat and fauna surveys. • All sensitive, relic and wetland habitats should be avoided to preserve habitat diversity within the site. • The maximum height to blade tip shall not exceed 206m.

Permit	Date Obtained	E&S Conditions
		• Blades must be painted to be easily noticeable to wildlife. • The flashing obstruction lights should be used on wind turbines. Lighting of other structures must be minimised and directed downwards. • All installations must be grounded, secured and insulated to prevent or minimise animal electrocution and mortality. The substation 33/110kV, cabling network and other auxiliary structures must be designed to prevent bird nesting or bat roosting. **Construction:** • No construction work is allowed in areas with high concentration of birds and bats, particularly in areas of their roosts, and foraging and nesting areas. • Existing roads should be used as much as possible. Degradation of natural, semi-natural or agricultural habitats should be avoided. • Stockpiles of earthen material/ spoil must be protected from erosion and dust generation and finally properly disposed off-site. • New access tracks shall not cause instabilities or erosion. • Cable trenches and turbine foundations should be properly backfilled to keep out burrowing animals and prevent attracting raptors. • Upon completion of the construction, all degraded areas must be restored (excluding planting near the turbines and access tracks). • Only native plants should be used in restoration of degraded areas. Introduction of invasive species is prohibited. **Operation:** • Post-construction mortality monitoring is required for at least 3 years. The results must be reported to the IfNC on a regular basis. The report should include photographs of carcass, location and time of the finding, distance to the nearest WTG and record on weather conditions. • Based upon the post-construction mortality monitoring results, in case of high fatality rates, curtailment of turbines should be considered. The causes of fatalities and related mitigation should be identified in consultation with the IfNC. • If regular concentration of birds or bats is recorded in the vicinity of turbines (e.g. due to the attraction to structures, trees or waste dumps), appropriate mitigation should be defined in consultation with the IfNC (including the removal of problematic structures or technical measures to prevent concentration). • Bird and mammal carcass shall be regularly removed from the site (following appropriate recording within the scope of the mortality monitoring). • To protect the migratory species, the WPP must be equipped for continual monitoring of bird and bat movements over the site area.

Permit	Date Obtained	E&S Conditions
		• Shrub and weed growth shall be removed within a radius of 200m from the turbines and mowed at a height of 20cm, in particular at the turbine bases. • Operational noise should be monitored and controlled. In case of exceedance of legal noise limits, curtailment of turbines should be considered. If the noise level is increased due to turbine faults, the turbine must be stopped and repaired. • Disposal of organic or construction waste is prohibited at the site. If present, existing illegal landfills/dumps shall be removed. • Open wet areas at the site should be properly drained to minimise the concentration of insects which might attract birds and bats. **Decommissioning:** • Upon completion of the WPP operational phase, all structures and equipment must be removed, and the site must be completely restored.
Building Permit	Expected in September 2022	No E&S conditions are set by the permit. The EIA Study (unconsented) is included in the permit application.
Registration of Works	Expected in 2023	The EIA Consent is a prerequisite for the Registration of Works and requires implementation of mitigation measures listed in the EIA Study.

The E&S Permit Conditions are included within the Register of Legal Requirements (Table 6-9) and the ESMMP (Table 17-2).

Table 6-9 Register of Legal Requirements for the Crni Vrh WPP

Item No.	Primary Legislation/ Regulation/ Directive/ Other	Description of the Requirement and Project Application	Adjudicating Body	Limits or Conditions imposed	Responsibility	Mant. Plan Ref.
Occupational, Health and Safety						
1	Law on Occupational Health and Safety Articles 13, 15, 23, 49	An Employer is obliged to provide a safe working environment. In particular, the employer must: • Complete a Risk Assessment for each task, • appoint an OHS person, • Provide Personal Protective Equipment (PPE) for each employee and control their use, • organize training for employees on working in a healthy and safe way and providing first aid, • keep records of employees' health, and training, • report to authorities on OHS injuries. • regularly test the safety of working equipment, • measure the occupational exposure (e.g. to non-ionising radiation, noise, air temperature, etc.)	Ministry of Labour, Employment, Veteran and Social Affairs	These requirements will be audited by a specialist, third party consultant. Monthly reports are to be provided to CVP and their contractors.	CVP and their contractors	EHS Management Plan prepared by the O&M Contractor.
Emergency Preparedness						
2	Law on Reducing the Risk of Catastrophic Events and Managing Emergency Situations Article 30	Take all necessary mitigation measures to reduce risk of emergencies. The employer is obliged to respond in case of asking by authority to help when some catastrophic event occur.	Ministry of Interior	This requirement will be audited by a specialist, third party consultant. A compliance report will be provided to CVP and their contractors.	CVP and their contractors	Emergency Preparedness and Response Plan EHS Management Plans
3	Law on Fire Protection Article 23, 24, 25	The Operator must develop and implement an internal Regulation on Fire Protection.	Ministry of Interior	This requirement will be audited by a specialist, third party consultant. A	CVP and their contractors	Emergency Preparedness and Response Plan

Item No.	Primary Legislation/ Regulation/ Directive/ Other	Description of the Requirement and Project Application	Adjudicating Body	Limits or Conditions imposed	Responsibility	Mant. Plan Ref.
			Fire Safety Department	compliance report will be provided to CVP and their contractors.		EHS Management Plans
Handling and Management of Hazardous Materials						
4	The Law on Environment, Article 29	The management of dangerous substances is carried out under conditions and in a manner that ensures the reduction of the risk of their hazardous properties to the environment and human health in the process of production, storage, use and disposal. The legal and physical person managing hazardous substances shall plan, organize and undertake all necessary preventive, protective, safety and sanitary measures to minimize the risk to the environment and human health.	Ministry of Environment - Environmental Inspection Department	Make a document that defines measures to prevent environmental pollution.	CVP and their contractors	OEMP Emergency Preparedness and Response Plan EHS Management Plans
Waste Management and Disposal						
5	Law on Waste Management Article 15, 26	Waste streams generated at the site have to be classified. Hazardous or potentially hazardous waste streams have to be tested by a certified laboratory and their class code determined. Certificated waste operator for transport, treatment and disposal of waste has to be hired. Waste records should be kept for at least 2 years. If more than 100t of non-hazardous waste or more than 200kg of hazardous waste is generated annually at site then the Operator is obliged to implement a Management Plan. Hazardous waste shall not be stored on site for > 12 months.	Ministry of Environment	This requirement will be audited by a specialist, third party consultant. A compliance report will be provided to CVP and their contractors.	CVP and their contractors	Emergency Preparedness and Response Plan EHS Management Plans
Wastewater Management						

Item No.	Primary Legislation/ Regulation/ Directive/ Other	Description of the Requirement and Project Application	Adjudicating Body	Limits or Conditions imposed	Responsibility	Mant. Plan Ref.
6	Law on Water, Article 100	The integrity of septic tanks and associated sewage has to be tested every 5 years.	Ministry of Agriculture, Forestry and Water Management	This requirement will be audited by a specialist, third party consultant.	CVP and their contractors	CESMP and OESMP
Water Supply						
7	Law on Water, Water Approval for Well	Annual reporting on water extraction for WF operation purposes to public water management company Srbijavode.	Ministry of Agriculture, Forestry and Water Management	This requirement will be audited by a specialist, third party consultant. A compliance report will be provided to CVP and their contractors.	CVP and their contractors	CESMP and OESMP
Location Permit						
9	Law on Planning and Construction, Official Journal of RS, No. 09/2020	The Location permit provides specific conditions for connection of the project to the existing infrastructure onsite. The Location permit includes a number of environmental conditions that must be applied. The environmental conditions are prepared by the Institute for Nature Conservation.	Ministry of Construction, Transport and Infrastructure	**Construction**: • No construction work is allowed in areas with high concentration of birds and bats, particularly in areas of bat roosts, bird nests and overnight roosts. • Existing roads should be used as much as possible. Degradation of natural, semi-natural or agricultural habitats should be minimised. • Stockpiles of earthen material/ spoil must be protected from erosion and dust generation and finally properly disposed off-site. • New access tracks shall not cause instabilities or erosion. • Cable trenches and turbine foundations should be properly backfilled to keep out burrowing animals and prevent attracting raptors. • Upon completion of the construction, all degraded areas must be restored (excluding planting near the turbines and access tracks). • Only native plants should be used in restoration of degraded areas.	CVP and their contractors	CESMP and OESMP

Item No.	Primary Legislation/ Regulation/ Directive/ Other	Description of the Requirement and Project Application	Adjudicating Body	Limits or Conditions imposed	Responsibility	Mant. Plan Ref.
				Introduction of invasive species is prohibited.		
10	Law on Planning and Construction, Official Journal of RS, No. 09/2020	The Location permit provides specific conditions for connection of the project to the existing infrastructure onsite. The Location permit includes a number of environmental conditions that must be applied. The environmental conditions are prepared by the Institute for Nature Conservation.	Ministry of Construction, Transport and Infrastructure	**Operation**: • Post-construction mortality monitoring is required for at least 3 years. The results must be reported to the IfNC on a regular basis. The report should include photographs of carcass, location and time of the finding, distance to the nearest WTG and record on weather conditions. • Based upon the post-construction mortality monitoring results, in case of high fatality rates, curtailment of turbines should be considered. The causes of fatalities and related mitigation should be identified in consultation with the IfNC. • If regular concentration of birds or bats is recorded in the vicinity of turbines (e.g. due to the attraction to structures, trees or waste dumps), appropriate mitigation should be defined in consultation with the IfNC. • Bird and mammal carcass shall be regularly removed from the site (following appropriate recording within the scope of the mortality monitoring). • To protect the migratory species, the WPP must be equipped for continual monitoring of bird and bat movements over the site area. • Shrub and weed growth shall be removed within a radius of 200m from the turbines and mowed at a height of 20cm, in particular at the turbine bases.	CVP and their contractors	CESMP and OESMP

Item No.	Primary Legislation/ Regulation/ Directive/ Other	Description of the Requirement and Project Application	Adjudicating Body	Limits or Conditions imposed	Responsibility	Mant. Plan Ref.
				• Operational noise should be monitored and controlled. In case of exceedance of legal noise limits, curtailment of turbines should be considered. If the noise level is increased due to turbine faults, the turbine must be stopped and repaired. • Disposal of organic or construction waste is prohibited at the site. If present, existing illegal landfills/ dumps shall be removed. • Open wet areas at the site should be properly drained to minimise the concentration of insects which might attract birds and bats.		
11	Law on Planning and Construction, Official Journal of RS, No. 09/2020	The Location Permit provides specific conditions for connection of the WPP to the existing infrastructure onsite. The Location permit includes a number of environmental conditions that must be applied.	Ministry of Construction, Transport and Infrastructure	**Decommissioning:** • Upon completion of the WPP operational phase, all structures and equipment must be removed, and the site must be completely restored.	CVP and their contractors	CESMP and OESMP
Energy Permit						
12	Law on Energy, Article 33	To obtain the Energy Permit, the Developer has to comply with applicable environmental regulatory requirements set by a competent environment authority.	Ministry of Mining and Energy	This requirement will be audited by a specialist, third party consultant. A compliance report will be provided to CVP and their contractors.	CVP and their contractors	CESMP and OESMP
Zoning Plan						
13	Law on Planning and Construction, Official Journal of RS, No. 09/2020	To initiate the Serbian EIA Study procedure, the local authorities must develop and adopt a Zoning Plan that includes a basic description of a new project. The approval of the Zoning Plan includes consultation with a series of national and regional statutory bodies that provide their conditions under which a development is possible. They indicate potential	Town of Bor, Municipality of Žagubica and Municipality of Majdanpek	The Zoning Plan requires that: • Areas of particularly sensitive habitats of conservation concern (pastures, woodland, grassland etc.), should be preserved. • Pre-construction surveys of flora, habitats, birds and bats should be undertaken at the OHL site. One-year surveys should be	CVP and their contractors	CESMP

Item No.	Primary Legislation/ Regulation/ Directive/ Other	Description of the Requirement and Project Application	Adjudicating Body	Limits or Conditions imposed	Responsibility	Mant. Plan Ref.
		conflicts with existing or planned infrastructure, may require pre-construction investigations or studies or describe technical and management measures that must be implemented as part of project development.		undertaken . . . and survey report delivered to IfNC. • The survey report should contain data on all bird and bat species and habitat types present within the site, population abundance of sensitive groups (birds, bats and other), seasonal changes in population numbers during the survey period, commuting and migration routes, breeding sites, staging sites, wintering sites, etc.. • Surveys should record details of precise observation locations of bird and bat species, and their flight paths and heights. Surveys should be undertaken using modern technology for species observation, bats in particular. Surveys should be undertaken by qualified surveyors with expertise in biology and ecology of the given taxa. • Construction works are prohibited: - during the wildlife breeding season; - in the bed of watercourses, including removal of riverside vegetation; - if causing changes in the morphology and hydrology which may impact functionality of the ecological corridors; - during the days when they will cause long-term water turbidity. If during the night the water in the watercourses clears satisfactorily, the works can continue next day; - if causing water turbidity for more than 5 consecutive days		

7 Study Area, Survey Methodologies and Data Modelling

7.1 Project Area of Influence

All projects have direct and indirect impacts on the environmental and social setting where they will be placed. Consideration of these impacts means that the scope of the ESIA goes beyond the physical footprint of the facilities or infrastructure to be built and includes the activities undertaken during the construction, operation and decommissioning of the project. Specifically, the IFC PS1 require a broader consideration of:

1. The area likely to be affected by:
   - Project activities and facilities that are directly owned, operated, or managed (including by contractors) by the Developer;
   - Impacts from unplanned but predictable developments caused by the Project that may occur later or at a different location; or
   - Indirect project impacts on biodiversity or on ecosystem services upon which 'Affected Communities' livelihoods depend.
2. Associated facilities, which are facilities that are not funded as part of the Project and that would not have been expanded if the Project did not exist and without which the Project would not be viable.
3. Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the Project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

The basis of the Area of Influence ("AoI") for the Crni Vrh ESIA is summarised in the following Table 7-1. This broad definition of the AoI has been applied by the technical specialists involved with the Crni Vrh ESIA. Any variations to the broad definition are explained in the body of the Chapter.

Table 7-1 General Definition of a Project Area of Influence

Impact Type	Area of Influence by Project Phase	
	Construction	Operation
Air Quality - dust and emissions from project vehicles	100m either side of the transport routes to the site. 100m either side of tracks within the construction site. 250m zone around working areas.	There are no significant sources of emission during operation.
Noise	250m either side of the roads used for the transport of workers and materials to and from the construction site. 250m either side of all construction areas where mobile plant and vehicle may generate noise.	Defined by quantitative modelling as the area impacted by noise from the WTGs. The limits at the noise sensitive receptor (NSR) are based on Serbian and IFC limits.
Ecology, nature conservation and ecosystem services	The area cleared for the construction of the Project as well as access roads, cable installation, construction camp or compound, lay-down areas or similar activities. Areas identified by the ESIA where access will not be allowed during the construction period. These areas may be fenced.	The geographical area where biodiversity or protected species, could be impacted by the windfarm project. This includes the area up to 500 m from each WTG and up to 2 km from the boundary of the windfarm for direct impacts, and wider area (East Serbia region) determined by possibility that birds, bats and/ or other species from

Impact Type	Area of Influence by Project Phase	
	Construction	Operation
		certain populations/ area occur at the WPP site.
Visual and Landscape	500m from the working areas to take account of artificial lights and the use of large items of equipment such as cranes.	Defined by quantitative modelling as the Zone of Theoretical Visibility.
Cultural heritage and archaeology	Archaeological monuments and other features within 1km of a WTG.	Archaeological monuments and other features within 1km of a WTG.
Community health, safety and wellbeing	100m either side of the transport routes to the site. The geographical area where workers could interact with local residents and potentially spread communicable diseases such as Covid-19.	100m either side of the transport routes to the site. A perimeter with the diameter of 1.5 times the highest point of the WTG (i.e. to the blade tip). This is the area that could be impacted due to a sudden collapse of a WTG, loss of a blade, or a fire within the nacelle. Defined by quantitative modelling of the shadow flicker limit within the ten times rotor diameter area of the candidate turbine model with longest blade. Initial ice throw risk area defined by worst-case perimeter of 1.5 the sum of rotor diameter and hub height. Refined by quantitative modelling.
Land use	Defined as the land that may be used by the project. Permanent areas include the land acquired under lease agreements for the WTGs, access roads, sub-station and OHL. Temporary areas include the working area, the construction compound and laydown areas,	Defines as the area occupied by the WTG foundations and maintenance pads, site tracks, sub-station compound and pylons for the OHL.
Public infrastructure	Specific location where roadways may need to be widened, or the curve radius changed, to allow WTG convoys to pass.	May be required if any WTGs need to be replaced.
Employment and other expectations	The area that includes communities or residents that expect to benefit from the Project. This could be direct employment or through increases in local tax revenue.	The area that includes communities or residents that expect to benefit from the Project. This could be direct employment or through increases in local tax revenue.
Procurement and the generation of energy	The area within which local businesses may be used for the procurement of goods and services.	The area within which local businesses may be used for the procurement of goods and services.

With these requirements in mind, the Project Area of Influence, which forms the basis of the study area, for the preparation of the Crni Vrh WPP ESIA includes the:

- Any potential impacts on local and migratory bird and bat populations, including stopover sites, and the possible creation of barrier, displacement or cumulative effects, as well as any potential impacts on other biodiversity;

- The transport route to site for heavy vehicles and, in particular, the delivery of the WTG components;
- The impact on the wider landscape as defined by a Zone of Theoretical Visibility;
- The potential for economic displacement and or social disruption as well as any benefits due to the presence of the construction teams within the local communities;
- The benefit to the local communities of tax paid by Crni Vrh (as well as any profit sharing that may be agreed);
- Location of the concrete batch plant (if the batch plant is off-site, then the routing of the concrete delivery vehicles will be included in the assessment of transport impacts).

The ESIA will also include consideration of potential cumulative impact of the Crni Vrh wind power plant. The Cumulative Impact Assessment ("CIA") will include the definition of a temporal and spatial boundary for the CIA.

7.2 ESIA Study Area

7.2.1 Ecology and Nature Conservation

The Survey area for each of the undertaken ecological surveys was defined according to relevant guidance (as elaborated in section 7.3.3), mostly as the area extending 50-500 m beyond the Project infrastructure to be developed. All potential impacts of the Project's power-producing facilities and support infrastructure (including WTGs, access tracks, OHLs) on habitats, species populations and activities, including impacts associated with all phases (construction, operation, and decommissioning) and cumulative impacts, were considered.

The wider surrounding area of the East (Carpathian) Serbia region (Figure 8-58) was taken into consideration as a potential Area of Influence, designated sites in particular, as well as considered appropriate geographic and ecological scale at which cumulative effects have been assessed. The Crni Vrh ESIA considered the potential Project impacts on ecological features, including habitats, flora, birds, bats, ground mammals, reptiles, amphibians, and invertebrates within the study area.

Control/ reference site surveys were *not undertaken* since considered unfeasible. Best practice guidance with regard to birds, both previous (SNH 2005, 2014b) and current (SNH 2017), recommend that for proposals greater than 50 MW where post-construction monitoring will be undertaken, which is the case here, a comparable control or reference site should also be selected and surveyed at the time of pre-construction surveys to enable Before-After-Control-Impacts (BACI) methods (Anderson *et al.* 1999) to be implemented during post-construction monitoring. However, as established by thorough examination throughout the region, a comparable control/reference site could not be found – potential sites mostly have much more preserved natural habitats and biodiversity and are thus mostly protected, some are heavily degraded by mining, whilst the rest of the region has very different topography and aspect.

All bird and bat species are legally protected in Serbia. As required by Nature Protection Conditions for the project, all bird and bat populations occurring at the site were considered, including resident, breeding, migrating, and wintering, as well as all aspects of habitat use, particularly: nesting/roosting, foraging, resting, commuting and migration. Bird species were classified as target or secondary species and treated accordingly.

7.2.2 Landscape and Visual Impact

Wind turbines are large structures that inevitably attract a range of opinion, from very adverse to very beneficial. As a consequence, this LVIA has adopted the precautionary principle, and assumes that all landscape and visual impacts that occur as a consequence of the Project are adverse.

In addition, the prominence of the turbines in the landscape will vary according to the prevailing weather conditions. The assessment has been carried out by assuming the 'worst case' conditions, i.e. a clear, bright day in summer, with most vegetation in full foliage when landscape amenity reaches its full potential.

There is no Serbian guidance for landscape and visual impacts that would provide specific recommendations for the Study Area. UK (NatureScot) guidance recommends that the initial Zone of Theoretical Visibility (ZTV) for turbines with blade tip higher than 150m should be 45km, allowing adjustments based on specific characteristics of the landscape and/or proposed development.

Following the Guidance, the initial ZTV has been set as 45km from the outer most turbines and the ZTV plans have been developed accordingly. The Study Area has been further informed by the geographic extent of theoretical visibility shown in the ZTV plans, as well as actual visibility, weather conditions, and distance.

The ZTV plans showed that frequency of visibility at distances over 35km would be very limited, mostly from areas of higher ground which are hardly accessible (and thus not representative) or screened by vegetation. The susceptibility of Crni Vrh Mountain to fog (described in 8.1.10 Climate Setting) has a material influence on the actual visibility of the project and the likely significant effects, especially at long viewing distances. It has also been taken into account that perceived clarity and details of turbines seen from a distance beyond 30km are not likely to constitute significant effects on the landscape character and visual receptors, even during conditions of a very good visibility.

Based upon this, the spatial scope for the proposed Crni Vrh WPP has been defined at a distance of 30km radius from the outer turbines.

7.2.3 Ice Throw and Ice Fall Risk

There is no Serbian guidance for wind turbine ice throw and ice fall risk that would provide recommendation for the Study Area. The operational windfarms in Serbia have been predominantly concentrated in the northern part of the country where icing is only occasional and light (less than 7 days per year). During the permitting process authorities have not gained any practical experience related to the ice throw risk. The proposed Crni Vrh WPP would be the first one in Serbia developed in an area prone to heavy icing.

For the purpose of this assessment, to establish the initial spatial scope for the ice throw risk area, the guidelines of the international expert group IEA Wind TCP Task 19 “Wind Energy in Cold Climates” have been followed. The guidelines are also recommended by the 2015 IFC EHS Guidelines for Wind Energy (page 18).

The initial ice throw Study Area has been determined based upon an empirical and simplified equation (‘Seifert formula’), widely accepted as being conservative:

Maximum falling distance of ice fragments [m] = 1.5 (D + H) [6]

D = Rotor diameter [m]
H = Hub height [m]

For the worst-case considered candidate WTG (Vestas V162-5.6, rotor diameter: 162m, hub height: 125m) the conservative ice throw risk area would be: 1.5 (162m + 125m) = **430.5m**.

The key drawback of this approach is that it distributes the ice throw risk 360 degrees uniformly around each WTG and does not take into account the topography, wind direction or wind speed. It is therefore considered to be a “worst case” scenario, a general zone of likely ice throw which is likely larger than the throwing distance in reality.

As the initial ice throw assessment identified a community health and safety risk and a detailed ice throw study was commissioned by the Developer from specialist consultants DNV. The objective of the study was to consider the risk of ice fragments being thrown from WTGs and striking areas around the WTGs.

DNV adopted a methodology that was developed by DNV in partnership with the Finnish Meteorological Institute and the Deutches Windenergie-Institut. The methodology adopted the following staged approach:

- “Determine the periods when ice accretion on wind turbine blades might occur. Based on historic climatic observations.
- Within those periods, determine when the wind speed conditions are within the operational range of the wind turbines.
- Based on the above-described estimate of icing occurrence, use guidelines to derive the probability of fragments landing at distances from the turbines which are of interest.”

The results of the analysis were provided for one turbine model in two modes: operational and on-hold (idling). The operational mode can be considered as a worst-case scenario. This assumes that all the ice expected on the blades in these climate conditions will be generated and thrown by the operating turbine. The ice particle trajectories will be influenced by the rotor speed, gravity, as well as wind speed and direction. No turbine down time (failures or maintenance) is considered.

The on-hold mode still assumes that all the ice expected to form on the blades in these climate conditions will detach but the rotor will not be rotating. The turbine could be non-operational, e.g. due to insufficient (or excessive) wind speed, maintenance periods or icing detection systems switching off the turbines. In such

[6] H. Seifert, A. Westerhellweg and J. Kröning, “Risk analysis of ice throw from wind turbines,” BOREAS VI, 9 to 11 April 2003, 2003

state the ice drop trajectory will simply be influence by gravity and potential wind. Hence, the range of impact will be limited, compare to ice throw. The actual length of down time was not analysed within this study.

7.2.4 Shadow Flicker

There is no official Serbian guidance for shadow flicker impacts that would provide specific recommendations for the Study Area. International best practice considers that shadow flicker from wind turbines does not occur beyond a distance equivalent to ten rotor diameters from a given wind turbine. The distance of ten rotor diameters has been adopted in this assessment.

The shadow created by a wind turbine is directly dependent on the blade length and width. The hub height is of a secondary importance, i.e. wind turbine with lower hub height but longer blades will create larger shadow than the one with higher hub but shorter blades. In order to determine the worst-case model for shadow flicker occurrence, six models preliminarily selected by the CVP have been considered (Table 7-2).

Table 7-2 Specific Criteria for Assessing the Extent and Magnitude of Visual Impact

	General Electric GE 5.5 - 158	Nordex N149/5.7	Nordex N163/5.7	Vestas V150 – 5.6	Vestas V162– 5.6	Siemens Gamesa SG 6.0 - 155
Rotor diameter (m)	158	149	163	150	162	155
Hub height (m)	120.9	105	118	105	125	102.5

The two models with longest blades are Nordex N163/5.7 and Vestas V162-5.6, having the rotor diameters of 163m and 162m, respectively and Nordex having a slightly larger swept area of 20,867m^2 compared to 20,612m^2 of Vestas. As the N163/5.7 presents the worst-case model, the Study Area of ten rotor diameters, i.e. 1,630m has been set for the proposed development.

7.2.5 Traffic and Transport

Although all construction materials would be sourced from locations off-site, it is assumed that the project-related traffic would be most pronounced in the vicinity of the site. The further are the vehicles from the site they would disperse over the wider road network and the potential effects on traffic and transportation are less likely to be significant.

International transport of wind turbine components by river barges is not included in this assessment, assuming that there is a sufficient infrastructure before the Serbian waterways to manage the required transport.

The town of Bor (30km from the site) is a regional centre and key transportation hub and it is assumed that the majority of construction materials for the project would arrive via Bor or the nearby local hub Brestovac. It is not yet been decided if an existing, commercial concrete batching plant will be used for the Project or if a plant will be constructed on or near the construction site. The route via Bor is also a preferred route for delivery of large turbine components. Therefore, the Study Area has been defined to include sections of the public road network between Bor/ Brestovac and the development site.

The likely route to the proposed WPP site that would be used by construction traffic including the transport of turbine components is the following:

- Road No. 400: Prahovo Port - Samarinovac;
- Road No. 168: Samarinovac – Dušanovac;
- Road No. 35: Dušanovac – Vražogrnac;
- Road No. 37: Vražogrnac – Brestovac;
- Road No. 161: Brestovac – Žagubica.

For each WTG, a maximum of ten abnormal loads will be required to be transported to site on oversized road transporters from Prahovo Port to the trans-shipment area (20 total trips in and out):

- WTG tower sections – Five loads per WTG (hub, top section, middle 1, middle 2, bottom section), each transported separately.
- Blades – Three loads per WTG, each transported separately.

- Nacelle – One load per WTG.

The transport from the trans-shipment area to the site will require blade lifters (2 per WTG) and modular trailers for the other components.

Drivetrain (one load per WTG) will be transported directly from Prahovo to the site.

International transport of wind turbine components by river barges is not included in this assessment, assuming that there is a sufficient infrastructure before the Serbian waterways to manage the required transport.

7.3 Baseline Studies and Assessment Methodologies

In order to identify the scale of the potential effects of the Project, it is necessary to establish the baseline conditions at the time of assessment. The baseline condition of the study area was established using:

- Site visits and surveys;
- desk-based studies of existing information;
- modelling; and
- consultation with the relevant stakeholders (as defined by the SEP).

The initial characterisation of the existing physical, ecological and social environment included a desktop study of data provided by the Developer (such as windfarm design and land acquisition) as well as from published sources (such as satellite imagery, aerial photography, topographical maps, environmental studies and academic papers).

The desktop study was then supplemented by extensive field surveys defined by the technical experts who undertook the impact assessment. Some of the photographs taken during the field surveys have been included in this ESIA report.

The following sections describe the field study methodologies, the modelling applied to the data collected and the assessment methodologies that were used.

7.3.1 Socio-Economic

The social impact element of the ESIA describes how stakeholders (identified within the SEP) have been informed, consulted, and have participated in the process of preparing the ESIA. Stakeholders have assisted in the identification of potential socio-economic impacts and provided information on socio-economic conditions and land use activities.

The social impact assessment considers the changes which may occur during the construction, operation, and decommissioning of the Project in demographics and economics, social infrastructure, land use, community wellbeing, and the health and safety of workers and communities.

The social impact assessment included the following tasks:

- Identifying types of adverse and beneficial impacts of the proposed action.
- Assessing the level of socioeconomic risks in terms of frequency (how likely is it to happen) and consequences.
- Assessing the acceptability of the risks.
- Introducing mitigation measures to reduce risks to acceptable level.

The social impact assessment has considered:

- Demographics: Changes in local population size, emigration/immigration in the area, migration of people in search of work, and other issues.
- Economic issues: Supply chain impacts, local sourcing opportunities, potential impacts on local markets for goods and services, the impact on livelihoods from changes in land lease agreements and restrictions in land access, the impact of an influx of workers, employment opportunities for construction, operation, and decommissioning phases of the Project.
- Health issues: Risks of new diseases to indigenous communities (particularly from an influx of workers during construction), impacts on health of operations personnel and local communities, impacts from road transport (and the potential for damage to occur to local roads), impact of local diseases on workers.

- Social infrastructure: Adequacy of health care and education facilities, transport and roads, power supply, fresh water supply to support project activities and personnel as well as the local communities.
- Resources: Land use changes, increased access to rural or remote areas, use of natural resources.
- Psychological and community aspects: Changes from traditional lifestyles, community cohesion, attitudes and behaviour, perception of risk.
- Cultural: Issues associated with sites that have archaeological, historical, religious, cultural, or aesthetic values.
- Social equity: Local social groups who will gain or lose as a result of the Project or operation.

7.3.2 Ecosystem Services

The UN Millennium Ecosystem Assessment (MA) published in 2005 defined Ecosystem Services as “the benefits people derive from ecosystems”. Besides provisioning services or goods like food, wood and other raw materials, plants, animals, fungi and micro-organisms provide essential regulating services such as pollination of crops, prevention of soil erosion and water purification, and a large range of cultural services, like recreation and a sense of place.

Despite the ecological, cultural and economic importance of these services, ecosystems and the biodiversity that underpins them are still being degraded and lost. One major reason for this is that the value (importance) of ecosystems to human welfare is still underestimated and not fully recognized in every day planning and decision-making, in other words, the benefits of their services are not, or only partly, captured in conventional market economics.

Many of the most significant changes to ecosystems have been essential to meet growing needs for food and water; these changes have helped reduce the proportion of malnourished people and improved human health. Agriculture, including fisheries and forestry, has been the mainstay of strategies for the development of countries for centuries, providing revenues that have enabled investments in industrialization and poverty alleviation.

These gains have been achieved, however, at growing costs in the form of the degradation of many ecosystem services, increased risks of nonlinear changes in ecosystems, the exacerbation of poverty for some people, and growing inequities and disparities across groups of people.

Ecosystem Services have been broadly categorised by the MA in accordance with the following:

1. Supporting:
   - Nutrient cycling;
   - Soil formation;
   - Primary production;
2. Provisioning of Food:
   - Freshwater;
   - Wood and fibre;
   - Fuel;
3. Regulating or Climate Regulation:
   - Flood regulation;
   - Disease regulation;
   - Water purification;
4. Cultural or Aesthetic:
   - Spiritual;
   - Educational;
   - Recreational.

The IFC PS6 requires a systematic review to identify priority ecosystem services and assess potential disruptions to them. The following process proposed by the World Resources Institute[7] has been adopted within this assessment to identify the priority ecosystem services:

1. Could the Project affect the ability of others to benefit from the ecosystem service?
2. Is the ecosystem service important to beneficiary livelihoods, health, safety or culture?
3. Do beneficiaries have viable alternatives to the ecosystem service?

Priority ecosystem services are those for which the answer to question 1 and 2 has been "Yes" or "Unknown" and the answer to question 3 has been "No" or "Unknown". The ecosystem services categorised as "non-priority" have not been considered further.

There are strong linkages between categories of ecosystem services and components of human well-being that are commonly encountered. Within the project site the function of the land is to accommodate grazing of livestock. No other services have been identified. The irrigation canals are outside the project boundary and no important plant species were encountered. All land has been previously leased to private individuals and has now been leased to the Project Company. As a result, the site is not deemed to provide any ecosystem services.

7.3.3 Ecology and Nature Conservation

7.3.3.1 Permit Conditions

The IfNC included a number of Nature Protection Conditions ("NPCs") in the zoning plans of the WPP, the OHLs as well as in the location permit of the WPP. NPCs for the WPP Location Permit are listed in section 6.7 and these relate largely to the operation of the WPP.

The NPCs for the WPP Zoning Plan relate more to the design and construction of the WPP and are:

> "2) WPP site should be considered and analysed as a whole, not as administrative segments of the municipalities of Majdanpek and Žagubica and the City of Bor."
>
> "5) OHL routing should consider the 14 OHLs already planned within the city of Bor area, to avoid the destruction of any significant habitats and fragmentation of larger forest complexes.".
>
> "14) Areas harbouring a large number of species sensitive to WTGs should be excluded from development, and construction should be planned in areas where the population densities of sensitive species are low."

The NPCs within the OHLs Zoning Plan are:

> "3) Areas of particularly sensitive habitats of conservation concern (pastures, woodland, grassland etc.), should be preserved."
>
> "6) Pre-construction surveys of flora, habitats, birds and bats should be undertaken at the OHL site. One-year surveys should be undertaken . . . and survey report delivered to IfNC . . ."
>
> "7) Survey report should contain data on all bird and bat species and habitat types present within the site, population abundance of sensitive groups (birds, bats and other), seasonal changes in population numbers during the survey period, commuting and migration routes, breeding sites, staging sites, wintering sites, etc."
>
> "8) Surveys should record details of precise observation locations of bird and bat species, and their flight paths and heights. Surveys should be undertaken using modern technology for species observation, bats in particular. Surveys should be undertaken by qualified surveyors with expertise in biology and ecology of the given taxa."
>
> "9) Construction works are prohibited:
> - during the wildlife breeding season;
> - in the bed of watercourses, including removal of riverside vegetation;
> - if causing changes in the morphology and hydrology which may impact functionality of the ecological corridors;
> - during the days when they will cause long-term water turbidity. If during the night the water in the

[7] Weaving Ecosystem Services into Impact Assessment – World Resources Institute (2013) http://pdf.wri.org/weaving_ecosystem_services_into_impact_assessment.pdf

watercourses clears satisfactorily, the works can continue next day;
- if causing water turbidity for more than 5 consecutive days. "

7.3.3.2 Classification and Nomenclature

The following classifications have been used in this ESIA:

- The EUNIS Habitat classification system (EEA 2017) was adopted for the Crni Vrh ESIA. This system is a comprehensive Pan-European system for habitat identification devised by the EU European Environment Agency. The classification is hierarchical and covers all types of habitats from natural to artificial, from terrestrial to freshwater and marine. The habitat types are identified by specific codes, names and descriptions (EEA 2020). Although Serbia is still an EU candidate country, this system of habitat classification describes many of the habitats of neighbouring countries, including Croatia, Hungary, Romania and Bulgaria. As such, it was considered that the habitat categories within the EUNIS system would be suitable to describe the habitats likely to be encountered within the site. For convenience, along with EUNIS codes and names, corresponding habitat types according to EU Habitats Directive Annex I (Official Journal of the EU [1992/43/EEC]) and national (Official Journal of RS, No. 35/2010) classification systems are also given, as applicable.
- The latest World Plants checklist (Hassler 2019) was followed regarding plant species English nomenclature, in congruence with a checklist of the flora of Serbia (Niketić & Tomović 2018) and regional flora (Josifović 1970–1977, Sarić 1992, Stevanović 2012) and in consultation with other relevant sources (WCSP 2021, WPPO 2021) regarding scientific nomenclature and classification.
- Current IUCN (2021) Red List was considered referential regarding fauna species other than birds and bats classification and nomenclature, scientific and English both, except for butterflies where current European checklist was followed (Wiemers 2018).
- The latest IOC World Bird List (Gill et al. eds. 2021) was followed regarding bird nomenclature, scientific and English both, and classification.
- Current IUCN (2021) Red List was considered referential regarding bat scientific nomenclature and classification, and EUROBATS (Lina 2017) regarding English nomenclature.

7.3.3.3 Bird Target and Secondary Species

SNH guidance requires that bird species of particular concern or target species are "likely to be affected by wind farms" and must be "afforded a higher level of legislative protection". Target species should be identified during the scoping phase, although additional species can be added at a later stage during the site surveys.

For the purpose of this assessment, the SNH criteria were further specified, as follows:

1. Species fulfilling one of the following sub-criteria were regarded as being "afforded a higher level of legislative protection":
    - Listed on the CMS Appendix I or II (Official Journal of RS, No. 102/2007b);
    - Listed on The Bern Convention Appendix II (Official Journal of RS, No.102/2007a);
    - Listed on the EU Birds Directive Annex I (Official Journal of EU [1992/43/EEC]);
    - Strictly Protected in Serbia (Official Journal of RS, No. 5/2010, 32/2016, 98/2016);
    - Classified as Threatened (i.e. CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) or at least Near Threatened (NT), at global or regional [European] level on the current version of the IUCN (2021) Red List of Threatened Species, or national level according to the Red Book of birds of Serbia;
    - Considered to be of conservation concern by BirdLife International (2017), either as SPEC 1 (European species of global conservation concern), SPEC 2 (species of European conservation concern whose global population is concentrated in Europe), or SPEC 3 (species of European conservation concern whose global population is not concentrated in Europe).
2. "Species considered likely to be affected by wind farms" (Langston & Pullan 2003, Gove et al. 2013, SNH 2017, 2018a, European Commission 2010) potentially occurring at the site include: Raptors (Accipitriformes and Falconiformes), Waterfowl (Anatidae), Storks (Ciconiidae), Cranes (Gruidae), and Owls (Strigiformes).

Based on the criteria above, a final list of 21 target species was defined (see Appendix C). The initial list was based on the 2019-2020 surveys and SS desk studies comprised 20 species, of which one species was not recorded by surveys (Hen Harrier), whilst 2 additional species meeting the criteria (Black Stork, Long-legged

Buzzard) were recorded during surveys and added afterwards as required (SNH 2017).Since all wild bird species are legally protected in Serbia and potentially affected by the Project at least to some extent, and since Nature Protection Conditions require for all bird species to be included in the assessment (IfNC 2020, 2021 a, b), all species not regarded as target species were considered secondary species.

7.3.3.4 General Methodological Concepts

The ecological methodologies used as the basis of this assessment were devised and conducted in accordance with Serbian legislation and regulatory requirements, IFIs requirements (see section 6.5), relevant international best practice and current scientific knowledge. In the absence of applicable national guidance, the methodological concept was based upon international best practice guidelines for Ecological Impact Assessment (CIEEM 2016), with some necessary adaptation to the Serbian situation.

The findings of the desk study, Preliminary Surveys, and the main ESIA surveys, have enabled the Consultants to make a reliable assessment and evaluation of current baseline ecological conditions, both within the WPP site and the AoI. These findings have, in turn, enabled reliable assessment of impacts of the Crni Vrh Project on ecological features so that an appropriate mitigation programme can be devised.

7.3.3.4.1 Baseline Conditions

Baseline ecological conditions were assessed for the WPP site and immediate surroundings as of 2021-2022, based on ESIA surveys, whilst for the AoI based on the latest data available.

All geospatial data (surface areas, lengths, distances) presented and used are original measurements taken in Google Earth Pro software (© Google LLC).

7.3.3.4.2 Consideration of Significance

In broad terms, significant effects encompass impacts on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution). Significant effects should be qualified with reference to an appropriate geographic scale (e.g. local, regional, country).

When seeking mitigation or compensation solutions, efforts should be consistent with the geographical scale at which an effect is significant. For example, mitigation and compensation for effects on a species population significant at a county scale should ensure no net loss of the population at a county scale. The relative geographical scale at which the effect is significant will have a bearing on the required outcome which must be achieved.

Significant effects encompass impacts on the structure and function of defined sites and ecosystems. The following need to be determined:

- For designated sites – is the Project and associated activities likely to undermine the conservation objectives of the site, or positively or negatively affect the conservation status of species or habitats for which the site is designated, or may it have positive or negative effects on the condition of the site or its interest/qualifying features?
- For ecosystems – is the Project likely to result in a change in ecosystem structure and function?

Consideration should be given to whether:

- Any processes or key characteristics will be removed or changed.
- There will be an effect on the nature, extent, structure and function of component habitats.
- There is an effect on the average population size and viability of component species.

Consideration of functions and processes acting outside the formal boundary of a designated site is required, particularly where a site falls within a wider ecosystem e.g. groundwater dependent terrestrial ecosystems can be damaged where the proposed activity impacts on the quantity or quality of groundwater that feeds these habitats. Predictions should always consider wider ecosystem processes.

Information pertaining to protected areas were sourced from the Bird Life Data Zone with regards to Important Bird Areas (IBAs) as well as through consultation with local experts regarding locally or nationally protected areas in the vicinity of the wind farm.

Consideration of conservation status is important for evaluating the effects of impacts on individual habitats and species and assessing their significance:

- Habitats – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area.
- Species – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

In many cases (e.g. for species and habitats of principal importance for biodiversity), there may be an existing statement of the conservation status of a feature and objectives and targets against which the effect can be judged. However, not all species or habitats will be described in this way and the conservation status of each feature being assessed may need to be agreed with the relevant statutory nature conservation body and set out in the impact assessment. The conservation status of a habitat or species will vary depending on the geographical frame of reference.

When assessing potential effects on conservation status, the known or likely background trends and variations in status should be taken into account. The level of ecological resilience or likely level of ecological conditions that would allow the population of a species or area of habitat to continue to exist at a given level or continue to increase along an existing trend or reduce a decreasing trend, should also be estimated.

National and regional Red List data books as well as other available sources (e.g. IUCN, Habitats Directive Annexes) were used to inform the impact assessment when characterising species sensitivity.

The evaluation of significant effects should always be based on the best available scientific evidence. If sufficient information is not available further survey or additional research may be required. In cases of reasonable doubt, where it is not possible to robustly justify a conclusion of no significant effect, a significant effect should be assumed. Where uncertainty exists, it must be acknowledged in the assessment.

7.3.3.4.3 Nature Conservation Evaluation

Only those ecological features (species, habitats and sites) considered to be potentially affected by the project and of significant nature conservation value (i.e. "important") should be the subject to detailed impact assessment (Official Journal of RS, No. 135/2004, 36/2009b, 69/2005b, CIEEM 2016, SNH 2018a, European Commission 2020).

Nature conservation evaluation has been undertaken in two steps:

1. Evaluation of conservation concern of habitats and species occurring at the WPP site and potentially affected sites/ habitats, and
2. Assessment of nature conservation value of habitats and species of conservation concern occurring at the WPP site.

Rating of the nature conservation value was assessed using the following grades:

- Major,
- Moderate,
- Minor,
- Negligible,
- No.

The geographical scale was defined according using following levels:

- Global,
- European,
- National = Serbia,
- Regional = East (Carpathian) Serbia Region,
- Local = municipal.

Nature conservation value of any ecological feature was always assessed at the highest relevant geographical level.

Ecological features valued (rated minor or higher) at regional level or higher are considered as of significant nature conservation value (CIEEM 2016, SNH 2018a).

7.3.3.4.4 Assessment and Evaluation of Impacts

Each potential impact on each ecological feature (habitat, species and site) identified as of significant nature conservation value was systematically assessed, as required (CIEEM 2016, SNH 2018a, Rodrigues et al. 2015, Hundt ed. 2012, Collins ed. 2016, European Commission 2020, Bennun et al. 2021).

7.3.3.4.5 Characterising Impacts

Impacts were described using their following characteristics and ratings, according to relevant guidance:

- Magnitude: major, moderate, minor, negligible, no;
- Direction: positive or negative;
- Extent (geographical scale): global, European, national (Serbia), regional [East (Carpathian) Serbia], local (municipal);
- Duration, timing and frequency: short, medium or long-term, temporary or permanent;
- Reversibility: reversible or irreversible.

The magnitude of the impacts was quantified whenever possible (i.e. amount of the habitat lost, percentage of the population affected or lost).

Impacts on habitats were assessed based on habitats locations within the WPP site in relation to planned locations of the WPP infrastructure.

Assessment of impact on populations was undertaken in three steps:

1. Estimation of site-and-population-specific risk of particular impact, on the basis of occurring population ecological status at the site (established within the scope of this assessment), and species-specific susceptibility to the impact (determined by species ecology);
2. Estimation of the potentially affected population sensitivity, on the basis of population nature conservation value (established within the scope of this assessment), and, where possible, relevant population size and demographic parameters;
3. Estimation of the particular impact effect on the sustainability of potentially affected population, on the basis of estimated site-and-population-specific risk, and population sensitivity.

Justification for the assessment of each impact on each potentially affected ecological feature has been clearly presented.

7.3.3.4.6 Evaluating Impacts

According to relevant guidance (CIEEM 2016, SNH 2018a, Hundt ed. 2012, Collins ed. 2016, Rodrigues et al. 2015, European Commission 2020), significant impact is an impact likely to affect the conservation status of an ecological feature (population or habitat). Following principles set out in relevant guidance and adapting them to Serbian context and relevant geographical scope, impacts assessed as minor or higher at regional level (at IBA level for triggering populations which may be affected the Project) or higher, were considered as significant impacts for the purpose of this assessment. A precautionary approach was followed, as required by all relevant documents, i.e. in cases where it was not possible to robustly justify a conclusion of no significant effect, a significant effect has been assumed.

Neither scoring nor matrix approach has been used to determine the significance of impacts, since considered spurious and thus their use discouraged (CIEEM 2016).

The evaluation of the impacts has been undertaken at three stages of the assessment:

1. Evaluation of impacts without any mitigation implemented;
2. Evaluation of residual impacts (after mitigation);
3. Evaluation of cumulative impacts.

7.3.3.4.7 Mitigation

Mitigation was devised and proposed following legal requirements, NPC (IfNC 2020, 2021a, b) and relevant best practice guidance (CIEEM 2016, SNH 2016, 2018a, Haas et al. 2003, Prinsen et al. comp. 2012, Rodrigues et al. 2015, Hundt ed. 2012, Collins ed. 2016, European Commission 2020). As required (IFC 2012a, EBRD 2019, CIEEM 2016, European Commission 2020), the mitigation hierarchy – a strategy to reduce impacts based on avoidance of impact first, then minimisation (or mitigation), and finally compensation of residual effects, in that order, was adopted and implemented.

7.3.3.5 Desk Study

The Crni Vrh SS was undertaken from October to December 2020 and included walk over surveys. In addition, the ESIA desk study included consideration of:

- A programme of ecological surveys (including, habitats, birds and bats) undertaken at the Project site during 2019 and 2020 (Milovanović 2020a, b).
- A programme of preliminary surveys (habitats, birds and bats) undertaken between October 2020 and April 2021 as part of the Strategic EIA for the off-site OHLs.

Although these preliminary surveys were not undertaken in full compliance with all the relevant IFIs requirements, they are considered sufficiently robust for reference purposes. Data from all the preliminary surveys are summarised in this ESIA and considered along with the main ESIA survey data.

The ESIA desk study was undertaken between October 2020 and November 2021. It considered all relevant publicly available sources (printed and online), as well as ESIA team own data (from occasional observations and surveys unrelated to this assignment).

In addition, the following websites were used to search for relevant information and publications:

- https://www.iucnredlist.org/
- http://datazone.birdlife.org/home
- http://www.keybiodiversityareas.org/kba-data
- https://cloud.gdi.net/visios/zzps
- http://pticesrbije.rs/
- https://scholar.google.com/
- https://www.researchgate.net
- https://biologer.org
- http://extra.bioras.petnica.rs
- https://www.gbif.org/
- https://www.inaturalist.org/
- https://euro.observation.org/
- https://ebird.org/explore
- https://www.mammalwatching.com/

Only data on species occurrence from the last ten years, i.e. from 2011 to date, were considered relevant for the purpose of this assessment.

In instances where sources do not present species occurrence data for exact locations but per MGRS 10x10 km squares, the EP79 square encompasses almost entire survey area was considered relevant. Squares EP78 and EP89 cover only the peripheral parts of the survey area although they include the neighbouring IBAs and areas of the Ecological Network. However, the use spatially undefined data could be misleading and the data from EP78 and EP89 squares had to be disregarded.

7.3.3.6 Field Surveys

An overview of the implemented survey methodologies is provided in this section, whilst more details on survey and assessment methodology specifics for particular ecological features are provided in following sections.

7.3.3.6.1 Preliminary Surveys

Preliminary pre-construction habitat, flora, bird and bat surveys were undertaken between October 2019 and April 2021 (Table 7-3).

Table 7-3 Timetable of Preliminary Pre-Construction Biodiversity Surveys Oct 2019 – April 2021

Shows the number of days per month and survey - *Source: Milovanović 2020a, b. - **Source: Josimović et al. 2021a

Survey \ Year	2019			2020												2021				Total
Survey \ Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
WPP habitat surveys*								*number of days not specified*												?
OHL habitat and flora surveys**													2	2	1			1	3	9
Bird surveys – WPP*	6	2	2	3	3	4	6	5	6	7	8	9	9							70
Bird surveys – OHL**													2	2	2	2	2	2		12
Bat surveys – WPP*			*number of days not specified*																	?
Bat surveys – OHL**															1			2	2	5

Preliminary surveys were carried out by various qualified surveyors, commissioned by the CVP or on behalf of CVP by the Projektura d.o.o. / Eko Plan (commissioned to undertake the Strategic EIA for the off-site OHLs), as follows:

- WPP habitat surveys – not specified in the report (Milovanović 2020b),
- OHL habitat and flora surveys – Marko Rućando (Josimović et al. 2021a),
- WPP and bat surveys – Zoran Milovanović (Milovanović 2020a, b),
- OHL bird surveys – Ištvan Ham (Josimović et al. 2021a),
- OHL bat surveys – Andrej Čonti (Josimović et al. 2021a).

7.3.3.6.2 Main ESIA Surveys

Based on the findings of the SS, a number of WTGs that were expected to have potentially significant, adverse impact on mature near-natural woodland areas within the site were removed from the WPP scheme (see Chapter 12). This meant that potentially significant adverse impact on the project site's most sensitive ecological features was avoided and that detailed surveys of these areas was not required.

The main pre-construction habitat, flora and fauna surveys, bird and bat in particular, have been undertaken between November 2020 and February 2022 within the scope of the ESIA (Table 7-4).

The SS identified a number of legally protected ground mammal, reptile, amphibian, invertebrate and plant species, as well as certain conservation priority habitat types. However, the SS concluded that the potential impacts on these sensitive receptors were not likely to be significant with the Primary Mitigation implemented, and only limited surveys were undertaken for most ecological features.

Table 7-4 Timetable of Realised Main Preconstruction Biodiversity Surveys March 2021 – February 2022

Showing the number of days per month and survey

* Nights (hours) fully analysed to attribute the recordings to particular species groups; all remaining nights were also analysed, though only to count bat passes (without identifying species groups, as elaborated below).

** Surveys have commenced as soon as automated bat registration systems were installed and operational (at meteorology masts).

ear / Month / Survey		2020		2021										2022		Total
		Nov	Dec	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Site reconnaissance and preliminary appraisal		3														3
Habitat mapping and flora surveys		1			2	3	3	2	2	2						15
Fauna surveys	Invertebrates				1	3	4	2		2						12
	Amphibians and Reptiles				2	2	3	2		1						10
	Ground Mammals						1	2	1	1	2		1	1	1	10
Bird surveys	Breeding woodland and farmland bird surveys				3	3	3									9
	Breeding raptor surveys				2	2	2	2								8
	Breeding owl surveys				1	1	1	1								4
	Vantage point surveys			3	3	2	2	2	2	2	2	2	3	3	3	29
Bat surveys	Roost Surveys	1	2			1		3	1	1	1					9
	Trapping surveys							2		1						3
	Transect surveys				2	6	4	4	6	4	6	2				34
	Automated surveys				2	6	4	4	6	4	6	2				34
	Surveys at height, Surveys above canopy & Continuous surveys*				**	3	5	5	5	5	5	5				33

All main ESIA field surveys have been carried out by Fauna C&M and Habitat ESIA Team (assisted by specialised technicians when needed).

7.3.3.7 Designated Sites

For the purpose of this assessment, designated sites include formally Protected Areas and Areas of the Ecological Network of Serbia.

There are no designated sites within the WPP site boundary or in the area potentially directly affected by the Project, and no surveys were undertaken for designated sites specifically.

The ESIA identified a number of legally designated sites within the assessment AoI. The boundaries of the IBAs are given according to BirdLife International (2021a, b, c, d), and of the protected areas and areas of the Ecological Network according to IfNC (2022). Description of designated sites was based on latest relevant information available acquired through desk study.

It is noted that only designated sites whose populations are suspected to occur at the WPP site have been considered relevant. Although the geographical context is species-specific, the widest possible context was identified as being of interest.

7.3.3.7.1 Nature Conservation Evaluation - Evaluation of Conservation Concern

Sites of conservation concern are statutory sites designated (and proposed) or classified under:

- International conventions or EU legislation, for example:
  - Wetlands of International Importance (Ramsar sites), Key Biodiversity Areas ("KBAs"), IBAs, Critical Sites for waterbird species (AEWA), habitats of regularly occurring globally significant concentrations of migratory bird species (CMS),
  - Areas of the Ecological Network of Serbia (Official Journal of RS, No. 102/2010, IfNC 2022) due to become SPAs (≈IBAs) and SACs (i.e. Natura 2000 sites),
  - Ecological Corridors of International Importance (Official Journal of RS, No. 102/2010, IfNC 2022);
- National legislation, for example:
  - National parks ("NP") (Official Journal of RS, br. 84/2015, IfNC 2022),
  - Special Nature Reserves ("SNR") (IfNC 2022),
  - Landscapes of Outstanding Features ("LOF") (IfNC 2022),
  - Nature Parks ("PP") (IfNC 2022),
  - Ecological Corridors of National Importance (Official Journal of RS, No. 102/2010, IfNC 2022);
- Locally designated, for example:
  - Habitats of Strictly Protected Species (IfNC 2022),
  - Ecological Corridors of Regional and Local Importance (IfNC 2022).

7.3.3.7.2 Nature Conservation Evaluation - Assessment of Nature Conservation Value

The nature conservation value of the designated sites at the WPP site and within the AoI was assessed based on their rated relevance for conservation of flora and fauna, in particular birds and/or bats, and the level of their statutory designation, as follows:

- Global: Wetlands of International Importance (Ramsar sites), Global KBAs, Critical Sites for Waterbirds (AEWA), habitats of regularly occurring globally significant concentrations of migratory bird species (CMS);
- European: Regional [European] KBAs, IBAs, Areas of the Ecological Network of Serbia due to become SPAs (≈IBAs) and SACs (i.e. prospective Natura 2000 sites), Ecological Corridors of International Importance;
- National: National Parkas and all other protected areas of category I (of national or exceptional importance) that do not meet the criteria for higher levels, and Ecological Corridors of National Importance;
- Regional: protected areas of category II (of provincial/regional or high importance), and Ecological Corridors of Regional Importance;
- Local: protected areas of category III (of local importance).

7.3.3.7.3 Assessment and Evaluation of Impacts

Only designated sites within the developed areas of the WPP site and in immediate surroundings could be directly affected by the Project. However, all designated sites are located in wider surroundings, and could only be affected through possible impacts on their fauna species, in particular bird and bat, populations (e.g. if/when a bird population of particular IBA visits the site or commutes over). Therefore, these indirect impacts were considered within the scope of species assessment, where applicable.

7.3.3.8 Habitats

7.3.3.8.1 Survey Methodology

Desktop analyses of satellite imagery and walkover surveys were undertaken within the scope of the Preliminary Surveys. The purpose of the walkover surveys was to observe and identify habitats at the proposed WTG locations and along the off-site OHLs route. Habitat surveys at the WTG locations were undertaken between May and September 2020; habitat lists and descriptions per WTG locations were produced. Surveys along the off-site OHLs route were undertaken between October 2020 and April 2021; habitat list and descriptive distribution and evaluation of habitat types were produced.

Walkover surveys to observe and map habitats were undertaken between November 2020 and September 2021 throughout the WPP site within the scope of the Main ESIA Surveys. Detailed habitat mapping was undertaken within developed areas of the site, i.e. detailed habitat survey area extending 50 m beyond any Project infrastructure to be developed and covering about 400 ha. Coarse habitat mapping and ecological evaluation was undertaken within entire site boundary (about 2.710 ha). Habitat types were identified according to EUNIS (EEA 2017), to the level 1 or 2 for coarse mapping and higher for the detailed mapping, precisely located and digitally mapped on the spot using GPS and *Google Earth Pro* software (© *Google LLC*). A Detailed Habitat Map of the developed area, as well as Coarse Habitat Map of the entire site were produced.

Habitats within the survey area were identified, mapped and characterised and their abundance quantified according to surface area, both in hectares and as a % of the survey area.

7.3.3.8.2 Nature Conservation Evaluation - Evaluation of Conservation Concern

Habitats fulfilling any of the following criteria were regarded as habitats of conservation concern:

- Priority habitats in danger of disappearance listed as (*) on the EU Habitats Directive Annex I (Official Journal of EU [1992/43/EEC]);
- Classified as Threatened (i.e. CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) on the current version of the European Red List of Habitats (Janssen *et al.* 2016);
- Conservation Priority Habitat Types listed on the Annex II of the Serbian Code of Regulations on habitats (Official Journal of RS, No. 35/2010).

7.3.3.8.3 Nature Conservation Evaluation - Assessment of Nature Conservation Value

The (overall) nature conservation value of habitats at the WPP site as such was assessed based on their nature conservation concern and ecological context. The nature conservation value of habitats at the WPP site for flora and fauna, birds and bats in particular, was assessed based on their (species-specific) flora and/or fauna interest (i.e. their use by particular species) and the relevant population's nature conservation value (at relevant geographical scale).

7.3.3.8.4 Nature Conservation Evaluation - Assessment and Evaluation of Impacts

All potential impacts of the Project on sites and habitats were considered, as follows (European Commission 2020, Bennun *et al*. 2021):

- Destruction of habitats– direct complete loss to the construction of WPP infrastructure;
- Degradation of habitats – deterioration of structure and/ or functionality due to the construction works.

7.3.3.9 Flora and Fauna

7.3.3.9.1 Flora Survey Methodology

Along with the preliminary habitat surveys of the off-site OHLs route, plant species were recorded and lists of flora species per habitat types produced.

Plant species were recorded (and collected when needed) along with the Habitat Mapping surveys between November 2020 and September 2021 throughout the WPP site within the scope of the Main ESIA Surveys. When definite species identification was not possible on the spot, sample specimens have been collected and identified later on. Collected specimens were identified using Flora Europaea (Tustin *et al.* 1964, 1968–1980, 1993), regional flora (Josifović 1970–1977, Sarić 1992, Stevanović 2012), and other relevant sources. Based on all records, a consolidated list of plant species within the survey area was produced.

7.3.3.9.2 Fauna Survey Methodology

Walkover surveys to record fauna species (other than birds and bats) were undertaken between April 2021 and February 2022. General fauna surveys were undertaken throughout the broader survey area defined by the WPP site boundary and further extending 500 m beyond the outermost WTG locations. More detailed surveys of small mammals, reptiles, amphibians and invertebrate were undertaken within developed areas of the site, i.e. survey area extending 50 m beyond any Project infrastructure to be developed. Non-standardised walking and driven transects were used.

The occurrence of mammal (excluding bats), reptile, amphibian, and invertebrate species was recorded based on direct visual and acoustic observations – sightings of animals and records of characteristic calls, as well as on indications of their occurrence – tracks, lairs, traces of feeding and/ or other activities etc. In addition, camera-trapping was also used to record larger mammals, whilst pitfall-trapping (on ground and trees) was used to record beetles. Invertebrate fauna surveys were primarily focused on three taxonomic groups that are both well-known and good biodiversity indicators: butterflies (grassland indicators), beetles (forest indicators) and dragonflies (wetland indicators).

Habitat suitability for all subject fauna species was evaluated, and the possibility of additional species occurrence assessed.

Based on desktop and survey data, as well as on evaluated habitat suitability and the possibility of additional species occurrence, consolidated lists of mammals (excluding bats), reptile, amphibian, and invertebrate species were produced.

7.3.3.9.3 Evaluation and Assessment Methodology

Fauna (other than birds and bats) and flora species ecological status within the WPP site and immediate surroundings were categorised as follows:

(1) Occurrence:

- X – confirmed,
- P – probable,
- ? – possible;

(2) Abundance:

- a – abundant,
- c – common,
- u – uncommon,
- r – rare;

(3) Faunistic status:

- r – resident,
- v – visitant.

7.3.3.9.4 Nature Conservation Evaluation - Evaluation of Conservation Concern

Following flora species were considered as of conservation concern:

- Listed on The Bern Convention Appendix I (Official Journal of RS, No. 102/2007a);
- Listed on the EU Habitats Directive Annex I, IV or V (Official Journal of EU [1992/43/EEC]);
- Strictly Protected in Serbia (Official Journal of RS, No. 5/2010, 32/2016, 98/2016);
- Classified as Threatened (i.e. CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) globally or regionally [in Europe] on the current version of the IUCN (2021) Red List of Threatened Species, or on the national Red Book (Stevanović *ed*. 1999).

Following fauna species were considered as of conservation concern:

- Listed on The Bern Convention Appendix II (Official Journal of RS, No. 102/2007a);
- Listed on the CMS Appendix I or II (Official Journal of RS, No.102/2007b);
- Listed on the EU Habitats Directive Annex II (Official Journal of EU [1992/43/EEC]);
- Strictly Protected in Serbia (Official Journal of RS, No. 5/2010, 32/2016, 98/2016);

- Classified as Threatened (i.e. CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) globally or regionally [in Europe] on the current version of the IUCN (2021) Red List of Threatened Species, or on relevant national Red Books or Lists where appropriate (Savić *et al*. 1995, Kalezić *et al*. 2015, Tomović *et al*. 2015, Maes *et al*. 2019);

7.3.3.9.5 Nature Conservation Evaluation - Assessment of Nature Conservation Value

The nature conservation value of flora and fauna species populations occurring at the WPP site was assessed based on their ecological status at the site and available population parameters (at relevant geographical scale), using matrix presented in Table 7-5, and then pondered according to species/ population conservation status at the relevant scale (see section 7.3.3.10.2.4).

For species / taxonomic groups where population parameters are not available, expert judgment was used to assess the share of the relevant population that occurs at the site and Table 7-5 as a general guidance.

7.3.3.9.6 Nature Conservation Evaluation - Assessment and Evaluation of Impacts

All potential impacts of the Project on flora species were considered, as follows (European Commission 2020, Bennun *et al*. 2021):

- Loss of habitat – direct destruction/degradation of habitat to or due to the construction of WPP infrastructure;
- Destruction of individuals/populations caused by construction works;
- Illegal deliberate destruction of individuals/populations – construction/maintenance staff could engage in illegal activities of deliberate destruction of protected plants (including medicinal herbs, decorative plants, wild fruits and berries) and mushrooms, such as picking, collecting, cutting, digging, uprooting etc.

All potential impacts of the Project on fauna species excluding birds and bats were considered, as follows (European Commission 2020, Bennun *et al*. 2021):

- Loss of habitat – direct destruction/ degradation of habitat or due to construction of WPP infrastructure.
- Displacement (i.e. disturbance or indirect habitat loss) – if animals avoid WPP and its surroundings due to construction and operation (which may also include barrier effects).
- Accidental/ incidental mortality – death or injury of animals, and damage or destruction of their development stages (including nests, eggs and litters), lairs and habitations, unintentionally caused by construction/maintenance works.
- Illegal deliberate mortality – construction/ maintenance staff could engage in illegal activities of deliberate capture or killing (e.g. poaching), and disturbance of protected animal species, as well as damaging or destruction of their development stages (including nests, eggs and litters), lairs and habitations.

All of the potential impacts on flora and fauna are negative, except possibly for the habitat changes that may have ambiguous effects depending on species (European Commission 2020, Bennun et al. 2021).

7.3.3.10 Birds

7.3.3.10.1 Survey Methodology

The Preliminary, one-year bird surveys were undertaken between October 2019 and October 2020 throughout the WPP site. The survey area included the WPP Zoning plan boundary and (not precisely defined) surroundings. Point counts and non-standardised (mostly walking) transects were used, implementing standard methodology for this type of surveys (Bart & Earnst 2002, Rosenstock et al. 2002, Hamel et al. 1996). Fourteen counting points were selected in the vicinity of WTG locations and each was surveyed at least once per month. Transect walks were undertaken between the counting points and throughout the WPP site. This approach is not fully compatible with the SNH (2016, 2017) methodology, but it is scientifically robust and provides quality data on bird abundance and distribution, However, such data cannot be used to quantify flight activity and cannot be used as an input for CRM (SNH 2000, 2017, Band et al. 2007). Based on the survey data, a consolidated list of bird species within the survey area was produced and ecological status of the species reliably assessed.

The Preliminary surveys also included a 6-month bird survey between October 2020 and March 2021 along the off-site OHL routes (Josimović et al. 2021a). SNH guidance on wintering bird surveys and OHLs was consistently implemented. The survey area extended about 300 m either side of the outermost proposed routes. Non-standardised walking transects along the rough tracks throughout the survey area were used, as recommended (SNH 2017), substituted by observations from fixed points when the tracks were not accessible due to snow. Fortnightly survey visits were undertaken throughout the migration and wintering season (SNH 2017). Based on survey data, a consolidated list of bird species within the survey area was produced and ecological status of the species reliably assessed.

Bird surveys within the scope of the main ESIA surveys were designed and undertaken in full compliance with the most relevant and up-to-date SNH (2016, 2017) guidelines, and included as follows:

- Breeding raptor (and other larger bird species) surveys,
- Breeding nocturnal species (owl) surveys,
- Breeding woodland and farmland bird surveys,
- Vantage point (VP) surveys;

Preliminary surveys (Milovanović 2020a, b, Josimović et al. 2021a) and the SS indicated only negligible occurrence of wintering (and migrating) birds. The site has very limited potential to support them, and it was considered that sufficient insight into this aspect would be achieved through proposed more general VP surveys. The ESIA ecology team did not consider it necessary to undertake specific wintering bird surveys.

7.3.3.10.1.1 Breeding Raptor and Breeding Nocturnal Species Surveys

The aim of Breeding Raptor Surveys and the Breeding Nocturnal Species Surveys was to identify breeding territories and active nests and to assess breeding populations of bird of prey (and other larger) species at the site and in its surroundings. Methodology from Hardey *et al.* (2009) considered referential by relevant guidance (SNH 2017) was consistently implemented in these surveys.

The survey area extended 2 km beyond the site boundary for all the species that SS and preliminary surveys identified as being potentially impacted (non-negligible).

Total counts of occupied home ranges and active nests were undertaken across the survey area, using walkover surveys (non-standardised driven and walking transects) and territory mapping. Surveyors walked or slowly driven the survey area completely and evenly, locating and mapping all occupied home ranges and active nests of bird of prey (and other larger) species, including owls, within. Occupied sites or home ranges were identified based on direct observation of nests and nesting and but other indicative signs. Breeding Raptor Surveys were undertaken during the daylight, whilst Breeding Nocturnal Species Surveys were undertaken between dusk and dawn (an hour before sunset and until the sunrise).

Four survey visits were undertaken – in April, May, June and July 2020. Each visit for the Raptor Surveys consisted of two survey days needed to cover the whole survey area, whilst one survey day per survey visit was sufficient for Nocturnal Species Surveys.

7.3.3.10.1.2 Breeding Woodland and Farmland Bird Surveys

The aims of the Breeding Woodland and Farmland Bird Surveys were to determine the number of bird nests and/ or breeding territories and to assess breeding bird populations of the common bird species within the study area. Distance Sampling methodology from Buckland *et al.* (2015) was consistently implemented in these surveys.

The survey area (outlined light blue on Figure 7-1) extends 500 m beyond the outermost WTGs (and other Project infrastructure do be developed), as required (SNH 2017), and has an area of about 28.7 km^2. Thirty sampler points (light blue spots on Figure 7-1) were defined using specialised software (*Distance*) to provide thorough coverage of the area, both spatially and ecologically.

Each sampler point was surveyed using Snapshot Method (Buckland *et al.* 2015). All birds observed (seen or heard) were recorded and mapped. Breeding was identified based on direct observation of nests and nesting and other indicative behaviour, singing in particular.

Three survey visits were undertaken – in April, May and June 2021. Each survey visit consisted of 3 survey days needed for a single surveyor to cover all 30 sampler points.

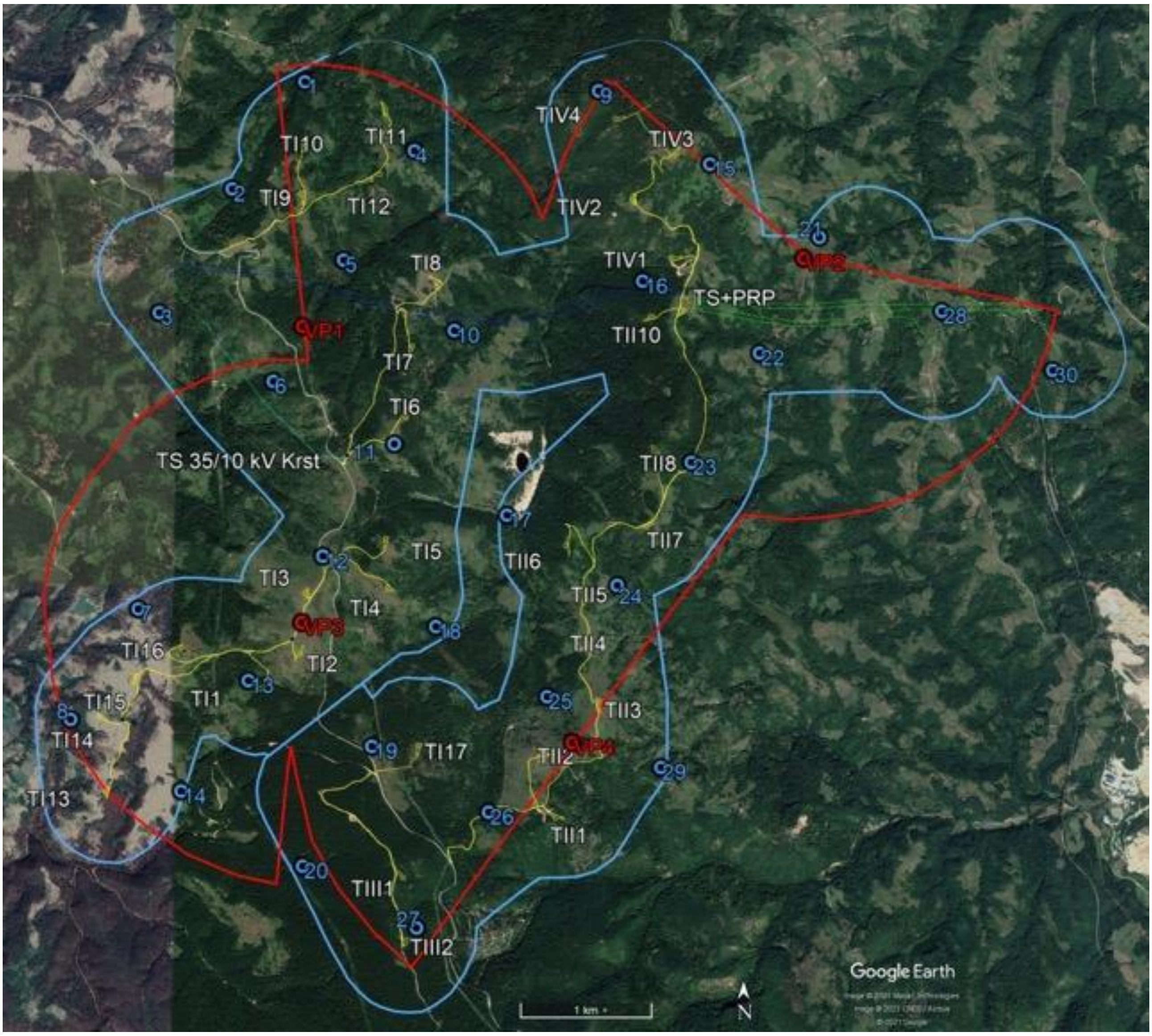

Figure 7-1 Spatial Setup of Bird Surveys

Source: GoogleEarth 2022, CVP, with modification by B. Karapandža and M. Raković, original

Legend and notes: Locations of breeding bird survey sampler points (light blue spots) within pertaining survey area (outlined light blue); locations of VPs (red spots) and pertaining survey area defined by the total visual envelope (outlined red); locations of WTGs (T), site access tracks (yellow lines) and OHL routes (dark blue, cyan and green lines) according to Conceptual Design layout (valid at the beginning of the surveys) are also shown.

7.3.3.10.1.3 Vantage Point Surveys

VP Survey is designed to quantify the level of bird (target species in particular) flight activity and its distribution over the survey area. Its primary purpose is to provide input data for the Collision Risk Model ("CRM"), which predicts mortalities from a collision with WTGs (SNH 2017). It also provides an insight into bird use of the site, which informs an assessment of potential disturbance and displacement (SNH 2017). SNH methodology for VP Surveys (SNH 2017) was consistently implemented in these surveys.

Four VPs were defined (red dots on Figure 7-1) to achieve complete visual coverage of the WPP with a minimum number of VPs. Wherever possible VPs were located at the outer edge of the WPP (in order to minimise the surveyor's effect on bird behaviour), but also close to existing road or rough tracks (to ensure accessibility throughout the season and in a variety of weather conditions) and on the tops of the hills (to provide an unobstructed view). Visual envelope from each of the VPs was defined by 180° arc and 2 km radius. The total combined visual envelope of all VPs (outlined red in Figure 7-1) has an area of about 27 km^2 and constitutes the survey area of these VP surveys. The survey area defined in this way largely meets the required areas, which should extend 500 m beyond the outermost WTGs (and other Project infrastructure do be developed, including OHLs).

Two types of data were recorded: detailed characteristics of all observations/ flights of target species (including mapping of flight trajectories), and a number of individuals of all other (non-target) species recorded per survey unit at certain VP.

VP surveys were undertaken from March 2021 to February 2021. Each survey visit consisted of a single surveyor covering all VP successively during one or two days (depending on the daylight duration and visibility) with each observation at each VP lasting 3 hours. Two survey visits were undertaken each month, totalling 6 survey hours per VP each month. Thus, a total of 72 survey hours per VP was conducted, and divided between seasons (36 hours breeding and 36 hours non-breeding), as required.

7.3.3.10.1.4 Limitations to Surveys

NatureScott guidance recommends that *"[T]wo years [bird] survey . . . [is] required unless it can be demonstrated . . . that a shorter period of the survey is sufficient*", such as "*a lowland farmland site with lower bird interest"* (SNH 2017). Whilst the Crni Vrh WPP site is not a lowland farmland site, the SS concluded that the bird interest of the site is not high. It is noted that the preliminary surveys had been undertaken for more than a year (but they did not fully meet the SNH requirements) whilst the ESIA bird surveys were undertaken for one full year and were fully compliant with SNH guidelines. The consultant has concluded that the data collected by these surveys is sufficiently robust and informative for the ESIA.

Although recommended for WPP projects greater than 50 MW where post-construction monitoring will be undertaken (SNH 2017), control/ reference site bird surveys were not undertaken since they were considered unfeasible (as elaborated in section 7.2.1).

7.3.3.10.2 Evaluation and Assessment Methodology

7.3.3.10.2.1 Evaluation of Populations

Breeding bird populations were assessed based on the results from the following surveys:

- Breeding raptor surveys. Active nests and/or occupied home ranges of birds of prey (and other larger) species, including owls, within the WPP site and up to 2 km beyond the site boundary were mapped (Appendix C), and breeding populations of the species within the area counted (Hardey *et al.* 2009).
- Breeding woodland and farmland bird surveys. The sample of 30 points within the WPP site was surveyed for breeding birds. After all visits had been completed, each species (or group of species for rare species) records were analysed using specialized software (*Distance*) according to Distance Sampling methodology implemented (Buckland *et al.* 2015) to estimate the total breeding bird populations of the whole survey area (28.7 km^2) (Appendix C).

Local (municipal) population estimates, since not being available, were based on expert judgment.

Regional (East Serbia) breeding population estimates were taken from Puzović *et al.* (2015).

Population estimates for Important Bird Areas (IBAs), breeding and/ or wintering whichever relevant, were taken from official IBA / BirdLife web pages: Derdap gorge (BirdLife International 2021a), Homolje (BirdLife International 2021b), Kucaj-Beljanica (BirdLife International 2021c), Veliki krs and Stol (BirdLife International 2021d).

Breeding population estimates and trends for Serbia were taken from BirdLife International (2021e) or Puzović *et al.* (2015), whichever the latest. Wintering population estimates and trends for Serbia were taken from BirdLife International (2021e). Percentages of the European populations in Serbia were calculated from the above estimates for Serbia and European population estimates from BirdLife International (2021e).

7.3.3.10.2.2 Evaluation of Flight activity

The flight activity of Target species was recorded during VP surveys and subsequently was mapped and quantified. After all visits had been completed, each target species flight trajectories were transferred onto separate species maps (Appendix C**Error! Reference source not found.**), which were then analysed to i dentify species spatial activity patterns and use of the WPP area.

Quantitative data on target species flight activity (Appendix C) were used to calculate various activity indices, according to SNH's CRM (SNH 2000, Band *et al.* 2007), such as:

- I_t/h - total number of birds observed per survey hour (of the period species occurs at the site) [n/h],
- I_C/h - number of birds observed at blade swept height per survey hour (of the period species occurs at the site) [n/h],

- O_t/h - total bird occupancy (birds x flight time) observed per survey hour (of the period species occurs at the site) [n x s / h],
- O_C/h - bird occupancy observed at blade swept height per survey hour (of the period species occurs at the site) [n x s / h],
- r_IC - share of birds observed at blade swept height [%],
- r_OC - share of bird occupancy observed at blade swept height [%].

The WTG model was not selected at the time of writing, and blade swept height differs among the models under consideration:

- 36.5-199.5 m for Nordex N163-5.7.
- 44.0-206.0 m for Vestas V162-5.6.
- 30.5-179.5 m for Nordex N163-5.7.

Indices were calculated for all three turbines. Activity indices for WTGs were also the input for CRM (SNH 2000, Band *et al.* 2007), though not for OHL where CRM is not applicable (SNH 2016).

The OHL collision zone is defined as the entire airspace from the ground to the maximum height of the towers (SNH 2016), which in this case is 0.0-39.1 m, which is not a realistic but the worst-case scenario based on the precautionary approach.

Activity indices were used to identify, describe and analyse species temporal activity patterns and use of the WPP area.

7.3.3.10.2.3 Evaluation of Ecological status

Bird species ecological status was defined through four key aspects and categorised as follows:

(1) Occurrence:

- Regular - recorded on most VP survey visits (of the period species occurs at the site) or nesting confirmed,
- Occasional - recorded on several VP survey visits (of the period species occurs at the site),
- Rare - recorded few times,
- Incidental - recorded once or twice;

(2) Abundance:

- High - > 50 individuals recorded per survey visit,
- Moderate - 10-50 individuals recorded per survey visit,
- Low - 2-10 individuals recorded per survey visit,
- Negligible - only single individuals recorded;

(3) Seasonality:

- Breeding - recorded only during the breeding season (March-August),
- Migrating - recorded only on migration (February-April and/or August-October),
- Wintering - recorded only on wintering (October-February),
- Resident - recorded throughout the year,
- not defined - not possible to define the seasonality due to scarce records;

(4) Habitat use:

- Nesting - nesting confirmed by breeding bird surveys or otherwise,
- Foraging - foraging regularly recorded during VP surveys,
- Resting - resting/perching regularly recorded during VP surveys,
- Commuting - commuting overflights regularly recorded during VP surveys,
- Passage only - only occasional overflights recorded during VP surveys,

When specific spatial and/or temporal patterns were identified, in order to define certain aspects more precisely, modifiers were used, such as: locally, just beyond site boundaries, locally, occasionally, rarely.

7.3.3.10.2.4 Nature Conservation Evaluation

Following bird species were considered as of conservation concern:

- Listed on The Bern Convention Appendix II (Official Journal of RS, No. 102/2007a);
- Listed on the CMS Appendix I or II (Official Journal of RS, No.102/2007b);
- Listed on the EU Birds Directive Annex I (Official Journal of EU [2009/147/EC]);
- Strictly Protected in Serbia (Official Journal of RS, No. 5/2010, 32/2016, 98/2016);
- Classified as Threatened (i.e. CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) globally or regionally [in Europe] on the current version of the IUCN (2021) Red List of Threatened Species or in national Red Book (Radišić *et al*. *eds*. 2018;
- Bird species considered to be of conservation concern by BirdLife International (2017), either as SPEC 1 (European species of global conservation concern), SPEC 2 (species of European conservation concern whose global population is concentrated in Europe), or SPEC 3 (species of European conservation concern whose global population is not concentrated in Europe);
- Bird species triggering designation of relevant IBAs, though only if individuals from the particular IBA population of triggering species (possibly) occur at the site.

7.3.3.10.2.5 Assessment of Nature Conservation Value

The nature conservation value of bird populations occurring at the WPP site was assessed based on their ecological status at the site and available population parameters (at relevant geographical scale), using matrix presented in Table 7-5, and then pondered according to species/population conservation status at the relevant scale.

Table 7-5 Assessment Matrix - Nature Conservation Value of Flora and Fauna Species Populations

Percentage of the relevant population that occurs at the WPP site	Occurrence			
	Regular	Occasional	Rare	Incidental
>50%	major	major	moderate	moderate
10-50%	major	moderate	moderate	minor
5-10%	moderate	moderate	minor	negligible
1-5%	minor	minor	negligible	negligible
<1%	negligible	negligible	negligible	negligible

The final conservation value was determined by adjusting the basic rating acquired through Table 7-5 according to species conservation status (IUCN Red List Category) at relevant geographical scale, as follows:

- for Threatened species (i.e. CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) and decreasing populations – upgrading by 2 levels within the corresponding column of the Table 7-5;
- for Near Threatened (NT) and, following precautionary approach, Data Deficient (DD) species – upgrading by 1 level within the corresponding column of the Table 7-5;
- for Least Concern (LC) species – taken as it is.

7.3.3.10.2.6 Assessment of Impacts

All potential impacts of the Project on birds (SNH 2016, 2017, 2018a, Haas *et al.* 2003, Prinsen *et al. comp.* 2012, European Commission 2020, Bennun *et al*. 2021) were considered, as follows:

- Loss of habitat – direct destruction/ degradation through construction of WPP infrastructure;
- Displacement (i.e. indirect loss of habitat) – if birds avoid the WPP and its surroundings due to construction and operation, which may also include barrier effects;
- Mortality in nests – death or injury of birds or damage/ destruction of eggs due to accidental/incidental damage or destruction of nest or nest site whilst birds/eggs are present within;

- Electrocution mortality - occurs when perching or flying bird causes a short circuit, either by touching two different phase conductors, or a conductor and an earth wire (or equivalent energised components of the pole/pylon structure);
- Collision mortality from OHL – death or injury through collision or other interaction with wires or other OHL infrastructure;
- Collision mortality from WTG – death or injury through collision or other interaction with WTG blades;
- Illegal deliberate mortality – construction/maintenance staff could engage in illegal activities of deliberate capture or killing (e.g. poaching), and disturbance of protected bird species, as well as damaging or destruction of their development stages (including nests, eggs and hatchlings).
- Use of OHL pylons for perching and nesting.

All of the potential impacts on birds are negative, except possibly for the use of OHL pylons for perching and nesting and the habitat changes that may have ambiguous effects depending on species (SNH 2016, 2017, 2018a, European Commission 2020, Bennun et al. 2021).

7.3.3.11 Collision Risk Modelling

The risk of bird collision with operating WTGs was assessed using SNH Collision Risk Model (SNH 2000), with avoidance rate applied (SNH 2010, 2018b) and fully following appropriate recommendations for its application (Chamberlain *et al.* 2005, Band *et al.* 2007, SNH 2014a).

Collision risk modelling (CRM) is undertaken to further inform the magnitude of collision impacts on the bird populations that were recorded flying within the proposed WPP area. The model runs as a three-stage process. Firstly, the risk is calculated assuming that flight patterns and behaviours are unaffected by the presence of the WTGs i.e. that no avoidance action is taken. This is essentially a mechanistic calculation, with the collision risk calculated as the product of (i) the probability of a bird flying through the rotor swept area, and (ii) the probability of a bird colliding if it does so. This probability is then multiplied by the estimated numbers of bird movements through the WTG rotors at the risk height (i.e. the height of the rotating rotor blades) in order to estimate the theoretical numbers at risk of collision if they take no avoiding action.

A bird is simplified in shape to a flying cross with length, wingspan, and speed, and always flying perpendicularly towards the rotor. A bird may be ‘gliding’ i.e. with the arms of the cross fixed, or ‘flapping’ i.e. with the arms of the cross flapping so as to occupy a space similar to that of a spinning top, with the length of the bird being the axis of spin. ‘Gliding’ flight has a marginally lower collision risk than ‘flapping’ flight – notably for passage at points level with the rotor hub, where the wings lie parallel with potentially colliding blades. However, the difference is rarely sufficient to warrant detailed consideration of different bird behaviours. As a ‘worst case’ scenario, all flight data entered into the collision risk model is set to ‘flapping’ flight.

The second stage of the collision risk model incorporates the probability that the birds, rather than flying blindly into the WTGs, will actually take a degree of avoiding action. The most recent guidelines based on research at operational wind farms in the UK and Europe, advise that the default avoidance rates for all species is 98% with the exception of a small number of species, including Common Kestrel, Lesser Kestrel and vulture species which are considered to have an avoidance rate of 95%.

Once the avoidance rate is incorporated, the model then predicts the likely number of annual collisions of each particular species. The number of predicted collisions (i.e. the extent) is then assessed against the total local, national or international populations as appropriate to ascertain the magnitude and hence significance of any impacts.

For the Crni Vrh WPP, the modelling involved:

1. Estimation of the number of birds passing through the blade swept zone (expressed by appropriate activity indices, calculated from quantitative data on target species flight activity collected by VP surveys, for three scenarios according to different WTG models under consideration, as elaborated in 7.3.3.10.2.1);
2. Assessment of the probability of a bird colliding when flying through the rotor (calculated using SNH collision probability model, based on bird dimensions, flight speeds and WTG characteristics, again, in three variants according to WTG models under consideration);
3. Application of species-specific avoidance rate.

The result of the CRM is an estimated number of bird collisions likely to occur at a proposed WPP over a period of time, by target species (in three variants according to WTG models).

7.3.3.12 Risk of Collision Mortality from OHLs

The risk of bird collision mortality from OHLs is not predictable or quantifiable from the pre-construction surveys activity data using CRM. However, a range of interacting species-specific, site-specific and project-specific factors influence the risk of collision, often creating collision hotspots where collisions are concentrated along relatively short sections (SNH 2016, Haas *et al*. 2003, Prinsen *et al. comp.* 2012). Increased risks are usually associated with:

- power lines sited near or crossing important areas or flyways used by birds, especially when perpendicular to important migration flight paths, which is considered major risk factor, but also within wintering and staging areas, especially when crossing commuting flight paths (between resting and feeding areas);
- larger species, birds flying in flocks and/or in low light, birds with limited visual capacity, younger and more inexperienced birds and migrants not familiar with the landscape;
- weather that forces birds to lower their normal flight heights, affects flight control and reduces visibility (e.g. strong winds, fog, or heavy rain);
- OHLs with vertical cable configuration and earth wire on the top.

7.3.3.12.1 Estimation of Population Sensitivity and Sustainability

The sensitivity of bird populations potentially affected by collision mortality and displacement was estimated using the Potential Biological Removal ("PBR") approach as applicable for bird populations (Niel & Lebreton 2005, Dillingham & Fletcher 2008). PBR is considered best practice when Population Modelling (using population matrixes) is not possible due to the absence of detailed population-specific demographic data for potentially affected populations. The PBR calculations indicate:

- Allowable harvest rate, i.e. additional human-caused mortality rate likely to be sustainable for the particular population, and
- maximum harvest rate, i.e. maximum mortality rate that could possibly be sustainable.

Calculated harvest rates were then compared with the mortality from collision (estimated by CRM) or population loss from displacement (as an equivalent of habitat loss) to determine if collision mortality or displacement is likely to be sustainable. Any human-caused mortality is considered sustainable when below the allowable harvest rate, and unsustainable (detrimental) when above maximum harvest rate, whilst any value between these two critical rates would need further investigation (Dillingham & Fletcher 2008).

The precautionary approach was consistently implemented in PBR calculations undertaken in this Assessment, including:

- 80% confidence interval (1-α) of all population size estimates has been assumed,
- all mortality rates have been calculated against a conservative estimate of the population size (N_{min}),
- the worst-case mortality rates from collision have been used and assuming that all the fatalities would be from the particular population,
- recovery factor (a corrective coefficient applied to take into account the conservation status of the species/population at the relevant level) has been selected according to maximum precaution.

Arbitrary (non-population-specific) *mortality thresholds*, such as the so-called "1% mortality criterion" set up by European Commission (1993), were not used since scientifically disproved, "in Europe also questionable from a legal perspective", and thus rejected (SNH 2018b).

7.3.3.13 Bats

7.3.3.13.1 Survey Methodology

The Preliminary, one-year bat surveys were undertaken between December 2019 and October 2020 throughout the WPP site (Milovanović 2020a, b). The survey area included the WPP Zoning plan boundary and wider surroundings. Roost surveys were undertaken during hibernation season (winter) using direct visual internal inspection of underground (speleological) features in wider surroundings (up to 10 km from the site boundary) and buildings within the site and in immediate surroundings. Non-standardised manual bat detector surveys at ground level were used (using point count methodology) throughout the WPP site. This methodology is compatible with EUROBATS (Rodrigues *et al.* 2015) in respect of roost surveys. However, the activity surveys undertaken did not allow for reliable and exhaustive assessment of bat activity, abundance and distribution. Based on survey data, a list of recorded roosts and a list of bat species within the survey area was produced.

A half-year bat surveys were undertaken between November 2020 and April 2021 along the off-site OHL routes within the scope of the preliminary surveys (Josimović et al. 2021a). The EirGrid guidance (McCrory *et al.* 2015) was (roughly) implemented. Survey area extended ca. 200 m either side of the outermost proposed routes. Non-standardised walking Transects Surveys along the rough tracks throughout the survey area were used, as well as Automated Surveys, and Roost Surveys. Based on survey data, a consolidated list of bat species within the survey area was produced and ecological status of the species reliably assessed.

Bat surveys within the scope of the Main ESIA Surveys were designed and undertaken in full compliance with the most relevant and up-to-date EUROBATS (Rodrigues *et al.* 2015), and as much as possible BCT (Hundt *ed.* 2012, Collins *ed.* 2016), guidelines, and included as follows:

- Investigation of roost sites (i.e. Roost Surveys),
- Trapping surveys: mist-netting and harp-trapping
- Manual bat detector surveys at ground level (transects) (i.e. Transect Surveys),
- Automated bat detector surveys at WTG locations (i.e. Automated Surveys),
- Automated bat detector surveys at height (i.e. Surveys at Height),
- Automated bat detector surveys above the canopy (i.e. Surveys Above Canopy),
- Continuous automated bat detector survey (Continuous Surveys).

7.3.3.13.1.1 Investigation of roost sites

The aim of Roost Surveys was to identify and assess bat roosts and potential roosting features within the survey area. EUROBATS (Rodrigues *et al.* 2015) methodology was used in these surveys along with the approach recommend by the BCT (Hundt *ed.* 2012, Collins *ed.* 2016).

Detailed surveys were carried within 200 m of the any Project infrastructure do be developed (WTG locations and OHL routes in particular), whilst evaluation of roosting potential was undertaken within a wider survey area – up to 2 km of the site boundary (Rodrigues *et al.* 2015), where indicated that bats from such roosts use the site (Hundt *ed.* 2012).

The preliminary roost assessment included the identification of potential roosting features. Buildings were identified through the national cadastre (Republički geodetski zavod 2020), satellite imagery (*Google Earth Pro* software, © *Google LLC*) and in the field, and speleological features by review of published sources and available internal archives, consultations with speleologists and in the field. The identified potential roosts were then subjected to detailed visual external and internal daytime inspection for evidence of roosting bats, and, where needed, presence/ absence (night-time) surveys for behaviour indicative of roosting (emergence/ entering, swarming, display flights and display calls around/from the potential roost sites), to characterise roosts and/ or evaluate roosting potential.

In accordance with all standards, potential roosts in trees were not subjected to a detailed and systematic inspection because this would not be expedient for the purpose of this assessment (since bats change such roosts every few days). Instead, the potential of roosts in trees in certain areas was evaluated.

The preliminary roost assessment was undertaken in November and December 2021, and each potential roosting feature has then been surveyed at least once in every season (breeding, mating and hibernation).

7.3.3.13.1.2 Trapping surveys

The aim of the trapping surveys was to confirm the presence of species which cannot be reliably identified using acoustic surveys (Rodrigues et al. 2015, Paunović et al. 2011). The trapping surveys are recommended as a supplementary method where woodland is present within a WPP site, and in particular where the WTGs are sited in or at less than 200 m from forest habitats (Rodrigues et al. 2015, Paunović et al. 2011), such as several of the Crni Vrh WTGs. EUROBATS methodology (Battersby comp. 2010, Rodrigues et al. 2015) was consistently applied in this monitoring.

According to the Law on Nature Protection (Official Journal of RS, no. 36/2009a, 88/2010, 91/2010 - correction, 14/2016, 95/2018 - another law, 71/2021), an appropriate licence issued by the competent Ministry is required for trapping bats. Two members of the ESIA team (Milan Paunović and Branko Karapandža) were Licenced in 2021 for the collection of strictly protected and protected species of mammals for scientific research purposes (number 353-01-351/20217-04, dated 19/3/2021).

The trapping was undertaken in three selected localities within the WPP site (Figure 7-2), which were identified as suitable for trapping, based on the recorded bat activity and habitat structure.

Trapping was carried out using mist-nets (total length 160-185 m per survey night) and harp traps (1-2 traps per survey night). Each survey night lasted from sunset until sunrise. The trapped bats were immediately processed on the spot, marked with the appropriate wing bands issued by the national Centre for Animal Marking (at the Natural History Museum in Belgrade) and released as soon as possible. The species was identified based on standard morphological and biometric parameters (Dietz et al. 2009, Paunović et al. 2020).

Trapping surveys were undertaken in July (at localities M1 and M2) and September (at locality M3) 2021, one surveys night at each.

7.3.3.13.1.3 Manual bat detector surveys at ground level (transects)

The aim of Transect surveys was to identify and assess the presence, activity levels, and habitat use of bat species across the survey area and it is required by all the relevant documents. EUROBATS survey methodology (Rodrigues *et al.* 2015) was consistently implemented in these surveys, as well as best practice principles (Brigham *et al. eds.* 2004, Fraser *et al. eds.* 2020).

Two transect routes along existing rough tracks were defined (Figure 7-2) to provide complete the spatial and ecological coverage of the WPP developed area, and to encompass all ecological features that are potentially important for bats. The off-site OHLs area was not included as it was considered that the sufficient information had already been collected by Preliminary Surveys, since the only impacts on bat habitats are possible from the OHL (McCrory *et al.* 2015). Each transect route was about 9.5km long and was divided into 19 segments, each 500 m long.

Each transect segment was surveyed for 10 minutes, either walking the whole length at a fairly constant speed of 2-2.5 km/h, or at two 5-minute stops at random locations, depending on the possibility to safely walk the route without using light. Bat activity was observed by acoustic detection of bat calls using a hand-held bat detector, aided by visual observation to improve species identification and counts (Rodrigues *et al.* 2015). Preliminary species identification, the number of individuals, time, duration, location, flight height and direction (when possible) and observed behaviour were recorded on spot for each detected bat pass (contact). When needed for a more precise species identification, bat calls were recorded. Recorded calls were subsequently analysed using specialized software, appropriate literature[8] and the Consultant's bat call library.

Transect Surveys were undertaken from April to November 2021, one survey visit per transect every ten days, i.e. 2-3 times per month depending on the weather conditions, on consecutive nights on two transect routes whenever possible.

[8] Russo & Jones 2002, Pfalzer & Kusch 2003, Obrist et al. 2004, Papadatou et al. 2008, Boonman et al. 2009, Hammer et al. 2009, Limpens 2010, Barataud 2015, Marckmann & Pfeiffer 2020 etc.

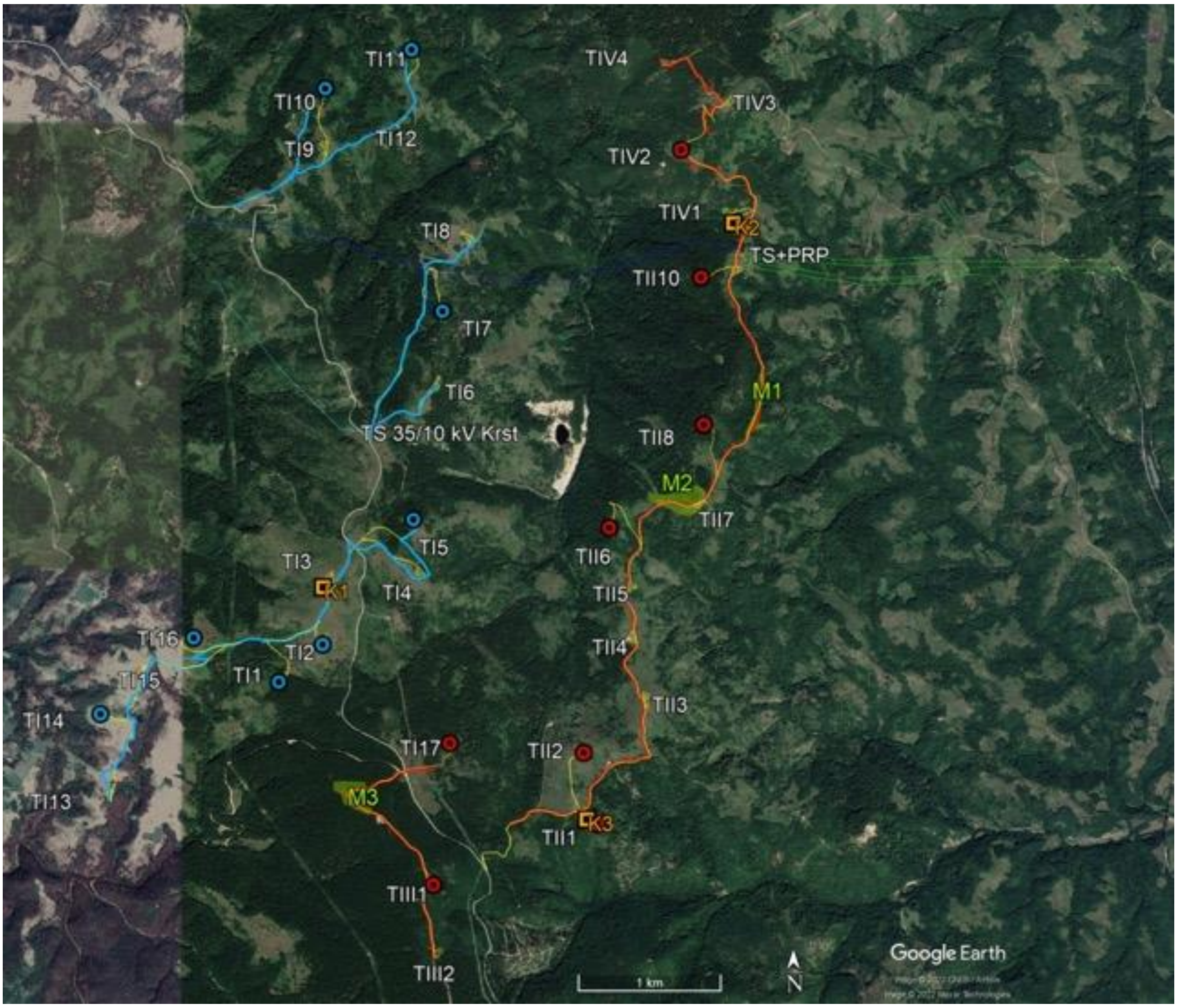

Figure 7-2 Spatial Setup of Bat Surveys

Source: GoogleEarth 2022, CVP, with modification by B. Karapandža, original

Legend and notes: Routes of manual bat detector surveys at ground level – transects (light blue - T1, red - T2) ; locations of automated activity surveys at ground level – surveyed WTG locations (light blue spots T) ; locations of automated activity surveys at height – utilised meteorology masts (orange spots K); locations of other WTGs (T), site access tracks (yellow lines) and OHL routes (dark blue, cyan and green lines) according to Conceptual Design layout (valid at the beginning of the surveys) are also shown.

7.3.3.13.1.4 Automated bat detector surveys at WTG locations

The aim of Automated Surveys was to identify and assess bat activity levels at a representative sample of WTG locations. EUROBATS survey methodology (Rodrigues *et al.* 2015) was consistently implemented in these surveys, as well as best practice principles (Brigham *et al. eds.* 2004, Fraser *et al. eds.* 2020).

A representative sample of 16 WTG locations (Figure 7-2) was surveyed. The sampled WTGs were selected based on expert judgement as to provide the coverage and representation of the developed area, both spatially and ecologically, as required by all the relevant guidance. The automated bat registration systems were operated from 30 minutes before sunset to 30 minutes after sunrise. The recordings were analysed using specialized software, appropriate literature[9], and Consultant's bat call library. Recorded calls were identified to the level of bat species groups – *Rhinolophus* spp., *Myotis/Plecotus/Barbastella* spp., *Pipistrellus/Hypsugo/Miniopterus* spp., *Nyctalus/Vespertilio* spp., *Tadarida teniotis* and *Eptesicus serotinus* (plus indeterminable).

[9] Russo & Jones 2002, Pfalzer & Kusch 2003, Obrist et al. 2004, Papadatou et al. 2008, Boonman et al. 2009, Hammer et al. 2009, Limpens 2010, Barataud 2015, Marckmann & Pfeiffer 2020 etc.

Automated Surveys were undertaken from April to November 2021, one survey visit per sampled WTG every ten days, i.e. 2-3 times per month depending on the weather conditions, on the same nights Transect Surveys were undertaken.

7.3.3.13.1.5 Automated bat detector surveys at height, Automated bat detector surveys above the canopy and Continuous automated bat detector survey

The aim of Surveys at Height was to identify and assess bat presence and activity levels within the blade swept zone of the WTGs. Although not strictly required, these Surveys are considered useful, particularly in non-farmland habitats.

Surveys Above Canopy are required by EUROBATS where WTGs are sited in woodland (Rodrigues *et al.* 2015), such as few of the Crni Vrh WTGs.

EUROBATS (Rodrigues *et al.* 2015) survey methodology was consistently implemented in these surveys, as well as best practice principles (Hundt *ed.* 2012, Brigham *et al. eds.* 2004, Fraser *et al. eds.* 2020).

The Crni Vrh site has three meteorological masts and automated bat registration systems were installed on these masts: two for Surveys at Height with microphones installed at approximate nacelle height of 100 m (K1 and K3 on Figure 7-2) and one for Surveys Above Canopy with the microphone installed at 50 m height (K2 on Figure 7-2). Each microphone was connected to a recorder accessible from the ground. The equipment continuously records bat activity every night from sunset to sunrise throughout the bat activity season. A sub-sample of recordings, from 5 consecutive nights (Hundt *ed.* 2012), was fully analysed to identify bat calls and to attribute those to particular species groups using the same methodology as the Automated Surveys to maximise the comparability throughout the surveys. Recordings from all remaining nights were also analysed, though only to identify and count bat calls; this is to ensure that *Continuous automated bat detector survey* is also undertaken, as recommended, in non-farmland habitats in particular, whenever possible (Rodrigues *et al.* 2015).

The automated bat registration Surveys at Height, Surveys Above Canopy and Continuous Surveys ran from May 2021 to November 2021.

7.3.3.13.1.6 Limitations to Surveys

The Transect Survey methodology used in this assessment (or any other acoustic-based method), can only very rarely reliably attribute the observations of certain species groups to particular species, by either visual features or analyses of acoustic signals (e.g. Paunović *et al.* 2011, Boonman *et al.* 2009, Limpens 2010). It is therefore standard procedure (Collins *ed.* 2016, Rodrigues *et al.* 2015) that these are considered as species groups – *Myotis myotis/blythii*, *Myotis brandtii/mystacinus*, *Myotis emarginatus/alcathoe* and *Plecotus* spp. However, this does not impede impact assessment, since each group consists of sibling species, taxonomically close and ecologically similar (Dietz *et al.* 2009, Paunović *et al.* 2011), and thus WPP projects have the same expected impacts on them, including collision risk level (Rodrigues *et al.* 2015).

The Automated Survey methodology used in this assessment allows only for the identification of recorded bat calls to the level of particular species groups (as listed above). This is standard procedure for this survey type (Collins *ed.* 2016, Rodrigues *et al.* 2015) and does not impede the impact assessment. This is because the species groups are defined to reflect the taxonomical and ecological traits of the species (Dietz *et al.* 2009, Paunović *et al.* 2011, 2020) so that expected impacts of WPP projects on them are very similar, collision risk level in particular (Rodrigues *et al.* 2015).

The required period for all bat activity surveys is March to November in this part of Europe, according to EUROBATS (Rodrigues *et al.* 2015). However, due to site area elevation and slightly prolonged period of adverse weather conditions in surveyed activity season 2021, the bat activity, as well as Transect Surveys and Automated Surveys accordingly, commenced in late April, which is considered to be fully compliant. For Surveys at Height, Surveys Above Canopy and Continuous Surveys it was not possible to commence before late May when automated bat registration systems were installed and operational. Nevertheless, despite a slightly shorter survey period, these surveys have still provided a complete and thorough insight into bat activity (within the blade swept zone of the WTGs and above the canopy) throughout the bat activity season.

Transect Surveys, as well as Automated Surveys undertaken in parallel according to implemented methodology, should be carried out once every 10 days (Rodrigues et al. 2015). On the other hand, these surveys cannot be undertaken in inadequate weather conditions – temperature below 7ºC, wind speed above 5 m/s, intense and long-lasting rain and/ or fog (Rodrigues et al. 2015). During the ESIA survey period, there were several occasions when surveys were not possible for periods longer than 10 days due to continuously inadequate weather conditions. On such occasions, the next survey visit was always undertaken as soon as weather conditions sufficiently improved. Therefore, it is considered that, under given conditions, these surveys were carried out in full compliance with applicable requirements.

The automated bat registration systems used in Automated Surveys, occasionally failed to record bat activity during parts or occasionally the entire night, due to various reasons (moisture, malfunctions, technical problems, etc.). However, since the proportion of failed recordings was less than 5% with no bias for any of the surveyed WTG locations, this had no effect on the total sample. Therefore, it is considered that these surveys provided a complete and thorough insight into bat activity at the WTG locations throughout the bat activity season and provides reliable input for the impact assessment.

7.3.3.13.2 Evaluation and Assessment Methodology

7.3.3.13.2.1 Evaluation of Baseline Conditions - Populations

It is important to note that, in line with international standards, the ESIA surveys were not designed to determine the absolute abundance of bat populations (i.e. population size) at the WPP site area. Activity surveys (bat detector based) that were adopted “provide a number of bat passes rather than absolute number of bats” (Rodrigues *et al.* 2015, Collins *ed.* 2016, Fraser et al. eds. 2020). The indices used to quantify bat activity and relative abundance from the activity surveys data should not be interpreted as a direct measure of population size (Hundt *ed.* 2012, Collins *ed.* 2016). However, some of these indices can be informative of the species abundance if calculated and interpreted adequately (as elaborated below), and bat populations at the WPP site were estimated, where possible, based on the survey results.

Population estimates and trends for Serbia were taken from Paunović *et al.* (2020), whilst not available at any other level (geographical scale), including local, regional, European and global (IUCN 2021, Rodrigues *et al.* 2015). Regional (Carpathian Serbia) populations were estimated based on the national populations, current knowledge and expertise.

7.3.3.13.2.2 Evaluation of Baseline Conditions - Flight activity

Bat pass (or contact) was used as a standard measurement unit of observed/ recorded bat flight activity (Rodrigues *et al.* 2015, Collins *ed.* 2016), defined as follows:

- Transect Surveys –bat activity when the target did not definitely leave the audio-visual range of the surveyor was regarded as a single pass, or as many passes as many individuals have been positively observed simultaneously (Limpens 2010);
- Automated surveys – series of successive pulses (two at least) separated from other such series by at least 1.1 seconds (according to technical features and settings of the automated system used) was regarded as a single pass, or as many passes as many individuals have been positively identified within the same time interval.

According to implemented guidance (Rodrigues *et al.* 2015, Hundt *ed.* 2012, Collins *ed.* 2016) and best practice (e.g. Brigham *et al. eds.* 2004, Barataud 2015, Fraser *et al. eds.* 2020), bat flight activity recorded (Appendix C) by Transect Surveys and, as applicable, by automated surveys, was quantified using the following indices:

- AI - activity index, number of bat passes recorded per time unit [contacts/h];
- cA - relative abundance, percentage of passes attributed to particular species/group of the total passes identifiable to the highest applicable species/group level, corrected by species-specific detectability coefficient [%];
- F% - the percentage of passes with feeding behaviour or feeding buzz registered of the total passes recorded [%];
- aD - average duration of pass [s];
- SC% - the percentage of passes with social call registered of the total passes recorded [%].

Activity indices can be calculated for any given time period, or any given area, per species/ groups or total, and are used to identify, describe and analyse bat temporal and spatial activity patterns.

Seasonal changes of activity were analysed to identify distinctive patterns indicative of particular phenomena in this part of Europe (Bartonička & Zukal 2003, Dietz *et al.* 2009, Rodrigues *et al.* 2015, Paunović *et al.* 2011, 2020), such as:

- Activity peaks in late summer and early autumn (during or just after the period of autumn migration when an influx of migratory populations is expected), and at the very beginning of the activity season (before the spring migration, when migratory populations are still present) are indicative of an occurrence of migratory population.

- Activity minimum in early autumn (during or just after the period of autumn migration when an efflux of species swarming elsewhere is expected), followed by absence later in autumn (when swarming takes place), are indicative of an occurrence of (breeding population of) short-distance migratory swarming species.
- Activity minimum in late spring – early summer (during the period of birthing and lactation) followed by a peak in midsummer (when ca. 1-month-old juveniles fledge and wean) is indicative of reproductive (nursing) activity of the occurring population.

Activity indices, in conjunction with visual observations, have been analysed to identify distinctive patterns indicative of particular aspects of habitat use (Bartonička & Zukal 2003, Dietz *et al.* 2009, Rodrigues *et al.* 2015, Collins *ed.* 2016, Paunović *et al.* 2011, 2020), such as:

- Higher values of F% and aD, associated with higher AI are considered indicative of foraging area.
- Lower values of F% and aD, associated with higher AI, as well as with pronounced unidirectionality and spatial focus of flights along particular habitat/ landscape feature, at the beginning or at the end of daily activity in particular, are considered indicative of commuting route.
- Lower values of F% and aD, associated with higher AI, as well as with observation of large flocks and pronounced unidirectionality and spatial focus of flights along particular habitat/landscape feature during spring and/or autumn migration season, are considered indicative of migration route.
- Higher values of SC%, associated with higher AI and spatial focus of flights around particular habitat/landscape structure/feature are considered indicative of either display (i.e. mating or courtship) territory, where s single male is observed in display flight, or swarming site, where more individuals congregate, (and mating roost within them, which is typically also used as hibernation roost afterwards).
- Regular earlier beginning and later ending of daily activity in a certain area, associated with an identified commuting route in particular, and possibly with the swarming behaviour observed at the end of daily activity as well, are considered indicative of proximity to roost.

Due to inherent species-specific differences in bat call intensity, the probability of acoustic observation/ recording differs among species (Barataud 2015, Collins *ed.* 2016, Rodrigues *et al.* 2015). Species-specific call intensity differs also between habitats in relation to structure, defined mostly by vegetation density, being lowest in clutter and highest in open space. Species-specific detectability coefficients, based on the maximum distance of detection, have been calculated for different habitats; applying these coefficients to observed/ recorded activity (or indices) per species allows comparison of the activity between species (Barataud 2015, Rodrigues *et al.* 2015). Relative abundance was used in this assessment to compare the activity between species, and thus detectability coefficients have been applied when it has been calculated. Species-specific detectability coefficients for semi-open habitats, such as at the site, were used (Appendix C).

7.3.3.13.2.3 Evaluation of Baseline Conditions - Ecological status

Bat species ecological status has been defined through five key aspects and categorised as follows:

(1) Occurrence:

- Regular - recorded on most survey visits,
- Occasional - recorded on several survey visits,
- Rare - recorded few times,
- Incidental - recorded once or twice;

(2) Activity:

- Very High - AI > 30 contacts/h,
- High - AI = 10-30 contacts/h,
- Moderate - AI = 5-10 contacts/h,
- Low - AI = 1-5 contacts/h,
- Negligible - AI < 1 contacts/h;

(3) Abundance:

- Very High - cA > 50 %,
- High - cA = 10-50 %,
- Moderate - cA = 5-10 %,
- Low - cA = 1-5 %,
- Negligible - cA < 1 %;

(4) Migratory status:

- Resident,
- Migratory,
- Undetermined;

(5) Habitat use:

- Roost(s),
- Foraging area(s),
- Commuting route(s),
- Migration route(s).

When specific spatial and/or temporal patterns were identified, in order to define certain aspects more precisely, modifiers were used, such as: locally, just beyond site boundaries, occasionally.

7.3.3.13.2.4 Nature Conservation Evaluation - Conservation Concern

Following bat species were considered as of conservation concern:

- Listed on The Bern Convention Appendix II (Official Journal of RS, No. 102/2007a);
- Listed on the CMS Appendix I or II (Official Journal of RS, No.102/2007b);
- Listed on the EU Habitats Directive Annex II (Official Journal of EU [1992/43/EEC]);
- Strictly Protected in Serbia (Official Journal of RS, No. 5/2010, 32/2016, 98/2016);
- Classified as Threatened (i.e. CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) globally or regionally [in Europe] on the current version of the IUCN (2021) Red List of Threatened Species or on national Red List (Paunović *et al.* 2020);

7.3.3.13.2.5 Nature Conservation Evaluation - Assessment of Nature Conservation Value

The nature conservation value of bat populations occurring at the WPP site was assessed based on their ecological status at the site and available population parameters (at relevant geographical scale), using matrix presented in Table 7-5, and then pondered according to species/population conservation status at the relevant scale (see section 7.3.3.10.2.4).

7.3.3.13.2.6 Assessment and Evaluation of Impacts

All potential impacts of the Project on bats (Rodrigues *et al.* 2015, Hundt *ed*. 2012, McCrory et al. 2015, European Commission 2020, Bennun *et al*. 2021) were considered, as follows:

- Disturbance from construction (through turmoil, vibrations, noise, and lighting);
- Loss of habitats to construction of WPP infrastructure, in particular: loss of roost sites, loss of foraging areas, and loss or disturbance of flight paths (commuting and migration routes);
- Fatalities in roosts due to roost sites destruction (through construction) whilst bats are present within them;
- Operational mortality - death or injury through collision or barotrauma caused by operating WTG blades.

Displacement (i.e. indirect habitat loss) of bats due to avoidance of operating WPPs is not considered since it has been plausibly disproved (Rodrigues et al. 2015), as well as any impacts of OHL operations on bats (McCrory et al. 2015). The risk of bat collision mortality from OHLs mentioned by some sources (e.g. APLIC & USFWS 2005, World Bank Group 2007), relates only to large species of the tropical flying-foxes (Pteropodidae) bat family (Bennun et al. 2021).

All of the potential impacts on bats are negative, except possibly for the habitat changes that may have ambiguous effects depending on species (Rodrigues et al. 2015, Voigt et al. 20185, European Commission 2020, Bennun et al. 2021).

7.3.3.13.2.7 Nature Conservation Evaluation - Risk of Collision Mortality from WTGs

The risk of bat mortality from operating WTs is not predictable or quantifiable from the pre-construction surveys activity data in a way bird collisions are. "[T]he highest mortality is expected in areas of [regularly] greatest bat activity such as migration and commuting routes, important foraging areas, and close to bat roosts, particularly for species and populations that are at higher risk due to their specific ecology" and "the mortality risk is considered particularly high for migratory populations" (Rodrigues *et al.* 2015). "When wind farms are constructed within forests the impacts can be exacerbated", and thus "wind turbines should not be installed within all types of woodland or within 200 m" (Rodrigues *et al.* 2015). Therefore, the collision risk is estimated qualitatively on the basis of occurring populations' ecological statuses and habitat use at the site, and species-specific susceptibility to collision with WTs (Rodrigues *et al.* 2015).

7.3.3.13.2.8 Nature Conservation Evaluation - Population Sensitivity and Sustainability

Since modelling of bat mortality from operating WTGs is not possible, qualitative assessment of the impact has been undertaken using the reverse approach (compared to birds). This means that the overall sustainability limits of potentially affected population (i.e. population-specific mortality thresholds) at relevant scale (regional or higher) have been estimated using PBR methodology (as described in section 7.3.3.10.2.6). The PBR method as adapted to birds (Niel & Lebreton 2005, Dillingham & Fletcher 2008) is scientifically proven to be applicable for mammals in general (Dillingham *et al.* 2016) and bats in particular (Haider *et al.* 2017), and even recommended to assess impacts of operational mortality from WPPs on bat populations (Diffendorfer *et al.* 2015). Since all the population parameters needed for the PBR calculations (for the purpose of this particular assessment) have been available, the PBR method has been used to assess sustainability limits of bat populations in this ESIA.

Arbitrary (non-population-specific) *mortality thresholds*, such as the so-called "1% mortality criterion" set up by European Commission (1993) for birds, were not used since scientifically disproved, "in Europe also questionable from a legal perspective", and thus rejected (Rodrigues *et al.* 2015).

7.3.4 Noise and Vibration

7.3.4.1 Introduction

Wind turbines are not noisy in absolute terms. It is possible to stand at the base of a turbine tower and hold a normal conversation.

Noise from wind turbines comprises aerodynamic noise from the turbine blades turning in the wind and mechanical noise from the gearbox (if present) and generator. Over years, turbine manufacturers have succeeded in substantially reducing the mechanical noise sources. Aerodynamic noise is characterised as a broadband sound not unlike wind blowing through trees, but modulated, so it appears as a swishing sound at regular intervals.

Wind turbines typically operate above a "cut-in" wind speed of around 3 metres per second (m/s) (at hub height). The noise and power output then gradually increases with rising wind speed until the rated power is reached; typically, at a wind speed of 8 – 10 m/s at 10m height. Above this, the noise levels generally flatten off and there is little or no increase in noise with wind speed as the turbine blades are pitched to shed energy and maintain constant electrical power. The noise from wind however continues to rise with increased speed; it is therefore not necessary to assess the noise above a wind speed of 10 m/s at 10m height. The turbines are shut down, typically at wind speeds above 25m/s (at hub height) to prevent damage.

As distance from a windfarm site increases, the noise level decreases as a result of the spreading out of the sound energy, but also due to air absorption, which increases with increasing frequency. This means that although the energy across the whole frequency range is reduced, higher frequencies are reduced more than lower frequencies such that wind turbine noise is heard as a low frequency noise at large distance. This effect may be observed with road traffic noise or natural sources, such as the sea, where higher frequency components are diminished relative to lower frequency components at long distances.

Windfarm noise increases with increasing wind speed to the point where the rated power is achieved. At high wind speeds the background noise can be considerable and this will often mask the wind turbine noise. It is therefore at low to moderate wind speeds that wind turbine is more audible. Operational noise from wind farms can be assessed as a function of wind speed, against existing background noise (BGN) levels at the same wind speed. A lower fixed lower limit, such as 35 dB L_{A90} is often applied at the lowest wind speeds.

Separate noise limits are applied for daytime and for night-time as during the night the protection of external amenity becomes less important and the emphasis is preventing sleep disturbance. Absolute noise limits and margins above background should relate to the cumulative effect of all turbines in the area contributing to the noise received at the properties in question.

Even when noise limits are fixed, there is merit in assessing windfarm noise by comparison with existing BGN. BGN is usually measured in the external amenity of nearby NSRs. Measurements are made in ten-minute intervals over a range of wind speeds.

7.3.4.2 Baseline Noise Survey Methodology

7.3.4.3 Baseline Noise Levels

The WPP is set in a mountainous area with hilly terrain. Apart from the road passing north-south through the site, there are few other sources of noise. Therefore, baseline noise levels will be largely determined by natural sources such as the wind passing through the trees and, in some locations, streams.

A baseline noise survey was carried out by Zaštita AD Beograd to establish noise levels in the area for this project. This was done at six locations with a minimum of two weeks continuous monitoring at each location. The full survey report is provided in Appendix D.3. The findings are summarised below.

7.3.4.4 Measurement Locations

Six measurements locations were chosen as set out in Table 7-6.

Table 7-6 Locations for Baseline Measurements

D	Receptor Co-ordinates UTM		Description	Survey Period
	X	Y		
W3	573356	4891062	Nevenko's Farm occupied in the summer until first snow	13th – 28th September 2021
W24	575913	4891168	House by road occupied in summer	13th – 28th September 2021
O1	573771	4895740	Former Café (Currently Closed)	13th – 28th September 2021
R5	573751	4895744	Dimitri's Farm	29th September – 13th October 2021
W20	579059	4895183	House occupied in the summer by Dragica	29th September – 13th October 2021
O5	578922	4894922	Logger's Cabin	29th September – 13th October 2021

7.3.4.5 Measurement Equipment

Measurements were carried out using Brüel & Kjær Type 2250 and Type 2270 sound level meters and calibrated using Brüel & Kjær Type 4231 calibrators.

7.3.4.6 Weather Conditions

The survey was carried out in consecutive 10-minute periods to obtain data over the operational wind speed range of the wind turbines. Wind speed data was taken from the nearest on-site meteorological mast with the mast data corrected to the turbine hub height of 118m and then standardised to 10m height. Turbine sound power data are also stated with reference to the standardised wind speed. Therefore, by stating the background noise levels in relation to the same reference, the results are directly comparable and wind shear is taken into account.

7.3.4.7 Data Processing

The wind speed and noise measurements have been correlated to show the variation in noise with the standardised wind speed. From these results some data has been excluded where the data did not obviously follow the variation in wind speed. This may have been as a result of rain, or it may have been due to farming activity etc.

Following this the valid data has been split into the daytime 06.00 – 22.00 hours and night-time 22.00 to 06.00 hours and a scatter plot obtained for each location showing the variation in noise with wind speed. The prevailing background noise level from the scatter plots has been derived with a polynomial trendline fitted to the data. Scatter plots showing the data are provided in Appendix D.4.

7.3.4.8 Operational Noise Impact Modelling

For this project, operational noise levels have been predicted using ISO 9613-2: Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation. The standard allows noise levels to be predicted for short-term downwind conditions, i.e. for wind blowing from the proposed turbine towards the houses. This provides a typical worst case in terms of propagation because when the wind is blowing in the opposite direction, noise levels will be significantly reduced compared with the downwind case.

Noise from wind turbines is reduced by distance, atmospheric losses, screening effects (if present) and other 'miscellaneous' losses. Noise levels can be increased or reduced by the interaction of the sound waves with the ground. The ISO propagation model calculates the predicted sound pressure level at a specified distance by taking the sound power level in octave frequency bands and subtracting a number of attenuation factors according to the various losses and the ground effect as described above. The noise level in each octave band can be represented by equation 1 below:

Predicted Level $L_{eq} = L_{W(eq)} + D - A_{geo} - A_{atm} - A_{gr} - A_{bar} - A_{misc}$ (Equation 1)

The predicted octave band levels from each of the turbines are then summed together to give the overall 'A' weighted predicted sound level from all the turbines acting together. The attenuation factors in the calculation (A_{geo} etc.) are described in Appendix D.

Using the standard above can give rise to variable results depending on the input parameters chosen. To provide better consistency in the calculation results and to provide a reasonable correlation with measured results, the UK Institute of Acoustics (IoA) have published a good practice guide (GPG)[10] which amongst other guidance, stipulates the input parameters which can usually result in reliable predictions.

In accordance with the IoA GPG, the following input parameters and assumptions have been adopted for this scheme:

- Downwind propagation in respect of all turbines and other windfarms;
- Turbine sound power levels include a +2dB allowance for uncertainty;
- An assumption of 'Mixed ground' (G=0.5, that is neither wholly absorptive or reflective) is set to calculate the ground effect (Agr) with a receiver height of 4m;
- Air absorption calculated using a temperature of 10°C and 70% relative humidity;
- Screening losses are limited to a maximum value of 2dB with the source modelled at the tip of the source turbines.

7.3.4.9 Modelling Traffic Noise

The methodology described in the UK Calculation of Road Traffic Noise (CRTN)[11] is used. This provides two equations to describe the increase in noise levels associated with construction traffic, referred to below as Equations 1 and 2:

Increase due to increased flow: $10\,log(\frac{q_1}{q_0})$ (1)

Increase due to percentage HGVs $10\,log(1+\frac{5p_1}{V}) - 10\,log(1+\frac{5p_0}{V})$ (2)

In the above, q_1 and q_0 are the traffic flows with construction and the baseline flows respectively and p_1 and p_0 are the percentage of heavy vehicles for the construction year and baseline year respectively and v, the traffic speed in km/h.

7.3.4.10 Noise Limits and Significance Criteria

The WPP must meet the Serbian noise limits in Table 6-3. This represents a pass/ fail significance test. However, noise impacts can occur at lower levels and the ESIA process aims to identify effects at lower

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[10] UK Institute of Acoustics (2013) A Good Practice Guide to the application of ETSU-R-97 for the assessment and rating of wind farm noise
[11] UK Department of Transport (1988) Calculation of Road Traffic Noise (CRTN)

thresholds. For this project, following the IFC EHS guidelines, a significant effect can be identified in relation to the background noise level as assessed using the L_{A90} parameter. While the 2007 guidelines indicate that the increase in background noise should be limited to 3dB, the 2015 Wind Energy Guidelines set a threshold of 35 dB L_{A90} for determining a more detailed assessment.

Background noise levels vary with wind speed. At low wind speeds, low background noise levels would occur but constraining the wind farm to 3dB over a low level is not practical. Instead, it is proposed to define a moderate significance effect at 35 dB L_{A90} or 3dB over the background noise, whichever is the greater.

This limit is similar in approach to the UK ETSU-R-97 noise limit, although the UK lower daytime limit would allow a maximum increase of 5 dB(A) over the background noise (or 35 dB L_{A90}) whichever is the greater. For larger schemes there is also a higher UK limit of 40 dB L_{A90} or 5 dB above the background whichever is the greater. In this context, and in the context of other international wind energy limits and the WHO European Region guidance, it can be seen that the limit of 3dB over the background recommended in the IFC guidelines is an onerous standard.

The significance effects can be set out in Table 7-7 below:

Table 7-7 Noise Effect Significance

Significance Rating	Effect	Noise Criterion
Major	Where the proposed development could be expected to have a very significant impact on the nearby noise-sensitive receptors	Serbian Residential Noise Limits (55 dB L_{Aeq} daytime & 45 dB L_{Aeq} night-time)
Moderate	Where the proposed development could be expected to have a small impact on the nearby noise-sensitive receptors	Where wind turbine noise levels exceed the greater or 35 dB L_{A90} or the background noise (dB L_{A90}) + 3dB
Minor	Where the proposed development could be expected to have a small impact on the nearby noise-sensitive receptors	Where wind turbine noise levels exceed the background noise (dB L_{A90})
Negligible	Where there is no discernible impact on noise sensitive receptors	Where wind turbine noise levels do not exceed the background noise (dB L_{A90}).

7.3.4.11 Noise during Construction and Decommissioning

Construction noise levels generally have a negligible effect in this case because it takes place some distance from the receptors and is short term in nature. Noise emissions from construction equipment will be limited by the Serbian legislation and a Construction Environmental and Social Management Plan (CESMP) will be prepared to ensure that construction noise is controlled. This will include best practical means measures to reduce noise. The construction activity on site will be far from residential receptors. However, there can be effects to construction traffic on local roads. This has been assessed by calculating the increase in traffic noise arising from the increase in flows. Criteria for assessing the increase in traffic are available in the UK design manual for roads and bridge (DMRB)[12]. This gives the following significance thresholds for short-term changes in traffic noise (dB).

- Major Adverse >5dB
- Moderate Adverse 3.1 dB – 5 dB
- Minor Adverse 1.1dB – 3 dB
- Negligible 0 dB – 1 dB

[12] UK Standards for Highways, Design Manual for Roads & Bridges (2020) LA 111 Noise and Vibration

7.3.5 Landscape and Visual

7.3.5.1 Introduction

The methodology for the Landscape and Visual Impact Assessment ("LVIA") is in accordance with the following best practice guidance:

- Siting and Designing Windfarms in the Landscape, Version 3a, Scottish Natural Heritage (August 2017);
- Guidance: Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations, (2015);
- Guidance: Assessing the Cumulative Impact of Onshore Wind Energy Developments, Scottish Natural Heritage (2012);
- Visual Representation of Windfarms Version 2.2, Scottish Natural Heritage (February 2017); and
- Photography and Photomontage in Landscape and Visual Impact Assessment - The Landscape Institute, Advice Note 01/11, March 2011, and consultation draft 2018.

The assessment included the preparation of initial Zone of Theoretical Visibility ("ZTV") plans, field work, establishing the LVIA Study Areas with the help of ZTV plans, initial proposal of representative viewpoints and their final selection during the fieldwork, photography and preparation of visualisations, and evaluation of landscape and visual effects and their significance.

A 30km Study Area is defined for consideration of potential receptors and cumulative windfarms. The rationale for the LVIA Study Area is described in Section 7.2.2.

7.3.5.2 Zone of Theoretical Visibility

The analysis of Zones of Theoretical Visibility (ZTVs) has been a starting point in the determining the potential landscape and visual effects of the proposed Crni Vrh WPP and identifying potentially affected sensitive visual receptors.

The ZTV maps were prepared using Geographic Information System (GIS) software (ESRI ArcGIS 10.7.1) based on the Shuttle Radar Topography Mission Digital Elevation Model (SRTM DEM) of 30m interval resolution. To compensate for potential inaccuracies in digital terrain data and to ensure that the worst-case is represented, observer's eye level was set to 2.0m.

The ZTV overviews for the project are shown on a 1:380,000 base map based on the WTG height to hub (hub height ZTV) and height to blade tip (blade tip ZTV).

7.3.5.3 Viewpoints

Representative viewpoints have been selected in an iterative process that started during the scoping exercise. A preliminary list of proposed viewpoints was developed during the scoping phase, based on the visibility indications of the hub height and blade tip ZTV plans.

The following criteria for viewpoint selection were applied: (1) visibility from settlements, (2) visibility from designated natural or cultural heritage sites, (3) visibility from roads, (4) visibility from recognised viewpoints, (5) visibility from trekking routes, hill tops and recreation areas (provided that they are representative and not isolated viewpoints).

The initial list of viewpoints has been refined by using wirelines to exclude the viewpoints which showed similar results or indicated that potential effects would not be significant. The objective has been to choose viewpoints which represent several of the issues from the same location as this would reduce the total number of viewpoints. The viewpoints have been chosen to represent a variety of landscape types and views from different directions and distances.

7.3.5.4 Field Survey

To establish the visual baseline and finally check the relevance of the proposed representative viewpoints the ZTVs accuracy was tested during the field work.

The ESIA has considered the landscape character during both the good weather and low visibility periods.

The field surveys were carried out in June and July 2021. The work was undertaken during periods of very good visibility (visibility between 20km and 40km). The field surveys included travelling around the LVIA Study Area to consider potential effects on landscape character and visual receptors.

The photographs were taken in accordance with SNH Visual Representation of Windfarms (2017) using a SLR digital camera with a full frame (35mm) CMOS sensor and a 50mm fixed focal length lens. All photography was taken using a tripod mounted camera at a viewing height of 1.5m, and location data recorded with a hand-held GPS.

7.3.5.5 Visualisations

A range of visualisations (photographs, photomontages and wirelines) were used to illustrate the viewpoint assessment, in accordance with SNH Visual Representation of Windfarms (2017).

The baseline photographs were taken with an overlap between frames and were digitally stitched using PTGui® software to create fully cylindrically projected baseline panoramas of the 90-degree field of view. Minor enhancements to contrast and brightness were made on baseline photographs.

The photographs were also joined using PTGui® software to create planar projection panoramas used in the creation of the 53.5-degree field of view photomontages. Photomontages were created with WindPro 3.4 software.

Matching wireline representations were used in the assessment to predict the theoretical appearance of the turbines. The wirelines were produced with WindPro 3.4 software and are based on a digital terrain model with a 20m grid.

The baseline photographs, wireline visualisations and photomontages are prepared to be printed on paper 841mm x 297mm (half A1) and should be viewed flat at a comfortable arm's length.

7.3.5.6 Evaluation of Effects and Criteria of Significance

The significance of landscape and visual effects has been assessed separately. However, it has been based upon the same principle - a combination of two considerations: the sensitivity to change of the landscape receptor or visual receptor and the magnitude of change that would result from the proposed windfarm.

The level of identified impact concerns the importance of changes resulting from the Project. Evaluation of the impact is based on consideration of the magnitude of change in relation to sensitivity and is established using professional judgement. The assessment takes into account likely changes to the visual composition, including the extent to which new features would distract or screen existing elements in the view or disrupt the scale, structure or focus of the existing view.

The prominence of the WTGs in the view will vary according to the prevailing weather conditions. The assessment has been carried out, as is best practice, by assuming the ‘worst case’ scenario i.e. on a clear, bright day in summer. The Final ESIA will also include the clear bright winter conditions, without deciduous foliage in the foreground.

7.3.5.7 Sensitivity of Landscape and Visual Receptors

The sensitivity of landscape depends on susceptibility to change and value of the landscape receptor. It has been defined as High, Medium, Low or Negligible, based on professional judgment and by considering factors that are typically used to identify the landscape value: distinctiveness, scenic quality, rarity, tranquillity, sense of place, recreation value, cultural associations, etc.

Due to the lack of official national studies, the sensitivity of landscape character areas has been considered based upon the literature, professional judgement and its ability to accommodate large-scale wind power projects. The key criteria to express the landscape sensitivity to wind power projects have been: scale, landform, degree of openness, land cover, degree of remoteness and wilderness, rarity and scenic quality, perception of change in the landscape, and inter-visibility with surrounding areas.

The criteria used to assess the sensitivity of landscape are shown in

Table 7-8.

Table 7-8 Specific Criteria for Assessing the Landscape Sensitivity

Sensitivity of Landscape	Criteria Adopted by the Impact Assessment
High	A landscape in good condition, predominantly intact and with a clearly apparent distinctive character. Landscapes susceptible to relatively small changes.
Medium	A landscape in moderate condition, reasonable intact, retaining a distinctive character. Landscapes reasonably tolerant of changes.
Low	A landscape in poor condition, with poor integrity, where landscape character has been adversely affected. Landscapes potentially tolerant of substantial change.
Negligible	A heavily degraded landscape in damaged condition, lacking any integrity.

The sensitivity of visual receptors is defined as High, Medium, Low or Negligible based on professional interpretation of the value attached to the views experienced by people in the Study Area. Views from residential properties are typically considered to be highly valued. Views from roads are considered to be of medium to low value given that people's attention is primarily focused on the road. People involved in recreational activity (trekking, mountain biking) are considered to be medium sensitive receptors, except walkers in Crni Vrh who are considered to be highly sensitive. People who work in the area are considered to be low sensitive receptors, given that their main interest is related to their occupation or activity.

7.3.5.8 Magnitude and Significance of Effects

The magnitude of change to the landscape character arising from the proposed windfarm is defined as High, Medium, Low or Negligible (Table 7-9). It is based interpretation of a combination of parameters: the extent and proportion of existing landscape elements that would be lost, the geographic area over which the loss of landscape elements would be perceived, the degree to which the perceived value of the landscape would be changed, duration of the change and the reversibility of the change.

Table 7-9 Specific Criteria for Assessing the Extent and Magnitude of Impact on Landscape Character

Extent and Magnitude of Impact on Landscape Character	Criteria Adopted by the Impact Assessment
High	Total loss or major alteration to key landscape features such that the landscape character will be fundamentally changed.
Medium	Partial loss or alteration to one or more key landscape features such that the landscape character will be partially changed;
Low	Minor loss or alteration to one or more key landscape features such that the change/loss will be perceptible but the underlying landscape character or composition of the view will be similar to the baseline.
Negligible	Very minor loss or alteration to one or more key landscape features. Change will be barely distinguishable.

The magnitude of change to visual receptors is described as High, Medium, Low or Negligible (see

Table 7-10, below). It is based on interpretation of the following factors: the distance to the proposed windfarm, the duration of the predicted impact, the context in which the proposed windfarm would be seen, and the proportion of the affected view.

Table 7-10 Specific Criteria for Assessing the Extent and Magnitude of Visual Impact

Extent and Magnitude of Visual Impact	Criteria Adopted by the Impact Assessment
High	The Project would become a prominent and very detracting feature and would result in a very noticeable deterioration to an existing highly valued and well composed view.
Medium	The Project would introduce some detracting features to an existing highly valued and well composed view or would be prominent within a pleasing or less well composed view, resulting in a noticeable deterioration of the view.
Low	The Project would form a perceptible but not detracting feature within a pleasing or valued view or would be a more prominent feature within a poorly composed view of limited value, resulting in a small deterioration to the existing view.
Negligible	The Project would form a barely perceptible feature within the existing view and would not result in any discernible deterioration to the view.

The significance of any identified landscape or visual effect has been determined by correlating the magnitude of the effect (high, medium, low, negligible) with the sensitivity of receptor (high, medium, low, negligible). The effect significance is assessed as Major, Moderate, Minor or Negligible with the inter-categories of Major-Moderate, Moderate-Minor, and Minor-Negligible.

For the purposes of this assessment impacts of moderate adverse and above are considered to be significant in terms of ESIA.

7.3.6 Ice Throw and Ice Fall Risk Assessment

The methodology of the ice throw risk assessment has followed the International Recommendations for Ice Throw and Ice Fall Risk Assessments developed by the IEA Wind TCP Task 19 (2018).[13]

Once the development site has been identified to be prone to icing, the initial Study Area for ice throw has been established based on the conservative 'Seifert Formula' (see section 7.2.3). The Study Area has been screened on presence of any receptors. Due to the presence of residential structures and public roads, a need for further refinement of the Study Area has been recognised.

A numerical ice throw risk model has been deployed to quantify the risk based on the annual calculation of ice fragment strikes per m^2. The calculated risk has been illustrated by risk contour plots and overlain by the proposed WPP layout. The estimated risk levels have been evaluated in accordance with the established criteria for risk acceptance. Risk mitigation strategies have been proposed.

7.3.6.1 Identification of Potential Receptors

Potential ice throw receptors included: pedestrians (residents, hunters, forest loggers, visitors), road travellers, windfarm staff, vehicles and structures. Structures' positions have been determined by using the national GIS database GeoSrbija (https://a3.geosrbija.rs).

7.3.6.2 Site Survey

A site survey was conducted in late July 2021 in order to inspect the structures occupancy and condition. The structures were classified in the following categories: (1) permanently occupied residential house, (2) periodically occupied residential house (in Serbian: weekend house), (3) abandoned house, (4) non-residential structure (barn or storage shed), (5) dilapidated structure, (6) derelict structure. More details about the categorisation are provided in section 7.3.12 Description of Structures and Buildings.

7.3.6.3 Ice Throw Numerical Modelling

The numerical model has been based on Monte Carlo simulations of a range of ice build-up and ice shed scenarios for two candidate turbines (Nordex N149, Vestas V162). The model has taken into account the Crni Vrh site topography and the predicted 32 days of icing per annum. The standard assumptions (non-site specific) included an ice accretion rate of 1cm/day and an average width of a leading edge of 1dm. The model result provided risk zones of ice throw and ice fall as a function of distance from the turbine and wind direction.

[13] IEA Wind TCP Task 19 - International Recommendations for Ice Throw and Ice Fall Risk Assessments: https://iea-wind.org/wp-content/uploads/2021/09/Task19_Recommendations_ice_throw_2018.pdf

The main uncertainty of the model has been related to the limited experience of the Original Equipment Manufacturers (OEM) in the Balkans and consequently lack of validation of the Icing Protection Systems (IPS) efficiency. To compensate for this uncertainty, the model has considered an ice fragment weighing 0.5kg as the most representative (despite the international research data suggesting that 95% of ice fragments weigh below 0.5kg).

7.3.6.4 Evaluation of Effects and Significance Criteria

There is no universal international standard for acceptable risk levels from ice throw. One of the approaches suggested by the IEA Recommendations is the ALARP principle (As Low As Reasonably Practicable).

Following the IEA Recommendations, the following fatality risk acceptance criteria have been adopted within this assessment (see Table 7-11):

Table 7-11 Criteria for Risk Acceptance [13]

Societal risk	Individual risk	Evaluation	
> 10^{-3}	> 10^{-5}		The risk is unacceptable high. Risk reduction measures shall be initiated.
10^{-4} to 10^{-3}	10^{-6} to 10^{-5}		The risk is high and it is located in the upper ALARP region. Well-known risk-reducing measures shall be implemented and it is advised to look for additional risk-reducing measures.
10^{-5} to 10^{-4}	10^{-7} to 10^{-6}		The risk is tolerable and in the lower ALARP region. If further common measures to reduce the risk are known, they should be examined under cost-benefit aspects. A recommendation to implement such measures is not pronounced.
< 10^{-5}	< 10^{-7}		Risk is lower than risks people are exposed in everyday life.

7.3.7 Shadow Flicker

The methodology of the shadow flicker assessment included the following: a desk-based assessment to identify the potential receptors neighbouring the proposed Crni Vrh WPP, a site survey to inspect the receptors occupancy and condition, modelling of the potential level of shadow flicker from the turbines and evaluation of predicted levels and their significance. The Study Area shadow flicker has been set at ten rotor diameters, i.e. 1,630m. The rationale for the shadow flicker Study Area is described in Section 7.2.4.

7.3.7.1 Identification of Potential Receptors

A geoprocessing ArcGIS buffer tool was used to calculate the extent of the Study Area of 1,630m. All structures identified within the Study Area have been considered to be potential receptors. Prior to the site visit, receptors' positions have been determined by using the national GIS database GeoSrbija (https://a3.geosrbija.rs).

7.3.7.2 Site Survey

A site survey was conducted in late July 2021 in order to inspect the structures occupancy and condition. The structures were classified in the following categories: (1) permanently occupied residential house, (2) periodically occupied residential house (in Serbian: weekend house), (3) abandoned house, (4) non-residential structure (barn or storage shed), (5) dilapidated structure, (6) derelict structure. More details about the categorisation are provided in section 7.3.12 Description of Structures and Buildings.

The presence and position of obscuring features and vegetation screening were checked around the houses, as well as the positioning and size of windows and doors and presence of blades and shades.

In addition to the site visit, the CVP made their records about the receptors available for this assessment.

7.3.7.3 Shadow Flicker Modelling Scenarios

The shadow flicker modelling was carried out using the commercial WindPro 3.4 software. The WindPro model is based upon a Zone of Theoretical Visibility (ZTV) analysis, which in this case was based upon a Digital Terrain Model (DTM) of 10m resolution. The model accounted for a set of conservative assumptions that simplified the real conditions in order to calculate the maximum risk of shadow impact. The calculations were undertaken for two scenarios: the worst case (astronomical) and the real corrected case (meteorological).

The worst-case scenario represents the astronomical maximum shadow, a theoretical maximum assuming a number of simplifications:

- The sunshine is always of sufficient intensity to cause flicker;
- The wind turbines are in constant operation;
- The prevailing wind direction is always perpendicular to the turbine rotor to cast a sufficient shadow towards the receptor; more than 20% of the sun is always covered by the blade;
- All receptors have windows oriented in every direction ("greenhouses"). All windows have been assumed to measure 1m by 1m, actual house dimensions have not been taken into consideration;
- There are no trees, shrubs, blinds or other features to obscure the view of the turbines and block any potential shadow flicker.

The real case scenario presents a corrected model based on the meteorological conditions relevant for the windfarm site. The corrections are related to the real sunshine data and the prevailing wind direction at the site. A 30-year average of monthly sunshine hours from the nearest weather station in Crni Vrh (approx. 2km south of the windfarm site) was used (the data is provided in Chapter 8.1.10 in Table 8-1). The wind direction at the site and presumed annual operational hours of the Crni Vrh WPP were provided by CVP.

With these adjustments, the real case scenario presents more realistic model compared to the worst-case scenario. However, the real case scenario is still conservative as it does not account for the intervening vegetation or man-made structures.

The input parameters used in the model included the proposed WTG positions, turbine dimensions (Nordex N163/5.7), and receptors' positions.

Based upon calculations of the potential shadow impact at a given location, a shadow flicker map was created by rendering the isolines of the shadow impact.

7.3.7.4 Evaluation of Effects and Significance Criteria

At the time of writing there is no legal limit in Serbia for shadow flicker to be identified as a significant effect. The IFC Guidelines and international best practice recommend that the duration of shadow flicker experienced at a sensitive receptor do not exceed 30 hours per year and 30 minutes per day on the worst affected day, based on a worst-case scenario.

German threshold for the realistic shadow flicker has also been used (8 hours per annum), as it turned out to correspond very well in Crni Vrh with the worst-case threshold of 30 hours per annum.

Significance of impact is typically defined as a function of the sensitivity of a receptor and the magnitude of expected change. In this case, the sensitivity of shadow receptors depends on their use (residential / non-residential) and the level of occupancy (unoccupied / periodically occupied / permanently occupied). The sensitivity of receptor has been assessed by using the professional judgement on a scale of High, Medium, Low or Negligible.

Within this assessment, permanently occupied residential properties are considered to be highly sensitive receptors. Periodically occupied weekend houses are considered to be medium sensitive. Structures used by people who work (logging camp, mushroom collectors' hut) are considered to be low sensitive. Agricultural buildings sensitivity is considered to be low to negligible.

Once the worst-case shadow flicker effect has been modelled, if a receptor is predicted to exceed the thresholds, and its sensitivity is considered to be high or medium, then the shadow flicker effect is considered significant. Any shadow flicker effect on a low-sensitive receptor or below the threshold is not considered to be significant.

The resulting (adverse) impact significance is assessed as significant or not significant.

Mitigation have been proposed to minimise or remove predicted effects, if levels of shadow flicker have been deemed to be significant.

7.3.8 Archaeology and Cultural Heritage

A desktop assessment has been completed based on the preliminarily data provided by the statutory consultees; the Institute for Cultural Heritage from Niš, Smederevo and Belgrade. Mitigation and management measures have been proposed to ensure that the Institute's requirements are properly implemented.

7.3.9 Community Health and Safety

A qualitative risk assessment concerning the potential risks to the general public and workers associated with the construction, operation and decommissioning of the windfarm.

7.3.10 Traffic and Transport

The Traffic and Transport Study Area (see Section 7.2.5) has included the public road network around the development site that will be used for delivery of the construction materials as well as the roads that would be used for delivery of large WTG components.

A desk-based assessment has been carried out to (1) establish the baseline traffic conditions along the route, (2) estimate the traffic levels likely to be generated during the construction phase, (3) conduct qualitative assessment of potential impacts, and (4) propose control and mitigation measures.

Baseline annual traffic flow data have been extracted from the annual traffic count database published a state road management company 'Roads of Serbia'. Baseline data on traffic accidents has been extracted from the annual reports published by the Ministry of Interior and the Agency for Traffic Safety.

There is no Serbian guidance on the environmental assessment of road traffic. This assessment has taken into account the Guidelines for the Assessment of Road Traffic (IEMA, 1993) which suggest two broad rules to be used to determine the extent of the impact assessment, i.e. the road links that will be included in the assessment. The rules are:

- Rule 1 - Include any road links where traffic flows would increase by more than 30% or the number of Heavy Goods Vehicles (HGVs) would increase by more than 30%; and
- Rule 2 - Include any other specifically sensitive areas where traffic flows would increase by 10% or more.

The sensitivity of roads, their users, and settlements along the proposed route, has been assessed in accordance with UK IEMA Guidelines as set out in Table 7-12. Sensitive receptors include hospitals, places of worship, schools, and historic buildings.

Table 7-12 Specific Criteria for Assessing the Sensitivity of Transport and Traffic Receptors

Sensitivity of Receptor	Criteria Adopted by the Impact Assessment
High	Settlements bisected by class I or class II state roads. Limited traffic management measures in place (such as controlled crossings and signalled junctions). Minor rural roads not constructed to accommodate HGVs. Will include unclassified unpaved roads with low traffic flow.
Medium	Roads constructed to accommodate HGVs in urban and residential areas with developed public facilities and services. Traffic management measures in place. Local road (paved or unpaved) suitable for HGV traffic and abnormal loads.
Low	Small rural setting with limited public services. Roads constructed to accommodate HGVs, class II state roads out of settlements. Minimal traffic management measures are in place. Paved road suitable for large volumes of HGV traffic and abnormal loads.
Negligible	Scattered dwellings with no local amenities. Motorways and class I state roads suitable for all types of vehicles and volumes. Outside settlements and no traffic management measures in place.

Potential effects have been assessed based on the sensitivity of the receptor and the magnitude of impact and have been concluded to be of High, Medium, Low or Negligible significance. High and Medium significance represent effects considered to be "significant".

The assessment is based on the use of a number of different types of vehicles used during the construction and operation of the Project. These include:

- Light Goods Vehicles (LGVs) – contractors' vans, minibuses, private cars etc.;
- Heavy Goods Vehicles (HGVs) – vehicles with a maximum rigid length of 12m and a maximum articulated length of 16.5m;
- Abnormal loads – vehicles over 25m in length or 3.6m wide.

Criteria for assessing the magnitude of change for road transport is listed in Table 7-13.

Table 7-13 Specific Criteria for Assessing the Magnitude of Change for Road Transport

Magnitude of Change due to Traffic Impact	Increase in Traffic Flow	Increase in HGVs
High	Above 90%	Above 90%
Medium	Between 60% and 90%	Between 60% and 90%
Low	Between 30% and 60%	Between 30% and 60%
Negligible	Under 30%	Under 30%

7.3.11 Radio Communication and Aviation

A qualitative risk assessment concerning the potential obstructions and interference during the operation of the windfarm. The Study on Impact on Weather Radar has been referenced within the assessment.

7.3.12 Description of Structures and Buildings

The assessment of the impact of a project on people, often referred to as "sensitive receptors", is a central part of any ESIA. Within the context of a windfarm, the technical specialists are particularly concerned about the impact of noise, shadow flicker, and ice throw. The initial site surveys, using satellite images and then visual inspection, will identify all of the structures within or close to the windfarm that may be occupied by people. The design, location and condition of these structures is determined by their intended use.

For domestic properties, the general terminology of "farm building" or "summer house" is quite crude and can lead to confusion. It is also important to recognise that a derelict structure that cannot be occupied or used be people, will be very attractive to bats and other species. Within this ESIA, the authors have used four basic categories of structure, i.e. Residential House, Weekend House, Barn or Storage Shed. In addition, each category has been given secondary descriptive words for the condition of the structure, i.e. In-use, Dilapidated and Derelict.

The basic categories of residential, domestic building adopted in this ESIA report are:

- Residential House: domestic building intended for permanent use; has facilities for cooking and has sleeping accommodation.
- Weekend House: periodically occupied, small domestic house or cabin that is occupied for only part of the year, seasonally occupied; has facilities for cooking and has sleeping accommodation.
- Barn: non-residential, medium to large agricultural building used for storing agricultural equipment (including tractors, ploughs etc.); used for housing livestock; used for storage of hay; not for habitation.
- Storage shed: non-residential, small building used for storing horticultural/ gardening tools (e.g. small power tools or hand tools); may be used for shelter during the day but has no formal sleeping accommodation.

The sub-categories that describe the condition of the building are:

- In-use: in good condition and is being used for its' primary purpose.
- Abandoned: in good condition and not currently in use.
- Dilapidated: not in use; a sound structure but only usable after repair (this could include repairs to broken windows and doors as well as minor roof repairs).
- Derelict: not in use; in a state of significant disrepair such as a collapsed roof, lack of doors and windows, collapsed walls. Probably easier and cheaper to knock down rather than repair.

It is noted that commercial buildings have been given an individual descriptive name, e.g. restaurant, hotel, garage, timber mill, etc as well as the sub-categories for their condition.

In addition, the ESIA has identified if each building is Formal or Informal. The construction of a Formal building is legal, listed in the cadastre and has a building permit. Informal buildings have none of these approvals and are therefore considered to be illegal. This is an important distinction as the owner of a Formal building is permitted to build a new structure in place of the old one. Any replacement of an Informal building requires a new building permit.

8 Environmental Setting – Natural Geography

8.1 The Physical Environment

The proposed WPP site is located in a mountainous terrain in Eastern Serbia on Crni Vrh mountain (1,043m a.s.l.). The area is rural and sparsely populated with many derelict and dilapidated structures. The structures in use are mostly seasonally occupied in the warmer months. Only a few houses and permanently occupied.

The area in and around the Project site is characterised by woodland, open meadow and low-grade agricultural land. The woodland is predominantly planned for logging, the minor part is being managed for erosion control and recreation.

CVP propose to position the WTGs along the highest points of two parallel ridges extending in the south-north direction (see section 8.1.2 Topography). The narrow valley between the ridges is crossed by a number of small, ephemeral and intermittent streams discharging to the Lipa River which runs at the bottom. Forest tracks traverse the site.

The old, open cast copper mine Gornja Lipa is situated in the central valley in the middle of the site. The mine closed in 1967. Further information about Gornja Lipa mine is provided in section 8.1.5 Mining History and Prospective Mines.

8.1.1 Surrounding Area

The area surrounding the Project site is rural with developed copper and gold mining activities (Figure 8-5).

About 500m from the southern boundary of the site is a local ski centre “Crni Vrh” (Figure 8-5). The centre is very small and comprises two ski runs and one ski lift. Within the centre is a huge unfinished hotel complex partially built in the late 1990s and abandoned since 2000. Given the lack of tourist infrastructure, the ski centre is primarily used by local people on day trips from Bor and Zaječar. At the top of the hill above the ski runs is national weather station ‘Crni Vrh’.

Figure 8-1 Ski Lift South of the WPP Site

About 7km south-east, in a valley below Crni Vrh Mountain is Bor Reservoir built in 1959 to provide water supply for the nearby copper smelting plant. The reservoir has become a centre for local tourism and recreation with accommodation facilities around the banks (Figure 8-2).

Figure 8-2 Bor Reservoir

East and south-east of the site is a large copper mining and smelting area and the mining centre of the country. The mining operations were commenced in 1903 and had been increased to industrial-scale mining in the 1950s by the then state-owned company RTB Bor. Since 2018, the majority owner has been Zijin Mining Group, one of the largest Chinese copper and gold producers. The industrial complex has been poorly regulated for decades and the emissions of SO_2 and particulate matter have caused large-scale contamination of the air, soil, groundwater and surface water in a wide area around Bor.

The closest active open pit copper mine is Cerovo, about 4km east of the proposed WPP site. The Cerovo mine initially operated from 1991 to 2002 and then from 2012 to 2017 when it was closed again. It was reopened by Zijin in March 2020.

About 15km to the south-east is the town of Bor. This is a regional industrial centre developed in the 1950s to support the mining operations (Figure 8-3).

Figure 8-3 Town of Bor

Bor is surrounded by several active copper mines (open cast and underground) and a smelting plant (Figure 8-4). Further information about the copper smelting plant is provided in section 8.1.8 Air Quality.

Figure 8-4 Smelting Plant and Old Open Cast Mine in Bor

Further to the south, the new underground copper mine Čukaru Peki has been opened by Zijin in 2021 and is planned to operate until 2035.

About 15km to the west is the small town of Žagubica, the administrative centre of the municipality, and the closest town to the site.

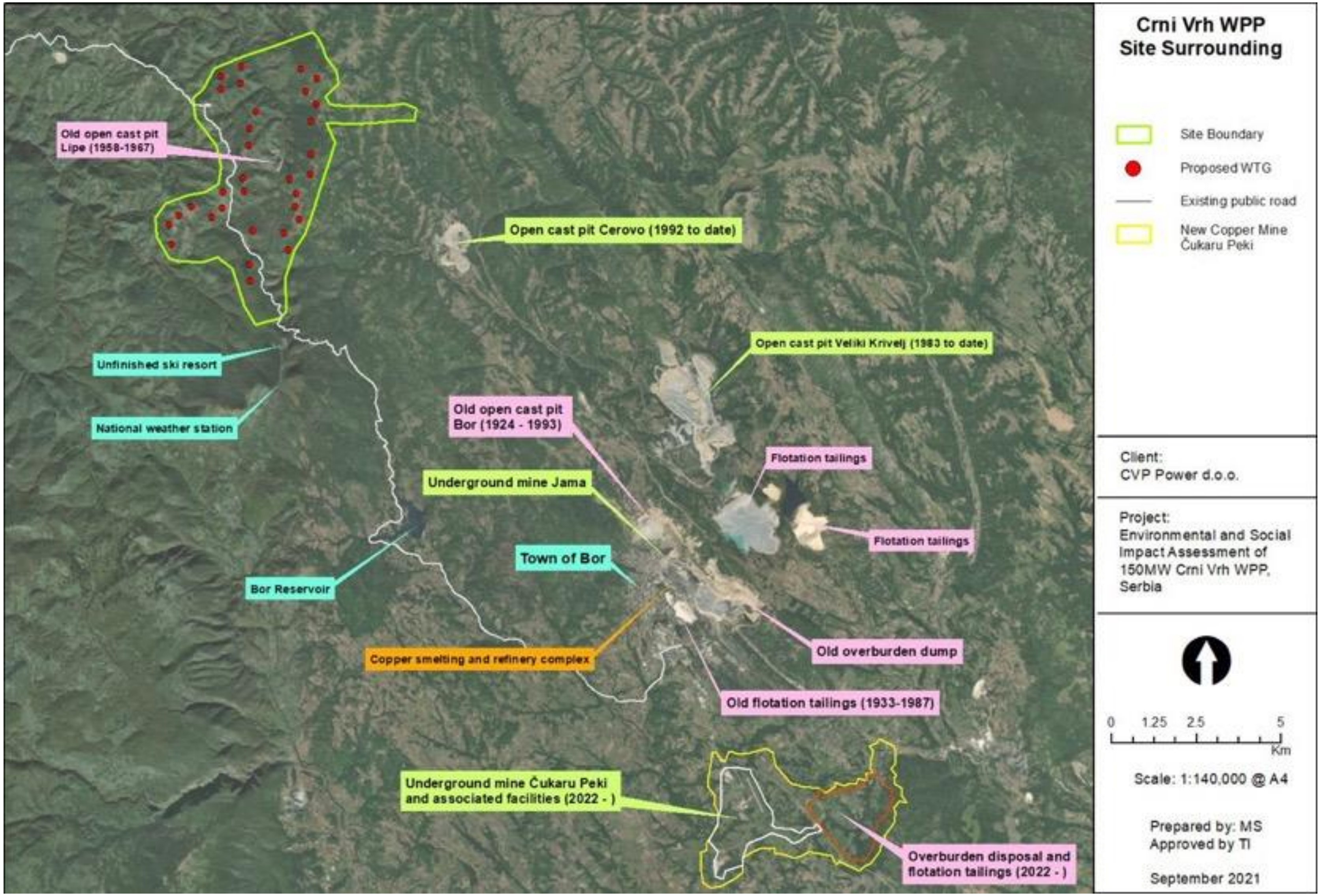

Figure 8-5 Site Surrounding Area

8.1.2 Topography

Crni Vrh Mountain is distinguished by two cone-shaped volcanic landforms in the very south where the highest peak reaches 1,043m a.s.l, see Figure 8-6. The topography at the development site varies from gently to strongly rolling. The proposed WPP site comprises two parallel ridges divided by a narrow valley. The site elevation descends in the south-north direction. The highest point at the site is the Golo Brdo hill (928 m a.s.l.) in the south. The lowest point is 570m a.s.l. in the northmost part of the valley. The proposed WTG positions are at elevations in the range from 694m a.s.l. (TIV-1) to 891m a.s.l. (TIII-1).

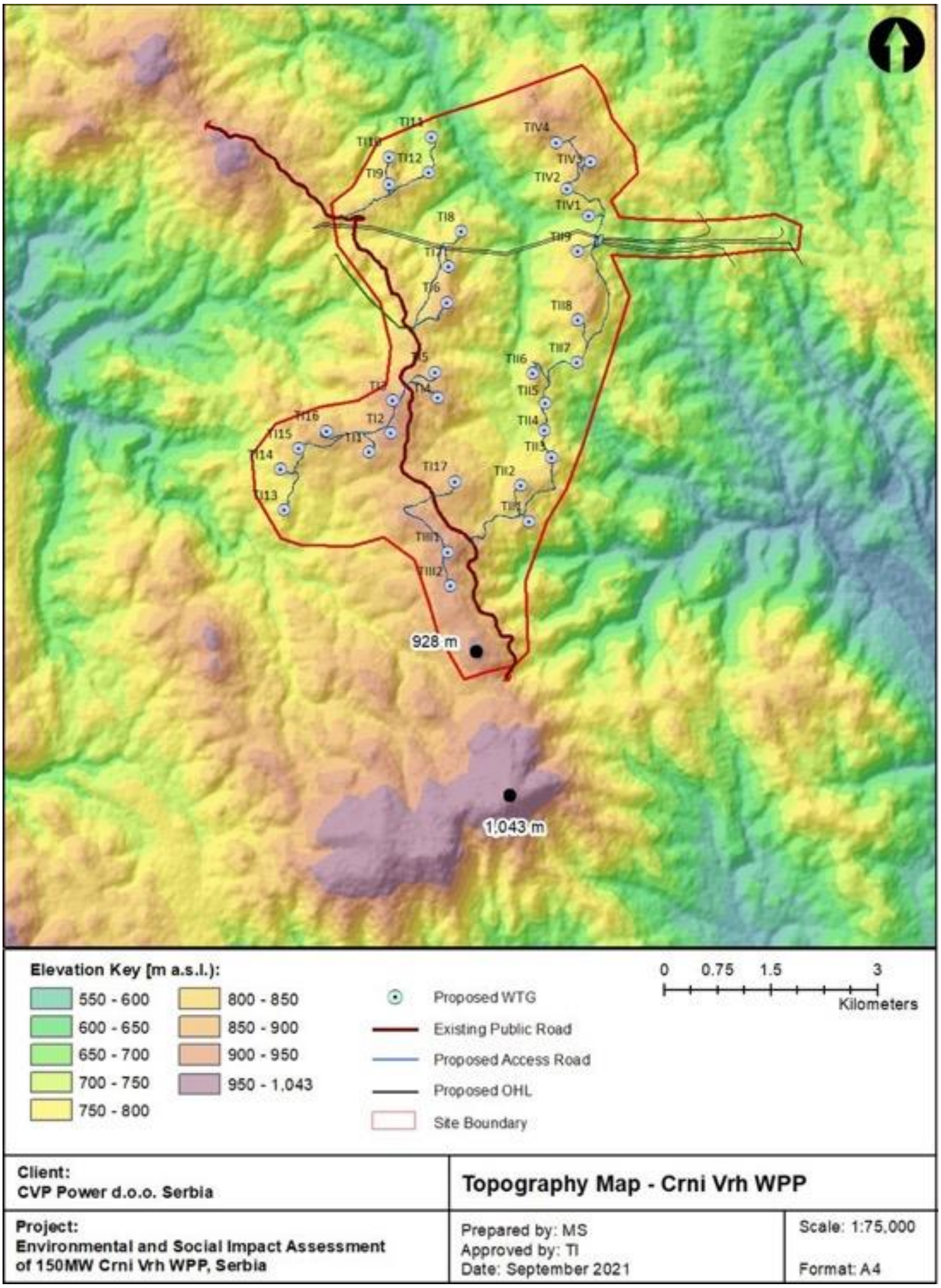

Figure 8-6 Elevation Map of the WPP Site

A 3D surface model of the development site is shown on Figure 8-7.

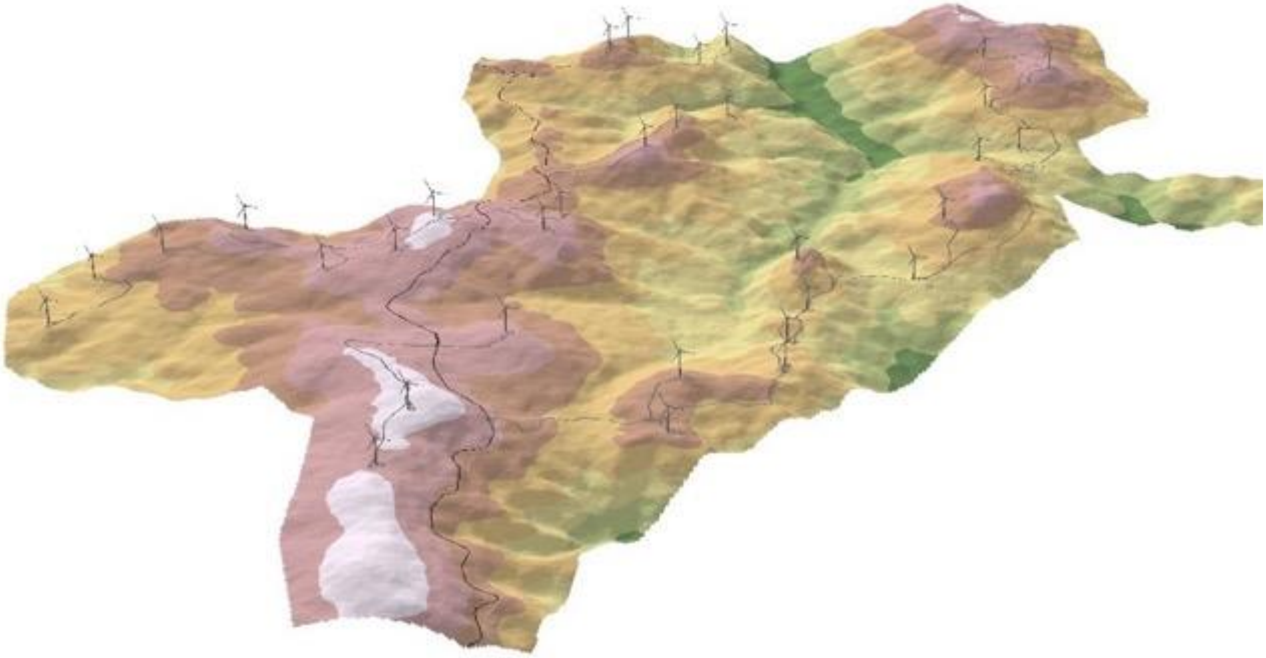

Figure 8-7 3D Surface Model of the Project Site

8.1.3 Geology

The project site lies within the mineral deposits area known as Timok Magmatic Complex ("TMC"). The TMC occupies the major part of Eastern Serbia. The belt extends in the N-S direction and is approx. 85km long and 25km wide (Figure 8-8). The predominant metals in the TMC are copper and gold, accompanied by iron, base-metals, silver, molybdenum, and minor platinum-group elements.

The TMC is composed of various volcanic rocks, a result of an extensive volcanic activity that occurred 80 million years ago (during the Upper Cretaceous period). The volcanic rocks predominantly comprise andesites, as well as volcano-sedimentary and sedimentary rocks (andesite breccia, volcaniclastic conglomerate and sandstone).

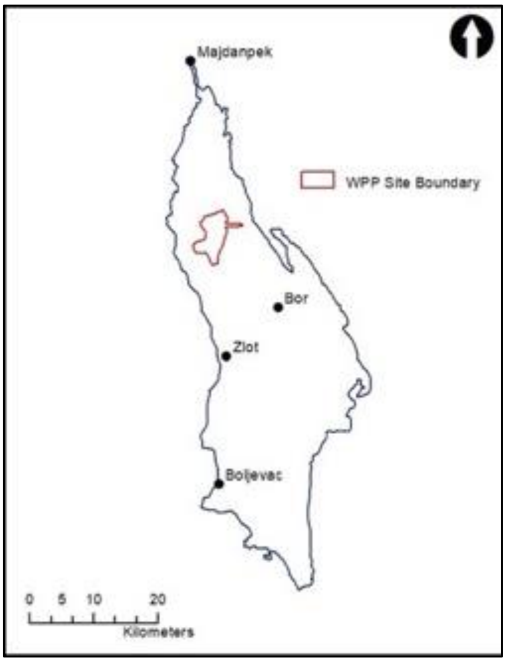

Figure 8-8 Project Site within the Timok Magmatic Complex

Volcanic rocks are hard but are fractured and decomposed in the subsurface zone due to the physical, chemical and biological weathering and disaggregation. Based on the preliminary geological investigation for the Zoning Plan (Geoservis, 2019), the thickness of the weathered (fractured) zone within the site varies between 5 and 15 metres below the ground surface. Wind, ice and surface run-off are the main contributors to weathering and erosion, shaping the rocky surface and forming gullies and small valleys for ephemeral streams.

Narrow belts around ephemeral surface streams and the Lipa River are characterized by alluvial sediments.

8.1.4 Hydrogeology

Crni Vrh mountain is a volcanic massif with very little to no primary porosity due to the rock's texture. Groundwater has a very limited potential to be stored within cracks of the subsurface weathered zone, forming only locally-spreading shallow aquifers (see Figure 8-9). The fractured groundwater aquifer is discharged through numerous low-yield springs. Groundwater level in Crni Vrh varies depending on elevation, topography and the amount of precipitation.

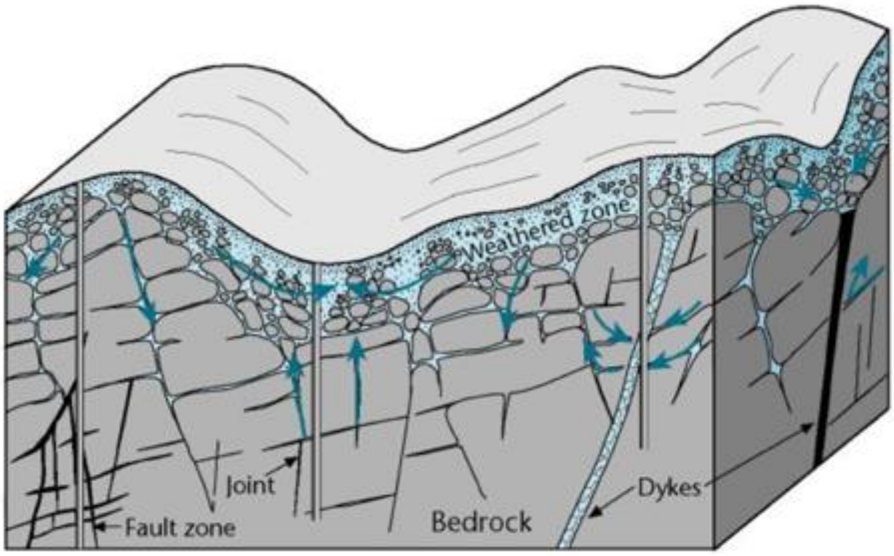

Figure 8-9 Fractured Volcanic Aquifer – Conceptual Hydrogeological Model

(Adapted from Freeze and Cherry 1979, Davis and De Wiest, 1966)

The development site is not located in a groundwater protection area. There is no organised water supply of houses in the Study Area. Various solutions for private water supply of the residential and weekend houses (and livestock) are very likely. Shallow groundwater wells, taped low-yield springs, collection of near-surface or surface water are likely options.

During the course of the site visit, the interviewed residents who live north-east of the WPP site reported that tapped groundwater sources are used for water supply and that households do not supply from private groundwater wells. The low-yield tapped groundwater sources were observed during the site visit. The one observed at a weekend house just east of the site is shown on Figure 8-10.

Figure 8-10 Tapped Low-Yield Groundwater Source East of the Site

The groundwater quality monitoring is not established in Crni Vrh. The groundwater is assumed to be in its natural background condition. The only exception is the central valley at the WPP site, historically used as a copper open cast pit between 1957 and 1968 and abandoned since. The small River Lipa runs along the valley floor and is heavily contaminated with the acid mine drainage (described in section 8.1.6 Surface Water and Drainage). Due to the hydraulic connection, the alluvial aquifer of the Lipa River is very likely contaminated as well.

The groundwater resource sensitivity at the site is assessed to be medium - the groundwater aquifer is low-yield but is being used for individual water supply.

The sensitivity of private water supplies considered to be high – Crni Vrh is not a water abundant area; people and livestock are highly sensitive to loss of water as other options are not readily available.

8.1.5 Mining History and Prospective Mines

As part of the TMC, Crni Vrh Mountain is rich in metallic minerals and ore deposits and has been subject to mining activities since the 1950s. The current status of exploration and exploitation licences within 10km of the Project site is shown on Figure 8-11.

The area west to the WPP site (Potaj Čuka Tisnica, Figure 8-11) has been under intensive exploration since 2007 by Avala Resources, a subsidiary of the Canadian Dundee Precious Metals (DPM). In October 2021 the Spatial (Zoning) Plan of the Gold Exploitation Area of Potaj Čuka Tisnica has been disclosed for early public consultation.[14] The legal deadline for development of the Spatial Plan is 12 months (June 2022). It is understood that the early public hearing had taken place but at the beginning of July 2022 there is no evidence that the Spatial Plan as not been adopted.

[14] https://www.mgsi.gov.rs/cir/dokumenti/rani-javni-uvid-povodom-izrade-prostornog-plana-podruchja-posebne-namene-eksploatacije-0

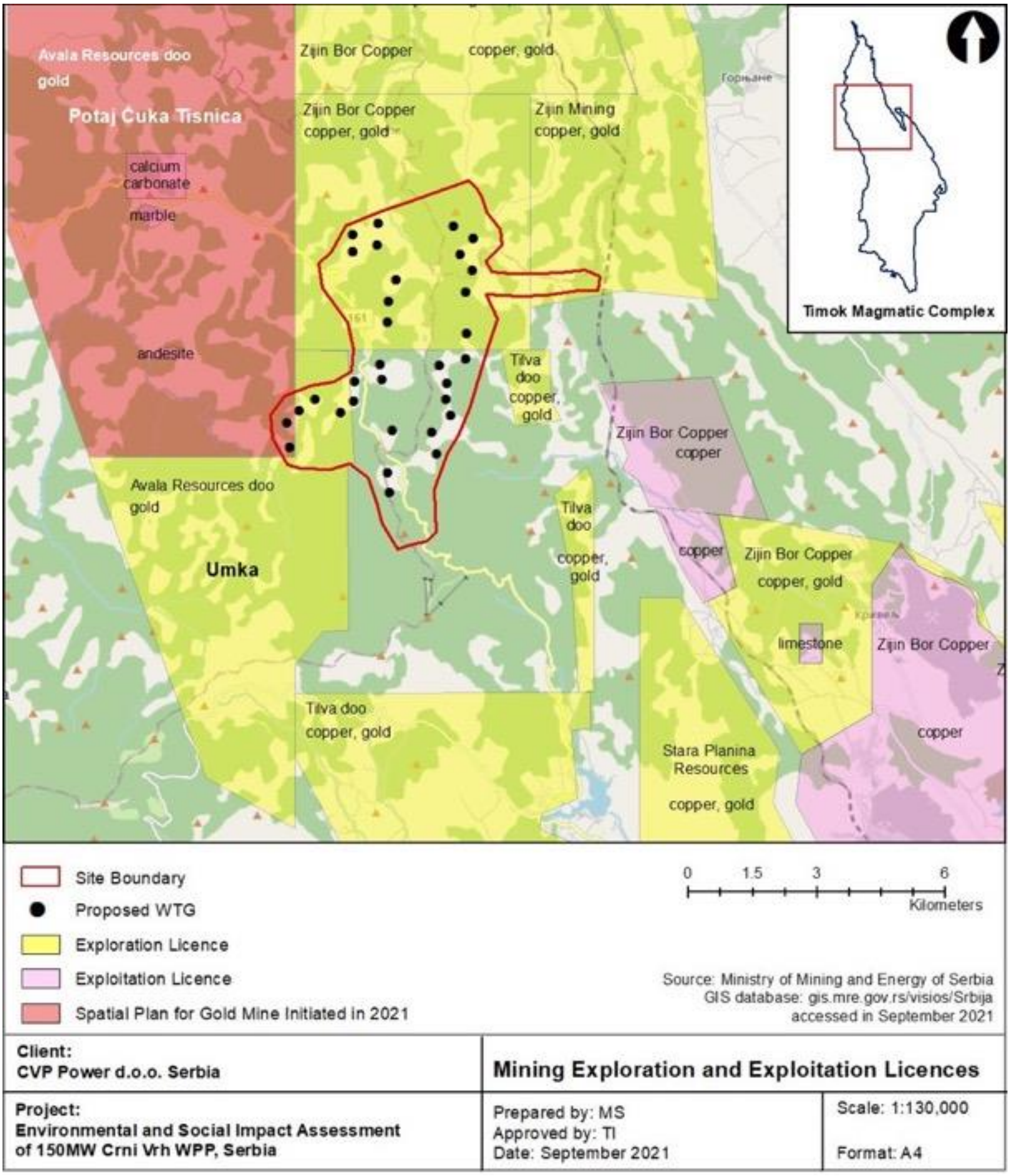

Figure 8-11 Mining Exploration and Exploitation Licences in the Project Area

The proposed location of the gold mine is north-west to the WPP site in the areas called Bigar Hill, Korkan Hill and Kraku Pester. The facility most proximate to the WPP site would be the heap leach facility, about 4km to the north-west.[15]

DPM estimated that the planning and permitting process for the mine will take 3 years, i.e. the construction of mine facilities is not planned to start before 2024. The proposed operational life of the mine is 7 years. [15]

[15] Dundee Precious Metals - Technical Report Timok Project Pre-Feasibility Study Žagubica, Serbia (2021), https://minedocs.com/21/Timok-PFS-02232021.pdf

8.1.5.1 Abandoned Open Cast Pit

The proposed WPP site was subject to historical copper mining. The abandoned open cast pit Gornja Lipa is situated in a central valley in the middle of the site (Figure 8-12). The pit was operated from 1958 until 1967 by the then state-owned mining company RTB Bor and was connected to processing facilities in Bor by a railroad decommissioned in 1968.

Figure 8-12 Perspective View of the Proposed WPP and Gornja Lipa Abandoned Open Cast Pit

Gornja Lipa mine occupies an area of about 16 hectares and has not been rehabilitated. The ore body was mined to the depth of 100 m. The pit lake is surrounded by disposed overburden with slopes about 10m high (Figure 8-13). The mine is formally owned by Zijin Mining which acquired the Bor mining and smelting complex. The mine is identified in the national database of mining waste. The view of the lake pit is shown on Figure 8-13.[16]

Figure 8-13 Gornja Lipa Pit Lake[16]

There have been no historical mine workings beneath the ridges where the turbines are proposed. No mining-related risks have been identified and no mitigations are considered to be required.

[16] Tamina Josefa Buttinger-Kreuzhuber – Master Thesis: Mineralogical Characterization of Sulfidic Mine Waste of the Abandoned Copper Deposit Gornja Lipa, Bor District, Serbia, University of Vienna (2016)

8.1.6 Surface Water and Drainage

The undulating and steep terrain within the development site provides conditions for a number of ephemeral and intermittent streams that originate on the ridges where the WTGs are proposed. The Project site is located in the boundary area of three catchments (Figure 8-14). The majority of the site drainage is anticipated to flow towards the central valley and the Lipa River, the only perennial watercourse at the site. The Lipa River falls within the Veliki Pek River catchment.

The streams along the eastern ridgeline drain to the east and fall within the Krivelj River catchment. The streams along the western ridgeline flow to the west and fall within the Tisnica River catchment.

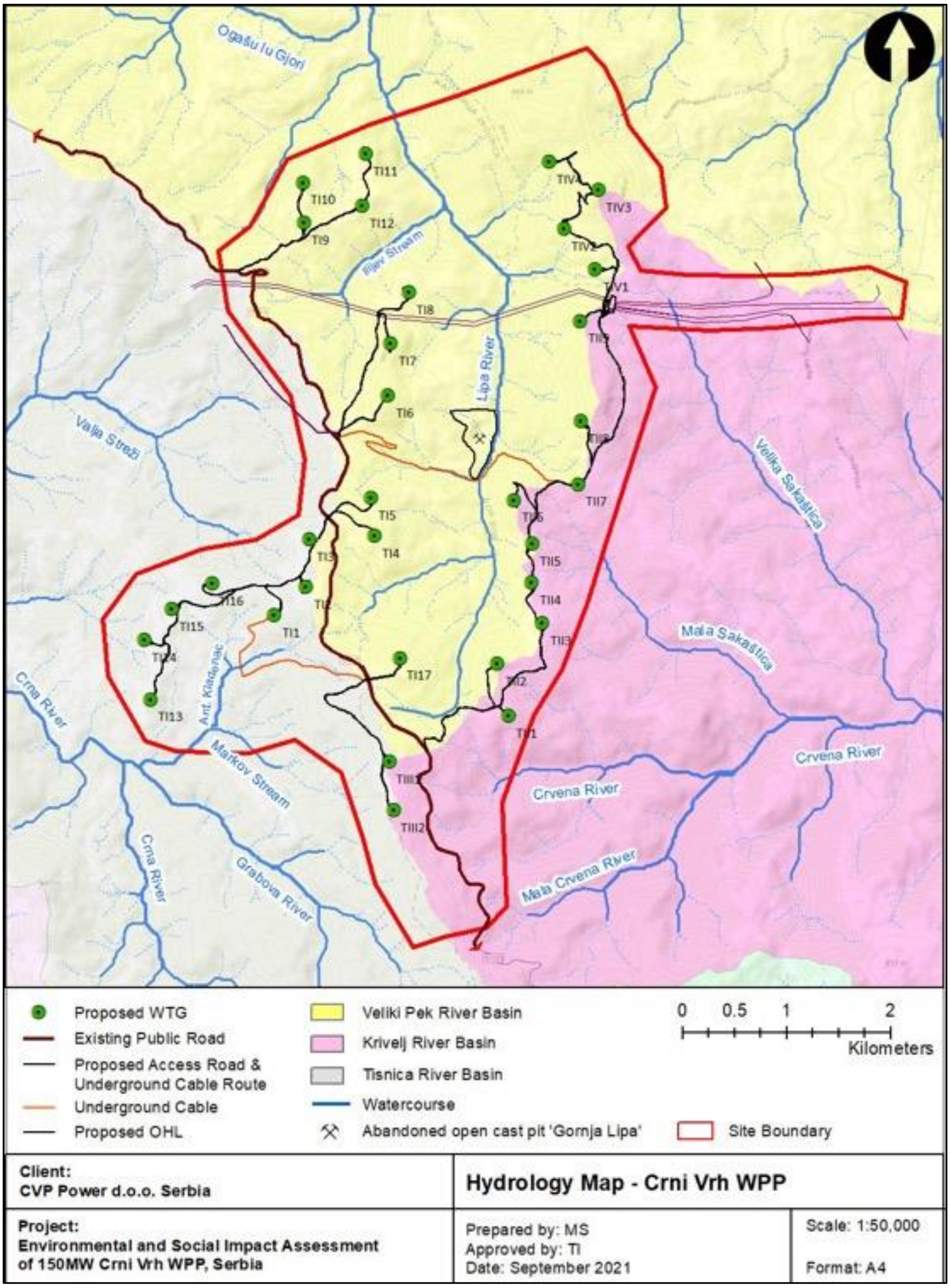

Figure 8-14 Hydrology at Crni Vrh WPP Site

The Lipa River originates in the wooded slopes south of the WTG TI-17 and runs in the south-north direction. As the Lipa is very small it has not been included in national surface water quality monitoring programme. After approx. 2.5km, the river reaches the abandoned copper open cast mine Gornja Lipa. The mine has not been properly closed and the sulphide acid drainage flows directly into the Lipa. A horizontal tunnel (adit) is damaged and provides a pathway for the mine water with high arsenic and iron content to discharge to the Lipa. A conceptual model of the Lipa pollution from the mine is shown on Figure 8-15.

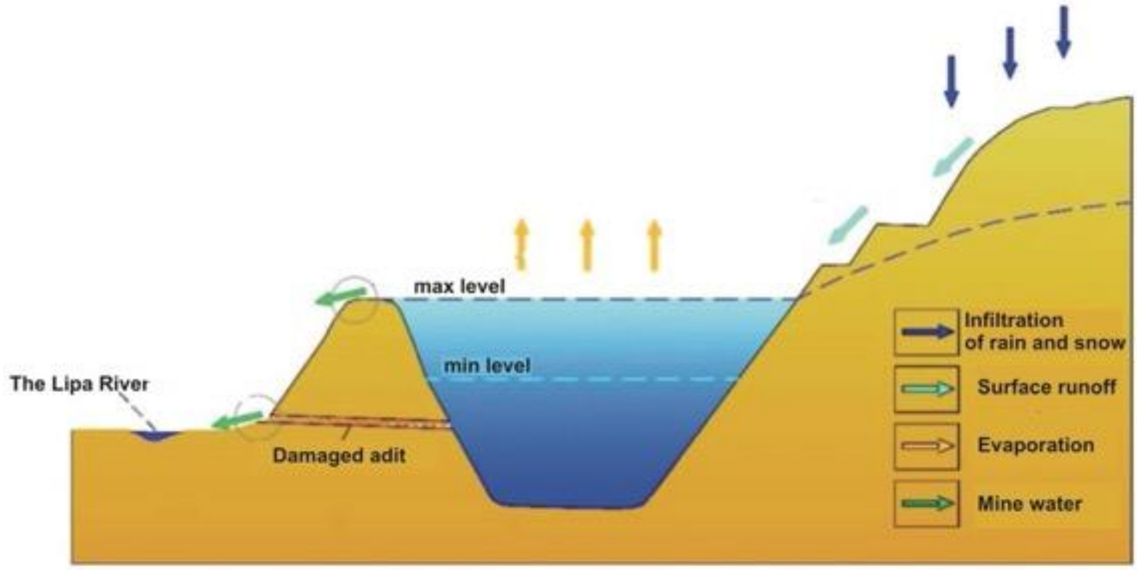

Figure 8-15 Conceptual Model of the Gornja Lipa Acid Mine Drainage

(*Adapted from Dragišić, 1995*)

The Lipa water quality is heavily deteriorated, out of any class and devoid of life. The river in the mine area is shown on Figure 8-16.

Figure 8-16 The Lipa River Near the Gornja Lipa Mine

As the Lipa is an exemplary case of surface water pollution by the mining activity, it has been investigated for decades by the academic community, i.e. the University of Belgrade, Faculty of Mining and Geology. The monitoring results have shown that upstream of the mine the Lipa has clear, low mineralised water and aquatic life. The water pH upstream is neutral (6.98). Downstream of the mine, pH drops to 2.28 and remains acidic even 2km downstream. Arsenic and iron in the river remain high 2km downstream of the mine, arsenic varying in the range 0.94-1.9mg/l and iron in the range 3-9.7mg/l.[17] Iron, manganese and aluminium deposits cover the riverbed.

The polluted Lipa discharges to the Veliki Pek River c. 6km north of the site. The Veliki Pek has also been under pressure of acid mine drainage from gold and copper exploration works in the area north of the site. The Veliki Pek discharges to the Pek River which runs through the mining area of Majdanpek and has been affected by the mining works for decades (heavy metals were found in the river sediment downstream of Majdanpek).[18]

Watercourses east of the site form the Krivelj River which runs towards the mining area of Bor where it is being significantly affected by acidic mining waters, its water quality deteriorating to “out of class” category.

Watercourses west of the site run for the Tisnica River which runs towards Žagubica valley. Their flow regime is influenced by rainfall and snow-melt when they can become torrential.

In its upper stretch, before it reaches the abandoned mine, the Lipa is in its natural, undisturbed condition and has a local ecological value. Other watercourses are ephemeral or intermittent and in their natural condition as well. During high flow periods, the watercourses have the potential to be used for (limited) private water supply. Given that the Crni Vrh area is not water-abundant, the watercourses have local importance and their sensitivity is considered to be medium.

The sensitivity of the Lipa River stretch in the mine area and further downstream is assessed to be negligible, given the significantly deteriorated water quality and no ecological value.

8.1.7 Soil Quality

The development site presents an association of acidic brown forest soil (dystric cambisol) and brown forest soil (eutric cambisol).

Investigation of the forest soil in Crni Vrh has been limited, undertaken mostly by forest ecologists of the University of Belgrade and the state Institute of Forestry as part of academic research of beech woodland.

Crni Vrh Mountain belongs to a rich metallogenetic complex, consisting of numerous metallic minerals and ore deposits, and therefore the presence of metals in the soil is expected. However, the sampling and analyses of soil in the north-eastern parts of the mountain (at elevations between 700 and 800m a.s.l.) recorded elevated content of copper and lead in the humus layer and in the forest floor, significantly higher than natural background concentrations.[19]

First published papers indicating a strong correlation between the acidity of the soil in Crni Vrh and the deposition of air pollutants from Bor (particularly sulphur falling as acid rain) date from 1974.[20] The bedrock in Crni Vrh consists of a neutral volcanic rock (andesite) and the soil would naturally be expected to be fertile, carbon-rich and base saturated. However, the soil was found to be acidic, low-fertile, and base unsaturated. The acidification of the soil in Crni Vrh is most likely a result of the long-term acid deposition of sulphur gases from the Bor smelting plant.

The effect of air pollution has been acknowledged in the Forest Management Plan for Crni Vrh (2020-2029) prepared by Serbia Forests, suggesting that the acidic soil has resulted in a reduced woodland growth which then provided conditions for soil erosion.[21]

Historically, the central part of the site was used as a copper open cast mine between 1957 and 1968 which has been abandoned since. While there has been no systematic soil investigation in the mine area, the local soil contamination with heavy metals (e.g. arsenic, iron, manganese, copper) is highly likely.

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[17] Prosun Bhattacharya, Arun B. Mukherjee, Jochen Bundschuh, Ron Zevenhoven, Richard H. Loeppert - Arsenic in Soil and Groundwater Environment, 2007 Dragišić, S. et all, 1992

[18] Quality of Sediment in Rivers and Reservoirs in Serbia – SEPA (Serbia Environment Protection Agency), 2019

[19] Kneževic, M, Belanovic, S, Košanin, O, Kadović, R. – Heavy metal content in beech forest in Crni Vrh and oak forest in Fruška Gora, 2000.

[20] Košanin O, Knežević M. - Properties and production potential of cambic soils on andesite rocks in beech forests on Crni Vrh near Bor, 2003.

[21] The Forest Management Plan for “Crni Vrh – Kupinovo” Unit (2020-2029), Serbia Forests (2019), page 11

8.1.8 Air Quality

The WPP development site is situated about 15km (air distance) north-west of a copper mining and smelting complex close to the town of Bor. The former state-owned company “RTB Bor”, has been in operation since the early 1950s. “RTB Bor” was privatised in 2018 when Zijin Mining, one of China’s biggest gold producers and the second biggest producer of copper ore became its majority owner.

The smelter has adversely affected the ambient air quality in Bor for decades. The high concentrations of SO_2 and particulates have had a long-term impact on the health and wellbeing of its residents. Many years of air quality data shows that the ambient concentration of SO_2 had reached 2,000 μg/m^3 and even 3,000μg/m^3 against a limit value of 350μg/m^3 (1-hour average).

According to the official data for 2020, daily SO_2 values exceeded the legal limit 10 times in Bor town centre and 17 times in the northern suburb. The national limit value for daily average of SO_2 in ambient air is 125μg/m^3, and this must not be exceeded more than 3 days per annum.[22]

The particulates emitted from the smelter have a high heavy metal content. Arsenic and cadmium concentrations monitored in Bor have a long record of exceeding the ambient air quality standards. The official data for 2020 show that the average annual concentration of arsenic in particulates in Bor town centre was 77ng/m^3 (the legal target value is 6ng/m^3) and cadmium 12ng/m^3 (legal target value is 5ng/m^3).

As an illustration, Figure 8-17 shows SO_2 concentrations at 10m height over the Western Balkans on an exemplary day of 26th November 2020 at 2pm, as modelled by the air quality forecasting system SILAM.[23] The non-verified ambient hourly concentration of SO_2 recorded at 10am that day in the northern suburb of Bor was 1,027 μg/m^3 (the legal limit is 350 μg/m^3).[24] Other SO_2 emission sources captured by the model were thermal power plants.

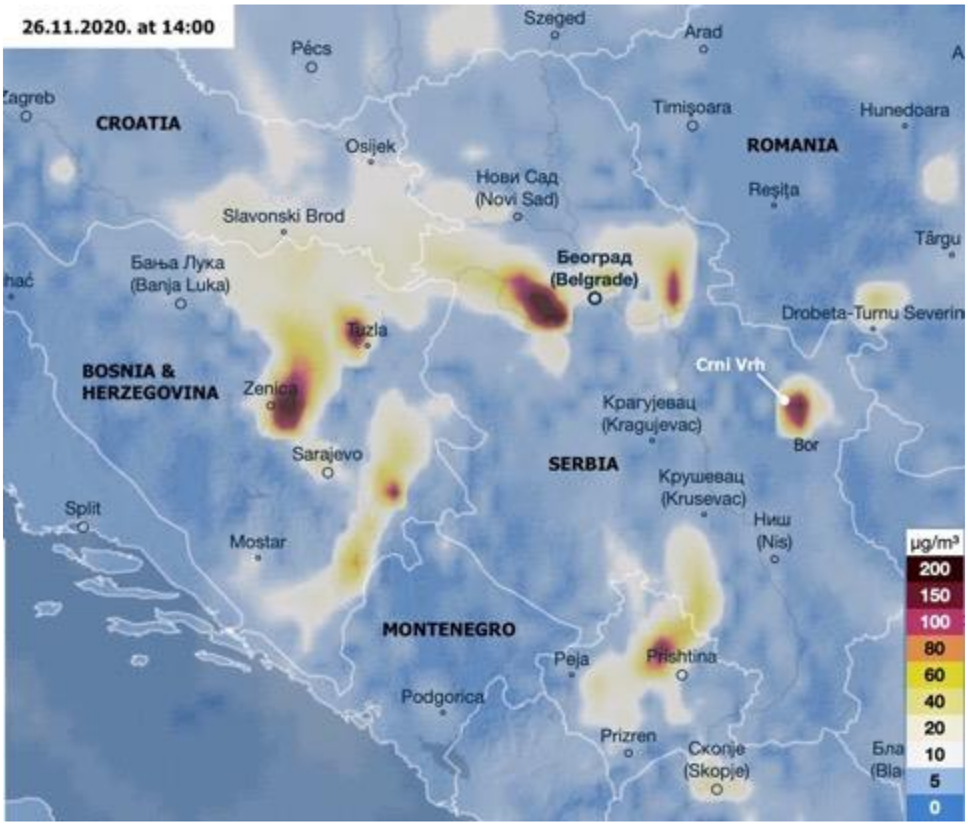

Figure 8-17 Hourly SO_2 Concentrations Over the Western Balkans on an Exemplary Day[23]

The smelting plant is currently under reconstruction (October 2021) which will reportedly include the installation of adequate air emission abatement systems.

[22] SEPA – Annual Report on Ambient Air Quality in Serbia in 2020
[23] SILAM model visualization provided by the Ventusky web application (www.ventusky.com)
[24] Ambient Air Quality Data for 2020 – Serbian Environment Agency (SEPA), non-verified data http://data.sepa.gov.rs/dataset/kvalitet-vazduha/resource/f9166e68-1088-4c28-a56a-5ad650944078

8.1.8.1 Atmospheric Deposition in Crni Vrh Mountain

There is no ambient air quality monitoring station at Crni Vrh and the potential exposure of the mountain to the air pollutants from the Bor smelting complex has never been systematically investigated. The earliest published academic paper of the exposure of Crni Vrh to the acid deposition dates from 1989 (Grubčik et al.). The paper indicated that one of the prevailing winds blowing from the south-east provided conditions for the long-distance transport of air pollutants towards Crni Vrh.

The Forest Management Plan for Crni Vrh (2020-2029) confirms that the mountain is within the zone of influence of the pollutant deposition from Bor during south-west wind *"when the ellipse-shaped pollution plume up to 20km long and 10km wide travels in the NE-SW direction"*. [25]

Continual monitoring of atmospheric deposition in Crni Vrh Mountain began in 2013 as part of the international cooperation on assessment and monitoring of air pollution on forests (ICP Forests).[26] The monitoring plot is situated about 2km south-east of the WPP site, within a pure beech woodland. The atmospheric deposition has been collected by bulk rainfall collectors, through-fall (rainfall that passes through canopy) and stem collectors (rainfall that moves down the stem). The monitoring results have indicated occasional drop of pH value below 4 which accounts for the acidic rainfall character (compared to normal rainfall pH value of 5.6). [27]

The exposed surface of the abandoned open cast pit Gornja Lipa is a local source of particulate emission, especially during periods of strong wind.

8.1.9 Contaminated Land

The major part of the development site has been an undeveloped shrubland or woodland. The only exception is the abandoned open cast pit in the central valley which has been a decades-long source of land and groundwater contamination.

The underground cable route from the WTG TII-7 to the medium-voltage substation is proposed across the central valley, along the existing forest track just adjacent to the mine and underneath the Lipa riverbed (see Figure 8-14).

Trench excavation and drilling below the Lipa riverbed are not anticipated to disturb the mine area. However, the land and groundwater in this area are contaminated with heavy metals and any excavated material must be treated as such. Control measures to prevent cross-contamination must be implemented (proposed in 13.10 Environmental Pollution).

There are no hazardous waste landfills in Serbia where the surplus contaminated material could be safely disposed. The abandoned mine Gornja Lipa is identified in the national database of mining waste but there is no national strategy on management of mining waste or mining rehabilitation. It would be sensible to consider disposing of the surplus contaminated material within the mine area, rather than searching for limited opportunities for its disposal off site.

8.1.10 Climate Setting

This section describes key climate features of Crni Vrh based upon data from a nearby national weather station, literature sources and weather forecasting models. The analysis of the observed climate change is provided in section 10.1.1 Climate Change.

8.1.10.1 Key Climate Features

Crni Vrh mountain is a specific area in Serbia, known as the foggiest place in the country, experiencing harsh winters with snowdrifts and icing events. Despite its moderate altitude (1,043 m a.s.l.), the mountain receives more snow than many higher altitude areas in Serbia and has more days with ice deposition than many areas with lower average temperature.

Similar to a major part of Serbia, Crni Vrh has moderate continental climate but with pronounced local features due to its geographic position and terrain altitude. Under certain weather conditions the mountain is found in a transition zone between cold and warm air masses. The exposure to weather fronts creates specific conditions, often very different to the remaining part of the Timok Region. High precipitation, persistent fog,

[25] The Forest Management Plan for "Crni Vrh – Kupinovo" Unit (2020-2029), Serbia Forests (2019), page 11
[26] http://icp-forests.net
[27] Monitoring and Assessment of Air Pollution Impacts and Its Effects on Forest Ecosystems in Republic of Serbia: Forest Condition Monitoring – The Institute of Forestry of Serbia (2021)

rapid shifts in wind direction, sharp temperature changes followed by snowdrifts or quick ice deposition are some of the climate features in Crni Vrh.

The national weather station in Crni Vrh is located about 1.7km south of the WPP site at 1,037 m a.s.l. and is considered representative of the site.

During the standard reference period 1981 to 2010, monthly average temperatures for the warmest and coldest months were in the range from 17°C (August, the warmest month) to -3.5°C (January, the coldest month). The absolute temperature maximum recorded was 36.5°C (July 2007), the absolute minimum was -23.2°C (February 1985).

Precipitation has a pronounced seasonality. The average annual rainfall is 769mm, and is highest in late spring and early summer. Rainfall maximum reaches up to 93mm in June dropping to 46mm in February. Maximum daily rainfall of 132.5mm was recorded in August 2018 which significantly exceeded the previous maximum of 100.7mm recorded in June 1969.

The average annual number of days with snow is 67 while the average annual duration of snow cover is 123 days. Snow cover is present 29 days in January and 26 days in February and December. March has 22 days with snow cover.

The average annual number of cloudy days is 133. The average total sunshine duration is 2,053 hours. The average monthly sunshine duration is shown in Table 8-1.

Table 8-1 Average Monthly Hours of Sunshine (1981-2010)

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
84.1	90.6	139.5	173.9	227.0	257.0	292.3	277.2	196.5	147.8	96.6	70.6

Predominant wind directions are from the north-west and south-east, both with the mean annual wind speed of 5.3m/s at 10m height.

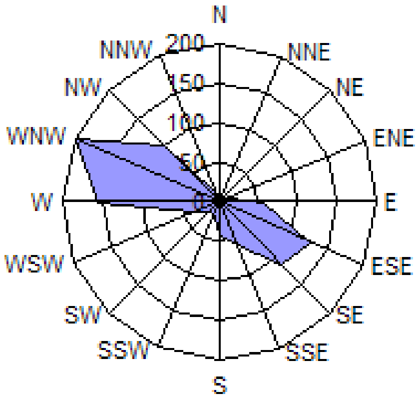

Figure 8-18 Wind Rose in Crni Vrh (1981-2010)

8.1.10.2 Cold Climate Area

Crni Vrh is a Cold Climate (CC) area in terms of the International Energy Agency (IEA) definition, as it is prone to atmospheric icing. CC areas are defined as regions where either icing events or periods with temperatures below the operational limits of standard wind turbines occur, which may impact project implementation, economics and safety.[28]

Crni Vrh only occasionally experiences air temperatures below the operational limit of standard wind turbines (-10°C) and its climate does not classify as Low Temperature Climate (LTC) as defined by the IEA. LTC areas are those where air temperature is below -20°C on more than 9 days per year (hourly value) or the mean annual temperature is below 0°C.

[28] Wind Energy Projects in Cold Climates – IEA Wind, 2011

However, the mountain experiences atmospheric icing and is therefore considered to be an Icing Climate (IC) and CC area, as per the IEA definition. According to the IEA, if a WPP site is an IC site, there is a further need to define the IEA ice class for this specific site.

8.1.10.3 Icing Climate

Icing measurements at weather stations in Serbia began in 1964 (at 2m height). After the initial ten-year observation period (1964 - 1974) a map was developed showing spatial distribution of a number of days with ice deposition (rime, glaze, and wet snow). The number of days with ice deposition is related to persistence of ice after an icing event. It is notable that a narrow area in Eastern Serbia which includes Crni Vrh was found to be more prone to ice deposition than any other part of the country (see Figure 8-19). [29]

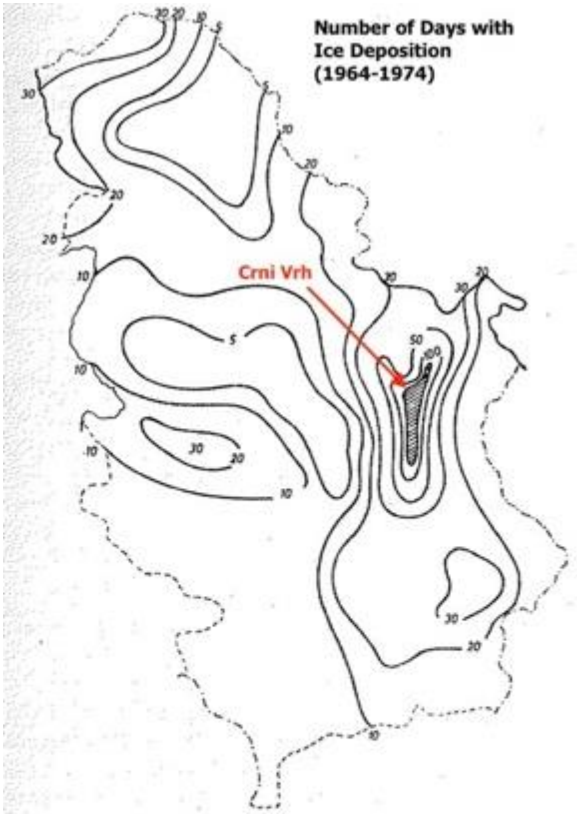

Figure 8-19 Days with Ice Deposition in Serbia (1964 - 1974)

(Source: Plazinić, S. – Technical Meteorology, 1985)

The susceptibility to icing is further confirmed by Wind Power Icing Atlas (WIceAtlas) developed by VTT Technical Research Centre of Finland, widely used in the wind industry for preliminary assessment of wind sites in respect to icing events. WIceAtlas derived data from historical meteorological measurements from thousands of weather stations across the world. Figure 8-20 presents Serbia in WIceAtlas. It is clear from the map that Crni Vrh is the region with the highest occurrence of icing in Serbia.

[29] Technical Meteorology – Slobodan Plazinić, 1985 (Naučna knjiga)

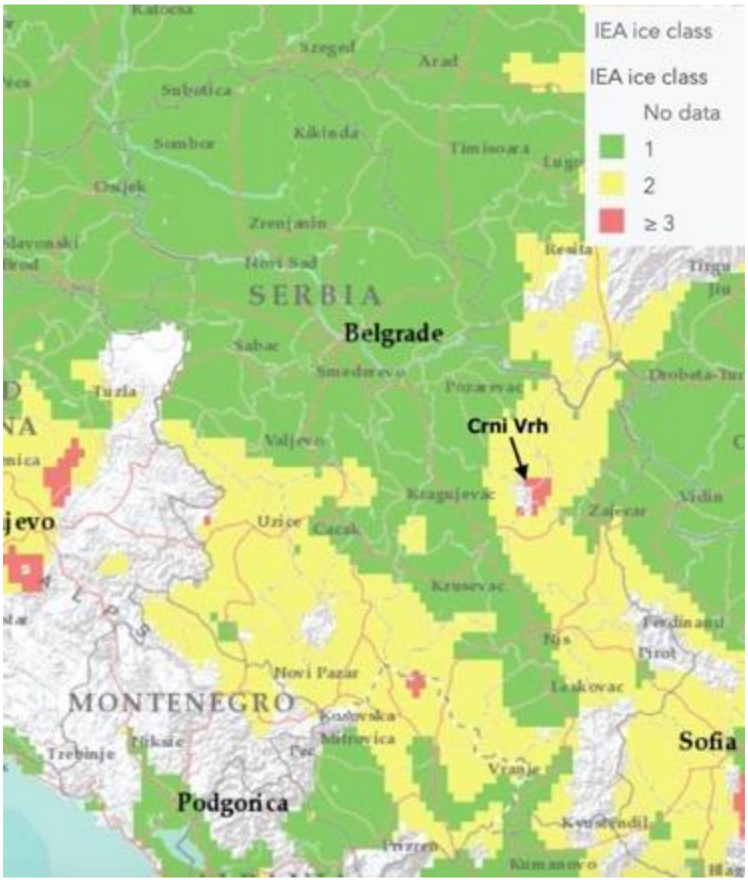

Figure 8-20 Serbia in Wind Power Icing Atlas

(Source: WIceAtlas - VTT Technical Research Centre of Finland)

Crni Vrh experiences both in-cloud icing (rime, glaze, and their mix) and precipitation icing (freezing rain and wet snow). Serbian literature sources suggest that accumulation of ice in the mountain is a result of a complex combination of terrain, humidity, temperature, precipitation (including fog), cloud type, and wind.[29] For ice to accumulate it is not necessary that temperature is particularly low or that wind speed is high.

8.1.10.4 Conditions for Ice Formation

Based upon the initial observations in Eastern Serbia (1964-1974) it was determined that hard rime was most often created during an anticyclonic air circulation while glaze was predominantly formed during fronts (cold, warm, and occluded). Wet snow mostly occurred during cyclonic circulation and warm fronts.[29]

The most frequent temperature range for ice accretion in Crni Vrh was observed to be between +1°C and -2°C and the most favourable wind speed was up to 5m/s, including quiet periods. With further temperature drop, the ice accretion tends to decrease. As the wind speed increases, the frequency of icing events drops (although mixed rime and glaze events can occur in wind speeds up to 10m/s). Icing occurs in all wind directions but is most frequent during the predominant wind (WNW and ESE).

Ice deposits can persist for many days in Crni Vrh, and in combination with strong winds the accumulated ice load can become high and cause instabilities, faults, and damages to overhead power lines and trees. CVP reported that two met masts collapsed at the site since 2013. It is assumed that the ice load in combination with high wind speeds contributed to the collapse.

The most recent major damage in Eastern Serbia was recorded during a 3-week cold spell in 2014 (November/ December) when combined ice load, freezing rain and strong wind damaged more than 40,000 hectares of woodland, power transmission lines and caused prolonged power outage in the region.

8.1.10.5 On-site Icing Conditions

Icing events are subject to large annual variation and ideally should be considered on a 30-year scale of climatology norms. However, even when long-term icing measurements are available (such as those from the nearby national weather station Crni Vrh), they are taken at 2m height and cannot be considered representative of icing events at hub height at the WPP site 2km away. The lack of long-term icing measurements at hub height remains one of the key constraints of ice-related models which then rely on extrapolations and assumptions.

In October 2020, CVP engaged DNVGL to undertake an icing climate assessment of the WPP site. To model the site-specific meteorological icing conditions, a state-of-the-art meso-scale numerical weather prediction model Weather Research and Forecasting (WRF) was used. The model was run on weather dataset from May 2002 to April 2019 and aimed to predict the duration of meteorological icing at the position of the met mast K1 (WTG TI-3), at 85.5m height. [30]

Meteorological icing is defined by the IEA as a period during which the meteorological conditions for ice accretion are favourable (active ice formation). Instrumental icing is a period during which the ice remains at a structure and/or an instrument or a wind turbine is disturbed by ice.

The model results indicated that the average duration of active ice formation (meteorological icing) at the Crni Vrh site is 32 days. This accounts for 9% of year. Icing at the site was found to have a high inter-annual variability, reaching 43 days of active icing formation in season 2017/2018 and dropping to 15 days in 2006/2007.

The model indicates that the ice build-up mostly occurs in January and February, at temperatures between 0 and -2°C (at the height of 85.5m) and wind speeds between 8 and 9m/s (at 85.5m height). Active icing is most frequent in ESSE and WNW wind directions. This corresponds to the 1970s observations made for Crni Vrh at 2m height, discussed in section 8.1.10.4 Conditions for Ice Formation.

DNVGL also employed their WICE 2.0 model to predict production losses due to icing. Icing losses were predicted to be between 6.1% and 6.7% (depending on turbine model), provided that no Ice Protection Systems (IPS) are installed. Installation of the IPS would reduce the losses to between 2.6% and 4.4%.

8.1.10.6 IEA Icing Class Rating

The IEA classifies wind sites into five Icing Classes, with Icing Class 5 being at highest risk for ice accumulation and Icing Class 1 being at lowest risk (Table 8-2).

The predicted duration of meteorological icing of 9% of year falls within the IEA Icing Class 4. The estimated production loss of 6% falls within the IEA Icing Class 3.

Table 8-2 IEA Ice Class Definitions

IEA Icing Class	Meteorological Icing (% of year)	Instrumental Icing (% of year)	Production Loss (% of year)
1	0 – 0.5	0 - 1.5	0 – 0.5
2	0.5 – 3	1 – 9	0.5 – 5
3	3 – 5	6 – 15	3 – 12
4	5 – 10	10 – 30	10 – 25
5	> 10	> 20	> 20

The IEA suggest that when using the classification, sites can end up in different ice classes for meteorological icing, instrumental icing or production loss. In that case using the higher class is recommended. Crni Vrh site is therefore considered to be the Class 4 within this assessment.

8.1.10.7 Fog

Fog is a local phenomenon in Crni Vrh. The mountain has the highest number of foggy days in Serbia; the 1981-2010 normal was 213 days. From October to March, the average number of fog days is over 20 per month. The number of fog days in spring and summer is between 11 days per month in July and 17 days per month in April.

[30] Crni Vrh Icing Climate Assessment – DNVGL (October 2020)

Figure 8-21 On-Site Met Mast During Dense Fog in November 2020

Apart from significantly reducing visibility, fog has a key role in ice build-up. More than 80% of hard rime and glaze icing events in the mountain occur during the intense fog, i.e. when low-level stratus clouds are formed, with other meteorological parameters contributing as well.

8.1.10.8 Lightning

Crni Vrh experiences an average of 35 days with lightning per year. The frequency of lightning is the highest in summer months, the most lightning strikes occur in June and July (Figure 8-22).

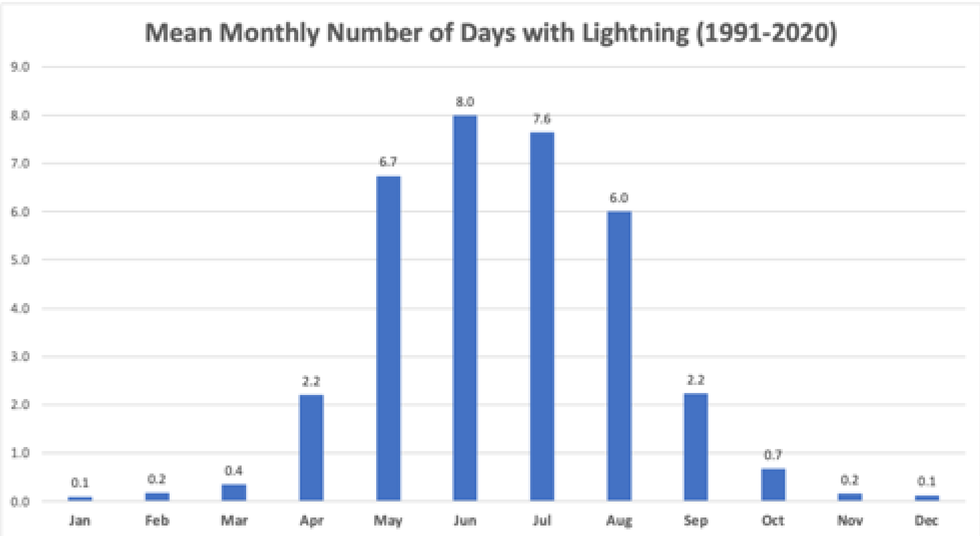

Figure 8-22 Mean Monthly Number of Days with Lightning (1991 - 2020)

8.2 Natural Hazards

8.2.1 Wildfires

Similar to the global statistics, the majority of wildfires in Serbia are caused by people, accidentally or deliberately. There is a pronounced seasonality to wildfires, with an early spring peak (March/April) when there is dry, dead ground vegetation from the previous season, and a later summer peak (August) associated with warm and prolonged dry periods. Eastern Serbia (and Timok Region) is prone to wildfires given the significant area under woodland and prolonged warm and dry periods in July and August.

The official methodology for wildfire risk assessment and mapping has not been established in Serbia. The only official document that indicates the wildfire hazard across the country is the Natural Disaster Risk Map of Serbia developed by the Ministry of Interior (Sector for Emergency Management) and available on their website.[31] The map identifies areas of wildfire, landslide, flood, and earthquake hazard. Crni Vrh Mountain is marked as a wildfire hazard area (Figure 8-23).

It is presumed that the Natural Disaster Risk Map has been developed based upon the history of emergencies, i.e. wildfires in Crni Vrh.

Figure 8-23 Natural Disaster Risk Map of Serbia of the Ministry of Interior

In the absence of forest fire risk mapping, the only system used in Serbia is early fire warning service provided by the Serbian national weather service (RHMI), based on the Canadian Fire Weather Index (FWI). Based solely on daily weather readings, the system is unanimously considered by statutory stakeholders to be useful but limited and in need of improvement.

8.2.1.1 History of Wildfires in Crni Vrh

There is a history of wildfires in Crni Vrh and within the proposed WPP site. Over the past 20 years, a wildfire at the development site occurred every 4 to 5 years (2003, 2007, 2012, 2017); the one in 2017 was by far most severe. The wildfires primarily occurred in July and August. Common to all the years was extreme drought as a result of exceptionally high air temperatures across the country.

The data on fire history at the development site has been retrieved from the publicly available satellite dataset provided by the European Space Agency (ESA). The burnt area data have been overlaid with the historical EU Corine Land Classification map from 2000 in order to determine the historical type of land cover affected by the wildfires, see Figure 8-24.[32]

[31] Disaster Risk Map for Serbia – The Ministry of Interior (accessed in June 2021) http://prezentacije.mup.gov.rs/sektorzazastituispasavanje/HTML/karta%20rizika%20od%20elementarnih%20nepogoda.html
[32] ESA Fire Disturbance Climate Change Initiative Burnt Area Dataset – MODIS FireCCI51_pixel, 2019

It is notable from the fire history map that the majority of burnt area within the WPP site was shrubland and land occupied by agriculture, i.e. wildfires appear to most likely originated in shrubland or cultivated land and had partly spread to woodland. This correlates with the national wildfire statistics for Serbia, where shrubland has been the most burnt land cover as it is usually close to areas where people are present (public roads, houses, etc.).[33]

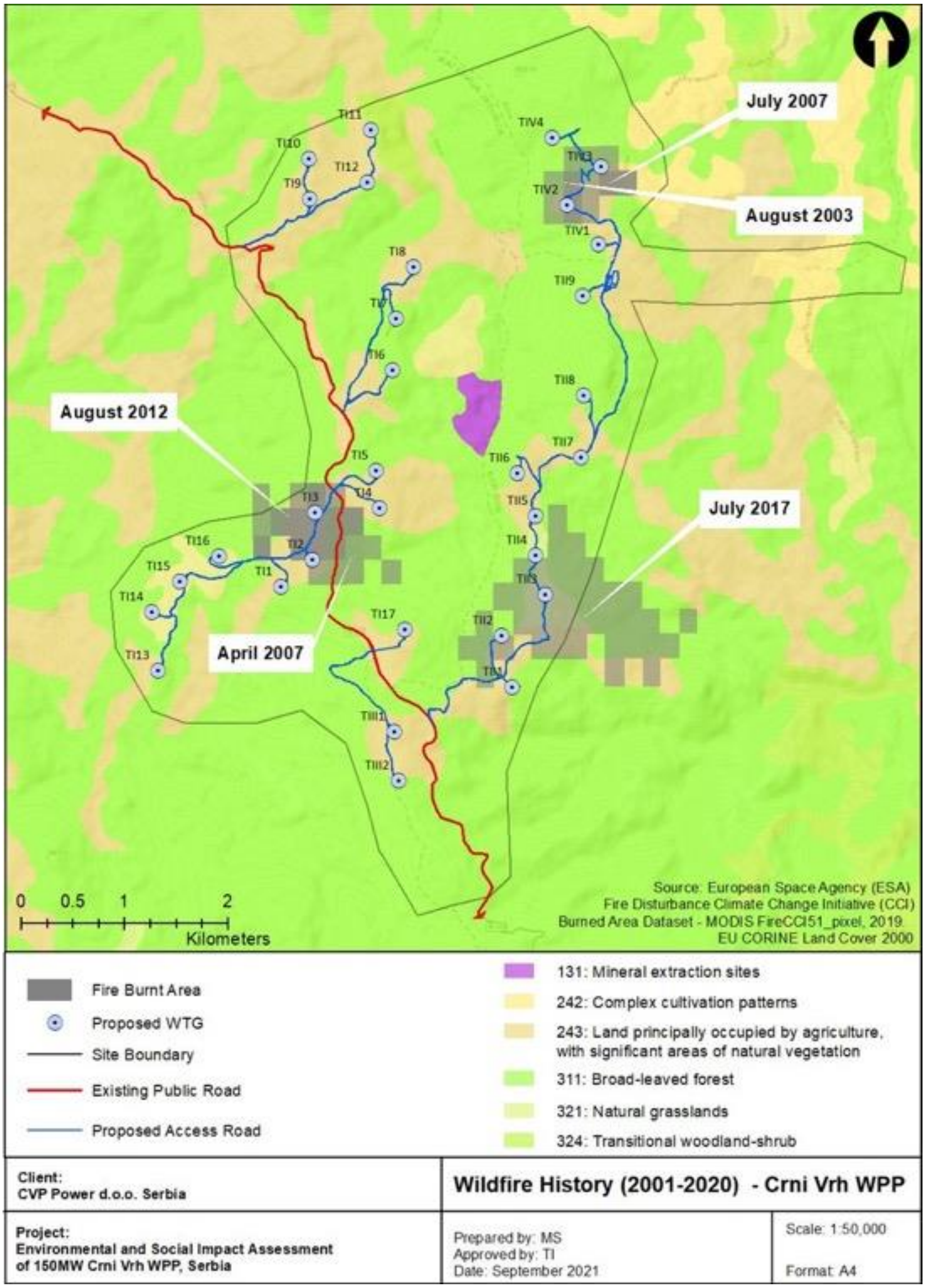

Figure 8-24 Wildfire History in Crni Vrh (2001-2021)

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[33] Prediction of Fire Hazard and Early Fire Warning System in Eastern Serbia – Slobodan Milovanović et al. (2019)

The most recent wildfire occurred in late July 2017 in the south-eastern portion of the site, in the area of the proposed turbines TII-1 to TII-5 and further eastwards (Figure 8-24). The fire lasted about 10 days and burnt the area of about 155 hectares, shrubland (107ha) and beech and oak woodland (48ha).[34] The fire-fighting efforts were hampered due to the inaccessibility of the area and high-speed wind (up to 11m/s) which often changed direction. Aerial fire suppression was used. The water was abstracted from Bor Reservoir. The rainfall on 13th August 2017 finally helped to put the wildfire down. The burnt area is evident in the latest EU Corine Land Classification Map from 2018, shown on Figure 8-72 in the section 8.5 Landscape and Visual Amenity.

The area around the met-mast K1 and the proposed WTGs TI-1 and TI-3 which was affected by wildfires in 2012 and 2007 is shown on Figure 8-25. There are still dead trees standing, presumably remnants of the fire.

Figure 8-25 The Area Affected by Wildfire in 2012 and 2007

During the course of the site walkover, no wildfire prevention signs were observed. A single roadside board with a warning that open-air fire burning near forests is prohibited was observed at the access to the WPP site from Žagubica, about 7km north-west of the site. The board was installed as part of the EU-funded transboundary project between Serbia and Romania aimed to improve the emergency preparedness and response. The board does not properly convey the message as it is placed on the left side of the road and contains long sentences in small lettering size (Figure 8-26).

[34] EU Corine Land Classification Map (2018)

Figure 8-26 Wildfire Warning Board North-West of the WPP Site

8.2.1.2 Forest Fire Risk at the WPP Site

Forest fire risk is a complex combination of hazard (current weather), exposure (terrain topography and forest area), vulnerability (tree species and their maturity) and proximity to human activities (settlements, roads, cultivated areas, power lines, etc.).

Weather

Crni Vrh receives a medium annual amount of well distributed rainfall (769mm). However, severe drought episodes that have occasionally affected the whole country (2000, 2003, 2007, 2012, 2017) have shown to significantly increase the wildfire risk in the mountain.

Terrain Slope and Orientation

Slope and wind are major factors in wildfire intensity and the speed of spread. Fires tend to burn uphill at greater speed and intensity than they burn downhill. It is commonly known that for every increase of 10 degrees in slope, the rate of fire spread doubles. Thus, for a 20 degree slope the speed of spread is four times that on level ground.

The site topography is characterised by moderately rolling hills which are occasionally steep. The proposed wind turbines are located along ridgelines whose gradient is relatively low – from less than 5° in the south-west to up to 10° in the north-east. Majority of the proposed access roads leading to turbines have a gradient between 5° and 15°. Several short forest tracks sections are steep, with a gradient exceeding 20°. The adjacent land around the occasionally turbine positions is on a downslope gradient. The slope map of the site is provided in section 8.2.3 Soil Erosion.

Slope orientation to the sun influences the amount of solar radiation that slope will receive. Sites with predominately south-facing slopes will be warmer than those facing north and will be warmest in the afternoon; wildfires on these sites are therefore more likely to exhibit extreme fire behaviour. Slope orientation at the development site is mostly to the north-east, east, south-west, and west.

Vulnerability of Tree Species

As part of the WPP planning process, the institutional stakeholder in charge of forest management "Serbia Forests" provided information on vulnerability of the vegetation at the site to fire. The categorisation comprised 6 grades of vulnerability, the 1st category being the most vulnerable and the 6th being the least vulnerable to fire.

"Serbia Forests" noted that the following categories of vegetation are present within the site: 1st category (pine and larch), 2nd category (spruce, fir and other conifers), 3rd category (mixed conifers and broad-leaved stands), 4th category (oak tree stands) and 5th category (beech and other broad-leaved stands).

It should be noted that this categorisation was developed in 1992 and is considered by fellow forest fire specialists to be simplified and proven incorrect compared to the history of forest fires in Serbia.[35] The key limitation is that it primarily relates to the probability of fire occurrence in forests without taking into account the vulnerability of tree species to fire or the extent of damage that can occur once forest is affected.

For instance, the categorisation suggests that beech forests are resistant to fire (category 5 out of 6) and that shrub thickets are the most resistant (category 6 out of 6). The fire history in Serbia largely contradicts this as some of the most severe fires recorded over the last 20 years occurred in pure beech forests and the majority of burnt area in Serbia have been under shrub thickets which have been most frequently affected. Thin bark of beech trees provides little protection from ground fire. [35]

In the formal conditions that they issued, "Serbia Forests" did not consider or suggest any buffer areas between the proposed WPP and nearby vegetation.

Proximity to Human Activities

Proximity to settlements, cultivated areas, roads or power lines is known to generally increase the risk of wildfire.

The majority of the proposed WPP site area has been affected by human activities. The public road No. 161 traverses the western part of the site. An 110kV OHL is parallel to the road. Logging and hunting are regular activities for which the forest tracks are used. There are up to 15 weekend and residential houses adjacent to the site south-western and north-eastern boundary, cultivating orchards and gardens, some raising cattle and poultry.

Forest Fire Prediction Model for Eastern Serbia

Initiatives to improve the forest fire risk management have been coming up from the academic community (University of Belgrade, Faculty of Forestry), sponsored by the Forest Directorate at the Ministry of Agriculture, Forestry and Water Management. The work is still at a pilot project stage. The most recent predictive model (2019) has been developed solely for Eastern Serbia as the most wildfire-affected region in the country. The report has been published on the website of the Forest Directorate.[36]

The geospatial model has taken into account a 5-year history of fires (2012-2017), topography (elevation, slope, aspect), vegetation and land cover, human factors, and climate (drought) data. The outcome has been a series of maps indicating the spatial probability of forest fire occurrence from March to October in Eastern Serbia. The maps indicated that the probability of forest fire in Crni Vrh area is 'High' in July and September and 'Very High' in the rest of the months. While the 5-year fire history dataset is small and more robust long-term data are needed to achieve the highest model accuracy, the pilot model results can be considered indicative of the wildfire risk in Crni Vrh.

Wildfire Risk

In the context of this ESIA and based on the 20-year wildfire history, the wildfire risk at the development site is considered to be high in July and August and medium in the rest of the months (March to October).

8.2.2 Earthquake Hazard

Serbian technical standards for seismic design of buildings are in line with the European standard EN-1998 Eurocode 8: Design of Structures for Earthquake Resistance which sets two requirements:

- The structures shall be designed not to collapse during earthquake with a probability of exceedance of 10% in 50 years (this corresponds to 475 years return period);
- The structures shall be designed to withstand limited damage during earthquake with a probability of exceedance of 10% in 10 years (this corresponds to 90 years return period).

An earthquake hazard map for the development site provided by the statutory stakeholder - Institute for Seismology of Serbia indicates that the macro seismic intensity for the return period of 475 years is VII-VIII degrees of the European EMS-98 scale which refers to a damaging and heavily damaging earthquake.

Under Serbian regulations, windfarm design has to be in compliance with technical standards for construction of high-rise buildings in earthquake areas.[37] The respective regulation classifies high-rise buildings into four

[35] Prediction of Fire Hazard and Early Fire Warning System in Eastern Serbia – Slobodan Milovanović et al. (2019)
[36] https://upravazasume.gov.rs/wp-content/uploads/2019/07/KORIGOVANI-IZVEŠTAJ-25-04-2019.pdf
[37] Regulation on Technical Standards for Construction of High-rise Buildings in Seismic Areas (Off. Journal of RS, No. 31/81, 49/82, 29/83, 21/88, 2/90)

categories, depending on the severity of potential earthquake damage. The zero category (or "out of category") buildings relate to nuclear power plants, buildings with more than 25 storeys, storages of flammable or toxic substances, etc. WPPs are in the category below ("1st category"), i.e. buildings whose seismic design requirements must be based on site-specific risk analysis (i.e. seismic micro-zonation).

The seismic micro-zonation at each of proposed 32 turbine locations was carried out in autumn 2020. The results will be used as seismic requirements for the detailed design.

8.2.3 Soil Erosion

The development site presents an association of acidic brown forest soil (dystric cambisol) and brown forest soil (eutric cambisol). Average soil thickness varies from 30-50cm (dystric cambisol) to 50-70cm (eutric cambisol), depending on slope gradient. Brown soils are moderately permeable and generally susceptible to erosion.

CVP conducted a preliminary geotechnical investigation in 2019 which indicated that the development site is prone to sheet and gully erosion. Sheet erosion is present within the whole site, especially in weathering-prone areas. Gully erosion is pronounced on slopes of fractured rock. Some sections of the existing forest tracks were noted to be severely affected by gully erosion.

A number of deep and shallow gullies have formed on slopes. The slopes are steep, with a gradient in the range between 10° and 25°. Ridgetops have gentle to moderate slopes, between 5° and 15°. The slope map of the development site is shown on Figure 8-27. It is notable on the map that there are short sections of the proposed access roads where the slope exceeds 20 degrees (access to WTGs TII-6, TII-9) or is between 15 and 20 degrees (access to WTGs TI-6, TI-7).

The average annual rainfall in Crni Vrh is 769mm, the wettest month is June. Most of the high-intensity rainfall occurs between June and August. Snow cover is present from December to March.

The geotechnical investigation report concluded that there are no active landslide risk areas or other visible terrain instabilities identified at the site. Erosion control measures have been recommended for earthworks in areas with a thick layer of fractured rock to prevent potential local instabilities.

The sensitivity of the development site to soil erosion is considered to be medium.

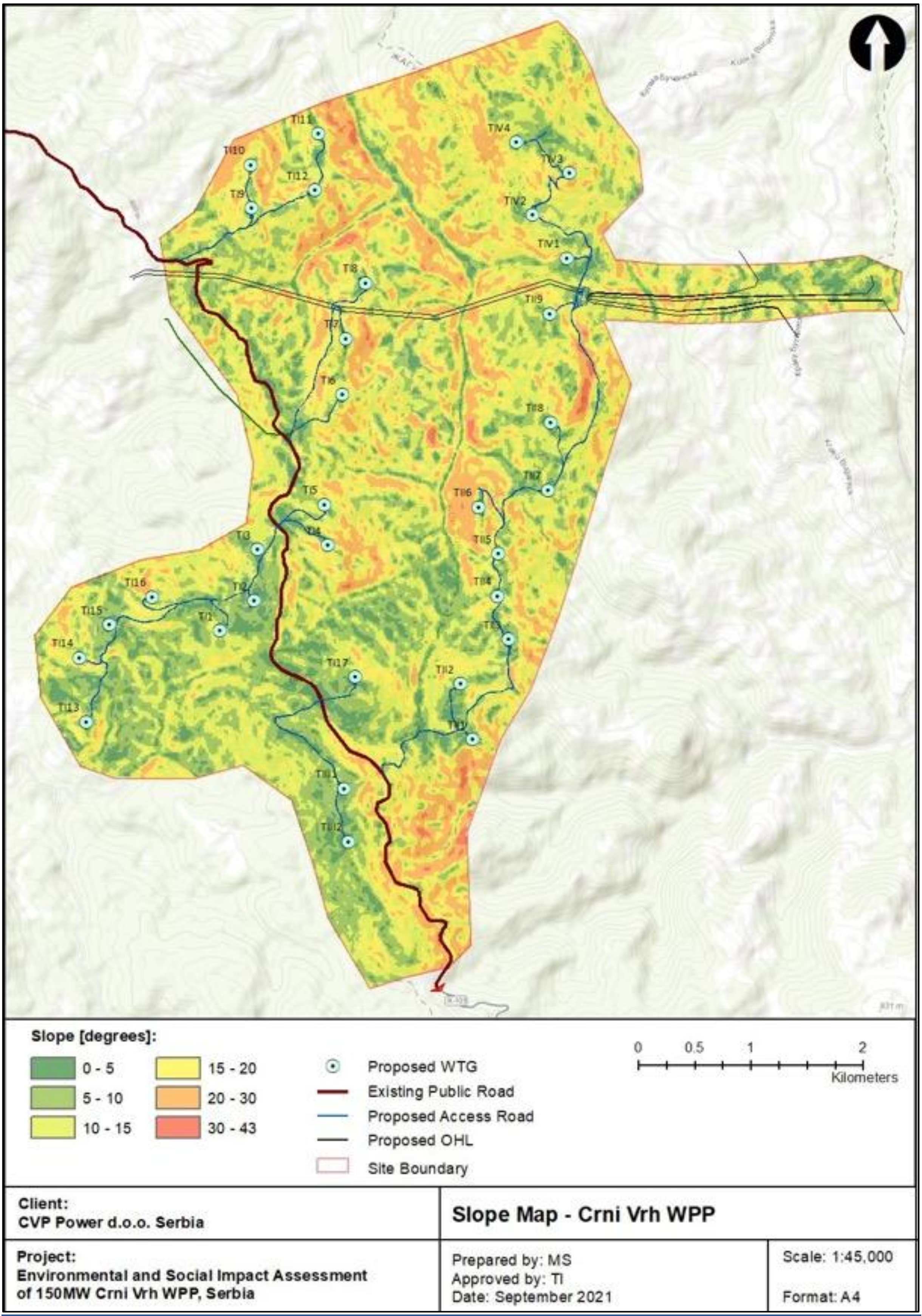

Figure 8-27 Slope Map of Crni Vrh WPP Site

8.2.4 Flood Risk

The WPP site is not identified as prone to flooding by the public water management company “Srbijavode”. During the statutory consultation, no specific flood protection measures have been suggested.

There is no national flood risk map developed in Serbia and no official flood risk assessment for Crni Vrh area.

Due to the undulating terrain and steep slopes, there is the potential of ephemeral streams for pluvial (flash) flooding during high rainfall periods or snow-melt. The risk of fluvial flooding of the Lipa River is considered to be restricted to the riparian corridor and thus low.

Culverts along the public road No. 161 which traverses the site appear to be poorly maintained. The 2020 ‘Study of Flood Risk Assessment on Public Roads’ prepared for the public road management company ‘Roads of Serbia’ identified a 500m-long road section in a cutting where the culverts were in poor condition, blocked by vegetation and debris. The risk of road flooding during high rainfall periods (i.e. flash floods) was assessed to be 2 and 3 on the scale from 1 (low) to 4 (very high). [38]

The culverts are situated downstream of the proposed WTGs TIII-1 and TIII-2.

As the scope of the Study was limited only to the Timok River catchment (south-eastern part of the development site), there is the potential that other northerly culverts along the road No. 161 have also been poorly maintained and blocked.

The overall baseline sensitivity of the development site with respect to flooding is considered to be low.

8.3 Ecology and Nature Conservation

This section presents an overview of the ecological desk study and survey results, and, based upon these results, provides a nature conservation evaluation of the relevant ecological features within the Crni Vrh WPP site and Project's AoI.

8.3.1 Introduction

The site is located in the Moesian province of the Central-European (i.e. Continental) biogeographic region that is characterised by natural forest vegetation. The historic, natural vegetation and ecosystems have become heavily fragmented and altered in the entire province by millennia of human activity, and these processes still take place. The current forest cover (at the provincial level) is only about 30% of the original area. The majority of the surviving woodland is intensively managed and degraded, whilst near-natural forest habitats are only preserved in more remote areas that have been given protected status. Most of the Moesian province is now dominated by farmland, mostly pastures and hay meadows in montane areas. These montane pastures and hay meadows are not self-sustainable, and continue to undergo a progressive succession and regression throughout the province due to the depopulation of rural areas.

As a consequence, most of the province, and the Crni Vrh WPP site itself, has limited ecological value.

8.3.2 Designated Sites

There are **no designated sites**, within the WPP site boundary or within the AOI (IfNC 2020, 2021a, b, 2022).

The AOI does include a number of Protected Areas and Areas of the Ecological Network of Serbia that are relevant to this assessment (Figure 8-28).

[38] The Study of Flood Risk Assessment for Roads in the Timok River Catchment – The Institute of Forestry, The Geographic Faculty (University of Belgrade), 2020

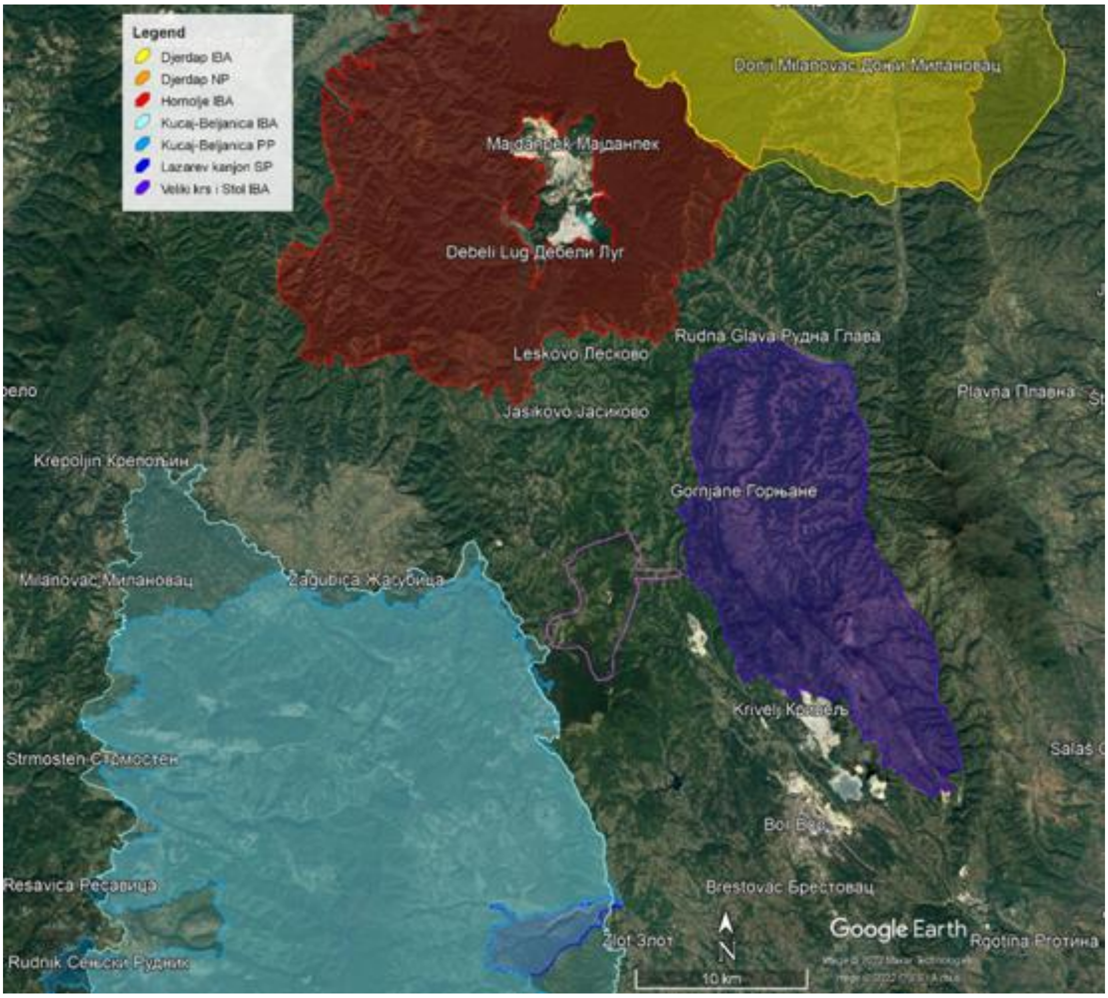

Figure 8-28 Location of the Crni Vrh WPP site in the East (Carpathian) Serbia Region

The Crni Vrh WPP site is outlined in pink

Source: Google Earth 2022, IfNC 2022, BirdLife International 2021a, b, c, d, with modification by I. Karapandža, original

8.3.2.1 Mali Krš – Veliki Krš – Stol mountains

To the east of the site is the limestone mountain range Mali Krš - Veliki Krš - Stol that stretches in a north-south direction (Figure 8-29). It is characterised by a karst relief, a mosaic of woodland and pastures, and a high diversity of flora and fauna (Marković 1980, BirdLife International 2021d). It is recognized as an IBA (code RS082), and also includes an Important Plant Area ("IPA") and two Prime Butterfly Areas ("PBA") (IfNC 2022).

It comprises two Areas of the Ecological Network: Mali Krš (3,714 ha) and Stol – Veliki Krš (5,167 ha) (Official Journal of RS, No. 102/2010). The IBA covers a wider area (22,657 ha). At the nearest point, the IBA boundary is located at about 550 m from the WPP site boundary (off-site OHL connection point to existing OHL No. 177, and at about 3.3 km from the closest WTGs, whilst the Ecological Network Area boundary lies at about 1.8 km from the site boundary and about 4 km from the closest WTGs.

Figure 8-29 Veliki Krš Mountain – View from the WPP Site Eastern Boundary

Existing OHLs No. 150 and 177 in the mid-foreground; looking towards the point of the Project OHLs connection

This is an important nesting area for a number of protected bird species of woodland, open and rocky habitats, including several raptor species. The IBA designation has been triggered by the nesting population of single species, Woodlark (*Lullula arborea*) (BirdLife International 2021d). The breeding population of the single IBA-triggering species is distinctively territorial (e.g. Radišić et al. eds. 2018) and these individuals are not expected to occur within or close to WPP site.

The Levant Sparrowhawk (*Accipiter brevipes*), a rare and endangered species in Serbia, is also a resident of the IBA (Radišić et al. eds. 2018). However, this species was not recorded at the WPP site or in the immediate surroundings, during the main ESIA and the Preliminary Surveys.

This is also an important foraging and, especially, roosting area for bats (especially cave- and tree-roosting species). Some individuals of cave-roosting species roosting there, could have foraging territories in the WPP site area as well.

8.3.2.2 Kučaj – Beljanica mountains

To the southwest of the WPP site are the Kučajsko-Beljanički mountains (Figure 8-30), the most extensive mountain complex of Carpathian Serbia. It is characterised by numerous gorges, cliffs, waterfalls, springs, caves, and other karst formations (Marković 1980, Official Journal of RS, no. 98/2014, Bogdanović 2017), many of which are protected as Natural Monuments ("NM") or Landscapes of Outstanding Features ("LOF") e.g. Lazarev Canyon, Prerast Samar natural bridge, Lisine waterfall, Vrelo Grze spring, Lazareva Pećina cave (IfNC 2022) and others.

Figure 8-30 Kučaj and Beljanica Mountains – View from the WPP Site Western Boundary

The Kučajsko-Beljanički massif is characterised by exceptionally diverse and preserved habitats (Official Journal of RS, No. 98/2014, Bogdanović 2017, Figure 8-31), among which poly-dominant relict communities and pristine forest ecosystems protected as Strict Nature Reserves stand out: Vinatovača, Busovata, Klisura Resave gorge, Klisura Suvaje gorge (IfNC 2022). This is also one of the most important diversity hotspots of the entire flora and fauna in Serbia (Official Journal of RS, no. 98/2014). The mountain range is identified as an IBA (RS060) in its entirety, and includes the IPA, as well as two PBA (BirdLife International 2021c, IfNC 2022). It is also the most important bat diversity hotspot in Serbia with 29 species recorded (Paunović et al. 2020). About 130 bird species have been confirmed (Bogdanović 2017), almost all nesting birds.

Figure 8-31 One of Many Preserved Habitats in the Kučaj Mountains including the Grža River

The area of 87,644 ha is currently in the process of legal designation as a Category I protected area the Kučaj-Beljanica Nature Park (MoEP 2020). The wider area (105,147 ha), which also includes Lazarev Canyon NM, is designated as Ecological Network Area (and the Emerald Area, code YUSRB0055) Kučajske Planine (IfNC 2022). The IBA comprises an even larger area (113,913 ha), though the current boundaries of the IBA (BirdLife International 2021c) and the Ecological Network Area (IfNC 2022) are not fully compatible. At the nearest point, the IBA boundary is located at about 300 m from the WPP site boundary and about 650 m from the closest WTGs, the preliminary boundary of the Nature Park at about 1.4 km from the site boundary and about 1.6 km from the closest WTGs, and the Ecological Network Area at about 1.7 km from the site boundary e and about 2 km from the closest WTGs.

This is primarily an important nesting area for a great number of protected bird species of woodland, scrub, and rocky habitats, including a number of raptor species. The IBA designation has been triggered by the breeding/ resident populations of as many as 12 species (BirdLife International 2021c), of which only two raptor species, the European Honey Buzzard (*Pernis apivorus*) and the Peregrine Falcon (*Falco peregrinus*), are of possible concern for this assessment. The presence of the European Honey Buzzard was recorded within the WPP site, both by the main ESIA and Preliminary Surveys (

Table 8-5). There are three pairs that nest and regularly foraging in the site area. This means that individuals occurring at the site do not belong to IBA population. Only a single passage of the Peregrine Falcon was observed by Preliminary Surveys, on the WPP site western margin, whilst this species was not recorded by main ESIA Surveys (Table 8-6). All remaining IBA-triggering species are distinctively territorial (e.g. Radišić et al. eds. 2018) and the individuals of any other IBA population cannot be expected to occur within or close to WPP site.

The Kučajsko-Beljanički mountains are probably the most important area for bats in Serbia, with a great abundance and diversity of prime foraging and roosting habitats. The most important bat underground roosts in Serbia are also located there, e.g. Lazareva Cave and Vernjikica Cave (Paunović *et al.* 2020). However, all known bat roosts of any importance are beyond the Project AoI. The main roosts are beyond the maximum commuting distances of all species (potentially) occurring at the site (Rodrigues et al. 2015, Dietz et al. 2009), and is therefore of no concern for this assessment. Some individuals of cave-roosting species, with roosts in the marginal parts of this area, could have foraging territories in the WPP site area, but these could only be smaller, less important roosts, such as four small caves identified by Preliminary Survey (see section 8.3.6.1.1).

8.3.2.3 Homolje mountains

the Homolje mountains are to the northwest of the WPP site (Figure 8-32). This is a limestone massif also characterised by karst formations (Marković 1980, BirdLife International 2021b). Some of these formations are protected as Natural Monuments, e.g. Homoljska Potajnica intermittent spring, Bigrena Akumulacija Beli Izvorac travertine accumulation, Prerast Suplja Stena natural bridge, and Rajkova Pećina cave. Along with the Kučajsko-Beljanički massif, this is the area with the most preserved woodland in East Serbia, of which the most valuable pristine forest ecosystems are protected as Strict Nature Reserves - Feljšana and Mustafa (IfNC 2022).

Figure 8-32 Homolje Mountains – View from the WPP Site Western Boundary

A part of the massif was designated as an IBA (RS055) in late 2020 following the last regular revision of IBAs in Serbia. Although the Homolje IBA is still not listed as an Area of the Ecological Network of Serbia (IfNC 2022), due to its recent designation, all IBAs are generically considered to be part of the Network. The Homolje IBA comprises a vast area of 47,793 ha, at the nearest point at about 9 km from the site boundary and the closest WTGs.

For birds, this is primarily an important nesting area for a number of protected woodland species. The IBA designation has been triggered by the breeding/ resident populations of seven species. However, as all of the IBA-triggering species are distinctively territorial (e.g. Radišić et al. eds. 2018) the individuals of any IBA population cannot be expected to occur within or close to WPP site.

For bats, this is also one of the most important areas in Serbia, with an abundance and diversity of prime foraging and roosting habitats. Some of the most important bat underground roosts in Serbia are also located there, e.g. Rajkova Cave (Paunović *et al*. 2020). However, all known bat roosts of any importance are beyond the potential AoI as they are located at distances greater than the maximum commuting distances (Rodrigues et al. 2015, Dietz et al. 2009) and therefore of no concern for this assessment. Some individuals of cave-roosting species, with roosts in the marginal parts of this area, could have foraging territories in the WPP site area as well, but these could only be smaller, less important roosts

8.3.2.4 Đerdap

The Đerdap National Park is located to the north of the WPP site, along the course of the Danube as it passes through the Carpathian Mountains (Figure 8-33). One of only five national parks in Serbia (Official Journal of RS, No. 84/2015, IfNC 2022). It was designated "*to preserve: objects of karst relief and hydrology, the Đerdap Gorge, the canyon ... ; diverse habitat types: poly-dominant relict communities, ... woodland ...; habitats and populations of wild flora ...; habitats and populations of wildlife, especially birds..., mammals..., etc.; extremely rich cultural and historical heritage" .... It comprises a part of the Đerdap Gorge (Iron Gate) ... and, parts of the*

Severni Kučaj, Miroč, and Štrbac massifs with a width of 2-10 km, as well as the part of the Danube river within the border of Serbia" (Official Journal of RS, no. 84/2015).

This is also an important diversity hotspot for the entire flora and fauna in Serbia, and is identified as an IBA (BirdLife International 2021a), IPA, and PBA (IfNC 2022). About 170 bird species have been recorded so far, 130 of which nesting (Puzović et al. 2009), as well as 24 bat species (Grubač & Milovanović 2012, Paunović *et al*. 2020, ESIA Team data).

Figure 8-33 Đerdap Gorge

The National Park (and Emerald Area YUSRB0012) encompasses an area of 63,786ha, with the IBA (RS034) a slightly broader area of 76,268 ha, whilst the broadest (85,390 ha) is the Area of the Ecological Network (IfNC 2021b). At the closest point, the boundary of all these areas is about 22 km from the site boundary and about 23 km from the nearest WPPs.

For birds, this is primarily an important nesting area for a great number of protected species of woodland, scrub and rocky habitats, including a number of raptor species, as well as a nesting or wintering area for certain waterbirds. The IBA designation has been triggered by the breeding/ resident populations of as many as 16 species, mostly associated with woodland and rocky habitats, and one wintering waterfowl population (BirdLife International 2021a). However, due to the distance and topography, it is considered that the Đerdap area is beyond the Project AoI with regard to birds, i.e. that the Đerdap bird populations (including IBA-triggering) cannot be exposed to any significant Project impacts. Only rare or incidental passage of single individuals of certain migratory and vagrant species in non-breeding season is considered possible, which is fully consistent with the findings of both the main ESIA and Preliminary Surveys.

For bats, this is also one of the most important areas in Serbia, with an abundance and diversity of prime foraging and roosting habitats. Some of the most important bat underground roosts in Serbia are also located there, e.g. Gradašnička Cave (Paunović *et al*. 2020). However, this entire area is located at a distance greater than the maximum commuting distances (Rodrigues et al. 2015, Dietz et al. 2009) of all species (potentially) occurring at the site, and thus beyond the Project AoI with regard to bats.

8.3.2.5 Other protected areas

Within a radius of about 20-30 km from the site, there are also several smaller protected areas of geo- or bio-heritage and Areas of the Ecological Network of Serbia (IfNC 2022), though none of these sites could possibly be impacted by the Project.

8.3.3 Habitats

8.3.3.1 General Description

The entire survey area is a mosaic of semi-natural habitats, including semi-natural grassland, scrub, woodland (Figure 8-34), a single fragment of marshland, and a very small area of farmland and buildings.

Beech woodland (*EUNIS* code G1.6, national code A3.231) is the most dominant habitat type across the survey area, covering 33.37% of total survey area. This is Natura 2000 habitat (EU Habitat Directive Annex I code 91W0).

Figure 8-34 Mosaic of Forest, Scrub and Grassland Habitats Characteristic of the WPP Site

The most widespread type of grassland is *Calamagrostis epigejos* stands (*EUNIS* code E1.74, national code C1.528), which covers 20.21% of the survey area. The second most widespread type of grassland is Balkan-mountain hay meadows (*EUNIS* code E2.33, national code C2.3), which is Natura 2000 habitat (EU Habitat Directive Annex I code 6520) and occupies 4.78% of the survey area.

According to the national classification, scrub (code B2) belongs to the type of broad-leaved xerophilous shrubs and correspond the best to the *EUNIS* type F3.24 (*Subcontinental and continental deciduous thickets*), covers 16.46% of the survey area.

South-eastern European *Quercus-Carpinus betulus* forests (*EUNIS* code G1.A1C, national code A2.611) and thermophilous deciduous woodland (*EUNIS* code G1.7, national code A2.5) together occupy a further 8.54% of the survey area, and constitute the second most widespread woodland type. These two types are presented as a single habitat type on the map as the (mostly degraded) fragments form a single mosaic. Wherever possible, i.e. in parts of the survey area where they are clearly distinctive, they are presented separately on the map. South-eastern European *Quercus-Carpinus betulus* forest is Natura 2000 habitat (EU Habitat Directive Annex I code 91Y0), as well as the thermophilous deciduous woodland (EU Habitat Directive Annex I code 91M0).

The third most common habitat type is Non-riverine woodland with *Betula*, *Populus tremula* or *Sorbus aucuparia* (*EUNIS* code G1.9, national code A3.812), which covers 5.72% of the surface area.

Other, less represented, habitat types include: *Carpinus betulus* woodland (*EUNIS* code G1.A3 / national code A3.111) – occupying 1.34% of the survey area, Small broadleaved deciduous anthropogenic woodland (G5.2 / A4.11J) – 0.28%, Small coniferous anthropogenic woodland (*Picea abies*) (G5.4 / A7.111) – 2.94%, Small coniferous anthropogenic woodland (*Pinus nigra*) (G5.4 / A7.114) – 0.36%, Fruit orchards (G1.D4 / B7.222) – 0.41%, Temperate and Mediterranean-montane scrub (F3 / B3.22) – 2.23%, *Nardus stricta* swards (E1.71 / C1.526) – 0.19%, *Pteridium aquilinum* fields (E5.3 / C5.13) – 0.87%, medium-scale intensive unmixed crops

(1-25ha) (I1.12 / G1.12) – 0.35%, and derelict spaces of disused rural constructions (J2.61 / H2) – 0.18%. The survey area and surroundings are criss-crossed by a network of rough tracks.

There are no permanent watercourses within the survey area. There is a single intermittent watercourse, but no aquatic habitats. Also, one small fragment of a wetland (beds of large sedges normally with no free-standing water, i.e. marshland) has been identified, consisting of tall terrestrial sedges and occupying 0.87% of the area.

The study area is very complex and to aid the understanding of the reader, a detailed habitat map of the developed area of the site is provided in Figure 8-35, and a coarse habitat map of the entire WPP site in Figure 8-36. A list of habitat types recorded, with their protection and conservation status, and abundance within the survey area, is available in Appendix C.

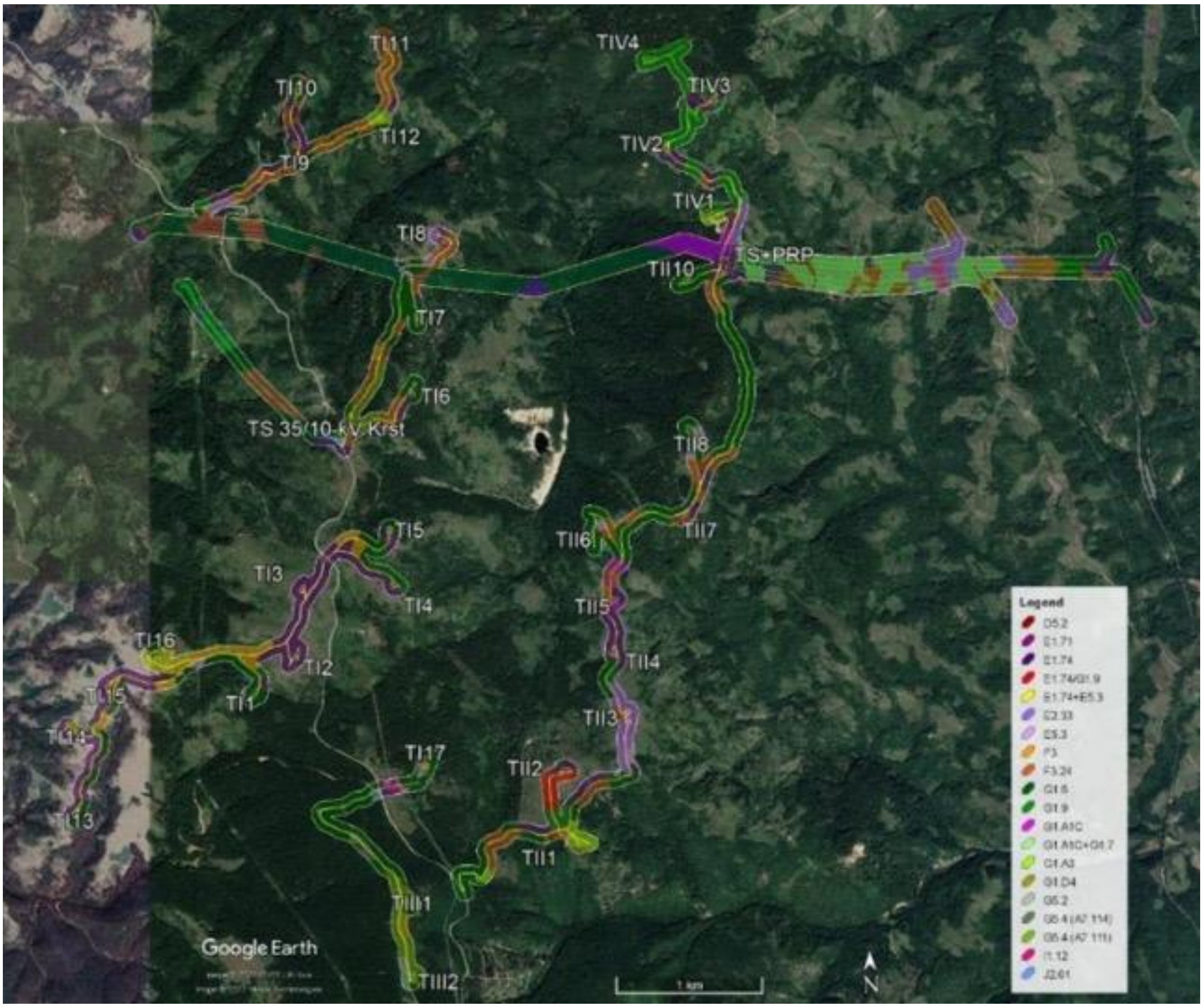

Figure 8-35 Detailed Habitat Map of the Crni Vrh WPP Site Development Area

Source: GoogleEarth 2022, CVP, with modification by U. Buzurović, I. Karapandža, and B. Karapandža, original

Legend and notes: Location of all habitat types within the detailed habitat survey area extending 50 m beyond any Project infrastructure to be developed identified according to EUNIS (EEA 2017) habitat code; locations of WTG locations (T), site access tracks (yellow lines) and OHL routes (dark blue, cyan and green lines) according to Conceptual Design layout (valid at the beginning of the surveys) are also shown.

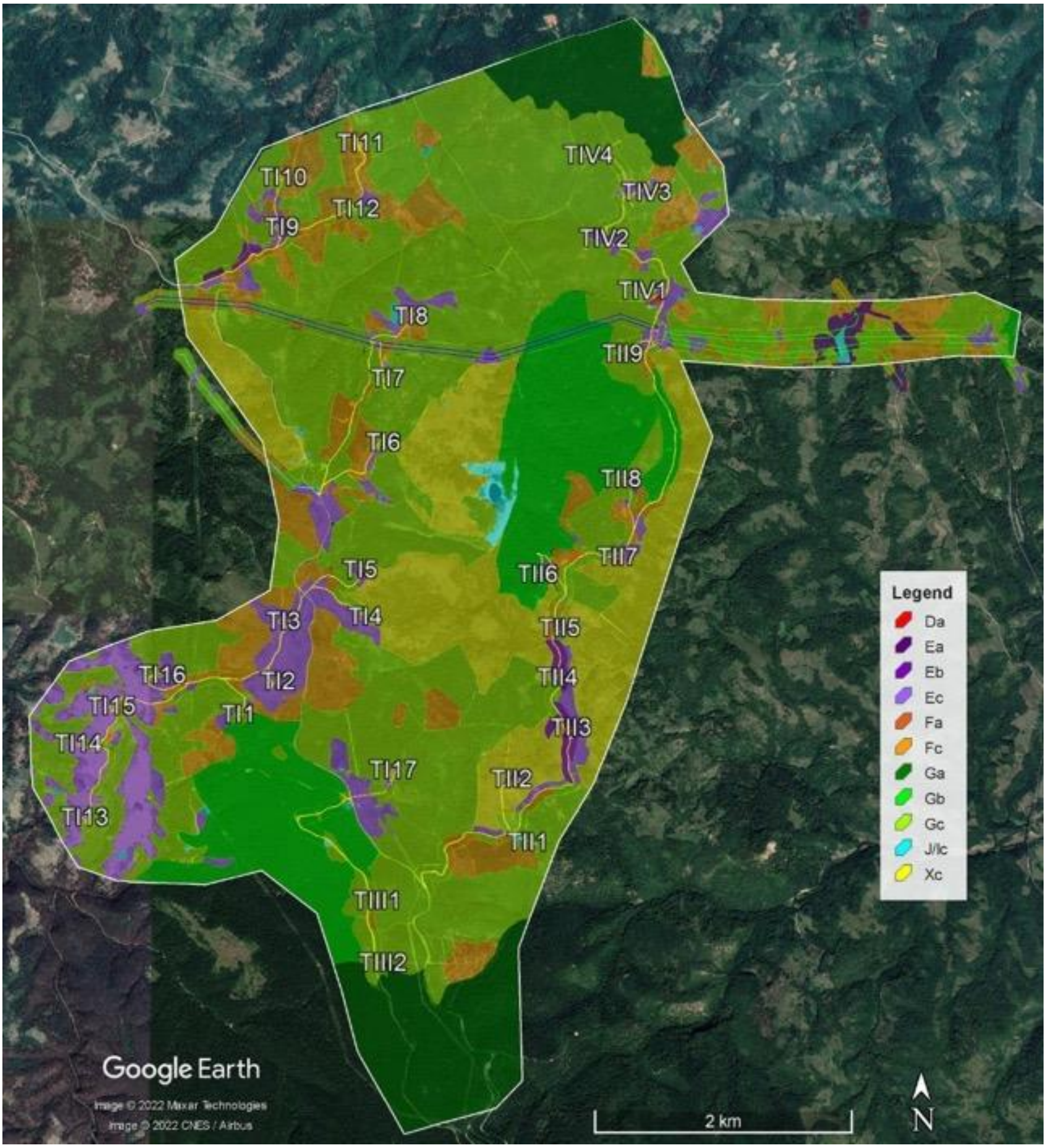

Figure 8-36 Coarse Habitat Map of the Crni Vrh WPP Site

Source: GoogleEarth 2022, CVP, with modification by U. Buzurović, I. Karapandža, and B. Karapandža, original

Legend and notes: Location of habitat types within the entire Crni Vrh WPP site identified according to EUNIS (EEA 2017) habitat code and ecological value (a – high, b- moderate, c – negligible or low); locations of WTG locations (T), site access tracks (yellow lines) and OHL routes (dark blue, cyan and green lines) according to Conceptual Design layout (valid at the beginning of the surveys) are also

Cc – Aquatic habitat of negligible or low ecological value: Lipa stream (not visible on map);

Da – Wetland (marshland) of high ecological value;

E – Grassland:

- **Ea** –Grassland of high ecological value: maintained Balkan-mountain hay meadows, humid areas harbouring valued populations,
- **Eb** – Grassland of moderate ecological value: neglected Balkan-mountain hay meadows, humid areas where valued populations are possible present,
- **Ec** – Grassland of negligible or low ecological value;

F – Scrub:
- **Fa** –Scrub of high ecological value: humid areas harbouring valued populations,
- **Fc** – Scrub of negligible or low ecological value;

G – Woodland:
- **Ga** – Woodland of high ecological value: mature near-natural forest stands,
- **Gb** – Woodland of moderate ecological value: younger relatively preserved forest stands,
- **Gc** – Woodland of negligible or low ecological value: (heavily) degraded, depleted, or fragmented, including poorly managed thickets and conifer plantations, clear-cut and burnt areas;

J/Ic – Highly artificial habitat of negligible or low ecological value: including constructed, mining, farmland etc.

Xc – Mosaic/complex habitat of negligible or low ecological value.

8.3.3.2 Grassland

8.3.3.2.1 Grassland types within developed areas of the WPP site

E1.71 Nardus stricta swards
National code: **C1.526**
EU Habitats Directive Annex I: *none*

Low, medium-high or high, closed or open, floristically poor herbaceous grass formations that are characteristic of siliceous geological substrate. The communities have developed on dry or semi-wet silicate soils at altitudes between 150 and 1400 meters. They mostly occur in flat or slightly sloping terrain. These habitat types are often exposed to strong anthropogenic influences.

This habitat type covers 0.19% of the survey area – there is one small fragment with a total surface area of 0.77 ha.

It is of **no conservation concern,** and of **no conservation value**.

E1.74 *Calamagrostis epigejos* stands
National code: **C1.528**
EU Habitats Directive Annex I: ***none***

Low, medium-high or high closed or open, floristically poor herbaceous grass formations or very rich rocky or steppe formations that are characteristic on siliceous geological substrate. In dry steppe communities are dominated by grasses such as *Agrostis capillaris, Festuca fallax, Festuca valesiaca, Anthoxanthum odoratum, Danthonia calycina, Chrysopogon gryllus, Calamagrostis epigejos, Nardus stricta* and various species of clovers (*Trifolium alpestre, Trifolium montanum, Trifolium pannonicum, Trifolium pratense, Trifolium repens, Trifolium velenovskyi, Trifolium campestre*), while succulent species (*Sempervivum, Jovibarba* and *Sedum*) dominate in open rocky communities. Communities developed on dry or medium wet siliceous geological substrate at elevations between 150 and 1400 metres. This habitat has developed where the forests have been clearcut, and these habitat types are often exposed to strong anthropogenic influences.

This habitat type (Figure 2.X18) covers 20.21% of the survey area, with a total surface area of 80.12 ha.

It is of **no conservation concern,** and of **no conservation value**.

Figure 8-37 *Calamagrostis epigejos* Stands

E2.33 Balkan-mountain hay meadows
National code: **C2.3**
EU Habitats Directive Annex I: ***6520 Mountain hay meadows***

Mesophile meadows develop in mountainous and subalpine regions where forest zones of beech or beech-fir are present. They occur on siliceous and carbonate geological substrate at all exposures. Species occurring in this habitat type include: *Agrostis vulgaris, Alopecurus pratensis, Anthoxanthum odoratum, Arrhenatherum elatius, Avena pratensis, Betonica officinalis, Brachypodium pinnatum, Bromus erectus, Cynosurus cristatus, Dactylis glomerata, Festuca pratensis, Festuca rubra, Nardus stricta, Trisetum flavescens, Rhinanthus rumelicus* and others.

Balkan-mountain hay meadows cover 4.78% of the survey area, with a total surface area of 18.96 ha. This habit type is not self-sustainable below the natural upper forest boundary such as at the site area. If not maintained by mowing or grazing, it undergoes a succession, i.e. overgrows with weeds and shrub, which has already advanced in most of the survey area and the entire WPP site. Only a small share of Balkan-mountain hay meadows at the site that is maintained (regularly mown or grazed) is of high ecological value (Figure 8-38).

This habitat listed as threatened (VU) on the IUCN European Red List (Janssen *et al*. 2016) and of Conservation Priority habitat type in Serbia (Official journal of RS, br. 35/2010). The nature conservation value of regularly maintained patches of high ecological value has been assessed as **high local** and even **low regional**, and thus **significant**. The nature conservation value of neglected patches undergoing succession has been assessed as **negligible**, and not significant.

Figure 8-38 Maintained Balkan-Mountain Hay Meadows

E5.3 *Pteridium aquilinum* fields
National code: **C5.13**
EU Habitats Directive Annex I: ***none***

This habitat type includes communities with at least 30% plant cover. The dominant species are high ferns and other species that do not belong to the Poaceae, Cyperaceae and Juncaceae families. They are found on wet ground, but less often on semi-arid soils, at all altitudes. They are most common in the forest zone.

This habitat type covers 0.87% of the survey area – there are 12 small fragments with a total surface area of 3.43 ha.

It is of **no conservation concern,** and of **no conservation value**.

8.3.3.2.2 Flora and fauna interest of the grassland at the site and surroundings

Grassland provides a trophic base for many of the bird and bat species present at the WPP site. They are of particular interest for certain specialists (i.e. birds that feed on grass seed, bats that collect their prey from the ground or grass), but also for many generalists (i.e. birds of prey, bats foraging in the open airspaces). Grassland is of particular importance for several bird species specialised for nesting in this habitat type (usually on the ground). In both these aspects, maintained Balkan-mountain hay meadows are the most important. The presence of the grazing livestock, even for short periods of time, multiplies the abundance and diversity of invertebrate fauna and additionally enhances trophic base of insectivorous species (a number of bird and all bat species), which consequently leads to higher activity and diversity of the fauna (e.g. Ancillotto *et al.* 2021). Since grazing livestock was observed only at two out of three active farmsteads this benefit is not common in the AoI. However, livestock grazing may be useful in terms of the future management of this habitat. Described species-specific interest (along with relevant populations' nature conservation value) defines species-specific nature conservation value of grassland habitats at the site for birds and bats, though valued only at the local level (minor to major) and is considered as not significant (as elaborated in sections 8.3.5 and 0).

Certain fragments of humid grassland are recognised as crucial for the valued population of the Small Pearl-Bordered Fritillary (*Boloria selene*) butterfly species and their nature conservation value has been assessed as **major national**, and thus **significant**. The conservation value of maintained Balkan-mountain hay meadows for population of Nickerl's Fritillary (*Melitaea aurelia)* has been assessed as **minor regional**, and thus **significant** (as elaborated in section 8.3.4.2).

The Balka-mountain hay meadows are also particularly important for plant species, as they are characterised by a high diversity of flora and the presence of species that are characteristic only for this habitat type. However, most of the plant species present at the WPP site are of no conservation concern, and thus of no conservation value (elaborated in section 8.3.4.1). The exceptions are two strictly protected orchid species, whose valued populations are present in certain patches of Balkan-mountain hay meadows. Therefore, the nature conservation value of particular patches for two orchid species populations has been assessed accordingly as **low regional**, and **significant**. Furthermore, certain fragment of humid grassland hosts a valuable population of the Common Clubmoss (*Lycopodium clavatum* L.). The nature conservation value of this fragment, for this population, has been assessed as **low regional**, and **significant**.

8.3.3.3 Scrub

8.3.3.3.1 Scrub types within developed areas of the WPP site

F3.24 Subcontinental and continental deciduous thickets
National code: **B2**
EU Habitats Directive Annex I: ***none***

This habitat type consists of shrubs of broadleaved xerophilous species (*Syringa vulgaris, Forsythia europaea, Acer monspessulanum, Amygdalus nana, Frangula rupestris, Cotinus coggygria, Prunus fruticosa*, *Prunus mahaleb, Rosa spinosissima, Crataegus monogyna, Fraxinus ornus, Prunus spinosa, Ligustrum vulgare*). Deciduous pre- and post-forest formations, forest edges, hedges and woodland recolonization of thermophilous deciduous oak forest and steppe forest zones of the Balkan peninsula, of southeastern Europe, of western Asia and of Central Eurasia, in particular, of the *Quercion frainetto* and *Ostryo-Carpinion* zones of the Balkan peninsula, with very local irradiations in Central Europe, extreme northeastern Italy, the Aegean and the eastern Mediterranean.

This habitat type covers 16.46% of the survey area, with a total surface area of 65.27 ha. It most commonly occurs as a succession stage in areas where mesophile meadows were once present but are no longer maintained or as a degradation phase in areas where forests have been clearcut.

It is of **no conservation concern,** and of **no conservation value**.

Scrub mostly occurs at the WPP site as a succession stage where hay meadows were once present (Figure 8-39).

Figure 8-39 Scrub as a Succession Stage of Former Hay Meadows at the Development Site

F3 Temperate and mediterranean-montane scrub
National code: **B3.22**
EU Habitats Directive Annex I: ***none***

This habitat type is open and sparse and very rarely closed deciduous shrubs formation; 2-3 meters high. The dominant species is *Salix caprea,* but in addition *Rhamnus fallax*, *Sambucus racemosa* and other shrubby species may also be prevalent. Communities of this habitat type belong to the autochthonous marginal phytocenoses at the edge of mesophilous and frigorifilous montane forests. This habitat often occurs where the forest has been cut by anthropogenic influences. They also develop on calcareous and siliceous geological substrate under the conditions of various mountain climates in the zone of mesophilous deciduous forests, frigorifilous coniferous forests, as well as in mixed forests.

This habitat type covers 2.23% of the survey area, with a total surface area of 8.83 ha.

It is of **no conservation concern,** and of **no conservation value**.

G1.D4 Fruit orchards
National code: **B7.222**
EU Habitats Directive Annex I: ***none***

High-stem orchards of apple, pear, plum, apricot, peach, cherry and other Rosaceae.

This habitat type covers 0.41% of the survey area – there is seven small fragments with total area of 1.61 ha.

It is of **no conservation concern,** and of **no conservation value**.

8.3.3.3.2 Flora and fauna interest of the scrub at the site and surroundings

Scrub provides a trophic base, as well as nesting and perching opportunities for many bird species present at the site. These habitats are particularly important for certain specialists (i.e. frugivorous species feeding on berries and fruits, species nesting in bushes and within dense vegetation, species singing/displaying on/from the bushes in the open ecotone habitats), but also for many generalist species (e.g. birds of prey). Scrub also provides a trophic base for bat species, especially for generalists that hunt in the open airspace and/ or close to vegetation. Scrub is less important for bird and bat fauna at the site compared to grassland and, in particular, woodland. Described species-specific interest (along with relevant populations' nature conservation value) defines species-specific nature conservation value of grassland habitats at the site for birds and bats, which is assessed as **minor to major local** (as elaborated in sections 8.3.5 and 0), and is **not significant**.

Certain scrub fragments, characterised by higher humidity, are habitat of valued population of the Small Pearl-Bordered Fritillary (*Boloria selene*) butterfly species. Their nature conservation value is assessed as **major national**, and evaluated accordingly as **significant**.

Several shrub species present in the survey area are legally protected and their collecting is regulated by law (see details in section 8.3.4.1). However, these and all other plant species recorded in scrub habitats at the site are of no conservation concern, and thus of no conservation value as well. Therefore, this habitat type is of **no conservation value for flora**.

8.3.3.4 Woodland

8.3.3.4.1 Woodland types within developed areas of the WPP site

G1.7 Thermophilous deciduous woodland
National code: **A2.5**
EU Habitats Directive Annex I: ***91M0 Pannonian-Balkanic turkey oak - sessile oak forests***

This habitat type includes forests with folded or nearly folded floor of wood. Sessile oak (*Quercus petraea*) or Turkey oak (*Quercus cerris*) may be the dominant species in this habitat. In addition to these two species, the following species are important for the structure of some forest types in this habitat: *Fraxinus ornus, Carpinus orientalis, Ostrya carpinifolia, Juniperus oxycedrus, Frangula alnus, Cotinus coggygria, Forsythya europaea, Erica carnea* and others. They usually occur on flat or slightly sloping terrain in hilly regions. These habitats develop on siliceous and carbonate geological substrate at 200-1150 m altitude.

This type of habitat could not be classified at a lower level [such as Sessile oak (*Quercus petraea*) forests – A2.51, or Sessile oak (*Quercus petraea*) and Turkey oak (*Quercus cerris*) forests – A2.53] because it was usually not possible to make a clear distinction between the two, either on the ground or on satellite images; these fragments are mostly degraded and merge into one another to form a mosaic. For the same reason, in the area of off-site OHLs this type of habitat is presented on the map together with habitat type G1.A1C (Southeastern European *Quercus* - *Carpinus betulus*), whilst in the WPP area habitat G1.A1C is shown separately. In the area of off-site OHLs, this type of habitat is more dominant than G1.A1C. These two habitat types combined cover 8.54% of the survey area, with a total surface area of 33.86 ha. Both types are Conservation Priority habitat types in Serbia (Official journal of RS, br. 35/2010), and are regarded as of **conservation concern**.

This habitat type is fragmented and more or less degraded, mostly due to logging, and of low ecological value. Therefore, its nature conservation value has been assessed, depending on the degree of degradation, as **minor to moderate local** at the most, and **not significant**.

Figure 8-40 Fragmented Oak Woodland at the WPP Development Site

G1.A1C Southeastern European *Quercus - Carpinus betulus*
National code: **A2.611**
EU Habitats Directive Annex I: ***91Y0 Dacian oak & hornbeam forests***

This habitat type includes forests with folded or nearly folded floor of wood. Sessile oak (*Quercus petraea*) and common hornbeam (*Carpinus betulus*) are dominant species in abundance. They usually occur on flat or slightly sloping terrain in hilly regions. These habitats develop on various geo-logical substrates at altitudes up to 700 meters.

In the area of off-site OHLs this habitat type is presented on the map together with habitat type G1.7 Thermophilous deciduous woodland (which is explained above), which is much more common in this area. These two habitat types, combined, cover 8.54% of the survey area, with a total surface area of 33.86 ha. Both types are Conservation Priority habitat types in Serbia (Official journal of RS, br. 35/2010), and are regarded as of **no conservation concern**.

This habitat type is fragmented throughout the detailed survey area and entire WPP site, mostly degraded, and of low ecological value. Therefore, its nature conservation value has been assessed as **low local**, and **not significant**.

G1.A3 *Carpinus betulus* woodland

National code: **A3.111**
EU Habitats Directive Annex I: ***none***

Medium to high mesophilous deciduous forest with folded or nearly folded floor of tree. Common hornbeam (*Carpinus betulus*) is the dominant species. In addition to hornbeam (*Carpinus betulus*), the following species are important for the structure of the tree and shrub layer in this habitat: *Acer campestre*, *Crataegus monogyna*, *Sambucus nigra*, *Cornus sanguinea*, *Fagus moesiaca*, *Quercus petraea*, *Evonymus europaeus* and others. They generally occur on flat or slightly sloping terrain in hilly regions. These habitats develop on siliceous geological substrates.

This habitat type covers 1.34% of the survey area – there are seven small fragments with a total surface area of 5.33 ha.

It is of **no conservation concern,** and of **no conservation value**.

G1.6 *Fagus* woodland

National code: **A3.231**
EU Habitats Directive Annex I: ***91W0 Moesian beech forests***

Beech forests have diverse composition and structure. They can be a monodominant forest where the Moesian Beech (*Fagus moesiaca*) dominates species in the tree and shrub layer, while almost no other species occur in the ground layer. There are also relict polydominant forest in which a large number of other tree and shrub species are equally present with *Fagus moesiaca*. In addition to these two types of beech forests, there are also mixed forests in which other species of trees and shrubs are found, such as: *Abies alba, Acer heldreichii, Acer obtusatum, Acer platanoides, Acer pseudoplatanus, Corylus colurna, Fraxinus excelsior, Ilex aquifolium, Juglans regia, Prunus laurocerasus, Sorbus aucuparia* and others. Beech forests develop on various geological substrates and exposition.

This type of habitat is the most dominant in the survey area, occupying 33.37%, with a total surface of 132.30 ha. These beech forests are mostly degraded, fragmented, overthinned or destroyed (by logging, wildfire and poor forest management) in the wider surrounding area of the WPP site. Mature (near) natural forest stands of high ecological value constitute a very small portion of the forests in the wider surrounding area of Crni Vrh. Some of them are also encompassed by the WPP site boundary, though they are not present within the detailed habitat survey area (i.e. developed area of the Project). Younger but relatively well-preserved forest stands of moderate ecological value are more common (see Figure 8-41), and included four fragments with a total surface area of about 29 ha, i.e. 22% of this habitat type within the survey area. As these beech forests are heavily degraded, they are of negligible ecological value at the most. In certain areas the stumps remained and saplings have already started to grow from some of them.

It is important to note that, according to the standard methodology, such heavily degraded habitats are still identified as forests. In certain areas, where beech forests have burnt down completely, a degradation type of vegetation, the *Calamagrostis epigejos* stands (*EUNIS* code E1.74, national code C1.528), has appeared instead.

Figure 8-41 Young Relatively Well-Preserved Beech Forests

Being a Conservation Priority habitat type in Serbia (Official journal of RS, br. 35/2010), beech forest is considered as of **conservation concern**. Areas of relatively preserved beech forests are of moderate ecological value, and some have nature conservation value. However, since such stands cover only a small part of the survey area and the entire WPP site, this habitat has been assessed as **moderate to low local**, and **not significant**. The nature conservation value of (heavily) degraded, depleted or destroyed beech forests of **low or negligible** ecological value, has been assessed as **negligible or none**, and **not significant**. Only mature beech forest of high ecological value would likely be assessed as of significant nature conservation value, though these have all been excluded from the development through Primary Mitigation at early stage of Project development and are not the subject of this assessment.

Figure 8-42 Degraded Beech Forests at the WPP Development Site

G1.9 Non-riverine woodland with *Betula*, *Populus tremula* or *Sorbus aucuparia*
National code: **A3.231**
EU Habitats Directive Annex I: ***91W0 Moesian beech forests***

This habitat type includes light deciduous forests with folded or nearly folded ground, where the species *Betula pendula* predominates. In the tree and shrub layer there are not many other species, i.e. they are floristically poor. In addition to birch, other species may occur, such as: *Quercus petraea*, *Carpinus betulus, Populus tremula* and others. Communities generally developed on flat or gently sloping terrain in hilly or lower parts of the mountainous region, usually at elevations between 700 and 1300 meters. This habitat type developed on siliceous geological substrate.

This habitat type covers 5.72% of the survey area, with a total area 22.66 ha.

It is of **no conservation concern,** and of **no conservation value**.

Figure 8-43 Birch Forest at the WPP Development Site

G5.2 Small broadleaved deciduous anthropogenic woodland
National code: **A4.11J**
EU Habitats Directive Annex I: ***none***

Plantations and small intensively-managed woods of deciduous broadleaved trees. If evergreen broadleaved species are present, they have a lower canopy cover than deciduous species.

The dominant species is *Acer pseudoplatanus.*

This habitat type covers 0.28% of the survey area – there is one small fragment with total area of 1.1 ha.

It is of **no conservation concern,** and of **no conservation value**.

G5.4 Small coniferous anthropogenic woodland
National code: **A7.111**
EU Habitats Directive Annex I: ***none***

Plantations and small intensively-managed woods of coniferous trees (usually monoculture). If broadleaved species are present, they have canopy cover less than 25%.

The dominant species is *Picea abies*.

This habitat type covers 2.94% of the survey area – there are nine small fragments with a total surface area of 11.65 ha.

It is of **no conservation concern,** and of **no conservation value**.

Figure 8-44 The Largest Spruce Plantation in the Survey Area – Close to the Proposed WTG TIII2

G5.4 Small coniferous anthropogenic woodland
National code: **A7.114**
EU Habitats Directive Annex I: ***none***

Plantations and small intensively-managed woods of coniferous trees (usually monoculture). If broadleaved species are present, they have canopy cover less than 25%.

The dominant species is *Pinus nigra.*

This habitat type covers 0.36% of the survey area – there are five small fragments with total area of 1.42 ha.

It is of **no conservation concern,** and of **no conservation value**.

8.3.3.4.2 Woodland flora and fauna of interest

Woodland provides a variety of trophic and cryptic opportunities for many present bird and bat species. These habitats are particularly important woodland species that meet all their ecological requirements and spend their entire life cycle in this habitat (the majority of bird and bat fauna at the site). Of particular importance are the bird species that nest in tree hollows or within the canopy, tree-roosting bat species (roosting in hollows, cracks, under loose bark) and clutter-adapted and gleaning species (which hunt their prey from or near woodland vegetation). Being the most productive habitat, the trophic base provided by woodland is crucial for most generalists (i.e. birds of prey or bats hunting in the open airspace). Finally, woodland provides sheltering from the elements (especially during the harsh winters which are common in the area).

All woodland at the WPP site is important for providing general trophic base, including those fragmented and degraded (coppiced, overthinned, regrown on stumps, etc.), even plantations to some extent. However, within the developed area of site, only relatively preserved beech forests provide complete and optimal conditions for woodland species. Such forests have a high roosting potential for tree-roosting bats, harbouring a considerable number of older trees with numerous features that bats could use for roosting. Such older trees are also found in degraded oak and beech forests at the WPP site, though only as scarce individual trees. However, a major share of the total roost-stock used by local populations of tree-roosting bat species is situated in mature and better-preserved woodland in both the immediate and wider surroundings. Considering all the above, the species-specific nature conservation value of woodland habitats within developed areas of the site for birds and bats, has been assessed as **minor to major local**, and **not significant** (as elaborated in sections 8.3.5 and 0).

The nature conservation value of relatively preserved beech forests at the WPP site for several valuable populations of the invertebrate species (Alpine longhorn beetle (*Rosalia alpina*), *Molops piceus* and the False Comma (*Nymphalis vaualbum*)) has been assessed as **minor regional**, and **significant**.

Several woodland plant species present in the survey area are legally protected and their collecting is regulated by law (see details in section 8.3.4.1). However, these and all other plant species recorded in the forest habitats within developed areas of the site are of **no conservation concern** and **no conservation value**.

8.3.3.5 Wetland

8.3.3.5.1 Wetland types within developed areas of the WPP site

D5.2 Beds of large sedges normally without free-standing water
National code: **E4.2**
EU Habitats Directive Annex I: ***none***

Densely compacted grass-like herbaceous communities dominated by tall sedges such as: *Carex riparia, Carex vulpina, Carex acuta (= Carex gracilis), Carex acutiformis, Carex paniculata, Carex disticha* or rushes, such as: *Juncus effusus, Juncus articulatus, Juncus inflexus*, and other species. This type of habitat occurs in places of natural or artificial depressions, marshes, in places where the groundwater levels remain high throughout the year, and where the surface layer of water tends to occasionally dry up during the summer. Habitats are moist even when the water recedes and they mostly occur at altitudes from 70 to 1300 m.

There are two small fragments of this habitat type, covering 0.06% of the survey area at 0.24 ha.

It is of **no conservation concern,** and of **no conservation value**.

Figure 8-45 Wetland (Marshland) Fragment Close to the Proposed WTG TIV1

8.3.3.5.2 Flora and fauna interest of the wetland at the site and surroundings

The conservation value of wetland for a single bird, the Corn Crake (*Crex crex*), and bat, the Brown Long-Eared Bat (*Plecotus auritus*) is assessed as **major or moderate local**, and **not significant** (elaborated in sections 8.3.5 and 0).

The single marshland fragment is a habitat of valued population of the Small Pearl-Bordered Fritillary (*Boloria selene*) butterfly species, and its nature conservation value is assessed as **major national**.

8.3.3.6 Cultivated habitats

8.3.3.6.1 Cultivated habitats types within developed areas of the WPP site

I1.12 Medium-scale intensive unmixed crops (1-25ha)
National code: **G1.12**
EU Habitats Directive Annex I: ***none***

Arable farmland with cereal and other crops grown on large surfaces.

This habitat type covers 0.35% of the survey area – there are two small fragments of arable farmland with wheat and corn, with total area of 1.39 ha.

It is of **no conservation concern,** and of **no conservation value**.

8.3.3.6.2 Flora and fauna interest of the cultivated habitats at the site and surroundings

Cultivated habitats provide some addition to the trophic base for certain bird species present at the WPP site. However, considering that this habitat type is extremely scarce within the survey area, its nature conservation value for birds and bats has been assessed as negligible, and thus not significant.

8.3.3.7 Other habitat/landscape elements

Gullies (intermittent watercourses)

The off-site OHLs No. 150 and 177 are routed along the area of intensive rinsing and deposition (Faculty of Mining and Geology 2012) and crosses several gullies that mostly stretch in north-south direction (see section 8.1.6). Some of these gullies are also intermittent watercourses and the Velika Sakaštica is the largest among them, with two of its branches starting from the central part of the OHL route (see section 8.1.6). However, during the ESIA surveys, only the eastern branch of Velika Sakaštica, the deepest gully in the survey area, had a minimal amount of water in the early spring (March-April) and only in its deepest parts beyond the detailed habitat survey area. Furthermore, neither in this part, or anywhere else within the survey area was aquatic vegetation recorded, and no aquatic habitat type can be identified within the survey area. As no elements of aquatic vegetation exist in the small temporary watercourses within the site, their nature conservation value for overall flora has been assessed as **none**.

However, even such temporary and small water courses are important as sources for drinking water for local bird and bat populations (Seibold *et al.* 2013) as well as for other fauna. Their nature conservation value for birds and bats has been assessed as **high local**, and **not significant**.

Figure 8-46 Small Intermittent Watercourses Form in Spring

Permanent watercourses and springs

There are no permanent watercourses or springs within the developed area of the site.

However, there is a permanent watercourse outside the developed area, the Lipa river (see section 8.1.6). The river spring is located in the central part of the WPP site and the stream flows towards the north in the deep, steep valley. The Lipa river is heavily polluted from the adjacent abandoned open cast pit Gornja Lipa and lacks any living organisms. The nature conservation value of Lipa river for overall fauna has been assessed as **none**.

This suggests that two tapped springs, which are located on the edges of the central valley and ephemeral puddles that retain rainwater are crucial in providing drinking water for entire local fauna are. Therefore, their nature conservation value for entire fauna has been assessed as **major local**, but **not significant**.

Figure 8-47 One of the Two Tapped Springs at the WPP site close to the proposed WTG TIV2

J2.61 Derelict spaces of disused rural constructions

National code: **G1.12**
EU Habitats Directive Annex I: ***none***

There are five small fragments of this habitat which occupies a very small part of the site (0.18%); with a total surface area of 0.73 ha. Within the survey area at the WPP site, there are two weekend-cottages which are relatively well-maintained and appear to be used occasionally, and two derelict buildings/complexes which were previously used as farmsteads or weekend-cottages.

In the area of off-site OHLs, there is a part of a farmstead whose majority is located outside the survey area, whilst only one smaller agricultural building is within the survey area. The garden was in the early stage of overgrowth, although the buildings did not show any obvious signs of deterioration. It was concluded that these objects are either occasionally used, or recently abandoned.

It is of **no conservation concern,** and of **no conservation value**.

These surveys determined that buildings in developed areas of the site (i.e. the detailed habitat survey area), although have some potential, do not support nesting of any birds, or any roosting of birds and bats. Therefore, their conservation value for birds and bats has been assessed as negligible, and thus not significant.

At the WPP site, but beyond of the detailed habitat survey area, there are more buildings, mostly belonging to farmsteads and weekend-houses. It would appear that 11 of these buildings are maintained and used at least seasonally or occasionally, 21 are dilapidated or derelict, whilst 15 are not existent even in traces. All existing buildings have the potential for use by several bird and bat species, and were visually inspected within the scope of the ESIA Bat Roost Surveys and Breeding Bird Surveys. However, no bat roosts or evidence of bat roosting in any of this buildings was found (see section 8.3.6.1.1 and Appendix C), whilst nesting of a single bird species, the Red-Rumped Swallow (*Cecropis daurica*), was recorded in two buildings only (section 8.3.5.1.1, Appendix C). The nature conservation value of the buildings within the entire WPP site for almost all bird and bat species has been assessed as **negligible**, and only for the Red-Rumped Swallow as **high local**, but **not significant**.

Transmission lines

Several exiting transmission lines cross the WPP site and immediate surroundings. These lines could provide nesting and perching opportunities for some of the present bird species. However, the field surveys did find any evidence of bird nesting on the towers, and only occasional perching on the cables was observed (mostly for swallow species). The nature conservation value of the transmission lines for birds at the survey area is assessed as **negligible**, and **not significant**.

8.3.4 Flora and Fauna

8.3.4.1 Flora

A total of 250 species of plants was recorded during main ESIA Surveys within the WPP site. The complete list of species, with their protection and conservation status as well as their distribution and ecological status in the site area is provided in Appendix C. The vast majority of the recorded plant species are of **no conservation concern**, and therefore of **no conservation value**. Only four species are of conservation concern, and the conservation evaluation of their populations and habitats is presented below.

Two orchid species, the Bug Orchid (*Anacamptis coriophora*) and the Burnt Orchid (*Neotinea ustulata*), as well as Common Clubmoss (*Lycopodium clavatum*), are strictly protected in Serbia and are of conservation concern.

Figure 8-48 Two Strictly Protected Orchid Species –
***Anacamptis coriophora* (left) and *Neotinea ustulata* (right)**

Both orchid species are rare in the survey area and a small number of individuals were recorded in two small fragments of maintained Balkan-mountain hay meadows. Due to the absence of mowing and grazing in the survey area, as well in wider surroundings, the potential habitats of these two species are mostly in various stages of succession (overgrowth) and have become unsuitable for these species. The nature conservation value of the two orchid species populations at the WPP site has been assessed as **high local** and **low regional**, whilst their habitats in maintained Balkan-mountain hay meadows have been assessed as **low regional**, and **significant**. The nature conservation value of all other habitats at the site for these species has been assessed as **negligible** or **none**, and **not significant**.

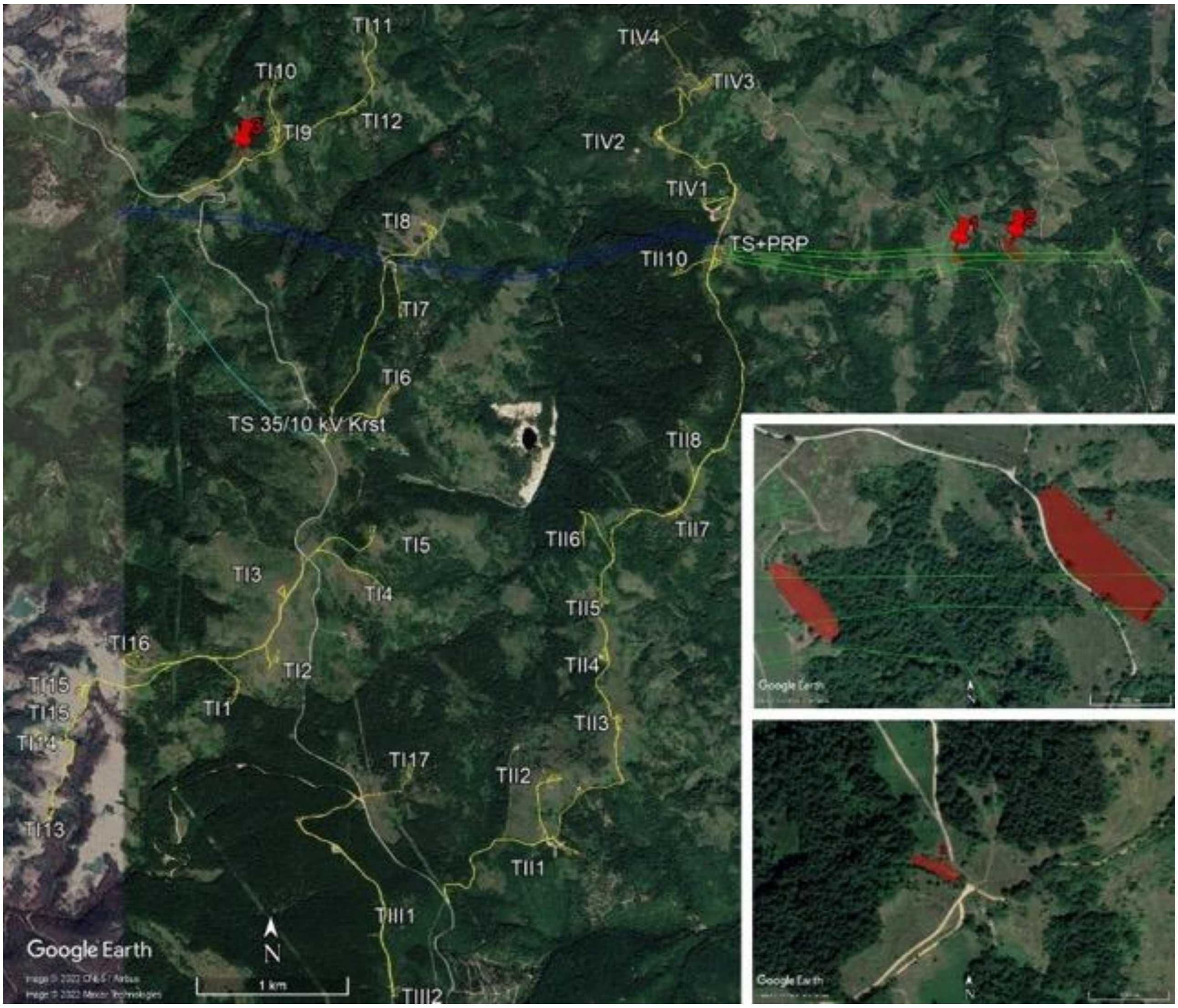

Figure 8-49 Habitats of Valued Flora Species within the Crni Vrh WPP Site

Source: Google Earth 2022, CVP, with modification by U. Buzurović, I. Karapandža, and B. Karapandža, original

Legend and notes: Location of habitats within the detailed habitat survey area extending 50 m beyond any Project infrastructure to be developed where the species populations were identified by ESIA surveys: **1+2** –**Bug Orchid** (*Anacamptis coriophora*) and **Burnt Orchid**(*Neotinea ustulata*), **3** - **Common Clubmoss** (*Lycopodium clavatum*); locations of WTGs (T), site access tracks (yellow lines) and OHL routes (dark blue, cyan and green lines) according to Conceptual Design layout (valid at the beginning of the surveys) are also shown.

The Common Clubmoss (*Lycopodium clavatum*) is a Strictly Protected species in Serbia as well as in the EU, and thus of conservation concern. The species is very rare in the survey area, and was recorded in a single small fragment of a humid grassland. It is also rare in the entire Serbia. Therefore, the conservation value of the Common Clubmoss population at the WPP site has been assessed as **low regional** and **significant**, as well as of the fragment of humid grassland where it is present. The nature conservation value of all other habitats at the site for these species has been assessed as **none**.

Figure 8-50 Strictly Protected Common Clubmoss (*Lycopodium clavatum*) at the WPP site.

The Mountain Elm (*Ulmus glabra*) is classified as threatened (VU) in Europe (IUCN 2021), and is regarded as of **conservation concern**. However, the species is present at the WPP site only as sparse individual trees. No forest habitats were recorded where this species was dominant, nor where it formed a plant community, and not even the areas where it is any more abundant. Therefore, the conservation value of the Mountain Elm population at the WPP site was assessed as **minor local**, and **not significant**.

Figure 8-51 Representative Area of Scrub at the WPP site

Twenty-seven plant species present at the WPP site have a legal status of Protected species in Serbia (Official Journal of RS, No. 5/2010, 32/2016, 98/2016, see Appendix C) but are considered of **no conservation concern**. However, their collection is prohibited by the Regulation on Control of the Use and Traffic of Wild Flora and Fauna (Official Journal of RS, No. 31/2005, 45/2005 - *correction*, 22/2007, 38/2008, 9/2010, 69/2011, 95/2018 - another law). Nevertheless, at the WPP site (and immediate surroundings), none of these species is abundant enough in the area for their collection to be undertaken at a commercial scale.

8.3.4.2 Invertebrates

A total of 185 invertebrate species has been recorded within the WPP site. The complete list of all the recorded species, along with their protection, conservation and ecological status is given in Appendix C.

169 of these species are of **no conservation concern** and are of no **conservation value**.

Sixteen species of conservation concern are recorded within the WPP site, whilst additional five species of conservation concern are recorded in the wider surroundings. Therefore, the conservation evaluation of their populations and habitats is presented below.

Nine butterfly species of conservation concern are recorded within the WPP site, all Strictly Protected in Serbia: Yellow-banded Skipper (*Pyrgus sidae*), Large Copper (*Lycaena dispar*), Northern Blue (*Plebejus argyrognomon*), Sloe Hairstreak (*Satyrium acaciae*), Purple Emperor (*Apatura iris*), Cardinal (*Argynnis pandora*), Small Pearl-bordered Fritillary (*Boloria selene*), Nickerl's Fritillary (*Melitaea aurelia*) and Swallowtail (*Papilio machaon*).

Figure 8-52 Small Pearl-Bordered Fritillary (*Boloria selene*)

The most important butterfly species recorded at the WPP site is Small Pearl-bordered Fritillary (*Boloria selene*), listed as Endangered (EN) in Serbia (Maes *et al.* 2019). The species is recorded on four locations – a small marshland fragment and two humid meadows interspersed with scrub. These are the only recent observations of Small Pearl-bordered Fritillary in Serbia. There are a few individual records from Alciphron insect database, but this data is not publicly available and most of those individual observations are not confirmed by subsequent revisits of the localities (HabiProt 2014-2022). It is listed to occur on Kopaonik (Jakšić & Nahirnić 2014) and Fruška Gora Mts. (Stojanović 2012), but it is not clear if these observations are recent or observations collected from older literature data. In Eastern Serbia, it was recorded some 50 years ago on several locations (Zečević 2002), but these observations remained unconfirmed in recent studies despite significant field effort in the region. Due to all the above, the nature conservation value of Small Pearl-bordered Fritillary population and habitats at the site has been assessed as **major national** and **significant**.

Figure 8-53 Habitats of the Small Pearl-bordered Fritillary (*Boloria selene*) Within the WPP site

Source: GoogleEarth 2022, CVP, with modification by M. Popović, I. Karapandža, and B. Karapandža, original

Legend and notes: Location of habitats within the detailed habitat survey area extending 50 m beyond any Project infrastructure to be developed where the species population was identified by ESIA surveys; locations of WTG locations (T), site access tracks (yellow lines) and OHL routes (dark blue, cyan and green lines) according to Conceptual Design layout (valid at the beginning of the surveys) are also shown.

Large Copper (*Lycaena dispar*) is also listed on Annexes II and IV of the EU Habitats Directive and Appendix II of the Bern convention. It is classified as Near Threatened (NT) globally (IUCN 2021). The Large Copper was recorded in the two humid meadows where Small Pearl-bordered Fritillary also occurs. The nature conservation value of the Large Copper populations and habitats has been assessed as **moderate local**, and **not significant**.

- Nickerl's Fritillary (*Melitaea aurelia*) is classified as Near Threatened (NT) in Europe (Swaay et al. 2010). Nature conservation value of its populations and habitats (maintained Balkan-mountain hay meadows) within the WPP site have been assessed as **major local** to **minor regional** and **significant**.
- The nature conservation value of populations and habitats of Yellow-banded Skipper (*Pyrgus sidae*) and Purple Emperor (*Apatura iris*) is assessed as **moderate local**, and **not significant**.
- The nature conservation value of populations and habitats of Cardinal (*Argynnis pandora*) is assessed as **moderate local** and **not significant**.

The nature conservation value of populations and habitats of all other butterfly species of conservation concern is assessed as **negligible**.

Six coleopteran species recorded within WPP site are strictly protected in Serbia and are of conservation concern: *Carabus ullrichii*, Violet Ground Beetle (*Carabus violaceus*), *Molops piceus*, *Morimus asper* (*funereus*), Alpine Longhorn Beetle (*Rosalia alpina*) and European Stag Beetle (*Lucanus cervus*). *Morimus asper* (*funereus*) is also listed on Annex II of the EU Habitats Directive.

- The Nature conservation value of the *Morimus asper* population is assessed as minor local, while its habitats (preserved beech forests) as **major local**, and **not significant**.
- The European Stag Beetle is also listed on Annex II of EU Habitats Directive and Appendix III of the Bern convention. The nature conservation value of the European Stag Beetle population and habitats at the WPP site has been assessed as **minor local**, and **not significant**.
- The Alpine Longhorn Beetle is also listed on Annexes II and IV of the EU Habitats Directive and Appendix II of the Bern convention. The nature conservation value of populations and habitats of Alpine Longhorn Beetle and *Molops piceus* within the WPP site has been assessed as **minor regional**, and **significant**.
- The conservation value of populations and habitats of all other coleopteran species of conservation concern has been assessed as **negligible**.

One species of dragonfly, the *Cordulegaster heros*, is Protected in Serbia, though listed on Annexes II and IV of the EU Habitats Directive and is regarded as species of conservation concern. The nature conservation value of populations and habitats of this species within the WPP site is assessed as **negligible to minor local**, and **not significant**.

Five butterfly species of conservation concern are recorded only in wider surrounding of the WPP area (Popović et al. 2020, Jakšić 2006, Zečević 2002, Jakšić 1988): Lesser Purple Emperor (*Apatura ilia)*, Dusky Meadow Brown (*Hyponephele lycaon*), Poplar Admiral (*Limenitis populi*), False Comma (*Nymphalis vaualbum*) and Clouded Apollo (*Parnassius mnemosyne)*.

- The False Comma is Strictly Protected in Serbia and listed on Annexes II and IV of the EU Habitats Directive as a priority species and Appendix II of the Bern Convention. Its presence at the WPP site is considered likely, since it is a migrant and is recorded only a few kilometres of the WPP site. False Comma is found in beech forests, where adults are predominantly found along the tracks and at forest clearings. The conservation value of False Comma populations and habitats is assessed as **minor regional**, and **significant**.
- The Clouded Apollo is Strictly Protected in Serbia and listed on Annex IV of the EU Habitats Directive and Appendix II of the Bern Convention. It is classified as Threatened (NT) in Europe. The presence of the Clouded Apollo within the WPP site is expected and is probably not recorded only due to bad weather conditions in June during field surveys. Its host plant (*Corydalis* spp.) is present in the entire WPP site. Conservation value of the populations and habitats of this species is assessed as **minor local** and **not significant**.
- The Poplar Admiral is strictly protected and listed as Neat Threatened (NT) in Serbia (Swaay et al. 2010). The main host plant for this butterfly is aspen (*Populus tremula*), and it usually occurs in light, regularly cut forests with young aspen sprouts. A presence of small population of Poplar Admiral is expected within the WPP site, and the nature conservation value of its population and habitats has been assessed as **minor local**, and **not significant**.
- The Dusky Meadow Brown is Strictly Protected and Near Threatened (NT) (Maes *et al.* 2019) in Serbia. Its presence within the WPP site is not expected due to lack of suitable habitats (rocky habitats and rocky pastures).
- The Lesser Purple Emperor is Strictly Protected in Serbia. Permanent populations are not expected within the WPP site and, even if found, it is not expected to be abundant due to lack of suitable habitats (stream and river valleys with willow trees).

8.3.4.3 Amphibians

A total of four species of Amphibian were recorded within the developed area of the site, all by these ESIA Surveys only and the occurrence of one more species is expected. The complete list of species, with their protection and conservation status as well as their distribution and ecological status in the site area is provided in Appendix C.

The four of the species are of conservation concern are Yellow Belly Toad (*Bombina Variegata*), Green Toad (*Bufo Viridis*), Common Toad (*Bufo Bufo*), and Agile Frog (*Rana dalmatina*). All these species are Strictly Protected in Serbia (Official Journal RS, No. 5/2010, 32/2016, 98/2016) and listed in the list of Annex IV (yellow belly toad also on Appendix II) of the EU Habitats Directive.

The lack of permanent aquatic habitats indicates that the WPP site is not suitable for most amphibian species. However, some species of frogs and toads spend most of their life cycle away from water, returning to it only during the breeding season. Such species can also be found at great distances from water. Habitats within the area, especially scrub and a small part of grassland can provide suitable conditions for the life and survival of some species of amphibians. Therefore, during reproduction (early spring) most of these species need aquatic habitats, which are very rare in both survey area and the entire WPP site.

Considering the small number and only occasional occurrence at the WPP site of all present species of amphibians of conservation importance, as well as the fact that they are not threatened (LC) at any level (IUCN 2021, Kalezić *et al*. 2015), the conservation value of all amphibian populations at the WPP site is assessed as **low** to **moderate local**, and of the habitats as **negligible** and **not significant**.

8.3.4.4 Reptiles

A total of seven reptile species was recorded at the developed area of the site, all by these ESIA Surveys only, whilst the presence of one more species is considered expected, which totals 8 species of reptiles (potentially) occurring at the site. The complete list of species, with their protection and conservation status as well as their distribution and ecological status in the site area is provided in Appendix C.

Seven of the species are of conservation concern – Green Lizard (*Lacerta viridis*), Common Wall Lizard (*Podarcis muralis*), Meadow Lizard (*Darevskia praticola*), Grass Snake (*Natrix natrix*), Caspian Whipsnake (*Dolichophis caspius*), Aesculapian Snake (*Zamenis longissimus*), and Aesculapian Snake (*Vipera ammodytes*). Meadow Lizard, Grass Snake, Caspian Whipsnake and Aesculapian Snake are Strictly Protected species in Serbia (Official Journal RS, No. 5/2010, 32/2016, 98/2016), Green Lizard, Common Wall Lizard, Aesculapian Snake are listed on Annex II of the Bern Convention, whilst Green Lizard, Common Wall Lizard, Grass Snake, Caspian Whipsnake and Nose-Horned on Annex IV (Nose-Horned Viper also on Appendix II) of the EU Habitats Directive.

Habitats in the survey area are diverse and are considered optimal for many reptile species.

The most important reptile species (in respect of conservation concern) potentially present at the WPP site is the Meadow Lizard, which is classified as Near Threatened (NT) at the global and European level (IUCN 2021), and as endangered (EN) in Serbia (Tomović *et al*. 2015). However, the habitats on the site are not suitable for the meadow lizard, as it prefers preserved thermophilic oak forests (Tomović et al. 2015), which are very scarce at the site. Although the presence of this species cannot be excluded, a significant population is certainly not present. Therefore, the nature conservation value of the Meadow Lizard population at the WPP site was assessed as **major local** at the most, and of the habitats as **negligible**, and therefore **not significant**.

Most of the other reptile species of conservation concern present at the WPP site are characterised by low abundance, whilst the Caspian Whipsnake and Aesculapian Snake occur only occasionally at the site. This is a consequence of the composition and quality of the habitats at the WPP site, which are mostly fragmented and degraded, and therefore, at best, suboptimal for these species, especially compared to the habitats in the surrounding designated sites. Also, none of these species are threatened (LC) at any level (IUCN 2021, Tomović *et al*. 2015). Therefore, the nature conservation value of populations and habitats of the Grass Snake, Caspian Whipsnake, Aesculapian Snake, and Nose-Horned Viper at the WPP site has been assessed as low to **moderate local**, and **not significant**.

Only the Green Lizard and Common Wall Lizard abundant resident populations are present at the WPP site and the ecological conditions there close to optimal for them. However, regional populations of these species are also very large, and local populations constitute a negligible part of them. Therefore, the conservation value of the populations and habitats of the Green Lizard and Common Wall Lizard at the WPP site has been assessed as **negligible**.

8.3.4.5 Ground Mammals

A total of 25 mammal species excluding bats was recorded within the WPP site and the immediate surroundings. 21 of these were recorded during the 2021-2022 ESIA Surveys, whilst 4 species were only recorded earlier, during the ESIA Team members' surveys unrelated to this assessment. The occurrence of 12 more species is considered probable, and possible for a further one, totalling 38 mammal species (potentially) occurring within the WPP site and the immediate surroundings. The complete list of species, with their protection and conservation status as well as their distribution and ecological status in the site area is provided in Appendix C.

Ten of the species are of conservation concern – Southern Water Shrew (*Neomys anomalus*), Lesser Mole-Rat (*Nannospalax leucodon*), Eurasian Harvest Mouse (*Micromys minutus*), Hazel Dormouse (*Muscardinus avellanarius*), Forest Dormouse (*Dryomys nitedula*), Grey Wolf (*Canis lupus*), Brown Bear (*Ursus arctos*), Eurasian Otter (*Lutra lutra*), Wild Cat (*Felis silvestris*), and Eurasian Lynx (*Lynx lynx*). Almost all of these species are Strictly Protected in Serbia. The two exceptions are the Grey Wolf and Wild Cat, having (only) Protected species status within the particular part of Serbia, though listed on The Bern Convention Appendix II and EU Habitats Directive Annex IV, Grey Wolf on Annex II as well (Official Journal of the EU [1992/43/EEC]). The Brown Bear and Eurasian Otter are also on listed The Bern Convention Appendix II and, along with Hazel Dormouse, Forest Dormouse and Eurasian Lynx, on EU Habitats Directive Annex II and/or IV. The nature conservation value of the populations and habitats of these 10 species occurring at the WPP site and immediate surroundings has been assessed, which is presented below.

Two species, the Southern Water Shrew and the Eurasian Otter, do not occur at the WPP site (but only in surroundings) due to the lack of suitable (aquatic) habitats. The nature conservation value of their populations and habitats at the site has been assessed as **none**.

The habitats at the site are not suitable for the Lesser Mole-Rat. This species exhibits a very strong preference for maintained pastures and meadows (Petrov 1992) which are very scarce at the site. Although the occurrence of the species at the WPP site cannot be completely excluded, the least important population is certainly not present. Therefore, the nature conservation value of the Lesser Mole-Rat population and habitats at the site is assessed as **negligible**.

Very small populations of almost all other mammal species of conservation concern are (potentially) present at the WPP site, whilst only single individuals of Brown Bear and Eurasian Lynx occur only incidentally in passage. This is due to the poor ecological value of habitats at site, woodland in particular, which is mostly fragmented, degraded and/or depleted, and are suboptimal for these species, especially compared to woodland within the surrounding designated sites. Furthermore, both the ESIA Surveys and the systematic long-term studies in which the ESIA Team members participated (which also include GPS tracking of large mammals), clearly indicate that wildlife corridors that connect better preserved habitats in the surroundings are not located in the site area. Therefore, the nature conservation value of the populations and habitats of the Eurasian Harvest Mouse, Hazel Dormouse, Forest Dormouse, Brown Bear, Wild Cat, and Eurasian Lynx at the site has been assessed in the range from **negligible** to moderate local, and **not significant**.

Only the Grey Wolf resident population in the WPP site area is relatively abundant and the ecological conditions at the site close to optimal for the species. The regional population of Grey Wolf is large, one of the largest in Serbia, and the local population constitutes only a very small percentage. Therefore, the nature conservation value of Grey Wolf population and habitats at the site is assessed as **moderate local** at the most, and **not significant.**

8.3.5 Birds

8.3.5.1 Survey Results

An overview of the results of the pre-construction 2021-2022 main ESIA Surveys and the results of the 2019-2020 Preliminary Surveys is provided. Full results of the 2021-2022 main ESIA Survey are provided in Appendix C, whilst those of the previous Preliminary Surveys are available in corresponding reports and their Appendices (Milovanović 2020a, b, Josimović et al. 2021a).

A total of 118 bird species was recorded or considered (potentially) occurring at the Crni Vrh WPP site and immediate surroundings between 2016 and 2021. Only one record, from 2016, that could be unambiguously attributed to the WPP site was found by the desk study, 98 species were recorded by 2019-2021 Preliminary Surveys, and 93 species by 2021-2022 main ESIA Surveys. Based on the records from wider surroundings, and at least to some extent suitable ecological conditions at the site, nine more species are considered potentially present. In respect of taxonomy, the most numerous are the passerines (Passeriformes): 74 species, followed by raptors (Accipitriformes and Falconiformes): 13 (10 recorded + 3 potentially occurring), woodpeckers (Piciformes): 9, and owls (Strigiformes): 6 species.

Occurrence of additional species might not be completely excluded, though only as a rare or incidental passage of single individuals, and thus not relevant for this assessment.

8.3.5.1.1 Breeding birds

Breeding bird population estimates from the main ESIA surveys (Breeding Woodland and Farmland Bird Surveys, Breeding Raptor Surveys, Breeding Owl Surveys, and occasional observations (over the course of VP Surveys and other ecological surveys, non-raptor species recorded during Breeding Raptor Surveys etc.) breeding season are summarised in Table 8-3, whilst full survey results are available in Appendix C. An overview of breeding population estimates from the 2019-2020 Preliminary Surveys is not available. Methodologically sound surveys of breeding woodland and farmland birds were not undertaken. The records of Preliminary Surveys do not provide population estimates or overview of breeding bird species, although there are individual quotes of recorded nesting of some bird species in some parts of WPP site or wider surroundings (Milovanović 2020a, b).

Breeding of 58 species was confirmed within the Crni Vrh WPP site boundary and immediate surroundings in 2021 breeding season, and breeding population estimates for 42 species based on the surveys (Table 8-3). The breeding of 17 more species within the WPP site boundary and immediate surroundings has been considered very likely based on their ecology and occurrence, activity and behaviour observed, thus totalling 75 breeding species.

Furthermore, nesting of 15 more bird species was recorded during these and Preliminary Surveys in wider surroundings, though their nesting is not considered possible at the WPP site and in immediate surroundings.

Table 8-3 Estimates of Breeding Bird Population at the Crni Vrh WPP Site for 2021 (Target Species Highlighted).

Numbers in column 1. - same as in Table 8-5, for convenience;

Breeding woodland and farmland bird surveys - number of breeding pairs / territories within the WPP site (calculated from Point Counts using Distance Sampling): upper-lower confidence limit;

Breeding raptor surveys - number of active nests / occupied home ranges recorded: within the WPP site, () - up to 2 km beyond the site boundary;

Occasional observations - number of breeding pairs / adult individuals* recorded: within the WPP site, () - beyond the site boundary.

No.	Species name		Breeding raptor surveys and Breeding owl surveys	Breeding woodland and farmland bird surveys	Occasional observations
	Scientific	English			
1	Coturnix coturnix	Common Quail			3*
2	Phasianus colchicus	Common Pheasant			3*
3	Perdix perdix	Grey Partridge		53 (15-195)	4**
5	Columba palumbus	Common Wood Pigeon		107 (41-274)	
8	Caprimulgus europaeus	European Nightjar			1
10	Cuculus canorus	Common Cuckoo		107 (41-274)	
11	Crex crex	Corn Crake			2
18	Strix aluco	Tawny Owl	2		
21	Pernis apivorus	European Honey Buzzard	1+ (2)		
22	Circaetus gallicus	Short-toed Snake Eagle	2		
26	Accipiter nisus	Eurasian Sparrowhawk	1		
27	Accipiter gentilis	Northern Goshawk	1+ (1)		
29	Buteo buteo	Common Buzzard	24+ (5)		
34	Picus canus	Grey-headed Woodpecker		27 (5-147)	2+ (2)

No.	Species name		Breeding raptor surveys and Breeding owl surveys	Breeding woodland and farmland bird surveys	Occasional observations
	Scientific	English			
35	Picus viridis	European Green Woodpecker		67 (22-205)	2
36	Dryocopus martius	Black Woodpecker		27 (5-147)	7+ (1)
39	Dendrocopos leucotos	White-backed Woodpecker		27 (5-147)	4
41	Dendrocopos major	Great Spotted Woodpecker		27 (5-147)	2
43	Falco subbuteo	Eurasian Hobby	1		
45	Lanius collurio	Red-backed Shrike		189 (64-558)	5
49	Oriolus oriolus	Eurasian Golden Oriole		45 (8-249)	
50	Garrulus glandarius	Eurasian Jay		126 (34-461)	
54	Corvus cornix	Hooded Crow		63 (11-348)	
55	Poecile palustris	Marsh Tit		189 (64-558)	
56	Poecile lugubris	Sombre Tit			(1)
57	Periparus ater	Coal Tit			1
58	Parus major	Great Tit		600 (324-1111)	
59	Cyanistes caeruleus	Eurasian Blue Tit		639 (375-1087)	
62	Cecropis daurica	Red-rumped Swallow			2
64	Aegithalos caudatus	Long-tailed Tit		126 (34-461)	
66	Lullula arborea	Woodlark		178 (71-448)	6
70	Phylloscopus collybita	Common Chiffchaff		1150 (602-2197)	
71	Phylloscopus sibilatrix	Wood Warbler			2
72	Sylvia atricapilla	Eurasian Blackcap		979 (530-1808)	
74	Curruca communis	Common Whitethroat		693 (376-1279)	
75	Curruca curruca	Lesser Whitethroat		82 (15-452)	1
76	Curruca nisoria	Barred Warbler			1
77	Regulus regulus	Goldcrest			4
78	Troglodytes troglodytes	Eurasian Wren			2+ (1)
79	Sitta europaea	Eurasian Nuthatch		189 (64-558)	
80	Certhia familiaris	Eurasian Treecreeper		45 (8-249)	1
81	Certhia brachydactyla	Short-toed Treecreeper			1
82	Sturnus vulgaris	Common Starling			(1)
83	Turdus merula	Common Blackbird		1027 (583-1810)	
85	Turdus philomelos	Song Thrush		211 (83-537)	5+ (1)
86	Turdus viscivorus	Mistle Thrush		158 (50-502)	5+ (3)

No.	Species name		Breeding raptor surveys and Breeding owl surveys	Breeding woodland and farmland bird surveys	Occasional observations
	Scientific	English			
87	Erithacus rubecula	European Robin		474 (237-947)	
88	Luscinia megarhynchos	Common Nightingale		89 (24-332)	
90	Phoenicurus phoenicurus	Common Redstart		45 (8-249)	10+ (1)
91	Saxicola rubetra	Whinchat			1
95	Ficedula albicollis	Collared Flycatcher		134 (44-404)	11+ (4)
96	Ficedula parva	Red-breasted Flycatcher			1
100	Motacilla cinerea	Grey Wagtail			1
101	Anthus trivialis	Tree Pipit		312 (134-725)	
104	Fringilla coelebs	Common Chaffinch		1812 (1266-2592)	
113	Coccothraustes coccothraustes	HaWPPinch		189 (64-558)	5
115	Emberiza citrinella	Yellowhammer		163 (63-424)	
118	Emberiza hortulana	Ortolan Bunting		89 (16-497)	4+ (2)
Number of species			**7**	**35**	**32**
Number of target species			**7**	**0**	**0**
Total number of species			**57**		
Total number of target species			**7**		

The active nests/ occupied home ranges of seven owl and raptor species were recorded by Breeding Raptor Surveys in 2021 breeding season (Table 8-3): Tawny Owl (*Strix aluco*), European Honey Buzzard (*Pernis apivorus*), Short-toed Snake Eagle (*Circaetus gallicus*), Eurasian Sparrowhawk (*Accipiter nisus*), Northern Goshawk (*Accipiter gentilis*), Common Buzzard (*Buteo buteo*) and Eurasian Hobby (*Falco subbuteo*) All breeding populations are very small, except for the Common Buzzard; 24 pairs at the WPP site, and additional 5 pairs in the immediate surroundings.

Based on the presence in immediate and wider surroundings, species ecology and suitable ecological conditions at the WPP site, breeding of 3 more owl species – Eurasian Scops Owl (*Otus scops*), Long-eared Owl (*Asio otus*) and Tawny Owl (*Strix aluco*) is considered possible, though in very small numbers. Furthermore, foraging of Long-legged Buzzard (*Buteo rufinus*) were regularly recorded by VP Surveys in southeastern part of the WPP site, very likely of single pair nesting just outside of Breeding Raptors survey area. Since Long-legged Buzzard preferably nests on rocks and cliffs (which are not found at the WPP site and immediate surroundings), and since nesting on trees is also recorded (Radišić *et al. eds*. 2018), the occasional nesting of this pair at WPP site as well, cannot be completely excluded, but is not considered likely.

Nesting of all other raptor species at the WPP site, including those whose nesting is recorded in immediate and/or wider surroundings, is not considered likely, since suitable ecological nesting conditions do not exist. The findings of Breeding Raptor Surveys are within expectations, with the only exception being the Common Kestrel (*Falco tinnunculus*), whose nesting could have been expected at least in immediate surroundings. Nesting of the Common Kestrel was recorded only in wider surroundings, whilst the even the occurrence was only recorded in the area of off-site OHLs, and only non-breeding season. Since these surveys were designed and implemented to reliable determine the nesting (and flight activity) of raptors, it is considered confirmed that the Common Kestrel does not nest regularly at the WPP site.

The most abundant breeding populations at the WPP site (Table 8-3) belong to passerines associated with woodland and mosaic habitats which do not exhibit preference for well-preserved woodland – Common Chaffinch (*Fringilla coelebs*), Common Chiffchaff (*Phylloscopus collybita*), Common Blackbird (*Turdus* *merula*), Eurasian Blackcap (*Sylvia atricapilla*), Eurasian Blue Tit (*Cyanistes caeruleus*), Great Tit (*Parus major*), European Robin (*Erithacus rubecula*), Song Thrush (Turdus philomelos), Marsh Tit (*Poecile palustris*), Eurasian Nuthatch (*Sitta europaea*), Hawfinch (*Coccothraustes coccothraustes*), Woodlark (*Lullula arborea*), Mistle Thrush (*Turdus viscivorus*) etc. The following are species which prefer more open scrub and mosaic habitats: Common Whitethroat (*Curruca communis*), Tree Pipit (*Anthus trivialis*), Red-backed Shrike (*Lanius collurio*), Cirl Bunting (*Emberiza citrinella*), Ortolan Bunting (*Emberiza hortulana*), etc. Furthermore, important breeding populations of several woodland species are recorded: Woodpeckers: European Green Woodpecker (*Picus viridis*), Black Woodpecker (*Dryocopus martius*), Grey-headed Woodpecker (*Picus canus*), White-backed Woodpecker (*Dendrocopos leucotos*) and Great Spotted Woodpecker (*Dendrocopos major*). The only significant breeding population of grassland associated species is that of Grey Partridge (*Perdix perdix*). Such composition of breeding bird community is fully consistent with the habitat composition and ecological quality at the WPP site, and expected.

8.3.5.1.2 Flight activity

Details of target species flight activity were recorded during VP surveys. An overview of flight activity recorded by 2021-2022 surveys is provided in Table 8-4, whilst the full list of records and maps of flight trajectories are is available in Appendix C.

The methodology implemented in 2019-2020 Preliminary Surveys (Milovanović 2020b) does not allow for the observed flight activity to be adequately quantified (see section 7.3.3.10). However, qualitative comparison of results of Preliminary Surveys and main ESIA Surveys is possible and considered useful in relation to recorded species, and to a certain extent, flight trajectories.

The flight activity of a total of 10 target species was recorded by the 2021-2022 VP surveys at the WPP location and immediate surroundings (Table 8-4: Black Stork (*Ciconia nigra*), European Honey Buzzard (*Pernis apivorus*), Short-toed Snake Eagle (*Circaetus gallicus*), Western Marsh Harrier (*Circus aeruginosus*), Eurasian Sparrowhawk (*Accipiter nisus*), Northern Goshawk (*Accipiter gentilis*), Black Kite (*Milvus migrans*), Common Buzzard (*Buteo buteo*), Long-legged Buzzard (*Buteo rufinus*) and Eurasian Hobby (*Falco subbuteo*) was recorded.

Table 8-4 Target Species Flight Activity Recorded by VP Surveys (March 2021 – February 2022)

No.in column 1 - same as in Table 8-5, for convenience; **Flight activity:** F_t - total number of flights observed [n], I_t - total number of birds (individuals) observed [n], I_C - number of birds observed at blade swept height [n], O_t - total bird occupancy observed = birds x flight time [n x s], O_C - bird occupancy observed at blade swept height = birds at blade swept height x flight time at blade swept height [n x s]. **Activity indices:** O_t/h - total bird occupancy observed per survey hour (of the period species occurs at the site) [n x s / h], O_C/h - bird occupancy observed at blade swept height per survey hour (of the period species occurs at the site) [n x s / h], rO_C - share of bird occupancy observed at blade swept height [%]; **Blade swept height (highlighted) / OHL height:** [1] – 36.5-199.5 m (for *N163-5.7*), [2] – 44.0-206.0 m (for *V162-5.6*), [3] – 30.5-179.5 m (for *N149-5.7*), [4] – 0.0-39.1 m (for OHL).

No.	Species name	Flight activity								Activity indices									
		F_t	I_t	I_C	O_t	O_C^1	O_C^2	O_C^3	O_C^4	O_t/h	O_C/h^1	O_C/h^2	O_C/h^3	O_C/h^4	rO_C^1	rO_C^2	rO_C^3	rO_C^4
12	*Ciconia nigra* Black Stork	2	5	1	360	0	0	0	0	15.00	0.00	0.00	0.00	0.00	0.0%	0.0%	0.0%	0.0%
21	*Pernis apivorus* European Honey Buzzard	7	8	2	658	103	107	103	0	16.53	2.64	2.75	2.30	0.00	15.7%	16.2%	13.9%	0.0%
22	*Circaetus gallicus* Short-toed Snake Eagle	13	13	8	1334	679	619	679	66	32.26	17.42	15.88	17.21	1.70	50.9%	45.6%	53.4%	8.9%
24	*Circus aeruginosus* Western Marsh Harrier	6	6	6	658	293	241	293	49	34.96	16.29	13.38	17.44	2.70	44.6%	36.1%	49.9%	11.2%
26	*Accipiter nisus* Eurasian Sparrowhawk	33	33	20	2396	347	120	347	181	33.12	4.82	1.67	7.23	2.52	14.5%	5.0%	21.8%	7.9%
27	*Accipiter gentilis* Northern Goshawk	18	21	17	1943	1133	1181	1133	0	24.95	15.74	16.40	13.70	0.00	58.3%	59.3%	54.9%	0.0%
28	*Milvus migrans* Black Kite	2	2	1	204	69	72	69	0	12.99	4.58	4.77	3.99	0.00	33.7%	34.6%	30.7%	0.0%
29	*Buteo buteo* Common Buzzard	159	218	161	36086	12858	11590	12858	1358	481.59	178.58	160.97	178.17	18.87	35.6%	31.7%	37.0%	5.4%
30	*Buteo rufinus* Long-legged Buzzard	10	10	6	967	412	429	412	0	25.38	11.44	11.93	9.96	0.00	42.6%	43.6%	39.3%	0.0%
43	*Falco subbuteo* Eurasian Hobby	3	3	3	249	107	76	107	27	6.15	2.74	1.95	3.21	0.68	43.0%	30.2%	52.1%	14.8%

8.3.5.2 Ecological Status

The surveys suggest that 106 species actively use the Crni Vrh WPP site and immediate surroundings; 65 for foraging and resting, and 75 for nesting. These are mostly breeding birds of woodland, scrub and grassland mosaic, and a small number of species which are occasionally or rarely present at the WPP site, only in non-breeding season (on migration, vagrancy and wintering).

54 (potentially) present species occur at the Crni Vrh WPP site and immediate surroundings, incidentally or rarely, most of them in negligible or small numbers, and 9 of them in a passage only.

The surveys did not record any regular occurrence of larger flocks of breeding or wintering birds that would be indicative of significant commuting flight paths between resting and foraging areas. The birds that regularly commute across the WPP site include:

- single individuals or pairs of Common Buzzard (*Buteo buteo*), Eurasian Sparrowhawk (*Accipiter nisus*), Northern Goshawk (*Accipiter gentilis*), and Long-legged Buzzard (*Buteo rufinus*);
- single individuals, or rarely small flocks (a few individuals) of Northern Raven (*Corvus corax*), as well as small flocks (several to twenty individuals) of Common Starling (*Sturnus vulgaris*), all from resident local populations.

The WPP site is not situated within any recognised flyways and the Surveys did not record regular or occasional occurrence of larger flocks of migrating birds. The surveys did record the passage of:

- Single individuals, or incidentally small flocks (a few individuals) of Black Stork (*Ciconia nigra*) and White Stork (*Ciconia ciconia*);
- single individuals of Western Marsh Harrier (*Circus aeruginosus*), Montagu's Harrier (*Circus pygargus*), Black Kite (*Milvus migrans*) and Lesser Grey Shrike (*Lanius minor*); and
- small flocks (a few to dozen individuals) of Common Swift (*Apus apus*), European Bee-eater (*Merops apiaster*), Sand Martin (*Riparia riparia*) and Common House Martin (*Delichon urbicum*);
- single migrating individuals or small flocks (a few individuals) of a few small passerine species were rarely or incidentally observed to rest and/or forage at the site.

The WPP site has minimal importance for wintering birds. Except for the resident local populations, only small wintering flocks (a few to few dozen individuals) of a few small passerine species occasionally forage and rest at the site. The flocks of Brambling (*Fringilla montifringilla*) with up to 50, Eurasian Siskin (*Spinus spinus*) of up to 20 and Eurasian Bullfinch (*Pyrrhula pyrrhula*) of up to dozen individuals are the most frequently recorded and the most abundant.

The composition of bird community, both in ecological and taxonomical aspect, is fully consistent with the habitat composition and ecological quality at the WPP site.

Table 8-5 Evaluation of Ecological Status of All Bird Species (Target Species Highlighted)

Records: + - within the site, [] –in wider surroundings only;
literature - Radišić (2021): EP79, 2016;
2019-2021 - Preliminary Surveys (Milovanović 2020a, b, Josimović et al. 2021a) ;
2021-2022 – Main ESIA Surveys.

Ecological status
occurrence: R - regular, O - occasional, r - rare, i - incidental, () - locally;
abundance: H - high, M - moderate, L - low, n - negligible, () - occasionally and/or locally;
seasonality: B - breeding, M - migrating, W - wintering, R - resident, n/d - not defined, () - rarely;
habitat use: N - nesting, F - foraging, R - resting, C - commuting, p - passage only,
? - probably, () - just beyond site boundary, [] –in wider surroundings only.

No.	Species name	Records			Ecological status				
		literature	2019-2021	2021-2022	occurrence	abundance	seasonality	habitat use	comment
1	*Coturnix coturnix* Common Quail		+	+	R	L	B, M	N, F, R	

No.	Species name	Records			Ecological status				
		literature	2019-2021	2021-2022	occurrence	abundance	seasonality	habitat use	comment
2	Phasianus colchicus Common Pheasant		+	**+**	R	L	R	N, F, R	
3	*Perdix perdix* Grey Partridge		+	**+**	R	M-H	R	N, F, R	
4	*Columba livia* f. *domestica* Domestic (Feral) Pigeon			**+**	i	n-L	[R], M	[N], (F, R), p	
5	*Columba palumbus* Common Wood Pigeon		+	**+**	R	M-H	B, M, W	N, F, R	
6	*Streptopelia turtur* European Turtle Dove		+	**+**	O	L	(B), M	(N), N?, F, R	
7	*Streptopelia decaocto* Eurasian Collared Dove		+		(i) *	(L) *	[B], M, W	[N], F?*, R?*, p*	*marginally (only in the area of off-site OHLs) small wintering flocks
8	*Caprimulgus europaeus* European Nightjar		+	**+**	R	n-L	B, M	N, F, R, p	
9	*Apus apus* Common Swift			**+**	r	L-M	M	p	
10	*Cuculus canorus* Common Cuckoo		+	**+**	R	M-H	B, M	N, F, R	
11	*Crex crex* Corn Crake		[+]	**+**	(R) *	(L) *	B	N*, F*, R*	*marginally (only humid meadows on eastern margin of the site)
12	*Ciconia nigra* Black Stork		+	**+**	i	n-L	M	p	
13	*Ciconia ciconia* White Stork		+		(i) *	(n-L) *	M	p	*marginally (only in the area of off-site OHLs)
14	*Scolopax rusticola* Eurasian Woodcock		+		r	n	R	[N], (N?), F?, R?, p	
15	*Athene noctua* Little Owl		[+]		(r) *	(n-L) *	R	[N], (N?, F, R) *, p	*only close to houses
16	*Otus scops* Eurasian Scops Owl		[+]		O*/r	n	B, M	[N], N?, F, R	*in immediate surroundings
17	*Asio otus* Long-eared Owl		[+]		O*/r	n-L	R	[N], N?, F, R	*in immediate surroundings
18	*Strix aluco* Tawny Owl		+	**+**	R	L	R	N, F, R	
19	*Strix uralensis* Ural Owl		+		i	n	[R], M	[N], F?, R?, p	
20	*Bubo bubo* Eurasian Eagle-Owl		[+]	**+**	i	n	[R], M	[N], F?, R?, p	
21	*Pernis apivorus* European Honey Buzzard		+	**+**	R	L	B, M	N, F, R, p	

No.	Species name	Records			Ecological status				
		literature	2019-2021	2021-2022	occurrence	abundance	seasonality	habitat use	comment
22	*Circaetus gallicus* Short-toed Snake Eagle		+	**+**	R	L	B, M	N, F, R, p	
23	*Aquila chrysaetos* Golden Eagle		[+]		i	n	[B], M, W	[N], p	
24	*Circus aeruginosus* Western Marsh Harrier			**+**	O	n-L	M	F, R, p	
25	*Circus pygargus* Montagu's Harrier		+		i	n	M	F?, R?, p	
26	*Accipiter nisus* Eurasian Sparrowhawk		+	**+**	R	L	R	N, F, R, C	
27	*Accipiter gentilis* Northern Goshawk		+	**+**	R	L	B, M, (W)	N, F, R, C	
28	*Milvus migrans* Black Kite			**+**	i	n	M	p	
29	*Buteo buteo* Common Buzzard		+	**+**	R	M	R	N, F, R, C	
30	*Buteo rufinus* Long-legged Buzzard			**+**	i/R*	n-L	B, M	(N?), F*, R*, C*, p	* southeastern part of the site
31	*Upupa epops* Eurasian Hoopoe		[+]		r	n	B, M	[N], N?, F, R	
32	*Merops apiaster* European Bee-eater		[+]	**+**	r	L-M	M	p	
33	*Jynx torquilla* Eurasian Wryneck		+	**+**	i	n	B, M	N?, F?, R?, p	
34	*Picus canus* Grey-headed Woodpecker		+	**+**	R	L-M	R	N, F, R	
35	*Picus viridis* European Green Woodpecker		+	**+**	R	M-H	R	N, F, R	
36	*Dryocopus martius* Black Woodpecker		+	**+**	R	M	R	N, F, R	
37	*Dryobates minor* Lesser Spotted Woodpecker		+	**+**	i	n	[R], M	[N], F, R	
38	*Dendrocoptes medius* Middle Spotted Woodpecker		+		i	n	[R], n/d	N?, F?, R?, p	
39	*Dendrocopos leucotos* White-backed Woodpecker		+	**+**	R	L-M	R	N, F, R	
40	*Dendrocopos syriacus* Syrian Woodpecker		[+]	**+**	i	n	[R], M, W	[N], F?, R?, p	
41	*Dendrocopos major* Great Spotted Woodpecker		+	**+**	R	L-M	R	N, F, R	
42	*Falco tinnunculus* Common Kestrel		+		i/r*	n	[B], M, W	[N], F*, R*, p	*marginally (only in the area of off-site OHLs)
43	*Falco subbuteo* Eurasian Hobby		+	**+**	R	L	B, M	N, F, R, p	

No.	Species name	Records			Ecological status				
		literature	2019-2021	2021-2022	occurrence	abundance	seasonality	habitat use	comment
44	*Falco peregrinus* Peregrine Falcon		+		i	n	[B], M, W	[N], p	
45	*Lanius collurio* Red-backed Shrike		+	**+**	R	H	B, M	N, F, R	
46	*Lanius minor* Lesser Grey Shrike		[+]	**+**	i	n	B, M	p	
47	*Lanius excubitor* Great Grey Shrike		+	**+**	r	n	W	F?, R?, p	
48	*Lanius senator* Woodchat Shrike		[+]		i	n	M	F?, R?, p	
49	*Oriolus oriolus* Eurasian Golden Oriole		+	**+**	R	M	B, M	N, F, R	
50	*Garrulus glandarius* Eurasian Jay		+	**+**	R	H	R	N, F, R	
51	*Pica pica* Eurasian Magpie		+	**+**	r*/i	n-L	[R], (M), W	[N], F*, R*, p	*marginally (only in the area of off-site OHLs)
52	*Coloeus monedula* Western Jackdaw		[+]		i	n	[R], M, W	[N], p	
53	*Corvus corax* Northern Raven		+	**+**	R	L-M	R	[N], F, R, C	
54	*Corvus cornix* Hooded Crow		+	**+**	R	M-H	R	N, F, R	
55	*Poecile palustris* Marsh Tit		+	**+**	R	H	R	N, F, R	
56	*Poecile lugubris* Sombre Tit			**+**	R*/r	n-L	R	(N), N?, F, R	*in immediate surroundings
57	*Periparus ater* Coal Tit			**+**	R	n-L	R	N, F, R	
58	*Parus major* Great Tit		+	**+**	R	H	R	N, F, R	
59	*Cyanistes caeruleus* Eurasian Blue Tit		+	**+**	R	H	R	N, F, R	
60	*Riparia riparia* Sand Martin			**+**	O	L-M	M	p	
61	*Hirundo rustica* Barn Swallow		+	**+**	R	L-M	B, M	(N?), F, R*	*on cables of existing OHLs
62	*Cecropis daurica* Red-rumped Swallow		+	**+**	R	L-M	B, M	N*, F, R	* buildings (ruins)
63	*Delichon urbicum* Common House Martin			**+**	O	L-M	M	p	
64	*Aegithalos caudatus* Long-tailed Tit		+	**+**	R	H	R	N, F, R	
65	*Galerida cristata* Crested Lark		+		i-r	n-L	W	F?, R?, p	

No.	Species name	Records			Ecological status				
		literature	2019-2021	2021-2022	occurrence	abundance	seasonality	habitat use	comment
66	*Lullula arborea* Woodlark		+	+	R	H	B, M	N, F, R	
67	*Alauda arvensis* Eurasian Skylark		+		i-r	n-L	B, M	N?, F?, R?, p	
68	*Hippolais icterina* Icterine Warbler		[+]	+	i	L	M	F, R, p	
69	*Phylloscopus trochilus* Willow Warbler			+	i	L	M	F, R, p	
70	*Phylloscopus collybita* Common Chiffchaff		+	+	R	H	B, M	N, F, R	
71	*Phylloscopus sibilatrix* Wood Warbler			+	R	L	B, M	N, F, R	
72	*Sylvia atricapilla* Eurasian Blackcap		+	+	R	H	B, M	N, F, R	
73	*Sylvia borin* Garden Warbler			+	i	n-L	M	F, R	
74	*Curruca communis* Common Whitethroat		+	+	R	H	B, M	N, F, R	
75	*Curruca curruca* Lesser Whitethroat		+	+	R	H	B, M	N, F, R	
76	*Curruca nisoria* Barred Warbler			+	R	n-L	B, M	N, F, R	
77	*Regulus regulus* Goldcrest		+	+	(R) */i	L	(R) */M, W	N*, F*, R*, p	*marginally (northern slope of Crni Vrh, mostly conifer plantations)
78	*Troglodytes troglodytes* Eurasian Wren		+	+	(R) */O	L	(R) */ (M), W	N*, F, R, p	*marginally (northern slope of Crni Vrh, mostly conifer plantations)
79	*Sitta europaea* Eurasian Nuthatch		+	+	R	H	R	N, F, R	
80	*Certhia familiaris* Eurasian Treecreeper			+	R	M	R	N, F, R	
81	*Certhia brachydactyla* Short-toed Treecreeper	+	[+]	+	(R) */i	n-L	R	N*, F*, R*, p	*marginally (only in the area of off-site OHLs)
82	*Sturnus vulgaris* Common Starling		+	+	R	L-M	B, M	(N), F, R, C	
83	*Turdus merula* Common Blackbird		+	+	R	H	R	N, F, R	
84	*Turdus pilaris* Fieldfare			+	O	L-M	W	F, R, p	
85	*Turdus philomelos* Song Thrush		+	+	R	H	B, M	N, F, R	
86	*Turdus viscivorus* Mistle Thrush		+	+	R	H/M*	R	N, F, R	*wintering

No.	Species name	Records			Ecological status				
		literature	2019-2021	2021-2022	occurrence	abundance	seasonality	habitat use	comment
87	*Erithacus rubecula* European Robin		+	+	R	H/M*	R	N, F, R	*wintering
88	*Luscinia megarhynchos* Common Nightingale		+	+	R	H	B, M	N, F, R	
89	*Phoenicurus ochruros* Black Redstart		+		r	n-L	B, M	N?, F?, R?	
90	*Phoenicurus phoenicurus* Common Redstart		+	+	R	M	B, M	N, F, R	
91	*Saxicola rubetra* Whinchat		+	+	R*/r	L	B*, M	N*, F*, R*, p	*marginally (northwestern margin of the site)
92	*Saxicola rubicola* European Stonechat		+	+	i	n-L	M	F, R	
93	*Oenanthe oenanthe* Northern Wheatear		+		i	n-L	M	F, R	
94	*Muscicapa striata* Spotted Flycatcher		[+]	+	r	L	(B), M	N?, F, R	
95	*Ficedula albicollis* Collared Flycatcher		+	+	R	H	B, M	N, F, R	
96	*Ficedula parva* Red-breasted Flycatcher			+	R*/i	n-L	B, M	N*, F, R	*marginally (northwestern margin of the site)
97	*Passer domesticus* House Sparrow		+		(r) *	(L-M) *	[B], M, W	[N], F?*, R?*, p*	*marginally (northwestern margin of the site) small wintering flocks
98	*Passer montanus* Eurasian Tree Sparrow		+		(r) *	(L) *	[B], M, W	[N], F?*, R?*, p*	*marginally (northwestern margin of the site) small wintering flocks
99	*Motacilla alba* White Wagtail		+	+	i	n	B	N?, F?, R?, p	
100	*Motacilla cinerea* Grey Wagtail		[+]	+	R*/i	L*/n	B	N*/N?, F?, R?, p	*marginally (southwestern margin of the site)
101	*Anthus trivialis* Tree Pipit		+	+	R	H	B, M	N, F, R	
102	*Anthus pratensis* Meadow Pipit		+	+	i	L	M, (W)	F, R	
103	*Anthus spinoletta* Water Pipit			+	i	L-M	M, (W)	F, R	
104	*Fringilla coelebs* Common Chaffinch		+	+	R	H	R	N, F, R	
105	*Fringilla montifringilla* Brambling			+	O	M	W	F, R	
106	*Serinus serinus* European Serin		+		i-r	L	M	F, R	
107	*Chloris chloris* European Greenfinch		+	+	R*/r	L-M*/L	(B), M, W	[N], N?, F*, R*, p	*non-breeding season

No.	Species name	Records			Ecological status				
		literature	2019-2021	2021-2022	occurrence	abundance	seasonality	habitat use	comment
108	*Spinus spinus* Eurasian Siskin			**+**	R	M	(M), W	F, R	
109	*Carduelis carduelis* European Goldfinch		+	**+**	R*/r	L-M* /L	(B), M, W	[N], N?, F*, R*, p	*non-breeding season
110	*Linaria cannabina* Common Linnet			**+**	O	L	[R], M, W	[N], F, R	
111	*Loxia curvirostra* Red Crossbill			**+**	i	L	W	F, R, p	
112	*Pyrrhula pyrrhula* Eurasian Bullfinch		+	**+**	O	L-M	W	F, R	
113	*Coccothraustes coccothraustes* Hawfinch		+	**+**	R	H/ L-M*	R	N, F, R	*wintering
114	*Emberiza calandra* Corn Bunting		+		r	n-L	M, (W)	F?, R?, p	
115	*Emberiza citrinella* Yellowhammer		+	**+**	R	H	R	N, F, R	
116	*Emberiza cirlus* Cirl Bunting		[+]		i-r	L	n/d	[N], N?, F?, R?	
117	*Emberiza cia* Rock Bunting		+		i	n-L	n/d	p	
118	*Emberiza hortulana* Ortolan Bunting		+	**+**	R	H	B, M	N, F, R	
Total number of species		**1**	**97**	**93**	**118**				
Number of target species		**1**	**18**	**12**	**21**				

8.3.5.3 Nature Conservation Evaluation

109 species (including all 21 target species), out of a total of 118 species recorded during the Preliminary and the ESIA surveys have been identified as of conservation concern.

The nature conservation value of the species recorded has been assessed based on occurring population ecological status at the WPP site (Table 8-5) and the share of the relevant wider population according to matrix presented in Table 7-5. The parameters of the relevant wider populations (European, national, relevant IBAs) used in this nature conservation evaluation are provided in Appendix C. The assessment of the nature conservation value of the occurring populations and their habitats is presented in Table 8-6.

Breeding/ resident populations of **24 species** (including 5 target species highlighted), were assessed as being of **significant nature conservation value**, these are: Grey Partridge (*Perdix perdix*), European Turtle Dove (*Streptopelia turtur*), Common Cuckoo (*Cuculus canorus*), European Honey Buzzard (*Pernis apivorus*), Short-toed Snake Eagle (*Circaetus gallicus*), Eurasian Sparrowhawk (*Accipiter gentilis*), Common Buzzard (*Buteo buteo*), Long-legged Buzzard (*Buteo rufinus*), Grey-headed Woodpecker (*Picus canus*), European Green Woodpecker (*Picus viridis*), Black Woodpecker (*Dryocopus martius*), White-backed Woodpecker (*Dendrocopos leucotos*), Marsh Tit (*Poecile palustris*), Eurasian Blue Tit (*Cyanistes caeruleus*), Long-tailed Tit (*Aegithalos caudatus*), Woodlark (*Lullula arborea*), Common Chiffchaff (*Phylloscopus collybita*), Common Whitethroat (Curruca communis), Lesser Whitethroat (*Curruca curruca*), Mistle Thrush (*Turdus viscivorus*), Common Redstart (*Phoenicurus phoenicurus*), Collared Flycatcher (*Ficedula albicollis*), Tree Pipit (*Anthus* *trivialis*) and Hawfinch (*Coccothraustes coccothraustes*), as well as two resident populations that were added as a precaution: Golden Eagle (*Aquila chrysaetos*) and Peregrine Falcon (*Falco peregrinus*).

By far the most valued breeding populations are:

- A single pair of Long-legged Buzzard (*Buteo rufinus*) are thought to be nesting in wider surroundings but regularly hunt in the south-eastern part of the WPP site.
- An abundant resident population of White-backed Woodpecker (*Dendrocopos leucotos*) that meets all their ecological requirements in the woodland at the WPP site.
- A resident population of Grey Partridge (*Perdix perdix*) (Figure 8-54) that meets all its ecological requirements in the grassland at the WPP site.
- Two pairs of Short-toed Snake Eagle (*Circaetus gallicus*) nesting within the site boundary, whilst the hunting territory of one of them is located in south part of the WPP site.

Habitats of the occurring populations within the Crni Vrh WPP site boundary were assessed as of **value at the local level** (i.e. only for the present individuals) at the most, and of **not significant nature conservation value**.

The nature conservation evaluation undertaken here is not comparable with the evaluation undertaken following the Preliminary Surveys. The assessors used different terminology and were not clear about the criteria used in corresponding reports (Milovanović 2020a, b, Josimović et al. 2021a). As a consequence, the ESIA assessment has not relied upon the findings or evaluation of the Preliminary Surveys.

Figure 8-54 Valued Resident Population of Grey Partridge (*Perdix perdix*)

There are nests in grassland at the WPP site: adult – left, hen with chicks – right.

Table 8-6 below, provides a summary of the nature conservation value of populations and habitats of bird species of conservation concern. Target species have been highlighted.

Table 8-6 Nature Conservation Value of Populations and Habitats of Bird Species of Conservation Concern

No. in column 1 - same as in Table 8-5, for convenience;

Target species highlighted

Population / Habitats - rating and scale of nature conservation value assessed on the basis of species abundance (Table 8-3) and ecological status at the site, population parameters (Appendix C) and conservation status (Appendix C); populations and habitats valued at the regional level or higher are considered to be of significant conservation value (**blue**) ;
rating (grade): major, moderate, minor, negligible, no;
scale (level): local (municipal), regional (East Serbia), national (Serbia), European, global;
() - at the most;
bold and ***bold italic*** refer to particular habitat types/elements and/or populations marked accordingly in the Justification column;

Justification- summarised, complete data and references are provided in tables and text above and Appendix C.

No.	Species name	Population	Habitats	Justification
1	*Coturnix coturnix* Common Quail	negligible	**minor local** / negligible	Small local breeding population (a few pairs max.) meets all its ecological requirements within **grassland** at the site.
3	*Perdix perdix* Grey Partridge	**major regional**	**major local** / negligible	Relatively large local resident population (= up to 1.6% of regional, VU) meets all its ecological requirements within **grassland** at the site.
6	*Streptopelia turtur* European Turtle Dove	**moderate regional**	**moderate**/ ***minor* local**	Small local breeding population (a few pairs max, VU) nests in surroundings **woodland**, possible also at the site, and forages throughout the mosaic in the area.
8	*Caprimulgus europaeus* European Nightjar	negligible	negligible	Small local breeding population (a few pairs max) meets all its ecological requirements within the site.
9	*Apus apus* Common Swift	negligible	no	Only rarely passage of small migrating flocks.
10	*Cuculus canorus* Common Cuckoo	**minor regional**	**moderate local** / negligible	Relatively large local breeding population (= up to 1.3% of regional) meets all its ecological requirements within **woodland and scrub** at the site.
11	*Crex crex* Corn Crake	major local	**major local** / negligible	Two pairs (few max. = up to 1% of regional breeding population) meet all their ecological requirements within **humid meadows and marshlands** at the site.
12	*Ciconia nigra* Black Stork	negligible	no	Only incidental passage of single individuals or small migrating flocks (= up to 3% of national breeding population).
13	*Ciconia ciconia* White Stork	negligible	no	Only incidental passage of single individuals or small migrating flocks (<1% of national breeding population)
14	*Scolopax rusticola* Eurasian Woodcock	moderate local	**minor local** / negligible	Only rare passage, and possible foraging, in **woodland** at the site, of single individuals of unabundant, though relatively large population (= up to 3% of regional) nesting in wider, and possibly (occasionally) immediate, surroundings.
15	*Athene noctua* Little Owl	(negligible)	no	Only rare passages of single individuals of small population nesting in immediate surroundings.
16	*Otus scops* Eurasian Scops Owl	negligible	negligible	Max. one pair foraging, and possibly occasionally nesting, in the area (regularly in surrounding.)
17	*Asio otus* Long-eared Owl	minor local	negligible	A few pairs max. rarely forages, and possibly occasionally nest, within the site (regularly in surrounding.)

No.	Species name	Population	Habitats	Justification
18	*Strix aluco* Tawny Owl	minor local	**minor local** / negligible	Two pairs are residents of the of the **woodland** at the site which provides them for all of their ecological requirements.
19	*Strix uralensis* Ural Owl	(negligible)	(negligible)	Only incidental passages, and possible foraging, in non-breeding season of single individuals (nesting in wider surroundings).
20	*Bubo bubo* Eurasian Eagle-Owl	negligible	negligible	Only incidental passages, and possible foraging, in non-breeding season of single individuals (nesting in wider surroundings).
21	*Pernis apivorus* European Honey Buzzard	**minor regional**	moderate local	Three pairs (= up to 1.7% of regional population) nest and regularly forage at the site.
22	*Circaetus gallicus* Short-toed Snake Eagle	**major regional**	major local	Two pairs (=ca. 5% of regional population, NT) nest and regularly forage at the site.
23	*Aquila chrysaetos* Golden Eagle	negligible (*precautionary* ***minor regional***)	no	Only incidental passage of single individuals in non-breeding season (DD). However, precaution is justified because it is resident in wider surroundings, and even single individuals constitute up to 2.8% of regional breeding population (VU).
24	*Circus aeruginosus* Western Marsh Harrier	minor local	negligible	Only incidental passages and foraging of migrating single individuals or pairs.
25	*Circus pygargus* Montagu's Harrier	negligible	no (negligible)	Only incidental passages, and possible foraging, of single migrating individuals.
26	*Accipiter nisus* Eurasian Sparrowhawk	minor local	minor local	One pair (= up to 0.3% of regional population) nests and regularly forages at the site.
27	*Accipiter gentilis* Northern Goshawk	**moderate regional**	minor local	Two pairs (= up to 1% of regional population, VU) nest and regularly forage at the site.
28	*Milvus migrans* Black Kite	negligible	no	Only incidental passage of single migrating individuals (DD).
29	*Buteo buteo* Common Buzzard	**minor regional**	**major local**	Relatively abundant local resident population (=up to 3.3% of regional) regularly nests and forages at the site.
30	*Buteo rufinus* Long-legged Buzzard	**major national**	**major local** / negligible	Single individuals regularly forage in **southeastern part of the site** during nesting season, elsewhere only incidental in passage. These individuals most likely belong to a single pair (= up to 4.5% of national population, VU) nesting in wider surroundings.
31	*Upupa epops* Eurasian Hoopoe	negligible	negligible	Single individuals of small population (a few pairs max.) nesting in wider surroundings, only rarely forage, and possible (occasionally) nest at the site.
32	*Merops apiaster* European Bee-eater	negligible	no	Only occasional passages of small migrating flocks.
33	*Jynx torquilla* Eurasian Wryneck	minor local	negligible (minor local)	Only incidental passages of single individuals in breeding season (though nesting and foraging possible as well).
34	*Picus canus* Grey-headed Woodpecker	**minor regional**	**major local** / negligible	Relatively large local resident population (up to 4% of regional) meets all its ecological requirements within the **woodland** at the site.

No.	Species name	Population	Habitats	Justification
35	*Picus viridis* European Green Woodpecker	**minor regional**	**major local** / negligible	Relatively large local resident population (up to 3.4% of regional) meets all its ecological requirements within the **woodland** at the site.
36	*Dryocopus martius* Black Woodpecker	**minor regional**	**major local** / negligible	Relatively large local resident population (up to 5% of regional) meets all its ecological requirements within the **woodland** at the site.
37	*Dryobates minor* Lesser Spotted Woodpecker	negligible	negligible	Only in non-breeding season incidental passage and foraging of single individuals (nesting in wider surroundings).
38	*Dendrocoptes medius* Middle Spotted Woodpecker	(negligible)	no (negligible)	Only incidental passages of single individuals (nesting in wider surroundings), though nesting and foraging possible as well.
39	*Dendrocopos leucotos* White-backed Woodpecker	**major national**	**major local** / negligible	Relatively large local resident population (up to 5.5% of national, VU) meets all its ecological requirements within the **woodland** at the site.
40	*Dendrocopos syriacus* Syrian Woodpecker	(negligible)	no (negligible)	Only incidental passage, and possible foraging, of single individuals (nesting in wider surroundings).
41	*Dendrocopos major* Great Spotted Woodpecker	major local	**minor local** / negligible	Abundant, though relatively small local resident population (= up to 0.1% of regional) meets all its ecological requirements within the **woodland** at the site.
42	*Falco tinnunculus* Common Kestrel	negligible	negligible	Single individuals (nesting in wider surroundings) occur at the site only during non-breeding season in rare passage, marginally also foraging.
43	*Falco subbuteo* Eurasian Hobby	major local	moderate local	One pair (= up to 1% of regional population) nests and rarely forages at the site.
44	*Falco peregrinus* Peregrine Falcon	negligible (precautionary ***minor national***)	no	Only incidental passage of single individuals in non-breeding season (NT). However, precaution is justified because it is resident in wider surroundings, and even single individuals constitute up to 1.2% of national breeding population (EN)(= up to 3.8% of regional, and up to 17% of relevant IBA population).
45	*Lanius collurio* Red-backed Shrike	moderate local	**moderate local** / negligible	Abundant, though relatively small local breeding population (= up to 0.8% of regional) meets all its ecological requirements mainly within the **scrub** at the site.
46	*Lanius minor* Lesser Grey Shrike	negligible	no	Only incidental passages of single migrating individuals.
47	*Lanius excubitor* Great Grey Shrike	negligible	no (negligible)	Only incidental passage, and possible foraging and resting, of single wintering individuals.
48	*Lanius senator* Woodchat Shrike	(negligible)	no (negligible)	Only incidental passage, and possible foraging and resting, of single migrating individuals.
49	*Oriolus oriolus* Eurasian Golden Oriole	minor local	**minor local** / negligible	Abundant, though relatively small local breeding population (= up to 0.2% of regional meets all its ecological requirements mainly within the **woodland and mosaic habitats** at the site.
55	*Poecile palustris* Marsh Tit	**minor regional**	**moderate local** / negligible	Abundant, and relatively large local resident population (= up to 1.4% of regional) meets all its

No.	Species name	Population	Habitats	Justification
				ecological requirements mainly within the **woodland** at the site.
56	*Poecile lugubris* Sombre Tit	negligible	(negligible)	Single individuals of unabundant local resident population (a few pairs max.) rarely forage, and possibly occasionally nest, at the site.
57	*Periparus ater* Coal Tit	negligible	negligible	Single individuals of unabundant local resident population (a few pairs max.) forage and nest at the site.
58	*Parus major* Great Tit	minor local	**minor local** / negligible	Abundant, though relatively small local resident population (= up to 0.3% of regional) meets all its ecological requirements mostly within the **woodland and mosaic habitats** at the site.
59	*Cyanistes caeruleus* Eurasian Blue Tit	**minor regional**	**moderate local** / negligible	Abundant and relatively large local resident population (= up to 1.3% of regional) meets all its ecological requirements mostly within the **woodland and mosaic habitats** at the site.
60	*Riparia riparia* Sand Martin	negligible	no	Only occasional passage of small migrating flocks.
61	*Hirundo rustica* Barn Swallow	negligible	negligible	Regular foraging and resting in breeding season of single individuals and small flocks (probably nesting in wider surroundings). Slightly larger flocks (30-40 individuals) only on migration.
62	*Cecropis daurica* Red-rumped Swallow	minor local	minor local	Relatively small local resident population (up to 0.4% of regional) meets all its ecological requirements at the site. Only incidentally small flocks in passage on migration.
63	*Delichon urbicum* Common House Martin	negligible	no	Only occasional passage of very small migrating flocks.
64	*Aegithalos caudatus* Long-tailed Tit	**minor regional**	moderate local	Relatively abundant local resident population (up to 1.1% of regional) meets all its ecological requirements at the site.
65	*Galerida cristata* Crested Lark	(negligible)	no (negligible)	Only incidental passage, and possibly foraging and resting, of single wintering individuals.
66	*Lullula arborea* Woodlark	**minor regional**	**moderate local** / negligible	Relatively abundant local breeding population (up to 4.3% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.
67	*Alauda arvensis* Eurasian Skylark	(minor local)	**(minor local)** / negligible	Small share of unabundant local breeding population meets all its ecological requirements **in grassland** at the site (probably more in surroundings).
68	*Hippolais icterina* Icterine Warbler	negligible	negligible	Only incidental foraging and resting of single migrating individuals.
69	*Phylloscopus trochilus* Willow Warbler	negligible	negligible	Only incidental foraging and resting of single migrating individuals.
70	*Phylloscopus collybita* Common Chiffchaff	**minor regional**	**moderate local** / negligible	Very abundant and relatively large local breeding population (= up to 1.3% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.

No.	Species name	Population	Habitats	Justification
71	*Phylloscopus sibilatrix* Wood Warbler	major local	**moderate local** / negligible	Scarce and relatively small local breeding population (= up to 1% of regional) meets all its ecological requirements **in woodland** at the site.
72	*Sylvia atricapilla* Eurasian Blackcap	minor local	**minor local** / negligible	Very abundant, though relatively small local breeding population (= up to 0, 4% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.
73	*Sylvia borin* Garden Warbler	negligible	negligible	Only occasional foraging and resting of single migrating individuals.
74	*Curruca communis* Common Whitethroat	**minor regional**	**moderate local** / negligible	Abundant and relatively large local breeding population (= up to 4. 1% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.
75	*Curruca curruca* Lesser Whitethroat	**minor regional**	**moderate local** / negligible	Relatively large local breeding population (= up to 2.3% of regional) meets all its ecological requirements **in scrub** at the site.
76	*Curruca nisoria* Barred Warbler	negligible	negligible	Scarce local breeding population meets all its ecological requirements at the site.
77	*Regulus regulus* Goldcrest	major local	**major local** / negligible	Unabundant local resident population (a few pairs max. = up to 1% of regional) meets all its ecological requirements **in woodland on the northern slope of the Crni Vrh**, elsewhere only incidentally in passage in non-breeding season.
78	*Troglodytes troglodytes* Eurasian Wren	minor local	**minor local** / negligible	Scarce local resident population (few pairs max.) meets all its ecological requirements **in woodland on the northern slope of the Crni Vrh**, elsewhere only incidentally in passage and foraging in non-breeding season.
79	*Sitta europaea* Eurasian Nuthatch	minor local	**minor local** / negligible	Abundant, though relatively small local resident population (= up to 0.3% of regional) meets all its ecological requirements **in woodland** at the site.
80	*Certhia familiaris* Eurasian Treecreeper	major local	**moderate local** / negligible	Relatively small local resident population (= up to 0.9% of regional) meets all its ecological requirements **in woodland** at the site.
81	*Certhia brachydactyla* Short-toed Treecreeper	negligible (minor local)	**(minor local)** / negligible	One pair (a few pairs max.) of scarce local resident population meets all its ecological requirements **in woodland** at the site.
82	*Sturnus vulgaris* Common Starling	negligible	negligible	One pair/family regularly nests and forages at the site. Small flocks (up to twenty individuals) regularly in passage and foraging on migration.
83	*Turdus merula* Common Blackbird	moderate local	**moderate local** / negligible	Very abundant though relatively small local resident population (= up to 0.7% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.
84	#N/A	negligible	negligible	Only occasional passages, foraging and resting of single individuals or small wintering flocks.
85	*Turdus philomelos* Song Thrush	minor local	**minor local** / negligible	Abundant though relatively small local breeding population (up to 0.3% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.

No.	Species name	Population	Habitats	Justification
86	*Turdus viscivorus* Mistle Thrush	minor regional	**moderate local** / negligible	Abundant and relatively large local resident population (up to 3.2% of regional) meets all its ecological requirements **in woodland** at the site.
87	*Erithacus rubecula* European Robin	minor local	**minor local** / negligible	Abundant and relatively small local resident population (up to 0.4% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.
88	*Luscinia megarhynchos* Common Nightingale	minor local	**(minor local)** / negligible	Relatively small local breeding population (=up to 0.1% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.
89	*Phoenicurus ochruros* Black Redstart	negligible	negligible	Only rare foraging, and possible nesting of single individuals (of unabundant local breeding population) at the site.
90	*Phoenicurus phoenicurus* Common Redstart	minor regional	**moderate local** / negligible	Unabundant, though relatively large local breeding population (=up to2. 3% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.
91	*Saxicola rubetra* Whinchat	negligible (minor local)	negligible **(minor local)**	One pair (a few max.) of unabundant local resident population meets all its ecological requirements **in grassland**, mostly in **northwestern parts of the site.**
92	*Saxicola rubicola* European Stonechat	negligible	negligible	Only incidental foraging and resting of single migrating individuals.
93	*Oenanthe oenanthe* Northern Wheatear	(negligible)	(negligible)	Only incidental foraging and resting of single migrating individuals.
94	*Muscicapa striata* Spotted Flycatcher	negligible (minor local)	negligible (minor local)	Only occasional foraging at the site in non-breeding season, though possible (occasional) nesting of single individuals (of unabundant local breeding population).
95	*Ficedula albicollis* Collared Flycatcher	minor regional	**moderate local** / negligible	Relatively large local breeding population (=up to 2.8% of regional) meets all its ecological requirements **in better preserved woodland** at the site.
96	*Ficedula parva* Red-breasted Flycatcher	minor local	**minor local** / negligible	One pair (a few max. = up to 1% of regional resident population) meets all its ecological requirements **in grassland**, mostly in **northeastern parts of the site.**
97	*Passer domesticus* House Sparrow	negligible	negligible	Rare passage, possible foraging and resting, of single individuals and small flocks (of local resident population nesting in wider surroundings) only in the area of off-site OHLs, in non-breeding season.
98	*Passer montanus* Eurasian Tree Sparrow			
99	*Motacilla alba* White Wagtail	negligible	negligible	Only incidental passages, possible foraging and (occasional) nesting, of single individuals of scarce local breeding population, at the site.
100	*Motacilla cinerea* Grey Wagtail	negligible	negligible	One pair (a few max.) of unabundant local resident population meets all its ecological requirements in **south western parts of the site.**

No.	Species name	Population	Habitats	Justification
101	*Anthus trivialis* Tree Pipit	**moderate regional**	**major local** / negligible	Abundant and relatively large local breeding population (= up to 5.9% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.
102	*Anthus pratensis* Meadow Pipit	(negligible)	(negligible)	Only in non-breeding season incidental foraging and resting of single individuals at the site.
103	*Anthus spinoletta* Water Pipit	negligible	negligible	Only incidental foraging and resting of single wintering individuals (and very small flocks) at the site.
104	*Fringilla coelebs* Common Chaffinch	moderate local	**moderate local** / negligible	Very abundant, though relatively small local breeding population (= up to 0.6% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.
105	*Fringilla montifringilla* Brambling	negligible	negligible	Only occasional foraging and resting of small wintering flocks (up to fifty individuals) at the site.
106	*Serinus serinus* European Serin	(negligible)	(negligible)	Only rarely foraging and resting of single migrating individuals.
107	*Chloris chloris* European Greenfinch	negligible	negligible	Only regular foraging and resting of single individuals and small flocks in non-breeding season. In breeding season only rarely in passage (although small local resident population is present in wider surroundings).
108	*Spinus spinus* Eurasian Siskin	negligible	negligible	Only occasional foraging and resting of small wintering flocks (up to twenty individuals) at site.
109	*Carduelis carduelis* European Goldfinch	negligible	negligible	Only foraging, possibly (occasional) nesting, of single individuals of scarce local resident population at site. Regular foraging and resting of single individuals and small flocks in non-breeding season at site.
110	*Linaria cannabina* Common Linnet	negligible	negligible	Only occasional foraging and resting in non-breeding season at the site (although unabundant local resident population is present in wider surroundings).
111	*Loxia curvirostra* Red Crossbill	negligible	negligible	Only occasional foraging and resting of single wintering individuals at the site.
112	*Pyrrhula pyrrhula* Eurasian Bullfinch	negligible	negligible	Only occasional foraging and resting of small wintering flocks (up to ten individuals) at the site.
113	*Coccothraustes coccothraustes* Hawfinch	**minor regional**	**moderate local** / negligible	Relatively large local resident population (=up to 1.6% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site. Only single individuals and small flocks on wintering.
114	*Emberiza calandra* Corn Bunting	negligible	negligible	Only occasional foraging and resting of single wintering individuals at the site.
115	*Emberiza citrinella* Yellowhammer	moderate local	**moderate local** / negligible	Abundant, though relatively small local breeding population (= up to 0.8% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.

No.	Species name	Population	Habitats	Justification
116	*Emberiza cirlus* Cirl Bunting	(negligible)	(negligible)	Only rare foraging and resting, and possibly breeding, of single individuals (of local resident population which regularly nests in wider surroundings).
117	*Emberiza cia* Rock Bunting	(negligible)	no	Only incidental passages of single individuals in non-breeding season at the site.
118	*Emberiza hortulana* Ortolan Bunting	moderate local	**moderate local** / negligible	Relatively small local breeding population (=up to 0.7% of regional) meets all its ecological requirements **in woodland and mosaic habitats** at the site.

8.3.6 Bats

This section provides an overview of the survey results, characterisation of the ecological status of all bat populations occurring within the Crni Vrh WPP site and immediate surroundings, and nature conservation evaluation of these populations and their habitats.

8.3.6.1 Survey Results

An overview of the results of the pre-construction 2020-2021 and the main ESIA Surveys is provided in this section, as well as comparisons with the 2019-2021 Preliminary Surveys results. Full results of the 2020-2021 main ESIA Surveys are provided in Appendix C.

A total of 22 bat species were recorded by the main ESIA Surveys, and 11 by the Preliminary Surveys (Table 8-11). No current bat records (2011-2021) from the WPP site area were found by the desk study.

Based on the occurrence in the wider surroundings (Paunović et al. 2020) and the presence (at least partially) of suitable habitats at the site, the occurrence of two more species is assessed as probable, and further six as possible; i.e. a total of 24 and 30 respectively.

Species belonging to all four European bat families were recorded: Vesper Bats (Vespertilionidae): 17 species (+ 2 probably / 4 possibly), Horseshoe Bats (Rhinolophidae): 3 (+ 0 / 2), as well as Bent-Winged Bats (Miniopteridae) and Free-Tailed Bats (Molossidae): 1 species each.

The 22 species recorded on site accounts for more than two-thirds of the national bat fauna, and almost three quarters of the regional bat fauna (Paunović *et al.* 2020, ESIA Team's data). In terms of species diversity alone, the bat fauna of the site and in immediate surroundings can be evaluated as **high**.

8.3.6.1.1 Bat roosting

No bat roosts were found in buildings within Crni Vrh WPP site and immediate surroundings. The preliminary roost assessment identified 47 individual buildings or small complexes (farmsteads) as potential bat roosts. However, the exhaustive surveys (external and internal daytime inspection) did not find any bat roosts or evidence of bat roosting. Moreover, most of the buildings identified during the preliminary roost assessment were found to be completely derelict or non-existent. Several structures were found to have negligible roosting potential and none had the potential for larger bat colonies (Appendix C, section 8.3.3.7).

It is evident that roosts in buildings, suitable at least for a small number of bats, exist in the wider surroundings. This is indicated by the occurrence at the site of a highly anthropophilic species (Dietz et al. 2009, Paunović et al. 2011, 2020) such as Kuhl's Pipistrelle Bat (*Pipistrellus kuhlii*). It is possible that such roosts are used by occurring individuals of a few more facultatively anthropophilic species.

No bat roosts in speleological features either have been found within Crni Vrh WPP site and immediate surroundings by both main ESIA Surveys and Preliminary Surveys. The preliminary roost assessment did not identify any speleological (or any other underground) features at site and immediate surroundings, which is fully expected because the geological substrate of the area is not karstic (limestone). Therefore, **no** roosting **potential** for cave-roosting bats at the site and immediate surroundings has been ascertained.

No bat roosts were found within the scope 2020-2021 off-site OHL Preliminary Surveys, and thus only evaluation of the area roosting potential has been undertaken, which is presented in section 1.2.2 of the off-site OHLs SEIA Report (Josimović et al. 2021a).

In the wider surroundings, several underground roosts were found during the Preliminary Surveys. These roosts were in four, very small caves located in the gorges of the Tisnica River and its tributary Crna Reka to the east of the site. Roosting of single hibernating individuals of four typical cave-roosting *species* was recorded: Lesser Horseshoe Bat (*Rhinolophus hipposideros*), Mediterranean Horseshoe Bat (*Rhinolophus euryale*), Greater Horseshoe Bat (*Rhinolophus ferrumequinum*), and Schreiber's Bent-winged Bat (*Miniopterus schreibersii*. The caves are located at a distance between 8.5 and 11 km from the site boundary, which is within the maximum commuting distances of these species (Rodrigues et al. 2015, Dietz et al. 2009), although at the upper limit for the Lesser Horseshoe Bat. It is possible that the few individuals of these species occurring at the site use these particular roosts during the activity season. Also, no caves were found by Preliminary Surveys in the area between the site boundary and the Veliki Krš mountain (Milovanović 2020b).

Unlike anthropogenic and underground roost sites, there is an abundance of potential roosting features in trees at the site and immediate surroundings. The surveys did not attempt to identify roosts in trees since bats change such roosts every few days. Instead, the potential of tree-roosts in certain areas was evaluated (see section 8.3.3.4). Based on the recorded display calls and/ or display flights, a number of display territories / mating roosts in trees has been identified at the site and immediate surroundings: 2-3 of Common Pipistrelle Bat (*Pipistrellus pipistrellus*), 12-15 of Nathusius' Pipistrelle Bat (*Pipistrellus nathusii*), 16-20 of Noctule Bat (*Nyctalus noctula*), and 7-9of Leisler's Bat (*Nyctalus leisleri*).

The potential (and recorded mating) roosts in trees at the site were found to be abundant and diverse in areas of better preserved and older forest stands. A small share of the total roost stock of tree-roosting bat species local populations was also found in other forest habitats and even in individual trees within the entire habitat mosaic. Ten, typical tree-roosting bat species certainly roost in the trees at the site and immediate surroundings, these are: Soprano Pipistrelle Bat (*Pipistrellus pygmaeus*), Common Pipistrelle Bat (*Pipistrellus pipistrellus*), Nathusius' Pipistrelle Bat (*Pipistrellus nathusii*), Bechstein's Bat (*Myotis bechsteinii*), Whiskered Bat (*Myotis mystacinus*), Alcathoe Whiskered Bat (*Myotis alcathoe*), Daubenton's Bat (*Myotis daubentonii*), Western Barbastelle Bat (*Barbastella barbastellus*), Noctule Bat (*Nyctalus noctula*), and Leisler's Bat (*Nyctalus leisleri*).

It is possible that five more species use such roosts facultatively and/ or in certain stages of the life cycle: Natterer's Bat (*Myotis nattereri*), Lesser Mouse-eared Bat *(Myotis blythii*), Greater Mouse-eared Bat (*Myotis myotis*), the common fringed nightjar (Myotis nattereri), the southern great nightjar (Myotis blythii), the European great nightjar (Myotis myotis), Brown Long-eared Bat (*Plecotus auritus*), and Serotine Bat (*Eptesicus serotinus*).

It is concluded that the roosts at the site are only a small proportion of the total stock that local populations of tree-roosting bat species use and regularly change, the majority are located in the wider surroundings.

8.3.6.1.2 Trapping Surveys

The results from the 2021 Trapping Surveys are summarised in Table 8-7, below. A total of 5 bats from 4 species was caught over the course of 3 survey nights, each at a different locality. No Trapping Surveys were undertaken within the scope of the Preliminary Surveys.

Table 8-7 Overview of the Results of Bat Trapping Survey at the Crni Vrh WPP Site in 2021

Loc. –trapping locality as in Figure 7-2;
N - number of bats caught.

Loc.	Date	Trapping equipment used (survey effort)	Bats caught		
			Species name	N	Age class, sex, reproductive status
M1	8/7/2021	mist-nets: 164 m harp traps: 2	Noctule Bat (*Nyctalus noctula*)	1	adult, female
			Bechstein's Bat *(Myotis bechsteinii)*	1	adult, female, lactating
M2	10/7/2021	mist-nets: 185 m harp traps: 2	Whiskered Bat *(Myotis mystacinus)*	1	adult male
M3	3/9/2021	mist-nets: 160 m harp traps: 1	Common Pipistrelle Bat *(Pipistrellus pipistrellus)*	1	adult, female
			Common Pipistrelle Bat *(Pipistrellus pipistrellus)*	1	juvenile, male

Loc.	Date	Trapping equipment used (survey effort)	Bats caught		
			Species name	N	Age class, sex, reproductive status
3	3	509 m / 5	4	5	

The survey methodology adopted (see section 7.3.3.13) identified and used locations with the highest level of bat activity within the developed area and had habitat structure appropriate for trapping. Trapping was carried out in the optimal time period; the weather conditions were optimal and bat activity maximal for the particular areas. However, the number of bats caught was relatively small. This is considered to be accurate and reflects the relatively low levels of bat activity within the survey area.

8.3.6.1.3 Flight activity

Bat flight activity was surveyed during 2021 at ground level along transects throughout the developed area of the site (manual Transect Surveys), at selected WTG locations (Automated Surveys), and at blade-swept height (using automated bat registration systems installed at meteorological masts). The quantitative overview of the overall flight activity from these Surveys is provided in Table 8-8, the spatial distribution of activity is presented in Table 8-9 and Figure 8-55, and temporal in Table 8-10 and Figure 8-56, whilst complete survey data are provided in Appendix C. The Preliminary Surveys reports do not provide a quantitative overview of the bat flight activity or any (detailed) survey data. Only lists of the species recorded by activity surveys are provided (per habitat types or certain spatial units).

The 2021 main ESIA activity Surveys recorded a minimum of 22 species, 20 were recorded during the 2021 main ESIA Transect Surveys. In addition, eight species were recorded during the 2020-2021 off-site OHL Preliminary Surveys, and two during the 2020 WPP Preliminary Surveys.

The number of species is given as a minimum as certain species were considered as groups. However, when taking in to account the species occurrence in the Carpathian Serbia region, the presence of suitable foraging habitats and roosting possibilities at the site (and/or within commuting distances), more than one species from two of these groups are expected to occur: Greater Mouse eared Bat (*Myotis myotis*) and Lesser Mouse-eared Bat (*Myotis blythii*), Brown Long eared Bat (*Plecotus auritus*) and Grey Long-eared Bat (*Plecotus austriacus*). For other groups, only the occurrence of the Whiskered Bat (*Myotis mystacinus*) is expected and its occurrence was also positively confirmed by Trapping Surveys.

The flight activity of two more species, Pond Bat *(Myotis dasycneme*) and European Free-tailed Bat (*Tadarida teniotis*), was recorded only by automated surveys (Pond Bat at the ground level and above the canopy, and European Free-tailed Bat above the canopy and at blade-swept height). It should be noted that the finding of the European Free-tailed Bat is also of particular scientific interest, because this is the first record of the species in Carpathian Serbia region, and it was up to date reliably recorded in Serbia only in furthest southwest region of Vlasina (Pejić et al. 2017, Paunović et al. 2020). When taking these matters into account, the total number of species occurring at the site is very likely to be 24, and the species richness of the area is evaluated as **high**.

The remaining six of the Carpathian Serbia species: Blasius's Horseshoe Bat (*Rhinolophus blasii*), Mehely's Horseshoe Bat (*Rhinolophus mehelyi*), Savi's Pipistrelle Bat (*Hypsugo savii*), Natterer's Bat (*Myotis nattereri*), Brandt's Bat (*Myotis brandtii*), and Long-fingered Bat (*Myotis capaccinii*), could possibly occur at the site, though only incidentally, since foraging habitats are sub-optimal and there is a lack of roosting possibilities within commuting distances.

No single species is dominant in the bat community at the site, although at least three species can be considered co-dominant: Western Barbastelle Bat (*Barbastella barbastellus*), Whiskered Bat (*Myotis mystacinus*) and Common Pipistrelle Bat (*Pipistrellus pipistrellus*). All the rest, at least occasionally and/or locally, occur in a non-negligible relative abundance. This means that the diversity of local bat fauna should be evaluated as **high** in a quantitative sense as well.

The overall recorded bat activity at the site is low for each of the species' groups identified by the automated surveys, and negligible for each species taken individually (on transects). Such a low overall activity does not indicate a high importance of the surveyed (i.e. developed) area of the site as a whole for the local bat fauna.

However, the activity is not evenly distributed in space (Table 8 9. Figure 8 55) and time (Table 8 10, Figure 8 56), so occasionally and/ or locally, most species were recorded with significantly higher activity, whilst certain indicative spatial and/ or temporal patterns can be identified.

Table 8-8 Overview of the Bat Flight Activity (April - November 2021) and Activity Indices

For clearer presentation, when species/ group was not recorded table cells are left blank, whilst crossed-out cells indicate inapplicability.

Flight activity:

N- total number of passes (contacts) observed/recorded [n];

Activity indices:

AI - activity index, number of bat passes recorded per time unit [contacts/h];

cA - relative abundance, percentage of passes attributed to particular species/group of the total passes identifiable to the highest applicable species/group level, corrected by species-specific detectability coefficient (Appendix C) [%].

<table>
<tr><th rowspan="2">Species / group Name</th><th colspan="3">Transect Surveys</th><th colspan="3">Automated Surveys</th><th colspan="3">Surveys at Height</th></tr>
<tr><th>N</th><th>AI</th><th>cA</th><th>N</th><th>AI</th><th>cA</th><th>N</th><th>AI</th><th>cA</th></tr>
<tr><td>Rhinolophus hipposideros
Lesser Horseshoe Bat</td><td>1</td><td>0.01</td><td>1.2%</td><td rowspan="3">142</td><td rowspan="3">0.07</td><td rowspan="3">1.3%</td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td></tr>
<tr><td>Rhinolophus euryale
Mediterranean Horseshoe Bat</td><td>3</td><td>0.03</td><td>1.7%</td></tr>
<tr><td>Rhinolophus ferrumequinum
Greater Horseshoe Bat</td><td>13</td><td>0.12</td><td>7.6%</td></tr>
<tr><td>Miniopterus schreibersii
Schreiber's Bent-winged Bat</td><td>17</td><td>0.16</td><td>3.3%</td><td rowspan="7">2924</td><td rowspan="7">1.35</td><td rowspan="7">27.1%</td><td rowspan="7">470</td><td rowspan="7">0.44</td><td rowspan="7">14.4%</td></tr>
<tr><td>Pipistrellus pygmaeus
Soprano Pipistrelle Bat</td><td>3</td><td>0.03</td><td>0.7%</td></tr>
<tr><td>Pipistrellus pipistrellus
Common Pipistrelle Bat</td><td>74</td><td>0.71</td><td>17.2%</td></tr>
<tr><td>Pipistrellus kuhlii
Kuhl's Pipistrelle Bat</td><td>2</td><td>0.02</td><td>0.5%</td></tr>
<tr><td>Pipistrellus kuhlii/nathusii
Kuhl's/Nathusius' Pipistrelle Bat</td><td>7</td><td>0.07</td><td></td></tr>
<tr><td>Pipistrellus nathusii
Nathusius' Pipistrelle Bat</td><td>14</td><td>0.13</td><td>3.3%</td></tr>
<tr><td>Pipistrellus/Hypsugo sp.
Pipistrelle Bats</td><td>2</td><td>0.02</td><td></td></tr>
<tr><td>Myotis alcathoe
Alcathoe Whiskered Bat</td><td>2</td><td>0.02</td><td>1.2%</td><td rowspan="9">5060</td><td rowspan="9">2.33</td><td rowspan="9">47.0%</td><td rowspan="9">21</td><td rowspan="9">0.02</td><td rowspan="9">0.6%</td></tr>
<tr><td>Myotis emarginatus
Geoffroy's Bat</td><td>1</td><td>0.01</td><td>0.6%</td></tr>
<tr><td>Myotis bechsteinii
Bechstein's Bat</td><td>9</td><td>0.09</td><td>3.5%</td></tr>
<tr><td>Myotis brandtii/mystacinus
Brandt's/Whiskered Bat</td><td>44</td><td>0.42</td><td>25.6%</td></tr>
<tr><td>Myotis daubentonii/capaccinii
Daubenton's/Long-fingered Bat</td><td>10</td><td>0.10</td><td>3.9%</td></tr>
<tr><td>Myotis myotis/blythii
Mouse-eared Bats</td><td>10</td><td>0.10</td><td>2.9%</td></tr>
<tr><td>Myotis sp.
Myotis Bats</td><td>46</td><td>0.44</td><td></td></tr>
<tr><td>Barbastella barbastellus
Western Barbastelle Bat</td><td>51</td><td>0.49</td><td>19.8%</td></tr>
<tr><td>Plecotus sp.
Long-eared Bats</td><td>6</td><td>0.06</td><td>1.7%</td></tr>
<tr><td>Eptesicus serotinus
Serotine Bat</td><td>7</td><td>0.07</td><td>1.0%</td><td>141</td><td>0.07</td><td>1.3%</td><td>13</td><td>0.01</td><td>0.4%</td></tr>
</table>

Species / group Name	Transect Surveys			Automated Surveys			Surveys at Height		
	N	AI	cA	N	AI	cA	N	AI	cA
Vespertilio murinus Parti-coloured Bat	10	0.10	1.2%						
Nyctalus leisleri Leisler's Bat	15	0.14	1.1%						
Nyctalus noctula/leisleri Noctule/Leisler's Bat	12	0.12		2134	0.98	19.8%	2744	2.58	84.0%
Nyctalus noctula Noctule Bat	30	0.29	1.7%						
Eptesicus/Vespertilio/Nyctalus sp. "Nyctaloid"	7	0.07	0.3%						
Tadarida teniotis European Free-tailed Bat							7	0.01	0.2%
Chiroptera *indet*	5	0.05		376	0.17	3.5%	12	0.01	0.4%
Total	**401**	**3.85**	**100.0%**	**10777**	**4.97**	**100.0%**	**3267**	**3.07**	**100.0%**
Total duration of survey (h)	**104.17**			**2168.9**			**1062.9**		

The activity Index of the most abundant bat species/ groups per transects and surveyed WTGs (April – November 2021) is provided in figure below.

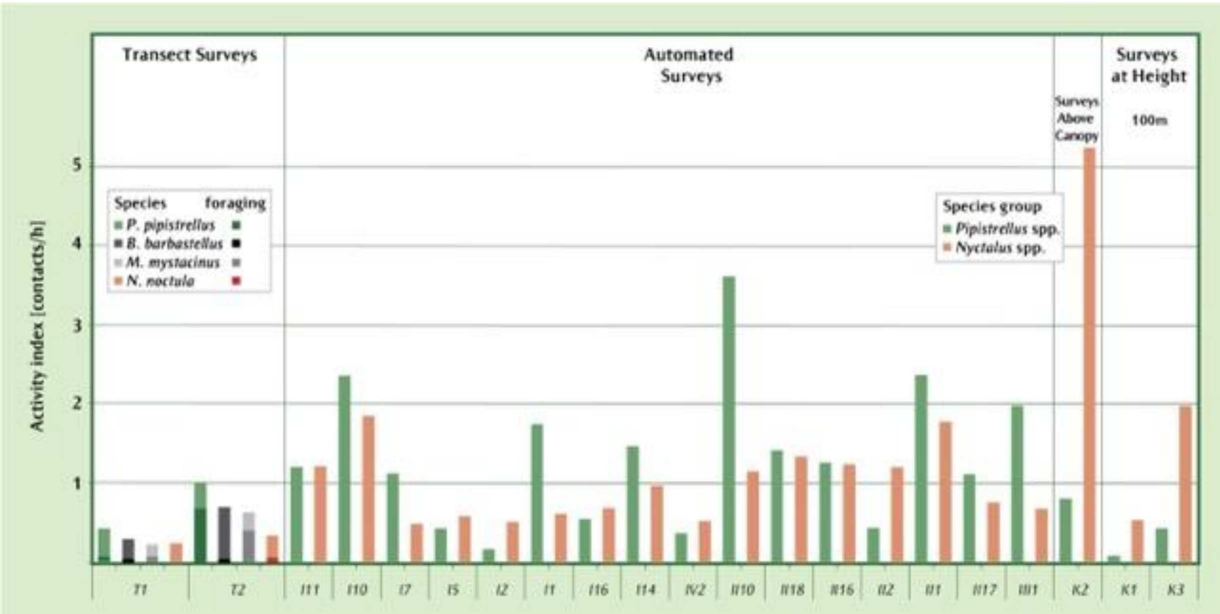

Figure 8-55 Activity Index of the Most Abundant Bat Species per Transects and Surveyed WTGs

Table 8-9 Bat Activity Indices per Transects, Surveyed WTs and at Height (April – Novr 2021)

For clearer presentation, when species/group was not recorded table cells are left blank, whilst crossed-out cells indicate inapplicability.

<u>Activity indices:</u>
AI - activity index, number of bat passes recorded per time unit [contacts/h];
F% - percentage of passes with feeding behaviour or feeding buzz registered of the total passes recorded [%];
aD - average duration of pass [s].

Species/ group name	Transect Surveys						Automated Surveys																At Height		
	T1			T2			I11	I10	I7	I5	I2	I1	I16	I14	IV2	II10	II8	II6	II2	II1	I17	III1	K1	K2	K3
	AI	F%	aD	AI	F%	aD	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
Rhinolophus hipposideros Lesser Horseshoe Bat				0.02	0.0	10.0																			
Rhinolophus euryale Mediterranean Horseshoe Bat	0.02	0.0	5.0	0.04	0.0	5.0	0.01					0.40	0.02	0.04	0.02	0.10				0.01	0.02	0.47			
Rhinolophus ferrumequinum Greater Horseshoe Bat	0.15	0.0	4.8	0.10	0.0	4.8																			
Miniopterus schreibersii Schreiber's Bent-winged Bat	0.09	0.0	4.4	0.24	45.0	54.8																			
Pipistrellus pygmaeus Soprano Pipistrelle Bat	0.04	50.0	3.5	0.02	0.0	3.0																			
Pipistrellus pipistrellus Common Pipistrelle Bat	0.43	16.0	47.0	1.01	67.4	194.9																			
Pipistrellus kuhlii Kuhl's Pipistrelle Bat	0.02	0.0	5.0	0.02	0.0	5.0	1.20	2.36	1.12	0.43	0.17	1.75	0.55	1.47	0.37	3.62	1.42	1.26	0.43	2.36	1.11	1.99	0.08	0.81	0.43
Pipistrellus kuhlii/nathusii Kuhl's/Nathusius' Pipistrelle Bat	0.07	16.7	3.3	0.06	0.0	3.3																			
Pipistrellus nathusii Nathusius' Pipistrelle Bat	0.13	0.0	5.4	0.14	0.0	6.1																			
Pipistrellus/Hypsugo sp. Pipistrelle Bats	0.02	0.0	2.0	0.02	0.0	5.0																			
Myotis alcathoe Alcathoe Whiskered Bat	0.04	0.0	6.5																						
Myotis emarginatus Geoffroy's Bat	0.02	0.0	3.0				0.43	0.33	0.21	0.31	0.10	0.80	0.25	1.06	0.26	3.34	0.33	1.29	0.19	0.37	1.00	24.95		0.06	0.00
Myotis bechsteinii Bechstein's Bat	0.07	0.0	2.6	0.10	50.0	8.6																			

Species/ group name	Transcect Surveys						Automated Surveys																At Height		
	T1			T2			I11	I10	I7	I5	I2	I1	I16	I14	IV2	II10	II8	II6	II2	II1	I17	III1	K1	K2	K3
	AI	F%	aD	AI	F%	aD	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
Myotis brandtii/mystacinus Brandt's/Whiskered Bat	0.22	37.5	50.6	0.64	64.8	38.7																			
Myotis daubentonii/capaccinii Daubenton's/Long-fingered Bat	0.06	0.0	4.8	0.14	41.7	112.9																			
Myotis myotis/blythii Mouse-eared Bats	0.06	0.0	4.5	0.14	0.0	4.2																			
Myotis sp. Myotis Bats	0.28	11.9	5.9	0.62	12.7	6.2																			
Barbastella barbastellus Western Barbastelle Bat	0.30	16.7	18.2	0.70	7.5	5.5																			
Plecotus sp. Long-eared Bats				0.12	41.7	63.2																			
Eptesicus serotinus Serotine Bat	0.02	0.0	5.0	0.12	25.0	6.1	0.04	0.03	0.17	0.13	0.06	0.26	0.02	0.08	0.01	0.07	0.03	0.01	0.02	0.07	0.01	0.09		0.00	0.03
Vespertilio murinus Parti-coloured Bat	0.06	0.0	4.7	0.14	0.0	5.3																			
Nyctalus leisleri Leisler's Bat	0.19	25.0	7.8	0.10	25.0	7.1																			
Nyctalus noctula/leisleri Noctule/Leisler's Bat	0.13	80.0	33.3	0.10	16.7	4.3	1.21	1.85	0.49	0.59	0.51	0.61	0.69	0.97	0.52	1.15	1.34	1.24	1.20	1.78	0.76	0.68	0.53	5.23	1.98
Nyctalus noctula Noctule Bat	0.24	6.1	12.5	0.34	17.3	32.4																			
Eptesicus/Vespertilio/Nyctalus sp.	0.06	0.0	3.5	0.08	0.0	3.5																			
Tadarida teniotis European Free-tailed Bat																								0.01	0.01
Chiroptera *indet*.	0.06	0.0	3.7	0.04	0.0	1.8	0.07	0.10	0.09	0.04	0.03	0.10	0.04	0.18	0.03	0.16	0.07	0.11	0.04	0.12	0.10	1.38		0.01	0.03
Total	2.75	17.9	22.7	5.03	28.4	52.9	2.97	4.68	2.07	1.50	0.88	3.92	1.56	3.79	1.21	8.44	3.18	3.91	1.89	4.70	3.01	29.55	0.62	6.12	2.48

This data indicates that overall bat activity is almost twice as high at T2 compared to T1. This difference becomes more pronounced when considering foraging activity from woodland species. Activity of Long-Eared Bat(s) (*Plecotus* sp.) is completely absent at T1, and the activity of the Western Barbastelle Bat (*Barbastella barbastellus*), Common Pipistrelle Bat (*Pipistrellus pipistrellus*) and Whiskered Bat (*Myotis mystacinus*) is 2 to 3 times higher at T2. In Common Pipistrelle Bat and Whiskered Bat this is accompanied by a significantly higher share of feeding activity recorded at T2. In contrast, a similar activity pattern is not observed in species that prefer to forage in scrub, e.g. Greater Horseshoe Bat (*Rhinolophus ferrumequinum*), grassland, e.g. Mouse-eared Bat(s) (*Myotis myotis/blythii*), or open airspace (*Nyctalus* spp.). These findings are completely consistent with the ecology of species and habitat composition along each transect.

The findings of the Automated Surveys also support this conclusion as they indicate that the activity at WTG locations in or close to woodland is significantly higher. The highest levels of activity were recorded at III1 (northern slope of the Crni Vrh), with slightly lower activity at II10, II1, I10, I1 and II6. Activity in the area close the K2 meteorological mast and WTG IV1 is also notable; this is the area of the only marshland fragment within the site is located. Where woodland is heavily degraded (e.g. WTGs I5 and I7), the activity is significantly lower (Table 8-9).

The overall and foraging activity of Common Pipistrelle Bat (*Pipistrellus pipistrellus*) is focused within T2, along the wide forest track on the northern slope of the Crni Vrh (transect segments T2.16-19, Appendix C). Daily activity of the Common Pipistrelle Bat also usually begins earlier there than elsewhere. The entire activity of the Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) at T2 was also recorded in the same area.

Almost the entire activity of Long-Eared Bat(s) (*Plecotus* sp.) was recorded in the area of the only marshland fragment surrounded by woodland (segment T2.4, Appendix C). The most of the Leisler’s Bat (*Nyctalus leisleri*) activity, including foraging activity and display flights, was recorded in this area (segment T2.4, Appendix C) and in better-preserved woodland in the northern part of the site (segments T1.4-5 and T2.5, Appendix C).

The activity of the Kuhl's Pipistrelle Bat (*Pipistrellus kuhlii*), a highly synanthropic species, also shows a distinct spatio-ecological focus, as it was recorded on the transects only in the area of state road (segments T1.13 and T2.16, Appendix C). This species was regularly recorded (unsystematically, outside the scope of standardised Transects Surveys) around the existing Krst transformer station whilst the lighting was on (until July 2021) as well as around certain farmsteads/ buildings when they had external lighting turned on.

The data shows evident differences in the altitudinal distribution of Kuhl's Pipistrelle. The overall activity is low at ground level (Automated Surveys and Transects total), the highest (moderate) above the canopy (K2), and the lowest at 100 m height – low above the woodland (K3) and negligible above the grassland (K1).

It should be noted that any survey at ground level survey (Transect and Automated likewise) inevitably underestimates the actual activity of species that primarily forage high up in the open airspace such as Noctule Bat (*Nyctalus noctula*), Parti-coloured Bat (*Vespertilio murinus*), European Free-tailed Bat (*Tadarida teniotis*), and, to some extent, Leisler’s Bat (*Nyctalus leisleri*). This is the reason why the significantly higher activity of the corresponding groups was recorded by Surveys at Height, and in particular Above Canopy, than at ground level.

The social calls of certain species were recorded on transects relatively often (Appendix C), as well as during the Roost Surveys, mostly from the end of August until November. Display flights of Common Pipistrelle Bat (*Pipistrellus pipistrellus*), Noctule Bat (*Nyctalus noctula*) and Leisler’s Bat (*Nyctalus leisleri*) were recorded in the areas of better-preserved forest stands, which is indicative of display territories and mating roosts in trees in these areas. In the same areas, display calls/ song of the Noctule Bat and Nathusius' Pipistrelle Bat (*Pipistrellus nathusii*) were also recorded, mostly stationary, from mating/ hibernation roosts in trees. Display flights of the Parti-coloured Bat (*Vespertilio murinus*) were also recorded, most often in the area of spruce plantations, but also around the K3 meteorological mast, already since the end of July, though no typical mating/hibernation roost sites, e.g. high cliffs or quarries, multi-story buildings have been identified in the area.

Migratory flocks were not recorded either in 2019-2020 or in 2021. Whilst the presence of any migration routes in the area is not expected and can be completely excluded. Known bat migration routes in Serbia are located along the valleys of large rivers (Danube, Tisa and Tamiš in particular, and probably Morava as well). In situations where such optimal migration routes exist, bats do not use more demanding and prey-scarce routes over mountain passes (Dietz et al. 2009, Paunović et al. 2020), such as those across the Alps where there is no other option (e.g. Caprio et al. 2020).

Seasonal activity patterns indicative of migratory influx and wintering in the area were identified in Noctule Bat (*Nyctalus noctula*) and, to a lesser extent, Nathusius’ Pipistrelle Bat (*Pipistrellus nathusii*) and Leisler’s Bat (*Nyctalus leisleri*), whose resident populations are also present within the site.

The activity of the Parti-coloured Bat (*Vespertilio murinus*) is recorded only from the end of July until November, though not during spring and summer (Table 8-10). This also indicates a migratory influx though the presence of a migratory/ wintering population of this species in the area only. Hibernation, due to the lack of suitable roost sites at the site and immediate surroundings, is only expected in the wider area.

All these species are long-distance migrants, whose migratory populations hibernate in the region (Dietz et al. 2009, Paunović et al. 2011, 2020), and these findings are as expected.

Seasonal activity patterns (Table 8-10) indicative of migratory flow (and/or vagrancy), though not of the wintering in the area, were clearly found in Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), a medium-distance migrant whose population both breeds and hibernates in the region, but seasonally changes roosts (Dietz *et al.* 2009, Paunović *et al.* 2011, 2020).

In contrast, seasonal activity patterns indicative of autumn migratory efflux was found in all species of Horseshoe Bats (*Rhinolophus* spp.), *Myotis* spp., Long-Eared Bats (*Plecotus* spp.), Common Pipistrelle Bat (*Pipistrellus pipistrellus*) and Serotine Bat (*Eptesicus serotinus*). This is typical of the species that gather in large numbers from a wider area in certain, usually underground, roost where they swarm, mate and/or hibernate (Dietz et al. 2009, Paunović et al. 2011, 2020).

The activity peak in October indicates that the mating of the Western Barbastelle Bat (*Barbastella barbastellus*) resident population takes place in the site area.

Table 8-10 Overview of the Bat Activity Index by Months Recorded (April – November 2021)

Legend and notes: Where species/ group was not recorded then the table cells are blank.

	Species/ group name	Month (2021)							
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Transect Surveys	*Rhinolophushipposideros* Lesser Horseshoe Bat					0.05			
	Rhinolophus euryale Mediterranean Horseshoe Bat	0.32					0.16		
	Rhinolophus ferrumequinum Greater Horseshoe Bat		0.16	0.08	0.08	0.42			
	Miniopterus schreibersii Schreiber's Bent-winged Bat	1.89	0.27			0.05		0.26	
	Pipistrellus pygmaeus Soprano Pipistrelle Bat					0.16			
	Pipistrellus pipistrellus Common Pipistrelle Bat	1.26	0.16	1.03	1.34	1.32	0.95		
	Pipistrellus kuhlii Kuhl's Pipistrelle Bat	0.32		0.08					
	Pipistrellus nathusii Nathusius' Pipistrelle Bat				0.08	0.05	0.08	0.37	0.63
	Myotis alcathoe Alcathoe Whiskered Bat					0.11			
	Myotis emarginatus Geoffroy's Bat					0.05			
	Myotis bechsteinii Bechstein's Bat				0.32	0.26			
	Myotis brandtii/mystacinus Brandt's/Whiskered Bat	0.32	0.11	0.95	0.87	0.79	0.24		
	Myotis daubentonii/capaccinii Daubenton's/Long-fingered Bat		0.21	0.08		0.21	0.08		
	Myotis myotis/blythii Mouse-eared Bats				0.16	0.21	0.32		
	Myotis sp. Myotis Bats			0.79	0.87	0.84	0.71		
	Barbastella barbastellus Western Barbastelle Bat	2.84	0.54	0.32	0.08	0.37	0.55	0.58	0.32

	Plecotus sp. Long-eared Bats		0.05	0.08		0.21			
	Eptesicus serotinus Serotine Bat		0.16	0.08	0.16	0.05			
	Vespertilio murinus Parti-coloured Bat							0.32	0.63
	Nyctalus leisleri Leisler's Bat				0.32	0.11		0.26	0.63
	Nyctalus noctula Noctule Bat		0.05		0.08	0.21	0.24	0.84	0.79
	Total	**7.58**	**1.77**	**3.71**	**4.42**	**6.00**	**3.55**	**3.05**	**3.79**
Automated Surveys	*Rhinolophus* spp.		0.01	0.12	0.14	0.12	0.02	0.01	
	Myotis/Barbastella /Plecotus spp.	0.33	0.16	3.12	4.95	5.24	0.38	0.27	
	Pipistrellus/Hypsugo/Miniopterus spp.	3.06	0.41	1.83	0.92	2.50	1.22	0.66	0.05
	Nyctalus/Vespertilio spp.	0.61	0.50	2.33	0.43	0.90	1.31	0.88	0.16
	Eptesicus spp.	0.03	0.06	0.08	0.06	0.10	0.09	0.02	
	Chiroptera *indet*.				0.18	0.62		0.07	
	Total	**4.02**	**1.15**	**7.49**	**6.68**	**9.48**	**3.01**	**1.91**	**0.20**
Surveys at Height	*Rhinolophus* spp.								
	Myotis/Barbastella /Plecotus spp.			0.02	0.06	0.03	0.02	0.01	
	Pipistrellus/Hypsugo/Miniopterus spp		0.01	0.48	0.39	0.86	0.75	0.40	0.10
	Nyctalus/Vespertilio spp.		0.20	4.53	4.17	3.07	3.92	1.45	0.94
	Eptesicus spp.			0.06				0.01	0.02
	Tadarida teniotis.					0.03	0.01		
	Chiroptera *indet*.			0.05	0.01		0.01	0.01	
	Total		**0.22**	**5.15**	**4.63**	**4.00**	**4.71**	**1.88**	**1.06**

The overall seasonal activity patterns indicate also reproductive (nursing) activity of the populations present at the site. This is most pronounced in the resident populations of the Western Barbastelle Bat (*Barbastella barbastellus*) and Common Pipistrelle Bat (*Pipistrellus pipistrellus*). Furthermore, according to the recorded patterns, Western Barbastelle Bat maternity roosts are located beyond the site boundary, whilst and the Common Pipistrelle Bat maternity roosts are located within the site, the most important ones in the area of the southernmost part of T2, i.e. on the northern slope of the Crni Vrh (as confirmed also by the catch of a cub in September 2021 in this area). Besides these, maternity activity is also reliably indicated in Greater Horseshoe Bat (*Rhinolophus ferrumequinum*), Daubenton's Bat (*Myotis daubentonii*), Mouse-eared Bat(s) (*Myotis myotis/blythii*), and Long-Eared Bat(s) (*Plecotus* sp.). There are also indications for the Whiskered Bat (*Myotis mystacinus*), though not reliable enough to draw a definite conclusion. All of these species are known to be strictly resident and breeding in the region (Dietz *et al.* 2009, Paunović *et al.* 2011, 2020).

Other species were recorded by Transect Surveys too infrequently to draw any conclusions about the reproductive activity of their populations at the site area based on these surveys. However, the negligible activity level in itself indicates that maternity activity in these populations, if any, is certainly not significant.

The only exceptions are the Noctule Bat (*Nyctalus noctula*) and Leisler's Bat (*Nyctalus leisleri*), whose actual activity cannot be determined by surveys at ground level (as explained above). Furthermore, the overall seasonal activity patterns of the corresponding species group recorded by Automated Surveys (Table 8-10, Figure 8-56) (Table 13, Figure 38) clearly indicate reproductive (nursing) activity of the populations constituting this group.

Also, the nursing activity within the Bechstein's Bat (*Myotis bechsteinii*) population present at the site is confirmed by the catch of a lactating female in July 2021.

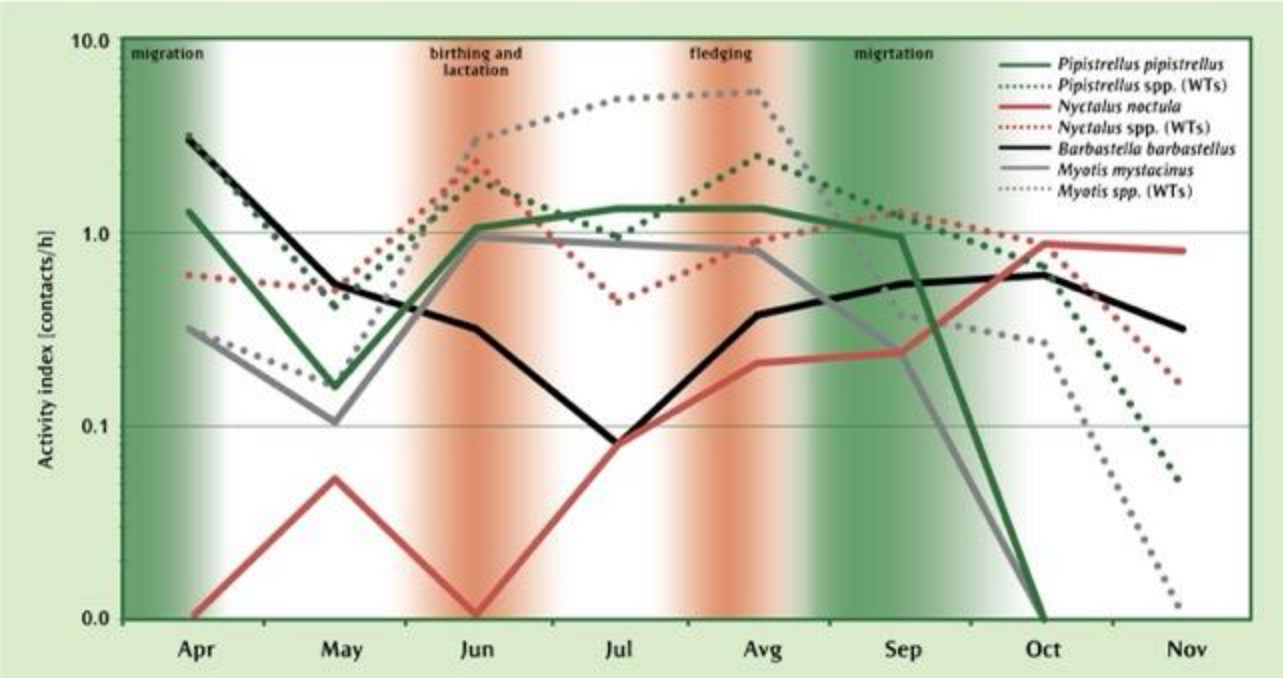

Figure 8-56 Activity Index of the Most Abundant Bat species/ Groups by Month (April – November 2021)

8.3.6.2 Ecological Status

The ecological status of all 30 bat species recorded in the Carpathian Serbia region, and (potentially) occurring at the site, was assessed and is presented in Table 8-11, below.

Table 8-11 Ecological Status of Bat Species Occurring at the Site and in the Carpathian Serbia Region

Records+ - within the site, [] –in wider surroundings only;
Region - Carpathian Serbia (Paunović *et al.*2020) ;
2019-2021 - Preliminary Surveys (Milovanović 2020a, b, Josimović et al. 2021a) ;
2020-2022 - Main ESIA Surveys.

Ecological status
occurrence: R - regular, O - occasional, r - rare, i - incidental, () - locally;
activity/abundance: V - very high, H - high, M - moderate, L - low, n - negligible, () - occasionally and/or locally;
migratory status: R - resident, M - migratory, ? - undetermined;
habitat use: R - roost (s), F - foraging area (s), C - commuting route (s),
? - probably, () - just beyond site boundary, [] –in wider surroundings only.

Species name	Records			Ecological status					
	Region	2019-2020	2020-2021	occurrence	activity	abundance	migratory status	habitat use	Comment
Rhinolophus hipposideros Lesser Horseshoe Bat	+	[+]	**+**	i	n	n	R	[R], (R?) / R?, F, C	
Rhinolophus euryale Mediterranean Horseshoe Bat	+	+	**+**	r	n	n- (L)	R	[R], (R?), F, C	
Rhinolophus blasii Blasius's Horseshoe Bat	+			certainly no roosts, only incidental occurrence possible					

Species name	Records			Ecological status					
	Region	2019-2020	2020-2021	occurrence	activity	abundance	migratory status	habitat use	Comment
Rhinolophus mehelyi Mehely's Horseshoe Bat	+			certainly no roosts, only incidental occurrence possible					
Rhinolophus ferrumequinum Greater Horseshoe Bat	+	[+]	+	O	n	M (n-H)	R	[R], (R?) / R?, F, C	
Miniopterus schreibersii Schreiber's Bent-winged Bat	+	+	+	r/ (R) *	n/ (M) *	n/ (H) *	M	[R]/F*, C*	* marginally (forest track along the northern slope of Crni Vrh)
Pipistrellus pygmaeus Soprano Pipistrelle Bat	+	+	+	i	n	n (n-M)	R	R, F, C	
Pipistrellus pipistrellus Common Pipistrelle Bat	+	+	+	R	L/ (M) *	H- (V) *	R	R, F, C	* in fledging season marginally (forest track along the northern slope of Crni Vrh)
Pipistrellus kuhlii Kuhl's Pipistrelle Bat	+	+	+	i/ (O) *	n/ (L) *	n/ (V) *	R	(R?) *, F*, C*	* marginally (lighting, paved road, buildings)
Pipistrellus nathusii Nathusius' Pipistrelle Bat	+		+	O	n-L	n-M	R+ (M)	R, F, C	
Hypsugo savii Savi's Pipistrelle Bat	+			certainly no roosts, only incidental occurrence possible					
Myotis alcathoe Alcathoe Whiskered Bat	+		+	i	n	n	R	(R?) /R?, F, C	
Myotis emarginatus Geoffroy's Bat	+		+	i	n	n	R	(R?), F, C	
Myotis bechsteinii Bechstein's Bat	+		+	R	n/ (n-M) *	L (n-H*)	R	R*, F*, C	* better preserved woodland
Myotis nattereri Natterer's Bat	+			only incidental occurrence possible					
Myotis brandtii Brandt's Bat	+			only incidental occurrence possible					
Myotis mystacinus Whiskered Bat	+			very likely all in the row bellow belongs to this species; confirmed by Trapping Surveys					
Myotis brandtii/mystacinus Brandt's/Whiskered Bat			+	R	n-L	H (n-V)	R	R, F, C	
Myotis capaccinii Long-fingered Bat	+			certainly no roosts or foraging areas, only incidental occurrence possible					
Myotis daubentonii Daubenton's Bat	+			very likely all in the row bellow belongs to this species					
Myotis daubentonii/capaccinii Daubenton's/Long-fingered Bat		+	+	O	n-L	L (n-H)	R	R, C	

Species name	Records			Ecological status					
	Region	2019-2020	2020-2021	occurrence	activity	abundance	migratory status	habitat use	Comment
Myotis dasycneme Pond Bat	+		+	i	n	n	?	(R?) /R?, C	Recorded only by automated surveys and surveys at height
Myotis blythii Lesser Mouse-eared Bat	+			bellow may belong to any or both of these species					
Myotis myotis Greater Mouse-eared Bat	+								
Myotis myotis/blythii Mouse-eared Bats		+	+	O	n	L (n-H)	R	(R?) /R?, F, C	
Barbastella barbastellus Western Barbastelle Bat	+	+	+	R	n/ (L-M) *	L/ (M-V) *	R	R*, F*, C	* better preserved and smaller, degraded woodland
Plecotus auritus Brown Long-eared Bat	+			bellow may belong to any or both of these species					
Plecotus austriacus Grey Long-eared Bat	+								
Plecotus sp. Long-eared Bats			+	i/O*	n/ (L-M) *	L/ (n-M) *	R	R, F, C	*marshland fragment
Eptesicus serotinus Serotine Bat	+		+	r-R	n- (L)	L (n-M)	R	R?, F, C	
Vespertilio murinus Parti-coloured Bat	+		+	i/r*	n/ (L) *	n/ (n-M) *	M	F?, C?	* migration
Nyctalus leisleri Leisler's Bat	+		+	i-R	n-L- (M) *	n (n-H) *	R+ (M)	R, F, C	* better preserved woodland and marshland fragment
Nyctalus noctula Noctule Bat	+	+	+	i-R	n-L- (M) *	n (n-L)	R+M	R, F, C	* migration and wintering
Tadarida teniotis European Free-tailed Bat			+	r	n	n-L	?	F, C	recorded only by automated surveys and surveys at height
Total (min.) number of species	**29**	**(11)**	**(22)**	**30 (22)**					

The site area is characterised by a high bat diversity, both qualitatively (species richness) and quantitatively (relative abundance of species and composition of bat community). The bat fauna of the site resembles the well-preserved Carpathian woodland ecosystems (Cel'uch & Kropil 2008, Kanuch et al. 2008). However, except occasionally and/ or locally, the activity of all species is negligible or low. This does not resemble preserved woodland ecosystems but it is consistent with the composition and condition of habitats at the site.

Most of the occurring species are sedentary and their populations resident. Almost only migratory populations of the Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) and Parti-coloured Bat (*Vespertilio murinus*) occur at the site. Both resident and migratory populations of the Nathusius' Pipistrelle Bat (*Pipistrellus nathusii*), Noctule Bat (*Nyctalus noctula*), and Leisler's Bat (*Nyctalus leisleri*) are present.

Based on the findings of Roost Survey and recorded activity, the size of populations using the site was estimated. The estimated size of resident populations does not exceed a few tens of adult individuals (20-50) even for the most numerous species: Common Pipistrelle Bat (*Pipistrellus pipistrellus*), Nathusius' Pipistrelle Bat (*Pipistrellus nathusii*), Whiskered Bat (*Myotis mystacinus*), Western Barbastelle Bat (*Barbastella barbastellus*), Leisler's Bat (*Nyctalus leisleri*), and Noctule Bat (*Nyctalus noctula*. Smaller (10-20 adult individuals) are the resident populations of Bechstein's Bat (*Myotis bechsteinii*), Daubenton's Bat (*Myotis daubentonii*), Mouse-eared Bat(s) (*Myotis myotis/blythii*), and Serotine Bat (*Eptesicus serotinus*), and even smaller of all other species (up to 10 adult individuals).

The migratory population of the Noctule Bat is probably of a similar size as the resident population of the species, whilst the migratory populations of the Nathusius' Pipistrelle Bat and Leisler's Bat are approximately half the size of their resident populations. Strictly migratory populations of Schreiber's Bent-winged Bat and Parti-coloured Bat are most likely within a range of 10-20 adult individuals.

All of the potentially occurring 30 species use the site and immediate surroundings for foraging and commuting. However, 18 species are regularly, or at least occasionally, present in the area with at least occasionally and/ or locally non-negligible activity and/ or abundance. This indicates that their foraging areas and commuting routes in the area are of some importance for present populations. The remaining 12 species potentially occur rarely or incidentally with negligible activity and abundance. This means that neither their populations nor their foraging areas and commuting routes in the area are of any importance.

There are no bat roosts in buildings or in speleological features at the site and immediate surroundings. Only roosts in trees are present within the site and used by 10 (typical tree-roosting) and potentially another 5 (facultatively tree-roosting) bat species. The major share of the total stock of roosts in trees that local populations of tree-roosting bat species use and regularly change is located outside the site boundary.

Resident populations of almost all tree-roosting species have maternity roosts at the site and immediate surroundings, whilst the vast majority mate and hibernate in wider surroundings (in underground roosts). Only certain resident and most migratory populations mate/ hibernate in roosts in trees at the site and immediate surroundings.

The Crni Vrh WPP site area is not situated within recognised migration routes and the occurrence of migratory flocks was not recorded.

8.3.6.3 Nature Conservation Evaluation

The evaluation of conservation concern of the species occurring within the WPP site and immediate surroundings was based on the set of criteria defining their protection and conservation status at global, European, national, and regional level. All bat species, being Strictly Protected in Serbia and listed under the relevant international conventions, have been regarded as of conservation concern.

The nature conservation value of the populations and habitats of species of conservation concern was assessed on the basis of

- The ecological status of the population occurring at the WPP site (Table 8-11); and
- the share of the relevant wider population occurring population (Table 7-5); and
- further adjusted according to species/ population conservation status at the relevant scale.

The parameters of the national populations (being only available) and their conservation status, as well as regional population estimates (based on national estimates, current knowledge and expertise), used in this assessment of nature conservation value, are given in Appendix C.

The assessment of the nature conservation value of bat populations and their habitats within the WPP site boundary of all 30 species of conservation concern was undertaken and is presented in Table 8-12.

Populations of seven species were assessed as of **significant nature conservation value.** These are resident populations of Bechstein's Bat (*Myotis bechsteinii*), Whiskered Bat (*Myotis mystacinus*), Lesser Mouse-eared Bat *(Myotis blythii*), Greater Mouse-eared Bat (*Myotis myotis*), Western Barbastelle Bat (*Barbastella barbastellus*, Brown Long-eared Bat (*Plecotus auritus*), and Leisler's Bat (*Nyctalus leisleri*), as well as the migratory population of Leisler's Bat (*Nyctalus leisleri*).

Figure 8-57 Bechstein's Bat (*Myotis bechsteinii*) left, Western Barbastelle Bat (*Barbastella barbastellus*) middle, Leisler's Bat (*Nyctalus leisleri*) right

Habitats of the occurring populations within the Crni Vrh WPP site boundary were assessed as of value at the local level at the most, and of **no significant** nature conservation value.

The nature conservation evaluation undertaken here is not comparable to that of the Preliminary Surveys, as the authors used a different terminology and unclear criteria in their assessment. However, the general conclusions of the off-site OHLs SEIA Report (Josimović et al. 2021a) are largely in agreement with the evaluation of bat habitats undertaken here. It is considered that clear and consistent assessment criteria and by far larger data sets used here do not need to rely on the findings or evaluation of the Preliminary Surveys in any respect.

Table 8-12 Nature Conservation Value of Populations and Habitats of Bat Species of Conservation Concern Occurring at the Site/ Immediate Surroundings

Population / Habitats - rating and scale of nature conservation value assessed on the basis of species' population size (Table 14-3) and ecological status at the site (Table 8-11), population parameters and conservation status; populations and habitats valued at the regional level or higher are considered to be of significant conservation value (**blue**);
rating (grade): major, moderate, minor, negligible, no;
scale (level): local (municipal), regional (Carpathian Serbia), national (Serbia), European, global;
() - at the most;
bold and ***bold italic*** refer to particular habitat types/elements and/or populations marked accordingly in the Justification column.

Species name	Population	Habitat	Justification
Rhinolophus ferrumequinum Greater Horseshoe Bat	negligible	negligible	Only occasional occurrence of single individuals at the site, though no roosts neither the least important foraging areas and commuting routs,
Miniopterus schreibersii Schreiber's Bent-winged Bat	minor local	**(minor local)** **/** negligible	Up to several dozen individuals (= up to 0.1% of regional population) on migration regularly use **foraging area on the northern slope of Crni Vrh**, whilst in other parts only single individuals rarely occur.
Pipistrellus pipistrellus Common Pipistrelle Bat	moderate local	**moderate local** **/** minor local	During activity season local resident population of several dozen individuals max. (= up to 0.3% of regional population) uses roosts, foraging areas and commuting routes throughout the site, the most important **on the northern slope of the Crni Vrh**. Major share of roost-stock and more important foraging areas in surroundings.
Pipistrellus kuhlii Kuhl's Pipistrelle Bat	negligible	**negligible** **/** no	A few individuals, whose roosts are probably in the immediate surrounding, occasionally use only a few foraging areas at the site, **around lighting**.
Pipistrellus nathusii	moderate local	**minor local** **/** negligible	During activity season, as well as hibernation, local resident population of several dozen individuals max. (= up to 0.5% of regional population) uses **roosts**, foraging areas and commuting routes in **woodland** throughout the site. Major share of roost-stock and more important foraging areas in surroundings.

Species name	Population	Habitat	Justification
Myotis bechsteinii Bechstein's Bat	**moderate regional**	**moderate local** **/** negligible	During activity season local resident population of dozen individuals max. (= up to 1.7% of regional population, NT) uses roosts, foraging areas and commuting routes in **better preserved woodland** throughout the site. Major share of roost-stock and more important foraging areas in surroundings.
Myotis mystacinus Whiskered Bat	**minor regional**	**minor local** **/** negligible	During activity season local resident population of several dozen individuals max. (= up to 1.3% of regional population) uses roosts, foraging areas and commuting routes in **woodland** throughout the site. Major share of roost-stock and more important foraging areas in surroundings.
Myotis daubentonii Daubenton's Bat	minor local	**(minor local)** **/** negligible	During activity season local resident population of dozen individuals max. (= up to 0.2% of regional population) uses **roosts** in **trees** throughout the site. Major share of roost-stock and all foraging areas in surroundings.
Myotis blythii Lesser Mouse-eared Bat	**minor regional**	negligible (minor local)	During activity season single individuals of local resident population of two dozen individuals max. (= up to 0.3% of regional population, NT), occasionally use foraging areas and commuting routes, and possibly a few roosts, at the site. Major share of roost-stock and more important foraging areas in surroundings.
Myotis myotis Greater Mouse-eared Bat	**minor regional**		
Barbastella barbastellus Western Barbastelle Bat	**high regional**	**high local** **/** negligible	During activity season local resident population of several dozen individuals max. (= up to 7% of regional population) uses **roosts**, foraging areas and commuting routes mostly in **better preserved woodland** throughout the site. Major share of roost-stock and more important foraging areas in surroundings.
Plecotus auritus Brown Long-eared Bat	**moderate regional**	**moderate local** **/** negligible	During activity season local resident population of dozen individuals max. (= up to 1% of regional population, *P. auritus* VU) uses **roosts**, foraging areas and commuting routes at the site, though almost only in the area of the single **marshland fragment**. Major share of roost-stock and more important foraging areas in surroundings.
Plecotus austriacus Grey Long-eared Bat	moderate local		
Eptesicus serotinus Serotine Bat	minor local	negligible (minor local)	During activity season local resident population of dozen individuals max. (= up to 0.3% of regional population) uses foraging areas and commuting routes, and possibly single roosts, at the site. Major share of roost-stock and more important foraging areas in surroundings.
Vespertilio murinus Parti-coloured Bat	minor local	**(minor local)** **/** negligible	Migratory population of two dozen individuals max. (= up to 0.3% of regional population) uses **display territories** at the site, mostly in the area of **spruce plantation**, and possibly foraging areas and commuting routes, though not the roosts. Roosts and more important foraging areas in surroundings.
Nyctalus leisleri Leisler's Bat	**minor regional**	**moderate local** **/** minor local	During activity and hibernation season, local resident population of several dozen individuals max. (= up to 0.8% of regional population, NT), and smaller migratory, uses **roosts in trees**, foraging areas and commuting

Species name	Population	Habitat	Justification
			routes at the site. Major share of roost-stock and more important foraging areas in surroundings.
Nyctalus noctula Noctule Bat	moderate local	**moderate local / minor local**	During activity and hibernation season, local resident and migratory population, each of several dozen individuals max. (= up to 0.4% of regional population in total), use **roosts in trees**, foraging areas and commuting routes at the site, as well as. Major share of roost-stock and more important foraging areas in surroundings.
ALL OTHER SPECIES	(negligible)	no (negligible)	Only (potentially) incidental or rare occurrence of single individuals, whilst no (the least important) roosts, foraging areas or commuting routes at the site.

8.4 Noise and Vibration

8.4.1 Noise Sensitive Receptors

Noise sensitive receptors have previously been identified during a site visit by Ion Acoustics and by the client and project team. They are identified in Table 8-13 below together with their coordinate locations and the distance to the nearest proposed turbine and the turbine number.

Table 8-13 Noise Sensitive Receptors

ID	Receptor Co-ordinates UTM		Distance (m) to Nearest Turbine (Turbine No.)	ID	Receptor Co-ordinates UTM		Distance (m) to Nearest Turbine (Turbine No.)
	X	Y			X	Y	
R1	575964	4897046	1045 (TI11)	W17	573856	4895683	1540 (TI10)
R2	573799	4895720	1597 (TI10)	W18	575808	4896999	1016 (TI11)
R3	573771	4895740	1624 (TI10)	W19	572373	4892521	1912 (TI14)
R4	573751	4895744	1644 (TI10)	W20	575234	4895504	234 (TI9)
R5	579059	4895183	1277 (TIV1)	W21	578642	4895374	1142 (TII9)
W1	578922	4894922	1016 (TIV1)	W22	573996	4891720	168 (TI15)
W2	578711	4890652	1327 (TII3)	W23	573986	4891347	115 (TI14)
W3	573356	4891062	583 (TI14)	W24	575913	4891168	410 (TI17)
W4	573182	4891346	690 (TI14)	W25	574231	4890468	422 (TI13)
W5	574717	4890513	826 (TI13)	O1	574867	4894601	909 (TI9)
W6	578736	4895862	1618 (TII9)	O2	575584	4893740	627 (TI6)
W7	578550	4896110	1785 (TII9)	O3	575624	4893586	592 (TI6)
W8	578798	4896277	2024 (TII9)	O4	575630	4893573	588 (TI6)
W9	579278	4896117	2114 (TII9)	O5	575531	4893546	690 (TI6)
W10	579245	4896672	2570 (TII9)	O6	578500	4894826	621 (TIV1)
W11	579367	4891667	1687 (TII3)	O7	577827	4892850	210 (TII7)
W12	579710	4894271	1661 (TII9)	WA1	574490	4894870	1023 (TI9)
W13	579372	4896423	2419 (TII9)	WA2	577214	4887958	1982 (TIII2)

ID	Receptor Co-ordinates UTM		Distance (m) to Nearest Turbine (Turbine No.)	ID	Receptor Co-ordinates UTM		Distance (m) to Nearest Turbine (Turbine No.)
	X	Y			X	Y	
W14	579563	4896476	2571 (TII9)	WA3	576113	4891093	220 (TI17)
W15	578037	4897364	2454 (TI11)	WA4	579488	4894846	1504 (TII9)
W16	578015	4897587	2567 (TI12)				

The receptors are classified as follows:

- R Residential locations – these are thought to be inhabited all year round
- W "Weekend" houses
- O Other huts, buildings and cabins
- WA Weekend houses which are abandoned or currently unoccupied.

Both the residential locations and "weekend" houses must be classified as Residential Locations in terms of Serbian and IFC noise limits and standards. The "Weekend" locations in some cases are occupied all summer, e.g. W3 and W5.

The "Other" huts and cabins are not thought to be regularly occupied for overnight stays. Some on the main road (e.g. O5) are used by forestry workers. Another O1 is a former café and O6 and O7 are used by mushroom collectors and hunters respectively. The residential status of these properties must be confirmed, but are currently assumed not be residential receptors for the purposes of this assessment.

There are several locations with separation distances of less than 500m. As such noise and other issues such as ice throw will result in the locations being taken out of residential use.

The abandoned weekend houses identified above are typically in good condition but are understood to be not currently occupied. However, they could be in the future so may represent a risk to the project.

There are a larger number of other structures in and around the wind farm site. These are derelict houses without roofs and barns or other structures. These are not currently considered in this assessment but it is important to note that any property designated as a formal residential property could be used or rebuilt in the future and may need to be assessed. Any planning permission should have the noise limits and residential properties which they apply to clearly stated. A noise limit should not apply to any new residential locations which are built or refurbished after any WPP farm permission is granted. Further details about the categorisation are provided in section 7.3.12 Description of Structures and Buildings.

8.4.2 Baseline Survey Results

The results are summarised below in Table 8-5 in terms of the variation in background noise with wind speed as derived from the scatter plots in Appendix D.4.

Table 8-14 Baseline Survey Results

Location	Period	Noise Levels (dB L_{A90}) at wind speeds (m/s) at 10m height							
		3	4	5	6	7	8	9	10
W3 Nevenko	Day	27.2	28.3	29.7	31.3	33.0	34.7	36.4	38.1
	Night	27.8	28.1	28.5	29.4	30.7	32.6	35.3	38.9
W24 House with Flowers by Road	Day	28.3	29.5	31.4	33.6	36.1	38.7	41.1	43.2
	Night	23.8	25.3	27.5	30.1	32.9	35.4	37.3	38.3
O1 Kafana	Day	26.9	28.1	29.7	31.7	33.9	36.0	38.0	39.7
	Night	27.1	27.1	27.5	28.6	30.3	32.8	36.2	40.6
R5 Dimitri	Day	26.5	26.4	27.8	30.3	33.4	36.9	40.2	43.0

	Night	24.1	24.7	26.4	28.9	32.0	35.4	39.0	42.4
W20 Dragica	Day	27.7	28.8	30.9	33.8	37.1	40.4	43.5	46.0
	Night	25.7	27.0	29.2	32.2	35.7	39.5	43.2	46.7
O5 Logger's Cabin	Day	31.3	32.7	34.1	35.5	36.9	38.3	39.8	41.3
	Night	29.1	29.3	30.0	31.1	32.6	34.4	36.5	38.7

The results are fairly similar across the different locations and show the same effect of very low noise levels at low wind speeds and increasing noise levels at higher wind speeds.

8.5 Landscape and Visual Amenity

8.5.1 Landscape Character

The proposed WPP will be situated between two distinctive landscape areas – rolling hills on volcanic rocks of the Timok Volcanic Region (to the south and east) overlain by steep limestones and dolomites of the Serbian Carpathians (to the west, north and east). Both areas are hilly and mountainous but geologically different, which has influenced their landscape characters, i.e. their landform, land cover, settlement and cultural value.

The Timok Volcanic Region (including Crni Vrh Mountain) lies on predominantly volcanic rocks rich in copper, gold, and silver ore deposits and has a long history of mining. Rolling conical hills are formed from volcanic deposits, some being remnants of volcanoes themselves (Tilva Njagra, 770m a.s.l.).

The Timok Volcanic Region is surrounded by the Serbian Carpathian Mountains whose northern and western part is also known as Homolje Region. The Serbian Carpathians (or Carpatho-Balkan arc) are an extension of the Romanian Carpathian Mountains across the Danube, connecting them with the Balkan Mountains in the southeast. The Serbian Carpathians are one of the most geomorphologically diverse areas in Serbia. It is a karst landscape created by rainwater dissolving and eroding the limestone rocks. The area has many of the key karst landscape features including gorges, waterfalls, natural bridges, sinkholes, caves, and springs.

Two areas within the Homolje Region are designated as national geological heritage sites: the Osanica River Gorge (25km NW to the WPP site) and the Samar Karst Bridge (7km SW to the WPP site). The Lazarev Kanjon (Lazar's Canyon, 15km to the south) within the Malinik Mountain has been designated for its geological and biodiversity value. Another eight areas are on a tentative list of the Institute for Nature Conservation of Serbia.

The Carpathian Mountains surrounding Crni Vrh (from north to southwest) are Homolje Mountains, Veliki Krš, Stol, Kučaj, and Malinik.

A panoramic view of Crni Vrh surrounded by the Serbian Carpathians is provided on Figure 8-58, seen from the very south-east of the Study Area at Rgotina karst ridge. Apart from Homolje Mountains and Stol, all other mountains are visible on the panorama.

Figure 8-58 View of the Study Area from the South-East

Landscape character types (LCT) identified as relatively homogenous units present within the two landscape areas are:

(1) Steep Wooded Karst Uplands LCT,

(2) Wooded High Volcanic Hills and Ridges LCT,

(3) Cultivated River Valleys LCT, and

(4) Mining and Post-Mining Areas LCT.

There is no windfarm development within views from any of the LCTs.

Steep Wooded Karst Uplands LCT

The LCT is part of the Serbian Carpathians and is a natural landscape producing dramatic features including cliffs, ridges, and gorges. It extends within the area from 8 to 30km around the WPP site. It forms the key skyline feature seen from other parts of the Study Area. Large parts of the LCT are remote and inaccessible. It is almost completely uninhabited and lack of roads or built form provide a strong sense of wildness, tranquillity and isolation.

The landscape has a good balance of diversity reflected in a variety of colours and shades. The scale varies from large in summits with open views to medium or enclosed views on hillslopes and in gorges. Inside the woodlands the landscape is small and enclosed.

This LCT has a strong local distinctiveness and visual and cultural identity. Medieval Orthodox monasteries - monuments of Serbian medieval culture, the folklore and traditional rituals of Vlach ethnic minority, gorges and caves which inspired legends and myths - all contribute to the strong spirit of place.

Typical features of the Steep Wooded Karst Uplands LCA are illustrated on Figure 8-59 showing the Gornjak Gorge cut by the Mlava River, approx. 35km west of the WPP site.

Figure 8-59 Steep Wooded Karst Uplands LCT

Wooded High Volcanic Hills and Ridges LCT

The Wooded High Volcanic Hills and Ridges LCT extend between Majdanpek and Bor in the NW-SE direction. Crni Vrh Mountain is located within this LCT. It is a series of large scale, smooth-rounded hills with peaks of similar height, covered by beech and oak, with occasional clearings of shrubland, farmland and pasture. Seen from a distance they merge into an undulating skyline, without clearly identifiable features.

Large wooded parts of the LCT are remote and inaccessible to vehicles. The landscape varies in scale from small and intimate with framed views inside the woodlands, to medium scale with filtered views in more open areas. The views are often obstructed by hills or woodland, not many panoramic views are provided. The hills are cut by streams and gullies. Roads, power transmission lines and scattered farmsteads present detraction in some areas.

Typical features of this LCT are illustrated on Figure 8-60 showing the central part of the proposed Crni Vrh WPP site and the Veliki Krš mountain in the backdrop.

Figure 8-60 Wooded High Volcanic Hills and Ridges LCT

Most of the local landscape within Crni Vrh Mountain is enclosed and confined by a dense woodland. Steep narrow forest tracks surrounded by tall broadleaved trees provide a strong sense of remoteness and wilderness contributing to a recognisable sense of place. Weather conditions can rapidly change the experience of the local landscape. Susceptibility to fog amplifies the sense of isolation. The difference in seasonal experience, showing a forest track in July and November, is illustrated on Figure 8-61.

Figure 8-61 Seasonal Change of the Enclosed Landscape in Crni Vrh

The abandoned mine Gornja Lipa in the central valley is screened by the terrain and woodland and dominates the landscape only in the very vicinity.

Cultivated River Valleys LCT

The Cultivated River Valleys LCT have been formed by streams originating in the uplands and hills. The two most distinct areas of this landscape type are Žagubica Valley west of Crni Vrh and Bor Valley to the east. It is a visually open landscape with wide views across the surrounding uplands.

The LCT is well inhabited, containing the villages with scattered houses and farmsteads located on the lower valley slopes and broad bottoms.

Typical features of this LCT are illustrated on Figure 8-62 showing Žagubica Valley, approx. 20km west of the site.

Figure 8-62 Cultivated Valleys LCT

This is a large-scale and open landscape, the result of a low-lying topography. The mosaic of cultivated land and built development creates a complex, fragmented landscape often lacking unity and visual harmony. The sense of tranquillity is decreased by movement and noise from roads. There are tranquil pockets away from the roads within small villages, especially in Žagubica valley. Extensive views are possible across open fields, towards the surrounding uplands. The views are sometimes fragmented by built development or vegetation.

Mining and Post-Mining Areas LCT

This LCT is a mosaic of degraded industrial and mining areas surrounded by dense oak and beech woodland covering rolling hills and patches of arable land. Transformation of the landscape resulting from mining activities has been ongoing for more than seventy years. Open cast pits have been progressively developed, waste rock has been disposed and large tailing ponds have been created. The tailings have not been rehabilitated which has resulted in over 2,000 hectares of “moonscape” areas around both Bor and Majdanpek, pale yellow desert-like sands, copper-red rivers and turquoise toxic lakes.

An example of the mosaic is the Bor River valley just downstream of the town (Figure 8-63).

Figure 8-63 Mining and Post-Mining Areas LCT

Despite the mining being part of the local identity having strong cultural and archaeological value, this LCT is damaged and disturbed, associated with contamination and impaired quality of life.

Figure 8-64 The Bor River in Bor - Mining and Post-Mining Areas LCT

This landscape type is still being transformed as the existing open cast mines have been expanded (Cerovo and Veliki Krivelj, east and south-east of the site), new waste rock and flotation tailings sites have been opened (Čukaru Peki, south of Bor) and a gold mine has been proposed (Potaj-Čuka Tisnica, 4km north-west of the site).

8.5.2 Landform

Both the Karst Uplands and Volcanic Hills and Ridges rise to over 1,000m a.s.l however, the karst landforms are more dramatic (Figure 8-65, left) with more recognisable shape which helps distinction and orientation. The Volcanic Hills and Ridges landform is weaker and simpler with many rounded domes and plateaus (Figure 8-65, right).

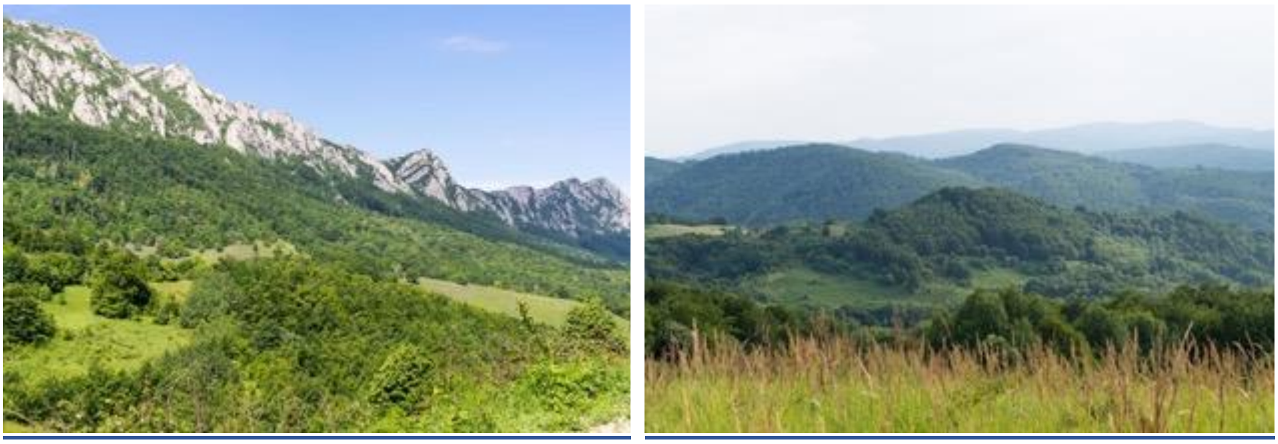

Figure 8-65 Landform in the Study Area – Karst Uplands (left) and Volcanic Hills (right)

The Karst landform is a focal point and key feature in the majority of views within the Study Area. It adds a hierarchy and dynamics to the local landscape as it forms a bluish backdrop to views from the Wooded Volcanic Hills LCT and Cultivated River Valleys LCT.

An illustration of the different dynamics in the local landscape in Crni Vrh is shown on two figures below. Figure 8-66 shows the landscape seen from the east. Rocky areas of Veliki Krš in the background give strong character to the landscape, contrasting with the lower slopes of Crni Vrh in the foreground. The landscape is large-scale and dynamic, enriched by the Karst landform.

Figure 8-66 Crni Vrh – View from the West Overlooking Veliki Krš Mountain

Seen from the west, the Crni Vrh landscape is smoother with less diversity and contrast. There are hills as local focal points but no immediately recognisable features are present (Figure 8-67). The landscape is mid-scale and less dynamic.

Figure 8-67 Crni Vrh - View from the East

The Cultivated River Valleys are flat to gently rolling valleys contained by distant foothills of the Volcanic Hills and Karst Uplands. The elevations vary from 200m a.s.l. south-east of Bor to 350m a.s.l in the valley of Žagubica. The hills form the backdrop to views across the valleys and there are extensive views of the valleys from the hills.

The natural landscape within the Mining and Post-Mining Areas has been altered and new landforms have been created. Heaps of waste rock dominate the views in Bor (Figure 8-68 left) while the town of Majdanpek visually appears to be on the edge of a few hundred meters-deep pit (Figure 8-68 right).

Figure 8-68 Landform of the Mining and Post-Mining Areas - Bor (left) and Majdanpek (right)

8.5.3 Land Cover and Pattern

Woodland is a key visual element of both the Karst Uplands and the High Volcanic Hills and Ridges. Natural and semi-natural beech and oak forests generally have an organic, continual shape and are visually coherent and interlocked. Rocky outcrops are a notable feature of the Karst Uplands (Figure 8-69 left).

Where the slopes are less steep, limited areas of meadows and pastures occur, with grazing sheep, cattle and horses. It is a pattern of irregular fields appearing as fragments within the continual woodland.


Figure 8-69 Land Cover in the Study Area – Woodland Pattern (left) and Mosaic Pattern (right)

As the altitude decreases and slopes become gentler, cultivated land appears with small plots of fruit trees and orchards, gradually transitioning to arable land with scattered houses or gardens. Figure 8-70 shows this type of land cover in Crni Vrh, north-east of the development site.

Figure 8-70 Wooded Side of Veliki Krš Mountain and the Mosaic of Cultivated Land and Shrubland

The Cultivated River Valleys are dominated by arable land with an irregular, organic field shape and a weak hedgerow pattern. Hedgerows are not common and field boundaries are not managed. Field size is small to medium (Figure 8-71).

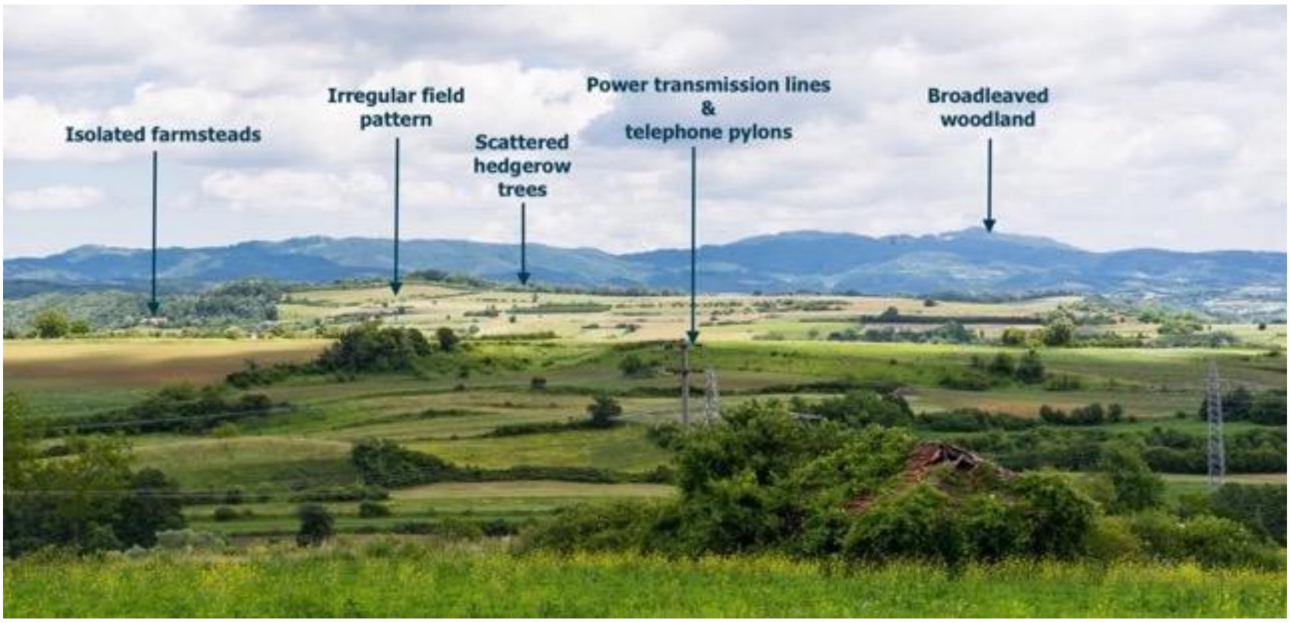

Figure 8-71 Land Cover and Pattern in the Cultivated River Valleys LCT

To obtain general information on the land cover within the Study Area, the EU CORINE Land Cover 2018 geodatabase has been used. The CORINE shows that broadleaved forest mixed with non-irrigated arable land is predominant in the Study Area (Figure 8-72).

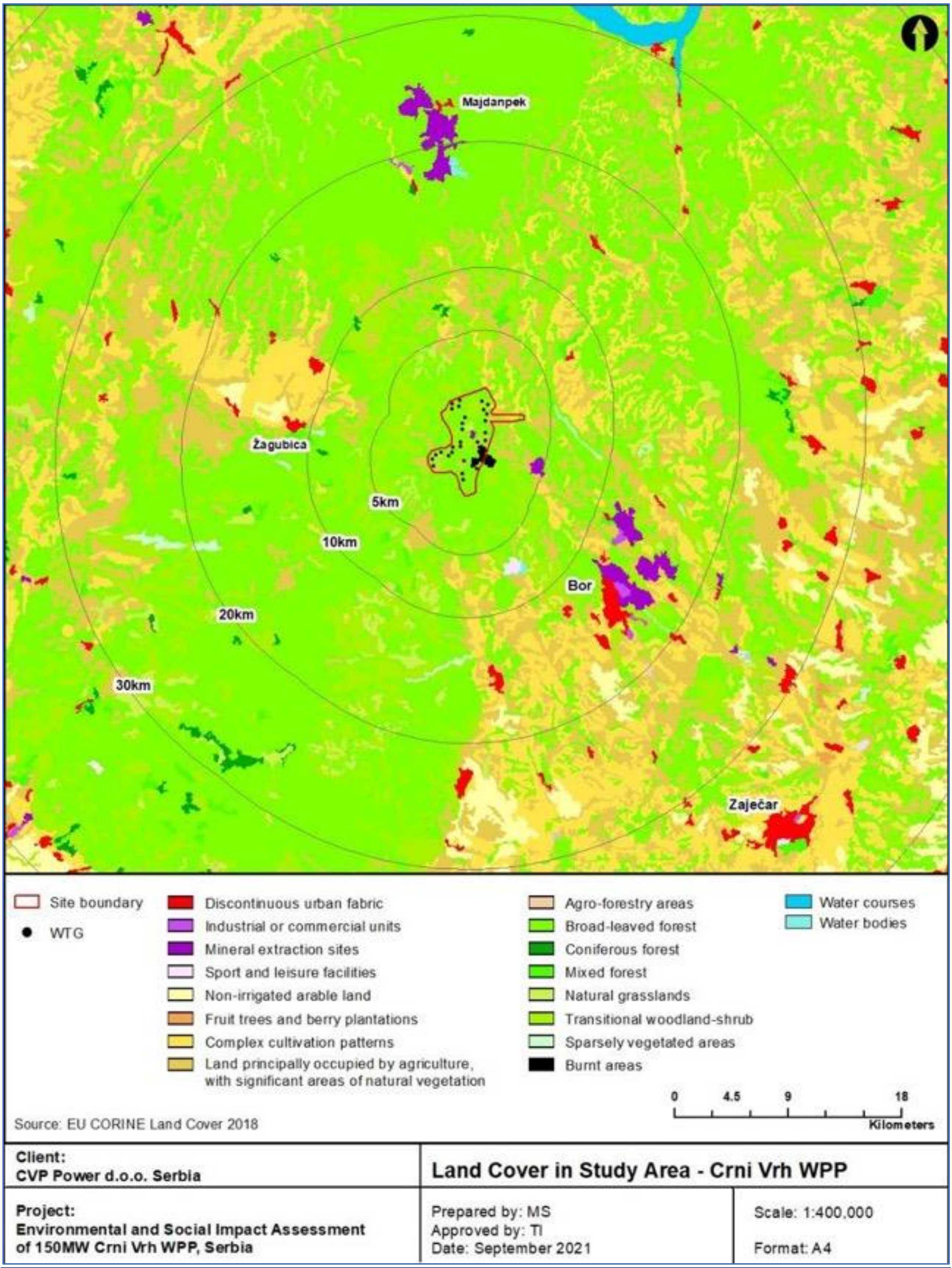

Figure 8-72 Land Cover in the Study Area

8.5.3.1 Land Cover and Pattern in Crni Vrh

Land cover reflects the past and current activity in a particular landscape, shows the level of land management and affects the landscape condition.

The land cover in Crni Vrh (including the development site) is a mosaic of broadleaved forest (predominantly beech), transitional woodland-shrub and patches of cultivated land (orchards and gardens).

About 62% of the site area is broadleaved woodland (1,686 hectares) while 25% (684 hectares) is transitional woodland-shrub. Cultivated land accounts for 9% (239 hectares).[39]

Historical 20-year data on tree loss in Crni Vrh suggest that about 15% of the woodland at the WPP site has been lost between 2000 and 2020. Out of 1,810 hectares of woodland present within the WPP site in 2000, c. 274 hectares has been either lost or degraded due to disturbances (e.g. selective logging or wildfire).

The complete canopy loss estimated by the Global Forest Watch (GFW) has been 84 hectares (4.7% decrease). The degradation to shrubland calculated from the EU CORINE Land Cover data has been 190 hectares (10.5% decrease). The estimation has not included ice damaged trees. The current Forest Management Plan for Crni Vrh (2020-2029) notes that ca. 80 hectares of woodland is ice damaged to a various degree. [40]

The area damaged in wildfires in 2007 and 2012 is shown on Figure 8-73. A narrow belt of the broadleaved forest along the public road which was recorded on the CORINE Land Cover Map from 2000 was replaced by the transitional woodland – shrub. Dead trees and shrubs are still visible.

Figure 8-73 Woodland Area Degraded to Shrubland

The remnant of burnt woodland-shrub after the 2017 wildfire is notable on the CORINE Land Cover Map from 2018 (Figure 8-72).

The tree loss in Crni Vrh area over the past 20 years is shown on Figure 8-74. The map shows both the complete canopy loss and degradation of woodland to shrubland. The random pattern seen on the map confirms the evidence obtained on the ground that the forest in Crni Vrh has not been managed in a sustainable way.

[39] EU Corine Land Cover https://land.copernicus.eu/pan-european/corine-land-cover/clc2018
[40] The Forest Management Plan for "Crni Vrh – Kupinovo" Unit (2020-2029), Serbia Forests (2019)

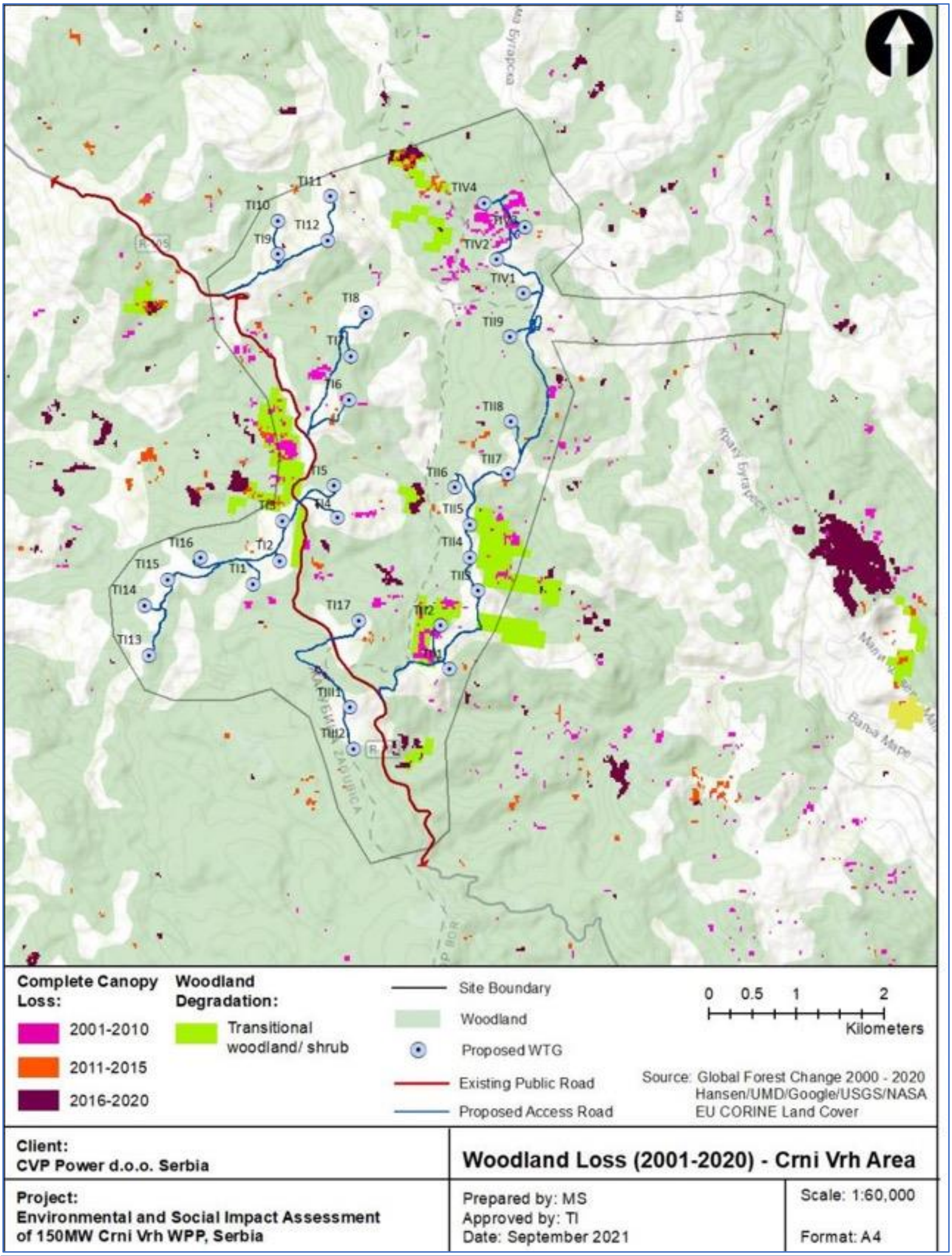

Figure 8-74 Woodland Loss in Crni Vrh Area (2001-2020)

Landscape Condition in Crni Vrh

The vast majority of the woodland in Crni Vrh is beech, primarily managed for logging. The presence of other tree species is symbolic, there is little internal diversity in the forest. Large areas of the mountain are covered by mature beech trees of similar age and density, providing very little difference in texture and colour, as illustrated on Figure 8-75. The figure shows the view from the proposed WTG T1-4 southwards.

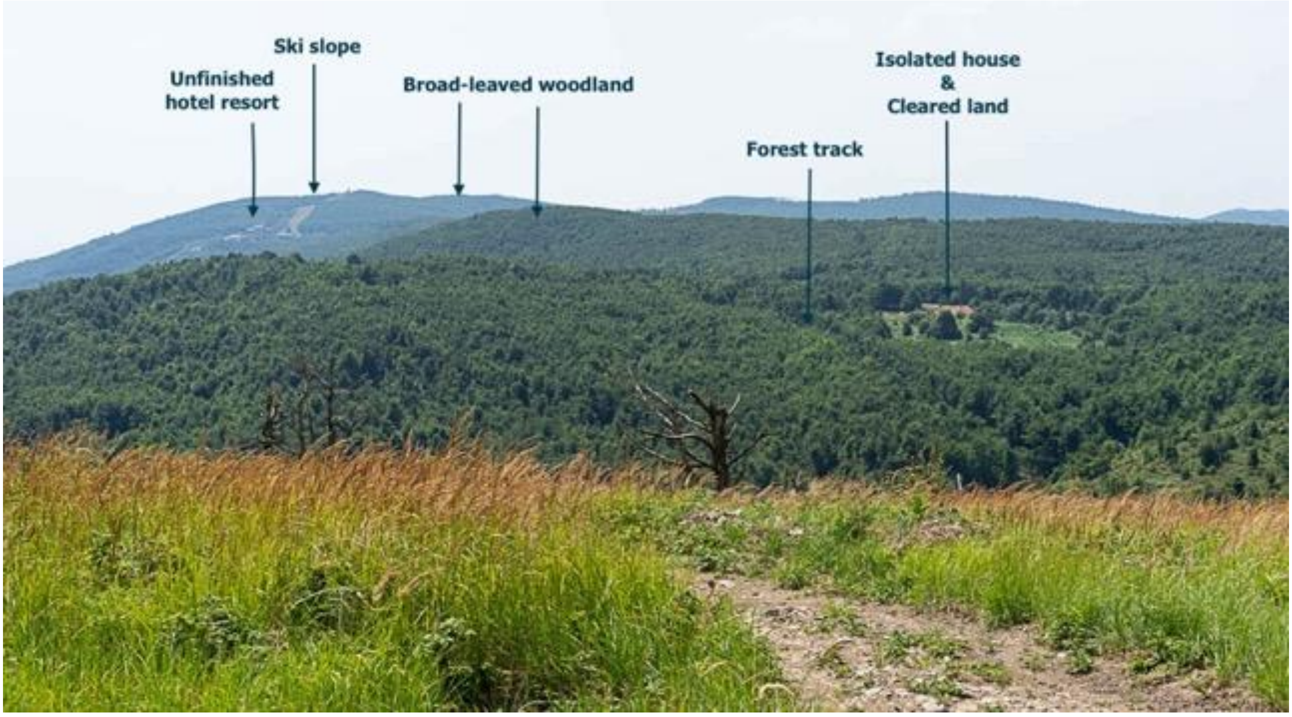

Figure 8-75 Uniform and Coarse Landscape Texture in Crni Vrh

The landscape generally appears uniform with a coarse texture of broadleaved woodland. Semi-natural grasslands represent internal open spaces within the woodland but some have been degraded. The pattern of pastures and meadows is random without a visual composition that would particularly contribute to the character of the landscape (Figure 8-76).

Figure 8-76 Random Landscape Pattern in Crni Vrh

Since the 1950s Crni Vrh mountain has been under intensive human influence by mining, logging, illegal felling, air pollution and clearance adding to the natural disturbance - ice damage and wildfire. This has left mark on the woodland which in some areas does not appear well-managed, and in some pockets even neglected. The landscape still provides some visually pleasing compositions but shows signs of loss and detraction. It is therefore judged to be in **moderate condition**.

8.5.4 Settlement

The Karst Uplands are almost completely uninhabited; Kučaj and Beljanica Mountains form the largest uninhabited area in Serbia. As the slopes become lower and less steep (from 600 to 400m a.s.l) - small, dispersed villages with isolated farmsteads appear. The highest concentration of settlement is at the foothills (Figure 8-77 left) and in river valleys (Figure 8-77 right). The villages are progressively depopulating.

The vernacular architecture can still be seen in the villages. Half-timbered ("bondruk") style houses are predominant, also called the Moravian-style houses as they originated in the Velika Morava River valley. Houses usually have two rooms (living-space and sleeping-space) with mild-hip roof covered with ceramic tiles. The walls are often mud-plastered and mostly white. Some houses have a stone socle or a stone basement (if built on slopes). The Moravian house usually has an open porch at the entrance, used for farming chores.

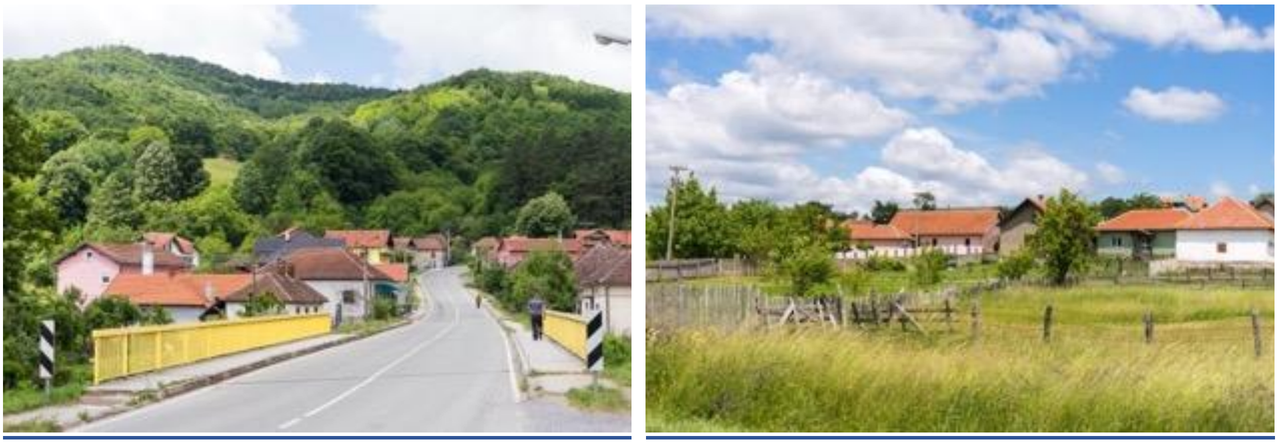

Figure 8-77 Krepoljin Village (left) and Ribare Village (right)

Most of the population in the Study Area is concentrated in the towns of Bor (Figure 8-78 left), Žagubica (Figure 8-78 right) and Majdanpek.

Bor has the appearance of a 1960s socialist industrialisation town and is dominated by high-rise residential buildings and stacks of the smelting plant. These stacks continue to release particulate laden flue gases which are visible within the town. Thirty year-long economic deprivation has left its' trace with buildings facades and metal structures visibly deteriorated due to heavy pollution. The appearance of dereliction is heightened by the number of public buildings that have been closed and residential houses that have been abandoned.

Figure 8-78 Bor Town Centre (left) and Žagubica Main Street (right)

8.5.4.1 Settlement in Crni Vrh

Settlement in Crni Vrh is sparse and dispersed. Dozens of derelict and dilapidated structures are evidence of a more dynamic life in the past. Several small farmsteads have remained occupied, scattered on hillsides to the north-east and south-west. Many appear to be originating from the 1950s/60s. Building materials are vernacular - brick and tiles. Barns and machinery buildings often have corrugated asbestos roofs (Figure 8-79 right). A couple of farms have cows and poultry, others have small orchards and gardens.

Figure 8-79 Isolated Farmsteads in Crni Vrh

8.5.5 Roads and Other Infrastructure

The road pattern is complex and irregular. The roads follow foothills of the mountains or use valleys, some sections passing through the gorges or over the upland areas. Several two-lane roads traverse the area connecting Bor, Žagubica, and Majdanpek. Single track paved roads connect the villages. The roads are winding and undulating with many sharp turns (Figure 8-80 left), apart from the road through Žagubica valley which is mostly flat and straight (Figure 8-80 right).

Figure 8-80 Public Road in the Gornjak Gorge (left) and in Žagubica Valley (right)

Long-distance views from roads to the surrounding upland are limited and occasional, possible only in Žagubica valley. Other views from public roads are usually obstructed either by landform, dense woodland or man-made features. Dirt tracks in the north-eastern part of Crni Vrh, not used by many people, provide panoramic views of the entire WPP site.

Moderate traffic volumes are present only in the areas of Bor and Majdanpek. Lorries are frequent, related to mining operations or logging. As the distance from the towns increases, the traffic volume drops to a very low (500 vehicles per day). Along the single-track roads between villages other cars are rarely encountered.

The western part of the proposed WPP site is traversed by the public road Bor Reservoir (Brestovac) – Žagubica (Figure 8-81). Within the site, the road mostly runs through woodland providing enclosed views of the road corridor; there are 4 rather short sections not screened by vegetation, providing medium distance views of the site.

Figure 8-81 Public Road Traversing the Development Site

A railway line (Majdanpek – Bor - Zaječar) runs east of Crni Vrh, visually hidden and enclosed by woodland and a set of tunnels.

Overhead power lines criss-cross the landscape, in no obvious pattern.

8.5.6 Designated Landscapes

Landscape designation system has not been established in Serbia. No area in Serbia is designated based on its scenic value.

8.5.7 Landscape Character Summary

The landscape of the Study Area varies from large-scale dramatic rocks, hills and ridges with dense semi-natural woodland, enclosed intimate small-scale forest landscapes, open cultivated valleys to ‘moonscape’ mining areas. Settlement is sparse and dispersed. The ongoing expansion of mining areas puts growing pressure on the landscape.

The Wooded High Volcanic Hills and Ridges is a host LCT. The landscape possesses perceptual qualities (tranquillity and wildness) but has some detracting features and shows signs of loss. There are no rare features, the smooth rounded wooded hills are typical of the wider area. The scenic quality is moderate. Parts of this LCT (Crni Vrh mountain) have been under long-term human influence including built development, logging, and acidification due to air pollution. The landscape is in moderate condition. The recreational value of the landscape is limited. Features in the landscape are unlikely to be one of the main reasons to visit but make positive contribution to the experience. The overall **landscape value is medium**.

The Steep Wooded Karst Uplands LCT contains features designated for their biodiversity or geological value. The landscape is largely intact with a pronounced perception of wildness, tranquillity and high scenic quality. The landscape is in good condition. The historical and cultural associations are strong. The experience of the landscape during recreational activity is important. The overall **landscape value is high**.

The Cultivated River Valleys LCT is a large-scale and open low-lying landscape with many distracting features – an irregular pattern of pastures, arable land and built development. The landscape offers long views to undeveloped skylines of wooded hills and ridges. The tranquillity is affected by movement and noise. The scenic quality is moderate. The overall **landscape value is medium to low**.

The Mining and Post-Mining Areas LCT is a degraded landscape and contaminated environment where characteristic features have been lost. There are no signs of management or care. It has a negative sense of place. The overall **landscape value is negligible**.

8.5.8 Visual Baseline

This section identifies the extent of theoretical visibility of the proposed WPP and identifies visual receptors that would be assessed. The section also presents the viewpoints that would be used to assess effects on receptors, including reasons for their selection.

8.5.8.1 Theoretical Visibility

The ZTV maps represent a theoretical worst-case scenario where landscape is a bare ground without screening structures or vegetation, and weather conditions are most favourable. The ZTVs cannot convey the nature or magnitude of visual effects and whether effects are significant or not. However, they are very useful in confirming areas where visibility is not possible due to the intervening topography (within the tolerances of the DEM used).

The ZTV models assume the best possible weather conditions and visibility and do not account for fog, mist and snow which are all rather common weather occurrences not just at the site but in the wider Timok Region from October to March.

As any other computer model, ZTVs have to be used with caution because they can show a place having full theoretical visibility of the turbines that in reality will have no view or the view will be marginal and the visual effect negligible.

To assess the visual effect of the Crni Vrh WPP, ZTVs have been produced on figures in Appendix A. The ZTVs identify the areas where turbine hubs and blades would be theoretically visible from any given point within the radius of 45km.

Two ZTV models have been created using the currently proposed turbine hub height of 125m and height to blade tip of 206m:

(1) The “bare-ground” model which does not take into account any vegetation or man-made screening and is strictly based on the topography of the area (see Appendix A, Figures A1 and A2). This model is useful in indicating areas where visibility is not possible due to intervening topography. This is the mandatory model required by the NatureScot guidelines.

(2) The "woodland screening" model which takes into account the present woodland but excludes any man-made screening structures (see Appendix A, Figure A3). This is the additional model and should not be considered as an alternative to the "bare ground" scenario.

8.5.8.2 Analysis of ZTVs

The analysis of ZTVs provided in this section has informed the selection of key visual receptors and representative viewpoints for the assessment.

The ZTVs indicated that across the 45km area, visibility of the proposed WPP is localised and mostly limited to higher ground areas of similar or higher elevation. There is no significant difference between the pattern of hub height visibility and the blade tip visibility. The areas that will experience theoretical visibility are mostly the same, only the number of visible turbines is different, i.e. blade tips are obviously being more visible than hub heights.

Within 5km of the site there is theoretical visibility from upland slopes facing the site except the very southern and south-eastern slopes of Crni Vrh Mountain.

Between 5km and 10km from the site, there will be visibility only from Kučaj Mountain (in the south-west) and Veliki Krš and Mali Krš Mountains (east and north-east). There is a potential for intermittent visibility at Gornjane plateau, a hilly area between Veliki and Mali Krš, with scattered farmsteads of the village of Gornjane. Higher ground areas above the village of Vlaole provide partial views of the turbine's hubs and towers.

Between 10km and 20km from the site, theoretical visibility is localised to the west, east and south-east of the site. To the west, the visibility extends across the Žagubica Valley and the eastern slopes of Beljanica Mountain. To the south-east, visibility is intermittent in higher ground areas around Bor and along Goli Krš Mountain. To the east, visibility extends along Deli Jovan Mountain. The WPP site is not visible from two designated natural heritage sites in this area: Mlava Spring (12km to the east) and Lazar Gorge (13km to the south).

Between 20km and 30km of the site, visibility extends further to the west (site-facing hills after Krepoljin and Beljanica Mountain) and to the south-east in the hilly area of Rgotina karst. The WPP site is not visible from two designated natural heritage sites in this area: Veliki Buk (Lisine) Waterfall (25km to the south-east) and Krupaj Spring (26km to the east).

Beyond 30km, theoretical visibility is limited to the hilly area near the town of Zaječar (south-east of the site) and hill summits above the Gornjak Gorge (west of the site). In the north, there is intermittent visibility from site-facing hills within the Djerdap National Park.

In reality, natural and man-made features will restrict or limit the theoretical visibility. Uplands and valleys will have restricted views either due to intervening topography or dense woodland, road-side hedgerows or houses within villages. The forest canopy in Crni Vrh Mountain will block many views of the site.

8.5.8.3 Key Visual Receptors

The key visual receptors in the wider area include:

- Residents (including settlements, scattered houses, isolated houses);
- Road users;
- People engaged in recreational activities (walking, cycling, skiing);
- People working in open areas (farmers, beekeepers, loggers, hunters, wild plant collectors, etc.).

Visitor attractions are not considered to be a key receptor as none of them will experience visibility of the WPP. The ZTV model to blade tip suggested that the proposed Crni Vrh WPP had the potential to be theoretically visible from the area near the UNESCO World Heritage site Gamzigrad – Romuliana (35km to the south-east). This was double-checked during the field survey when it was determined that Crni Vrh Mountain is not visible from the Gamzigrad visitor centre area, therefore Gamzigrad Romuliana has been excluded from the assessment.

The single railroad track Majdanpek – Bor – Zaječar traverses the Study Area but has no potential of theoretical visibility of the WPP site due to the intervening topography. While the route is scenic, it mostly runs in cuts or through tunnels, including the tunnels through hills between Gornjane and Krivelj (5-7km east of the site). The railroad has therefore been excluded from the assessment.

In order to focus the assessment on potential significant effects, settlements within 30km of the proposed WF have been reviewed. Beyond 30km, the main potential for views from settlements is considered to be largely theoretical and in reality, is restricted by vegetation or buildings.

8.5.8.3.1 Local Residents and Visitors in Settlements

Settlement in the Study Area varies from nucleated and concentrated in towns and villages to linear along the roads and dispersed in hilly areas. Scattered or isolated properties are frequent. Their occupancy varies from permanent to periodical during the warmer months.

Due to the intervening topography, the Crni Vrh WPP will not be visible from the towns (Bor, Žagubica and Majdanpek). Higher ground areas outside the urban areas of Bor and Majdanpek provide theoretical visibility but in reality, are either inaccessible or part of the open cast mines.

Within the 5km Study Area scattered houses in Crni Vrh Mountain will have widespread theoretical visibility of the windfarm. Some views might be screened or filtered by nearby woodland, however, parts of the proposed WPP will be very well seen from most of the properties.

Within the 10km Study Area, settlements predicted to partly experience the theoretical visibility of the windfarm are Gornjane and Vlaole, north-east of the site. Gornjane is a dispersed village with around 300 farmsteads scattered along the hills. Vlaole is a linear village at the foot of nearby hills and only individual farmsteads on higher ground east of the village will have views of the WPP site.

Within 10-20km of the site, there is the theoretical visibility of the WPP from a couple of settlements in Žagubica Valley, west of the site: Ribare (scattered), Izvarica (nucleated), Suvi Do (linear), and Milatovac (nucleated). Individual houses in higher areas of Ribare and outskirts of Izvarica will have a view of a number of turbines. Restricted theoretical visibility of the WPP is predicted in higher areas of Milatovac villages and outskirts of Suvi Do.

Beyond 20km of the site no settlement will experience theoretical visibility of the proposed windfarm. The settlements are situated at foothills and views of Crni Vrh Mountain are blocked by topography.

8.5.8.3.2 Travellers by Roads

Theoretical visibility of the proposed WPP from roads is illustrated on ZTV plans in Appendix A. Visibility from roads depends on the surrounding topography, man-made features and vegetation pattern. Given the undulating and winding character of roads in the Study Area, the visibility of the proposed WPP will be widely intermittent and restricted.

Within 5km of the site, visibility from the public road No. 161 is possible along the short stretches where there is no woodland or blocking terrain. Single track dirt road which provides access to scattered houses 3km north-east of the site will have views of the proposed WPP, filtered by vegetation and terrain.

Within 10km of the site, the visibility from roads will be occasional and limited. Short stretches of the road No. 161 will have views north-west of the site. There will be limited visibility from the public road No. 393 Krivelj – Gornjane – Vlaole traversing east of the site.

Within 10-20km of the Study Area, visibility will be possible from the road No. 161 running through Žagubica Valley west of the site.

Within 20-30km of the Study Area, higher sections of the public road No. 161 will have intermittent views of the site. South-east of the site, the public road No. 165 Rgotina – Bor running along the higher ground area of Rgotina karst will have panoramic views of the site.

Beyond 30km of the site, there will be no theoretical visibility from roads.

8.5.8.3.3 People Involved in Recreation

The Study Area is popular for outdoor recreation activities. The moderate altitude makes the mountains accessible for wide groups of walkers, trekkers, hikers and mountain bikers. Weekend trekking trips to Kučaj, Veliki Krš or Stol mountains are regular (Figure 8-82).

Within 5km of the site, skiers at the local ski centre at Crni Vrh will have views of the WPP, both from the top of the ski slope and from the entrance at the foothill.

Within 5-10km of the site, there will be widespread visibility from summits of nearby mountains (Veliki Krš, Stol, Kučaj) and the hilly area above Vlaole, on the way to the summit of Mali Krš Mountain called Garvan.

Figure 8-82 Trekkers on Veliki Krš Mountain
(*Source:* www.trekking-serbia.com)

Within 10-20km Study Area, visitors of Beljanica Mountain (west of the site) will have views from the summits. Within 20-30km Study Area, the hilly area Rgotina Kamen (south-east of the site) is popular among trekkers and provides panoramic views of the wider area including the development site.

8.5.8.3.4 People Working in the Open Countryside or Forest

People who work in the open countryside are local farmers and beekeepers. Farmers are primarily present in Žagubica Valley. Local beekeepers are assumed to be present throughout the Study Area, including Žagubica Valley and the area of Gornjane Plateau (Figure 8-83). Harvesters of mushrooms or other wild plants, loggers and hunters are present in Crni Vrh Mountain as well as other surrounding woodland areas.

Figure 8-83 Beekeepers in Žagubica Valley

8.5.8.4 Night-time Conditions

Crni Vrh mountain is a rural and remote area, distanced from major sources of artificial lighting. The closest source of lighting is the Cerovo open cast pit, c. 4km east of the site. The public road traversing the western part of the site is an intermittent illumination source from car headlights, largely diminished by the enclosing woodland.

Due to the susceptibility to fog, Crni Vrh mountain is not considered to be an area with a value attached to night-time views.

The existing sources of artificial lighting are shown on Figure 8-84.

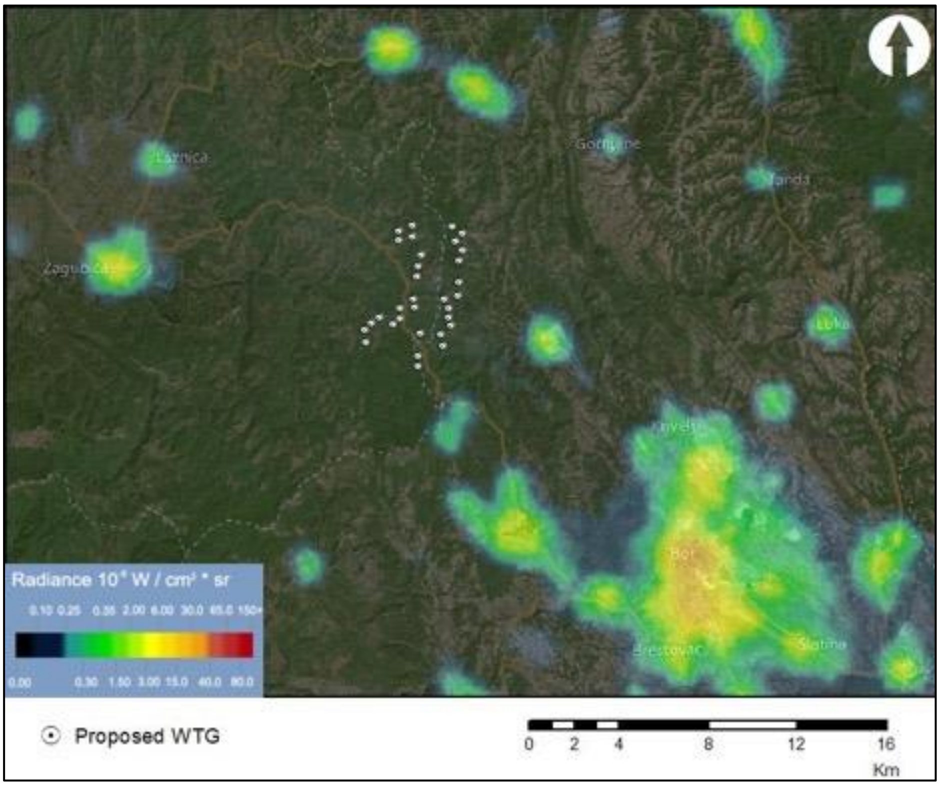

Figure 8-84 Existing Sources of Artificial Lighting in Crni Vrh Area

(Background map: https://www.lightpollutionmap.info)

Sensitivity of residential receptors to lighting depends on their position to the proposed WPP and the existing lighting sources. Residential properties within 5km to the development site are considered to be highly sensitive to lighting as no other sources of artificial lighting are present. The exception are properties east of the site and properties along the public road No. 161 which are considered to be medium sensitive as they are exposed to the Cerovo mine and car headlights, respectively. Drivers using the public road are considered to be low sensitive as they tend to be focused on the winding road illuminated by their lights.

8.5.8.5 Selection of Representative Viewpoints

The viewpoints have been selected to be representative of the key visual receptors within the Study Area and to include different directions, distances and elevations from the site. Thirteen viewpoints have been selected across the 30km Study Area to represent different landscape characters, settlements, routes and hilltops.

Each selected viewpoint is illustrated with a photograph and wireline of the existing view, and a photomontage and wireline showing the proposed Crni Vrh WPP.

Table 8-15 lists the selected viewpoints and provides information on their location and distance from the nearest turbine of the proposed Crni Vrh WPP.

Table 8-15 Representative Viewpoints

No.	Viewpoint	Receptor Type	Distance from Nearest WTG (m)	Direction from Nearest WTG	Elevation (m AOD)
1	Dirt road above the weekend house within the site – north-eastern corner Representative of views for residents and workers in open areas.	Local residents; Workers in open areas;	689	NE	750
2	Public road No. 161 within the site - south Representative of views road users and people working in Crni Vrh.	Road users; Workers in open areas; Visitors.	856	SW	828
3	Dirt road near the residential house north-east of the site Representative of views for residents and workers in open areas.	Local residents; Workers in open areas;	986	NE	721
4	Public road No. 161 within the site – centre Representative of views for road users and people working in Crni Vrh.	Road users; Workers in open areas;	1,038	W	854
5	Crossroad of dirt roads north-east of the site Representative of views for residents and workers in open areas.	Local residents; Workers in open areas;	1,103	NE	720
6	Eastern hillslope on Crni Vrh – near a weekend house Representative of views for residents, workers in open areas, and walkers.	Local residents; Workers in open areas; Walkers.	1,866	NE	657
7	Public road 161 - north-west of the site Representative of views for residents and road users travelling eastwards (from Žagubica) and people working in Crni Vrh.	Local residents; Road users; Workers in open areas; Visitors.	2,584	NW	824
8	'French Barracks' - Entrance area to ski centre "Crni Vrh" south of the site Representative of views for visitors to the ski centre (in winter), walkers and visitors to Crni Vrh.	Skiers; Walkers in the mountain.	2,683	S	736
9	Dirt road east of the site, close to Cerovo open cast pit Representative of views for residents and workers in the fields.	Local residents; Workers in open areas.	2,834	E	625
10	Public road No. 161 east of Žagubica Representative of views for road users travelling eastwards (from Žagubica).	Road users; Workers in open areas;	7,014	W	679
11	Ribare - southern edge of the village Representative of views from the edge of village.	Local residents; Workers in the field.	21,177	NW	334
12	Public road No. 161 east of Krepoljin Representative of views for road users travelling eastwards and local farmers.	Local residents; Road users; Workers in the field.	23,176	NW	398
13	Public road No. 165 west of Rgotina Representative of views for road users travelling westwards and local walkers in the area of Rgotina Karst.	Road users; Walkers / trekkers.	26,735	SE	330

8.6 Traffic and Transport

This section describes the regional road transport infrastructure that would be used once the wind turbine components are delivered by river barges and unloaded and the roads that would be used in the transport of aggregate and other construction material for the project.

8.6.1 Existing Road Network

The existing road network is moderately dense, comprising regional roads (class Ib state roads) which provide connection to the motorway E-75 in the west and the Danube River in the east. Other roads away from the regional roads are class II state roads that travel through small towns and villages. The layout of the proposed Crni Vrh WPP in the context of the local road network is shown on Figure 8-85.

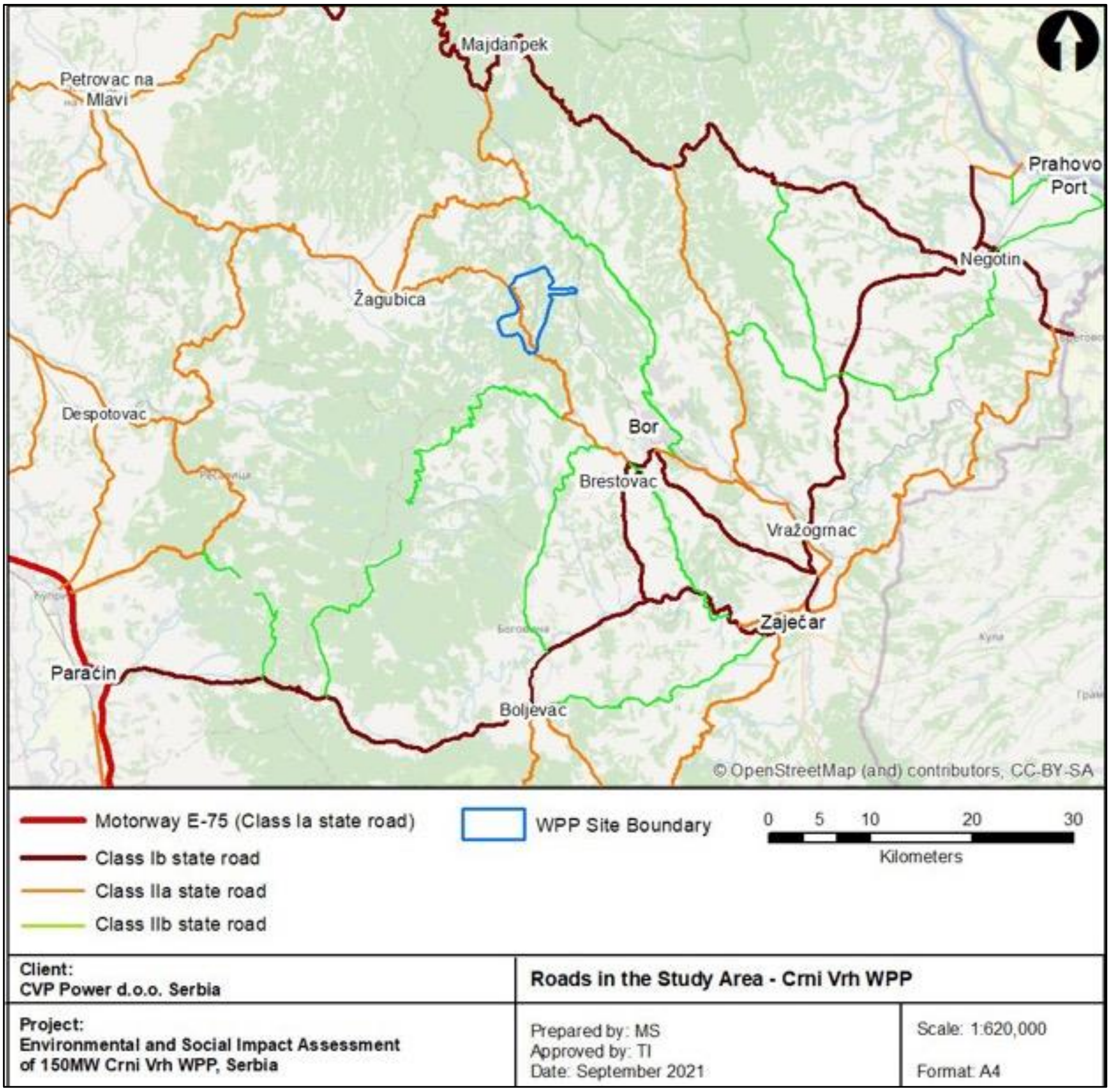

Figure 8-85 Road Network in the Study Area

It is of note that many roads in the Study Area are prone to icing and snowdrifts and subject to lorry restrictions in winter. This includes the roads Paraćin-Boljevac-Zaječar, Zaječar-Bor, Negotin-Majdanpek and the road traversing the WPP site Bor Reservoir – Žagubica. More details on the winter conditions on the road traveling the WPP site are provided in Section 14.7 - Ice Throw and Ice fall Risk.

The routes which would be used for access to the site during the construction phase are:

- For abnormal loads transport the route from Prahovo Port via Negotin, Vražogrnac, Bor, and Brestovac;
- For conventional construction traffic majority of vehicles would arrive northbound via Bor and Brestovac along the road No. 161.

8.6.2 Abnormal Loads Transport Route

At the time of writing (October 2021) the Developer has established one preferential transport route for delivery of large WTG components which can be seen on Figure 8-86. The route is about 100km long. This option requires turbine components to be delivered by river barges via the Danube River to the Port of Prahovo.

The route runs from the Port of Prahovo through the eastern edge of Prahovo village, continuing along the road No. 168 and road No. 35, bypassing the town of Negotin. After the Vražogrnac bypass, the road No. 37 climbs towards Bor and traverses the southern outskirts of the town to the northern edge of Brestovac village. The route then continues along the road No. 161 next to the small summer house settlement Brestovac Spa towards Bor Reservoir and northbound to the site.

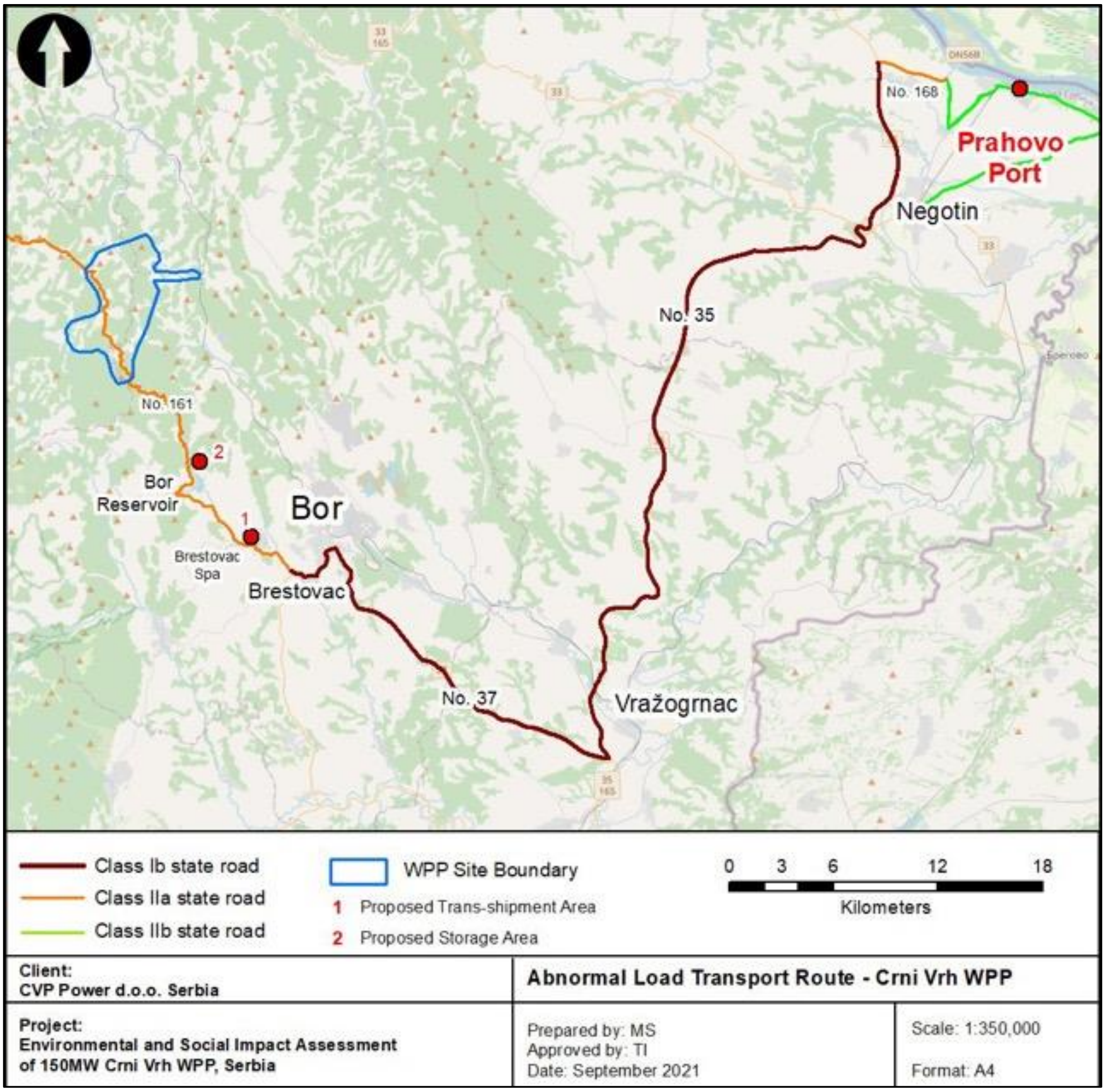

Figure 8-86 Proposed Route for Abnormal Loads Transport

Due to the narrow and winding road between Brestovac Spa and the site (20km), a conventional horizontal transportation of blades would not be possible and blade-lifters would need to be employed. The change of vehicles requires a trans-shipment area where the blades would be transferred to blade-lifters and other turbine components would be loaded on modular trailers. A trans-shipment area is proposed in the area of Brestovac Spa, approx. 5 km south of Bor Reservoir (Figure 8-86).

A storage area where tower components and blades would be temporarily unloaded and stored is proposed 1km north of Bor Reservoir at a plot 130m by 100m (Figure 8-86). The distance from the storage area to the last WPP site access is c. 16km.

8.6.2.1 Assessment of the Proposed Route

CVP has undertaken a preliminary assessment of the suitability of the proposed route.[41] The assessment has been based on a maximum turbine blade length of 81.5m and top section of the tower length of 35m which are the key constraints during transport.

The swept path analysis of the route identified more than 30 pinch-points which would require physical mitigation works. The majority of required mitigations are usual for windfarm projects: temporary removal of street furniture and utilities, minor stabilisation and levelling, widening of curves, and removal of vegetation in order to ensure a clearance of at least 6m.

There are three short sections (up to 400m each) where road bypasses are being considered as options. These would require acquis ion of third-party land and road design and engineering measures.

Prahovo Port

The port of Prahovo is the last and most eastern port on the Danube River in Serbia, situated just downstream (4km) of a large hydropower dam (Iron Gate II), see Figure 8-87. It is a small state-owned industrial port which has been serving a nearby large mineral fertiliser plant since the 1960s. The port has not been used before for delivery of wind turbine components.

The port is currently primarily used for general and dry bulk cargo (coal, phosphate, pyrite ash) and has 6,000 m^2 of open-air and 2,000m^2 of covered storage areas. The current unloading capabilities comprise six gantry cranes with maximum lifting capacity of 40 tonnes which is sufficient for blades but not for other turbine components weighting up to 80 tonnes. Mobile cranes with higher lifting capacity would need to be employed.

Figure 8-87 Prahovo Port

(Source: www.danube-logistics.info)

CVP have been in contact with the port management who confirmed that there is available storage capacity for the WTGs.

A significant reconstruction and expansion of the port is currently being financed by Serbia government. The works are planned to commence by the end of 2021 and to complete in 2024. The port will continue operation

[41] S.A.E. srl – Transport Feasibility Study Crni Vrh WF (March 2021)

throughout the reconstruction and it is not anticipated that the reconstruction activity would interrupt the WTG delivery for the Project.

8.6.3 Other Construction Transport

CVP are considering the creation of borrow pits within the boundary of the WPP to source stone aggregate. This stone will be used to construct the access roads and crane hardstandings. If the quality of local rock is not suitable, then crushed stone will be sourced from off-site locations. The most likely off-site source of stone will be from quarries in Eastern Serbia, areas of Popovac and Rgotina, within 100km from the site. It will be delivered to the site via state class Ib regional roads No. 36 and No. 37. Both roads have medium to high traffic flows and the project-related traffic is not likely to affect them.

At the time of writing, it had not been decided if an existing, commercial concrete batching plant will be used for the Project or if a plant will be constructed on or near the construction site. For the purposes of the ESIA it has been assumed that an existing, off-site plant will be used. The ESMMP includes actions for each option.

Effects associated with the WPP development would be most pronounced once the construction vehicles reach Brestovac village and continue northbound towards Bor Reservoir and to the site. This route partially overlaps with the one proposed for the delivery of large turbine components.

8.6.3.1 Existing Traffic Flows

Traffic flows along the route proposed for the transport of turbines components are low. The most frequented road is the 4km-long section which runs through the urban area of Bor where the number of vehicles reaches up to 4,800 vehicles per day. Upon exiting Bor, the number of vehicles drops to 2,000 per day.

A summary of 24h average annual daily traffic (AADT) recorded in 2020 is provided in Table 8-16. The provided data for Heavy Goods Vehicles (HGV) refer to goods vehicles over 3.5 tonnes.

Table 8-16 Average Annual Daily Traffic in 2020 on Roads in the Study Area

Road	Section	Length (km)	Total AADT (2020)	HGV (> 3.5t)	% HGV
400	Prahovo Port - Samarinovac	8	Not counted		
168	Samarinovac - Dušanovac	4.1	Not counted		
35	Dušanovac – Negotin	7.8	**2,167**	53	2.4%
35	Negotin - Bukovo	3.4	**2,259**	56	2.5%
35	Bukovo - Salaš	20	**2,140**	53	2.5%
35	Salaš - Rgotina	19.5	**1,824**	48	2.6%
35	Rgotina - Vražogrnac	3.8	**2,741**	63	2.3%
37	Vražogrnac - Bor	21.4	**2,850**	130	4.6%
37	Bor - Brestovac	3.9	**4,832**	93	1.9%
161	Brestovac - Brestovac Spa	4	**2,092**	82	3.9%
161	Brestovac Spa - Bor Reservoir	5.1	**1,313**	51	3.8%
161	Bor Reservoir - Žagubica	34.3	**533**	23	4.3%

Road sections which would be used for both abnormal loads transport and other construction material transport.

The section of the road No. 161 which traverses the WPP site (Bor Reservoir - Žagubica) has a rather low traffic volume, slightly over 500 vehicles per day. The traffic volume has been fluctuating over the last 13 years but has increased for 25% (106 vehicles) in relation to 2013.

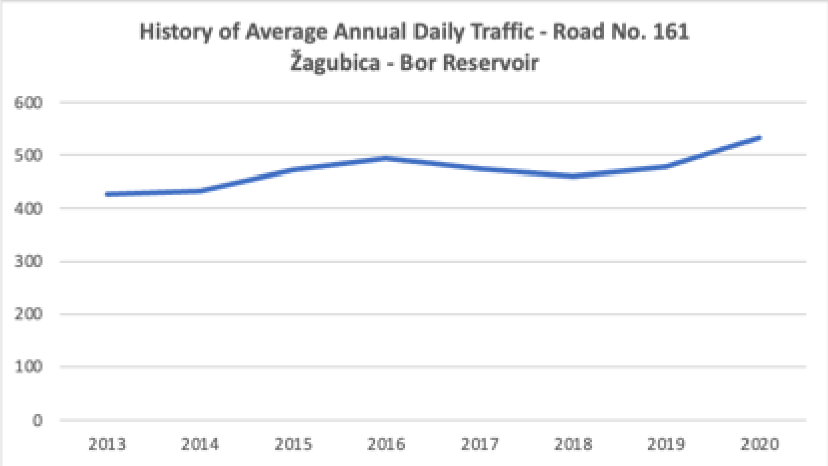

Figure 8-88 History of Average Annual Daily Traffic (2013-2020) on Road No. 161

Historic traffic patterns provided by Google Traffic suggest periods of slight congestion between Brestovac and Bor Reservoir on weekdays between 10am and 4pm. The section between Brestovac Spa and Bor Reservoir is prone to occasional vehicle convoys forming behind slower vehicles (mostly timber lorries). Other route sections and periods of the day have not been affected.

8.6.3.2 Existing Traffic Safety

The route between Brestovac and Žagubica would be a primarily used route for the project during the construction phase - not just for the abnormal loads but for other construction material as well. While the transport of abnormal loads is strictly regulated in Serbia and has to be undertaken with assistance of police, other heavy goods movements for the project would have more interaction with the local community.

The accident statistics provides an insight to the volume of traffic along the route and a driver behaviour. Road fatality rate in Serbia is higher than in the EU. The 5-year average rate of road deaths in Serbia is 81 per 1 million inhabitants compared to 51 per 1 million in the EU.

Over the past 5 years (2016-2020) a total of 71 traffic accidents were recorded in the Žagubica Municipality of which 45 were with injury or fatality (63%). In Bor there were 609 traffic accidents of which 301 with injury or fatality (49%).[42] The most common causes of traffic accidents were driver distraction and inappropriate speed.

The spatial distribution of accidents is shown in Figure 8-89. There are no obvious clusters or blackspots, however the section in the area of Brestovac appears to have a higher rate of collisions with injuries than collisions with material damage.

Three accidents were recorded within or adjacent to the WPP site, all three with injuries. During the course of the WPP site visit, speeding was observed to be an issue. The volume of traffic is very low and many drivers exceed the speed limit of 80km/h.

Vulnerable road user groups identified by the national road safety agency in the Bor area are drivers younger than 30, tractor drivers, cyclists and pedestrians older than 65. In the municipality of Žagubica, the vulnerable groups are tractor drivers and motorcyclists. In the context of this ESIA all pedestrians are considered to be vulnerable road users.

Apart from the urban area of Bor, none of the settlements are intersected by a road. However, the road No. 37 runs along the northern edge of Brestovac village while the road No. 161 is adjacent to two summer house settlements - Brestovac Spa and Bor Reservoir. The traffic control measures are present only in Bor (traffic lights, pedestrian crossings).

[42] Agency for Traffic Safety of Serbia – Annual Reports on Traffic Safety for Municipalities (2020)

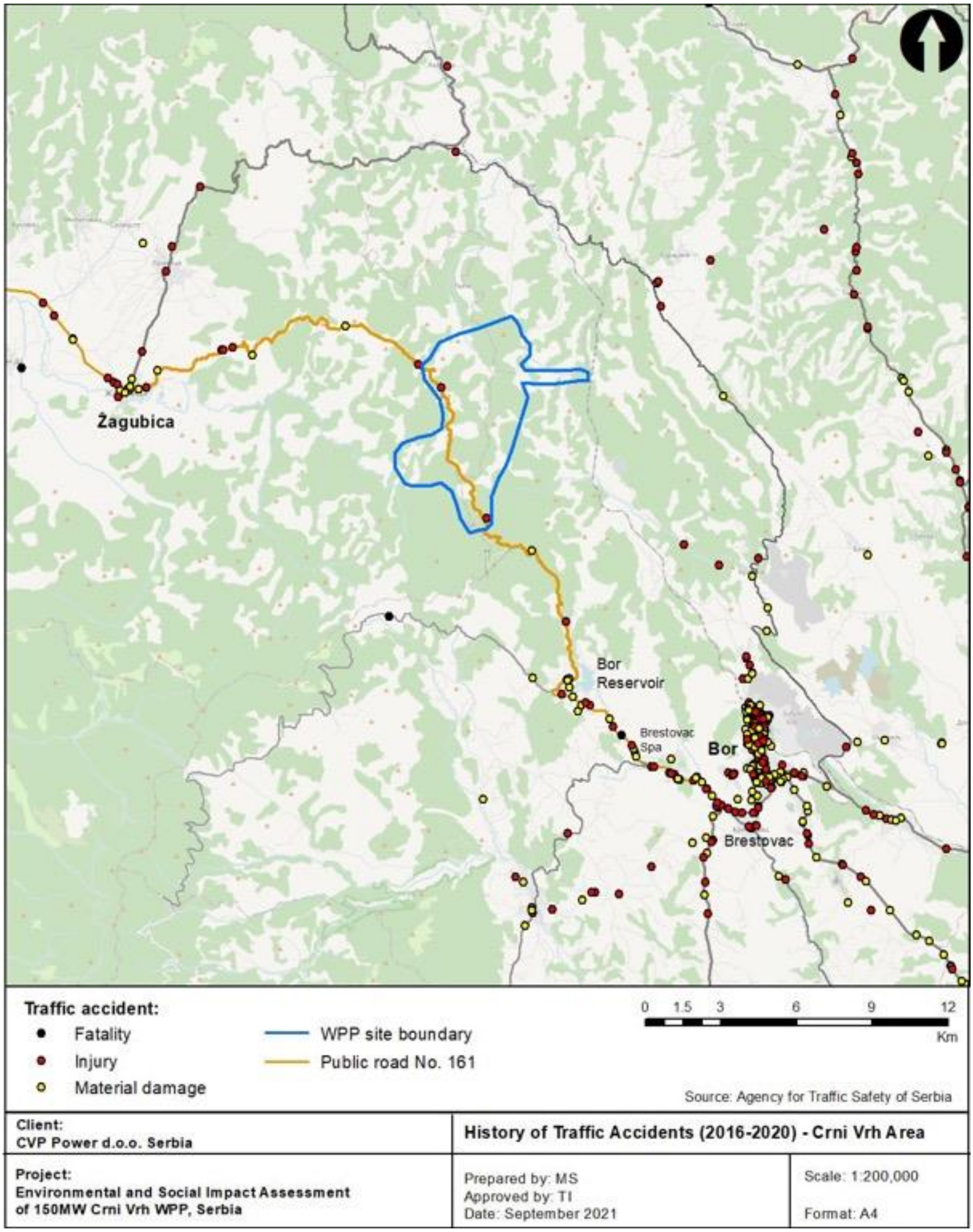

Figure 8-89 History of Traffic Accidents (2016-2020)

8.6.4 Site Access

The main access to the WPP site is from the state IIa class road No. 161 connecting Bor Reservoir and Žagubica. The road traverses the western part of the site. Access is possible from both NW and SE directions. A number of forest tracks connect to the road, allowing access to the eastern and western ridge.

8.6.5 Forest Tracks

The development site is traversed by unsurfaced forest tracks (3-5m wide). The tracks are mostly on moderate slopes (up to 15°), several short sections are steep (around 20° or higher). Some sections of the forest tracks were noted during the geotechnical investigation to be in poor condition and severely affected by gully erosion. During the wet period of the year the tracks are impassable to normal road vehicles. The forest tracks will be widened and upgraded to accommodate the access roads to the proposed WTG positions.

8.6.6 Sensitivity of Roads Users and Locations

The sensitivity of roads, their users and communities along the routes within the Study Area has been assessed and summarised in Table 8-17.

Table 8-17 Sensitivity of Road Receptors, Users and Communities

Route	Road Section	Sensitivity	Justification
Preferred abnormal transport route	No. 400 Prahovo Port - Samarinovac	Medium	Class IIb state single carriageway road with low traffic volume; has been used for decades for HGV traffic from the nearby mineral fertilizer production plant 'Elixir' (former IHP Prahovo). Passes through the outskirts of Prahovo and (potentially) Samarinovac settlements which have few local amenities. Minimal traffic management measures are in place (speed limit of 40km/h in the settlements). Potential presence of pedestrians in the areas of Prahovo and Samarinovac and tractors out of settlements.
	No. 168 Samarinovac - Dušanovac	Low	Class IIa state single carriageway road with low traffic volume capable of accommodating abnormal transport vehicles and HGVs. Minimal traffic management measures are in place (speed limit). Potential presence of tractors.
	No. 35 sections: Dušanovac – Negotin, Negotin – Bukovo, Bukovo – Salaš, Salaš – Rgotina, Rgotina - Vražogrnac	Low	Class Ib state road with moderate traffic volume constructed to accommodate general and HGV traffic moving between primary destinations. Minimal traffic management measures are in place (prohibit overtaking). Potential presence of tractors.
Preferred abnormal transport route and major route for other construction traffic	No. 37 sections: Vražogrnac – Bor Bor - Brestovac	Medium	Class Ib state road with medium to high traffic volume constructed to accommodate general and HGV traffic moving between primary destinations. Travels through the southern outskirts of Bor with residential buildings and some amenities. Traffic management measures present in Bor (crossings, traffic lights). Travels along the northern edge of Brestovac village with minimal traffic management measures are in place (speed limit, prohibited overtaking, etc). Slightly congested in Bor area on weekdays between 8am and 4pm. Potential presence of pedestrians and cyclists in the area of Bor.

Route	Road Section	Sensitivity	Justification
			Potential presence of tractors out of settlements.
	No. 161 Sections: Brestovac - Brestovac Spa Brestovac Spa – Bor Reservoir Bor Reservoir - Žagubica	Medium	Class IIb state road with medium to low traffic volume, suitable for HGV traffic. Abnormal loads transport is possible under certain conditions (e.g. blade-lifters). The road pavement is in modest condition, with many cracks and pothole patches. Travels next to the nucleated summer house settlements Brestovac Spa and Bor Reservoir. There are linear houses along the road with no amenities. Minor traffic management measures are in place (prohibited overtaking). The section between Brestovac Spa and Bor Reservoir is prone to vehicle convoys being unable to overtake timber lorries or other HGVs. Potential presence of pedestrians in the areas of Brestovac Spa and Bor Reservoir, especially in summer. Potential presence of pedestrians (skiers) in the ski resort area during winter. Slightly congested on weekdays between 10am and 4pm.

9 Socio-Economic and Cultural Setting – Human Geography

9.1 Introduction

The Crni Vrh WPP site extends across the territory of two municipalities[43] in Eastern Serbia – Žagubica and Bor. Žagubica, where most of the turbines are located, is a part of the Braničevo District, whilst Bor territorially belongs to the Bor District. The area is sparsely populated and although there are very few inhabited houses surrounding the project site, the majority of the inhabited houses are at significant distance from it. These houses territorially belong to Žagubica town or Laznica village, both in the Žagubica municipality, and Krivelj village in the Bor municipality.

The region of Eastern Serbia is one of the poorest parts of Serbia and is known for a rapidly declining population (particularly in rural areas). This is primarily due to the lack of employment opportunities and underdeveloped infrastructure, including the road network. This part of the country is also known for mining (copper and precious metals), particularly in the City of Bor, as well as coal near Žagubica itself. Eastern Serbia is also known for its beautiful natural landscape, however due to the lack of infrastructure, tourism has not developed to a significant degree. At the southern end of the project site is an unfinished ski resort, whose construction began during the 1990-ies, however the project has since been abandoned and, according to media reports, it appears unlikely that it will never be completed. Two ski runs and one ski lift are operational and used mainly by local people during the winter.

The planned budgets of the two affected municipalities are provided in Table 9-1.

Table 9-1 Municipality Budgets

Municipality	Budget (2022) in RSD	Budget (2022) in EUR
Žagubica	604 million	5.1 million
Bor	3,765 million	32.1 million

As with many other municipalities in Serbia, the budget of these units of self-government, are highly dependent on income transferred from higher levels of government. The municipalities do not have the ability to influence the level of key sources of funding, except from some local taxes and fees.

9.2 Population and Demographics

The area around the proposed Project site is largely unpopulated. There are occasional houses in several locations within the site, however most of them are abandoned. A few may eventually be used as weekend or holiday houses, but most are in poor condition and would need significant levels of work before they could be habitable.

The Project site is surrounded by several villages although none of these villages are in the vicinity of the wind turbines. The villages surrounding the site and their population according to the 2011 census are provided in Table 9-2 below. Their combined population is just over 5,500 people. It should be noted that, having in mind the general population trends in these areas, the population of these villages has likely reduced even further in the past decade.

[43] Following the initial revision of the conceptual design of the WPP (removal of string IV).

Table 9-2 Population by Village

Municipality	Village	Total population (2011 census)
Žagubica	Žagubica	2,590
	Laznica	1,881
Bor	Krivelj	1,052
TOTAL		5,523

The total population of the two affected municipalities combined is about 60,000. The population by municipality is provided in Table 9-3.

Table 9-3 Population by Municipality

Municipality	Total population (estimate 2021)
Žagubica	12,292 (14 per km^2)
Bor	47,911 (51 per km^2)
TOTAL	60,203

The population of Bor is almost exactly four times the population of Žagubica. Population density is also far higher in Bor than in Žagubica. The total population in the municipalities has been steadily declining over the past few decades, as in the rest of Serbia. The men to women ratio is close to equal in both municipalities.

With over 17 percent of its population being over the age of 65, Serbia's proportion of elderly people is among the highest in the world. The main factors contributing to this situation are low birth rates and significant outmigration of young people.

The aging index, which represents the ratio of the number of older inhabitants (60 and older) and younger inhabitants (0-19 years of age), is 144.72 at the country level, meaning that in Serbia, in 2020, there were 1.45 older people for every younger person in the population. In Žagubica, this index is alarmingly high at 251.16, while in Bor it is closer to the national level index, but still higher, at 153.72. The average age in Serbia in 2020 was 43.4 and has been increasing steadily in the last 10 years, when it was 40.2. The same trend is present in the two municipalities as can be seen in Table 9-4.

Table 9-4 Population Average Age by Municipality

Municipality	Average age (2020)		Average age (2010)	
	Men	Women	Men	Women
Republic of Serbia	42	44.8	41.4	42.7
Žagubica	47	50.3	44.9	48.4
Bor	42.4	45.2	40.3	42.9

The average age for women is higher everywhere than for men due to the longer life expectancy of women. Life expectancy in Bor is around 71 years for men and 77 years for women, while in Žagubica, life expectancy is more favourable, at 73 years for men and 80 years for women. This is likely due to better environmental circumstances, with less industry and pollution in the less developed municipality. The most significant causes of death in 2020 in all three municipalities were cardiovascular diseases (around 50% in Bor but as high as 75% in Žagubica) and tumours (around 20% in Bor and 10% in Žagubica). The situation in Bor is consistent with the national average.

The majority of the population in both municipalities declare themselves as ethnic Serbs. As is characteristic for this part of Serbia, the only other ethnic group that stands out are the Vlachs who comprise about 14% of the population in Bor and about 22% in Žagubica. Vlachs are the Balkan Romance speaking people and are considered to be a native ethnic group. The term Vlach has also become a synonym in the Balkans for the social category of shepherds.

The majority of Vlach people declare Serbian as their first language as they were born and live in Serbia. A significant minority also speak the Vlach language. It was declared as the first language by about the same number of people who declared their nationality as Vlach. According to local residents[8], Vlach is often spoken between them although, in Eastern Serbia there is no written form of the language (or at least, a standardised alphabet).

The vast majority of the population in both municipalities belongs to the Orthodox Christian denomination.

Reports from the Republic Institute for Social Protection for 2020, show that the share of social welfare beneficiaries in the total population is lower in both municipalities than at the level of the republic. In Žagubica, the share is almost half of the Republic level average, however this should not be taken as a clear indicator of the general wellbeing of the population. The lack of capacity and resources to include more beneficiaries in the system could also be playing a part in these results.

Table 9-5 Share of Social Welfare Beneficiaries in the Total Population by Municipality

Municipality	Share of social welfare beneficiaries in the total population (2020)
Republic of Serbia	10.2
Žagubica	6.2
Bor	8.1

The data presented in Table 9-5 include individuals who are beneficiaries of residential institutions for the elderly or the disabled, children in foster care, home care and so on. The numbers in Žagubica may be low due to the lack of social welfare institutions in the municipality. Analysing the number of people receiving financial social assistance through Centres for Social Welfare, may be the better indicator of vulnerability. These numbers and the share in the total population, and are provided inn Table 9-6 below.

Table 9-6 Beneficiaries of Financial Social Assistance by Municipality

Municipality	Number of beneficiaries of financial social assistance (2020)	Share of beneficiaries of financial social assistance in the total population (2020)
Republic of Serbia	218,166	2.9
Žagubica	167	1.5
Bor	1,298	3

While the share of beneficiaries of financial assistance in Bor is almost exactly the same as the republic level, in Žagubica, the percentage of people in the total population receiving this assistance is still half of that. Taking into account other available information, it can be anticipated that the lack of local capacity and resources to provide financial assistance in Žagubica are contributing to this postion. For example, according to the Poverty Map of Serbia, developed by the WB and the Serbian Statistics Office in 2013, as high as 40.3% of the population in Žagubica is at risk of poverty. In Bor, with 23.1% of the population being in this category, the situation is slightly better than at the national level (25.7%). Although these figures are bound to have improved with the increasing economic growth in recent years, they show the vast difference between the two municipalities, which is likely to be still the case.

9.3 Employment and Economic Activity

The municipalities of Žagubica and Bor are very different in terms of their economic status. They are at different stages of development when considering criteria such as GDP per capita as well as general trends in population numbers, unemployment, and education (Ref: Decree on Establishing a Uniform List of Regional Development and Local Self Government Units for 2014 of the Republic of Serbia[44]).

Žagubica is considered to be a severely underdeveloped municipality (belonging to the last, fourth category), whose level of development is below 60% of the Republic average. The economy of Žagubica municipality is mostly based on exploitation of natural resources, primarily the lumber industry and the mining of coal. The most significant employer in the municipality is a state-owned coal mine (about 300 employees), which has been under threat of closure for several years. Due to the mountainous terrain, livestock breeding has traditionally been the predominant form of agriculture, which has been regaining its former significance in the past few years.

In contrast, the City of Bor is considered to belong to first category municipalities, with a level of development above the Republic level average. The good standing of Bor can probably be attributed to a great extent to extensive mining activity, which was, in part, subsidized by the state for decades. In Bor, the economy is dominated by copper mining. The former state-owned copper and smelting complex RTB Bor was privatised in 2018, when Zijin Mining, one of China's biggest gold producers and the second biggest producer of copper ore became its majority owner. Agriculture is underdeveloped in the municipality, although it still provides an important source of livelihood for the local population.

Employment figures from 2020 for both municipalities are provided in Table 9-7 below. Up to 2019 there was a trend of increased employment in the two municipalities, which continued in Bor during 2020, despite the Covid-19 crisis. In Žagubica, registered employment reduced only slightly compared to 2019.

Table 9-7 Employment Data by Municipality

Municipality	Registered employment	of which in Legal entities	of which self employed	of which agricultural holdings
Žagubica	1,932	61%	22%	17%
Bor	12,962	86%	13%	1%

In both municipalities, most people are employed in the mining sector and the associated processing industry, as well as in trade. Significant numbers of people are also employed in education, health and social welfare. In the City of Bor, transport and storage are also important sectors of economic activity.

The average annual net salaries and wages in the country and in the two municipalities have been growing since 2010 as presented in Table 9-8. In Žagubica, the growth of salaries and wages has been slower and the municipality is still behind the national average, as opposed to the City of Bor which has surpassed it.

Table 9-8 Average Annual Salaries and Wages by Municipality

Municipality	Average annual salaries and wages (March 2022)		Average annual salaries and wages (2010)	
	RSD	EUR[45]	RSD	EUR[46]
Republic of Serbia	74,664	634	34,142	331
Žagubica	61,825	525	27,769	269
Bor	84,704	720	34,301	333

The number of active companies registered with the Serbian Business Registers Agency in the City of Bor has increased in the last 10 years, which is consistent with the national level which has been steadily growing. In Žagubica, the number of companies in the last ten years is almost unchanged, indicating a lower level of economic growth than in the City of Bor.

[44]Official Gazette of the RS 104/2014
[45] Average exchange rate for March 2022 (1 EUR = 117.6766 RSD)
[46] Average exchange rate for 2010 (1 EUR = 103.0431 RSD)

Table 9-9 Active Companies and Trends by Municipality

Municipality	Active companies in 2020	Active companies in 2010
Republic of Serbia	130,815	109,961
Žagubica	93	95
Bor	490	432

The main unemployment parameters from May 2022, for both municipalities are provided in Table 9-10. Consistent with previously presented data, registered unemployment has been decreasing over the years, particularly in Bor, where the number of registered unemployed persons has reduced by over 15% since the end of 2020. In Žagubica the decrease in that period has been negligible, however the trend in the last ten years is still there.

Table 9-10 Unemployment Data by Municipality

Municipality	Registered unemployment	of which women	Newly registered	of which women	Employed from the register	of which women
Žagubica	210	117	16	9	5	4
Bor	3,355	2,313	128	73	116	61
TOTAL	3,565	2,430	144	82	121	65

9.4 Education

According to data from the 2011 population census, in Žagubica approximately one third of the population has not been to school or has not completed primary education (of which 66% women), one third has completed basic primary education (46% women) and one third has completed secondary education (40% women). Only 4% of the population has a college or university degree (47% women).

The situation in Bor is more favourable, with 15% of the population with no school or incomplete primary education (of which about 72% are women). Around 21% of the population has completed primary education, while 51% have completed secondary education. In Bor, 12% of the population has a college or university degree (51% women).

A total of 1.91% of the population in Bor and 5.75% of the population in Žagubica, is illiterate, predominantly women over the age of 65, in all three.

9.5 Healthcare and Emergency Services

The City of Bor has a general hospital and both municipalities have primary health care centres, including emergency medical services departments. Small health clinics are available in some of the villages surrounding the Project site, where doctors and nurses treat patients several times per week.

9.6 Infrastructure

The City of Bor has close to 400 km of roads infrastructure, of which about 70% are paved roads. Žagubica has just over 200km of roads, of which around 65% are paved. In Bor, 43% of the roads are municipal (more than 50% are unpaved), meaning that they are maintained by the municipality. In Žagubica close to 60% are municipal roads (of which less than half are unpaved).

State Road No. 161 class IIA (section Žagubica to Brestovac), which passes through the middle of the Project site will be used as the main access point for the project. All other roads in the Project area are small, uncategorised and unpaved roads, as well as numerous forest access tracks. Access to the location in winter conditions is difficult.

The telecommunications and electricity networks exist in all villages; however, the electricity supply is often problematic due to outdated infrastructure and equipment. There are no sewage networks in the area and sewage water is collected in septic tanks. Most villages have public water supplies, however their capacity during the summer months is often insufficient. These supply networks are largely in poor condition due to old age and lack of investments. This impacts on the quality of drinking water. Individual households and small hamlets near the Project area use their own local groundwater wells. Solid waste disposal is organised only in larger villages which often results in the creation of unregulated waste dumps. Street lighting also exists only in the centres of larger villages.

9.7 Civil Society

According to the Serbian Business Registry Agency, the number of registered and active civil society organisations in Žagubica in 2021 is 96 (2 newly registered). In Bor, there are 290 such organisations (4 newly registered). The number of active organisations has been steadily increasing in both municipalities in the past few years.

The largest organisation in Žagubica is the hunting association 'Jovan Šerbatović' which has approx. 600 members. There are also three beekeepers' associations and two (sports) fishing associations. Other organisations include three that address ecological / environmental issues, several women's associations, one organisation assisting people with disabilities and numerous organisations dealing with sports, arts and culture (Municipality Žagubica, Development Plan 2021 – 2031).

In Bor, the types of citizens' associations are similar and they include those engaged in arts, sports, culture, assistance for vulnerable groups, etc. Organisations addressing environmental issues are numerous in Bor, as a result of the challenges faced by the local population in terms of pollution associated with mining and other activities. There are several networks of active associations which organise regular awareness raising and other events addressing these topics.

9.8 Tourism and Accommodation

Whilst Eastern Serbia is characterised by beautiful landscapes, natural resources and cultural and historical heritage, the tourist industry remains underdeveloped. This is most likely due to poor connection to other parts of Serbia and a reluctance to develop good accommodation facilities (due to lack of financial resources and in part due to poor networks for water, sewerage, and electricity). Those areas dominated by the mines and the copper smelter have rather and industrial feel which is not compatible with widespread tourism.

Apart from the modest ski infrastructure located at the southern end of the project site, the closest tourist locations to the Project area are the Bor lake and spa, also south of the site. According to discussions with local stakeholders, these locations have grown more popular in recent years. During the summer season, the lake is visited not only by residents of Bor and Žagubica, but also people from across Serbia as well as tourists from Bulgaria and Romania. The only large hotel in the Bor lake location is hotel Jezero, which belongs to the Serbia Zijin Bor Copper mine. At the time of the consultants' site visits, the hotel was closed to the public, however the information found online is that this closure is only temporary. Apart from the hotel, there is a small resort used for school children, an auto camp and numerous weekend houses around the lake area, many of which are rented to tourists as private accommodation. There are four large organised beaches, many smaller ones, various sports fields, as well as several restaurants and cafes.

The spa (Brestovačka banja) is located some 10 km further south from Bor lake and within that area, apart from the spa facilities, there are two more hotels, one belonging to Serbia Zijin Bor Copper mine, including restaurants and some private accommodation, available for tourists.

To access the spa, the lake and nearby accommodation, people use the State Road No. 161 class IIA (section Žagubica to Brestovac), which passes through the middle of the Project site will be used as the main access point for the project. The road is mainly used from the direction Brestovac, however, numerous visitors also come from Žagubica and other areas located north of the project site. There are regular bus lines operating on the road and there are seasonal, additional lines, operating from the beginning of April to the end of September each year.

9.9 Land Use and Property Ownership

Agricultural land (particularly pastures and meadows) and forest land, are the predominant land use categories, in both municipalities. The total area of the municipality Bor is 856 km^2, of which about 46% is agricultural land and 45% is forest land. The total area of Žagubica Municipality is 760 km^2, of which about 49% is agricultural land and 48% is forest land.

The total area of the project site is approx. 28.77 km^2 and about 58% of that land is forest land (40% public and 18% privately owned land) and an additional 36% is agricultural land (33% public and 3% privately owned land). A detailed breakdown is provided in Table 9-11 below.

Forest land surrounding the Project site is mainly used for the exploitation of timber/ firewood, while mushroom and herb picking (which used to be significant activities) are now reduced to individual and occasional activities. Sport hunting is widespread in the area and various hunting associations, from the two municipalities, are active in these locations.

Table 9-11 Project Site Land Categorisation[47]

Land category		Žagubica	Bor	Total	% of the total
Construction		1.39	0.95	2.34	0%
Agricultural	public	79.14	17.99	97.13	3%
	private	803.18	152.83	956.01	33%
Forest	public	297.64	211.29	508.93	18%
	private	921.81	224.98	1,146.79	40%
Other		67.84	97.96	165.8	6%
Total		**2,171**	**706**	**2,877**	**100%**

The Project requires the use of land for the construction of up to 32 WTGs, foundations, maintenance pads, a substation, the construction and/ or upgrading of access roads and the pylons for the OHL.

The majority of the Land Rights needed for the WTGs and foundations, have already been acquired from the owners through voluntary transactions. Most of the land has been acquired through long term lease agreements, for a period of 25 years from the start of construction and compensation has been paid for the first year of the lease, based on an agreed price per m^2. The payment of further annual compensation amounts will not be initiated before the Developer has accessed the land for the start of construction. A total of 86 land plots have been acquired for the turbines, seven of which were publicly owned and the rest owned by 58 individuals and one company. However, due to size of each foundation, only parts of these plots are being acquired, amounting to 34.47 Ha. On average only 6% of one land plot is being acquired. The actual affected land area will be recalculated when construction starts and included in a contract annex, with an adjusted compensation amount. It is noted that leasing the land, rather than buying it, means that the total income to the owner (over 25 years) is about eight times higher.

Table 9-12 Summary of Land Plots Affected by WTGs

Number of affected land plots	Total acquired area	Total plot area	Number of public land plots and area	Number of owners of private land
86	34.47 Ha (6% of the total area)	546.77 Ha	7 (2.05 Ha)	58 individuals, 1 company

During consultation meetings with the landowners (for the WTG towers), it became clear that many of them had not used their land for many years. The area is remote and often hard to access because of the poor condition of the access tracks. The interviewers were given an example of one land owner who tried to use some of the effected land for crop production, however the farmer gave up due to the damage caused by wild hogs. He does occasionally cut the grass on the effected land plot and uses it for animal feed. However, he also has other land for these purposes and the effected land plot is not a significant source of the grass.

Damage to trees which occur on any effected land are being and will continue to be compensated separately, based on the findings of certified valuators, as agreed with the owners of the effected land and assets. The

[47] Data taken from the Early Public Hearing Study Reports for the City of Bor (May 2020) and the Municipality Žagubica (October 2020).

land needed for the substation has been permanently acquired by the Developer through sale purchase agreements with the relevant owners.

Additional land has already been used by the project for preparatory activities and more is expected to be used during construction, i.e. to access construction locations. All losses caused in the process, for example, cutting of trees and any other damages, have been compensated by the Developer and will continue to be compensated to their owners, at full replacement cost. Agreements to use/ cross any needed land, are being signed by all owners of that land prior to accessing it.

Land use rights needed for the construction of OHL towers are also being acquired through a voluntary process, by way of permanent servitude contracts, signed between the owners of the affected land, the Developer and EMS (Elektromreža Srbije). An estimated 5 Ha of land will be occupied during construction (5km x 10m width of the construction zone). A total of 166 OHL towers are expected to be built and the average area which will be occupied by a single tower is about 65 m^2 (the area depends on the size of the tower and ranges between 45 and 100 m^2). This means that, in total, only 1 Ha of land will be permanently occupied after the OHL has been constructed. All of the remaining parts of plots will continue to be available for use to the owners, without any obstacles. Any additional damages to trees or any other assets, caused during repairs, or even regular maintenance, will be compensated separately, in accordance with the findings of certified appraisers.

A total of 202 plots of land will be affected in the two municipalities, of which the majority are privately owned (181). Publicly owned land plots belong to the two affected municipalities and the Republic of Serbia. Privately owned land plots belong to a total of 56 individuals and two legal entities, one of which is the Developer and the other, a bankrupt cooperative.

Table 9-13 Summary of Land Plots Affected by OHLs

Municipality	Ownership	Number of land plots
Bor	Public	14
	Private	110
Žagubica	Public	7
	Private	71
TOTAL		**202**

Land for the substation has been purchased from three owners. A total of 5 land plots amounting to 2.87 Ha in total have been permanently acquired for the substation.

Land will be permanently acquired for the construction and/ or upgrading of existing access roads, by the respective municipalities, through expropriation. This is an involuntary land acquisition process according to IFI standards, as the owners of affected land do not have the right to refuse it. Having in mind the capacity of the relevant municipal departments and the need to complete this process as quickly as possible in the interest of the Project, it is expected that, although the municipalities are technically responsible for acquiring land for the access roads, the Developer will play a significant role in identifying and contacting owners of effected land and assisting them to complete all necessary administrative tasks in the expropriation procedure. The Developer will also provide funding for all compensation payments to effected owners of land, including for any associated losses (trees). The compensation rates which will be used for the acquisition of land will be based on findings of certified appraisers, which will take into account a variety of criteria, including recent sale purchase transactions in the area. All fees and taxes will be borne by the Developer and therefore the price that will be offered will present full replacement cost, enabling people to buy replacement land if they wish, in a nearby location.

A total of 274 land plots in the two municipalities will be affected, the majority of which are privately owned (236). The total acquired area of all privately owned plots is 17.65 Ha. It should be highlighted that the access roads, as linear infrastructure, will only be affecting parts of land plots as the land is only being used to widen the tracks. The acquired area represents only 0.03% of one land plot, on average, as can be seen in the table below. The average affected area of privately owned land plots is somewhat higher at 7% in Bor and 5% in Žagubica.

Table 9-14 Summary of Land Plots Affected by Access Roads

Municipality	Ownership	Number of affected land plots	Total area of affected land plots (in Ha)	Total acquired area (in Ha)	% of acquired area (average)
Bor	Privately owned	152	131.04	9.29	7%
	Publicly owned	25	464.07	5.05	1%
Žagubica	Privately owned	84	184.31	8.36	5%
	Publicly owned	13	33.01	2.62	8%
TOTAL		274	812.43	25.32	3%

Publicly owned plots of land belong to the City of Bor or the Republic of Serbia and three of them are used by one cooperative (0.26 Ha are affected). Another affected legal entity is the cooperative under bankruptcy in Žagubica (effected 2.49 Ha of land, of 31.58 Ha). Four effected land plots are already owned by the Developer. According to cadastral records, privately owned land is registered as belonging to 127 owners of land, of whom 42% are women. The detailed breakdown per municipality is provided in the table below.

Table 9-15 Summary of Owners of Land Plots Needed for Access Roads

Municipality	Number of affected privately owned plots	Male owners	Female owners	Legal entities (owners of land)
Bor	152	41	29 (41%)	1
Žagubica	84	33	24 (42%)	1
TOTAL	236	74	53 (42%)	2

Further land may be needed at a later stage (e.g. more laydown areas, positioning of site containers), as agreed with the construction contractor and it will be leased through voluntary agreements.

9.10 Structures in the Affected Area

No physical displacement of people/ households is expected to occur as a result of the project.

An investigation was carried out by the Developer, including site visits, to identify structures with 500 m from each WTG location. It was determined that most of the structures have been abandoned and in a dilapidated state. The ESIA consultant team undertook a more detailed survey and a map showing all identified structures was created and is available as Figure 12-3.

During the ESIA development stage, through various discussions between the Developer and the ESIA consultant, it was decided that it would be best to remove all existing structures (residential and non-residential) located within 300 m from potential turbine locations. This was determined as the safety zone in which people should not be regularly present to avoid risks associated with ice throw or fire. The structures in this zone were mainly in a dilapidated state, while only one or two were used occasionally as weekend houses. In order to clear land within 300 m around the planned WTG locations, the Developer approached owners of these properties and offered them compensation for affected structures at full replacement cost, regardless of the state they were in. The cost of demolishing structures and clearing the land would also be borne by the Developer.

To ensure there are no losses for affected people, the Developer has decided to compensate the structures beyond full replacement cost. Depreciation, even for fully dilapidated structures, has not been factored in the appraisal of these properties. This means that people will be compensated in an amount which enables them to purchase new construction materials in the local market and construct a whole new structure, with the same (and improved) characteristics as the original one, in another suitable location on their land. The calculation of costs, which includes not only the cost of materials but also labour costs, costs of transport, electricity, registration fees and taxes, etc. was done by a certified appraiser hired by the Developer, whose calculation was used as a basis for making the offer. At the time of developing the ESIA, the Developer had concluded agreements with owners of all 4 effected properties (some with several structures, residential and non-residential) and contracts were being drafted. The effected owners will remain owners of the effected land, so no compensation will be provided for the land. As mentioned above, the Developer will demolish the effected structures and clear the land and there will be no cost for the affected owners associated with this activity. To organise the appraisal process and sign compensation agreements, the Developer had numerous contacts with each of the effected owners and their family members. They were all informed about the possible impacts and why the Developer proposed to compensate them for their structures, as well as the contact details of responsible persons whom they can get in touch with for any grievances. All contacts and discussions with effected owners have been documented by the Developer, with detailed records of meetings and exchanged documents, including the appraisers report, the compensation offer and draft contracts.

Further to the above, noise modelling activities determined that one weekend house, although not within the 300 m zone from any of the potential WTG locations, could also be under risk of increased noise, during construction, as well as operation. This house is the only house in the affected area in a relatively decent condition, which is regularly used by the owner, as a weekend house. The Developer approached the owner, a single elderly woman, and offered to compensate her for the value of the house. The Developer offered to hire an appraiser to calculate the cost of constructing a replacement house in a nearby location, which would be the basis for negotiation. The owner declined this offer stating that selling the house is not an option for her as it has been in her family for generations and she plans to pass it on to her children. The Developer offered to implement noise mitigation measures on and around the weekend house, however the owner stated that she would like to preserve the original state of the house. The owner expressed a preference to receive financial compensation to be able to carry out improvements of her house, by herself. The owner was given time to discuss these issues with her family members and the Developer representatives made themselves available for all additional questions and suggestions. Following confirmation from the owner that she wants to receive financial compensation, the Developer prepared a detailed calculation of the costs associated with implementing noise mitigation measures, including the replacement of all windows, insulation, etc. (using local market prices) and provided an offer to the affected owner, which she accepted and a contract was signed.

Table 9-16 Summary of Affected Structures and Compensation

No.	ID	WTG	Impact	Status of compensation contract
1	W20	TI9, TI10	Safety zone of 300m	Compensation for structures at full replacement cost. Contract agreed and signed.
2	W22	TI15	Safety zone of 300m	Compensation for structures at full replacement cost. Contract agreed and signed.
3	W23	TI14	Safety zone of 300m	Contract agreed and signed.
4	WA3	TI17	Safety zone of 300m	Compensation for structures at full replacement cost. Contract agreed and signed.
5	W24	Surrounded by a number of WTG locations	Construction and operation noise	Compensation for structures at full replacement cost offered and refused by owner. Compensation for mitigating noise impacts (improvements for the structure) accepted by owner. Contract agreed and signed.

Any additional properties, identified as affected by exceeding noise limits, will be addressed in the same manner as in the previously described cases. Mitigation of noise impacts will be the preferred course of action and where that is not possible, owners will be offered the option of compensation for their affected structures at full replacement cost.

9.11 Archaeology and Cultural Heritage

The wider site area has a long history of mining, dating from the 5th millennium BC and the Copper Age. A nationally designated archaeological site of great significance Rudna Glava, probably the earliest evidence of copper mining in Europe, is located about 15km north of the site. Rudna Glava belongs to the Vinča culture, the biggest European prehistoric civilization and Europe's first metallurgical culture. There is also evidence of the mining in the area date from the Roman Epoch, Medieval Age and Ottoman Period.

The WPP site area has not been archaeologically investigated. During the statutory consultation for the Zoning Plan of the project, the local statutory consultee, the Institute for Cultural Heritage from Niš suggested that presence of archaeological artefacts (evidence of mining from the Prehistoric Period to Ottoman Period) cannot be excluded. The Institute required a pre-construction archaeological reconnaissance of the WPP site area.

The pre-construction fieldwork was carried out by the Republic Institute for Cultural Heritage in April and May 2022. Eight areas with potential evidence of past mining activity were identified at the WPP site. The areas were recognised by features like pit-like depressions assumed to be formed during mining in the Prehistoric and Antique Period.

The features were identified in the areas of the following proposed WTGs: TI-9, TI-10 (Čoka Berbješće and Basanica), TI-16 (Petrova Glava), TI-1, TI-2 (Antonijev Kladenac), TI-3 (Javonilor), TII-2, TII-3 (Kulmea), TII-8 (Kupinovo), TI-17, TIII-1 (Obršja Lipe), TIV-3, TIV-4 (Čoka Korugu 2).

Given the presence of archaeological features, the site sensitivity in respect to cultural heritage is considered to be medium.

10 Project Wide Impacts

10.1 Climate Change Risk Analysis

Crni Vrh WPP is an example of expansion of wind power projects to non-traditional locations such as forested mountains. Specific local climate of Crni Vrh mountain presents opportunities for enhanced energy generation. At the same time, the forested area and susceptibility of the local climate to extreme conditions increase the exposure of the Project to climate change risks.

10.1.1 Climate Change Hazards

According to the Serbian national weather service (Republic Institute for Hydrometeorology), 2018 was the warmest year on record in Serbia and 2019 was the warmest year since modern measurements began in 1951. July 2021 was the second warmest July in Serbia (after July 2007).

Over the past 60 years the country experienced a significant increase of daily mean, daily maximum, and daily minimum temperature, with an average increase of 0.36°C per decade. After 1990 only four years showed negative anomalies, while eight out of ten warmest years occurred after 2000.[48]

The change in rainfall has not been linear and differs for regions and seasons. While the average rainfall increase is slight and insignificant, the rainfall patterns significantly changed. Summer months experienced a significant drop in rainfall. Extreme rainfall events have become more frequent, both the number of days with heavy rainfall and number of days without rainfall have increased.[48]

10.1.1.1 Observed Climate Change in Crni Vrh

National Data for Eastern Serbia

Compared to the baseline period 1961-1990, the average annual temperature in Eastern Serbia increased for 1-1.5°C over the period 1998-2017 and increased for 2-2.5°C over the period 2008-2017.

The average annual rainfall decreased by 5% during both the 1998-2017 and 2008-2017 periods. However, in summer months during 2008-2017, the average annual rainfall decreased by 20-30% compared to the baseline period.

The observed increase in temperature is most notable when climate indices are analysed, particularly the icing days (annual count of days when maximum daily temperature is below 0°C). During the period 2008-2017 the annual number of icing days decreased for 15 days in the area of Crni Vrh (Figure 10-1). [48]

The increase of tropic days (annual count of days when maximum daily temperature is equal or above 30°C) was up to 5 days. The number of extreme heat waves (more than 6 days when air temperature is higher than 90th percentile) increased for 2 (Figure 10-1). [48]

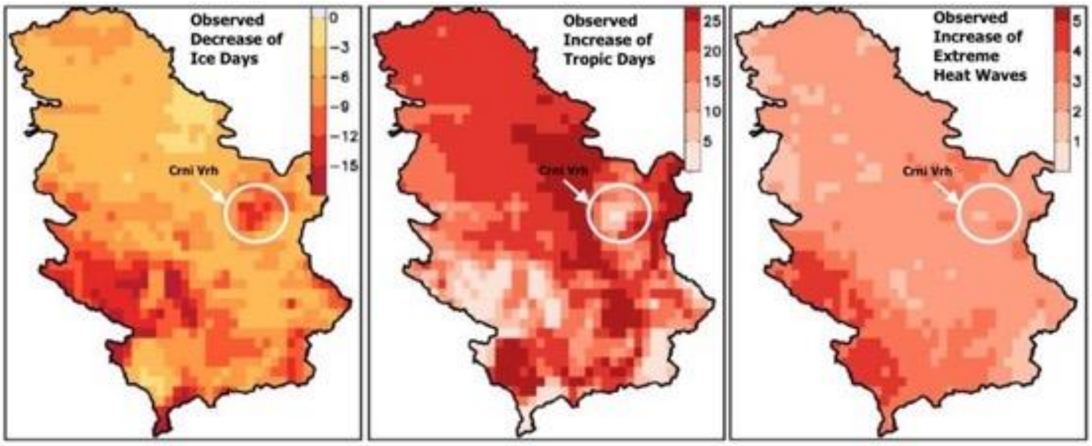

Figure 10-1 Observed Change of Climate Indices during 2008-2017 compared to 1961-1990

[48] V. Đurđević, A. Vuković, M. Vujadinović Mandić (2018) - Observed Climate Change in Serbia and Future Climate Projections based on Scenarios of Future Emissions. *GEF.*

<u>Crni Vrh Weather Station Data</u>

The analysis of data from the Crni Vrh weather station for three baseline periods (1966-1990[49], 1981-2010, 1991-2020) confirms the information provided in the national reports.

The key observed trends are the following:

- The average summer temperature significantly increased;
- The average annual rainfall slightly decreased but the rainfall pattern significantly changed with summer months recording much less rainfall;
- The average annual humidity decreased with the change being most notable in summer;
- The number of days when maximum daily temperature is below 0°C has dropped;
- The number of days with snow and duration of snow cover have dropped;
- Extreme weather events (heat waves, droughts, daily rainfall) are more frequent;
- The number of lightning days slightly decreased;
- The number of fog days remained within the natural variation.

It is of note that two significant weather extremes in Crni Vrh occurred only within the past 15 years: the highest temperature ever recorded (36.5°C) in July 2007, and the highest daily rainfall (132.5mm) recorded in August 2018.

Between 1966 and 2020, the average annual temperature increased for 0.7°C. The change is the most notable in summer months when the average maximum daily temperature increased for 1.1°C (Figure 10-2).

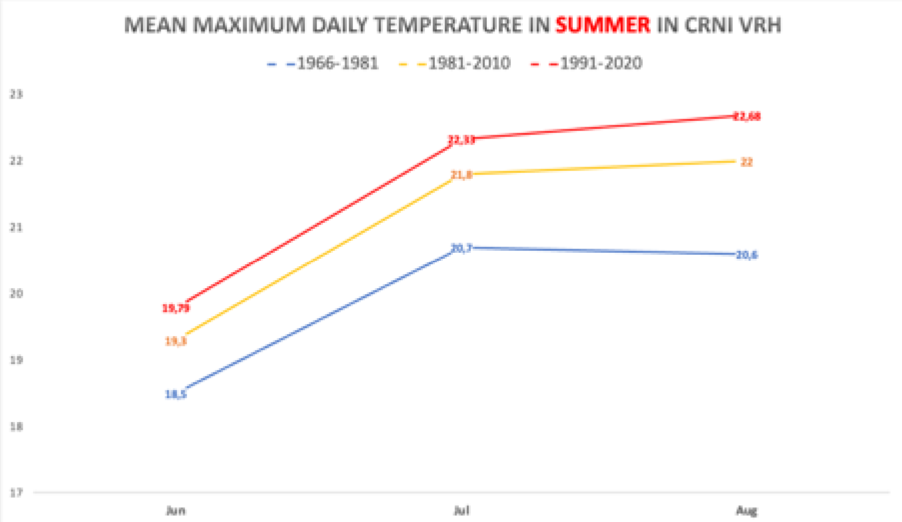

Figure 10-2 Change of Average Maximum Daily Temperature in Summer

The average annual rainfall has fluctuated from 810mm (1966-1980) to 769mm (1981-2010) which is 5% decrease and then increased slightly to 797mm (1991-2020). However, the decrease is the most pronounced in May, June and July when 25% decrease in rainfall has been observed (Figure 10-3).

[49] The weather monitoring in Crni Vrh started in 1966.

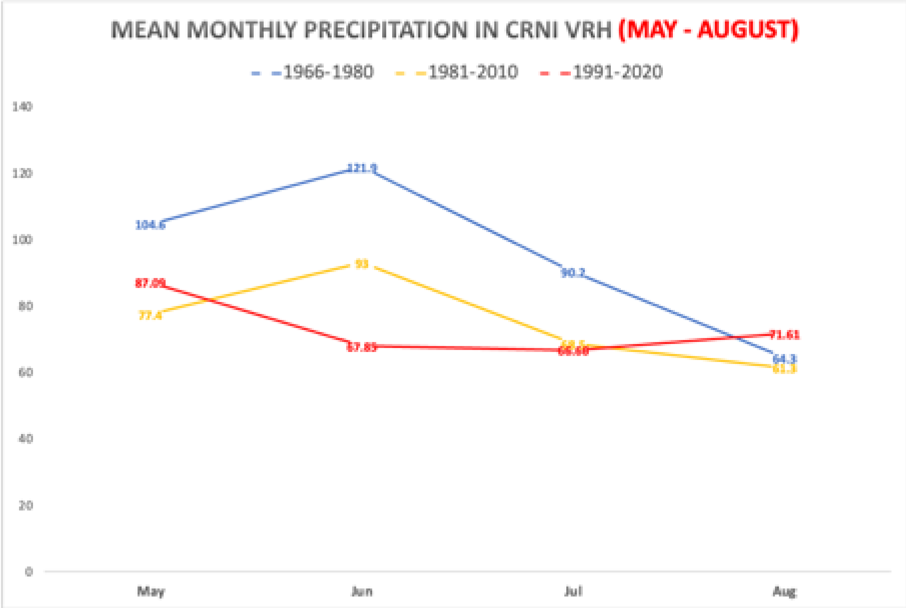

Figure 10-3 Change of Average Monthly Rainfall (May-August)

The maximum recorded daily rainfall decreased in March, June, and September but almost doubled in August from 69.5 to 132.55mm.

Similar to the decrease of average annual rainfall, the average annual humidity decreased (from 81.8% to 78%). The decrease is most notable in August, from 77% to 69%.

The trend of number of icing days (when maximum daily temperature remains below 0°C has been steadily decreasing from 70 (1981-2010) to 57 (1991-2020). A 10-year moving average shows a significant drop in relation to the normal (1981-2010), see Figure 10-4.

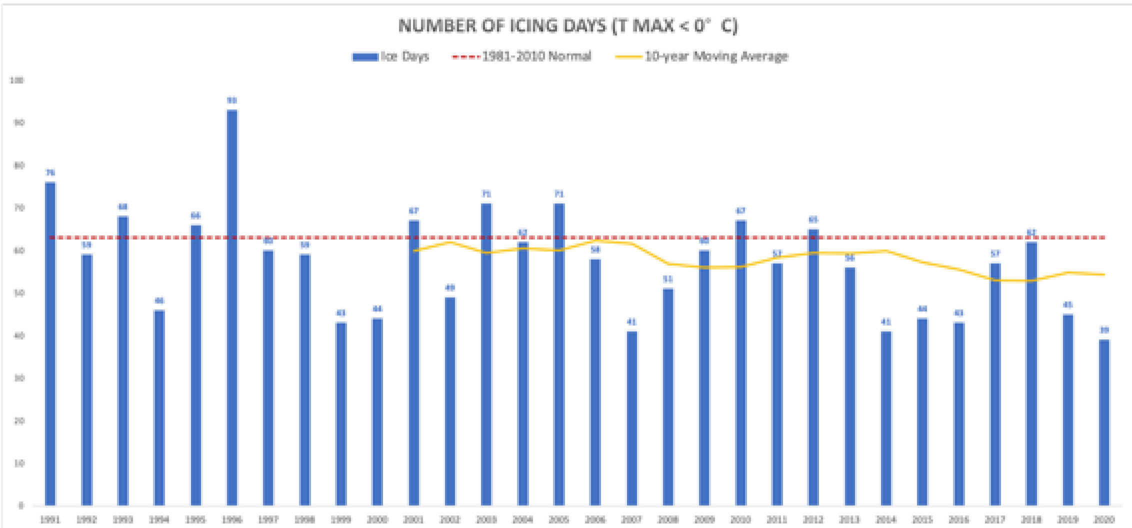

Figure 10-4 Rolling Trend of Number of Days with Maximum Temperature Below 0° C

The number of days with snow has been steadily decreasing from 77 (1966-1990) to 67 (1981-2010) to 57 (1991-2020) which is 25% reduction. The average annual duration of snow cover dropped from 124 (1966-1990) to 123 (1981-2010) to 113 (1991-2020).

The number of fog days appears to remain within the natural variation. Compared to the historical base period (1966-1990) the number of fog days increased during the 1981 – 2010 period, from 201.5 to 213. Over the past 30 years (1991 - 2020) the number slightly dropped to 209. However, a 10-year moving average has been close to the normal (1981 – 2010) with no obvious anomalies (Appendix G).

10.1.1.2 Future Climate Projections for Crni Vrh

The project operational life is considered to be 25 years. It is assumed that the project will be fully operational by 2024 and that the project lifetime will continue to 2049.

The information on future climate projections for the Crni Vrh area have been provided from the most recent Serbian official studies based on regional climate models, for the periods relevant to the project operational life (2016-2035, 2046-2065). The models have been developed to have high resolution and to be sensitive to local topographies and climate features and are considered to be of high confidence.[50]

The modelling methodology was in line with the IPCC Fifth Assessment Report, i.e. future changes were compared to the base period 1986-2005 and were provided for two Representative Concentration Pathway (RCP) scenarios of GHG emissions:

- RCP4.5 – stabilisation scenario, with GHG emissions peak around 2040 and decline afterwards;
- RCP8.5 – constant increase scenario.

As a general note, the models suggest that the air temperature in Serbia will continue to rise during this century, reaching values which will be 3 to 5°C higher than values during mid-20th century. This change is expected to further destabilise the climate system in Serbia in terms of the increase of extreme weather events - heat waves, severe drought episodes and high-intensity rainfall events. Extreme cold weather episodes will become more intense due to the disruption of the global climate system.

The key takeaways of the projections the Crni Vrh area are the following:

- Average annual temperature is certain to increase;
- Total annual precipitation will fluctuate but will certainly decrease in summer;
- Number and intensity of heavy rainfall events are certain to increase, especially in summer;
- Summer months (June, July, August) are the most vulnerable to climate change when highest anomalies in the temperature increase and precipitation decrease are predicted with certainty;
- Number and duration of extreme heat waves is certain to increase;
- Occasional extreme cold events are certain – more intense cold spells with heavy snowfalls;
- Change in atmospheric icing pattern is uncertain;
- Wind resource will remain stable, within the natural variation.

Projected Change of Temperature

The future temperature projections for Crni Vrh area in the coming decades suggest the increase of average annual temperature as shown in Table 10-1.

Table 10-1 Projected Mean Annual Temperature Changes in Crni Vrh Area

Period	Mean Annual Temperature Change (RCP4.5 Stabilisation Scenario)	Mean Annual Temperature Change (RCP8.5 Constant Increase Scenario)
2016 – 2035	↑ Increase 1.0°C	↑ Increase 1.5 – 2.0°C
2046 - 2065	↑ Increase 1.5 – 2.0°C	↑ Increase 2.0 – 2.5°C

In summer months (June, July, August) the temperature increase will be more pronounced than in other seasons. In the near future (2016-2035) the summer temperature will increase for 1.5°C (RCP4.5) or 2°C (RCP8.5). By mid-century the worst-case temperature could increase for 2-2.5°C (Appendix G).

[50] Ana J. Vuković, Mirjam P. Vujadinović, Sonja M. Rendulić, Vladimir S. Djurdjević, Mirjana M. Ruml, Violeta P. Babić, Dunja P. Popović - Global Warming Impact on Climate Change in Serbia for the period 1961-2100. *Thermal Science: Year 2018, Vol. 22, No. 6A, pp. 2267-2280.*

Projected Change of Precipitation

The future precipitation projections for the Crni Vrh area suggest slight decrease of annual precipitation until 2035 under both scenarios, further decrease for the stabilisation scenario but slight increase for the constant increase scenario in the second period (2046-2065), as shown in Table 10-2.

Table 10-2 Projected Mean Annual Precipitation changes in in Crni Vrh Area

Period	Mean Annual Precipitation Change (RCP4.5 Stabilisation Scenario)	Mean Annual Precipitation Change (RCP8.5 Constant Increase Scenario)
2016 – 2035	↓ decrease 0 - 5%	↓ decrease 0 - 5%
2046 - 2065	↓ decrease 5 – 10%	↑ increase 0 – 5%

Although the total annual precipitation is expected to fluctuate, the decrease anomaly (10-20%) will be rather pronounced during summer months (Appendix G).

Projected Change of Icing Days and Snow Cover

Following the projected temperature increase, the number of icing days (daily Tmax < 0°C) and frost days (daily Tmin < 0°C) are predicted to further decrease across Serbia, especially in high-altitude areas such as Crni Vrh.

Mid-century projections which relate to the WPP operational life are not available, however, the decreasing trend is to be expected. By the end of this century, the number of icing days in Eastern Serbia is projected to decrease by 20 (optimistic scenario RCP4.5) or by 40 (pessimistic scenario RCP8.5).

On the other hand, despite the number of icing days being dropping steadily for about 3 per decade, the Project lifespan of 25 years is relatively short to experience a significant drop in the icing events. Mechanisms of ice accretion are complex and depend on a number of factors, especially the water vapour availability. The future icing pattern in Crni Vrh at the hub height cannot be predicted with certainty.

The duration of snow cover is projected to continue to decrease.

Projected Change of Wind Resource

There is an emerging consensus in the scientific community that changes in regional wind resources will be relatively stable by mid-century. By the end of the century in Europe the mean annual energy density will increase in the north (e.g. over Denmark and the UK) and slightly decrease over the south (including the Mediterranean).[51]

Projections for Serbia are available only at the timescale 2071-2100 which is far beyond the Crni Vrh WPP project life. They suggest that the annual wind speed will slightly decrease by the end of the century compared to the 1971-2000 period.[52]

While the mean annual wind speed is expected to remain stable, occasional windstorms and gusts cannot be excluded.

10.1.2 Key Climate Change Risks Relevant for the Crni Vrh WPP

Based upon the observed and projected climate change in Eastern Serbia the following climate change risks have been identified as relevant for Crni Vrh mountain and the proposed WPP: wildfires, atmospheric icing events, change in rainfall pattern, and change in wind pattern.

Wildfire risk: According to the official national reports on effects of climate change, a natural hazard that had the most significant adverse impact in Serbia from 2000 to 2020 had been forest fires. Prolonged dry periods in summer increase potential for woodland drying and create favourable conditions for forest fires. Current wildfire risk level can be considered as high. Within the 2050 horizon the likelihood will increase with climate change.

[51] Sara C. Pryor, Rebecca J. Barthelmie, Melissa S. Bukovsky, L. Ruby Leung and Koichi Sakaguchi (2020) - Climate change impacts on wind Power generation. *Nature.*

[52] Zorica Podrascanin, Vladimir Djurdjevic (2018) - The influence of future climate change on wind energy potential in the Republic of Serbia. *Theoretical and Applied Climatology.*

Atmospheric icing risk: The development site is situated in an Icing Climate area, susceptible to atmospheric icing. The WPP design has already included ice protection and de-icing systems. Atmospheric processes responsible for ice accretion on turbine blades are complex and difficult to predict. If increased winter temperatures lead to increased water vapor availability, icing events at the site might even increase within the 2050 horizon.

Change in rainfall pattern / more frequent and intense rainfall events and thunderstorms: In August 2018 Crni Vrh experienced an unprecedented daily rainfall of 132mm within only 6 hours. The total rainfall recorded in June and July 2014 (252mm) was equivalent to a 20-year return period. Heavy rainfall events are expected to increase in intensity at the 2050 horizon. The frequency of lightning appears to have slightly decreased over the last 20 years but it is not certain whether this is just a natural variation.

Change in wind pattern: By default, a WPP design considers a range of wind parameters (e.g. wind gusts, 50-year return period wind speed, turbulence intensity) to guide the selection of an appropriate wind turbine for a specific location. However, a change in wind pattern can directly impact the productivity of the WPP and is therefore included in the risk analysis. The projected change in annual mean wind speed indicates no change by 2050, i.e. the wind resource will remain within the natural variability. Occasional wind gusts and windstorms cannot be excluded.

10.1.2.1 Risk Rating and Methodology

In accordance with the EU Commission Technical Guidance on the Climate Proofing of Infrastructure in the Period 2021-2027 (July 2021) the following qualitative method has been used to determine the level of risk associated with current and future climate change impacts to the Project:

Risk = Likelihood of impact (occurrence) x Severity (consequence of impact)

Both likelihood and potential severity of impacts have been rated based on uniform scales. The likelihood scale has been adapted from the IPCC's guidance and consistent treatment of uncertainty. Scores have been determined based on a combination of available evidence and literature and professional judgement. The definitions of impact likelihood and severity are presented in Table 10-3.

Table 10-3 Definition of Likelihood and Severity of Climate Change Impact

Impact Likelihood	Impact Severity to the Project
Very Likely: The event is almost certain. It occurred in the past and is very likely to occur again, according to available climate projections.	**Catastrophic:** The event can completely disrupt the Project activities, with long-term operational and commercial consequences.
Likely: The event is likely to occur following the current trend or climate projections.	**Major:** The event can have a high operational or commercial impact with potential significant consequences on assets, safety and health, engineering, reputation.
Moderate: The event is as likely to occur as not. It may occur according to available projections, but depending on the development of other linked phenomena, that might be more or less likely to occur.	**Moderate:** The event can have an operational impact without significant commercial impact. Requires additional emergency actions.
Unlikely: The event is unlikely to occur.	**Minor:** The event can have limited consequences on Project operation without commercial impact. Requires usual remedial actions.
Rare: The event is highly unlikely to occur.	**Insignificant:** 'Business as usual' for the Project.

The overall risk level obtained by combining the likelihood and severity of the impact is illustrated in the risk matrix presented in

Table 10-4.

Table 10-4 Definition of Climate Change Risk Level Based on Impact Likelihood and Severity

LIKELIHOOD	SEVERITY	Catastrophic	Major	Moderate	Minor	Insignificant
	Very Likely	Extreme	Extreme	High	Medium	Medium
	Likely	Extreme	High	High	Medium	Low
	Moderate	Extreme	High	Medium	Low	Low
	Unlikely	Medium	Medium	Medium	Low	Low
	Rare	Medium	Low	Low	Low	Low

The climate change risk analysis for the proposed Crni Vrh WPP is presented in Table 10-5, below.

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Table 10-5 Climate Change Risk Analysis for the Project

Climate Related Hazard	Climate Related Risk	Likelihood	Severity	Risk	WPP Operational Risk	Adaptation Measures
Air Temperature Increase						
More intense and longer heat waves; Increase of number of tropical days and nights.	Maximum daily temperature reaching 35º C and higher	Likely	Minor	Medium	- Turbine overheating; - Reduction of turbine power capacity; - Increase of turbine downtime; - Failure of heat-sensitive electrical equipment; - Grid connection issues.	Mitigation by design: (1) Reduction of power capacity at 35º C; (2) Complete turbine shutdown at 40º C;
Increase of drought periods, dry vegetation; Increase in number of days with wildfire risk.	Wildfire / Forest fire;	Likely	Major	High	- Turbine fire and damage; - Reduction of energy production; - Fire and damage of substation or transmission line.	Mitigation by design: (1) Asset zone (no-fuel), (2) Buffer zone (reduced-fuel), (3) Fire breaks. Wildfire Prevention and Response Plan.
Atmospheric Icing Events						
Increase of atmospheric icing as a combination of fog, humidity, temperature and wind.	Increased accretion of ice on sensors and blades;	Moderate	Moderate	Medium	- Reduction of energy production; - Change of blade aerodynamics; - Increased O&M costs; - Accidents.	Mitigation by design: (1) Ice Protection Systems (blade heating, ice detection, operational strategy during icing); (2) De-icing systems on sensors and blades; Installation of physical and visual warnings. Ice Throw and Ice Fall Management Plan.
	Increased ice load on power transmission lines;	Moderate	Moderate	Medium	- Damage of power transmission line; - Flashovers.	Mitigation by design of OHL for ice and wind load;
Rainfall Pattern Change						
More intense heavy rainfall events.	More frequent and intense torrential and fluvial floods;	Likely	Minor	Medium	- Soil erosion at the site; - Damage to access roads, - Flooding of access roads.	Mitigation by design: (1) Site drainage designed to mimic natural drainage conditions;

Climate Related Hazard	Climate Related Risk	Likelihood	Severity	Risk	WPP Operational Risk	Adaptation Measures
						(2) Site drainage to maximise infiltration and attenuation rather than direct discharge to natural watercourses or gullies; (3) Nearby vegetation areas to be used as buffers, where possible; (4) The velocity of surface water run-off to be reduced / attenuated.
More intense frozen rain and hail.	Rain and hail erosion of blades	Likely	Minor	Medium	- Blade leading edge erosion; - Reduction of energy production; - Change of blade aerodynamics; - Increased O&M costs.	Blade condition monitoring; Regular blade inspections.
Thunderstorms / increase of days with lightning.	Increased frequency of lightning strikes	Moderate	Moderate	Medium	- Turbine damage/ fire; - Blade damage; - Increased O&M costs.	Lightning protection incorporated into the blades; receptors located at multiple points along the blade length.
Wind Pattern Change						
More frequent and intense windstorms and gusts.	Increased periods of wind speed above the cut-out speed	Moderate	Minor	Low	- Reduction of energy production; - Increase of turbine downtime; - Extreme loading blade fatigue; - Damage of power transmission lines;	Blade condition monitoring Regular blade inspections.

10.2 GHG Displacement

In a wider context, beneficial impacts of the Crni Vrh WPP project are related to contribution to decarbonisation of the Serbian energy sector and production energy without adverse air quality impacts.

Both decarbonisation and ambient air quality have been relatively neglected topics in Serbia where significant investment is needed for the clean energy transition, preceded by more decisive political actions. Despite ratifying the 2015 Paris Agreement and committing to reduce the GHG emissions 9.8% below 1990 levels by 2030, the country has done very little in tackling the climate crisis. The key climate change legislation (The Law on Climate Change) has been adopted in March 2021.

Serbian government plans to add 1,000MW in the wind power sector by 2025 which would make a total of 1,500MW with the existing windfarms. However, Serbian energy sector is still highly dependent on fossil fuels accounting for more than 80% of the country's GHG emissions. Compliance with the EU Directive on Large Combustion Plants has not been achieved, despite the country obliging to do by being a contracting party to the Energy Community Treaty with the EU since 2006. State-owned lignite-fired thermal power plants (TPPs) are the major source of SO_2, NOx and particulate matter (PM) emissions with abatement systems of questionable efficiency. The TPPs emissions (especially SO_2) have been exceeding the limits set in the National Air Emission Reduction Plan.[53] The TPPs are one of the contributors to the poor ambient air quality in Serbia (besides individual combustion units and the transport sector) and are among ten top most polluting coal power plants in Europe.[54]

In November 2020, Serbian government accepted the EU Green Agenda for the Western Balkans (Economic and Investment Plan) by signing Sofia Declaration[55], pledging to follow the European Union in its decarbonisation path towards a carbon neutral economy by 2050.

This section contains the calculation of GHG emission reduction (expressed in CO_2 equivalent) that would result from the Crni Vrh WPP operation. The methodology used for calculation is based upon the internationally recognized IPCC Guidelines and the IFIs Harmonized Approach to GHG Accounting (2015).

According to the methodology, emission reduction for windfarm projects is the difference between baseline and project emissions when generating the same amount of power.

Baseline emissions are the scenario "without the windfarm project", i.e. the number of emissions that would be generated for the same amount of power by existing grid-connected power plants if the windfarm project was not developed.

Project emissions are the amount of GHG emissions generated by a project during a typical year of operation. For windfarms, the project emissions are considered to be zero or minor. The construction emissions are also excluded from calculation as they are acknowledged to be low compared to the construction of other types of power plants.

The calculation of the CO_2 emission reduction by a WPP is therefore a calculation of the baseline "no project" scenario. It is a product of the energy generated by a windfarm and the country specific grid emission factor.

The grid emission factor represents the CO_2 emission from grid-connected power plants in a specific country - those currently operating and those that are expected to be built. The grid emission factor used in this calculation is the Combined Margin for Intermittent Electricity Generation, provided in The IFI Dataset of Default Grid Factors v.2.0 (July 2019) derived from IPCC Guidelines for National GHG Inventories.[56]

The Combined Margin Grid Emission Factor for wind power projects in Serbia is 938 grams CO_2 per kilowatt hour (or 0.938 metric tonnes CO_2/MWh).

The estimated energy production of the Crni Vrh WPP for 150MW and 32 WTGs is c. 500,000 MWh/ annum.

The calculation is as follows:

Displaced CO_2 = Energy generated by a windfarm (MWh/per annum) * Country Specific Emission Factor for Electricity Combined Margin

[53]Comply or Close - Bankwatch (2019), https://bankwatch.org/wp-content/uploads/2019/12/comply-or-close.pdf
[54] Chronic Coal Pollution: EU action on the Western Balkans will improve health and economies across Europe – HEAL, 2019 https://www.env-health.org/wp-content/uploads/2019/02/Chronic-Coal-Pollution-report.pdf
[55]https://berlinprocess.info/wp-content/uploads/2021/02/Leaders-Declaration-on-the-Green-Agenda-for-the-WB.pdf
[56] The IFI Dataset of Default Grid Factors v2.0 (July 2019) https://unfccc.int/sites/default/files/resource/Harmonized_Grid_Emission_factor_data_set.pdf

500,000 MWh/per annum * 0.938 tCO_2/MWh = 469,000 tCO_2/ per annum.

The Crni Vrh WPP would displace c. 469,000 metric tonnes of CO_2 during every year of its operation that would otherwise be generated by existing grid-connected power plants in Serbia.

10.3 Beneficial Impact on Air Quality

The beneficial effect to ambient air quality is calculated as the offset of SO_2, NOx and PM emissions that would otherwise be generated by Serbian lignite power plants for the same amount of power as the Crni Vrh WPP (150MW).

The average pollutant emissions from the Western Balkans TPPs are estimated to 82 t/MW of SO_2, 9.5 t/MW of NOx and 3.3 t/MW of PM.[57]

For 150MW of power the pollutant emission reduction is therefore calculated to be 12,300t of SO_2, 1,425t of NOx and 495t of PM.

10.4 Cumulative Impact

There are no operating windfarms in Eastern Serbia. There are currently two consented WPP schemes: Nikine Vode situated about 18km to the north-east of the Crni Vrh WPP and Krivača, 45km to the north-west. One scheme has been proposed and there are no schemes that are under construction (as of October 2021).

Both consented schemes have been developed in 2012-2015 before the initial national quota of 500MW for wind power was reached in 2016. As they did not secure PPAs, they had been halted.

In the anticipation of the competitive tendering procedure, the Krivača WPP renewed and updated the 2015 permits in line with the technological advancement of wind turbines. The Nikine Vode WPP has not been updated, the valid Building Permit dates from 2015 and relates to the individual turbine power capacity of 2.5MW.

Information on both WPP schemes, power and turbine dimensions is provided in Table 10-6 and is based on publicly available planning documents and permits.

Table 10-6 Planned Windfarm Developments in Eastern Serbia

No.	Name	Status	Maximum Power	Number of Turbines	Hub Height (m)	Rotor Diameter (m)	Tip Height (m)	Distance from Nearest Crni Vrh WTG (km)
1.	Nikine Vode	Consented in 2015	45 MW	18	95	109	149.5	18 NE
2.	Rakova Bara	Proposed in 2021	150 MW	30	120	160	210	40 NW
3.	Krivača	Consented in 2020	103 MW	22	105	149	179.5	45 NW

Given the technological improvements of turbines since 2015, it is not considered likely that the Nikine Vode scheme would progress within the currently consented limits. The development is very likely to need a new application to take advantage of larger turbines. The new application would require a review of the planning document and a new EIA procedure. The current state of the Nikine Vode is therefore not considered relevant for the Crni Vrh WPP and the scheme has been excluded from the assessment.

The Krivača WPP situated over 45km from Crni Vrh is not considered likely to give rise to cumulative landscape and visual effects given the limited theoretical visibility of the Crni Vrh in the area beyond 30km (see Appendix A). Woodland in Eastern Serbia is likely to provide the additional screening and reduce the potential cumulative effect to non-significant.

[57] Chronic Coal Pollution: EU action on the Western Balkans will improve health and economies across Europe – HEAL, 2019 https://www.env-health.org/wp-content/uploads/2019/02/Chronic-Coal-Pollution-report.pdf

The proposed Rakova Bara WPP is at the stage of early public consultation for the draft Zoning Plan. As it has not progressed beyond the EIA Scoping Stage, it is not considered relevant for this assessment.

Locations of both WPP schemes in relation to the Crni Vrh WPP are shown on Figure 10-5.

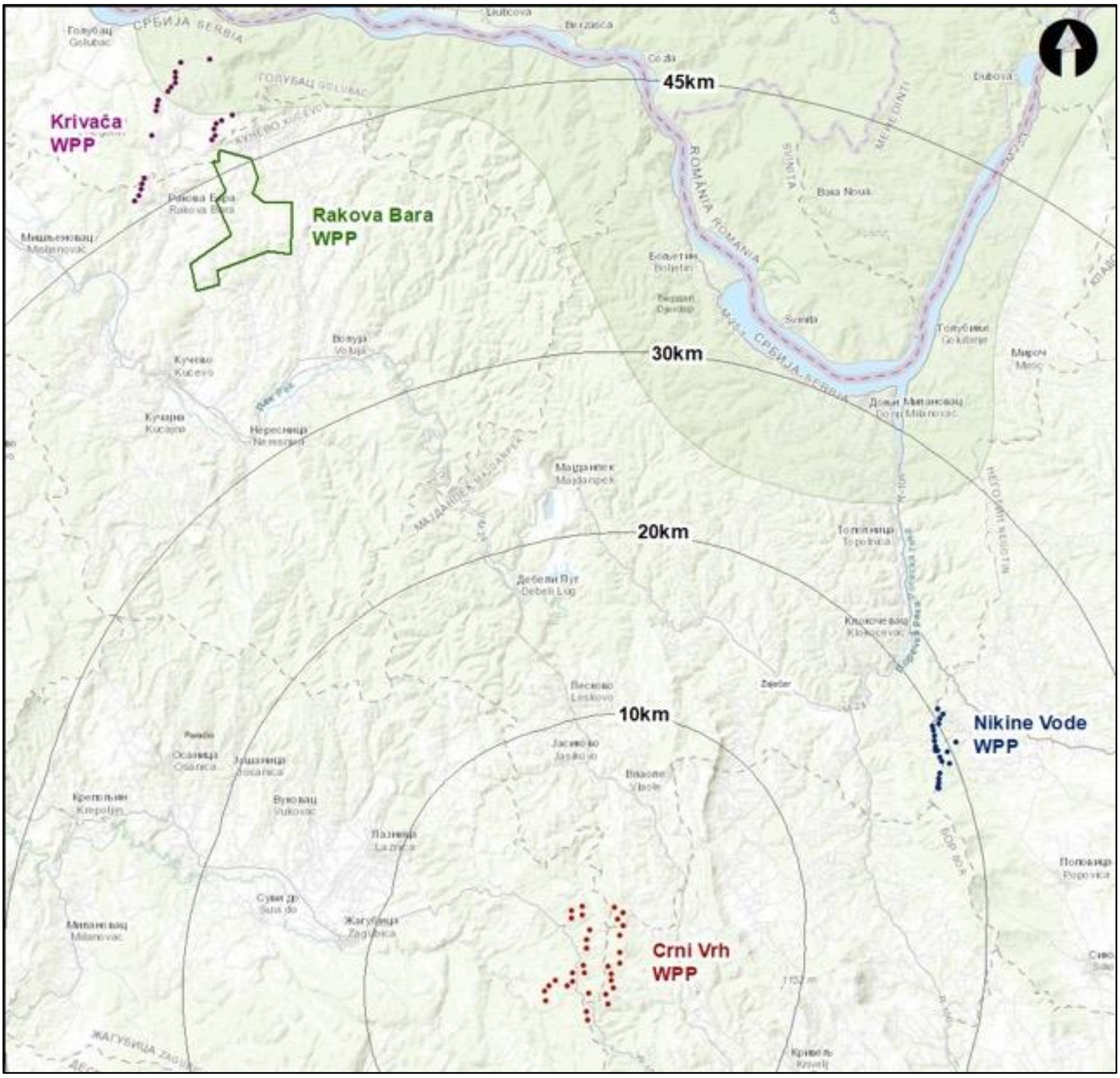

Figure 10-5 Cumulative Windfarm Schemes

10.4.1 Ecology and Nature Conservation

This ESIA has assessed that the potential negative impact of the Crni Vrh WPP on local ecological features will not be significant providing that the Developer adheres to the mitigations described within the ESMMP. The potential impact outside the AoI is considered to be insignificant.

Should WPPs proliferate in the area that there is the potential for an impact on regional populations of birds and bats as the impact of each WPP could be additive. However, within the context of the Crni Vrh WPP, a significant cumulative on bird and bat populations is considered unlikely. The mortality surveys that will be completed during the operation of the WPP will provide information to estimate cumulative mortality rates and their sustainability. The IfNC should use this data to consider the NCPs that are placed on other WPPs as they are proposed.

It is noted that the Crni Vrh WPP is to be developed in the area where industrial mining is both intensive and extensive, and further expansion is expected. The activities associated with mining often have a devastating impact on the overall biodiversity and are orders of magnitude greater than any impacts from local WPPs. In addition, local forests are managed for timber production rather the protection of biodiversity. The biodiversity in the region is exposed to very pronounced negative impacts of mining and poor forestry practices. Therefore, Crni Vrh WPP would not significantly contribute to the cumulative impacts on biodiversity of other commercial activities in the region.

11 Impact Significance and Mitigation Framework

11.1 Assessing Impacts and Opportunities

The impact of the Project, as well as the possible opportunities resulting from the Project, were considered and assessed by technical experts with professional experience of other wind power projects. Many of these experts are based in Serbia and are fully aware of the technical (GIIP) and legal constraints that must be met.

Wherever possible, a quantitative assessment of the impacts was undertaken, i.e. by comparison with appropriate legal requirements and GIIP standards. Where this was not possible, a qualitative assessment of impacts was undertaken, i.e. professional judgements were made.

There are a number of ways to determine the significance of impacts. These include methods for scoring and ranking impacts on the basis of subjective criteria. Results are often presented in the form of a matrix in which importance and magnitude of impact are combined into a significance score. When using a matrix approach, it can be less easy to make a clear distinction between evidence-based and value-based judgements so that decision makers and other stakeholders are aware of the level of subjective evaluation that has been used. The CIEEM Guidelines avoid and discourage use of the matrix approach and categorisation and make it clear that the suggested approach should be used only where categorisation has been specifically required. Spurious quantification should be avoided where cannot be a clear definition of the criteria and thresholds that underpin them are not used.

In summary, the impact assessment process adopted within the Crni Vrh ESIA involves:

- Identifying and characterising impacts and their effects.
- Incorporating measures to avoid and mitigate negative impacts and effects.
- Assessing the significance of any residual effects after mitigation.
- Identifying appropriate compensation measures to offset significant residual effects.

The assessment of impacts takes into account the baseline conditions to allow:

- A description of how the baseline conditions will change as a result of the Project and associated activities.
- The identification of cumulative impacts arising from the proposal and other relevant developments.

A significant impact is simply an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the consequences of supporting or permitting a project. A significant impact is a positive or negative impact that should be given weight in judging whether to authorise a project: it can influence whether permission is given or refused and, if given, whether the effect is important enough to warrant conditions, restrictions or further requirements such as monitoring. A significant impact does not necessarily equate to an impact so severe that consent or support for the project should be refused.

The subsequent evaluation of the significant impacts includes the subjective consideration of:

- Sensitivity of receiving environment;
- Extent and magnitude of the impact;
- Reversibility and duration of the impact;
- Inter-relationship between impacts; and
- Type and extent of cumulative impacts.

Positive and negative impacts are considered according to whether the change is:

- Positive (an "opportunity") – a change that improves the quality of the environment or provides a benefit to project stakeholders e.g. by extending habitat or improving water quality, or opportunities local employment, tax income or improved farmland tracks. This may also include halting or slowing an existing decline in the quality of the environment or stakeholder values.
- Negative (a "detriment") – a change which reduces the quality of the environment e.g. destruction of habitat, removal of foraging habitat, habitat fragmentation, pollution or has an impact on health, welfare, wellbeing of project stakeholders, e.g. the loss of land, livelihood or property.

The assessment of each impact or opportunity is complex and the likely significance of impacts is based upon the judgement of the technical experts. These individuals considered the importance or sensitivity of the affected receptor(s) and the nature and magnitude of the predicted changes. For example, a moderate negative effect on a feature or site of low importance is considered to be of lower significance than the same effect on a feature or site of high importance. The sensitivity of the receptor depends upon the relative importance of existing environmental features on or in the vicinity of the site or the sensitivity of receptors. The criteria for determining sensitivity or importance are based on existing guidance, legislation, statutory designation and professional judgement. Significance is a function of the sensitivity of the receptor and the extent or magnitude of the impact.

Short-term impacts typically relate to the construction and decommissioning periods. Impacts lasting less than the life of the Project are considered to be medium-term whilst those over or exceeding the life of the Project are considered long term. The reversibility of an impact, either wholly, or in part, in the short to medium term, were also considered where relevant. Following the assessment of receptor sensitivity, the potential impact on a receptor and the predicted magnitude of that change or impact was identified, i.e. the scale or degree to which the existing environment may be changed.

The technical specialists applied the general definitions presented in the following tables (Table 11-1, Table 11-2, and Table 13-3).

Table 11-1 Criteria for Impact Duration

Duration of the Impact	Criteria Adopted by the Impact Assessment
Temporary - Short Term	Impact continues during construction and up to 1 year following construction
Temporary – Medium Term	Impact continues for 1 to 5 years following construction
Temporary – Long Term	Impact continues for 5 to 10 years following construction
Permanent	Impact continues for more than 10 years following construction

Table 11-2 Criteria for Receptor Sensitivity

Sensitivity of the Receptor	Criteria Adopted by the Impact Assessment
High	Site or species subject to international or national protection
Medium	Site or species subject to regional or local protection
Low	Site or species subject to no specific protection measures
Negligible	Site or habitat already significantly degraded

Table 11-3 General Criteria for Extent and Magnitude of an Effect

Extent and Magnitude of Effect	Criteria Adopted by the Impact Assessment
High	Fundamental change to the specific environmental conditions assessed resulting in long term or permanent change
Medium	Noticeable change to the specific environmental conditions assessed resulting in non-fundamental temporary or permanent change
Low	Detectable but minor change to the specific environmental conditions assessed
Negligible	No discernible change to the specific environmental conditions assessed

Cumulative impacts are those that result from the incremental impact of the project when added to other existing, planned and reasonably predictable future projects and developments. While a single activity may itself result in an insignificant impact, it may when combined with other activities within the project AoI result in a cumulative impact that is significant.

The assessment of cumulative impacts is often restricted by the availability of reliable information. The rapid cumulative impact assessment adopted in this ESIA involves a combination of desk-based research and engagement with stakeholders.

11.2 Mitigation Framework

Following the assessment of the impacts identified, the technical experts considered appropriate mitigation measures that might prevent, reduce or remedy any potentially significant environmental impacts. Such measures may be implemented during design, construction and operation of the proposed development.

The development of mitigation measures was guided by the mitigation hierarchy (see Figure 11-1, below) presented in IFC guidelines. The general principles are:

- *Having identified the impact, can it be avoided?*
- *If not, can the impact be minimised by modification to the project design or through on-site operational measures.*
- *When impacts are unavoidable, or if on-site mitigation is not possible then the impact may be compensated by offsetting through off-site improvement works. When offsetting then the minimum objective should be no net loss or reduction in environmental quality.*

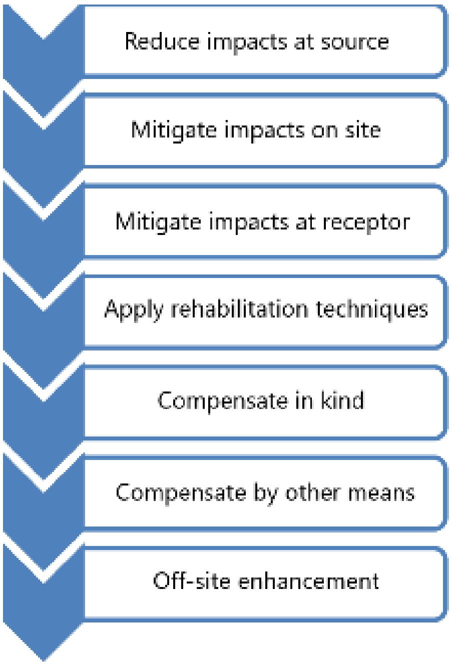

Figure 11-1 Mitigation Hierarchy

For each impact identified during the impact assessment the ESIA may recommend:

1. Remove the source of the impact to:
   - Avoid certain projects or elements that could result in adverse impacts;
   - avoid areas that are environmentally sensitive; and
   - putting in place preventative measures to stop adverse impacts from occurring.
2. Minimise the impact, i.e. to limit or reduce the degree, extent, magnitude, or duration of adverse impacts by:
   - Scaling down the proposal;

- redesigning elements of the project; and
- taking supplementary measures to manage the impacts.

3. Rehabilitation, i.e. mitigate unavoidable residual adverse impacts by:
   - Habitat restoration/ enhancement;
   - Species relocation; or
   - following closure of the project restoring the site or environment to its previous state or better.
4. Impact compensation, i.e. provide for off-site enhancement that matches or exceeds the negative impact of the project by:
   - Provision of replacement land at an alternative location to compensate for loss of farmland (i.e. in-kind);
   - compensation equal to the lost revenue experienced as a result of the project;
   - replacement of the same resource values at another location, for example, by habitat improvement to provide an equivalent area to that lost.

11.3 Residual Impact

Following the identification of mitigation measures to address significant adverse impacts, an assessment of the significance of any residual effects (i.e. those remaining after mitigation) was completed. Where significant residual impacts remain, consideration has been given to offsetting or compensating for residual impacts.

The scale of the 'Residual Impact', i.e. once the mitigation measures have been applied, has been summarised as a simple graduate scale from positive benefits down to negative impacts as follows:

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

Benefit

- No Change

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

Disbenefit

11.4 Linking Impacts, Mitigations and Management Plans

The environmental and social impacts identified during the assessment, the proposed mitigations and a scale of the residual impact has been recorded, in tabular form, within Chapters 12, 14, 15, and 16.

The mitigation and monitoring measures recommended by the technical experts have been summarised within the Environmental and Social Management and Monitoring Plan ("ESMMP"), see Section 17.1.2. The ESMMP will then be used to develop the ESMS management plans, see Section 17.1.

12 Primary Mitigation - WPP Design

12.1 Introduction

The Zoning Plan for Crni Vrh allows for the development of a WPP with a maximum installed capacity of 158MW, although the net export is limited to 150MW. Since the original application for the Zoning Plan was made, the generating capacity of wind turbines available on the open market has steadily increased and it became possible to achieve the export capacity of 150MW with fewer turbines.

Design change is considered to be the primary mitigation for the Crni Vrh Project. Due to the importance of these design changes, this Chapter has been prepared to summarise the basis for the design changes that have been made and the subsequent reduction in the environmental and social impact of the WPP. The detail of each topic: biodiversity, noise, and shadow flicker are presented in Chapters 13 to 15.

12.2 Design Changes Agreed at the Scoping Study Stage

The Scoping Study (December 2020) was based upon the original design of the WPP that included 40 x 4.2MW turbines, 18MW more that the export capacity of 150MW. The location of the 40 turbines was set to maximise the exploitation of local wind patterns for electricity generation, ease of grid connection, topography, access tracks through the forests, and land availability. CVP were seeking flexibility in the conceptual design so that the design could be optimised once a preferred turbine had been selected.

The Crni Vrh WPP will be located in a mountainous area and the landscape is dominated by mountain ridges and deep valleys. The area in and around the project site is characterised by woodland (both natural and cultivated), open meadow and low-grade agricultural land. Several of the woodland areas within the boundary of the WPP are considered to be near-natural forest habitats, and some of the woodland flora and fauna species are of particular conservation concern. A number of WTGs were located, and some segments of the site tracks were routed, in mature near-natural woodland. It is noted here that other forest habitats such as intensively managed, planted, degraded, or fragmented forest habitats, as well as (neglected) farmland are of no particular conservation concern. These habitats are not likely to be significantly adversely impacted by habitat conversion or degradation.

Following the completion of the Scoping Study it was clear that the siting of a small number of WTGs within or close to mature woodland would have a detrimental impact on these woodland habitats. The impact on these habitats, and the species dependant on them, would be permanent, detrimental and significant, i.e. a number of species could be displaced or suffer fatalities in nests, roosts and lairs. Following the completion of the Scoping Study it was agreed with CVP that these impacts could be significantly mitigated by removing or relocating a number of WTGs and by re-routing a some of the tracks; the objective being to avoid these habitats entirely. These changes were made prior to the start of the ESIA. Other impacts were investigated and design changes agreed with CVP during the ESIA.

It was agreed with CVP that turbines TI18, TI19, TI20, TI21, TIV5, TII10, TIII3 and TIII4 would be removed from the scheme and that turbines TIV4, TII8 and TI17 were re-sited to the areas of lower ecological risks (see Figure 12-1). It was also agreed that the network of tracks could be significantly reduced (by about 30%) and in large part, only existing rough tracks will be developed into site tracks. This also had the benefit of reducing land acquisition and changes in land use.

All these modifications were adopted within the Project Zoning Plan(s) (PDR), approved July–September 2021. This meant that, the potentially most significant adverse impacts of the Project on all ecological features were avoided. This layout was used as the basis of the subsequent ESIA which included consideration of the lesser impacts which could be mitigated through modification of construction and operational activities.

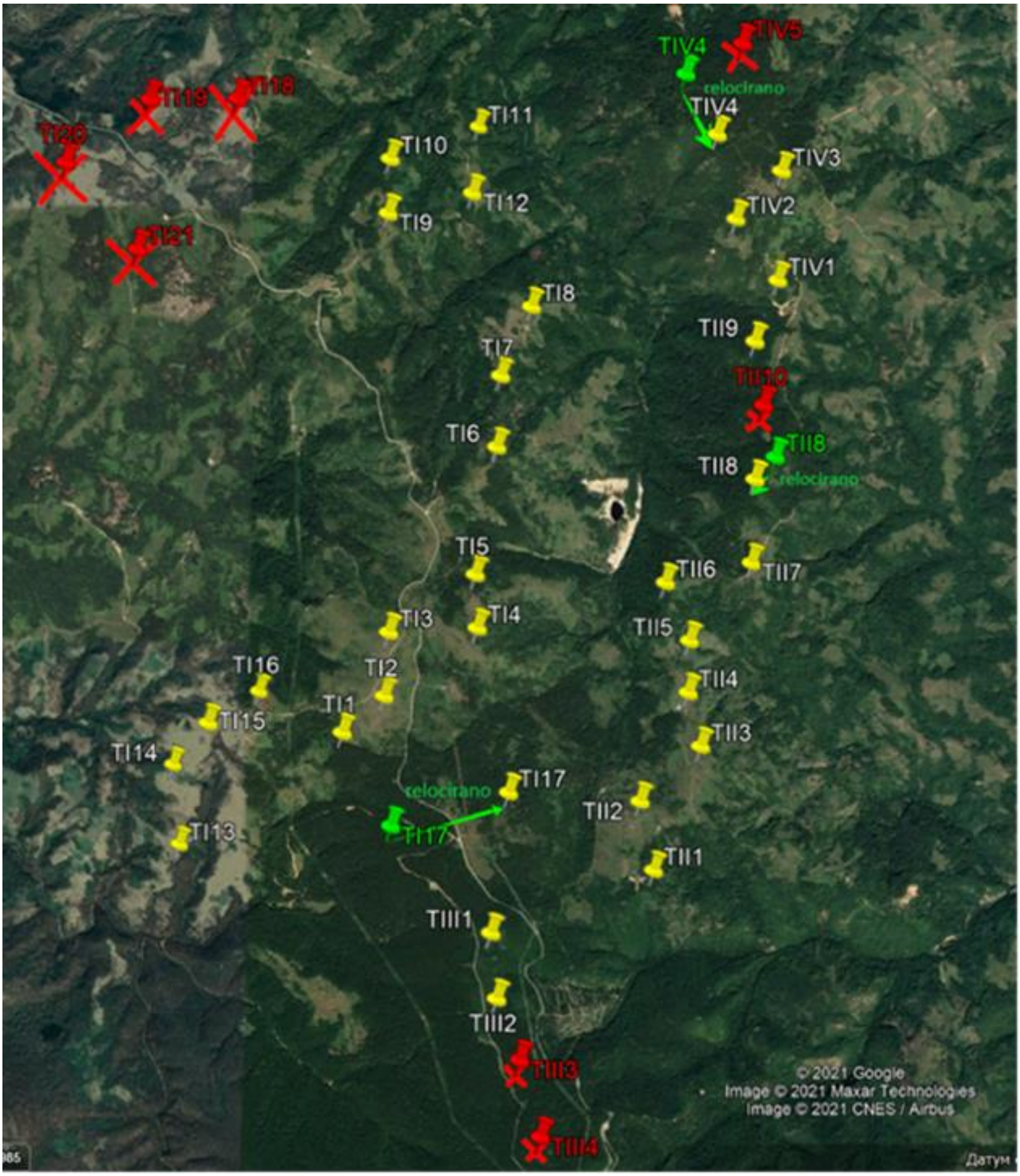

Figure 12-1 Design Changes made after the Scoping Study

12.3 Crni Vrh WPP Design used as the Basis of the ESIA

Following the agreement of the Scoping Study, the ESIA was undertaken on the basis of a WPP that would include no more than 32 WTGs. At the time of preparing the ESIA the developer was considering turbines with a capacity in excess of 5MW. This would allow a further reduction in turbine numbers. If a 5.6MW unit is used then only 27 turbines will be required to achieve the permitted export capacity. This meant that there was an opportunity for the ESIA specialists to consider the removal of other WTGs that might have a potentially significant impact on sensitive human receptors.

The layout of the WPP that was used as the basis of the ESIA, the conceptual design, is shown in Figure 12-2 below.

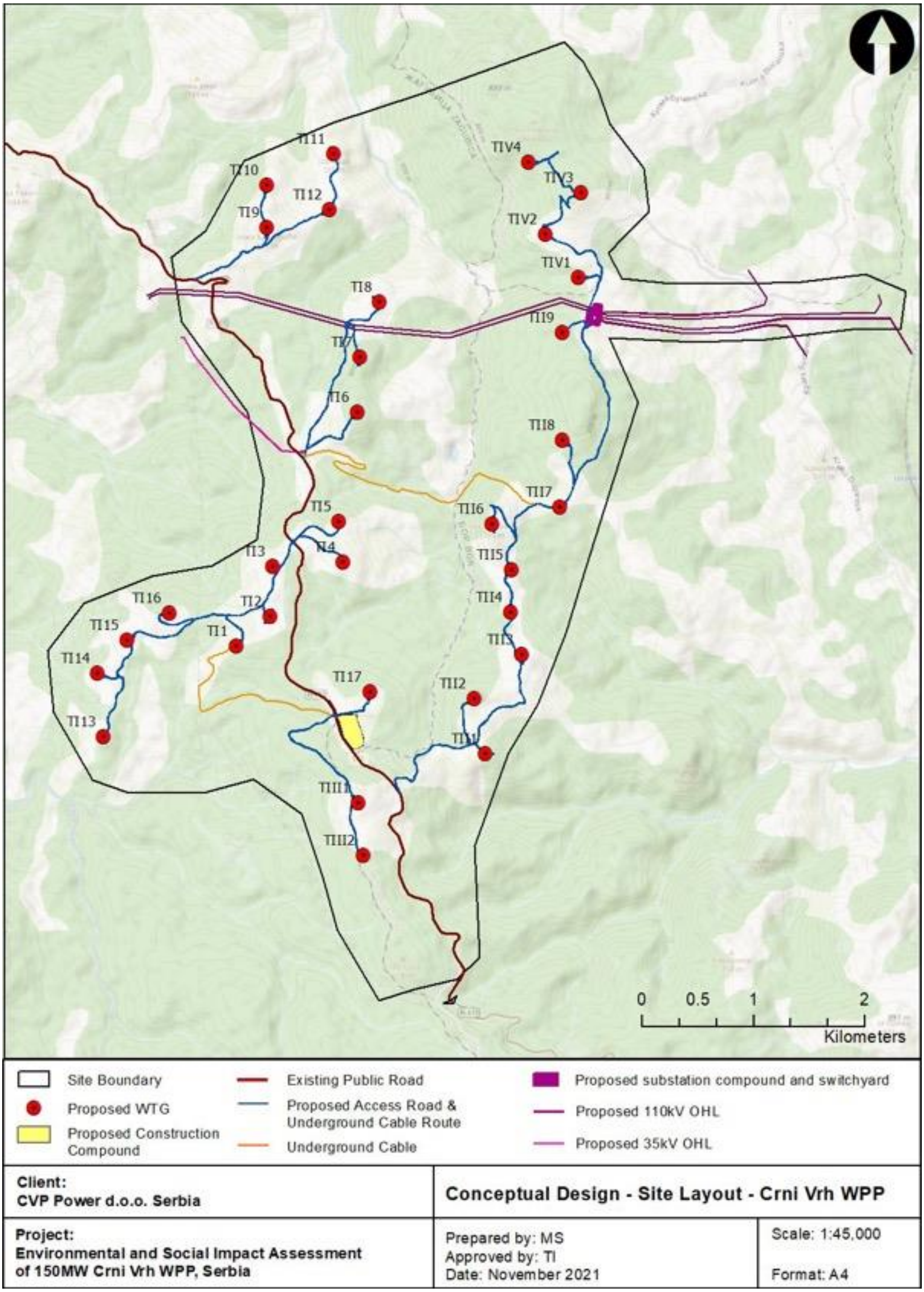

Figure 12-2 Conceptual Design - Site Layout

12.4 Spatial Constraints upon the Final Design

In addition to the findings of the Scoping Study, the environmental and social specialists considered a number of other constraints within the ESIA that also effected the final design of the WPP. In particular:

- The Zoning Plan sets a radius of 500m as an exclusion area, or setback zone where no new buildings can be constructed. The law does not require existing properties to be removed or demolished. It is the responsibility of the Developer to ensure the impact on these properties in minimised. No new buildings can be constructed within this setback zone.
- The IFC guidelines also require the creation of safety zones around each turbine of 1.5 x height to blade tip; in this case 300m.

To deliver an IFC compliant ESIA, the exclusion zone was set at a radius of 300m. This means that any structures within 300m of a turbine base are considered to be a potentially sensitive receptor.

12.4.1 Sensitive Human Receptors

There are only a small number of occupied houses across these rural uplands and the resident population continues to fall. The large number of derelict and dilapidated structures evidence this decline. Several small farmsteads remain occupied, scattered on hillsides to the north-east and south-west. Only a couple of farms still keep cows and poultry, others have small orchards and gardens.

The map in Figure 12-3 shows the location of all of the structures within the area of the WPP that could be impacted by the operating WTGs. A total of 200 structures (potential sensitive human receptors) were identified within the Study Area.

As is normal in rural Serbia, a large number of country properties are only occupied during the summer period and the ESIA included a survey of all 200 structures to determine how many are currently in use. The ESIA identified 34 properties where the occupants could be impacted by the operation of the WTGs. These properties are considered to be Sensitive Receptors within the ESIA. Five of these sensitive receptors are permanently occupied and the structures are referred to as Residential Houses (R1 to R5). Another 25 (W1 to W25) are occupied for only part of the year; these are referred to as Weekend Houses. The ESIA also identified a number of Weekend Houses that have been abandoned but could be brought back in to use within a few weeks. There are four Abandoned Weekend Houses (WA1 to WA4). The location of all 34 of these sensitive receptors is shown in Figure 12-4.

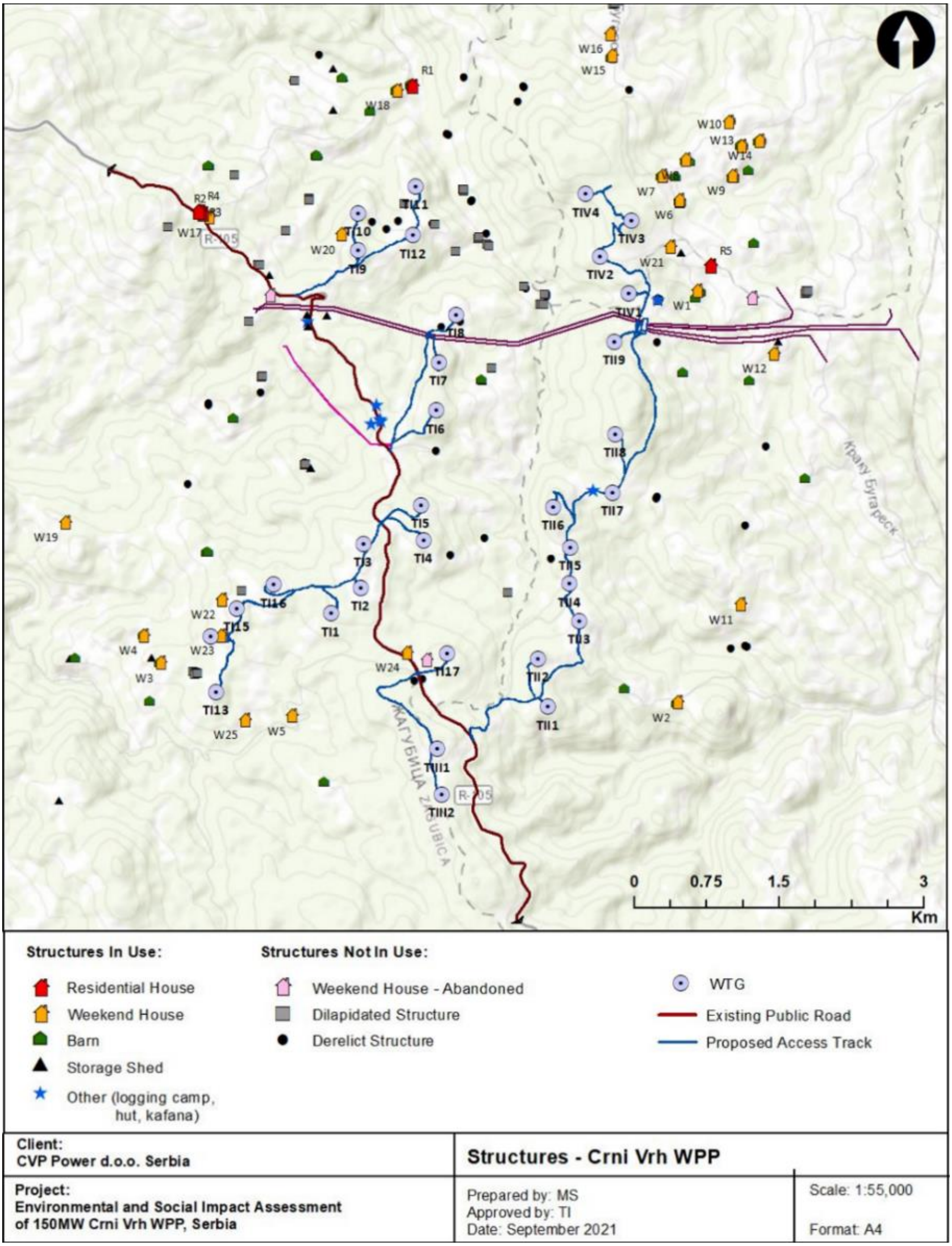

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Figure 12-3 Structures within 2km of the WPP Turbines

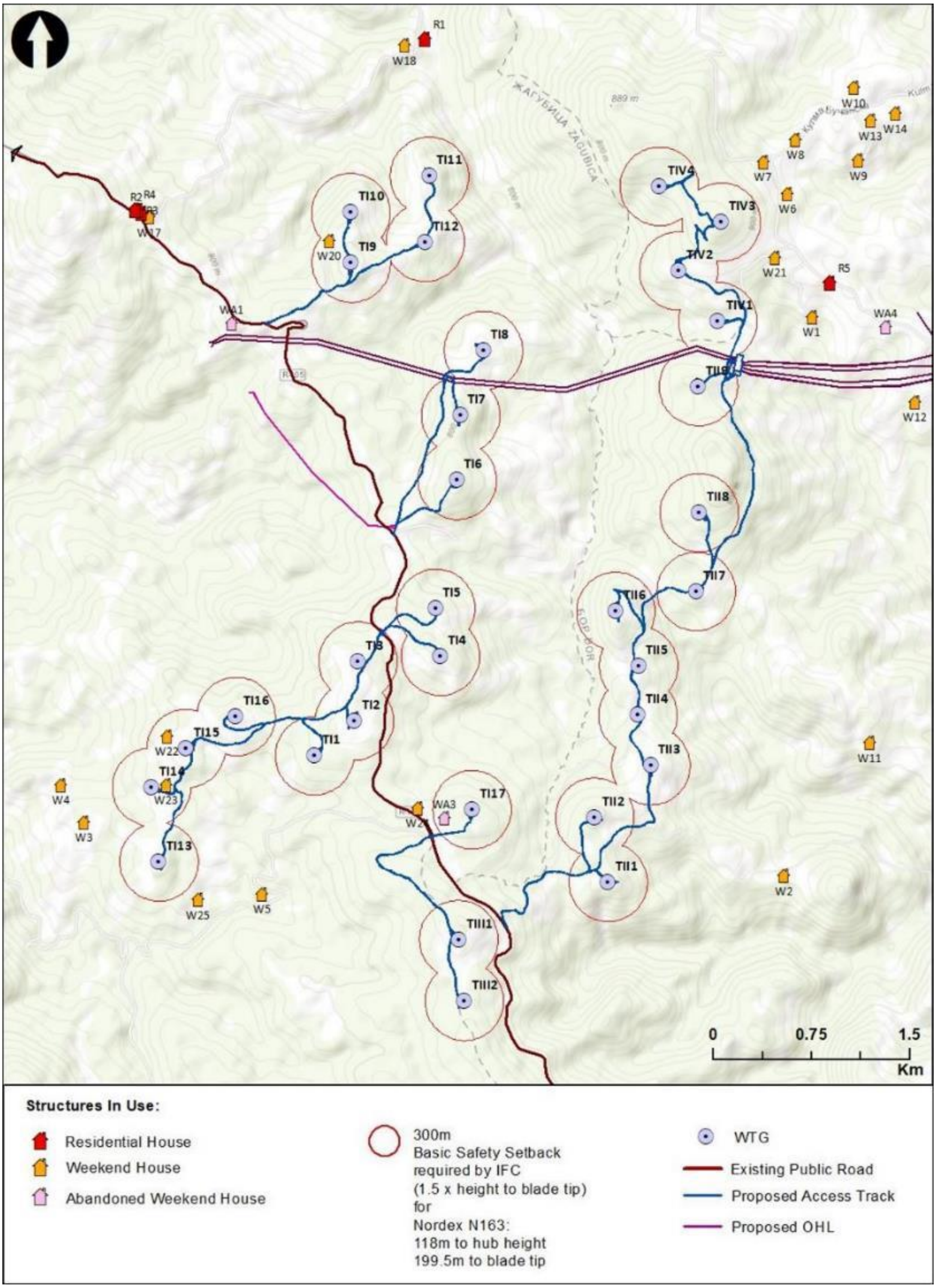

Figure 12-4 Location of Potential Sensitive Receptors

Figure 12-4 also shows the boundary of the 300m exclusion zone (from the base of the turbine towers) required by IFC guidelines. As described above, it is the responsibility of the Developer to ensure the impact on any properties within the 500m Setback Zone is minimised; it was agreed that the same level of responsibility will be applied to the IFC Safety Setback Zone. The following sections summarise the potential impact on the sensitive receptors from of noise and shadow flicker.

12.4.2 Noise

Where existing residential and other structures, regardless of their condition, are within, or close to the turbine safety Setback Zone, CVP met with the owners of these properties and described the potential impact of noise from the operating turbines. These consultation meetings included discussion of how best to mitigate or compensate for the risk of noise impact as well as a general consideration of safety risks. Depending upon the level of potential impact, the owners were offered the option to be compensated by the Developer for the removal of existing structures, or to agree a combination of physical mitigation (such as screening) and financial compensation. It was agreed that the structures within the safety Setback Zone of W20, W22, W23 and WA3 would be compensated at full replacement cost by the Developer and will be taken out of use. All costs associated with removing the structures would also be paid by the Developer and no change in terms of land ownership would occur. At the time of writing, all of the agreements with the owners have been formalised and the contracts have been signed.

The area adjacent to the north-eastern part of the WPP is the most densely populated (see Figure 12-4). The initial noise assessment identified several working farms and occupied properties (W21 and R5) would be affected. On the basis of the initial calculations, noise levels at W21 will exceed the Serbian night-time noise limit of 45 dB L_{Aeq} and at R5 the noise levels would also exceed the IFC limit on the basis of the background noise levels measured. CVP agreed with the ESIA specialists that a string of four turbines should be removed from the scheme to significantly reduce noise levels for these properties (TIV1, TIV2, TIV3 and TIV4). These turbines were the only ones to be located on the territory of Majdanpek municipality, which will no longer be affected. It is noted that WTG TIV5 had already been removed from the scheme following consideration of ecological impact reported in the Scoping Study.

The noise impact was remodelled following the removal of this string of four turbines (TIV1 – TIV4). The revised predictions indicated that Serbian noise limits may then only be exceeded at two residential properties, occasionally used as weekend houses, W24 (towards the centre of the site) and W25 (in the south-west; see Figure 12-4). The Developer offered the owner of W24 compensation for the full replacement cost of her weekend house, which could then be taken out of use. The owner declined this offer and chose to request financial compensation for any loss in amenity. With improved sound insulation it should be possible to achieve satisfactory internal conditions. CVP calculated the costs of implementing noise mitigation measures, as a basis for the financial compensation offer and this offer has been accepted by the owner (June 2022). However, CVP cannot force the owner to spend the money on the improvement of sound insulation at the property. The potential impact on this property will be monitored during WPP operation. Should any complaints be received, this will be managed through the Community Grievance Mechanism. The owner of W25 was visited by the CVP team and the potential impacts were discussed. However, as CVP still have the option of removing several turbines from the scheme, turbine TI13, which is the potential cause of this, and other impacts, is likely to be among them. If this turbine is not removed from the scheme, the owner of W25 will be offered the same compensation choices as those offered to the owner of W24.

It is possible that the IFC limits will also be exceeded at other properties at certain wind speeds. The IFC guidelines require that noise from the WPP must not result in a maximum increase in background levels of 3dB at the nearest receptor location. This imposes a low noise limit for locations where the background noise levels are low. However, the predictions methodology may overestimate noise levels especially those locations which cannot be downwind of all turbines at the same time. The ESMMP contains a requirement to monitor levels and to take remedial action (e.g. the installation of noise screens) should the noise levels cause justifiable complaints.

12.4.3 Shadow Flicker

The initial shadow flicker assessment concluded that there is the potential for shadow flicker to exceed the recommended worst-case threshold of 30 hours per year at 15 properties; one of these properties is a residential house and the other 14 are weekend houses that will only be occupied in summer months. However, as CVP subsequently agreed to remove turbine string IV (TIV-1, TIV-2, TIV-3, T-IV) due their potential noise impact, the shadow flicker effect on the receptors in the north-east has been completely avoided.

This means that only 4 weekend houses would be affected, all in the south-west (W3, W4, W5, W24). These weekend houses are likely to be affected in the early morning from April to September (6-8am). Additionally, the W5 ay also experience the effect in late afternoon (7pm) from May to August. The weekend houses W3 and W4 have vegetative screening which is likely to mitigate the flickering effects to some extent. The W5 is situated within a pocket of cleared woodland where the canopy between the house and the proposed TI-13 is 3 to 16m high and is likely to mitigate the flickering effect to a significant extent.

The remaining 184 properties that could be affected by shadow flicker are barns, storage sheds, hunting and logging structures, abandoned houses, dilapidated and derelict structures.

12.4.4 Biodiversity and Nature Conservation

Detailed biodiversity surveys were undertaken during the early stages of the ESIA. These surveys identified a number of sensitive habitats or species that would be impacted by the construction of the WPP:

- In addition to the near-natural mature woodland areas identified during SS, the ESIA surveys identified other sensitive habitats that should be protected. Whilst not within any WTG Setback Zone, a number of small fragments of wetland and humid meadows are located adjacent to existing forest tracks. These habitats support small but valued populations of a Strictly Protected plant species, the Common Clubmoss (*Lycopodium clavatum*), and a Strictly Protected butterfly species, the Small Pearl-Bordered Fritillary (*Boloria selene*). Widening of the tracks could have a detrimental effect on the habitats and populations. CVP have agreed that the routing of the widened site tracks will avoid these areas as well as any drainage interventions/ measures along particular sections of the site tracks. CVP will install fencing at the sensitive locations during construction to prevent any accidental damage.
- There are a few small areas of habitats and/ or species of particular conservation concern along the OHL route. These include two areas with populations of Strictly Protected plant species Burnt Orchid (*Neotinea ustulata*) and Bug Orchid (*Anacamptis coriophora*). CVP have agreed to site the OHL pylons outside of these areas. CVP will install fencing at the sensitive locations during construction to prevent any accidental damage.

The bat mortality assessment predicted that WTG TIV1 is likely to be cause the high levels of bat mortality during operation. The mosaic of small wetland, woodland and grassland (favouring abundance of insects) around the WTG and surrounding topography mean that the levels of bat activity at the blade swept height is much higher than anywhere else at the site. This risk was discussed with CVP who agreed to remove WTG TIV1 from the scheme. This means that the risk of bat operational fatalities will be significantly reduced, and also that destruction of the valued habitats/ populations in the area has been avoided.

12.5 Summary

During the preparation of this Assessment, the ESIA consultants worked in close cooperation with CVP to understand and then minimise the environmental and social impact of the WPP. The ESIA process has led to significant changes in the layout of the Project and CVP are to be applauded for their open and constructive approach to the ESIA process.

The consideration of the maximum capacity of the WPP allowed under the Zoning Plan and, in combination with the increasing capacity of the current generation of WTGs, CVP have been able to remove a number of the turbine locations suggested in the conceptual design from the final WPP design. Working with the ESIA consultants, CVP have settled on a final design that will include no more than 32 WTGs; eight of the high-impact WTGs have been removed. Specifically:

- Following the submission of the Scoping Study and discussions around potentially significant impacts and potential mitigations, CVP agreed that turbines TI18, TI19, TI20, TI21, TIV5, TII10, TIII3 and TIII4 would be removed from the scheme and that turbines TIV4, TII8 and TI17 were re-sited to areas of lower ecological risks. In addition, it was agreed that the extensive track network could be significantly reduced (by about 30%) and in large part, only existing rough tracks will be developed into site tracks.
- CVP worked proactively with the owners and occupants of properties that might be at risk of impact from noise and shadow flicker to reach mutually agreeable mitigations. This included the provision of financial compensation for any affected structures at full replacement cost, so that they may be taken out of use, or for any loss in amenity the owners may suffer.
- Agreement was reached with the owners of properties W20, W22, W23 and WA3 that their affected structures would be purchased by the Developer and will be taken out of use.
- A string of four turbines would be removed from the scheme to reduce noise levels at properties W21 and R5. The turbines removed from the scheme are: TIV1, TIV2, TIV3 and TIV4. It is noted that the removal of WTG TIV1 is expected to significantly reduce the predicted level of bat mortality.
- Residential properties W3 and W25 are potentially impacted by noise from WTGs TI-13 and TI-14. Whilst there was no need to change the layout of the WPP it is likely that this impact can be mitigated by other mitigation such as screening or running these turbines lower noise mode.

- Following the removal of turbine string IV (TIV-1, TIV-2, TIV-3, TIV-4) the shadow flicker effect on the receptors in the north-east will be completely avoided. This means that only 4 weekend houses would be affected, all in the south-west (W3, W4, W5, W24). The houses W3, W4, and W5 have vegetative screening which is likely to mitigate the flickering effects. The situation will remain under observation.

A plan of the final scheme, following the design changes listed in this Chapter, is shown in Figure 12-5. In addition, Figure 12-6 shows how the layout has changed due to the completion of the Scoping Study and the ESIA.

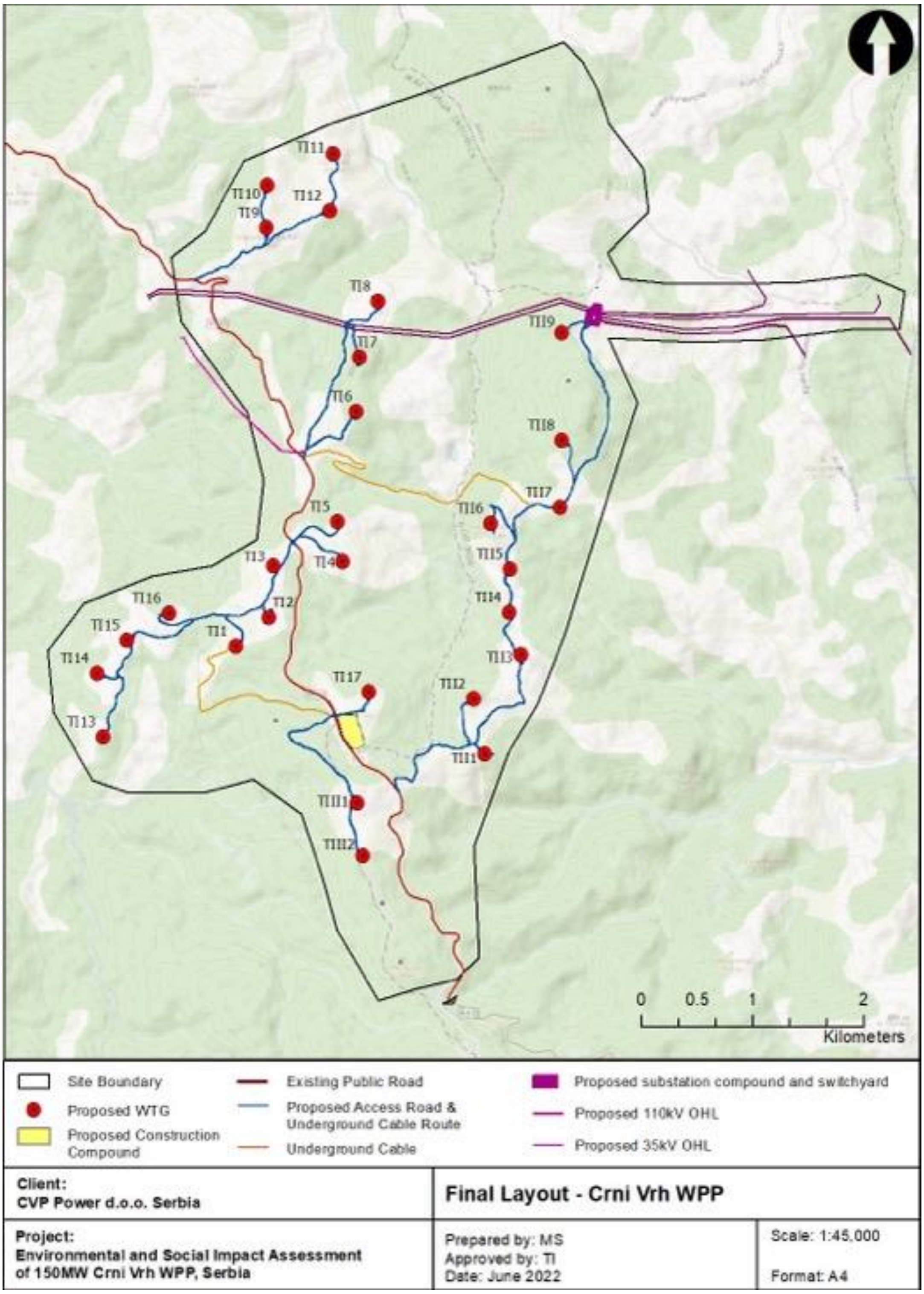

Figure 12-5 Final Layout of Crni Vrh WPP

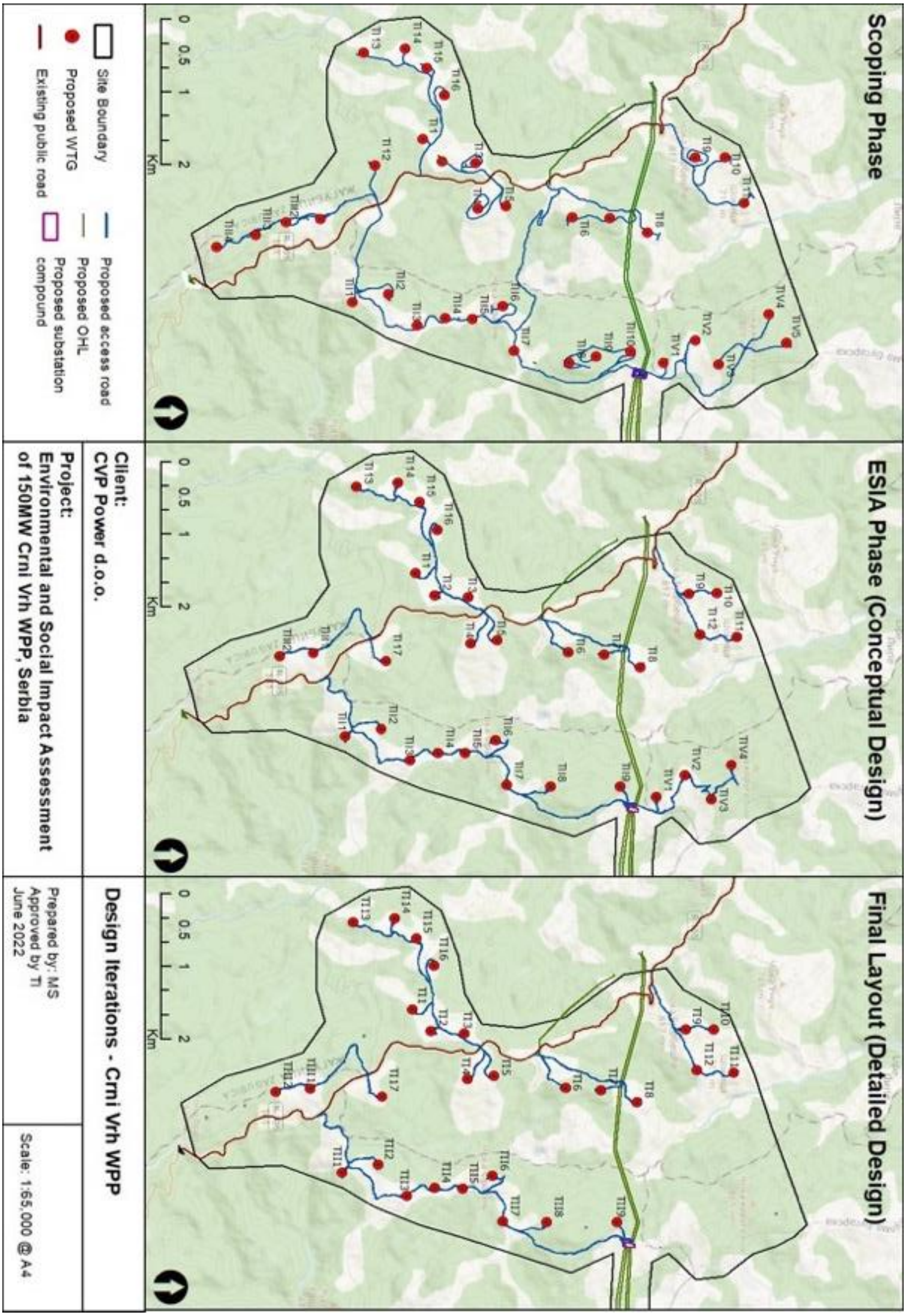

Figure 12-6 Layout Changes of the Crni Vrh WPP

13 Construction - Impact Assessment and Mitigations

13.1 Introduction

This Chapter describes the assessment and mitigation of the construction impacts identified within the Scoping Study. The impact topics are presented in the order of significance identified by the Scoping Study. A summary of the impacts identified and recommended mitigation or control measures are presented in one or more tables at the end of each topic section. These impacts, mitigations and control measures are consolidated in a single table in Chapter 16. The Construction impact summary table (see section 16.2) is linked to the Environmental and Social Monitoring and Management Plan (ESMMP) presented in Chapter 17. The ESMMP will be used as the basis of the Construction Environmental and Social Management Plan (CESMP). The CESMP will include a series of subsidiary, topic specific Management Plans (see Chapter 17) that will describe the procedures and controls required to manage the impacts in line with the Project Applicable Requirements (see section 6.1).

The Scoping Study categorised the construction impacts of the Crni Vrh WPP as:

Significance Level One Issues

- Ecology and Nature Conservation –woodland plant species of conservation concern (orchids in particular), birds and bats;
- Socio-economic.

Significance Level Two Issues

- Ecology and Nature Conservation – habitats other than woodland of conservation concern and their plant species of conservation concern;
- Traffic and Transport.

Significance Level Three Issues

- Ecology and Nature Conservation – non-woodland fauna species of conservation concern other than birds and bats;
- Landscape and Visual;
- Construction Noise;
- Archaeology and Cultural Heritage;
- Land and Groundwater Quality;
- Surface Water and Wastewater;
- Environmental Pollution;
- Ecosystem Services;
- Community Health Safety and Security;
- Fire/ Wildfire.

13.2 Ecology and Nature Conservation

This section identifies, characterises and evaluates the potential construction impacts of the Crni Vrh WPP project on ecological features of significant nature conservation value, identifies and describes mitigation measures needed as well as provides an assessment of the significance of any residual effects.

Only those ecological features considered to be potentially affected by the project and of significant nature conservation value should be subject to detailed impact assessment (CIEEM 2016). For ecological features of not significant nature conservation value (valued at the local level at the most), no detailed impact assessment is needed (CIEEM 2016, SNH 2018a) since any potential impact could only be not significant as well (CIEEM 2016, European Commission 2020).

It is noted that the Appendices of this ESIA contain the data from the surveys and the output of any modelling that was undertaken. The conclusions presented below are based upon the consideration of the survey findings and the outcome of the modelling.

13.2.1 Assessment of Impacts

13.2.1.1 Designated Sites

There are no designated sites within the WPP boundary and there will be no destruction or degradation of any designated sites as a consequence of the construction or operation of the Crni Vrh WPP.

13.2.1.2 Habitats

This ESIA has assessed the possible direct impacts on all habitats within the site as well as possible indirect impacts on occurring flora and fauna species populations, in particular on birds and bats. The magnitude, direction and scale of potential impacts on habitats have been assessed on the basis of the nature conservation value, abundance and spatial distribution of habitat types and their possible exposure and susceptibility to the potential impact.

The impact of the introduction of invasive species is not considered as they must be prevented.

13.2.1.2.1 Destruction or degradation of Balkan-mountain hay meadows

Maintained Balkan-mountain hay meadow (EUNIS code E2.33) is the only habitat type of significant nature conservation value within the developed areas of the site. There is only up to 2.6% (0.5 out of total 18.96 ha) of this habitat type within the developed areas of the site, which equates less than 0.1% at the site level, will be lost due to the construction of WTG TII3 foundation and platform, WTG TI8 platform marginal part, up to 10 OHL towers, and negligible areas of new tracks and widening of existing tracks.

This loss will be permanent (for the operational life of the Project), though reversible if restored properly during decommissioning. The somewhat larger area around particular WTG, up to 0.1% (0.6 ha) total at the site, will likely be disturbed/ lost during the construction, though only temporarily.

Considering such small magnitude of the impact even at the site level, the impact is assessed as **negligible,** and **not significant**.

13.2.1.2.2 Destruction or degradation of all other habitat types

Primary Mitigation has ensured that almost all areas of valued habitats within the site boundary were excluded from development at the SS stage, including in particular all mature near-nature woodland and majority of the younger relatively preserved forest stands. Therefore, all other habitat types within the developed areas of the site are of insignificant nature conservation value as such (valued at the local level at the most), and thus any potential impact could only be **not significant** as well.

13.2.1.3 Flora and Fauna

This ESIA assessed all possible impacts on flora species including loss of habitat and destruction of individuals/ populations. This section considers the possible impacts on fauna species due to construction.

Illegal activities, such as deliberate destruction of protected flora species individuals /populations and deliberate killing of protected fauna species (including destruction of nests/ roosts/ lairs/ habitations, eggs and litters), are not considered, since they must be prevented under Law.

The magnitude, direction and scale of potential impacts (CIEEM 2016) have been assessed on the basis of the species ecology, populations' nature conservation value, ecological status and spatial distribution at the site (section 0), and their possible susceptibility and sensitivity to the potential impact.

13.2.1.3.1 Loss or destruction of habitats and populations of Bug Orchid and Burnt Orchid

Small yet valued populations of Bug Orchid (*Anacamptis coriophora*) and Burnt Orchid (*Neotinea ustulata*), are present in two small fragments of Balkan-mountain hay meadows within the WPP site, in particular along the connecting OHL no. 150 and 177 routes (Figure 8 31). The construction of the OHL towers, and even the movement of construction machinery and personnel in these fragments, would cause, in the worst case, the complete loss of the habitats and destruction of the populations, which would be permanent and irreversible. The illegal deliberate destruction of these individuals/ populations would have the same and/ or synergistic effect. Therefore, according to the nature conservation value of these populations, this impact is assessed as **minor negative** regional, and therefore **significant negative**.

13.2.1.3.2 Loss or destruction of habitats and populations of Common Clubmoss

Small yet valued population of Common Clubmoss (Lycopodium clavatum) is present in a single small fragment of humid meadow within the developed areas of the site (Figure 8 31). No project infrastructure is planned within this fragment (Figure 8 31), and thus the loss of habitat and the destruction of the population to the project infrastructure are excluded. However, it is located in the immediate vicinity of the existing track planned for reconstruction, and thus the movement of construction machinery and personnel within this fragment is possible, whilst the hydrological regime of the fragment could be disrupted due to the track reconstruction (any drainage interventions/ measures along particular track section in particular). Any of these would, in the worst case, cause the complete loss of the habitat and destruction of the population, which would be permanent and irreversible. The illegal deliberate destruction of the individuals/population would have the same and/or synergistic effect. Therefore, according to the nature conservation value of the population, this impact is assessed as **minor negative** regional, and therefore **significant negative**.

13.2.1.3.3 Loss or destruction of habitat and population of Small Pearl-Bordered Fritillary

A highly valued population of a butterfly species, the Small Pearl-Bordered Fritillary (Boloria selene), is present in four small fragments of humid habitats (marshland, grassland and scrub) within the developed areas of the site (Figure 8 32). No project infrastructure is planned within these fragments (Figure 8 32), and the loss of habitat and the destruction of the population to the project infrastructure are excluded. However, all the fragments are located adjacent to the existing tracks planned for reconstruction. Therefore, possible widening of the tracks in these areas would cause the loss of the habitat, which would be permanent and irreversible, though negligible, as only minimal marginal parts of the habitat just by the existing tracks could possibly be affected. Nevertheless, possible disruption of the hydrological regime of these fragments due to the track reconstruction (any drainage interventions/ measures along particular track section in particular) as well as the movement of construction machinery and personnel within the fragments during the construction, would, in the worst case, cause the complete loss of the habitat and, consequently, of the population, which would be permanent and irreversible. Therefore, according to the nature conservation value of the population, this impact is assessed as **major negative** national, and therefore a **significant negative**.

13.2.1.3.4 Loss or destruction of habitat and population of Nickerl's Fritillary

A valued population of a butterfly species, the Nickerl's Pearl-Bordered Fritillary (Melitaea aurelia), is present in maintained Balkan-mountain hay meadows within the developed areas of the site. However, construction impact of the Project on this habitat type will be negligible, i.e. only a negligible area will be lost (as is explained in detail in section 13.2.1.2.1), and thus the impact on habitat and population of this species will also be **negligible**.

13.2.1.3.5 Loss or destruction of habitats and populations of Alpine Longhorn Beetle, Molops piceus and False Comma

Valued populations of two beetle species, the Alpine Longhorn Beetle (Rosalia alpina) and Molops piceus, and a butterfly species, the False Comma (*Nymphalis vaualbum*), are present in better-preserved beech forest stands within the developed areas of the site. Only the construction of certain shorter segments (where it was unavoidable) of connecting OHLs no. 122b, 150 and 177, as well as the reconstruction of two shorter segments of existing tracks, is planned in relatively preserved beech forest patches (Figure 8 29). This will cause the loss of up to 13 ha of such habitat to the OHL infrastructure and their protective belts and the possible widening of tracks in these areas, which will be permanent and irreversible. However, Primary Mitigation has ensured that all areas of mature near-natural beech forest stands of the highest ecological value, and even the areas of younger yet relatively preserved stands of some ecological value (Figure 8 30) have been excluded in the development at the Scopiing stage (see chapter 12). Only about 22% (29 ha) of beech forests within the developed areas of the site are relatively preserved, whilst their share is several-fold higher in undeveloped parts of the site, and even higher beyond the site boundary. Therefore, the impact of habitat loss to construction, and consequent population loss, on these three species is assessed as **minor negative** local at the most, and evaluated accordingly as **not significant**.

13.2.1.3.6 Loss or destruction of habitats and populations of all other flora and fauna species

The Primary Mitigation already adopted within the Project Zoning Plan(s) ensured that most areas of valued habitats within the site boundary, and thus their flora and fauna populations, were excluded from development at the Scoping stage, near-nature woodland in particular (see Chapter 12). All other populations and their habitats within the developed areas of the site are of insignificant nature conservation value (valued at the local level at the most), and any potential impact could only be **not significant** as well.

13.2.1.3.7 Disturbance or displacement and accidental or incidental mortality of all fauna species

The Primary Mitigation already adopted within the Project Zoning Plan(s) ensured that most areas of valued habitats within the site boundary, and thus their flora and fauna populations (near-nature woodland in particular), were excluded from development at the Scoping stage (see section 12.2). Most fauna populations and their habitats within the developed areas of the site are of insignificant nature conservation value (valued at the local level at the most), and any potential impact could only be **not significant** as well. Furthermore, all valued populations of fauna species which are present within the developed areas of the site (analysed in the sections above), are not susceptible to disturbance/displacement, whilst their accidental/ incidental fatalities can be completely (or with a very high probability), excluded. Therefore, the impact of disturbance/ displacement and accidental/ incidental mortality due to construction on all valued fauna populations is assessed as **negligible** at the most.

13.2.1.4 Birds

This ESIA assessed the possible impacts on all bird species populations occurring within the site boundary including the loss of habitats to construction, as well as displacement and mortality in nests due to construction.

The magnitude, direction and scale of potential impacts were assessed based on occurring populations' nature conservation value (Table 8 6), species ecology and susceptibility to potential impacts, and the populations' ecological status at the site (Table 8 5) and size (Table 8 3).

13.2.1.4.1 Loss of habitat

For the purposes of this ESIA, loss of habitat is considered to be the direct destruction, degradation and /or fragmentation of habitats due to the construction of the WPP that results in complete or partial physical disappearance of habitat or deterioration of its functionality for birds is considered.

Primary Mitigation already adopted within the Project Zoning Plans ensures that most of the (potentially) valued bird habitats (Figure 8 30) are excluded from development and that their loss to construction is largely avoided. These include all mature near-natural woodland, where most of the woodland bird species (including majority of valued populations) nest and forage, as well as most of the valued grassland used by remaining valued bird populations. The areas where the risk of bird habitat loss would be the highest, have therefore been avoided.

Therefore, the areas where the site-specific risk of bird habitat loss would be the highest are already avoided. As there will be **no** or **negligible** loss of any habitat at the WPP site the impact of habitat loss is assessed for all bird species populations is **not significant**.

13.2.1.4.2 Displacement

For the purposes of this ESIA, construction displacement is considered to be where birds are excluded from the areas of the WPP site and its surrounding, that were suitable for them before construction takes place.

All of the bird populations using the habitats within the site for nesting and/ or foraging are already habituated to human presence and activities (forestry, mining, agriculture), and are assessed as being not very susceptible to the disturbance that will be caused by construction. Furthermore, construction works will be carried out gradually, only one or a few WTG at a time, and only a small part of the entire site will be exposed to disturbance at any time.

Importantly, the NPCs prohibit earthworks and vegetation removal during the wildlife breeding season which are intended to prevent disturbance or displacement. Although construction may cause some localised and short-term disturbance, this cannot be considered displacement, and the ESIA considers that there will be **no impact** for all bird species populations (including those of significant nature conservation value).

13.2.1.4.3 Mortality in nests

For the purposes of this ESIA, "mortality in nest" is considered to be death or injury of birds or damage/ destruction of eggs that occurs due to accidental/ incidental damage or destruction of a nest (or nest site) whilst birds/ eggs are present within it (i.e. during the breeding season). Damage/ destruction of the nests could occur through vegetation removal and/ or earthworks during construction.

Importantly, the NPCs prohibit earthworks and vegetation removal during the wildlife breeding season. Therefore, **no impact** has been ascertained for all bird species populations (including those of significant nature conservation value).

13.2.1.5 Bats

This ESIA assessed the possible impacts on all bat species populations occurring within the site boundary, including loss of habitats, disturbance and fatalities in roosts due to construction.

Magnitude, direction and scale of potential impacts (CIEEM 2016) were assessed based on occurring populations' nature conservation value (Table 8 11), species ecology (Dietz et al. 2009, Paunović et al. 2011,

2020) and susceptibility to potential impacts, and populations' ecological status within the site (Table 8 10) and size (Table 14 3).

13.2.1.5.1 Loss of habitat

For the purposes of this ESIA, loss of habitat is considered to be the direct destruction, degradation and/ or fragmentation of habitats due to WPP construction that will result in complete or partial physical disappearance of habitat or deterioration of its functionality for bats.

Primary Mitigation already adopted within the Project Zoning Plan(s) has ensured that most of the (potentially) valued bat habitats are excluded from development and their loss to construction will be largely avoided. These include all mature near-natural woodland (Figure 8 30), where most of the bat roosts at the site are located, as well as the most valued foraging areas.

The ESIA concludes that there will be **no significant impact** of habitat loss for all bat species populations.

13.2.1.5.2 Disturbance

Turmoil, vibrations, noise, and lighting from construction can cause bat disturbance. However, localised disturbance from construction could only be significant where it is close to roosts, in particular during maternity and hibernation season. This risk is increased if the construction works are carried out at night using lighting, as roosting of all species is susceptible to disturbance from lighting, as well foraging and commuting of some species, woodland-adapted in particular.

Primary Mitigation already adopted within the Project Zoning Plan(s) has ensured that the areas where most of the bat roosts and most valued foraging areas at the site are located are excluded from development. Thus, the areas where the site-specific risk of bat disturbance would be the highest are already avoided.

The NPCs also prohibit earth works and vegetation removal during the wildlife breeding season (i.e. bat maternity season). In addition, it is not likely that any construction works will be carried out during the bat hibernation season as the site will be inaccessible due to snow and ice, or at night. Moreover, construction works will be carried out gradually, only one or a few WTG at a time, and thus only a small part of the entire site will be exposed to a disturbance at any time.

The ESIA considers that there will only be only localised and short-term disturbance in periods and areas of low susceptibility could occur and that there will be **no significant impact** of disturbance for all bat species populations.

13.2.1.5.3 Mortality in roosts

Bats may be accidentally killed during construction, due to roost sites destruction whilst bats are present within them. The most susceptible are juveniles in maternity roosts during the first 5-8 weeks of life until they fledge, as well as hibernating bats. In all other stages of the life cycle, fatalities in roosts in trees due to the felling of roost-site trees is extremely unlikely and is considered incidental.

Only bat roosts in trees are present at the site. Therefore, fatalities in roosts could only occur during the felling of old trees within the scope of vegetation removal. However, Primary Mitigation already adopted within the Project Zoning Plan(s) has ensured that the areas where most of the bat roosts are located are excluded from development.

The NPCs prohibit vegetation removal during the wildlife breeding season (i.e. bat maternity season). In addition, it is not likely that any construction works will be carried out during the bat hibernation season and this will prevent any fatalities in roosts during the periods all species are potentially most susceptible.

The ESIA concludes that there will only be incidental fatalities in roost and that this cannot affect the sustainability of the potentially affected populations, and i.e. that there will be **no significant impact** of mortality in roosts for all bat species populations.

13.2.2 Impacts Summary

Primary Mitigation already adopted within the Project Zoning Plan(s) and the NPCs has ensured that almost all potential negative impacts of the Project on ecological features are avoided or significantly reduced. Therefore, the ESA concludes that there will be **no** or **not significant impact** of construction on designated sites, habitats, birds and bats.

The only remaining significant negative impact is loss/ destruction of habitats and populations of a few plant and insect species populations of significant nature conservation value, which can be readily mitigated.

13.2.3 Proposed Mitigation/ Control Measures and Significance of Residual Impacts

In order to ensure legal compliance, comply with GIIP in terms of nature conservation, a preventive planning strategy a comprehensive set of Primary Mitigation measures to avoid and minimise negative effects of the Project forms the basis of the ESMMP.

Since **no** or **not significant** impact of construction is ascertained on designated sites, habitats, most flora and fauna, including all bird and bat, species populations, no specific, additional mitigation is needed.

Only loss or destruction of habitats and populations of three plant and one insect species is assessed as **significant negative impact**, and specific mitigation is proposed. All these measures are already implemented and are included in the ESMMP. Implementation of general and specific measures will ensure that any possible residual impacts on ecological features are **Negligible** at the most.

13.2.3.1 General measures

There are certain legal obligations imposed by the Law on Nature Protection (Official Journal of RS, No. 36/2009, 88/2010, 91/2010 - *correction*, 14/2016, 71/2021) which are listed in the ESMMP and whose enforcement must be ensured through the CESMP.

1. The following activities are strictly prohibited by the Law, and must be prevented (even though their potential impacts would be negligible):
   - Deliberate picking, collecting, cutting, uprooting or destruction of Protected and Strictly Protected plants and fungi (including medicinal herbs, decorative plants, wild fruits and berries, mushrooms etc.);
   - Deliberate capture or killing of specimens of Protected and Strictly Protected animal species (including collecting snails, poaching of game and birds etc.);
   - Deliberate disturbance of Protected and Strictly Protected animal species, particularly during the period of breeding, rearing, hibernation and migration;
   - Deliberate destruction or taking of eggs.
2. It is essential that work must stop in that area the IfNC must be contacted immediately and their instructions implemented in the event of:
   - Any violation of the above,
   - Incidental killing or injuring of Protected and Strictly Protected species,
   - Discoveries of any Protected and Strictly Protected species (including particularly nets, roosts and lairs) at the site.
3. Prevention of introduction, and eradication and suppression of invasive alien species (e.g. *Acer negundo, Amorpha fruticosa, Robinia pseudoacacia, Ailanthus altissima, Fraxinus americana, Fraxinus pennsylvanica, Celtis occidentalis, Ulmus pumila, Prunus padus, Prunus serotina*) is both legally binding for all landowners and users in Serbia, as well as explicitly required by the NPCs and by the IFIs “where feasible” and should be implemented through the CESMP as well.
4. Implementation of all the NPCs issued for the Project as they relate to construction must also be ensured through CESMP.

13.2.4 Conclusions

The Primary Mitigations, along with adherence to legal requirements, NPC and generic GIIP, as well project specific mitigations listed in the ESMMP will ensure that all potential negative impacts of the Project on any ecological features are avoided or minimised, and that **no significant negative** residual effects could occur.

Therefore, it can reasonably be expected that construction of the Crni Vrh WPP Project will result in **no net loss** in any aspect relevant for **any ecological feature**

A summary of potential impacts of construction on specific ecological features is provided in tables below.

Impact or Opportunity:	Loss or destruction of habitats and populations of Bug Orchid and Burnt Orchid	Ref. No.:	1
Characteristics of the Impact or Opportunity:	~~Positive/~~ **Negative** **Direct/** ~~Indirect~~ ~~Temporary/ Short-term/ Medium-term/ Long-term/~~**Permanent** ~~Local/ National/~~ **Regional** (according to affected population nature conservation value)		
Impact Mitigation or Opportunity Enhancement:	The impact of loss or destruction of habitats and populations of Bug Orchid (Anacamptis coriophora) and Burnt Orchid (Neotinea ustulata) has been assessed as significant negative. To prevent this impact, any construction works and the access of construction machinery and personnel in the two fragments of Balkan-mountain hay meadows where these populations are present must be avoided. Accordingly, the following measures are proposed: • Siting of OHL towers in the habitats of these populations must be avoided (this has already been adopted within the off-site OHLs Zoning Plan). • Fencing and marking of areas of the habitats of these populations during the construction must be installed, which should be implemented through the CESMP.		
Residual Impact:	**No** (or **negligible at the most**) loss or destruction of orchid species populations and habitats due to construction.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	***Negligible Adverse*** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-1 Impact on Populations of Bug Orchid and Burnt Orchid

Impact or Opportunity:	Loss or destruction of habitats and populations of Common Clubmoss	Ref. No.:	2
Characteristics of the Impact or Opportunity:	~~Positive/~~ **Negative** **Direct**~~/ Indirect~~ ~~Temporary/ Short-term/ Medium-term/ Long-term/~~ **Permanent** ~~Local/ National/~~ **Regional**		
Impact Mitigation or Opportunity Enhancement:	The impact of loss or destruction of habitat and population of Common Clubmoss (*Lycopodium clavatum*) has been assessed as **significant negative**. To prevent this impact, any access of construction machinery and personnel in the single fragment of humid meadow where this population is present must be avoided, as well any changes of the fragment's hydrological regime. Specific mitigations required are: • Fencing and marking of area of the habitat of this population during the construction must be installed, which should be implemented through the CESMP. • Any drainage interventions/measures along particular section of the site track in the vicinity of the habitat of this population must be avoided, which should be implemented through the Project planning documents and CESMP.		
Residual Impact:	**No** (or **negligible** at the most) loss or destruction of Common Clubmoss population and their habitats due to construction.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	***Negligible Adverse*** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-2 Impact on Populations of Common Clubmoss

Impact or Opportunity:	Loss or destruction of habitat and population of Small Pearl - Bordered Fritillary		Ref. No.:	3
Characteristics of the Impact or Opportunity:	~~Positive/~~ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary/ Short-term/ Medium-term/ Long-term/~~**Permanent** Local~~/~~ **National**~~/ Regional~~			
Impact Mitigation or Opportunity Enhancement:	The impact of loss/ destruction of habitats and population of a butterfly species, the Small Pearl-Bordered Fritillary (*Boloria selene*), has been assessed as significant negative. To prevent this impact, any construction works and the access of construction machinery and personnel in the four fragments of humid habitats where this population is present must be avoided, as well any changes of the fragments' hydrological regime. Accordingly, the following measures are included within the ESMMP and implemented via the CESMP: • Widening of the tracks at the expense of the habitats of this population must be avoided. • Fencing and marking of area of the habitats of this population during the construction must be installed. • Any drainage interventions/ measures along particular sections of the site tracks adjacent to the habitats of this population must be avoided.			
Residual Impact:	**No** (or **negligible** at the most) loss or destruction of Small Pearl-Bordered Fritillary population and habitats due to construction.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	***Negligible Adverse*** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 13-3 Impact on Populations of Small Pearl-Bordered Fritillary

13.3 Socio-Economic

13.3.1 Impact Assessment

Socio economic impacts associated with Project construction activities have been grouped and presented under the following headings:

- Impacts to structures;
- Impacts to land use;
- Employment and procurement opportunities;
- Impacts on livelihoods;
- Impacts on infrastructure.

13.3.1.1 Impacts to Land Use and Structures

The total area of the two municipalities affected by the Project (in Žagubica and Bor) is 161,600 ha. In both municipalities, land is almost equally split between forest and agricultural land. The total area of the project site is about 2,877 ha and the majority of that land is forest land, followed by agricultural land (one third).

The total amount of land which will be occupied for the Project, during construction, is up to 70 ha, most of which is forest land. This represents only 0.04% of the total area of both municipalities or 2.43% of the project site. Approximately half of the occupied land (33 ha) will only be temporarily occupied and available again for use after construction is completed (after the construction of WTGs and OHLs).

As the land in the affected areas is scarcely used, especially for agriculture, the extent of any possible damage to, or reduction of crops, is considered to be negligible. Clearing of land in forest areas will be needed, however, compared to the overall forest areas and even the overall sizes of affected land plots (on average 6% of plots affected by WTGs and 3% of plots affected by access roads), these losses can also be considered very small.

The total land which will be affected during construction is only a small portion of land in the area or the land within the Project site. The sensitivity of individual users of land is low, as most of the land is unused and the affected people have other land available for use instead i.e. the users will not suffer detriment overall. The magnitude of this impact is medium because although it will impact a small number of people, a part of the change will be permanent, and therefore this impact is assessed as **minor adverse**.

A total of seven structures, belonging to four households, will be demolished within the 300 m WTG safety zones and compensated to their owners. The structures are all in very poor condition and only one is occasionally used as a weekend house and somewhat maintained. The sensitivity of individual owners is low, as most of the structures are unused and in poor condition. The magnitude of this impact is also low because although it is permanent, it will impact a very small number of people who will be compensated for the loss with an amount that exceeds full replacement value. Therefore, this impact is assessed as **negligible**.

The possibility of impacts on livelihoods is discussed in the section on livelihoods further in the text.

13.3.1.2 Employment and Procurement Opportunities

The workforce needed during the construction phase will be sourced locally (from the municipalities Žagubica and Bor), nationally (from other parts of Serbia) and internationally, through third party construction firms.

It is estimated that up to 300 people will be employed in total during construction. Due to the technical nature of the Project and the relatively low educational status of the local population, it is likely that skilled and semi-skilled labour will be sourced nationally and internationally. Therefore, only an estimated 10% (up to 30 individuals) of the workforce may be locally sourced (primarily as unskilled labour). Preference will be given to residents of the affected communities surrounding the Project site, however the availability of working age population in these communities is low. The construction phase will last for about 24 months, and not all workers will be employed all the time. The frequency at which workers will be employed and the duration of their engagement could not be estimated at the time of developing the ESMS and will depend on the contractors' organization of work.

As the total working age population (15 to 65) of Žagubica and Bor is close to 42,000 the potential levels of employment translate to the creation of jobs for only 0.07% of the local population. The impact on a national level will be negligible. The positive impact will be significant only for those who are employed and their households. Employment opportunities will be short term, during construction, and this too reduces the significance of the impact. Based on experience from other similar projects, in Serbia and elsewhere, the presence of women within the construction workforce will be very small.

On the other hand, the employment of local residents will be beneficial as it should lead to improved relationships between the Project and local communities, improved local skill sets and the reduction of migratory workers moving in to the area (although this can have a positive impact on those offering accommodation).

Due to the importance of new employment, particularly for local residents, their sensitivity is considered to be medium. However, due to the short-term nature of employment and the small number of people who will benefit, the magnitude of the impact is considered low. Therefore, the significance of the creation of direct employment opportunities is assessed as **minor beneficial**.

Indirect employment opportunities will be created in connection to the Project's supply chain (goods and services) and spending of Project employees in local communities. The wind turbines will be procured internationally and delivered via the port of Prahovo. Materials needed for civil works and infrastructure improvements such as concrete, sand, gravel, crushed stone, clay, etc., will be procured locally by the selected construction company, as they are available in the area.

Experience from other similar projects in Serbia and elsewhere shows that employment of non-locals, as well as the increase of incomes of local employees, will also bring in some benefits for local communities, associated with increased spending in the project area, i.e. in small shops, bars and restaurants. Indirect employment usually provides more opportunities for women in food preparation, cleaning services, accommodation, etc., as opposed to direct employment, which has involved more men.

Taking into account that the turbine components will be imported, the overall technical nature of procurement requirements and the short construction timeframe, the magnitude of the impact is considered low. However, having in mind the importance of any economic activity in the project area for the local population, their sensitivity has been rated as medium. The significance of impacts related to indirect employment are therefore assessed as **minor beneficial.**

Appointed construction contractors and suppliers will have to abide by the Serbian Law on Labour and other relevant legislation, which is mostly in agreement with IFC's labour related requirements contained in PR 2. Any additional measures that must be undertaken will be described in the mitigation section.

13.3.1.3 Livelihoods

Land for the Project has been and will be acquired through voluntary sale purchase agreements for all components except for access and service roads, where land is being acquired by the municipalities, through a process of expropriation.

Due to the involuntary nature of the land acquisition for roads, persons who own the land plots which have been or will be acquired for the upgrading of existing and/ or construction of new roads may be economically displaced. However, having in mind that the affected land is scarcely used and that very small areas will be affected for the construction of roads, the affected people's sensitivity is considered to be low. The total area of all privately owned land plots affected by expropriation for roads is 315.35 ha, while only 17.65 ha (5.6%) are being acquired and will no longer be available for use. Considering that the area acquired from a single plot of land for upgrading and even construction of new roads is small and that land in the affected area is generally unused, the sensitivity of users of land, as well as the likelihood of economic displacement occurring for them, is negligible. The magnitude of this potential impact is assessed as medium and the overall significance of possible impacts on livelihoods associated with expropriation for roads is assessed as **minor adverse**, but will require monitoring and, if necessary, mitigation.

The four affected households whose structures are located within 300m of the planned WTG locations have the opportunity of obtaining compensation for structures, which they could never sell for that price on the market thereby positively impacting their livelihoods. This impact is assessed as negligible as it concerns a very small number of people.

Increased incomes generated through direct and indirect employment will have a beneficial impact on livelihoods in the local communities. The households whose members may be employed by the Project, as well as those who benefit indirectly from increased spending of these households and non-local employees, will have increased incomes and consequently an improved standard of living, and their sensitivity is considered to be medium. However, due to the low magnitude of the impact because of the small number of employees, particularly local residents and the short-term duration of construction, the significance of these impacts has been assessed as **minor beneficial**.

Transport and increased traffic impacts during construction, in the location of the Bor lake and spa, are presented in detail in section 13.6 and have been assessed as moderate adverse on visitors and residents in the area and moderate adverse on drivers. To mitigate these impacts, it will be necessary to develop a Traffic Management Plan. As presented in the baseline section, the affected area is extremely important for local tourism and failure to mitigate adverse impacts could further impact local livelihoods derived from various tourist activities, particularly during the summer season. The sensitivity of receptors is considered medium, while the magnitude is considered low, as the impact will occur only periodically over a short term, and thus the impact is assessed as **minor adverse**, but will require consideration when developing the Traffic Management Plan, consultation and monitoring.

13.3.1.4 Community Infrastructure

The upgrading of existing roads and construction of new ones will benefit the local population, including providing improved access to the owners of plots of land in remote locations. This impact has been recognised as being important for the local population, particularly for persons whose land currently is not accessible by roads and whose sensitivity is therefore considered medium. However, because of the small number of people who will benefit, the magnitude of the impact is considered low and therefore its significance is assessed as **minor beneficial**.

Damage to road surfaces during transport of heavy machinery, leading to damage to motor vehicles and road accidents, are possible. The Developer will maintain all roads used during construction, which is why the magnitude of the impact is considered low. However, the sensitivity of the local population is considered to be medium, due to its dependence on local roads, and the significance of this impact has been assessed as **minor adverse**. In addition, if roads used during construction are not well maintained, this could lead to tensions between the Project and the local communities. Experience from other similar projects in Serbia suggests that damage to local roads and failure to repair them in a timely manner (particularly on completion of WPP construction) is among the main sources of dissatisfaction of the local population which has required communication and implementation of corrective measures.

Utility infrastructure (water, electricity, sewerage) will be secured locally on the Project site and therefore the Project will not impact any community infrastructure during construction.

13.3.2 Impacts Summary

Socioeconomic impacts related to the construction phase are all assessed as having **minor significance**. Negative impacts include those in relation to land use, as up to 70 ha land will be occupied during construction, although close to 50% of it will be available for use again after construction is completed. Other negative impacts include possible economic displacement of users of land and person's whose tourism-based livelihoods can be impacted by increased project traffic, as well as damages to road surfaces. All other impacts are positive and they are in relation to compensation for old and mainly unused structures and the creation of employment and procurement opportunities, causing further positive impacts on local livelihoods, as well as in relation to the upgrading of access tracks, enabling local land owners to access their land more easily. The positive impacts are mostly short term and of a local character.

13.3.3 Proposed Mitigation/ Control Measure

13.3.3.1 Structures

Acquisition of structures through voluntary transactions at full replacement cost, without applying depreciation.

13.3.3.2 Land Use

During construction of the WPP there will be a reduction in land available for use. Certain measures will be implemented to mitigate it, as well as prevent any impacts to livelihoods. These measures include:

- Minimise the amount of land occupied during construction;
- Promptly compensate all damages to land and trees;
- Where needed, preserve topsoil and upon the completion of construction activities, fully reinstate all land not permanently occupied.

In total about 35 ha of land will remain permanently unavailable for use even after construction, however all other land will be available for use in the same way as before the Project.

13.3.3.3 Employment and Procurement Opportunities

Whilst the opportunities for local employment will be very low, the Developer should:

- Announce employment opportunities locally and encourage women to apply;
- Implement transparent and fair recruitment procedures;
- Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations;
- Provide a grievance mechanism for workers;
- Procure goods and services locally whenever possible.

If the above measures are implemented, more local people will be employed and more goods procured locally, enhancing the positive impact.

In addition, all of the above will lead to more local households benefitting and having increased livelihoods and standards of living.

13.3.3.4 Livelihoods

The potential for economic displacement and generally any loss of livelihood, as a result of loss of land available for use will be mitigated by undertaking the following measures:

- Aim to acquire land through amicable agreements to the extent possible;
- Compensate all affected land and any assets on it, at full replacement cost;
- Minimise the amount of land occupied / disrupted during construction;
- Determine whether each household whose land has been acquired for service and/or access roads has been economically displaced and if the household is vulnerable.

- Develop concrete measures to assist households who have been economically displaced (additional compensation, assistance to restore livelihoods) and those who have been identified as being vulnerable (assistance to restore livelihoods and any other measures depending on the type of vulnerability).
- Fully reinstate the land after disruption;
- Establish and implement a grievance mechanism.

If the above measures are implemented, it is expected that no one will be economically displaced by the project and the impact on land use will be reduced to **negligible**.

To ensure that tourism activities are disrupted as little as possible by increased transport and traffic during construction, the development and implementation of the Traffic Management Plan will consider ways of avoiding such impacts to the extent possible (for example, favouring increased project transport during week days and reducing it to a minimum on weekends during the summer season). The Traffic Management Plan will be presented to local businesses operating in the Bor lake and spa area, for suggestions and comments. The Developer's and contractors' grievance contact details will also be made available to businesses and any other interested stakeholders, so that they can voice their concerns and appropriate action can be taken.

13.3.3.5 Infrastructure

Transport of heavy machinery could lead to damages of road surfaces, further causing accidents, vehicle damages, etc. The following measures will be undertaken to mitigate these impacts:

- Preparation of roads for heavy transport before construction;
- Prompt restoration of roads to at least pre-construction quality;
- Upgrading and regular maintenance of roads will lead to improved access to land and land use for local land owners.

13.3.4 Conclusions

A summary of potential socio-economic impacts during construction is provided in tables below:

Impact or Opportunity:	Reduced amount of land for use by individual users who are considered low sensitive receptors.		**Ref. No.:**	4
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Minimise land that is used/occupied during construction, compensate any damages to land and crops, preserve all topsoil.			
Residual Impact:	In total 35 ha of land will remain permanently unavailable for use after construction; however, all other land will be available for use in the same way as before the Project.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 13-4 Reduced Amount of Land for Use

Impact or Opportunity:	Loss of 7 structures of four households (low sensitive receptors).	**Ref. No.:**	5
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary/ Short-term/ Medium-term/ Long-term/~~ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Acquire structures through voluntary transactions at full replacement cost, without applying depreciation.		
Residual Impact:	Owners of structures have no losses and have gains from receiving compensation.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ **Negligible Beneficial**	~~No Change~~	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-5 Demolished Structures

Impact or Opportunity:	Employment opportunities for local residents (medium sensitive receptors).	**Ref. No.:**	6
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Announce employment opportunities locally and encourage women to apply; Implement transparent and fair recruitment procedures; Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations; Provide a grievance mechanism for workers.		
Residual Impact:	More local people are employed than originally anticipated.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-6 Employment Opportunities during Construction

Impact or Opportunity:	Procurement opportunities for local companies (medium sensitive receptors).	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Procure goods and services locally whenever possible.		

Residual Impact:	More goods are procured locally than originally anticipated.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 13-7 Procurement Opportunities during Construction

Impact or Opportunity:	Involuntary economic displacement of users of land (low sensitive receptors).		**Ref. No.:**	8
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Aim to acquire land through amicable agreements to the extent possible; Compensate all affected land and any assets on it, at full replacement cost; Minimise the amount of land occupied / disrupted during construction; Determine whether each household whose land has been acquired for service and/or access roads has been economically displaced and if the household is vulnerable. Develop concrete measures to assist households who have been economically displaced (additional compensation, assistance to restore livelihoods) and those who have been identified as being vulnerable (assistance to restore livelihoods and any other measures depending on the type of vulnerability). Fully reinstate the land after disruption; Establish and implement a grievance mechanism.			
Residual Impact:	No one will be economically displaced by the project and people have gains from receiving compensation (and, if needed, assistance).			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ **Minor Beneficial** ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 13-8 Involuntary Economic Displacement of Users of Land

Impact or Opportunity:	Increased livelihoods of local households (medium sensitive receptors).		**Ref. No.:**	9
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ ~~Direct~~/ **Indirect** ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Encourage local employment and procurement to enhance local spending.			
Residual Impact:	More local spending than originally anticipated and better living standard of local households.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~	

	~~Minor Beneficial~~ ~~Negligible Beneficial~~		~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-9 Increased Livelihoods of Local Households

Impact or Opportunity:	Impacts on tourism activities, further causing loss of livelihoods in the Bor lake and spa area (medium sensitive receptors).	**Ref. No.:**	10
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	In the Traffic Management Plan consider ways of avoiding impacts on local tourism to the extent possible. Present the Traffic Management Plan (and grievance mechanism) to local businesses operating in the Bor lake and spa area, for suggestions and comments. Establish and implement a grievance mechanism.		
Residual Impact:	Some short-term impacts on tourism (traffic congestions) are to be expected.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-10 Impacts on Tourism Related Livelihoods

Impact or Opportunity:	Enhanced land use for local land owners (medium sensitive receptors) as a result of improved access tracks.	**Ref. No.:**	11
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ ~~Direct~~/ **Indirect** ~~Temporary/ Short-term/ Medium-term/ Long-term/~~ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Regular maintenance of access tracks.		
Residual Impact:	Improved land use for local landowners.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ **Negligible Beneficial**	~~No Change~~	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-11 Enhanced Land Use

Impact or Opportunity:	Damages to road surfaces on roads used by local residents (medium sensitive receptors).	**Ref. No.:**	12
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~		

	Local/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Preparations of roads for heavy transport before construction. Prompt restoration of roads to at least pre-construction level. Maintenance of roads during construction.		
Residual Impact:	Although some road damages are to be expected in the short term, regular maintenance will provide improved access to land and land use for local owners and overall good relations with local communities.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-12 Damage to Road Surfaces

13.4 Traffic and Transport

Increase of traffic movements in the Study Area has the potential to cause separation from local facilities and services and delay movements between communities. Key potential effects include: severance, driver delay, pedestrian amenity, pedestrian delay and fear and intimidation.

The potential effects on vulnerable road users and traffic safety in local communities have been assessed as part of the community health, safety and security impacts in section 13.12.1.

13.4.1 Impact Assessment

The trip generation used in this ESIA has been estimated based upon the experience of other WPPs in Serbia of a similar scale, for the construction period of 18 months and 6-day working week. Construction of a WPP of 32 turbines and c. 25km of access roads in a flat agricultural region of South Banat where aggregate and concrete are completely brought from off-site has resulted in an average of 50 HGV movements per day. The number has doubled during the peak construction period of several months and reached c. 100 HGVs per day.

Taking into account that Crni Vrh is a significantly more complex location where tree felling and land levelling would employ additional HGV traffic, the projected HGV movements have been increased for 50%. This results in the estimate of 75 HGV movements per day, reaching 150 HGV movements during the peak construction period. For an 18-month construction period, the most intensive months with highest HGV traffic are assumed to be month 6, 7, 8, and 9.

CVP intend to commence the construction in the autumn of 2022 meaning that the peak construction period is most likely to occur sometime between April and September 2023.

It has been assumed that 30% of the construction traffic would be generated by HGVs and the remaining 70% would arrive on LGVs and cars. The estimated number of light vehicles (LGVs and personnel private vehicles), based on the 70/30 ratio is 175 light vehicles per day. The total estimated number of daily vehicle movements on an average day during the 18-month construction period is 250 (175 light vehicle and 75 HGVs).

Given that the site can be accessed both northbound from Brestovac and eastbound from Žagubica, the route from Žagubica has some potential to be used by construction vehicles. However, in order to assess the worst-case scenario, it has been assumed that all construction material for the project would arrive northbound via Brestovac.

The estimated increase in HGVs traffic flows for each road section along the route from Brestovac to Žagubica are provided in

Table 13-13.

Table 13-13 Estimated Increase in Daily Traffic Flows between Bor and the WPP Site

Road	Section	Length (km)	Baseline HGV	Project HGVs (average)	Total Predicted Daily HGVs	% Increase of HGV
161	Brestovac - Brestovac Spa	4	82	75	157	91%
161	Brestovac Spa - Bor Reservoir	5	51	75	126	147%
161	Bor Reservoir – the WPP site	10	23	75	98	326%

The results indicate that a traffic flow increase along the road No. 161 would be significant. The section between Brestovac and the site would experience a 1 to 3 times increase which significantly exceeds the IEMA threshold of 30% and requires an assessment of impact significance for this transport link.

13.4.1.1 Impact on the Road Between Brestovac and Bor Reservoir

The road can accommodate HGV traffic and has no pedestrian crossings or traffic lights. Within a 5km distance there are 2 nucleated communities, both comprising summer houses with a pronounced tourist activity in summer. The total accommodation capacity of both communities is c. 1,000 people.[58] The sensitivity of the road location is judged to be medium.

The first community is Brestovac Spa with thermal mineral water facilities. The spa was built in the 19th century and is protected as a cultural heritage. Just across the road from the spa facilities is the summer house settlement Banjsko Polje with guesthouses and bed & breakfast accommodation (see Figure 13-1).

The second community is further northbound at Bor Reservoir. It comprises summer houses and various accommodation facilities including a 4-star hotel owned by Zijin Mining and school-children accommodation ‘Savača’. There are sport facilities and small restaurants; a camping site is situated just between the reservoir and the road No. 161.

There are 10 bus stations between the two communities.

A traditional 2-day Motorcycle Meet takes place at Bor Reservoir in August, attracting both local and regional motorcyclists.

There are two areas along the road where there is a need for people to cross the road or for traffic to enter the road: (1) between the spa facilities and the summer house settlement Banjsko Polje, and (2) at Bor Reservoir and surrounding accommodation facilities.

The sub-section of the road from Brestovac Spa to Bor Reservoir is shown on Figure 13-1.

[58] Plan of General Regulation of the Tourist Area: Brestovac Spa - Bor Reservoir, 2018

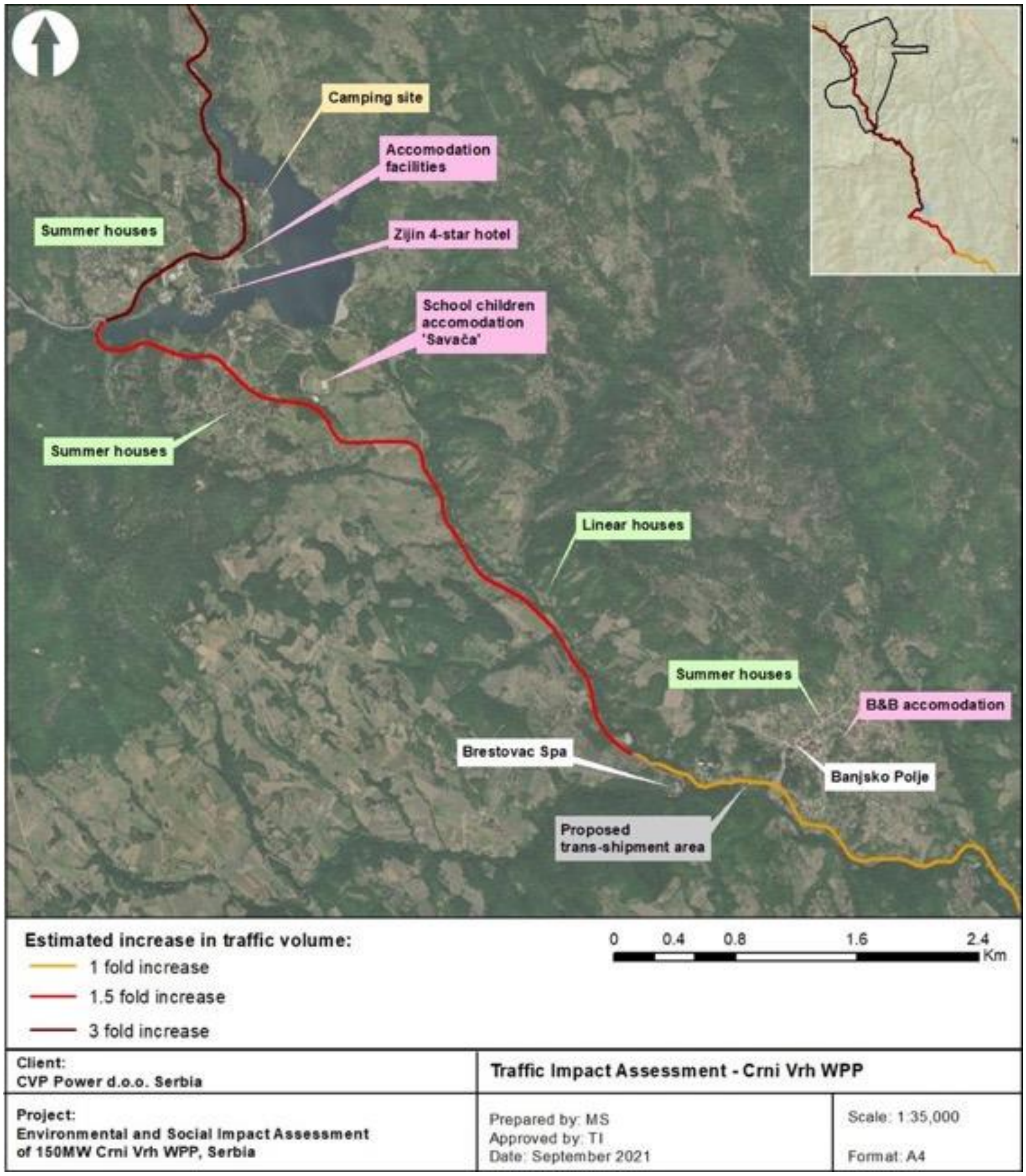

Figure 13-1 Increase in Traffic Volume on the Road No. 161

Severance

Severance is a 'traffic barrier effect' or perceived division that can occur within a community when it becomes separated by a major traffic artery.

The projected increase in the HGV traffic of more than 90% presents a change of **high magnitude** as per the IEMA Guidelines. However, the IEMA Guidelines acknowledge that "the measurement and prediction of severance is extremely difficult".

The road section between Brestovac Spa and Bor Reservoir would undoubtedly be affected by high traffic flow, especially in summer during the peak tourist activity. The area can accommodate up to 1,000 guests in summer, and a number of them can perceive severance from their accommodation. However, the effect would be temporary on a predominantly short-term visitors and a small number of residents. It is therefore considered to be of a medium magnitude in summer and a low magnitude in other parts of the year. For the communities of medium sensitivity this would result in **moderate adverse** impact significance in summer and **minor adverse** significance in other seasons.

Driver Delay

The IEMA Guidelines note that delays are only likely to be *'significant [or major] when the traffic on the network surrounding the development is already at, or close to, the capacity of the system'*.

Existing traffic levels (less than 2,000 vehicles per day) are significantly below the maximum capacity of the road. Between the spa and the reservoir, the road is winding with frequent turns, providing limited opportunities for overtaking of slower vehicles (see Figure 13-2). The entire section is marked with a single solid white line. Small convoys of cars forming behind timber lorries were observed during the visit to the area.

It is considered that there is the potential for driver delays between Brestovac Spa and Bor Reservoir, especially in summer. Given that the section is relatively short (5km) and that the traffic level is low, the effect would be localised and the change would be of a **medium magnitude,** resulting in **moderate adverse** impact significance.

Figure 13-2 Typical Blind Bend on the Road No. 161

Pedestrian Delay

The road does not have pedestrian crossings (which is a potential safety issue discussed in section 13.12 Community Health, Safety and Security). Similar to the driver delay, pedestrians could experience a short-term delay attempting to cross the road. Given that the projected traffic flow is significantly below the capacity of the road, the magnitude of change would be **low**, resulting in **minor adverse** impact significance.

Pedestrian Amenity, Fear and Intimidation

The IEMA Guidelines broadly define pedestrian amenity as the *"relative pleasantness of a journey"*. The impact on pedestrian amenity may be significant where traffic is either halved or doubled.

Pedestrian movement along the road No. 161 is rare, the road does not provide walking paths (except a very short section near Bor Reservoir which is fenced and lighted). Both communities are separated from the road by dense vegetation which also serves as a visual screening (see Figure 13-2).

The magnitude of change would be reservoir, **low** and the impact significance is assessed as **minor adverse**.

Figure 13-3 Typical Vegetative Screen along the Road No. 161

13.4.2 Impacts Summary

The construction of the proposed Crni Vrh WPP would contribute to a significant increase (1 to 3 times) in HGVs movements along the 5km-long section of the road No. 161 between Brestovac Spa and Bor Reservoir. The potential impact on traffic and transportation would be temporary and short-term, with medium magnitude of severance during summer months and moderate magnitude of driver delay. This would result in **moderate adverse** impact on visitors and residents in the area and **moderate adverse** impact significance on drivers.

13.4.3 Proposed Mitigation/ Control Measure

A Construction Traffic Management Plan (CTMP) should be developed in consultation with Roads of Serbia, Traffic Police Department in Bor and the Town of Bor. The framework for the CMTP should include but not be limited to:

- Agreements with local authorities and stakeholders regarding transport;
- Proposed route for delivery of turbine components;
- Proposed routes for other construction traffic, including methods to reduce the number of trips;
- Arrangements and timing restrictions for construction traffic, especially in summer season;
- Procedure on advance notification of local communities on turbine component delivery;
- Procedure for transport in adverse weather conditions;
- Route signing and public warning;
- On-site traffic arrangements, monitoring and repair of tracks, parking areas;
- Procedure for regular road cleaning and maintenance including wheel cleaning, road sweeping in the vicinity of the site access point, etc.;
- Feedback mechanism for complaints or inquiries related to construction traffic.

Potential residual impacts would likely be minor driver delays as a result of temporary road closures or slow movement of HGVs. Increase of traffic flows of heavy vehicles would add to the risk of road wear and tear. No significant residual impacts are anticipated during the construction transport for the project.

13.4.4 Conclusions

A summary of potential impacts on traffic and transport during the construction activity is provided in Table 13-14.

Impact or Opportunity:	Impact on community severance and driver delay along the road No. 161 between Brestovac Spa and Bor Reservoir (medium-sensitive communities), especially in summer months during tourist season.	**Ref. No.:**	13
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ **Indirect** **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A Construction Traffic Management Plan (CTMP) should be developed in consultation with Roads of Serbia, Traffic Police Department in Bor and the Town of Bor. The CTMP should include procedures related to off-site and on-site transport, suitable transport routes, arrangements with authorities, timing restrictions to mitigate congestion and nuisance, adverse weather conditions, road condition monitoring, etc.		
Residual Impact:	No significant residual impacts are anticipated during the construction transportation for the project. Minor driver delays as a result of temporary road closures or slow movement of HGVs. Increase of traffic flows of heavy vehicles would add to the risk of road wear and tear.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ **Minor Adverse** ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-14 Transport and Traffic Impact during Construction

13.5 Landscape and Visual

13.5.1 Effects on Landscape Character and Fabric during Construction

The construction phase of the proposed Crni Vrh WPP would last approximately 24 months. The construction activity would add temporary built development to the generally tranquil and low developed site. The physical changes would initially include the presence of construction compound and material storage areas, clearance/ disturbance of land cover, felling of trees, excavation of trenches, cutting and filling, and movement of construction machinery and vehicles across the site. The ground level work would be implemented in several stages, around 3 strings of turbines.

The planned activities related to construction phases imply that the first stage would start in the north-east, around the substation, switchyard and OHLs. It would then extend to the south and the turbine groups II and III and across the valley to the turbine group I. The final stage would be completed in the very north, around the WTGs TI-9 to TI-12.

Once the ground level work is completed, tall cranes would start to appear followed by partially built towers and gradual appearance of wind turbines.

The staged construction activity of various intensity will directly and indirectly affect several hectares of the landscape along two parallel ridges in the area approximately 8km long and up to 4km wide. The size and scale of effect on the site landscape is considered to be large. The geographical extent of the changes would be small and limited to the site level, compared to the vast wooded hilly upland present in the surrounding.

The forestry and land cover at the site would be subject to a direct, localised and temporary disturbance during construction. The reversibility of effects would vary – from irreversible tree felling required to accommodate access roads, service tracks, turbine foundations and crane pads, to fully reversible ground disturbances.

The landscape of Crni Vrh (The Wooded High Volcanic Hills and Ridges LCT) is of moderate value. The tranquil and largely undeveloped landscape is moderately susceptible to construction activities. The resulting sensitivity of the landscape at the site is therefore **medium**. While the works would be a change of **high**

magnitude within the local area of approx. 500m of each turbine, they would be temporary and short-term. In the context of the area as a whole, the works would have a **medium to low magnitude** effect. The impact of the construction activity is considered to be of **moderate adverse** significance.

13.5.2 Visual Effects during Construction

Visual effects during construction would occur in two stages. The early stage would include preliminary construction works at ground level (excavation of turbine foundations, underground cabling, development of access tracks, etc.) which would have intermittent visibility from parts of the surrounding area, depending on landform and vegetation. This would be a short-term medium magnitude change on local residents and visitors (highly sensitive) and road users and workers (medium sensitive) and result in **moderate adverse** significance impact for local residents and visitors and **minor adverse** significance for road users and workers in the open areas.

The later stage would include the erection of the proposed wind turbines which would involve large cranes and would be visible to a wider range of receptors. The duration of the construction phase effects would be short-term and localised resulting in a medium to low magnitude of change that would give rise to **moderate adverse** effect for local residents and visitors and **minor adverse** effect for road users and workers in the open areas.

13.5.3 Impacts Summary

The construction works would be direct, negative, temporary and short-term and would primarily affect the landscape and visual receptors within the local area.

Due to the intervening landform and vegetation, the effects on the landscape character would be moderate (within 500m of each turbine) to minor adverse (as the distance from the site increases).

The visual effects during construction would be major to moderate for local residents and visitors in the close site vicinity and minor for all other residents, local road users, people working in the open area and people involved in recreation.

13.5.4 Proposed Mitigation/ Control Measure

Landscape and visual mitigation measures proposed for the project are part of standard construction practices that should be part of the agreed construction method statement. The mitigation should include but not be limited to:

- All ground disturbances should be confined (where possible) to the construction compound, access tracks, turbine base areas, substation compound, routes for underground cables and OHL pylons.
- Existing vegetation should be suitable protected; land clearance/vegetation removal should be minimised as far as possible;
- Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required;
- Stockpiling of excavated material or construction debris should be avoided; the construction site should be maintained in good condition;
- The areas disturbed during the construction should be successively restored and reinstated.

Provided that the mitigation measures are implemented, the residual impact on the landscape character would be **minor adverse**.

No specific measures are proposed to mitigate the visual effects of the construction works. The residual impact would be **moderate adverse** for local residents and visitors and **minor adverse** for local road travellers and people who work in the open area.

13.5.5 Conclusions

A summary of potential landscape and visual impacts during the construction activity is provided in Table 13-15 and Table 13-16.

Impact or Opportunity:	Impact on the medium sensitive landscape character and fabric during construction.		**Ref. No.:**	14
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	All ground disturbances should be confined (where possible) to the construction compound, access tracks, turbine base areas, substation compound, routes for underground cables and OHL pylons. Existing vegetation should be suitable protected; land clearance/vegetation removal should be minimised as far as possible; Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; Stockpiling of excavated material or construction debris should be avoided; the construction site should be maintained in good condition; The areas disturbed during the construction should be successively restored and reinstated.			
Residual Impact:	A minor portion of the landscape character and fabric would be temporarily affected.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ **Minor Adverse** ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 13-15 Impact on Landscape Character and Fabric during Construction

Impact or Opportunity:	Visual impact on local residents, road users, people working in the area and people involved in recreation during construction, including highly sensitive residential receptors in the vicinity of the site (NE, SW).		**Ref. No.:**	15
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	No specific mitigation measures are proposed. Mitigation of the impact on the landscape character would mitigate the visual impact as well.			
Residual Impact:	Short-term and localised impact, affecting mostly the residents immediately north-east and south-west of the site and would decrease with the distance.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ **Minor Adverse** **Moderate Adverse** ~~Significant Adverse~~	

Table 13-16 Visual Impact during Construction

13.6 Construction Noise

Construction noise effects are normally of a temporary nature and result from both moving and static sources. Assessment allows the temporary impact of construction noise to be understood and for suitable mitigation measures to be identified to minimise any potential adverse effects.

Noise during the construction period will arise from the excavation of the turbine foundations and trenches for cables, the construction of new access tracks, hard standings and the substation, from large concrete pours and from the erection of the turbines. Most of these activities will occur within the site and are far from residential properties. Traffic noise on local roads will occur from heavy goods vehicles (HGVs) associated with the delivery of the turbine components, concrete and other construction materials.

13.6.1 Impact Assessment

13.6.1.1 Construction Noise

Noise during the construction period will arise from the excavation of the turbine foundations and trenches for cables, the construction or widening of access tracks, hard standings and the substation, from large concrete pours and from the erection of the turbines. These activities are localised, short term and, in many cases, the surrounding vegetation will provide significant levels of screening that will reduce noise transmission. The equipment used is not expected to generate more than negligible levels of noise although noise levels close to the construction areas will be low to moderate.

Tree cutting and earth moving equipment will be used during the widening or construction of access tracks. Tree cutting and construction of new tracks are currently commonplace as a large part of the area has been used for commercial forestry for many years.

Excavation and earth moving machinery will be used during the preparation of WTG foundations. Due to the predominance of rock at or just below the surface the use of piling equipment is unlikely. However, it expected that rock breaking equipment will be used when creating the borrow pits (the locations are not yet known) and during the creation of the foundations for some WTGs. The preparation of steel formwork will only generate negligible levels of noise. Pouring concrete to form the foundations of each WTG will require a large number of delivery vehicles and the use of a concrete pump. Forming the foundation is likely to take in excess of 12 hours as this must be done in a single, continuous pour. In some cases, the pour may extend in to the evening. Whilst the movement of the concrete delivery vehicles will affect a larger number of people (see the transportation section below) the noise associated with the construction of each foundation will be localised.

The movement of the cranes used to erect the WTGs may be heard by local people but the impact will be very short term. The operation of the cranes generates only negligible levels of noise.

Standalone diesel generators will be used at each construction area. Electrical power is required to commission each WTG and some lighting may be used.

Noise during construction will have a **negligible effect**. Noise from construction equipment is limited by the Serbian legislation and a CESMP will be prepared to set out the measures use to control construction noise.

13.6.1.2 Transportation Noise

Traffic noise will occur from vehicles on local roads associated with the delivery of the turbine components, concrete and other construction materials. Most of these activities will occur within the site and far from residential properties. This can be assessed in relation to existing traffic flows. Information on traffic flows has been taken from Transport assessment and noise effects due to the increase in traffic flows calculated.

The predicted increase in noise due to construction traffic on the southern route is set out below. The transport assessment indicates that there will be about 75 HGVs and 175 light vehicles (cars and small vans are identified) per day during the peak of construction activity. To assess the increase in noise these values have used in the calculations set out in

Table 13-17 below.

Table 13-17 Predicted Increase in Noise due to Construction Traffic

Road	Base Year		Construction Traffic		Totals		Traffic Speed (km/h)	Increase in Noise (dB)		
	Total Vehicles	HGVs	Total Vehicles	HGVs	Total Vehicles	HGVs		Vehicles (Flow)	% HGVs	Total Increase
Brestovac - Brestovac Spa	2,092	82	3.9%	175	2,267	157	70	0.3	0.7	1.0
Brestovac Spa - Bor Reservoir	1,313	51	3.9%	175	1,488	126	70	0.5	1.0	1.5
Bor Reservoir - Žagubica	533	23	4.3%	175	708	98	70	1.2	1.8	3.1

The calculations show that any increase in noise due to the transportation effects will be between 1 and 3.1 dB. An increase of 1 to 3 dB is normally regarded to create a minor adverse impact. A short-term increase in noise of up to 3.1dB is predicted between the Bor Reservoir and the WPP Site. However, it should be noted that the traffic flows on this road are fairly low and in this context the increase in noise would also be regarded as a minor adverse impact.

13.6.2 Impacts Summary

Construction noise levels are expected to have a **negligible** effect as the construction work is short-term in nature and will take place some distance from any sensitive receptors. The increase in noise due to construction traffic is rated as a **minor adverse** impact.

13.6.3 Proposed Mitigation/ Control Measure

Noise emissions from construction equipment will be limited by the Serbian legislation and a Construction Environmental and Social Management Plan (CESMP) will be prepared to ensure that construction noise is controlled. This will include the adoption of best practical means measures to reduce noise. Vibration from construction can occur but this again tends to dissipate with distance and no significant effects are likely.

There will be no residual impact for short-term noise.

13.6.4 Conclusions

A summary of potential noise and vibration impacts during the construction activity is provided in Table 13-18.

Impact or Opportunity:	Construction Noise		**Ref. No.:** 16, 17
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary/~~ **Short-term**/ ~~Medium-term/ Long-term/ Permanent~~ Local/ National/ Regional		
Impact Mitigation or Opportunity Enhancement:	Noise from construction equipment is limited by Serbian law. A CESMP will be prepared which will detail mitigation methods in accordance with the principle of using best practicable means to reduce noise. The increase in HGVs will cause a minor adverse impact due to the increased noise from traffic.		
Residual Impact:	No significant impact for short-term noise.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse (Construction Noise on Site)** **Minor Adverse (Construction Traffic)** ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-18 Construction Noise Impacts - Summary

13.7 Archaeology and Cultural Heritage

13.7.1 Impact Assessment

The pre-construction survey at the site indicated the potential presence of archaeological artefacts from mining activity in the Prehistoric and Antique Period. Given the significance of prior discovered artefacts in the wider area (Rudna Glava, 15km north of the site), the site sensitivity in respect to cultural heritage is considered to be medium.

The construction works could potentially destroy archaeological artefacts which would have a moderately adverse impact significance. An archaeological supervision during the excavation works was required in the areas of the following WTGs: TI-9, TI-10 (Čoka Berbješće and Basanica), TI-16 (Petrova Glava), TI-1, TI-2 (Antonijev Kladenac), TI-3 (Javonilor), TII-2, TII-3 (Kulmea), TII-8 (Kupinovo), TI-17, TIII-1 (Obršja Lipe), TIV-3, TIV-4 (Čoka Korugu 2).

13.7.2 Impacts Summary

If unmitigated, the construction works have the potential to destroy evidence of mining from the Prehistoric and Antique Period presumed to be present at the site and its surroundings.

13.7.3 Proposed Mitigation/ Control Measure

A set of measures should be implemented during the pre-construction and construction works, as required by the competent authority:

- CVP should promptly inform the competent institute about the commencement of earthworks;
- During the construction, archaeological supervision of works will be mandatory in the areas of foundations, cranes pads, cable routes, and access roads of the following WTGs: TI-9, TI-10, TI-16, TI-1, TI-2, TI-3, TII-2, TII-3, TII-8, TI-17, TIII-1, TIV-3, TIV-4;
- In case of valuable findings, the archaeological rescue excavation will be conducted;
- A chance finds procedure should be developed and workers trained to implement it. In case of chance finds, all work should be immediately halted and the area protected until the competent institute secures the findings

In case that the measures are implemented, there should be no impact on cultural heritage and archaeological findings.

13.7.4 Conclusions

A summary of potential impacts on archaeology and cultural heritage during the construction activity is provided in Table 13-19.

Impact or Opportunity:	Damage of archaeological artefacts or features by the construction works.	**Ref. No.:**	18
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary/ Short-term/ Medium-term/ Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	CVP should promptly inform the competent institute about the commencement of earthworks; During the construction, archaeological supervision of works will be mandatory in the areas of foundations, cranes pads, cable routes, and access roads of the following WTGs: TI-9, TI-10, TI-16, TI-1, TI-2, TI-3, TII-2, TII-3, TII-8, TI-17, TIII-1, TIV-3, TIV-4; In case of valuable findings, the archaeological rescue excavation will be conducted; A chance finds procedure should be developed and workers trained to implement it. In case of chance finds, all work should be immediately halted and the area protected until the competent institute secures the findings.		
Residual Impact:	If chance finds are encountered - potential for slowing down construction. Any findings will increase knowledge of archaeological and cultural heritage.		

Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ **Minor Beneficial** ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-19 Cultural Heritage and Archaeology Impact during Construction

13.8 Land and Groundwater Quality

The construction activities would have the potential to affect the soil by (1) soil destabilisation and erosion, (2) long-term loss of soil in the areas of WTGs, hardstandings and access tracks, (3) degradation of soil resulting from top-soil removal and compaction, (4) soil contamination in case of accidental release of fuels, oils, chemicals, uncontrolled release of concrete batching wastewater or uncontrolled discharge of sanitary wastewater.

Local groundwater can be affected by contamination in case of accidental release of pollutants or uncontrolled discharge of sanitary wastewater.

Potential disturbance of the groundwater regime in case of dewatering which might affect the private water supplies has been discussed in section 13.11 Ecosystem Services.

The pre-construction ground investigations were conducted in 2020 to establish ground and groundwater conditions at the site and to microsite the turbines to avoid unsuitable areas. The proposed access roads largely follow contours of the natural topography and a limited number of service tracks require new hillside cuts.

13.8.1 Impact Assessment

13.8.1.1 Soil Impact Assessment

The proposed WPP is located in an area of steep topography prone to sheet and gully erosion, i.e. considered to be medium sensitive to potential soil destabilisation. As suggested by the preliminary geotechnical investigation report, any slope cuts with the depth exceeding 3m are under risk of earth movements which must be controlled by engineering measures. The areas of potential deep slope cuts that have been identified are along the proposed access roads to the WTGs TI-6, TI-7, TI-9, TI-10, TII-6, TII-8, TII-9, TII-10, TIV-2.

The soil stabilisation is mandatory part of the 'Design for Building Permit' which is subject to approval by the national Ministry of Construction. The design documents have been informed by the geotechnical investigations since the early planning stage. If uncontrolled during the construction, the soil erosion and sediment build-up have the potential to create a medium magnitude effect on a medium-sensitive receptor, resulting in **moderate adverse** significance impact.

The soil at the site is brown forest soil, acidic and low-fertile. The sensitivity of soil structure is considered to be medium as it has been subject to change due to air pollution. The construction of turbine foundations, crane pads and access roads would lead to a loss of about 2% of forest soil available at the site which would be a change of negligible magnitude and would result in **negligible adverse** significance impact.

During the works, moving of heavy machinery over unmade areas might compact the soil and change its structure. The compaction decreases the soil porosity and restricts infiltration of water which may lead to drainage issues (formation of ponds) and the loss of nutrients. Prior to mitigation, the effect would be localised to areas of construction activities and would present an effect of a medium magnitude and **moderate significance** that requires control measures.

Accidental release of fuels, oils, or chemicals to the ground has the potential to occur in the construction lay-down area, during delivery, storage, handling and use of hazardous materials. Volumes of fuel and chemicals stored at the site would be limited. The effect on soil quality (low sensitive receptor) would be long-term but localised, affecting the area of the release and as such is considered to be of a low magnitude. The impact significance is assessed as **minor adverse**.

13.8.1.2 Groundwater Impact Assessment

Potential for contaminants to enter groundwater depends on the aquifer sensitivity and type and quantity of the released contaminant. In that respect, the shallow aquifer formed within the fractured subsurface layer is medium sensitive as it is being used for private water supply. The potential contamination would result in a medium magnitude effect and **moderate adverse** significance impact.

The subsurface layer is underlain by a non-permeable volcanic bedrock providing a barrier to deeper groundwater horizons which are considered to be low sensitive to contaminant propagation. The effect magnitude would be negligible, resulting in **negligible adverse** impact significance.

13.8.2 Impacts Summary

The construction activity has the potential to affect the local land and groundwater. If uncontrolled, soil erosion and sediment build up would be moderate adverse significance impact. Loss, compaction and degradation of soil would be moderate adverse significance impact. Potential releases of hazardous materials to the ground would be minor adverse impact for soil, and moderate adverse impact for the shallow fractured aquifer. Measures should be employed to reduce the risk for soil and groundwater posed by the construction activities.

13.8.3 Proposed Mitigation/ Control Measure

13.8.3.1 Soil Stabilisation and Erosion Control

A Soil Erosion and Sediment Control Plan should be developed and implemented to ensure that best management practice principles are applied during the construction:

- Earthworks will be staged and sequenced in order to limit the area of exposed soil;
- Open earthworks should be progressively and rapidly stabilised (e.g. use of mulch, aggregate, geotextile);
- Sediment control measures should be employed. Run-off should be controlled by interception, diverting or conveying to stabilised areas, across slopes at a minimum gradient;
- All slopes and areas of bare soil should be stabilised before the beginning of snow season. Installation of snow barriers should be considered to reduce the erosion on particularly sensitive disturbed areas;
- Integrity and effectiveness of erosion control and sediment treatment devices should be monitored;
- Upon completion of the construction, the original slope and drainage pattern should be reestablished, to the extent possible.

Provided that mitigation measures and best practice methods are adhered to during the construction phase, the residual impact on soil erosion and sedimentation would be **negligible adverse**.

13.8.3.2 Loss, Compaction or Degradation of Soil

- Removed topsoil should be stored adjacent to the excavated area and later used to cover backfilled areas;
- Topsoil removal and stockpiling should be halted if topsoil is saturated with water; soil compaction and long-term damage to soil structure will be avoided by handling soils that are in a suitably dry condition and not during wet weather;
- Removed topsoil should be preserved for re-use;
- Topsoil stockpiles should have adequate height and slope gradient and their erosion should be prevented by controlled compacting to the level that presents no threat of development of anaerobic processes;
- Excavations and areas of exposed soils should be reinstated as soon as practicable once construction works are complete at a certain location.

Provided that the control measures are implemented, the residual impact on soil would be **negligible adverse**.

13.8.3.3 Contamination of Soil and Groundwater

- Storage of fuels, oils, chemicals, and liquid waste materials should be carried out in designated, dedicated areas, equipped with spillage protection;
- Fuelling and maintenance of machinery and vehicles should be carried out in a designated area with available spill kits and drip trays;
- Appropriate working procedures should be implemented to minimise the risk of accidental release during storage and handling of hazardous materials, washing down of plant and equipment and fuelling and maintenance of machinery and vehicles;

- Emergency response plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc.

Provided that the control measures are implemented, there should be no contamination of land and groundwater at the site (**no change**).

13.8.4 Conclusions

The summary of potential land and groundwater impacts is provided in tables below:

Impact or Opportunity:	Destabilisation and erosion of soil (medium sensitive receptor) and sediment build up during the earthworks.		**Ref. No.:**	19
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	A Soil Erosion and Sediment Control Plan should be developed and implemented to ensure that best management practice principles are applied during the construction: Earthworks should be staged and sequenced in order to limit the area of exposed soil; Open earthworks should be progressively and rapidly stabilised (e.g. use of mulch, aggregate, geotextile); Sediment control measures should be employed. Run-off should be controlled by interception, diverting or conveying to stabilised areas, across slopes at a minimum gradient; All slopes and areas of bare soil should be stabilised before the beginning of snow season. Installation of snow barriers should be considered to reduce the erosion on particularly sensitive disturbed areas; Integrity and effectiveness of erosion control and sediment treatment devices should be monitored; Upon completion of the construction, the original slope and drainage pattern should be re-established, to the extent possible.			
Residual Impact:	No significant residual impacts of soil erosion are anticipated.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 13-20 Soil Destabilisation and Erosion during Construction

Impact or Opportunity:	Loss, compaction or degradation of forest soil (medium-sensitive receptor) during construction.	**Ref. No.:**	20
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Removed topsoil should be stored adjacent to the excavated area and later used to cover backfilled areas; Topsoil removal and stockpiling should be halted if topsoil is saturated with water; soil compaction and long-term damage to soil structure will be avoided by handling soils that are in a suitably dry condition and not during wet weather; Removed topsoil should be preserved for re-use; Topsoil stockpiles should have adequate height and slope gradient and their erosion should be prevented by controlled compacting to the level that presents no threat of development of anaerobic processes; Excavations and areas of exposed soils should be reinstated as soon as practicable once construction works are complete at a certain area.		

Residual Impact:	Loss, compaction or degradation of forest soil within the project footprint.	
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-21 Soil Degradation Impact during Construction

Impact or Opportunity:	Contamination of soil (low-sensitive) and groundwater (medium-sensitive receptor) due to accidental release of hazardous materials or waste.	Ref. No.:	21
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Storage of fuels, oils, chemicals, and liquid waste materials should be carried out in designated, dedicated areas, equipped with spillage protection; Fuelling and maintenance of machinery and vehicles should be carried out in a designated area with available spill kits and drip trays; Appropriate working procedures should be implemented to minimise the risk of accidental release during storage and handling of hazardous materials, washing down of plant and equipment and fuelling and maintenance of machinery and vehicles; Emergency response plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc.		
Residual Impact:	There should be no residual impact of soil and groundwater contamination.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-22 Soil and Groundwater Contamination Impact during Construction

13.9 Surface Water and Wastewater

The layout of the proposed WPP has been designed away from watercourses. The proposed access roads largely make use of the existing forest tracks without crossing the local streams. The only exception is the proposed underground cabling route which crosses the Lipa River (in the central valley of the site) and the intermittent stream Antonijev Kladenac (near the WTG T1-1), see Figure 8-14 in section 8.1.6 Surface Water and Hydrology.

The underground cables would be installed below the natural bed level of the watercourses. The installation method will be defined in the 'Design for Building Permit' which is subject to approval by the national Ministry of Construction.

The construction activities would have the potential to affect the surface water by (1) pollution from sediment transport and run-off (2) pollution from contaminated surface run-off, (3) disturbance of banks of local streams, (4) pollution from direct discharge of domestic wastewater.

13.9.1 Impact Assessment

During and after rainfall events, the construction activity may generate sediment transport and silty surface runoff from dewatering of excavations, exposed ground, earth stockpiles, vehicle/plant washing areas, or washing down concrete mixing equipment. The snow-melt period at the site can be intense and produce significant surface water run-off. If uncontrolled, the sediment transport and surface run-off would affect the hydrological and ecological function of the streams (medium sensitive) which would be an effect of a medium magnitude prior to mitigation. The initial impact would be **moderate adverse** and would require appropriate control measures.

Oil and fuel may leak or spill and contaminate the surface run-off and local watercourses. The cement component in wastewater is highly alkaline and any spillage from cement-related work would impair the quality of local streams (medium sensitive). The scale of change would be medium, resulting in **moderate adverse** impact significance, prior to mitigation.

Construction works close to the streams can affect the integrity of banks through direct damage of bankside material or indirectly, through soil loosening which can alter the stream morphology, initiate erosion or even destroy the banking. This would be a high magnitude impact on a medium sensitive receptor which would result in **major adverse** impact significance.

Sanitary wastewater from workers domestic facilities has a high organic load and can pollute the local streams if directly discharged. The magnitude of change prior to mitigation would be medium, on a medium sensitive receptor, resulting in the initial impact of **moderate adverse** significance.

13.9.2 Impacts Summary

The construction works would generate the sediment transport, potentially contaminated surface runoff, cement-based products and sanitary wastewater that would all constitute the effect of **moderate adverse** significance prior to mitigation. Works close to the streams can affect the integrity of the banks which would result in **major adverse** impact if not controlled.

13.9.3 Proposed Mitigation/ Control Measure

13.9.3.1 Uncontrolled discharge of silty or contaminated runoff during construction

- Procedure for works during wet periods should be developed and implemented. Certain activities (e.g. trenching, excavation) might need to be ceased during periods of intense rainfall;
- Silty and potentially contaminated runoff from the construction site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary;
- Single-point discharges that may lead to erosion and scour should be avoided;
- Excavations' face should be kept minimal to avoid the exposure of exposed surfaces to natural conditions.
- In the areas where hazardous materials and waste will be stored, secondary containment should be provided to retain any leakage; Spillage kits should be provided at key locations on site and in particular at refuelling areas, and staff should be trained to use them.

13.9.3.2 Uncontrolled release of cement-based products during construction

- If concrete batching is undertaken at the site, a designated area should be provided at a safe distance from watercourses.
- No discharge of cement-contaminated water to the construction drainage system or to any watercourse must be allowed;
- Concrete batching wastewater should be treated in sedimentation ponds and reused where possible;
- Concrete washout should be conducted in designated areas, lined to prevent infiltration to the subsurface and covered to prevent the collection of rainfall;
- Solidified content cleaned down from lorry chute should be cleared from the site and disposed of with other construction waste.

13.9.3.3 Disturbance of Stream Banks

- During the installation of underground cables beneath the Lipa River and the Antonijev Kladenac stream, the cable pipeline should be buried deep enough so that it is not exposed due to scour during high flows;
- Wherever possible, a minimum 15 metre buffer zone should be maintained between the works area and a watercourse including the intermittent streams. No storage of material or parking of machinery must be allowed in the buffer zone;

- After cable installation, the natural width, depth and bed material of the stream should be restored and the banks re-establish with native riparian vegetation.

13.9.3.4 Uncontrolled discharge of sanitary wastewater from workers domestic facilities

- Sanitary facilities should be regularly inspected and wastewater disposed of by a licensed contractor;
- Sanitary wastewater should not be discharged to local watercourses.

Provided the proposed measures are implemented there should be **no residual impact** on surface watercourses at the site.

13.9.4 Conclusions

A summary of effects related to wastewater impacts during the construction of the proposed Crni Vrh WPP is provided in tables below.

Impact or Opportunity:	Uncontrolled discharge of silty or contaminated runoff to local watercourses (medium sensitive) during construction.		**Ref. No.:**	22
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Procedure for works during heavy rainfall should be developed and implemented; Silty and potentially contaminated runoff from the construction site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary. Single-point discharges that may lead to erosion and scour should be avoided. Excavations' face should be kept minimal to avoid the exposure of exposed surfaces to natural conditions. In the areas where hazardous materials and waste will be stored, secondary containment should be provided to retain any leakage; Spillage kits should be provided at key locations on site and in particular at refuelling areas, and staff should be trained to use them.			
Residual Impact:	There should be no residual impact of sediment transport and surface runoff at the site.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 13-23 Impact of Silty and Contaminated Runoff during Construction

Impact or Opportunity:	Uncontrolled release of cement-based products to local watercourses (medium sensitive) during construction.	**Ref. No.:**	23
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	If concrete batching is undertaken at the site, a designated area should be provided at a safe distance from watercourses. No discharge of cement-contaminated water to the construction drainage system or to any watercourse must be allowed; Concrete batching wastewater should be treated in sedimentation ponds and reused where possible; Concrete washout should be conducted in designated areas, lined to prevent infiltration to the subsurface and covered to prevent the collection of rainfall;		

	Solidified content cleaned down from lorry chute should be cleared from the site and disposed of with other construction waste.				
Residual Impact:	There should be no residual impact of concrete batching wastewater on local watercourses.				
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~		

Table 13-24 Impact of Concrete Batching Wastewater during Construction

Impact or Opportunity:	Disturbance of stream banks (medium sensitive receptor) during construction.		**Ref. No.:**	24
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ ~~**Long-term**~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	During the installation of underground cables beneath the Lipa River and the Antonijev Kladenac stream, the cable pipeline should be buried deep enough so that it is not exposed due to scour during high flows; Wherever possible, a minimum 15 metre buffer zone should be maintained between the works area and a watercourse including the ephemeral/ intermittent streams. No storage of material or parking of machinery must be allowed in the buffer zone; After cable installation, the natural width, depth and bed material of the stream should be restored and the banks re-establish with native riparian vegetation.			
Residual Impact:	There should be no disturbance of stream banks.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 13-25 Disturbance of Stream Banks during Construction

Impact or Opportunity:	Uncontrolled discharge of sanitary wastewater from workers domestic facilities to local watercourses (medium sensitive receptor).		**Ref. No.:**	25
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Sanitary facilities should be regularly inspected and wastewater disposed of by a licensed contractor; Sanitary wastewater should not be discharged to local watercourses.			
Residual Impact:	There should be no impact of sanitary wastewater to local watercourses.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 13-26 Sanitary Wastewater Impact during Construction

13.10 Environmental Pollution

Other potential sources of environmental pollution at the development site would be air emissions and excavation of contaminated land in the area adjacent to the abandoned open cast pit.

13.10.1 Impact Assessment

13.10.1.1 Air Emission

Construction activities with potential to directly affect the ambient air quality by generating fugitive dust, fine particulate matter ($PM_{2.5}$, PM_{10}) and exhaust emissions (NO_2) from machinery are the following: (1) earth works (including land clearing, excavation, levelling, stockpiling, backfilling), (2) construction plant and delivery of aggregate and concrete (premix), (3) movement of construction mechanisation and transport vehicles. Uncontrolled air emissions would present a source of pollution during the construction activities.

Deposition of dust cause a nuisance and affect vegetation and local orchards and gardens. Favourable conditions for dust generation are extended dry weather combined with high winds. The possible impacts may be expected near to dust sources, at a distance of up to 500 meters.

According to the 30-year data from the nearest weather station Crni Vrh, the average annual number of “wet days” (day with rainfall amount of 10mm or more) when it is assumed that the dust would not be generated is 22 which is 6% of the year.

The closest weekend houses are situated between 500 and 600m from the turbine clusters TI-13 to TI-16 and TIV-1 to TIV-4. They are considered to be highly sensitive receptors. There are vegetation buffers between the houses and the development site. If uncontrolled, dust deposition would have temporary and short-term medium effect on the weekend houses and **moderate adverse** significance. As the distance increases, the deposition rates would decrease and the magnitude of effect at other properties would be low to negligible leading to **minor adverse** impact.

The exhaust emissions from construction vehicles and transport equipment would contribute to the existing traffic emissions at the local roads. The volume of local road transport in the area is low, and is not considered a significant source of air pollution. No long-term idling is anticipated along the transport route in the vicinity of residential receptors. Given the short-term nature of the construction period, and the limited area to be developed within the context of the large-scale nature of the site, effects on local air quality are likely to be **negligible adverse**.

13.10.1.2 Excavation of Contaminated Land

The installation of medium voltage and optical cables across the central valley at the site would require excavation of soil contaminated with heavy metals, including drilling beneath the polluted Lipa riverbed. The scale of work would be limited – the trenching and drilling would not produce a significant volume of contaminated material. It is presumed that the majority of the excavated material would be suitable for in-situ backfilling. If not properly managed, the excavated material could cross-contaminate other areas at the site. Depending on the volume, this would be an effect of low to medium magnitude and **minor to moderate adverse** impact significance.

13.10.2 Impacts Summary

Deposition of dust would have the potential to affect the nearby summer houses and crops within the radius of 500m of the construction activity. Prior to mitigation the impact would be **moderate adverse** for the closest properties. The effect of the exhaust emissions from construction vehicles is considered to be negligible adverse given the short-term nature of the works, and a large-scale nature of the site. If not properly managed, excavated soil in the area adjacent to Gornja Lipa mine could cross-contaminate other areas at the site which would be **minor to moderate** adverse impact significance.

13.10.3 Proposed Mitigation/ Control Measure

13.10.3.1 Air Emission

The measures to control dust and exhaust emissions are part of good construction practice commonly used at construction sites. A range of measures that should be implemented include: dust suppression (watering and sprinkling), covering of transport vehicles carrying the dusty material, topsoil stripping close to the period of excavation, barriers where needed to protect receptors from dust, speed limits on transport roads including dirt tracks, regular maintenance of machinery and vehicles, etc.

With the control measures employed, any emissions would be of a temporary nature minimising any potential for a nuisance to occur. The residual impact would be **negligible adverse**.

13.10.3.2 Excavation of Contaminated Land

A Contaminated Material Management Plan should be implemented as part of the CESMP to ensure that the excavated soil is segregated from the adjacent-underlying soil to avoid potential cross-contamination. The soil stockpiles should be covered with sheeting and protected from surface run-off. If suitable, the soil should be re-used to backfill the excavated area. Any surplus excavated soil should be safely disposed within the mine area.

With the control measures employed, there would be no contamination at the site.

13.10.4 Conclusions

A summary of effects related to air emission impacts and contaminated land during the construction of the proposed Crni Vrh WPP is provided in Table 13-27 and Table 13-28.

Impact or Opportunity:	Dust emission during construction works and exhaust emissions from machinery and vehicles to weekend and residential houses in the vicinity (highly sensitive receptors).	**Ref. No.:**	26
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Dust suppression techniques (watering and sprinkling) should be applied; Transport vehicles carrying the dusty material should be covered; Topsoil stripping should be undertaken close to the period of excavation; Barriers should be erected where needed to protect receptors from dust; Speed limits should apply on transport roads including dirt tracks; Regular maintenance of machinery and vehicles should be provided.		
Residual Impact:	Dust propagation should be limited to construction area and should not influence the local community.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-27 Air Emission Impact during Construction

Impact or Opportunity:	Cross-contamination at the site by the excavated contaminated soil in the area of Gornja Lipa open cast pit.	**Ref. No.:**	27
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A Contaminated Material Management Plan should be implemented as part of the CESMP to ensure that the excavated soil is segregated from the adjacent-underlying soil to avoid potential cross-contamination. The soil stockpiles should be covered with sheeting and protected from surface run-off. If suitable, the soil should be re-used to backfill the excavated area. Any surplus excavated soil should be safely disposed within the mine area.		
Residual Impact:	There should be no cross-contamination at the site.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~

	~~Negligible Beneficial~~		~~Significant Adverse~~

Table 13-28 Contaminated Soil during Construction

13.11 Ecosystem Services

The Crni Vrh site is a source of provisioning ecosystem services (private water supply and commercial logging) and recreational services (herb and mushroom picking and hunting).

Water supply is considered to be a priority ecosystem service. Crni Vrh is not a water abundant area, people and livestock are highly sensitive to loss of water as other options are not readily available. Various solutions for private water supply of residents and livestock are being used, e.g. shallow groundwater wells, taped low-yield springs, collection of near-surface or surface water. Excavation for turbine foundations has the potential to disturb the local groundwater regime in case of dewatering which can result in a temporary or permanent loss of private water supplies (PWS) at the site.

The development site is used for commercial logging but represents a minor portion of the area which is entirely managed by the public state company 'Serbia Forests'. Herb and mushroom picking is limited to individual households who mainly pick on their land or in the vicinity, where accessible. There is no organised purchasing of herbs or mushrooms, plants are primarily used for household consumption and not for sale or income. The site is used for hunting but represents only a small portion of the total hunting area (2,706ha out of the total 60,000ha).

Logging, herb/ mushroom picking and hunting are considered to be a non-priority ecosystem services and are not further considered in the assessment.

13.11.1 Impact Assessment

13.11.1.1 Impact on Private Water Supplies

Excavation for turbine foundations would be shallow, up to 5-6m deep but can potentially require a limited dewatering in areas where the shallow aquifer is formed within the weathered, subsurface zone. The groundwater sensitivity at the site is assessed to be medium as the shallow aquifer is used for water supply. It is possible that the dewatering disturbs the groundwater flow to households that are tapping low-yield mountain springs or use near-surface water. Depending on the local hydrogeological conditions, this impact can be temporary and reversible; however, the possibility of permanent loss of groundwater inflow in some areas after the turbine foundations are built cannot be entirely excluded.

The loss of groundwater inflow in springs would be localised to a limited number of individual cases and therefore is an effect of a low magnitude. However, the private households and livestock are high-sensitive receptors, and the effect would result in **moderate adverse** significance impact. The impact would require mitigation measures during the construction and potential compensation measures in case of permanent loss of inflow in the springs or near-surface water sources**.**

13.11.2 Impacts Summary

Disturbance of the groundwater regime during the excavation may result in a temporary or permanent loss of a limited number of private water supplies which would be **moderate adverse** impact significance.

13.11.3 Proposed Mitigation/ Control Measure

13.11.3.1 Impact on Private Water Supplies

A Private Water Supply Management Plan (PWSMP) should be developed as part of the CESMP to identify private water supplies (PWS), determine whether they are at risk of the construction activity and if necessary, to provide temporary or permanent alternative potable water sources. The framework for the PWMSP should include but not be limited to:

- Identification of PWS down-gradient of the excavation/dewatering areas including the source of their water feeding, their catchment, distribution infrastructure and supply;
- Risk Assessment: Potential of excavation, dewatering or road construction to affect the quantity, quality or continuity of water at the receptor and appropriate mitigation to avoid or reduce the risk;

- Provision of temporary or permanent alternative water supplies, if necessary. A permanent alternative source should be comparable or better to the current source and may include a groundwater borehole, or an alternative water spring/ source with pipe infrastructure;
- Monitoring of PWS should be undertaken during and after the excavation/dewatering phase to ensure that the baseline water quality and quantity in PWS is reinstated. The monitoring should last at least 6 months with monthly sampling from the water source and point of supply.

Provided that the control measures are implemented, the residual impact on the users of private water supplies would be **minor adverse**.

13.11.4 Conclusions

A summary of effects related to the impact on ecosystem service during the construction of the proposed WPP is provided in Table 13-29.

Impact or Opportunity:	Impact on private water supplies (high-sensitive receptor) due to disturbance of the groundwater regime during excavation.	**Ref. No.:**	28
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** ~~Direct~~/ **Indirect** ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A Private Water Supply Management Plan (PWSMP) should be developed as part of the CESMP to include but not be limited to: Identification of PWS down-gradient of the excavation/dewatering areas including the source of their water feeding, its catchment, distribution infrastructure and supply; Risk Assessment: Potential of excavation/ dewatering or road construction to affect the quantity, quality or continuity of water at the receptor and appropriate mitigation to avoid or reduce the risk; Provision of temporary or permanent alternative water supplies, if necessary. A permanent alternative source should be comparable or better to the current source and may include a groundwater borehole, or an alternative water spring/source with pipe infrastructure; Monitoring of PWS should be undertaken during and after the excavation/dewatering phase to ensure that the baseline water quality and quantity in PWS is reinstated. The monitoring should last at least 6 months with monthly sampling from the water source and point of supply.		
Residual Impact:	There should be no significant residual impact on the users of private water supplies.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ **Minor Adverse** ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-29 Impact on Private Water Supplies

13.12 Community Health, Safety and Security

Health, safety and security of local residents and visitors may be affected during the construction activity by: (1) the increase in traffic flows of heavy vehicles and increase of traffic accident risks, (2) unauthorised access to the construction site and security risks especially during heavy lifting operations, and (3) spread of COVID-19.

13.12.1 Impact on Traffic Safety

The transport of large wind turbine components (blades, tower sections, nacelle) is subject to regulation on safe abnormal loads transport and requires mandatory involvement of police escort with or without successive stopping of traffic (depending on load dimensions). Given the strict procedure that has to be implemented, the potential impact of abnormal loads transport is not considered to be a significant traffic safety risk.

Residential areas are highly sensitive receptors in terms of the traffic safety. Along the road No. 161 which would be used for the most part of the construction traffic, there is one potentially sensitive section, 5km long. The road runs next to two summer house settlements – Brestovac Spa and Bor Reservoir (see Figure 13-1). Additional HGV traffic (especially in summer) may increase the risk of accidents for the local community.

The road is narrow (6m) but has many blind bends and a speed limit of 80km/h. There are no pedestrian crossings or traffic lights that would facilitate the road crossing. During the summer season, there is an increased tourist and visitor activity in the two settlements and potential frequent crossings of the road. The increased traffic flow during the construction has the potential to produce a medium magnitude effect with **moderate adverse** significance impact.

The winding character of the road No. 161 does not provide many suitable opportunities to overtake HGVs. The entire road stretch between the spa and reservoir is marked with a single solid white line. This can lead to driver frustration and taking of unnecessary risks, potentially affecting both driver and pedestrian safety. The magnitude of effect would be medium (given the low traffic level) and the impact significance is assessed to be **moderate adverse**.

The road section within the development site has a very low traffic volume which some drivers take advantage of to speed. Numerous bends do not provide many opportunities for overtaking. During the construction phase and slow HGV traffic, some drivers might be tempted to overtake unsafely. This would increase the road safety risk to medium and result in **moderate adverse** impact significance.

Motorcyclists are present on the road No. 161. A traditional 2-day Motorcycle Meet takes place at Bor Reservoir each August, attracting both local and regional motorcyclists. The potential effect is assessed to be of a medium magnitude resulting in **moderate adverse** impact.

Bicycles are not widely used in the Study Area out of settlements. The potential effect is assessed to be of a low magnitude resulting in **minor adverse** impact.

Farmers driving tractors are rare on the road No. 161 and are more present along the abnormal transport route which would be strictly controlled. Given the very low number of tractors, the potential effect is assessed to be of a negligible magnitude resulting in **minor adverse** impact.

13.12.2 Unauthorised Access

Safety and security risks for local community may arise from unintentional or intentional entrance to the site, including potential contact with structures or excavations posing safety hazards. If not controlled, the impact is assessed to be **moderate adverse**.

13.12.3 Control of COVID-19

For the time being, COVID-19 remains a major health hazard for both the construction staff and the local community. If not appropriately controlled, the potential impact on the local community is considered to be significant adverse. As of October 2021, around 51% of adult population in Serbia has been fully vaccinated.

13.12.4 Impacts Summary

The increased traffic flows of heavy vehicles along the road between Brestovac Spa and Bor Reservoir is the potential effect of **moderate adverse** significance on road safety of visitors and residents, and requires management and mitigation. Increased journey times can lead to drivers taking unnecessary risks to overtake HGVs on the road with many blind bends. The road section within the development site might be affected by unsafe overtaking as well.

Other sections of the road are considered to be under minor adverse impact. Unauthorised access to the construction site can have moderate adverse effect on the safety of local residents. Uncontrolled transmission of COVID-19 would have significant adverse impact on the local community.

13.12.5 Proposed Mitigation/ Control Measure

13.12.5.1 Road and Traffic Safety

A Road Safety Management Plan should be developed and implemented (as part of a Construction Transport Management Plan) to define traffic safety procedures including but not limited to: details on vulnerable road users along the route, speed controls, training programmes and licences for all drivers, maintenance of vehicles, monitoring of the road condition (removal of dirt and debris).

Consultation with local traffic police should be held related to potential traffic control measures in the area of Brestovac Spa and Bor Reservoir, in order to decrease the risk for pedestrians crossing the road and their exposure to drivers overtaking HGVs in prohibited places. Temporary signing should be used to highlight the presence of construction traffic.

Discussions with the communities of Brestovac Spa and Bor Reservoir should be held in the pre-construction phase to raise awareness on traffic risks during the construction.

Temporary signing should be considered along the road No. 161 within the development site to prevent drivers previously accustomed to the low traffic to take unnecessary risks.

As a result of the proposed measures, the risk of the traffic accidents should be **negligible** for local residents and visitors.

13.12.5.2 Unauthorised Access

All reasonable measures should be taken to ensure that no unauthorised person enters the construction site;

Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community;

A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors.

Provided that the management measures are implemented, there should be no security risk for the local residents.

13.12.5.3 Control of COVID-19

A COVID-19 Management Plan should be developed and implemented. According to Serbian regulatory requirements, the COVID-19 Management Plan must be a result of a formal OHS Risk Assessment. Besides establishing the controls in the workplace, the Management Plan should include measures to prevent the transmission in the local community.

The COVID-19 Management Plan should establish a hierarchy of controls to limit the spread of COVID-19, including technical controls (testing, cleaning and disinfection, immunisation, separation of infected employees), management procedures (communication, training, work instructions, contact with local community, absence from work) and personal protective equipment.

Provided that the COVID-19 Management Plan is implemented, the risk of spread of the virus in the local community should be minimised.

13.12.6 Conclusions

A summary of effects related to community health, safety and security impacts during the construction of the proposed WPP is provided in tables below.

<table>
<tr><td>Impact or Opportunity:</td><td>Traffic safety risk for local residents and visitors (highly sensitive receptors), especially in summer, in the area of Brestovac Spa and Bor Reservoir due to increased traffic flows.</td><td>Ref. No.:</td><td>29</td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="3">~~Positive~~/ Negative
Direct/ ~~Indirect~~
Temporary/ Short-term/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~
Local/ ~~National~~/ ~~Regional~~</td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="3">A Road Safety Management Plan should be developed and implemented (as part of a Construction Transport Management Plan) to define traffic safety procedures including but not limited to: details on vulnerable road users along the route, speed controls, training programmes and licences for all drivers, maintenance of vehicles, monitoring of the road condition (removal of dirt and debris).
Consultation with local traffic police should be held related to potential traffic control measures in the area of Brestovac Spa and Bor Reservoir, in order to decrease the risk for pedestrians crossing the road and their exposure to drivers overtaking HGVs in prohibited places. Temporary signing should be used to highlight the presence of construction traffic.
Discussions with the communities of Brestovac Spa and Bor Reservoir should be held in the pre-construction phase to raise awareness on traffic risks during the construction.</td></tr>
</table>

	Temporary signing should be considered along the road No. 161 within the development site to prevent drivers previously accustomed to the low traffic to take unnecessary risks.		
Residual Impact:	There should be no traffic safety risk for local residents and visitors.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-30 Impact on Traffic Safety during Construction

Impact or Opportunity:	Security risk for local residents, loggers, hunters, wild plant pickers (high-sensitive receptor) due to unauthorised access to the construction site.		**Ref. No.:**	30
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	All reasonable measures should be taken to ensure that no unauthorised person enters the construction site; Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community; A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors.			
Residual Impact:	There should be no security risk for local community.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 13-31 Impact on Public Security during Construction

Impact or Opportunity:	Spread of COVID-19 among the local community (high-sensitive receptor).	**Ref. No.:**	31
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A COVID-19 Management Plan should be developed and implemented. Besides establishing the controls in the workplace, the Response Plan should include measures to prevent the transmission in the local community. The Management Plan should establish a hierarchy of controls to limit the spread of COVID-19, including technical controls (testing, cleaning and disinfection, immunisation, separation of infected employees), management procedures (communication, training, work instructions, contact with local community, absence from work) and personal protective equipment.		
Residual Impact:	There should be no risk of spread of COVID-19 in the local community.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-32 Control of COVID-19

13.13 Wildfire

13.13.1 Impact Assessment

The development site is situated within an area of wildfire risk. The construction activity will be most intensive between March and October which overlaps with the wildfire season - the risk is especially pronounced during prolonged dry periods in summer months.

High ambient temperature in summer, low humidity and high-speed wind can create fire-favourable conditions, adding to potentially dry vegetation (fuel) and low-moisture soil. Under such conditions, any ignition at the construction site is a fire risk that can spread and initiate a forest fire or affect the construction site and personnel safety.

Earthwork machinery can friction with rock and cause a spark. Ignition can occur during hot work (cutting grinding, welding) or due to an electrical fault on equipment. Improper storage and handling of flammable materials (fuel, transformer oil), use of vehicles with internal combustion engines, worker behaviour (smoking) are the potential sources of ignition.

The fire risk during the construction activity is judged to be medium to high (during prolonged dry summer periods). The potential magnitude of effect is assessed to be medium to high, resulting in **moderate to major adverse** significance impact. Additional precautions will be needed besides the routine fire prevention as part of construction best practice.

13.13.2 Impacts Summary

The development site is situated within an area of wildfire risk. The fire risk during the construction activity can result in **moderate to major adverse** impact and additional management and mitigation measures would be necessary, besides the routine ('best practice') fire prevention during construction.

13.13.3 Proposed Mitigation/ Control Measure

A Construction Fire Prevention and Response Plan should be developed prior to commencement of the construction. Where relevant, the statutory stakeholders 'Serbia Forests' and fire police departments from Žagubica and Bor should be consulted for the Plan development. The framework for the Plan should include but not be limited to:

- Monitoring of fire weather risk: During the wildfire season (especially in July and August) both short-term and long-term weather predictions should be monitored. The Fire Weather Index provided by the

Serbian national weather service (RHMI) should be monitored on daily basis and site personnel should be informed of the risk;

- Safe working and emergency procedures should be developed and strictly implemented during prolonged dry periods and high-speed winds, especially in summer. This should particularly include all hot work (e.g. grinding, cutting, welding) as well as operation of earth-moving equipment and vehicles;
- Restrictions should be considered for activities on days when the RHMI suggest that the wildfire danger is 'Extreme'. Activities that should be banned or taken with precaution should be identified;
- Pre-wetting of working areas should be considered during the days when the fire danger is 'High' or 'Extreme';
- Routes for construction traffic should be clearly defined to prevent driving through grass and igniting dry vegetation;
- Vehicles and machinery should have diesel engines and should be regularly cleaned from accumulated vegetation and other flammable material. Equipment checks to prevent malfunction should be ensured;
- Smoking should be allowed only in dedicated areas;
- The construction personnel should be trained in causes and prevention of wildfires and response;
- Fire-fighting equipment should be provided at the site and personnel trained to use it. Appropriate additional fire suppression equipment should be considered during periods when the wildfire risk is 'Extreme' (e.g. mobile water tanks);
- Fire response procedure should be clearly defined including actions to be taken by the construction personnel, informing the fire brigade, health and safety protocols, evacuation from the site, etc.

13.13.4 Conclusions

A summary of effects related to wildfire risk during the construction of the proposed WPP is provided in the table below.

Impact or Opportunity:	Increased fire/ wildfire risk during construction, especially during prolonged dry periods in summer.	**Ref. No.:**	32
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ **Medium-term**/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A Construction Fire Prevention and Response Plan should be developed prior to commencement of the construction in consultation with the statutory stakeholders 'Serbia Forests' and fire police departments from Žagubica and Bor: Monitoring of fire weather risk: During the wildfire season (especially in July and August) both short-term and long-term weather predictions should be monitored. The Fire Weather Index provided by the Serbian national weather service (RHMI) should be monitored on daily basis and site personnel should be informed of the risk; Safe working and emergency procedures should be developed and strictly implemented during prolonged dry periods and high-speed winds, especially in summer. This should particularly include all hot work (e.g. grinding, cutting, welding) as well as operation of earth-moving equipment and vehicles; Restrictions should be considered for activities on days when the RHMI suggest that the wildfire danger is 'Extreme'. Activities that should be banned or taken with precaution should be identified; Pre-wetting of working areas should be considered during the days when the fire danger is 'High' or 'Extreme'; Routes for construction traffic should be clearly defined to prevent driving through grass and igniting dry vegetation;		

	Vehicles and machinery should have diesel engines and should be regularly cleaned from accumulated vegetation and other flammable material. Equipment checks to prevent malfunction should be ensured; Smoking should be allowed only in dedicated areas; The construction personnel should be trained in causes and prevention of wildfires and response; Fire-fighting equipment should be provided at the site and personnel trained to use it. Appropriate additional fire suppression equipment should be considered during periods when the wildfire risk is 'Extreme' (e.g. mobile water tanks); Fire response procedure should be clearly defined including actions to be taken by the construction personnel, informing the fire brigade, health and safety protocols, evacuation from the site, etc.		
Residual Impact:	The residual risk of fire/ wildfire risk should be negligible, there should be no impact on construction site.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-33 Wildfire Risk during Construction

14 Operation - Impact Assessment and Mitigations

14.1 Introduction

This Chapter describes the assessment and mitigation of the operational impacts identified within the Scoping Study. The impact topics are presented in the order of significance identified by the Scoping Study. A summary of the impacts identified and recommended mitigation or control measures are presented in one or more tables at the end of each topic section. These impacts, mitigations and control measures are consolidated in a single table in Chapter 16. The Operation impact summary table is linked to the Environmental and Social Monitoring and Management Plan (ESMMP) presented in Chapter 17. The ESMMP will be used as the basis of the Operation Environmental and Social Management Plan (OESMP). The OESMP will include a series of subsidiary, topic specific Management Plans (see Chapter 17) that will describe the procedures and controls required to manage the impacts in line with the Project Applicable Requirements (see section 6.1).

The Scoping Study categorised the operational impacts of the Crni Vrh WPP as:

Significance Level One Issues

- Ecology and Nature Conservation – birds and bats in particular;
- Socio-economic;
- Landscape and Visual;
- Shadow Flicker.

Significance Level Two Issues

- Operational Noise;
- Ice Throw and Ice Fall;
- Community Health Safety and Security;
- Forest Fire and Wildfire.

Significance Level Three Issues

- Traffic and Transport;
- Environmental Pollution (in relation to Hazardous Materials, Wastes, Land and Groundwater, Surface Water and Wastewater);
- Ecosystem Services;
- Electromagnetic Interference and Telecommunications;
- Aviation Safety and Radar Systems.

14.2 Ecology and Nature Conservation

This section identifies, characterises and evaluates all potential operation impacts of the Crni Vrh WPP project on ecological features of significant nature conservation value, identifies and describes mitigation measures needed as well as provides an assessment of the significance of any residual effects.

Only those ecological features considered to be potentially affected by the project and of significant nature conservation value should be subject to detailed impact assessment (CIEEM 2016). For ecological features of not significant nature conservation value (valued at the local level at the most), no detailed impact assessment is needed (CIEEM 2016, SNH 2018a) since any potential impact could only be not significant as well (CIEEM 2016, European Commission 2020).

14.2.1 Impact Assessment

14.2.1.1 Designated Sites

There are no direct possible impacts of WPP operation on designated sites. There is the potential for indirect impacts, i.e. those on designated sites fauna species populations, in particular birds and bats, and these are considered in the following sections.

14.2.1.2 Habitats

There are no direct negative impacts of WPP operation on habitats. This assumes that all maintenance vehicles and activities are restricted to the newly constructed tracks and the maintenance pads that will be constructed next to each WTG.

The NPC (IfNC 2021b, see Table 6-8) require that shrub and weed vegetation must be removed within a radius of 200 m from the WTGs and mowed (or grazed) at a height of 20 cm. This Condition is rather inappropriate in as much of the meadow land within this boundary is not owned by CVP. Full compliance with the Condition may not be possible if access to this land may not be agreed by the owners. Formal clarification regarding the interpretation of this Condition is being sought from the IfNC. IfNC staff have provided an unofficial interpretation that this requirement is applicable only in scrub and grassland (i.e. not in woodland, marshland or farmland). This means that the surface area of hay meadows at the site will increase at the expense of scrub and other grassland types. Maintained hay meadows at the site belong to Balkan-mountain hay meadows habitat type (EUNIS code E2.33) which is of particular conservation concern and of significant nature conservation value. However, this habit type is not self-sustaining at the site area and, if not maintained (mown or grazed), undergoes a succession, i.e. overgrows with weeds and shrub, which has already advanced in many parts of the site. The majority of the scrub and other grassland habitat types at the site are succession stages of neglected Balkan-mountain hay meadows. CVP intend to interpret the scrub management requirements set by the regulators in order to increase the area of Balkan-mountain hay meadows, a habitat of conservation value. The operation biodiversity management plan will consider how the land owned by CVP can be grazed in order to promote growth of Balkan-mountain hay meadow. Hopefully, this will lead to the restoration and maintenance of some of the Balkan-mountain hay meadows at the site. Considering the significant nature conservation value of this habitat type and none of the succession habitat types that would be lost, such alteration would be **beneficial**. The areas of 200 m radius around 23 of the WTG locations are (mostly) covered in scrub and grassland. This means that the total surface area of maintained Balkan-mountain hay meadows could increase by more than 200 ha (a 12 to 15-fold existing area within the developed areas of the site). This benefit will be **permanent** (for the operational life of the Project), though **reversible** if left to succession after decommission. Due to all of the above, the impact of increase in surface area and maintenance of Balkan-mountain hay meadows is assessed as **positive moderate regional**, and thus **significant positive**.

14.2.1.3 Flora and Fauna

Only a few plant species populations and several insect species populations occurring at the site have been assessed as of significant nature conservation value. However, none of these species/ groups is potentially affected by the WPP operations. Therefore, the ESIA assesses that there will be **no** or **negligible** negative impact of operation on all valued flora and fauna species populations.

Other than birds and bats, all other (potentially) occurring populations of flora and fauna species were assessed as of **not significant** nature conservation value. Only several of these species, *large mammals* in particular, are known to be possibly displaced by WPP operations, although significant impacts have been observed only extremely rarely (European Commission 2020, Bennun *et al*. 2021). Any potential impact on populations of insignificant nature conservation value could only be **not significant** as well (CIEEM 2016, European Commission 2020), and **no impact** is ascertained for most of the flora and fauna species.

However, habit gain in valued Balkan-mountain hay meadows will certainly positively affect the general diversity of the flora and fauna of the area, grassland-associated species in particular. It is not possible to reliably assess whether this impact will be significant, as it will depend on a number of factors that cannot be predicted without very extensive research that would be far beyond the scope of this Assessment. Project's operational monitoring will inform on the general significance of this impact on flora and fauna and, as applicable, provide recommendations for the management of restored hay meadows as to maximise the positive impacts on flora and fauna.

14.2.1.4 Birds

All possible impacts on all bird species populations occurring within the site boundary are considered in this section including displacement due to operation, electrocution mortality from OHLs, collision mortality from OHLs, collision mortality from WTGs, and the use of OHLs for perching and nesting (SNH 2016, 2017, 2018a). A project specific impact of habitat gain due to NPC habitat management requirements is also considered.

The magnitude, direction and scale of potential impacts (SNH 2018a, CIEEM 2016) were assessed based on occurring populations' nature conservation value, species ecology and susceptibility to potential impacts, as well as populations' ecological status at the site size and other demographics.

14.2.1.4.1 Displacement

Operational displacement is where birds are excluded from the areas (of WPP and its surrounding) that were suitable for them before the development, due to avoidance of the operating WTGs or maintenance activities. It may also include barrier effects in which birds are deterred from using normal commuting or migration routes and prevented from reaching some destination due to WPP acting as a barrier along the route (SNH 2017, 2018a).

There are no important bird migration or commuting routes in the site area and, any **barrier effect** is positively excluded, i.e. there is **no impact** for all bird species populations.

All of the populations using the habitats within the site for nesting and/or foraging are already habituated to human presence and activities (forestry, mining, agriculture) in the area, including the use of machinery, and are not very susceptible to disturbance through operation. Therefore, although maintenance may cause some localised and short-term disturbance, this cannot be considered displacement, and **no impact** is assessed in this respect for all bird species populations (including those of significant nature conservation value).

Individuals of all occurring populations, either using the site and flying over it, will certainly exhibit avoidance behaviour towards operating WTGs or take other evasive action to prevent a collision. However, this is considered displacement only if such behaviour results in a change of home range, territory, or flight route (possibly over time), so that bird no longer uses the area (or parts) of the operational WPP or flight route above (SNH 2012).

All valued bird populations occurring within the site are either breeding or resident and mostly use the site for nesting and/ or foraging. The populations using the habitats within the site for nesting and/or foraging, again, are already habituated to human activities in the area. Furthermore, according to current knowledge, there is no indication that activities of any of these species are susceptible to displacement from operating WTGs. Thus, although avoidance behaviour will cause a slight increase in birds' energy expenditure, this cannot be considered displacement. Therefore, **no impact** of displacement from operating WTGs on all valued populations using the habitats within the site for nesting and/or foraging is assessed.

The ESIA surveys noted the presence of Short-toed Snake Eagle (*Circaetus gallicus*) and the literature (European Commission 2010) suggests that this species has the potential to be susceptible to displacement from operating WTGs. Unfortunately, the European Commission study does not provide a reference to original source and it is not known if this potential susceptibility relates to nesting, foraging or both. However, the available original research at operating WPPs clearly conclude that neither foraging nor nesting of the species is susceptible to displacement, and also that it habituates to disturbance from WTG operations in a short period (Cárcamo et al. 2011, Poirazidis 2017). Therefore, displacement of nesting and foraging of Short-toed Snake Eagle from operating WTGs is considered very unlikely. If examined further only as an utmost precaution, the maximum nest distances (from operating WTGs) of other comparable raptor species whose nesting is susceptible to displacement from operating WTGs, ranging from 150-500 m (Ruddock & Whitfield 2007, Hötker et al. 2006), can be taken as relevant. The existing nests of the Short-toed Snake Eagle snakes are located at about 400 m from the closest WTG positions and it is considered likely that even in the worst case they will not be displaced. Also, the WPP layout leaves a large area outside the 500 m radius around each WTG even within the site boundary, which would remain available for nesting of this species even if, hypothetically, the existing nests would be displaced. Due to all of the above, very likely no impact of displacement from operating WTGs on Short-toed Snake Eagle breeding population is assessed, and, only as a utmost precaution, **possibly negligible**, and thus **not significant**.

Two of the (precautionary) valued bird populations nesting in wider area, Golden Eagle (*Aquila chrysaetos*) and Peregrine Falcon (*Falco peregrinus*), occur within the site only in passage, i.e. flying over (see Table 8-5 and Table 8-6). The birds flying over the WPP site only, may increase their flight height in the area of the operating WPP (vertical avoidance), but also change their flight routes such as to take them around the WPP (horizontal avoidance). Horizontal avoidance, if permanent, should be considered displacement, and even a barrier effect (SNH 2017, 2018a). However, since only incidentally single individuals of both these species occur within the site, the only actual negative effect (of both avoidance options) on affected populations would be a negligible increase in individual birds' energy expenditure, which cannot be considered displacement. Therefore, **no impact** of displacement is ascertained on Golden Eagle and Peregrine Falcon populations passing over the WPP site.

14.2.1.4.2 Electrocution mortality

Mortality through electrocution occurs when perching or flying bird cause a short circuit, either by touching two different phase conductors, or a conductor and an earth wire, or equivalent energised components of the pylon structure (SNH 2016).

This is extremely unlikely at any high-voltage transmission lines because of the suspended insulators and large clearances. It is not possible at all in this particular case as minimum clearances of the project OHLs (3.4 m) are far too large to be bridged by any flying bird.

Furthermore, the NPCs require that all energised components of the OHLs, substation and other electric installations must be grounded, secured and insulated, which will prevent electrocution of perching birds. Although incidental electrocution fatalities cannot be completely excluded (due to possible malfunctions), such low (potential) additional mortality could not affect any bird population sustainability even at the site level.

Therefore, **no impact** of electrocution mortality on all bird species population (including those of significant nature conservation value) is ascertained.

14.2.1.4.3 Collision mortality from OHLs

Mortality through collision occurs when a bird flies into a wire and is killed either from the impact, subsequent impact with the ground, or from injuries sustained in the process. Earth wires are considered responsible for most collisions because they are thinner and less visible, and are positioned at the top of the wire array, putting them in the flight path of birds which have taken avoiding action to fly over the conductors (SNH 2016).

Site-and-population-specific risk of bird collision mortality from OHLs is not predictable or quantifiable from the pre-construction surveys flight activity data using CRM in the same way as collision mortality WTG blades. However, a range of interacting species-specific, site-specific and project-specific factors influence the risk of collision, often creating collision hotspots where are concentrated along relatively short sections of line. By comparing these risk factors with the design of the Crni Vrh WPP, it is clear that none of the key factors is present as:

- The power lines are neither sited near nor crossing important areas or flyways used by birds (which is considered the major risk factor), nor within wintering and staging areas, nor crossing commuting flight paths (between resting and feeding areas).
- Weather that forces birds to lower their normal flight heights, affects flight control and reduces visibility (e.g. strong winds, fog, or heavy rain) is common at the site during autumn and winter; however, the site has minimal importance for wintering birds and these are only local resident populations and a few small populations of certain finches (Fringillidae) for which such weather does not (significantly) increase the collisions risk;
- OHLs have vertical cable configuration and earth wire on the top; however, all Project OHLs are routed as 2 or even 4 in parallel and in close proximity, which significantly increases their visibility for birds and is considered to reduce the risk of vertical cable configuration (Haas et al. 2003 Prinsen et al. comp. 2012).
- The total length of the Project OHLs is small – No. 122b about 4.2 km, No. 150+177 about 2.7 km, and No. 122a about 1.7 km (from Project substation/TS to existing OHLs), which itself poses a low collision risk. There are also existing OHLs in the area (to which the Project OHLs will be connected), as well as several medium/ low voltage lines of the distribution network, which further reduces the risk.

Due to all the above, it is considered that the general site-specific and project-specific collision risk from Project OHLs is **negligible**.

The bird fauna of the site consists almost exclusively of resident and breeding local populations, including those of significant nature conservation value. Resident birds adapt to obstacles in their habitat which also additionally reduces collision risk.

The only large species regularly present in non-negligible numbers is the Common Buzzard (*Buteo buteo*), including younger and more inexperienced birds. Migrants (which are not familiar with the landscape) occur only incidentally or rarely and in negligible or very small numbers. Species that fly in flocks and/ or in low light, occur only incidentally and in small numbers.

Out of 21 target species (potentially) occurring within the site, the flight activity of only 10 was recorded by the VP surveys. Based on the recorded characteristics of flight activity, site-and-population-specific risk of collision with OHLs is estimated as low for Common Buzzard (*Buteo buteo*), and negligible for Short-toed Snake Eagle (*Circaetus gallicus*), Western Marsh Harrier (*Circus aeruginosus*), Eurasian Sparrowhawk (*Accipiter nisus*) and Eurasian Hobby (*Falco subbuteo*).

A low risk means that individual collision fatalities of Common Buzzard are possible on an annual basis, with the risk being highest for fledglings. However, Common Buzzard population at the site and immediate surroundings (as well as regional and national) is large, and such a low additional mortality could not affect the population even at the site level. Therefore, the impact of collision mortality from OHLs on Common Buzzard resident population is assessed as **negligible**, and evaluated accordingly as **not significant**.

It is not possible to completely exclude the occasional single fatalities (one every few years) of Short-toed Snake Eagle, Western Marsh Harrier, Eurasian Sparrowhawk and Eurasian Hobby. However, such a low additional mortality could not affect the sustainability of their populations at a regional level. Therefore, the impact of collision mortality from OHLs on Short-toed Snake Eagle and Eurasian Hobby breeding populations, Western Marsh Harrier migrating population, and Eurasian Sparrowhawk resident population is assessed as **negligible** at the most, and thus **not significant**.

No flight activity of 5 target species observed during the VP surveys was recorded at the OHL height: Black Stork (*Ciconia nigra*), European Honey Buzzard (*Pernis apivorus*), Northern Goshawk (*Accipiter gentilis*), Black Kite (*Milvus migrans*), and Long-legged Buzzard (*Buteo rufinus*). In addition, no flight activity of 11 more target species was recorded by the VP surveys: White Stork (*Ciconia ciconia*), Little Owl (*Athene noctua*), Eurasian Scops Owl (*Otus scops*), Long-eared Owl (*Asio otus*), Tawny Owl (*Strix aluco*), Ural Owl (*Strix uralensis*), Eurasian Eagle-Owl (*Bubo bubo*), Golden Eagle (*Aquila chrysaetos*), Montagu's Harrier (*Circus pygargus*), Common Kestrel (*Falco tinnunculus*), and Peregrine Falcon (*Falco peregrinus*). Moreover, all these species were recorded rarely or incidentally and with negligible (or low) abundance by all other surveys/ methods. Based on this, the site-and-population-specific risk of collision with OHLs for all these 16 species is estimated as negligible at most (only as a precaution). Although incidental single collision fatalities of these species cannot be excluded, such a low (potential) additional mortality could not affect their populations sustainability even at the site level. Therefore, no impact of collision mortality from OHLs on these 16 target species populations can be ascertained, including (precautionary) valuable populations of European Honey Buzzard, Golden Eagle, Long-legged Buzzard, and Peregrine Falcon.

The remaining species whose valued populations occur within the site, are not susceptible to collision mortality, which is the reason they are not identified as target species. Although incidental single collision fatalities of these species cannot be completely excluded, such a low (potential) additional mortality could not affect their populations even at the site level. Therefore, **no impact** of collision mortality from OHLs on all other populations of significant nature conservation value can be ascertained.

All other bird populations (potentially) occurring within the site are of insignificant nature conservation value (valued at the local level at the most), and any potential impact could only be not significant as well (CIEEM 2016, European Commission 2020, SNH 2018a). Moreover, these species are not susceptible to collision mortality (and were not identified as target species). Although incidental single collision fatalities of these species as well cannot be completely excluded, such a low (potential) additional mortality could not affect their populations even at the site level. Therefore, **no impact** of collision mortality from OHLs on all bird populations of insignificant nature conservation value can be ascertained.

14.2.1.4.4 Collision mortality from WTGs

Mortality through collision occurs when a bird flies into an element of WPP infrastructure and is killed either from the impact, subsequent impact with the ground, or from injuries sustained in the process (SNH 2017, 2018a). The WPP infrastructure elements considered to pose the highest risk for collision are moving WTG blades (SNH 2017, 2018a).

A total of 12 target species were recorded by 2021-2022 main ESIA surveys. However, two of these target species, Tawny Owl (*Strix aluco*) and Eurasian Eagle-Owl (*Bubo bubo*), were only recorded during the Breeding Owl Surveys or by occasional observations. Since flight activity was not recorded during the VP Surveys, it is not possible to model collision risk for these two species. However, as no flight activity was recorded within the site boundary, the site-and-population-specific collision risk of both species must be considered to be **negligible**.

Nine of the target species were recorded only during the 2019-2021 Preliminary Surveys: White Stork (*Ciconia ciconia*), Little Owl (*Athene noctua*), Eurasian Scops Owl (*Otus scops*), Long-eared Owl (*Asio otus*), Ural Owl (*Strix uralensis*), Golden Eagle (*Aquila chrysaetos*), Montagu's Harrier (*Circus pygargus*), Common Kestrel (*Falco tinnunculus*), Peregrine Falcon (*Falco peregrinus*). Of these nine species, four were observed only in wider surroundings rather than within the WPP site: (Little Owl, Eurasian Scops Owl, Long-eared Owl, and Golden Eagle). Since the methodology implemented in Preliminary Surveys does not allow for the observed flight activity to be quantified adequately, it is not possible to model collision risk for these 9 species. As none of the 11 (2+9) species were recorded within the site boundary during the VP Surveys, and only incidentally within the Preliminary Surveys, their site-and-population-specific collision risk must be considered to be **negligible** and only as a precaution. Incidental collision fatalities of these 11 species cannot be excluded, such low (potential) additional mortality could not affect their populations sustainability even at the site level.

Therefore, **no impact** of collision mortality from the WTGs on these 11 target species populations can be ascertained, including (precautionary) valuable populations of Golden Eagle and Peregrine Falcon.

A total of 10 target species was recorded within the scope of the 2021-2022 main ESIA VP Surveys (Table 8-4). Their site-and-population-specific collision risk with WTG blades of three of the candidate turbines was modelled using SNH methodology. Collision risk indices calculated from flight activity data are presented in Table 14-1, whilst all the details on parameters and calculations are available in Appendix C.

Table 14-1 Estimated Collision Risk for Target Species Recorded at the Crni Vrh WPP Site

Legend and notes

Calculated using SNH CRM (SNH 2000, 2014a, 2018b, Chamberlain *et al.* 2005, Band *et al.* 2007).

The highest risk value (worst case) for each species in relation to the WTG model is in **bold.**

No. - same as in Table 8-5, for convenience;

WTG model scenarios

N163-5.7 - blade swept height 36.5-199.5 m, maximal chord width of blade 4.00 m

V162-5.6 - blade swept height 44.0-206.0 m, maximal chord width of blade 4.32 m

N149-5.7 - blade swept height 30.5-179.5 m, maximal chord width of blade 4.00 m

No.	Species name	Number of birds colliding annually			Number of years per collision			Number of birds colliding over lifespan of project (25 years)		
		N163-5.7	V162-5.6	N149-5.7	N163-5.7	V162-5.6	N149-5.7	N163-5.7	V162-5.6	N149-5.7
12	*Ciconia nigra* Black Stork	*Not observed at a blade swept height*								
21	*Pernis apivorus* European Honey Buzzard	0.03	**0.03**	0.02	39.02	**35.57**	41.77	0.64	**0.70**	0.60
22	*Circaetus gallicus* Short-toed Snake Eagle	0.18	0.17	**0.19**	5.68	5.93	**5.35**	4.40	4.22	**4.68**
24	*Circus aeruginosus* Western Marsh Harrier	0.06	0.05	**0.07**	15.94	18.42	**13.86**	1.57	1.36	**1.80**
26	*Accipiter nisus* Eurasian Sparrowhawk	0.08	0.03	**0.14**	11.89	32.42	**7.38**	2.10	0.77	**3.39**
27	*Accipiter gentilis* Northern Goshawk	0.25	**0.27**	0.23	4.07	**3.71**	4.35	6.15	**6.74**	5.74
28	*Milvus migrans* Black Kite	0.02	**0.02**	0.02	62.26	**56.78**	66.42	0.40	**0.44**	0.38
29	*Buteo buteo* Common Buzzard	2.73	2.60	**2.94**	0.37	0.39	**0.34**	68.35	64.90	**73.46**
30	*Buteo rufinus* Long-legged Buzzard	0.10	**0.11**	0.10	9.72	**8.86**	10.39	2.57	**2.82**	2.41
43	*Falco subbuteo* Eurasian Hobby	0.03	0.02	**0.04**	33.21	44.08	**26.44**	0.75	0.57	**0.95**

The data in Table 14-1 clearly illustrates that collision risk depends on WTG model and species ecology. It is evident that WTG N149-5.7 generates higher risk for most species as it has the lowest swept height. The species impacted spend more flight time at lower altitudes (closer to the ground and/ or vegetation).

For the remaining species, which show no preference for low-altitude flights, higher risk is generated by V162-5.6, which has larger maximal chord width of blade. The N163-5.7 poses the lowest risk for all species except for the Eurasian Sparrowhawk (N149-5.7) which has a significantly higher risk. The differences across the WTG models are not significant for any other species.

Very low collision risk (<1 collision over the Project lifespan) is predicted from CRM for 4 species populations: Black Stork (*Ciconia nigra*), European Honey Buzzard (*Pernis apivorus*), Black Kite (*Milvus migrans*), and Eurasian Hobby (*Falco subbuteo*). Although incidental collision fatalities of these species cannot be excluded, such low (potential) additional mortality could not affect their populations even at the site level. As no impact of collision mortality from the WTGs is assessed for the Black Stork, European Honey Buzzard, Black Kite, and Eurasian Hobby these species are not subjected to further detailed assessment.

A potentially significant impact on the population sustainability of the remaining six species cannot be excluded. Therefore, a detailed assessment of the potentially affected population sensitivity to additional mortality is considered needed. Since detailed demographic data for potentially affected local, regional or national populations are not available, population modelling (using population matrixes) is not possible. Therefore, the PBR methodology developed by Niel & Lebreton (2005) and Dillingham & Fletcher (2008) was used to estimate the level of additional mortality (or potential biological removal) that can be sustained by the potentially affected populations.

Calculated harvest rates for all potentially affected populations are presented in Table 14-2, along with potential mortality rates from collision, for direct comparison. All the details on parameters and all calculations are provided in Appendix C.

The likely effect of collision mortality on the sustainability of potentially affected populations were evaluated by direct comparison of estimated worst-case mortality rate from collision and harvest rates for the particular (sub) population. Collision mortality is considered sustainable when below the allowable harvest rate, and unsustainable when above maximum harvest rate, whilst any value between would need further investigation (Dillingham & Fletcher 2008).

When collision mortality at the lower level of the extent (geographical scale), i.e. on a smaller, sub-population, is evaluated as sustainable, sustainability at the higher scale is ascertained, and mortally rates of larger encompassing population have not been included in Table 14-2 for clearer presentation (although calculated and available in Appendix C).

Table 14-2 Estimated Effect of the Worst-Case Collision Mortality at the Crni Vrh WPP on Target Species Populations

Legend and notes

No in column 1. - same as in Table 8-5, for convenience;

Potentially affected (sub-) population - defined by source and character (breeding, migrating or wintering) ;

Annual harvest rate

- **h_a** = allowable harvest rate (additional human-caused mortality rate likely to be sustainable) - calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008),
- **h_{max}** = maximum harvest rate (maximum mortality rate that could possibly be sustainable) - calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008) ;
- **from collision** = n_c / N_{min} (n_c = number of birds colliding annually, from CRM (Table 14-1) ; N_{min} = conservative population size estimate, calculated according to Dillingham & Fletcher (2008)) - unsustainable in **red**, sustainable in **blue**.

No.	Species name	Potentially affected (sub-) population	Annual mortality rate (%)		
			h_a	h_{max}	from collision
22	*Circaetus gallicus* Short-toed Snake Eagle	East Serbia, breeding	2.02	6.94	0.22
24	*Circus aeruginosus* Western Marsh Harrier	Serbia, migrating	3.56	11.01	0.04
26	*Accipiter nisus* Eurasian Sparrowhawk	East Serbia, breeding	26.53	27.84	0.02
27	*Accipiter gentilis* Northern Goshawk	East Serbia, breeding	1.19	12.61	0.06
29	*Buteo buteo*	East Serbia, resident	7.17	7.61	0.15

No.	Species name	Potentially affected (sub-) population	Annual mortality rate (%)		
			h_a	h_{max}	from collision
	Common Buzzard				
30	*Buteo rufinus* Long-legged Buzzard	East Serbia, breeding	0.70	7.61	**0.49**

The impact of collision mortality was predicted for each of the six potentially affected populations: Short-toed Snake Eagle (*Circaetus gallicus*), Western Marsh Harrier (*Circus aeruginosus*), Eurasian Sparrowhawk (*Accipiter nisus*), Northern Goshawk (*Accipiter gentilis*), Common Buzzard (*Buteo buteo*), and Long-legged Buzzard (*Buteo rufinus*). The analysis indicates that there will be a **negligible** (i.e. not significant) **impact** on the regional populations of Short-toed Snake Eagle, Western Marsh Harrier, Eurasian Sparrowhawk, Northern Goshawk, Common Buzzard, and Long-legged Buzzard.

The remaining species observed within the WPP site are not susceptible to collision mortality. Whilst incidental single collision fatalities of these species cannot be completely excluded, such a low (potential) additional mortality could not affect their populations even at the site level. Therefore, **no impact** of collision mortality from WTGs on all other populations of significant nature conservation value has been assessed.

All other bird populations (potentially) occurring within the site are of insignificant nature conservation value (valued at the local level at the most), and any potential impact could only be not significant as well (CIEEM 2016, European Commission 2020, SNH 2018a). Moreover, these species are not susceptible to collision mortality (and thus not identified as target species). Although incidental single collision fatalities of these species as well cannot be completely excluded, such a low (potential) additional mortality could not affect their populations even at the site level. Therefore, **no impact** of collision mortality from OHLs on all bird populations of insignificant nature conservation value can be ascertained.

14.2.1.4.5 Use of OHL pylons for perching and nesting

The use of pylons for perching and nesting species such as corvids and raptors, is a possible exception to generally negative impacts of power lines on birds. This behaviour can put them at greater risk of collision or electrocution, and can negatively impact other species that take these birds as prey (SNH 2016). Such use of OHL pylons is usually important in areas where woodland vegetation and other options for nesting and perching are scarce, such as lowland farmland areas of Vojvodina Province in Serbia (e.g. Puzović 2007a, b).

There are several existing high-voltage OHLs as well as several medium/ low-voltage lines of the distribution network at site and surrounding area. However, not a single case of bird nesting on the OHLs was recorded by either the main ESIA Surveys or Preliminary Surveys. Individual birds were rarely observed perching on the cables. This was fully expected since natural options for nesting, resting and perching are available in the area in abundance.

Therefore, it is considered that the occurring bird populations will not use the Project OHLs for perching or nesting to any significant extent, and the **positive** impact is assessed as **negligible**, and evaluated as **not significant**.

Furthermore, any non-incidental electrocution is prevented (see section 14.2.1.4.2), and any negative effect is excluded. Therefore, **no negative impac**t is assessed.

14.2.1.4.6 Project-specific habitat gain

It is noted that any habit gain of Balkan-mountain hay meadows will certainly positively affect the general diversity of the bird fauna of the area, grassland-associated species in particular.

This is of particular importance as this habitat type is rapidly diminishing throughout the region. Consequently, the bird species associated with it are diminishing as well, including Grey Partridge (*Perdix perdix*) which occurs at the site. However, it is not possible to reliably assess whether this impact will be significant for bird fauna, as this depends on a number of factors that cannot be predicted without very extensive research. The operational monitoring of the Project will inform the consideration of the significance of this impact on birds. Once this work is complete, the operator may be able to suggest how any restored hay meadows could be maximised to ensure a positive impact on birds. However, it is essential that any such recommendations must not increase the risk of collision mortality from WTGs.

14.2.1.5 Bats

This section considers the potential impact of the WPP on all bat species populations occurring within the site boundary, principally operational mortality through collision or barotrauma caused by operating WTG blades. The potential impact of habitat promoted by the NPCs (IfNC 2021b) is also considered.

The magnitude, direction and scale of potential impact on bats were assessed based on occurring populations' nature conservation value, species ecology and susceptibility to potential impacts, as well as populations' ecological status at the site, size and other demographics.

14.2.1.5.1 Operational mortality

EUROBATS established the concept that "*the most significant impact of operating wind turbines on bats is direct killing, caused due to collision and/ or barotrauma. Migrating bats and bats from local sedentary populations are often killed by wind turbines, sometimes in large numbers*."

Bat mortality from operating WTGs cannot be predicted on the basis of the pre-construction surveys activity data in the same way that collision risk modelling is used to predict bird mortality. Bat site-and-population-specific risk of mortality must:

- Initially be estimated on the basis of occurring populations' ecological status and habitat use at the site. Particular consideration is given to the presence and location of commuting routes and foraging areas, and species-specific susceptibility to mortality from operating WTGs.
- The sensitivity of the potentially affected population can then be estimated on the basis of population nature conservation value and size.
- The estimate of the site-and-population-specific mortality risk and population sensitivity, the operational mortality rates and their effect on the sustainability of the potentially affected population is evaluated using PBR methodology.

Operational mortality is considered sustainable when below the allowable harvest, and unsustainable when above maximum harvest, whilst any value between would need further investigation.

It is important to note that the Primary Mitigation already adopted within the Project Zoning Plan(s) has ensured that most of the potentially valued bat habitats will not be impacted by the development. These areas include all of the mature near-natural woodland and the majority of the younger relatively preserved forest stands. These areas include the habitats where flight activity is expected to be the highest as many of the trees will contain bat roosts. Therefore, the areas where the site-specific risk of operational mortality would be the highest have already been avoided, and the overall site/ Project-specific risk has been significantly reduced for all occurring species.

The Conceptual Design layout (valid at the beginning of the surveys and on which the ESIA is based) included 14 WTGs locations within, or in the immediate vicinity of, woodland: I1, I5, I7, I10, I12, II1, II6, II8, II10, III1, III2, IV1, IV3, IV4. Although all woodland in the areas of these locations is degraded and of low ecological value, these positions still have a higher site-specific risk of operational mortality than other areas of the WPP. Species foraging areas of some importance (though not of a significant nature conservation value) have been identified on:

- The northern slopes of the Crni Vrh mountain (where WTG III1 and III2 are sited);
- in the area of a marshland fragment and surrounding woodland (where WTG IV1 is sited and K2 mast located); and
- to some extent in the areas of less degraded woodland (II10, II1, I10, I1 and II6, and II8).

Even in these areas, the overall activity of the *Pipistrellus/Hypsugo/Miniopterus* spp. and *Nyctalus/Vespertilio* spp. groups is generally low and only occasionally moderate. These species are highly susceptible to mortality from operating WTGs.

Only in area of WTG III1 is the overall activity considered to be high, and in the area of WTG IV1 the overall activity is moderate and occasionally high. It is noted that the Automated Surveys comes identified that this activity at WTG III1 is exclusively from the *Myotis/Barbastella/Plecotus* spp. Group. This species group is characterised by a very low (only exceptionally moderate) susceptibility to mortality from operating WTGs, and only incidental individual fatalities of only some of these species have been recorded at wind farms in Europe. In contrast, the activity at WTG IV1 mainly comes from the *Nyctalus/Vespertilio* spp. group of species characterised by a high susceptibility to mortality from operating WTGs, and they are amongst the most frequent fatalities at wind farms in Europe in Europe.

Based on the above, it is considered that the population, and location specific risk, of operational mortality for all species of bats is potentially:

- **moderate** in areas of woodland on the northern slopes of Crni Vrh mountain (WTGs III1 and III2) and the marshland fragment and surrounding woodland close to WTG IV1;
- **low** in the areas of less degraded woodland (I1, I10, I12, II1, II6 and II10); and
- **negligible** in all other areas.

When considering the very low species-specific susceptibility to operational mortality, as well as the negligible to low species activity and abundance at the site, a **negligible** site-and-population-specific mortality risk is concluded for Bechstein's Bat (*Myotis bechsteinii*), Whiskered Bat (*Myotis mystacinus*), Mouse-eared Bats (*Myotis myotis/blythii*), and Brown Long-eared Bat (*Plecotus auritus*). Although incidental single fatalities of these species cannot be completely excluded, the sustainability of potentially affected populations is predicted even at the local level. Therefore, **no** impact of operational mortality on Bechstein's Bat, Whiskered Bat, Mouse-eared Bats, and Brown Long-eared Bat resident populations is assessed.

The literature suggests that the species-specific susceptibility to operational mortality is **moderate** for Western Barbastelle Bat (*Barbastella barbastellus*) and **high** for Leisler's Bat (*Nyctalus leisleri*). However:

5. The literature also shows that only a very few Western Barbastelle Bat fatalities have been recorded at WPPs in Europe (Dürr 2021a). It seems likely that this is because this species flies at greater heights and immediately above the canopy. This would suggest that a **negligible** site-and-population-specific mortality risk would be appropriate, and a **negligible** mortality rate could be expected, i.e. significantly below allowable mortality from Table 14-3. However, moderate activity was occasionally recorded on site in the areas of less degraded woodland, such as around the WTG locations I1, I10, I12, II1, II6, II10, III1, III2, and IV1. Taking a precautionary approach, a **moderate** site-and-population-specific mortality risk, and consequently higher mortality rates (above the allowable mortality from Table 14-3), cannot be completely excluded. Taken within the context of a Carpathian Serbia regional population that is relatively small, the negligible mortality would not affect the sustainability of the regional population. Therefore, it is likely that there will be **no impact** of operational mortality on Western Barbastelle Bat resident population is assessed on a precautionary basis as **low negative regional**, and therefore **possibly significant**.
6. The literature shows that only half as many Leisler's Bat fatalities have been recorded at WPPs in Europe than of the sibling Noctule Bat (Dürr 2021a). This may be due to the Leisler's Bat ecology in that it flies mostly just above the canopy and in open space only up to 40 m. The literature also shows that the mortality risk is particularly high for migratory populations (Rodrigues *et al*. 2015). When considering a negligible overall activity at the site, a low site-and-population-specific mortality risk is considered likely, and low mortality rate is expected (bellow allowable mortality from Table 14-3). However, moderate activity was occasionally recorded in the area of the marshland fragment and in less degraded woodland in the northern part of the site, i.e. at or around the WTG locations I10, I12, II10, and IV1. Although occasionally higher activity is not predictable of a higher mortality rate, it can be indicative. Again, taking a precautionary approach, a **moderate** site-and-population-specific mortality risk, and consequently higher mortality rates (above the allowable mortality from Table 14-3), cannot be completely excluded. Taken within the context of a Carpathian Serbia regional population that is relatively large, the resident population at the site is small and migratory even smaller a negligible mortality would not affect the sustainability of the regional population. Therefore, it is likely that the impact of operational mortality on Leisler's Bat resident and migratory population is assessed as likely **negligible**, and, only as a precaution, possibly **low negative regional**, and evaluated accordingly as likely **not significant** and possibly **significant**.

It is important to note that these analyses are based on pre-construction surveys, whilst bat activity is very likely to increase within the site boundary following construction as many bat species are often attracted to WPPs (Rodrigues *et al*. 2015). Although particular care was taken in this assessment to identify such possible changes (e.g. due to Project-specific habitat gain), some of the changes remain unpredictable. As a precaution, worst case sustainability limits, i.e. the number of fatalities likely to be sustainable, have been calculated for all these populations using PBR methodology, see Table 14-3. This table includes site populations estimates, for direct comparison.

Simply put, mortality is considered sustainable when it remains below the allowable mortality, and unsustainable when above maximum mortality. This means that cumulative operational fatalities must not exceed the calculated allowable mortality (M_a in Table 14-3). It is noted that all species populations at the site are very small in comparison with their relatively large regional populations.

It is noted that the whole site populations (in pre-construction period) of all species considered highly susceptible to mortality from operating WTGs were smaller than the allowable mortality (Table 14-3). Therefore, the unsustainable mortality of all the species, except for the two analysed previously in detail, is considered **extremely unlikely**.

Potentially the highest risk is associated with the WTG IV1, where, due to numerous ecological specificities, the highest overall bat activity is recorded, as well as the highest activity of most of the highly susceptible species. The **impact** of operational mortality on **all other species highly susceptible to operational mortality** is assessed as very **likely negligible**, and, only as an utmost precaution, **possibly low negative regional**, and evaluated accordingly as **very likely not significant** and **unlikely significant**.

Table 14-3 Population Estimates and Sustainability Limits of Regional Populations of Bat Species

Legend and notes

These species are considered to be highly susceptible to mortality from operating WTGs, valued occurring populations are highlighted.

Crni Vrh WPP site population estimate (number of adult individuals) – estimated on the basis of the ESIA Bat Survey: minimum-maximum, () - migratory population;

Annual mortality sustainability limits (number of fatalities):

M_a - allowable harvest (i.e. additional human-caused mortality likely to be sustainable) = h_a x N_{min} [h_a = allowable harvest rate, N_{min} = conservative population size estimate, calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008)];

M_{max} - maximum harvest (maximum mortality rate that could possibly be sustainable) = h_{max} x N_{min} [h_{max} = maximum harvest rate, N_{min} = conservative population size estimate, calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008)].

Species name		Crni Vrh WPP site population estimate	Annual mortality sustainability limits	
Scientific	English		M_a	M_{max}
Myotis bechsteinii	Bechstein's Bat	10-20	42	178
Myotis mystacinus	Whiskered Bat	20-50	441	670
Myotis blythii	Lesser Mouse-eared Bat	<10	141	657
Myotis myotis	Greater Mouse-eared Bat	10-20	289	1,461
Barbastella barbastellus	Western Barbastelle Bat	<10	15	129
Plecotus auritus	Brown Long-eared Bat	<10	10	152
Nyctalus leisleri	Bechstein's Bat	20-50(10-25)	327	1,960
Miniopterus schreibersii	Schreiber's Bent-winged Bat	<10	4,566	7,265
Pipistrellus pygmaeus	Soprano Pipistrelle Bat	<10	918	1,499
Pipistrellus pipistrellus	Common Pipistrelle Bat	20-50	1,756	4,427
Pipistrellus kuhlii	Kuhl's Pipistrelle Bat	<10	12,490	18,975
Pipistrellus nathusii	Nathusius' Pipistrelle Bat	20-50 (10-25)	606	921
Hypsugo savii	Savi's Pipistrelle Bat	<10	730	1,311
Vespertilio murinus	Parti-coloured Bat	<10	326	584
Nyctalus noctula	Noctule Bat	20-50 (20-50)	6,101	12,519

14.2.1.5.2 Project-specific habitat gain

The assessment finds that habit gain in valued Balkan-mountain hay meadows is expected to be beneficial for bat species that collect their prey from the ground or grassland vegetation. These species are the Lesser Mouse-eared Bat (*Myotis blythii*) and Greater Mouse-eared Bat (*Myotis myotis*) both considered to have valued populations occur at the site, and Serotine Bat (*Eptesicus serotinus*). The increase in the area of Balkan-mountain hay meadows should lead to the increase in the population size of these species although the risk of operational mortality will not be significantly increased for these species as they are not particularly susceptible to mortality from operating WTGs.

The operational monitoring regime will provide data that will be used in the review the management plan for the restored hay meadows. The primary aim must be to maximise the positive impacts on bats whist taking particular care not to increase the risk of collision mortality from WTGs.

14.2.2 Impacts Summary

Primary Mitigation already adopted within the Project Zoning Plan(s) and the NPCs have ensured that almost all potential negative impacts of the WPP on potentially affected ecological features are avoided (or significantly reduced) early in the Project development. The Assessment finds that the operation of the WPP will have **no significant negative** impacts on all flora, fauna and bird populations.

There are **no direct impacts** of WPP operation on designated sites and habitats.

Only several plant and insect species populations of significant nature conservation value are present within the developed areas of the site and none of them are susceptible to any impact from WPP operation as such. All remaining flora and fauna (other than birds and bats) populations present are of insignificant nature conservation value and any impact on them could be not significant as well. However, none of the valued occurring populations is sensitive to disturbance and **no impact** is assessed.

Some bird collision fatalities from WTGs are inevitable. The collision risk assessment indicates that there will be a **negligible impact** on the regional populations of Short-toed Snake Eagle, Western Marsh Harrier, Eurasian Sparrowhawk, Northern Goshawk, Common Buzzard, and Long-legged Buzzard. The remaining species observed within the WPP site are considered not susceptible to collision mortality or of insignificant nature conservation value. Although incidental single collision fatalities of these species as well cannot be completely excluded, such a low (potential) additional mortality could not affect their populations even at the site level. Therefore, **no impact** of collision mortality from OHLs on all other bird populations can be ascertained.

Some bird collision fatalities from OHLs are inevitable, though site and project-specific collision risk from Project OHLs is considered negligible. Therefore, very low and sustainable mortality rates are predicted for several species populations susceptible to collision, and **negligible impact** (at the most) is assessed. For all other occurring bird species populations, only incidental fatalities might occur and **no impact** is concluded.

Bird electrocution mortality from the Project OHLs is not possible due to their technical features, whilst adherence to NPC will prevent any non-incidental electrocution on other electric installations.

Some bat fatalities from operational WTGs are inevitable. The impact on the majority of bat populations from mortality caused by operating WTGs is assessed as **none** or **negligible**, and **not significant**. The impact on the valued Western Barbastelle Bat resident population and Leisler's Bat resident and migratory population is assessed as **negligible to minor negative regional** and **likely not significant**.

The NPC habitat management requirements will increase the surface area of the valued habitat type, Balkan-mountain hay meadows. The NPC requires that shrub and weed vegetation must be removed within a radius of 200 m from the WTGs and mowed (or grazed) at a height of 20 cm (to be implemented through OESMP). This will lead to restoration and maintenance of about 289 ha of the valued Balkan-mountain hay meadows at the site. This impact on habitats as such is assessed as **positive moderate regional**, and **significant positive**. The habitat gains for flora and fauna, including bids and bats is expected to be *positive* but this must be assessed and confirmed following completion of the post-construction monitoring programme.

14.2.3 Proposed Mitigation/ Control Measures and Significance of Residual Impacts

The Primary Mitigation of the potential impacts on habitats, flora and fauna was achieved through a fundamental re-design of the WPP layout following the Scoping Study. These changes provided a comprehensive set of measures to avoid and minimise negative effects of the Project on various ecological features, see Chapter 12. The Primary Mitigation, along with adherence to legal requirements, NPC will ensure that all potential negative impacts of the Project on any ecological features are avoided or minimised, and the Assessments concludes that only **not significant negative** residual effects could occur.

The legal obligations imposed by the Law on Nature Protection (see section 13.2.3.1) are applicable during operation. Enforcement of these general measures during the operation as well must be ensured through the Project Management Plans (OESMP), along with other generic GIIP aimed at minimising operation impacts on all habitats and species.

Monitoring of the operational impacts on birds and bats is required by the Law (Official Journal of RS, No. 36/2009, 88/2010, 91/2010 - *correction*, 14/2016, 71/2021), the NPCs (IfNC 2021b) and the PR/PS 6 (IFC 2012b, EBRD 2019, World Bank Group 2015). The Post-construction monitoring methodological design should be based on the methodology implemented in this ESIA surveys (see section 7.3.3) to maximise compatibility and comparability of the results. Detailed post-construction Monitoring Programme should be agreed with the IfNC and Lenders, integrated into the Project OESMP and implemented as it's integral part. Outline of the key elements of the post-construction Monitoring Programme is provided below.

Bird Survey Plan

- Breeding raptor (and other larger bird species) surveys and breeding nocturnal species (owl) surveys:
  - The survey area extending 2 km beyond the site boundary,
  - Total counts of occupied home ranges and active nests using walkover survey and territory mapping (Hardey *et al.* 2009);
- Breeding woodland and farmland bird surveys:
  - Sampler points as in Figure 7-1,
  - Snapshot Method for surveys and Distance Sampling for analyses (Buckland et al. 2015);
- Vantage point surveys:
  - VPs location as in Figure 7-1,
  - SNH (2009, 2016, 2017) survey methodology.

Bat Survey Plan

- Automated monitoring of activity at nacelle height is required:
  - Automated bat registration systems are to be installed at WTGs I1, I10, I15, II1, II6, II10 and III1.
  - Full analyses of the recordings (to attribute bat calls to particular species groups) from 5 consecutive nights per month, only counts of bat calls for all remaining nights.

Bird and Bat Mortality Survey Plan

- Monitoring setup and initial training;
- Carcass searches – systematic surveys for bird and bat fatalities around each WTG, within the areas enabling efficient searches (road-and-pad), and where possible, along the Project OHLs;
- Bias-correction trials: Unsearched Area Correction Trials, Searcher Efficiency Trials, Carcass Removal Trials;
- Estimation of mortality rates – using appropriate modelling methods (e.g. *Genest* or *Evidence of Absence* software preferably, or possibly also www.wildlifefatalityestimator.com internet platform).

Along with the target cancellation of the WTGs, the targeted shut down of WTGs located in the areas where this impact is predicted, during periods and weather conditions of predicted impact, is the only mitigation proven to be effective (Rodrigues et al. 2015). WTGs in the areas of established foraging areas (and display territories) of the two valued populations have been identified as potentially the most harmful. Therefore, targeted mitigation is proposed to mitigate the worst-case scenario, i.e. possible significant negative impact on potentially affected populations: Western Barbastelle Bat, Leisler's Bat and Leisler's Bat (see the mitigation tables below).

Whilst not mandatory, it would be very informative if the OESMP Biodiversity Management Plan includes basic targeted surveys of flora and fauna, including bats, in the area of restored Balkan-mountain hay meadows. The purpose would be to determine the significance of habitat gain and inform adaptive management as to maximise positive effects on flora and fauna.

According to NPC (IfNC 2021b) and IFIs (IFC 2012b, EBRD 2019), an initial period of 3 years is required for Bird and Bat Mortality Surveys. For other elements of the Monitoring Programme, an initial period of one full year is proposed. After these periods, in accordance with the findings and in consultation with IfNC and Lenders, the need for continuation and the scope of further monitoring would be assessed.

In line with the requirements of PR/PS 6 (IFC 2012b, EBRD 2019, World Bank Group 2015), and the NPCs (IfNC 2021b), an adaptive management plan should be adopted "*in which the implementation of mitigation and management measures are responsive to changing conditions and the results of project monitoring throughout the project life cycle*". This is of particular importance considering inherent uncertainty in predicting bat operational mortality, and future consideration should be given to the careful use shutdown programmes to mitigate excessive bat mortality.

14.2.4 Conclusions

A summary of potential impacts of operation on ecological features is provided in tables below.

<table>
<tr><td>Impact or Opportunity:</td><td colspan="2">Operational mortality of valued Western Barbastelle Bat resident population.</td><td>Ref. No.:</td><td>33</td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="4">~~Positive/~~ Negative
Direct~~/ Indirect~~
~~Temporary/ Short-term/ Medium-term/~~ Long-term~~/ Permanent~~
~~Local/ National/~~ Regional</td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="4">Conditional shutdown programme for Western Barbastelle Bat resident population. The preliminary shutdown programme must be prepared for implementation at WTGs I1, I10, I12, II1, II6, II10, III1 and III2, from 15 March until 15 November, from sunset until sunrise when all the following thresholds are met:
• wind speed (measured from nacelle) 6 m/s or bellow,
• temperature 10°C or above,
• no heavy rainfall.
The proposed shutdown programmes would only be implemented if unsustainable mortality of the particular population is recorded by the post-construction monitoring mortality surveys. In such a case, immediate implementation of the shutdown programme is crucial to effectively mitigate fatalities. Therefore, shutdown programmes must be prepared and ready for implementation should they be needed. The conditional shutdown programmes should be implemented through OESMP.</td></tr>
<tr><td>Residual Impact:</td><td colspan="4">Negligible to minor negative local and not significant.</td></tr>
<tr><td>Residual Impact Rating:</td><td>~~Substantial Beneficial~~
~~Moderate Beneficial~~
~~Minor Beneficial~~
~~Negligible Beneficial~~</td><td>No Change</td><td colspan="2">~~Negligible Adverse~~
~~Minor Adverse~~
~~Moderate Adverse~~
~~Significant Adverse~~</td></tr>
</table>

Table 14-4 Operational Mortality of Western Barbastelle Bat

Impact or Opportunity:	Operational mortality of valued Leisler's Bat resident and migratory populations.	**Ref. No.:**	34
Characteristics of the Impact or Opportunity:	~~Positive/~~ **Negative** **Direct**~~/ Indirect~~ ~~Temporary/ Short-term/ Medium-term/~~ **Long-term**~~/ Permanent~~ ~~Local/ National/~~ **Regional**		
Impact Mitigation or Opportunity Enhancement:	Conditional shutdown programme for Leisler's Bat resident and migratory population. The preliminary shutdown programme must be prepared for implementation at WTGs I10, I12 and II10, from 15 March until 15 November, from sunset until sunrise when all the following thresholds are met: • wind speed (measured from nacelle) 6 m/s or bellow, • temperature 10°C or above, • no heavy rainfall. The proposed shutdown programmes would only be implemented if unsustainable mortality of the particular population is recorded by the post-construction monitoring mortality surveys. In such a case, immediate implementation of the shutdown programme is crucial to effectively mitigate fatalities. Therefore, shutdown programmes must be prepared and ready for implementation should they be needed. The conditional shutdown programmes should be implemented through OESMP.		
Residual Impact:	**Negligible** to **minor negative** local and not significant.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-5 Operational Mortality of Leisler's Bat

Impact or Opportunity:	The NPC habitat management requirements will result in a significant gain in valued Balkan-mountain hay meadows within the site. This is also expected to be beneficial for grassland-associated species of flora and fauna.	**Ref. No.:**	35
Characteristics of the Impact or Opportunity:	**Positive**/~~Negative~~ ~~Direct/~~ **Indirect** ~~Temporary/ Short-term/ Medium-term/ Long-term/~~**Permanent** **Local**/ ~~National~~/ **Regional**		
Impact Mitigation or Opportunity Enhancement:	No specific mitigation needed (other than adherence to legal requirements, NPC, and generic GIIP). The NPC (IfNC 2021b) habitat management requirement (to be implemented through OESMP) will lead to a gain in Balkan-mountain hay meadows at the site. This will also benefit grassland-associated species. Monitoring (to be implemented through OESMP): targeted bat surveys to determine the significance of habitat gain and inform adaptive management as to maximise positive effects yet not increasing collision risk.		
Residual Impact:	Positive impact of habitat gains due to NPC habitat management requirements, though of indeterminable significance (to be determined by Monitoring).		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ **Minor Beneficial** ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-6 Project-Specific Habitat Gain

14.3 Socio-Economic

Socio-economic impacts associated with Project operation activities have been grouped and presented under the following headings:

- Impacts to land use
- Employment and procurement opportunities
- Impacts on livelihoods
- Revenue generation for local government and communities and local development
- Impacts on infrastructure.

Impacts on community health, safety and security are presented in Section 14.8.

14.3.1 Impact Assessment

14.3.1.1 Land Use

As mentioned in the construction section of this impact assessment, an estimated 33 ha land will be available for use again upon completion of construction. As this land is largely unused, the sensitivity of individual users of land is low and the magnitude of this impact is medium; the impact will affect a small number of people, but the change will be permanent. As a result, the significance of this impact is assessed as **minor beneficial.**

14.3.1.2 Employment and Procurement Opportunities

The life of the project is expected to be at least 25 years and during that time a small workforce will be needed. The Developer estimates that no more than 10 individuals will be employed during operations. Whilst the stability of long-term employment will have a significant beneficial effect on the lives of these individuals and their households, whose sensitivity is medium, this number is very low making the magnitude negligible and resulting in the significance of this impact being assessed as **negligible beneficial**.

Indirect employment may occur as a result of increased spending of those employed by the Developer, however since this number is so low, this is also assessed as a **negligible beneficial** impact. The procurement of local goods and services is also likely to be minimal and have a **negligible** impact on local economies. In both cases the receptors' sensitivity (local residents / communities) is considered medium, however the magnitude of the impacts is negligible, as they will benefit a very small number of people.

14.3.1.3 Livelihoods

During the operational phase, some trees may be damaged or lost if land plots are accidentally entered by machinery or as the consequence of some other incident such as fire or ice throw. The Developer will compensate owners of land for all lost trees and damages, at full replacement value and land will be fully reinstated, which is why the magnitude is considered low. The sensitivity of users of land who are impacted is also low, as the affected areas are expected to be very small, which is why the significance of this impact is assessed as being **negligible adverse**.

14.3.1.4 Revenue Generation for Local Government and Communities and Local Development

As the Developer is registered in Žagubica, this municipality is the recipient of the environmental protection tax and the communal tax. Once the WPP and all associated facilities are constructed, both affected municipalities (Bor and Žagubica) will be the recipients of property tax revenues.

Any increase in the local budget will have significant benefits for the local population. It will enable the municipalities to make some important investments and will most likely improve the delivery of certain services to citizens, particularly in terms of infrastructure improvements. The magnitude is considered to be low. Due to the importance of any budget revenues for underdeveloped municipalities such as Žagubica, its sensitivity is considered to be medium and therefore the impact is assessed as **minor beneficial**. For Bor, whose budget is significantly higher, the sensitivity is minor and the impact is assessed as **negligible beneficial**.

CVP plans to support civil society including hunting organisations, through a corporate social responsibility programme. The sensitivity of the receptors, i.e. local organisations is considered to be medium as they lack financing opportunities to support their activities. However, the magnitude is considered to be low as only a small number of organisations will benefit. Therefore, the significance of these impacts is assessed as **minor beneficial**.

14.3.1.5 Infrastructure

The Developer will carry out regular maintenance of upgraded access tracks needed to access wind turbines for repairs and maintenance and the magnitude of these works is considered low. The sensitivity of local users of land is considered medium, and the significance of the impact is assessed as being **minor beneficial**.

14.3.2 Impacts Summary

The most significant socio-economic impacts during the operation phase are in relation to revenue generation, particularly in Žagubica, and support to local development through financing of local initiatives.

Minor beneficial impacts are expected as a result of land previously occupied for construction becoming available for use again, as well as the regular maintenance of access tracks used by local owners of land. All other impacts such as employment and procurement opportunities, as well as any impacts on livelihoods, are negligible. The positive impacts are mostly long term and all impacts are of a local character.

14.3.3 Proposed Mitigation/ Control Measure

14.3.3.1 Land Use

Maximise the amount of land which can be used again and fully restore all previously used land to its original condition. With that, at least 33 ha will be available for use again.

Employment and Procurement Opportunities

As for construction related employment, the contracting of any individuals for the operation of the WPP will follow principles of international best practice. To foster the creation of indirect employment opportunities, the Project will continue to procure goods and services locally whenever possible.

If the above measures are implemented, more local people will be employed and more goods procured locally, enhancing the positive impact.

Livelihoods

Economic displacement of persons whose trees may be affected by repairs will be mitigated by undertaking the following measures:

- Minimise the amount of land occupied / disrupted during repairs;
- Compensate all users of land for lost crops and any other damages at full replacement value;
- Fully reinstate the land after disruption;
- Implement a grievance mechanism.

If the above measures are implemented, it is expected that no one will be economically displaced by the project.

Revenue Generation for the Local Government and Communities and Local Development

Ensure that all revenues and tax payments are made in a timely and transparent manner. Regular payments into the municipal budget will provide some stability in the long term and will enable the municipalities to make more significant investments for the benefit of local residents.

Provide local organisations with financing opportunities which will further enable them to plan and implement more sustainable projects, increasing the rating of the impact from minor to **moderate beneficial**.

Infrastructure

Regular maintenance of access tracks will be carried out to contribute to improved access to land plots and this will maintain the positive relationship with local owners of land.

14.3.4 Conclusions

A summary of socio-economic impacts during the operational period is provided in the tables below.

Impact or Opportunity:	Land rehabilitated and available for use to individual users (low sensitive receptors).		**Ref. No.:**	36
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Maximise the amount of land which can be used again, fully restore all previously used land to its original condition.			
Residual Impact:	At least 33 ha will be available for use in the same way as before the project.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 14-7 Land Rehabilitated and Available for Use

Impact or Opportunity:	Employment opportunities for local residents (medium sensitive receptors).		**Ref. No.:**	37
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	As for construction related employment, the contracting of any individuals for the operation of the WPP will follow principles of international best practice.			
Residual Impact:	More local people are employed than originally anticipated.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 14-8 Employment Opportunities during Operation

Impact or Opportunity:	Procurement opportunities for local companies (medium sensitive receptors).	**Ref. No.:**	38
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ **National**/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	To foster the creation of indirect employment opportunities, the Project will continue to procure goods and services locally whenever possible.		
Residual Impact:	More goods are procured locally than originally anticipated.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-9 Procurement Opportunities during Operation

Impact or Opportunity:	Involuntary economic displacement of users of land (low sensitive receptors).	**Ref. No.:**	39
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Minimise the amount disrupted land and damages; Compensate all users of land for lost trees and any other damages at full replacement cost; Fully reinstate the land after disruption; Establish and implement a grievance mechanism.		
Residual Impact:	No one will be economically displaced by the project.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ **Negligible Beneficial**	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-10 Involuntary Economic Displacement of Users of Land

Impact or Opportunity:	Revenue generation for local government and communities (Žagubica: medium and Bor: low sensitive receptor).	**Ref. No.:**	40
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Ensure that all payments are made in a timely and transparent manner.		
Residual Impact:	Regular payments into the municipal budget will provide some stability in the long term and will enable the municipality to make more significant investments for the benefit of local residents.		
Residual Impact Rating:	~~Substantial Beneficial~~ **Moderate Beneficial** **Minor Beneficial** ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-11 Revenue Generation for Local Government and Communities

Impact or Opportunity:	Support for local initiatives and development (medium sensitive receptors).	**Ref. No.:**	41
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Ensure that calls for proposals are organised regularly and increase the amount of financing if feasible.		
Residual Impact:	Provide local organisations with sustainable financing opportunities which will enable them to plan and implement more sustainable projects.		
Residual Impact Rating:	~~Substantial Beneficial~~ **Moderate Beneficial** ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-12 Support for Local Initiatives

<table>
<tr><td>Impact or Opportunity:</td><td colspan="2">Regular maintenance of access tracks to enhance land use by local land owners (medium sensitive receptors).</td><td>Ref. No.:</td><td>42</td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="4">Positive/ ~~Negative~~
Direct/ ~~Indirect~~
~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ Long-term/ ~~Permanent~~
Local/ ~~National~~/ ~~Regional~~</td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="4">Regular maintenance of access tracks.</td></tr>
<tr><td>Residual Impact:</td><td colspan="4">Improved land use for local land owners, leading to maintained positive relationships with the local population.</td></tr>
<tr><td>Residual Impact Rating:</td><td>~~Substantial Beneficial~~
~~Moderate Beneficial~~
~~Minor Beneficial~~
~~Negligible Beneficial~~</td><td>No Change</td><td colspan="2">~~Negligible Adverse~~
~~Minor Adverse~~
~~Moderate Adverse~~
~~Significant Adverse~~</td></tr>
</table>

Table 14-13 Maintenance of Access Tracks

14.4 Landscape and Visual

Development of the Crni Vrh WPP would introduce the renewable energy generation in Eastern Serbia and establish up to 32 very large vertical features into a landscape that is largely undeveloped and has a sense of naturalness and tranquillity.

14.4.1 Mitigation by Design

Key mitigation of landscape and visual effects is an integral part of the project design as potential for mitigation (turbine relocation, screening features) would be rather limited in the later stages of the project.

The project layout that is the subject of this LVIA, already incorporates the landscape and visual design considerations for good WPP design. This assessment is therefore an assessment of the residual impacts of a design.

The primary mitigation measures incorporated in the Crni Vrh WPP design are the following:

- Turbines have been proposed along two parallel ridges following a natural form of the undulating landscape;
- The proposed layout is simple and regular. A double line shape (NE-SW direction) forms a coherent cluster of turbines. Spacing between turbines is consistent, there are no turbine outliers separated from the main group;
- The proposed layout is a result of design iterations and adjustments aimed to set back turbines from valuable forest habitats. The majority of WTG positions are out of the woodland;
- The proposed access road layout would use the existing forest tracks for most part of the route with the aim of minimising the effect on local topography and loss of woodland;
- The shade of white required by Serbian guidelines will reduce the turbine visibility when viewed against the distant landscape;
- As there are no specific viewpoints in the surrounding landscape and “key views”, no alternative layouts have been developed to optimise the visual composition of the Crni Vrh WPP.

Recommended additional mitigation for the later stages of the project is provided in the section 14.4.4 Proposed Mitigation/ Control Measures.

14.4.2 Impact Assessment

Landscape and visual effects are closely related but it is important to make a distinction between them and address the potential impacts separately. Landscape effects are related to changes to the topography, land cover, pattern and the way landscape is perceived. Visual effects relate to how people visually experience the landscape with its existing and new features, its structure, scale, and composition.

14.4.2.1 Impacts on Landscape Fabric

The direct physical effects on the fabric of the site would be removal of ground cover vegetation to build the turbine foundations, hard standing, access roads and service tracks. The landscape elements that would primarily be affected are broadleaved woodland and shrubland, and to a minor extent cultivated land. The key element of the landscape fabric at the site is woodland.

The majority of turbines (24) are proposed within the shrubland or low-grade cultivated land. Eight turbines (T1-7, T1-10, T1-12, TII-6, TII-8, TII-9, TIII-1, TIII-2) are proposed within the woodland and would require the forestry removal to accommodate the hardstandings and turbines. The existing forest tracks would be widened to accommodate the access roads and service tracks.

The necessary clearance of trees would create a new pattern of lines and shapes at the site and would give rise to the complexity of the current landscape fabric. The proposed turbines have been sited on gentle gradients on top of the ridgelines and the wooded slopes would largely remain intact.

It is estimated that each turbine foundation would require an area of up to 1,400m^2. Each crane pad would require an area of about 1,000m^2. The current width of the forest tracks is 3 to 5m while the required width of the access roads is 7m. The total length of the access roads and service tracks would be c. 25.5km. The total woodland that would be cut for the WTGs and access tracks is estimated to c. 19 hectares. Additional c. 49ha of woodland would be cut for the power transmission lines and substations and switchyards.

The beech woodland within the site is an important part of the landscape character of Crni Vrh. However, it is not a rare feature but widespread and common in the Timok Region. The beech in Crni Vrh has been under a long-term human influence including acidification, which is the important consideration that reduces its value to medium. Part of the woodland cleared for the Project would be possible to reinstate by compensatory planting (on or off site) thus its susceptibility to change is considered to be medium. The overall sensitivity of the woodland at the site is judged to be **medium**.

The estimated c. 68 hectares of broadleaved woodland that would be cleared for the development represents c. 4% of the woodland at the site (c. 1,670ha). In that respect, the proposed WPP would lead to a minor alteration of the key landscape element, i.e. the **magnitude of change is considered to be low**.

Given the medium sensitivity of the woodland and low magnitude of change, the overall effect of the proposed WPP on the landscape fabric is considered to be **minor adverse**.

14.4.2.2 Impacts on Landscape Character

The proposed WPP would introduce large vertical structures with moving elements into Crni Vrh mountain and would have a direct and substantial effect to the perceptual aspects of the landscape. The presence of wind turbines would become a dominant feature of the local landscape and would redefine its character. The site will change from an ‘area of wooded hills and ridges with scattered houses’ to an ‘area of wooded hills and ridges with scattered houses and wind turbines.

Despite the local landscape already being under human influence, it still contains elements of naturalness and tranquillity. The natural aspect would be decreased by the large-scale modern structures. The perceived tranquillity would be affected by large rotating elements and their moving shadows. Noise and night-time flashing of obstruction lights would give rise to the perception of man-made environment.

The High Wooded Volcanic Hills and Ridges is a host LCT. The landscape varies from medium-scale to small-scale and enclosed. Rolling hills covered by beech and oak woodland screen many views. Random patches of degraded meadows and cultivated land reflect an unplanned landscape. The human activity is apparent, particularly logging, scattered farmsteads, roads, and overhead power lines; they all reduce the susceptibility to WPP development to medium. Given the moderate landscape value, the overall **sensitivity of this LCT to large-scale WPPs is therefore considered to be medium**.

Considered very locally, on the scale of the site itself and out to about 2km, the turbines would dominate the medium-scale landscape horizontally and vertically as they would be visible over the tree tops. Keyholes and corridors would be cut in the woodland to accommodate the turbines and access roads. On the other hand, a significant part of the local landscape is small-scale and enclosed in the woodland and many landscape features would remain intact and unaltered by the turbines. The change due to the proposed WPP is therefore considered to be of a high to medium magnitude. Given the medium sensitive landscape character, this would result in **major to moderate adverse** impact significance.

As the distance from the site increases to 5km, the views of the site would be reduced by upland landform and broadleaved woodland areas. The turbines would gradually harmonize horizontally with the landform but a vertical emphasis would remain. The proposed WPP would create a medium to low magnitude of change, resulting in **moderate to minor adverse** impact significance.

Considering the landscape on the scale of 5 to 10km, the turbines would harmonise both horizontally and vertically with the landform. The local land undulations would not be obvious, and the turbines would appear in association with the broad-scale landform. The magnitude of effect would be low, resulting in **minor adverse** impact significance.

Considering the landscape on the wider scale of ten kilometres and beyond, the proposed turbines would be seen within occasional background views creating low to negligible magnitude of change, resulting in **minor to negligible adverse** impact significance.

The Wooded Karst Uplands LCT is a semi-open landscape with strong topographical variety and almost absent human development. Due to its distinctive character and strong sense of wildness, it is judged to be a highly susceptible to WPP development. Taking into consideration the high susceptibility and high value, overall **sensitivity to large scale WPPs is judged to be high**.

There would be no direct effects on the landscape features of this LCT. The proposed WPP would be visible from higher ground areas, provided that the views are not screened by the terrain or woodland. Where views are available, they would be open, expansive and medium to long-distance. Medium distance views would be available in the west of the Study Area (Veliki Krš, Mali Krš, Stol) but would be altered by the existing open cast mines or remnants of the past mining activities. In the east of the Study Area (Beljanica, Kučaj, Homolje Mountains), the WPP would appear in longer distance views which would remain unaltered. The proposed WPP is unlikely to affect how this LCT character is perceived. The overall size and scale of effect is therefore judged to be small. The geographical extent is judged to be small as views will be localised to hilltop areas without woodland or with gaps in surrounding woodland.

Given the small size/scale of effect, small geographical extent, long-term and reversible nature of effects, the overall the **magnitude of change is judged to be low**.

Overall, the effect of the proposed development on the Wooded Karst Uplands LCT is judged to be **minor adverse**.

The Cultivated River Valleys LCT is a large-scale and open landscape, flat or slightly undulated. The human influence is apparent with presence of built development, roads and overhead power lines. It is visually complex and irregular which makes it less susceptible to WPP development. However, parts of the LCT are enclosed by hills and ridges which form an undeveloped skyline with some recognisable features. The susceptibility of this LCT to wind farms is therefore judged to be medium to low. Given the medium to low value of the LCT, the overall **sensitivity to large scale WPPs is therefore medium to low**.

The LCT would not be directly affected by the proposed WPP. The WPP would be theoretically visible from parts of Žagubica valley and Bor valley, between 15 and 20km of the site. Local undulations in the terrain, built form and woodland would reduce actual visibility. Where views are available, they are likely to be long distance and more expansive, the WPP being a small feature in the overall skyline. The size and scale of effect is therefore judged to be small. The geographical extent is judged to be medium-small as views are localised to long-distance views from areas of open farmland and roads.

Given the small scale of effect, medium-small geographical extent, long-term and reversible nature of effects, the magnitude of change is judged to be low.

Overall, the effect of the proposed development on the Cultivated River Valleys LCT is judged to be **minor adverse**.

The Mining and Post-Mining Areas LCT is a non-prominent landscape, heavily degraded by human influence. No features of value are present, the landscape is in need of improvement. The susceptibility to WPP development is negligible. Considering the low value of this LCT, the overall **sensitivity to large scale WPPs is negligible**.

There will be no direct effects on the landscape of this LCT. The visibility of the proposed WPP from the LCT would be limited to higher ground areas of Cerovo and Veliki Krivelj mines, between 5 and 10km of the site. As such, the size and scale of effect is considered to be small. The geographical extent is judged to be small. Given the small scale of effect, small geographical extent, the **magnitude of change is considered to be low**.

Overall, the effect of the proposed WPP on the Mining and Post-Mining Areas LCT is judged to be **negligible adverse**.

14.4.2.3 Visual Impact Assessment

The analysis of ZTV maps, work in the field and visualisations have suggested that significant visual effects of the Crni Vrh WPP would be experienced by less sensitive receptors out to about 3km from the development site and by more sensitive receptors out to 10km. The visual assessment has therefore considered the core Study Area of 10km to focus on residential receptors, road users, people in recreation and workers in open areas. Beyond 10km the assessment was focused only on views from local roads, recreational areas and open fields – as the fieldwork confirmed that no significant visual effects would be experienced within settlements beyond 10km.

A summary of the visual effects for the main receptors in the core Study Area is provided in Table 14-14. This assessment assumes that all effects are long-term, during the proposed 25-year operational life of the WPP. All visual effects are considered to be reversible, unless stated otherwise. References are made to corresponding viewpoint photomontages, provided in Appendix B.

Table 14-14 Summary of Key Visual Impacts

Type of Receptor	Sensitivity	Description of Impact	Significance of Impact
Residential properties within 3km of the development site			
Residential properties in the north-east	High	The proposed WPP would be seen from these properties in close range, at a distance of 600m (string TIV) and beyond. The turbines would occupy the westerly and north-westerly views. Other views (to the south and east) would remain unaffected by the turbines but would have direct views to the proposed overhead power line. The northernmost turbines (string TIV) would appear as large man-made structures in the views, much larger than a nearby met-mast. If CVP optimise the WPP layout to exclude the turbine string IV the visual effect on the receptors in the north-east will be reduced, i.e. up to 10 other turbines would be clearly visible but less prominent as their distance to the properties would be more than 1km. They would appear as a relatively spaced-out array, with some overlapping of turbine blades. The remaining turbines (half of the total number) would be screened by the intervening landform and not present in the views. As people move along the dirt road away from the site, the composition of the turbines will change. The landform and vegetation would intermittently screen some views, and turbines would gradually be seen as two separated arrays – one in the foreground, the other in the background. The scale of change for receptors at this location will be large. The geographical extent will be medium as these views would be possible from a 5km stretch of hills and tracks east and north-east of the site. The overall magnitude of visual change would be high, resulting in **major adverse effect** on the receptors. Refer to Photomontages B1, B3, B5, B6 (Appendix B).	Major adverse

Type of Receptor	Sensitivity	Description of Impact	Significance of Impact
Residential properties in the south-west	High	The three westernmost turbines would be seen from these properties in close range, at a distance of 600-800m. Up to 10 additional turbines would be seen in middle distance, as a regular array along the hillslopes with limited stacking. The perception of scale would be different as the turbines T1-13, T1-14 and T1-15 would appear higher than the others. The turbines would occupy the easterly views. Other views (to the north, south and west) would remain unaffected, i.e. open and rural. The rest of the proposed turbines would be screened by the intervening landform. The scale of change for receptors at this location will be large. The geographical extent will be small as these views represent a remote viewpoint from a minor dirt road. The overall magnitude of visual change would be high, resulting in **major adverse effect** on the receptors.	Major adverse
Residential properties between 3km and 5km of the site			
Various scattered residential properties	High	A limited number of residential properties is present east and north-west of the site. The proposed WPP would be seen in a middle-distance horizon, breaking the skyline. The extent of visibility would vary depending on the scale of view. In middle-scale views, the turbines would be seen as notable features occupying the large portion of the view and the scale of visual change will be high. In large-scale views the turbines would occupy less space and the visual change will be medium. Higher ground areas or more distanced viewpoints would experience full visibility of up to 20 turbines appearing evenly spaced and in a similar size. Lower ground areas or closer viewpoints would experience obstructed views and fewer turbines (10-15), some towers partially screened by the woodland. The introduction of the turbines will result in a high-to medium scale change to the views. The change will affect a medium geographical area between Crni Vrh and Veliki Krš and along the public road north-west of the site. The overall magnitude of change is judged to be medium to low, and taking account of the high sensitivity will result in **major to moderate adverse** visual effect. Refer to Photomontage B9 (Appendix B).	Major to moderate adverse
Residential properties between 5 and 10km of the site			
Scattered residential properties in Vlaole and Gornjane villages	High	A limited number of properties in Gornjane and Vlaole would have a view of the proposed WPP, primarily in higher ground areas. The extent of visibility would be variable across the area due to the intervening hills and vegetation. The southernmost turbines would be entirely screened by the landform. The remainder of turbines (up to 20 in some views) would be fully visible above the horizon formed by the distant hills. The turbines would occupy a small proportion of the available views. In some views the turbines would appear as a compact group, evenly spaced, in others there would be uneven gaps and clustering due to the intervening landform. The most northerly turbines) would appear slightly higher than the others. Turbine stacking and blade overlapping would be possible in some views. Given the distant nature of this view, the tracks and ancillary infrastructure are unlikely to be visible.	Moderate to minor adverse

Type of Receptor	Sensitivity	Description of Impact	Significance of Impact
		The scale of change for receptors at this location will be medium to low. The change will affect a small geographical area around the neighbouring hills. The overall magnitude of change is judged to be medium and taking account of the high sensitivity will result in **moderate to minor adverse** visual effect.	
Local road users			
Travellers on local road no. 161 between Žagubica and Bor Lake (Brestovac)	Medium	Views from the road are mostly screened by the local topography or vegetation. Limited fleeting views of the proposed WPP would be available to the road users. Travelling from Žagubica towards Crni Vrh, a short ascending section of the road 7km west of the site would provide a first glimpse of the proposed WPP. The westerly string of turbines would be seen in a middle-distance, as a regularly shaped group set against the skyline, occupying the right half of the view. The remainder of turbines would not be visible. Refer to Photomontage B10 (Appendix B). As travellers move towards the site, the local landform would screen the views, until about 3km west of the site where an open view of the westerly string of turbines would be available. Eleven turbines would be clearly visible in middle distance, occupying the large portion of the view above the wooded horizon. The turbines would appear evenly spaced, without stacking or overlapping. Refer to Photomontage B7 (Appendix B). As travellers traverse the site, the views from the road are enclosed by vegetation and there would be only four 50m-long cleared sections where fleeting glimpses of the turbines would be available. The turbines would appear as prominent features in close distance. Their size and scale would differ due to the varying distance to the viewer. Due to the intervening landform, not more than 10 turbines would be clearly visible, occupying the entire view. Some turbine stacking and blades overlapping would be possible. Refer to Photomontages B2, B4 (Appendix B). The scale of the change is considered to be medium too small for travellers on this road. The geographical extent is judged to be small. The overall magnitude of change is medium to low and taking account of the medium sensitivity will result in **moderate to minor adverse** visual effect.	Moderate to minor adverse
Travellers on local road no. 161 from Krepoljin to Žagubica	Medium	The proposed WPP would be intermittently visible travelling eastbound, from Krepoljin towards Žagubica. The long-distance panoramic views would be possible from short sections of the winding and undulating road. Up to fifteen turbines would be visible in a distant horizon, set against the skyline. From this distance, the turbines would appear as a coherent group, with limited stacking. Due to the winding road, the proposed WPP would change the position in the views but would persistently occupy a small proportion of the available views. The scale of the change is considered to be small for travellers on this road. The geographical extent is judged to be medium to small. The overall magnitude of change is low and taking account of the medium sensitivity will result in **minor adverse** visual effect. Refer to Photomontages B11, B12 (Appendix B).	Minor adverse
Travellers on local road no. 165 from Rgotina to Bor	Medium	The proposed WPP would be visible travelling westbound, from Rgotina towards Bor. Long-distance views would be possible from a short stretch of the road, up to 1km long, next to a stone quarry.	Minor adverse

Type of Receptor	Sensitivity	Description of Impact	Significance of Impact
		The travellers would experience a panoramic view of several mountains with Crni Vrh taking central part in the view. Fifteen turbines would form a noticeable feature on a distant horizon set against the skyline. Additional ten turbines would be screened by the hills, with their blades visible. The proposed WPP would occupy less than a quarter of the available view from this viewpoint. The turbines would appear consistent in height and evenly spaced. The scale of the change is considered to be small for travellers on this road. The geographical extent is judged to be small as it is limited to a rather short stretch of the road. The overall magnitude of change would be low and taking account of the medium sensitivity will result in **minor adverse** visual effect. Refer to Photomontage B13 (Appendix B).	
People involved in recreation activity (walkers, trekkers, mountain bikers)			
Various recreational receptors whose attention is focused on their surroundings	High to Medium	The visual effect on recreational receptors would depend on distance. Within 3km of the site there would be a large-scale visual change for walkers in the mountain and skiers. Walkers are considered to be a highly sensitive receptor whose attention is focused on their surroundings. Skiers are judged to be medium sensitive. The proportion of the view occupied by the turbines would depend on viewers' altitude. Northerly and southerly viewpoints would experience irregularly shaped grouping of turbines with some stacking and overlapping of blades. Skiers would have large-scale views available and the turbines would be less prominent on a middle-distance horizon. Hill walkers would experience more views occupied by the turbines. The scale of change within 3km of the site would be large. The geographic extent of the visual change is judged to be small, limited to the hills within Crni Vrh. The overall magnitude of change would be medium (for walkers) to low (for skiers). Given the high to medium sensitivity of receptors, the visual effect would be **major to minor adverse**. Refer to Photomontage B8 (Appendix B). Beyond 3km of the site, recreational receptors would see the proposed WPP from higher ground areas and summits of the nearby mountains. The views would be large-scale and panoramic and would include the existing mining-degraded areas. The incremental visual change of the addition of the WPP is therefore judged to be small-scale. The geographical extent is judged to be medium. The overall magnitude of change would be low. Given the high to medium sensitivity of receptors, the visual effect would be **minor adverse**. Refer to Photomontage B6 (Appendix B).	Major to minor adverse
People in work (agricultural, logging, hunting, infrastructure)			
Various people involved in wild plant picking, beekeeping, agriculture, logging, hunting, infrastructure work, etc.	Low	The visual effect on people working in open areas would depend on distance. Within 3km of the site there would be a high magnitude visual impact and **moderate adverse** effect. Between about 3 and 5km there would be a medium magnitude visual impact. Beyond 5km from the site, there would be a visual impact of low magnitude and thus minor adverse effect. Beyond 10km from the site, the effect would become negligible.	Moderate to negligible adverse

14.4.2.4 Night-Time Assessment

As the proposed turbine heights are more than 150m to blade tip, obstruction lighting is mandatory. Following the ICAO regulations, the civil aviation authority required dual flashing lights on each turbine - white flashing light of medium intensity at the top of the nacelle and red flashing light of low intensity at the intermediate level of the tower.

The introduction of obstruction lighting would affect the host LCT: Wooded High Volcanic Hills and Ridges. The effects on the landscape character would be to further decrease the perception of darkness and remoteness. The geographic extent is considered to be small – within 2km of the site. The scale of change would be small. The magnitude of change would be low, resulting in **minor adverse** impact significance.

The number of visual receptors affected by aviation lighting would be limited to a radius of 2km of the site, i.e. up to 15 weekend and residential houses. Views from the properties would be limited due to presumed window coverings. The duration of the visual effects would be relatively short – mostly experienced after dusk and before sunrise. The scale of change would be small. The geographic extent is considered to be small. The magnitude of change would be low, resulting in **minor adverse** impact significance.

Night-time visualisations have been produced from representative viewpoints to illustrate the potential effect (Appendix B, Photomontage B1).

14.4.2.5 Local Weather Conditions

When considering the magnitude of potential visual effects, local weather conditions in Crni Vrh should be taken into account. The mountain experiences more than 200 days with fog and more than 130 cloudy days. The persistent fog conditions from October to March have the potential to significantly reduce the turbines visibility. Additionally, rain and cloud cover tend to decrease the contrast between the turbines and the background. The actual effects on the landscape character and visual receptors are likely to be less than predicted by the theoretical visibility models.

14.4.3 Impacts Summary

The scale and topography of the local landscape is considered appropriate to accommodate the proposed WPP. Significant effects on landscape character would occur out to about 2km where the turbines would dominate the landscape both horizontally and vertically, creating **major to moderate adverse** impact significance. As the distance from the site increases, the turbines would appear in association with the broad-scale landform, reducing the impact significance to **minor adverse**.

The significant visual effects would be localised and confined to an area of up to 5km. The wind turbines would be clearly visible and prominent in the views of a small number of receptors: a dozen of weekend and residential houses north-east and south-west of the site and to walkers in the mountain and it would constitute **major adverse** impact significance. Beyond 5km of the site the views would be limited and intermittent due to the intervening landform and woodland, resulting in **minor to negligible adverse** visual effect.

14.4.4 Proposed Mitigation/ Control Measure

The primary mitigation is embedded in the design of the proposed WPP.

To offset some of the residual landscape effects, viable compensatory and enhancement measures should be identified and incorporated in the ESMMP. Where practicable, the landscape enhancement should be developed in conjunction with the habitat enhancement measures.

The recommended measures should consider but not be limited to:

- Compensatory planting, on or off site. The location and design of compensatory planting should be agreed with 'Serbia Forests'. The planting should be carefully designed to achieve defined objectives (e.g. water catchment management, erosion control, landscape improvement, etc.);
- Enhancing of pastures and meadows or creation of new grassland habitats (in conjunction with the habitat management and mitigation measures);
- Creation of new recreational areas on or off site;
- Enrichment of impoverished or degraded landscapes (e.g. agricultural landscapes).

The compensatory and enhancement measures should be maintained and monitored during medium-term establishment for a minimum of 5 years upon completion of the proposed Crni Vrh WPP.

Bespoke mitigation planting should be considered near a small number of houses in the north-east and south-west from which there would be an open view at a distance of less than 2km. Specific consultation should be undertaken with the affected people and where possible, targeted screening by woodland planting should be considered.

Provided that the mitigation, compensatory and enhancement measures are successfully implemented, the significant adverse landscape and visual effects will be reduced to the acceptable level - **moderate to minor adverse**.

14.4.5 Conclusions

A summary of impacts on the landscape character during operation of the WPP is provided in Table 14-15 and Table 14-16.

Impact or Opportunity:	Impact on the landscape character (medium sensitive receptor).		**Ref. No.:**	43
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Mitigation embedded in the design. Landscape compensatory and enhancement measures should include: Compensatory planting, on or off site; the location and design to be agreed with 'Serbia Forests'. To be aimed to achieve objectives (e.g. water catchment management, erosion control, landscape improvement, etc.); Enhancing of pastures and meadows or creation of new grassland habitats (in conjunction with the habitat management and mitigation measures); Creation of new recreational areas on or off site; Enrichment of impoverished or degraded landscapes (e.g. agricultural landscapes); Maintenance and monitoring of the measures during medium-term establishment for a minimum of 5 years upon completion of the WPP.			
Residual Impact:	Significant effects in the immediate vicinity of the development site, introducing the tall industrial structures into a low-developed natural landscape. In the wider context of 5km and beyond the effect would be minor to negligible adverse.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ ~~Minor Adverse~~ **Moderate Adverse** ~~Significant Adverse~~	

Table 14-15 Impact on Landscape Character during Operation

Impact or Opportunity:	Impact on visual receptors (highly sensitive) in the north-east and south-west, within 2km of the site.		**Ref. No.:**	44
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Bespoke mitigation planting should be considered near a small number of houses in the north-east and south-west from which there would be an open view at a distance of less than two kilometres. Specific consultation should be undertaken with the affected people and where possible, targeted screening by woodland planting should be considered.			
Residual Impact:	Targeted screening should reduce the visual impact to moderate to minor adverse.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~	~~No Change~~	~~Negligible Adverse~~ **Minor Adverse**	

	~~Minor Beneficial~~ ~~Negligible Beneficial~~		**Moderate Adverse** ~~Significant Adverse~~

Table 14-16 Visual Impact during Operation

14.5 Shadow Flicker

14.5.1 Introduction

The term “shadow flicker" refers to the flickering effect caused when rotating wind turbine blades periodically cast shadows over neighbouring properties. The intensity of shadow flicker depends on distance and a number of environmental conditions that have to coincide for the effect to occur.

Apart from the sun shining and being at the low angle, position of the wind turbine rotor is additional circumstance that directly impacts shadow flicker occurrence. The effect is most intense when a wind turbine rotor plane is perpendicular to the line of sight between the receptor and the sun position. By default, the wind turbine rotor is always perpendicular to a current wind direction. Therefore, for each receptor, the rotor plane of the affecting wind turbine will only be perpendicular to it for a particular wind direction. For all other wind directions, the rotor will not be perpendicular to the receptor, and the shadow flicker occurrence and magnitude will be reduced.

Computer modelling programs for shadow flicker are aimed to calculate the maximum theoretical risk for the affected area and are therefore highly conservative and tend to overestimate the level of shadow flicker that would occur in reality. The models do not evaluate the flicker intensity rather calculate the number of hours irrespective of the effect being distinct or barely noticeable.

Blade or tower glint is an effect similar to shadow flicker, when the sun reflects off the turbine blade or tower at a particular distance. Modern wind turbines are painted with a matt, non-reflective finish, and glint is no longer considered to be a significant issue.

14.5.2 Potential Shadow Receptors

The Study Area of 1,630m around each proposed wind turbine has been established, based upon the guidelines described in Chapter 7.2.4.

A total of 200 structures (potential receptors) have been identified within the Study Area. 5 structures are residential houses, permanently occupied. 25 structures are weekend houses occupied during the warmer part of the year (May to October). There are 4 weekend houses in good condition which appeared abandoned during the site visit. There are 51 barns and 21 storage sheds, 44 structures are derelict and 43 dilapidated. There is one ‘kafana’ (drinking establishment), a logging camp with several structures, one hunting lodge and one mushroom collectors’ hut.

Residential and weekend houses are predominantly located north-east, north-west and south-west of the development site. It is of note that there is no electricity supply infrastructure south-west of the WPP site, i.e. the weekend houses in the south-west are not connected to the national grid.

The identified receptors are shown on Figure 14-1.

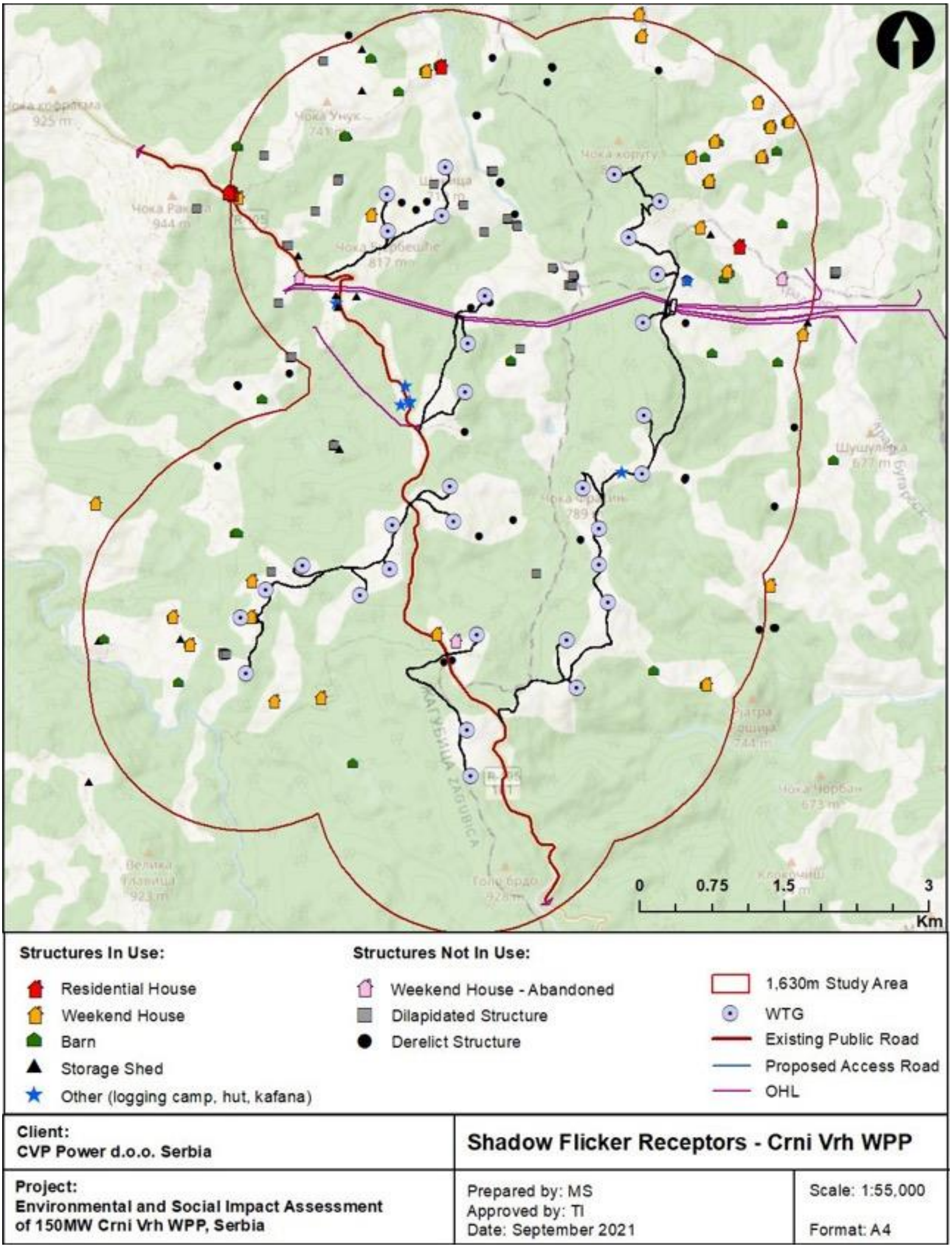

Figure 14-1 Potential Shadow Flicker Receptors

The categories of potential receptors are illustrated on figures below. Residential houses situated 700m north-west of the WPP site, near the public road No. 161 are shown on Figure 14-2.

Figure 14-2 Residential Houses North-West of the WPP Site

A weekend house situated in the area considered for the construction compound is shown on Figure 14-3.

Figure 14-3 Weekend House in the Central Part of the WPP Site

A dozen barns within in the Study Area are independent structures, not related to houses (Figure 14-4).

Figure 14-4 Barns in the Study Area

During the site visit, abandoned houses appeared to be structurally in good condition but with no evidence of the recent activity in or around the house (Figure 14-5).

Figure 14-5 Abandoned Houses in the Study Area

The majority of the structures in the Study Area are dilapidated or derelict (Figure 14-6 and Figure 14-7).

Figure 14-6 Dilapidated Structures in the Study Area

Figure 14-7 Derelict Houses in the Study Area

14.5.2.1 Sensitivity of Receptors

The sensitivity of receptor to shadow flicker depends on its usage and hours of occupancy. Within this assessment, permanently occupied residential houses are considered to be highly sensitive receptors. The sensitivity of periodically occupied weekend houses is considered to be medium. Structures which people use during their work (hunters lodge, mushroom collectors' hut, kafana, logging houses) are considered to be low sensitive receptors. Farm buildings (barns, storage sheds) are considered to be low to negligible sensitive receptors.

14.5.3 Impact Assessment

This section presents the results of both the worst-case and realistic scenario of shadow flicker at the identified receptors.

The worst-case scenario is a conservative prediction based on assumptions that all 32 turbines will be built, the turbines will be in continuous operation, the sun will shine every day, the turbine rotor will always be perpendicular to the window, receptors will always be occupied and will perceive the shadow flicker regardless of presence of windows or screening structures.

The realistic scenario based on meteorological data has also been developed. The real-case scenario is the corrected-case that uses the site-specific sunshine and wind data from the nearby Crni Vrh weather station. It also takes into account the annual operational hours of the Crni Vrh WP. While more realistic, this scenario is still conservative as it does not account for any screening features (e.g. vegetation or buildings) or presence of blinds or shades.

The recommended threshold of 30 hours per year (or 30 minutes per day, whichever is more stringent) for the worst-case scenario has been widely accepted in international good practice. The worst-case scenario is purely theoretical and this ensures consistency across all WPP projects.

On the other hand, the realistic scenario is location-specific and depends on how sunny a country is. No standard threshold value has been universally accepted; many countries have not set the standard for the realistic shadow flicker. The German standard for the acceptable realistic shadow flicker is 8 hours per year.

14.5.3.1 Modelling Results

Both the worst-case and real-case predicted hours of shadow flicker are illustrated on Figure 14-8. Isolines indicate the number of shadow flicker hours per year that would occur.

The German limit of 8 hours for the realistic scenario turned out to correspond well in Crni Vrh with the 30 hours threshold for the worst-case scenario. The 8-hours limit for the realistic case is therefore adopted within this assessment as relevant for identification of potentially significant impacts.

Both calculations indicate that the respective threshold values would be exceeded at one residential house and 11 weekend houses within the Study Area.

There are additional 4 weekend houses predicted to be affected by the shadow flicker; three are situated within the safety setback of 300m of the proposed turbines TI-14, TI-15, TI-10 and CVP have signed the agreements with owners to demolish these houses. The fourth weekend house is c. 400m from the WTG TI-17.

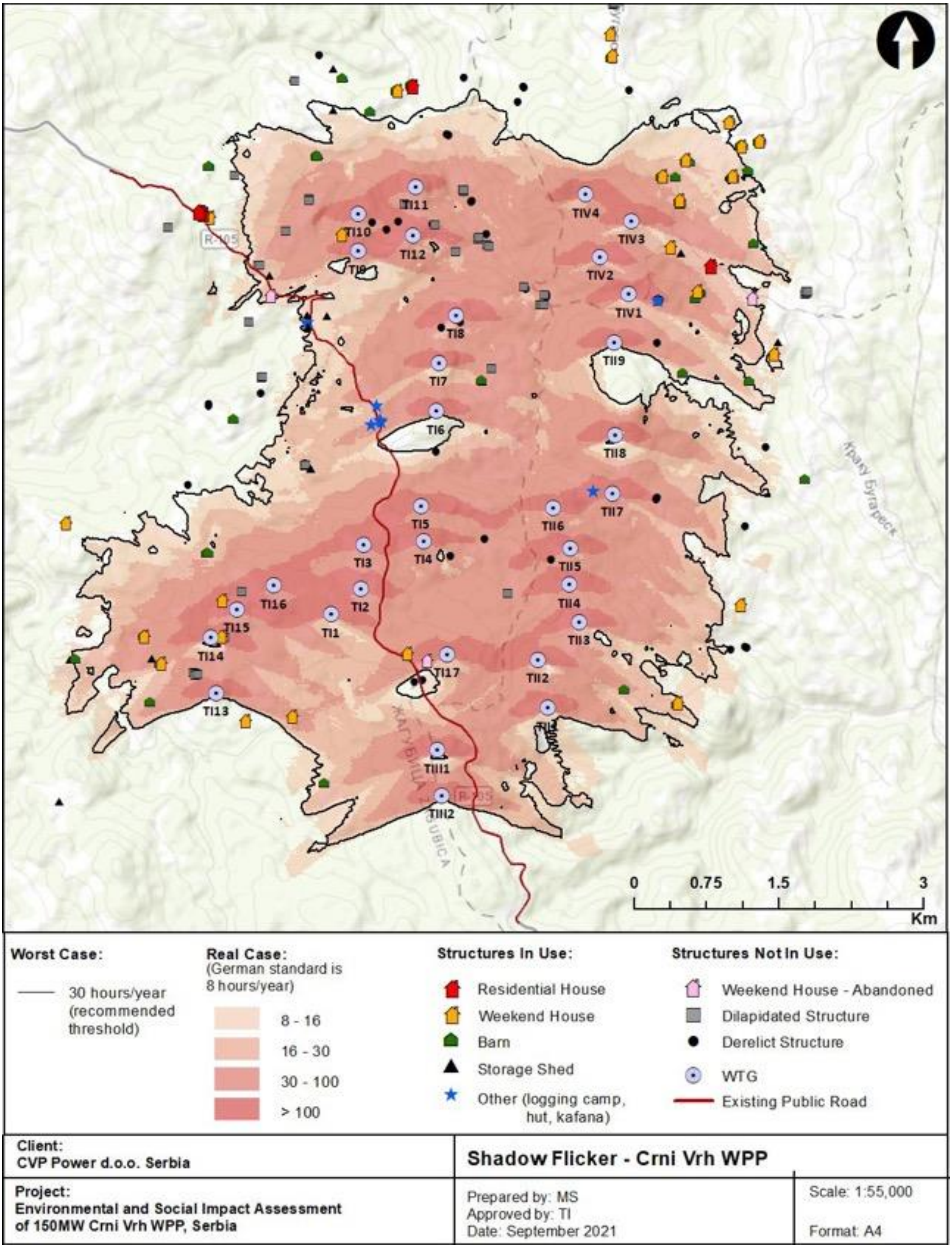

Figure 14-8 Shadow Flicker Map

The majority of the affected receptors are situated north-east and south-west of the development site. The exception are two isolated weekend houses – one in the north-west, between the turbines TI-9 and TI-10 and the other in the south-east, c.1,400m east of the turbine TII-1.

The complete results of both the worst-case and real-case predicted shadow flicker at each receptor are provided in Appendix E.

14.5.3.2 Season and Time of Day

A distinctive seasonal difference is notable in the predicted flickering effect between the north-eastern and south-western part of the Study Area. The north-east would be predominantly affected in afternoons during the colder part of the year (September to April) while the south-west would primarily experience the effect in early mornings during the warmer months. In that respect, the weekend houses in the south-west are in less favourable position as they tend to be occupied from April to September.

14.5.3.3 Affected Receptors in the North-East

The receptors in the north-east would be affected by the turbine group IV (Figure 14-9). If CVP optimise the layout to exclude the turbine string IV the shadow flicker effect on the receptors in the north-east will be completely avoided.

One residential house (R5) and 6 weekend houses (W1, W21, W6, W7, W8, W9) are predicted to experience between 11 and 46 hours of shadow flicker per year (realistic scenario, without vegetative screening).

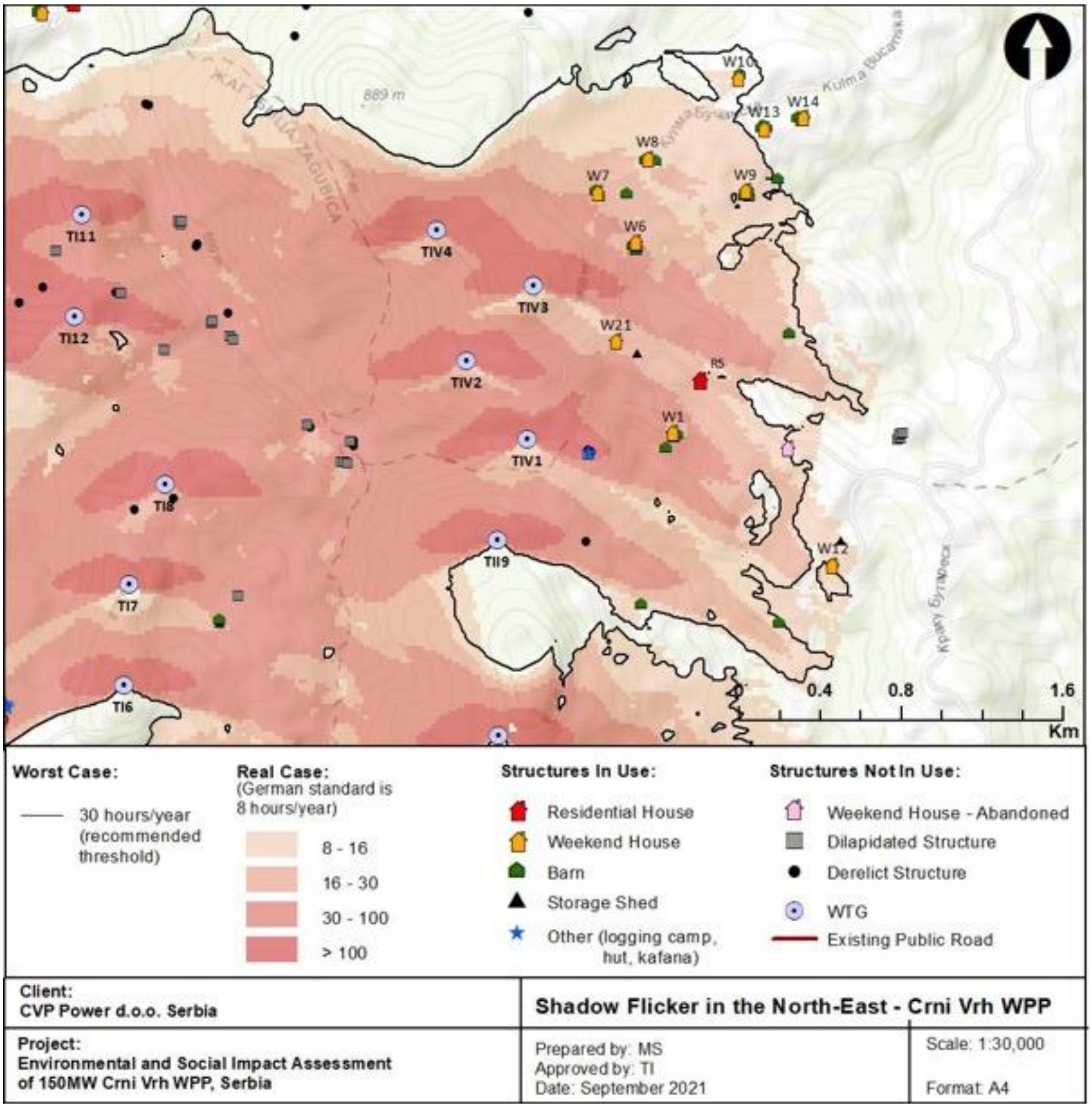

Figure 14-9 Receptors Predicted to be Affected by Shadow Flicker in the North-East

The strong seasonal character of the shadow flicker in the north-east, occurring mostly in winter or early spring/ autumn afternoons is illustrated by graphical calendars for the residential house R5 (Figure 14-10, left) and the weekend house W6 (Figure 14-10, right). The complete report is provided in Appendix E.

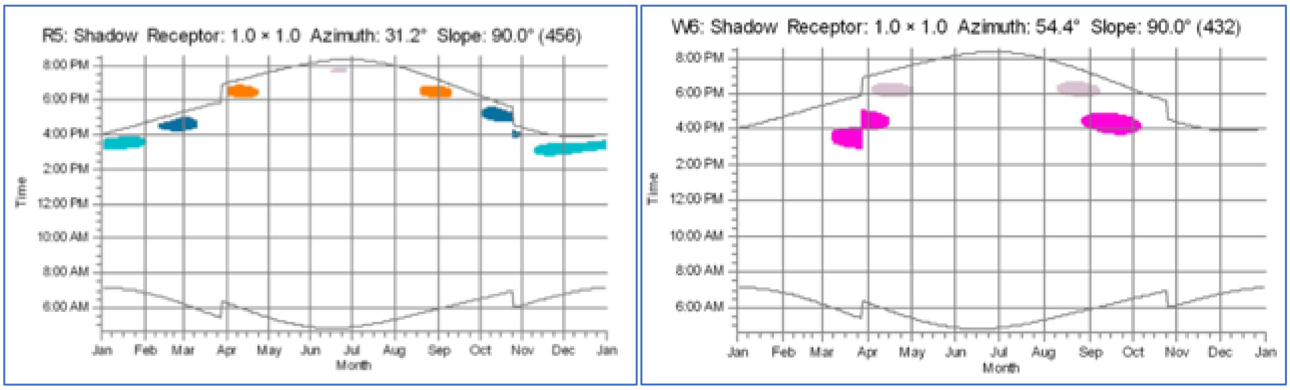

Figure 14-10 Seasonal Character of the Predicted Shadow Flicker at Receptors R5 and W6

The only exception to the seasonal shadow flicker would be the weekend house W1 which would experience the effect in summer as well. The W1 is situated 700m west to the northmost met mast and the nearby turbine TIV-1. The W1 is predicted to receive the highest amount of shadow flicker in the north-east, a total of 46 hours (realistic) throughout the year. The flickering in late summer afternoons (7pm) would be caused solely by the turbine TIV-2 (1,100m away).

The W1 house position is shown on Figure 14-11 (the met mast K3 is visible as well). While there is not much vegetative screening between the house and the proposed TIV-1 turbine, the higher ground area between the house and the TIV-2 is covered by woodland and is likely to provide some screening from the flickering effect in summer months. Also, given the distance involved (1,100m) it is likely that the shadow from the TIV-2 turbine will become more diffuse which would additionally mitigate the effect.

During the site visit in late July 2021 the house was not occupied.

Figure 14-11 Weekend House W1 West to the K3 Met Mast and Proposed Turbine TIV-1

14.5.3.4 Affected Receptors in the South-West

The receptors in the south-west would be under shadow flicker impact from the turbines TI-13, TI-14, TI-15, TI-16, TI-17 (Figure 14-12).

Out of 7 weekend houses in this area, two (W22, W23) are situated within the mandatory safety setback, less than 200m from the proposed turbines T1-13 and TI-14. If the final WPP layout includes the currently proposed TI-14 and TI-15 positions, these houses would need to be displaced. If TI-14 and T-15 are removed from the final layout, the weekend houses W22 and W23 will experience similar shadow flicker as other houses in the area. W24 would be under the impact of the proposed WTG TI-17.

The remaining 3 weekend houses (W3, W4, W5) are predicted to experience between 36 and 53 hours of shadow flicker per year (realistic scenario, without vegetative screening).

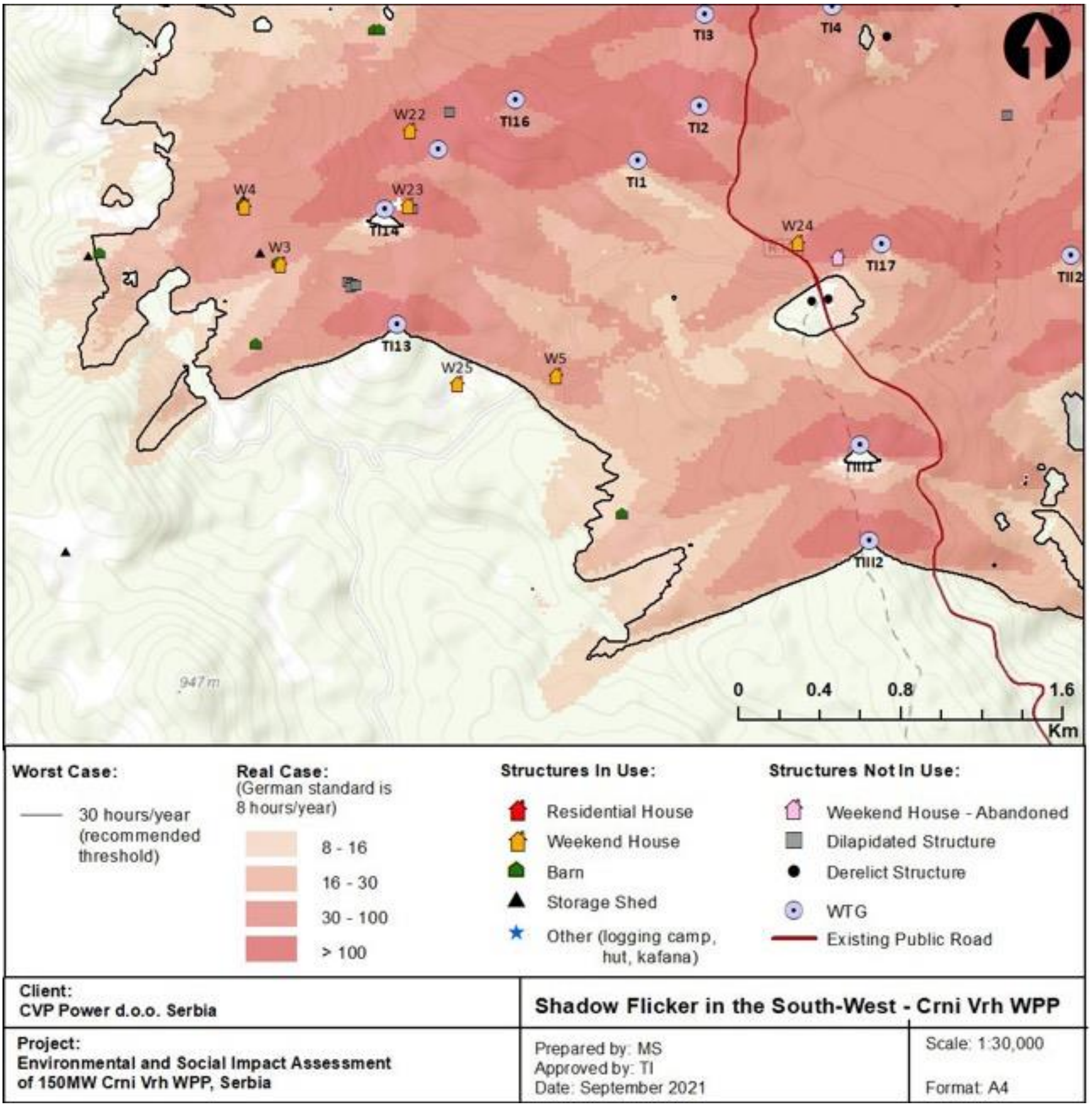

Figure 14-12 Receptors Predicted to be Affected by Shadow Flicker in the South-West

The weekend houses W3 and W4 were visited in late July 2021 (Figure 14-13). The W3 was occupied during the visit and the owner reported that he and family live there until the first snow. The W4 was not occupied at the time. The vegetative screening around the houses is likely to mitigate the flickering effect.

Figure 14-13 Weekend House W3 (left) and W4 (right) West of the Proposed T1-13 and TI-14

The weekend house W5 is situated within a pocket of cleared woodland, c. 830 south-east to the proposed turbine TI-13. It was visited by CVP in June 2022. The house is inhabited throughout the year by a local hunter. The canopy between the house and the proposed TI-13 is 3 to 16m high and is likely to mitigate the flickering effect to a significant extent (figure below).

Figure 14-14 Weekend House W5 South-East to the TI-13 Position

All three receptors would be affected in mornings from April to September (6-8am). Additionally, the W5 would experience the effect in late afternoons (7pm) from May to August.

A graphical calendar for the weekend houses W4 and W5 showing the seasonal character of the predicted shadow flicker is provided on Figure 14-15 (left and right, respectively). The complete report is provided as Appendix E.

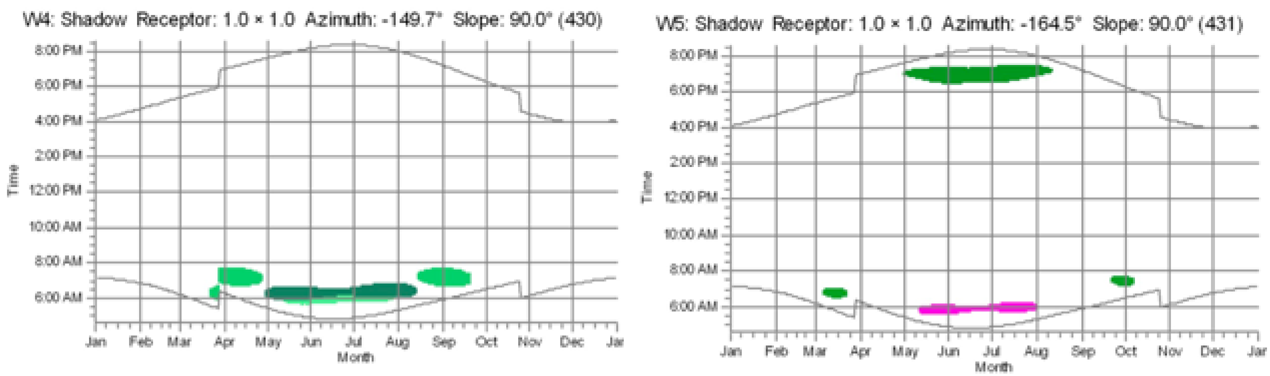

Figure 14-15 Seasonal Character of the Predicted Shadow Flicker at Receptors W4 and W5

14.5.4 Impacts Summary

The shadow flicker assessment conducted for the initially proposed 32 WTGs indicated the potential for the effect to exceed the recommended worst-case threshold of 30 hours per year at 15 properties in total, of which one is a residential house and 14 are weekend houses occupied in summer months.

Out of the 14 weekend houses, 3 are situated within the mandatory setback distance of the turbines and CVP made the agreement with owners to demolish these houses.

If CVP optimise the WPP layout to exclude the turbine string IV (TIV-1, TIV-2, TIV-3, T-IV), the shadow flicker effect on the receptors in the north-east will be completely avoided. In that case 4 weekend houses in total would be affected, all in the south-west.

The list of structures predicted to experience the shadow flicker in excess the recommended thresholds is provided in the table below.

Table 14-17 Structures where Shadow Flicker is Likely to Exceed Recommended Thresholds

No.	Receptor ID	Easting	Northing	Worst Case Shadow Flicker [hh:mm/year]	Real Case Shadow Flicker [hh:mm/year]	Comment
1.	R5	579,058	4,895,182	76:24	21:07	Shadow flicker will be avoided if the turbine string IV is excluded from the layout.
2.	W1	578,922	4,894,922	118:59	46:24	
3.	W3	573,356	4,891,062	105:14	36:42	
4.	W4	573,182	4,891,346	122:08	53:03	
5.	W5	574,717	4,890,512	87:21	38:52	
6.	W6	578,736	4,895,862	87:19	32:56	Shadow flicker will be avoided if the turbine string IV is excluded from the layout.
7.	W7	578,550	4,896,110	130:21	26:44	
8.	W8	578,798	4,896,277	67:31	14:33	
9.	W9	579,278	4,896,117	38:40	11:27	
10.	W10	579,244	4,896,673	38:57	7:29	
11.	W20	575,234	4,895,505	282:51	74:50	Within the safety setback / Agreed to be demolished.
12.	W21	578,642	4,895,374	41:00	15:21	Shadow flicker will be avoided if the turbine string IV is excluded from the layout.
13.	W22	573,995	4,891,720	793:30	282:43	Within the safety setback / Agreed to be demolished.
14.	W23	573,986	4,891,347	1039:58	442:26	
15.	W24	575,913	4,891,167	201:00	88:37	

The remaining 184 affected properties are barns, storage sheds, hunting and logging structures, abandoned houses, dilapidated and derelict structures.

The assessment was based on a conservative estimate and no account was taken of existing screening features and limited weekend house occupancy. It is therefore considered that the actual amount of shadow flickering is likely to be much less.

For the affected residential house (highly sensitive receptor) and weekend houses (medium sensitive), the **shadow flicker impact is considered to be significant**.

For the affected agricultural buildings as receptors of low to negligible sensitivity, **the impact is not considered to be significant**.

14.5.5 Proposed Mitigation/ Control Measure

To mitigate the effects of shadow flicker a number of mitigation options are available. There is no a universal solution applicable to all receptors and some measures would be possible only with cooperation of the affected people. However, all mitigation measures can be applied or adjusted at the WPP operational phase.

The shadow flicker impact should be managed by the implementation of the following measures:

- Provide information to people in the affected area that there is a potential for shadow flicker at their properties, and provide details on the timing and duration of the effect;
- Develop and implement a Shadow Flicker Management Plan that should set out a procedure for addressing a complaint received from a receptor in the affected area. The procedure should define how the shadow flicker occurrence should be verified and what mitigation measures will be undertaken in response;
- Mitigation measures that assume cooperation of the affected people should include installation of screening structures and planting of vegetative buffers. If these measures prove to be effective, the shutting down of turbines should not be required;
- Installation of screening structures on the affected houses (e.g. blinds, window shades, window tinting) is considered to be highly effective at the receptors in the south-west given that shadow flicker would occur in the morning;
- Planting of vegetative buffers (e.g. trees and shrubs) as a barrier between the wind turbine and the affected window is another option. To be effective, the planting should be relatively close to the affected window which in certain cases might obstruct the view and might not be acceptable to all affected people. Another potential disadvantage is that screening via planting may take some time to establish;
- Ultimately, in the unlikely event that there is extreme nuisance or no cooperation of the affected people, individual turbines should be fitted with devices to shut down automatically when the conditions are right for shadow flicker to occur at the affected receptor;
- Effectiveness of implemented shadow flicker control measures should be monitored.

Provided that any potential shadow flicker effects can be mitigated through the implementation of the Shadow Flicker Management Plan, no significant residual effects are predicted during the operation of the proposed Crni Vrh WPP.

14.5.6 Conclusions

Table 14-18 provides a summary of effects of the shadow flicker resulting from the proposed WPP.

<table>
<tr><td>Impact or Opportunity:</td><td colspan="2">Shadow flicker effects at four weekend houses (medium sensitive) in the vicinity of the proposed development site.</td><td>Ref. No.: 45</td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="3"><s>Positive</s>/ Negative
Direct/ <s>Indirect</s>
<s>Temporary</s>/ <s>Short-term</s>/ <s>Medium-term</s>/ Long-term/ <s>Permanent</s>
Local/ <s>National</s>/ <s>Regional</s></td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="3">Develop and implement a Shadow Flicker Mitigation Plan that should include:
Provision of information to affected people on timing and duration of the effect;
Procedure for addressing a complaint received from a receptor and how the shadow flicker occurrence should be verified and mitigation defined;
Mitigation measures (installation of screening structures or planting of vegetative buffers);
Monitoring of mitigation effectiveness;
Shut-down of individual turbines if measures prove to be ineffective.</td></tr>
<tr><td>Residual Impact:</td><td colspan="3">The residual shadow flicker should not exceed the recommended thresholds.</td></tr>
<tr><td>Residual Impact Rating:</td><td><s>Substantial Beneficial</s>
<s>Moderate Beneficial</s>
<s>Minor Beneficial</s>
<s>Negligible Beneficial</s></td><td><s>No Change</s></td><td>Negligible Adverse
<s>Minor Adverse</s>
<s>Moderate Adverse</s>
<s>Significant Adverse</s></td></tr>
</table>

Table 14-18 Shadow Flicker Impact

14.6 Operational Noise

In accordance with the IoA GPG, the following input parameters and assumptions have been adopted for this scheme:

- Downwind propagation in respect of all turbines and other wind farms;
- Turbine sound power levels include a +2dB allowance for uncertainty;
- An assumption of 'Mixed ground' (G=0.5, that is neither wholly absorptive or reflective) is set to calculate the ground effect (A_{gr}) with a receiver height of 4m;
- Air absorption calculated using a temperature of 10°C and 70% relative humidity;
- Screening losses are limited to a maximum value of 2dB with the source modelled at the tip height of turbines – in this case 200m.

14.6.1 Noise Limits

In the first instance, operational noise levels should be within the Serbian daytime and night-time noise limit of 55 dB L_{Aeq} and 45 dB L_{Aeq}. However, noise impacts can occur at lower levels and the EIA process aims to identify such effects at lower thresholds. For this project, following the IFC EHS guidelines, a significant effect can be identified in relation to the background noise level as assessed using the L_{A90} parameter. While the 2007 guidelines indicate that the increase in background noise should be limited to 3dB, the 2015 Wind Energy Guidelines set a threshold of 35 dB L_{A90} for determining a more detailed assessment.

14.6.2 Noise Predictions

Predictions of wind turbine noise levels have been carried out to ensure that the proposed development can comply with the Serbian Noise Limits. The calculations have been carried out using a computer model 'IMMI', which implements the previously referenced ISO 9613-2 methodology with the input parameters from the IoA GPG, as described above. The local terrain has been imported into the model.

For this project, the Nordex N163 5.X has been identified as a suitable candidate turbine with a potential hub height of 118m. The stated sound power is shown below for the standard operating mode (Mode 0) with a + 2dB allowance for uncertainty. The data shown is for variant with serrated trailing edges (STE) fitted to the turbine blades. This achieves a reduction of around 2dB compared with the plain edge blades. The turbine is available with a large number of reduced noise modes (with a corresponding loss in electrical power).

Table 14-19 Candidate Turbines Sound Power Levels dB LWA including uncertainty

Turbine	Sound Power Levels dB L_{WA} at Wind Speeds (m/s) at 10m Height							
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s
Nordex N163 5.X Mode 0 STE 118m Hub	97.5	100.0	104.8	108.9	109.2	109.2	109.2	109.2

It can be seen that the proposed turbine has a maximum sound power level of 109.2 dB between 7m/s and 10m/s at 10m height. Above this wind speed, there is no increase in noise as the turbine blades are pitched to reduce energy maintain a constant rotational speed.

For the ISO 9613-2 calculation, frequency information in terms of octave band sound power values are required. These are also provided by the manufacturer as set out in

Table 14-20. This represents the maximum sound power level.

Table 14-20 Octave Band Sound Power Levels dB L_{WA} including uncertainty

Turbine	Sound Power Levels dB L_{WA} in Octave Band Centre Frequencies, Hertz (Hz)						
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Nordex N163 5.X Mode 0 STE 118m Hub	90.9	97.1	100.8	103.4	104.1	101.6	94.0

For commercial reasons, it is not possible to state which turbine will definitely be used. The final choice of turbine will depend on many factors, including the noise output. The options will be studied carefully by the developer and turbine supplier when the turbines are procured and will be selected to be compliant with the planning noise limits. In addition, a tonal warranty should be obtained to ensure that the turbines are free from tonal components which would result in a tonal penalty.

14.6.3 Impact Assessment

The noise predictions have been carried out in the first instance in the form of a noise contour plot for the candidate turbine type, as shown in Figure 14.1.

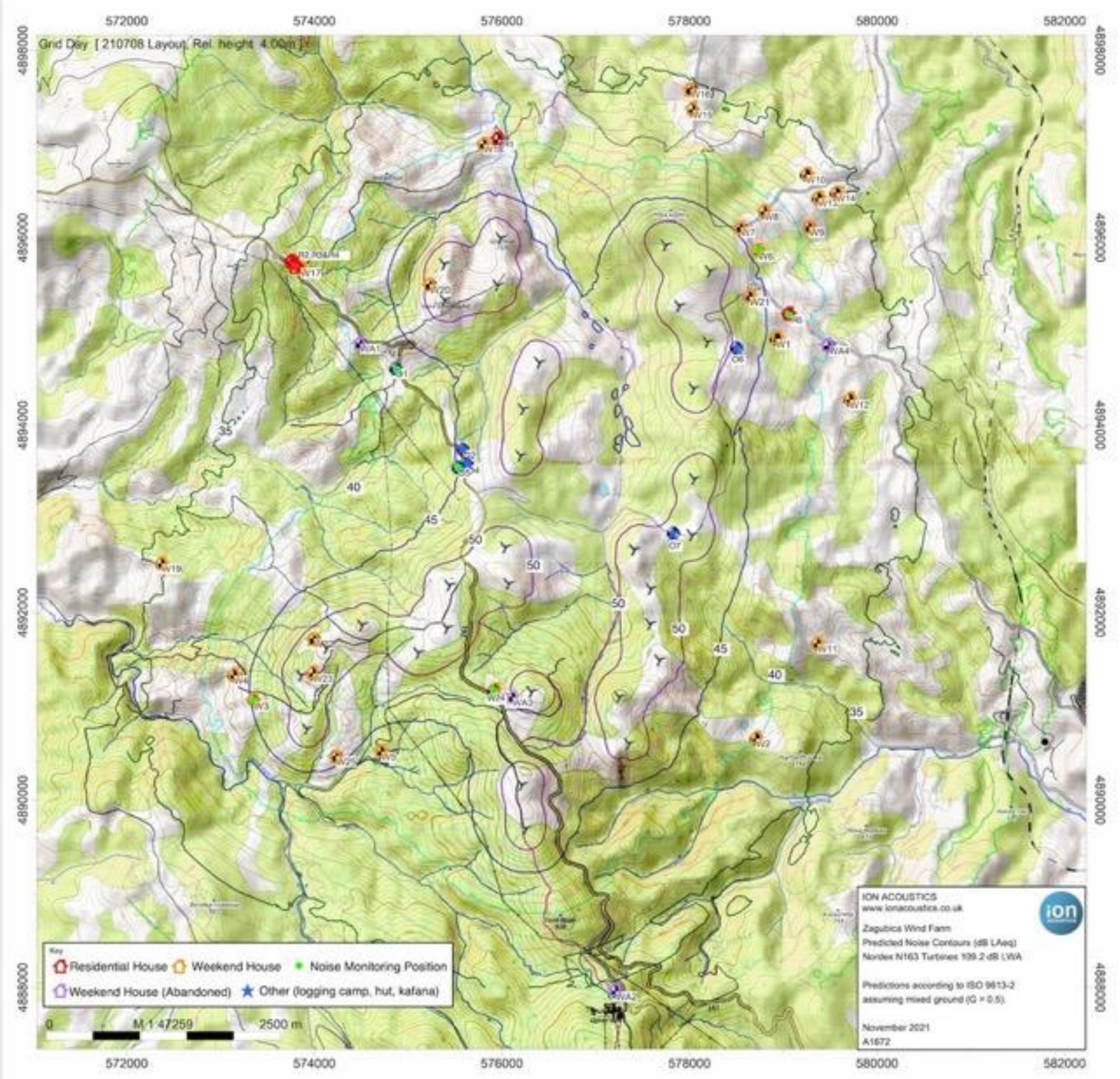

Figure 14-16 Noise contour Plot – Candidate WTG

The contour plot shows downwind noise levels at a wind speed of 8 to 10 m/s at 10m height. Noise levels at wind speeds above 10 m/s are no higher as the turbine sound output is flat above these wind speeds.

The predicted turbine noise levels at rated power referenced to wind speeds at 10m height are shown for the closest properties in Table 14-21.

Table 14-21 Operational noise predictions at Receptors (dB L_{Aeq})

Receptor	Predicted Noise Level dB L_{Aeq} at 8 – 10 m/s	Receptor	Predicted Noise Level dB L_{Aeq} at 8 – 10 m/s
R1	39.8	W17	37.9
R2	37.6	W18	40.3
R3	37.4	W19	35.7
R4	37.3	W20	51.2
R5	42.8	W21	46.7
W1	43.8	W22	52.2
W2	40.1	W23	53.8
W3	45.4	W24	48.0
W4	43.2	W25	46.1
W5	43.3	O1	42.5
W6	43.8	O2	45.5
W7	44.1	O3	45.7
W8	41.1	O4	45.8
W9	39.2	O5	45.0
W10	37.2	O6	49.0
W11	38.4	O7	51.4
W12	38.6	WA1	41.3
W13	37.3	WA2	34.6
W14	36.8	WA3	50.3
W15	36.5	WA4	40.0
W16	35.7		

For the residential properties and weekend houses, predictions show noise levels over 45 dB L_{Aeq} (the Serbian Night-time Limit) at two locations – see shaded cells. Noise levels at these locations are too high and noise levels must either be reduced by running the turbines in lower noise modes or the residents must be compensated so that their houses can have improved sound insulation such that the internal noise limits can be achieved. The sound insulation measures must also provide adequate ventilation so that windows can remain closed. The other locations with noise levels over 45 dB L_{Aeq} are assumed not to be residential properties or are locations that will be taken out of residential use with the appropriate compensation paid to the owners.

14.6.3.1 Variation in Noise with Wind Speed

In addition to the overall 45 dB L_{Aeq} considered above. The locations can be assessed against the IFC limits which allow a maximum 3dB increase in the background noise. This is applied for noise levels over 35 dB L_{A90}. A noise impact of moderate significance is predicted where this noise level is exceeded (see Table 7-7).

These predictions have been made in terms of the L_{A90} index to allow comparison with the measured background noise levels. Therefore, 2dB has been subtracted from the predicted wind farm noise levels since wind turbine noise levels rated according to the LA90 parameter are typically 2dB lower than the L_{Aeq} values presented in Table 14.7 above. A notional significance threshold has been set based on ensuring any increase in noise due to the turbines is limited to 3dB over the existing background noise. This will ensure that any noise increase has no more than a minor significance.

Note however that all locations are still subject to the maximum 45 dB L_{Aeq} night-time and 55 dB L_{Aeq} daytime Serbian noise limit, or in L_{A90} terms 43 dB L_{A90} and 53 dB L_{A90} for the night and daytime respectively. Therefore, any noise increase above the background has been capped at the Serbian Noise Limits.

The comparison has been made for the nearest noise-sensitive receptor to the monitoring locations.

14.6.3.2 Noise Levels at Location W3 Nevenko

The assessment is set out in Table 14-22 below.

Table 14-22 Assessment for Location W3 Nevenko

Location W3	Noise Levels (dB L_{A90}) at wind speeds (m/s) at 10m height							
	3	4	5	6	7	8	9	10
Predicted Noise Level dB L_{A90}	31.7	34.3	39.0	43.1	43.4	43.4	43.4	43.4
Measured Daytime Background (BG) Noise dB L_{A90}	27.2	28.3	29.7	31.3	33.0	34.7	36.4	38.1
Measured Night-time Background (BG) Noise dB L_{A90}	27.8	28.1	28.5	29.4	30.7	32.6	35.3	38.9
Daytime threshold (35 dB L_{A90} or BG +3dB)	35.0	35.0	35.0	35.0	36.0	37.7	39.4	41.1
Night-time threshold (35 dB L_{A90} or BG +3dB)	35.0	35.0	35.0	35.0	35.0	35.6	38.3	41.9
Margin Relative to Daytime Limit	3.3	0.7	-4.0	-8.1	-7.4	-5.7	-4.0	-2.3
Margin Relative to Night-time Limit	3.3	0.7	-4.0	-8.1	-8.4	-7.8	-5.1	-1.5

It can be seen that noise levels here are some 8 dB over the IFC limit at moderate wind speeds. Therefore, a noise impact of moderate significance is predicted at this location. Noise levels at W4 and W5 are approximately 2 dB lower than W3. Therefore, these locations will also have noise levels over the IFC noise limit such that an impact of moderate significance is predicted even though the Serbian night-time limit can be met.

14.6.3.3 Noise Levels at Location W24 House by Road with Flowers

The assessment is set out in Table 14-23 below.

Table 14-23 Assessment for Location W24 House with Flowers

Location W24	Noise Levels (dB L_{A90}) at wind speeds (m/s) at 10m height							
	3	4	5	6	7	8	9	10
Predicted Noise Level dB L_{A90}	34.3	36.9	41.6	45.7	46.0	46.0	46.0	46.0
Measured Daytime Background (BG) Noise dB L_{A90}	28.3	29.5	31.4	33.6	36.1	38.7	41.1	43.2
Measured Night-time Background (BG) Noise dB L_{A90}	23.8	25.3	27.5	30.1	32.9	35.4	37.3	38.3
Daytime threshold (35 dB L_{A90} or BG +3dB)	35.0	35.0	35.0	36.6	39.1	41.7	44.1	46.2
Night-time threshold (35 dB L_{A90} or BG +3dB)	35.0	35.0	35.0	35.0	35.9	38.4	40.3	41.3
Margin Relative to Daytime Limit	0.7	-3.9	-8.6	-11.1	-8.9	-6.3	-3.9	-1.8
Margin Relative to Night-time Limit	0.7	-1.9	-6.6	-10.7	-10.1	-7.6	-5.6	-4.7

Noise levels are up to 11 dB over the IFC noise limits. Note this location also has noise levels over the 45 dB L_{Aeq} Serbian limit with a turbine very close. It is noted that the owner has accepted financial compensation for this potential disturbance. The owner is expected to install improved sound insulation.

14.6.3.4 Noise Levels at R2

There is a group of houses designated as R2, R3 and R4 on the main road so the north of the site. Noise levels at R2 has been assessed using the background noise from O1 Kafana which is close by along the same road. The assessment is set out in Table 14-24 below.

Table 14-24 Assessment for Location R2 using Background Noise Levels at O1 Kafana

Location R2	Noise Levels (dB L_{A90}) at wind speeds (m/s) at 10m height							
	3	4	5	6	7	8	9	10
Predicted Noise Level dB L_{A90}	23.6	26.1	30.9	35.0	35.3	35.3	35.3	35.3
Measured Daytime Background (BG) Noise dB L_{A90}	26.9	28.1	29.7	31.7	33.9	36.0	38.0	39.7
Measured Night-time Background (BG) Noise dB L_{A90}	27.1	27.1	27.5	28.6	30.3	32.8	36.2	40.6
Daytime threshold (35 dB L_{A90} or BG +3dB)	35.0	35.0	35.0	35.0	36.9	39.0	41.0	42.7
Night-time threshold (35 dB L_{A90} or BG +3dB)	35.0	35.0	35.0	35.0	35.0	35.8	39.2	43.6
Margin Relative to Daytime Limit	11.4	8.9	4.1	0.0	1.3	3.7	5.7	7.4
Margin Relative to Night-time Limit	11.4	8.9	4.1	0.0	-0.3	0.5	3.9	8.3

Noise levels are 0.3 over the limit at one speed. In practice this location is likely to be acceptable, particularly as there would be reductions in noise because of reducing turbine noise at other locations. Predicted noise levels at the Café are much higher but this is not classified as a residential property.

14.6.3.5 Noise Levels at R5 Dimitri's Farm

The assessment for Dimitri's Farm (R5) is set out in Table 14-25 below.

Table 14-25 Assessment for Location R5

Location R5	Noise Levels (dB L_{A90}) at wind speeds (m/s) at 10m height							
	3	4	5	6	7	8	9	10
Predicted Noise Level dB L_{A90}	29.1	31.6	36.4	40.5	40.8	40.8	40.8	40.8
Measured Daytime Background (BG) Noise dB L_{A90}	26.5	26.4	27.8	30.3	33.4	36.9	40.2	43.0
Measured Night-time Background (BG) Noise dB L_{A90}	24.1	24.7	26.4	28.9	32.0	35.4	39.0	42.4
Daytime threshold (35 dB L_{A90} or BG +3dB)	35.0	35.0	35.0	35.0	36.9	39.0	41.0	42.7
Night-time threshold (35 dB L_{A90} or BG +3dB)	35.0	35.0	35.0	35.0	35.0	35.8	39.2	43.6
Margin Relative to Daytime Limit	5.9	3.4	-1.4	-5.5	-4.4	-1.0	2.4	5.2
Margin Relative to Night-time Limit	5.9	3.4	-1.4	-5.5	-5.8	-2.4	1.1	4.6

Noise levels are around 0.3 dB over the IFC limit at the farm at moderate wind speeds again in practice this will be acceptable given that noise levels are low in absolute terms and the exceedance occurs only at moderate wind speeds. A significant reduction in noise impact at this location has been achieved by omitting the cluster of four turbines at the north-eastern end.

14.6.3.6 Noise Levels at W6 Dragica

The assessment at Dragica's house is set out in Table 14-26 below. The IFC noise limits can be met at higher wind speeds.

Table 14-26 Assessment for Location W6

Location W6	Noise Levels (dB L_{A90}) at wind speeds (m/s) at 10m height							
	3	4	5	6	7	8	9	10
Predicted Noise Level dB L_{A90}	20.5	23.0	27.8	31.9	32.2	32.2	32.2	32.2
Measured Daytime Background (BG) Noise dB L_{A90}	27.7	28.8	30.9	33.8	37.1	40.4	43.5	46
Measured Night-time Background (BG) Noise dB L_{A90}	25.7	27	29.2	32.2	35.7	39.5	43.2	46.7
Daytime threshold (35 dB L_{A90} or BG +3dB)	35	35	35	36.8	40.1	43.4	46.5	49
Night-time threshold (35 dB L_{A90} or BG +3dB)	35	35	35	35.2	38.7	42.5	46.2	49.7
Margin Relative to Daytime Limit	14.5	12.0	7.2	4.9	7.9	11.3	14.3	16.8
Margin Relative to Night-time Limit	14.5	12.0	7.2	3.3	6.5	10.3	14.0	17.5

14.6.3.7 Noise Levels at O5 Logger's Cabin

The assessment is set out in Table 14-27 below.

Table 14-27 Assessment for Location O5

Location O5	Noise Levels (dB L_{A90}) at wind speeds (m/s) at 10m height							
	3	4	5	6	7	8	9	10
Predicted Noise Level dB L_{A90}	31.3	33.8	38.6	42.7	43.0	43.0	43.0	43.0
Measured Daytime Background (BG) Noise dB L_{A90}	31.3	32.7	34.1	35.5	36.9	38.3	39.8	41.3
Measured Night-time Background (BG) Noise dB L_{A90}	29.1	29.3	30.0	31.1	32.6	34.4	36.5	38.7
Daytime threshold (35 dB L_{A90} or BG +3dB)	35	35.7	37.1	38.5	39.9	41.3	42.8	44.3
Night-time threshold (35 dB L_{A90} or BG +3dB)	35	35.0	35.0	35.0	35.6	37.4	39.5	41.7
Margin Relative to Daytime Limit	3.7	1.9	-1.5	-4.2	-3.1	-1.7	-0.3	1.3
Margin Relative to Night-time Limit	3.7	1.2	-3.6	-7.7	-7.4	-5.6	-3.6	-1.3

Noise levels are up to 8dB over the limits at moderate wind speeds. This is not classified as a residential property however.

14.6.4 Impacts Summary

The assessment has indicated that two properties will exceed the Serbian night-time noise limits: W3 and W24. However even if mitigation were applied to these locations so that the night-time limit was achieved, noise levels would still exceed the IFC noise limit which is set as the threshold for an impact of moderate significance. Discussion in regard to compensating these residents are on-going. The owner of W24 has agreed to accept financial compensation for this potential disturbance. The owner is expected to install improved sound insulation. The owner of W3 has preferred to wait until the WPP is constructed and noise impact can be confirmed.

Note also that an impact of moderate significance is also predicted at W4 and W5 even though the Serbian limits can be met at these locations.

14.6.5 Proposed Mitigation/ Control Measure

Primary mitigation, through changes to the WPP design and the removal of four turbines from the scheme, has been agreed with the developer and this has significantly reduced the predicted noise levels at the receptors to the north-east. In addition, the worst affected houses have been fully financially compensated by the developer and taken out of residential use. Following these changes there are two properties where noise levels are likely to exceed Serbian noise limits. The potential impact has been discussed with the individuals and they have agreed to accept financial compensation so that improved sound insulation can be provided. In the event of complaints monitoring will be carried out at these properties as set out in the ESMMP.

14.6.6 Conclusions

A summary of operational noise impacts is provided in Table 14-28.

<table>
<tr><td>Impact or Opportunity:</td><td colspan="2">Increased environmental noise during operation</td><td>Ref. No.: 46</td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="3">~~Positive~~/ Negative
Direct/ ~~Indirect~~
~~Temporary/ Short-term/ Medium-term/~~ Long-term/ ~~Permanent~~
Local/ ~~National/ Regional~~</td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="3">The design evolution of the project has removed four turbines to mitigate the impacts at properties to the north-east. Embedded mitigation will be included in the form of serrated trailing edges fitted to the turbine blades. In addition, it will be possible to operate the turbines in reduced noise modes (with some loss in electrical power). Properties with noise levels exceeding the Serbian night-time limit will be offered compensation so that the sound insulation of the properties can be improved.</td></tr>
<tr><td>Residual Impact:</td><td colspan="3">Noise will still be audible and is classified as an impact of moderate significance.</td></tr>
<tr><td>Residual Impact Rating:</td><td>~~Substantial Beneficial~~
~~Moderate Beneficial~~
~~Minor Beneficial~~
~~Negligible Beneficial~~</td><td>~~No Change~~</td><td>~~Negligible Adverse~~
~~Minor Adverse~~
Moderate Adverse at 4 properties
~~Significant Adverse~~</td></tr>
</table>

Table 14-28 Operational Noise Impact

14.7 Ice Throw and Ice Fall

14.7.1 Creation of Ice Throw Conditions

The development site is situated in an Icing Climate area. The average duration of active ice formation at the site has been predicted to 32 days (768 hours) which is 9% of year, primarily in January and February. This is the period when meteorological conditions for ice build-up are favourable and ice accumulation on turbine blades and stationary components is initiated.

Icing on rotating blades starts earlier and has higher accretion rate than on non-rotating components (rotor hub, nacelle, tower).

Ice throw conditions are created when ice is removed from blades while turbine is in operation. This is caused either by melting due to activation of blade heating system, or due to the air temperature increase above the melting point of ice, or by shaking of ice fragments due to blade movement, or removal of ice by wind.

The ice detached from a rotating blade has initial velocity and can be projected away from the turbine which may present a safety risk. The landing distance depends on the rotor speed, the wind speed and direction, and the ice structure.

Ice fall conditions are similar to any tall structure – ice can shed from turbine tower, nacelle, hub or stopped blades. De-icing cycle on turbines which removes the ice from non-rotating blades can also trigger the ice fall. It may pose a safety risk to workers or anyone accessing the turbine's ice fall zone.

14.7.2 Mitigation by Design

Wind turbines in Icing Climate sites are designed to include commercially warranted anti-icing and de-icing systems aimed to reduce production losses and the risk of ice throw. The preferential candidate turbine model for the Crni Vrh WPP (Nordex N163) has the following icing protection systems (IPS) integrated to SCADA:

- Ice detection: Meteorological ice detection sensor on the nacelle roof and the power curve analysis are used to detect icing conditions and to predict the conditions of the blades;
- Ice prevention: As soon as icing conditions are detected, the electrical heating system underneath the blade surface is automatically switched on (manual start is also possible). The system limits the ice build-up on the blades while the turbine is in operation and actively produces energy;
- Ice removal: If vibrations caused by ice accretion reach levels that can be dangerous for the integrity of turbines, the turbine is stopped. After turbine downtimes, de-icing operation is triggered to enable the system to restart.

The IPS prevent/ remove the ice from the aerodynamically relevant parts of the blades, however the ice can still form on unheated areas (trailing edge, blade root, blade tip). The IPS do not fully prevent ice throw from the blades but reduce the ice fragment size and decrease the severity of potential strikes.

14.7.3 Potential Ice Throw Receptors

The initial Study Area of 430.5m around each proposed wind turbine has been established for the ice throw risk (see Figure 14-17 below), based on the conservative principle described in section 7.2.3.

It is notable on the map that two stretches of the state road No. 161 fall within the Study Area. Each stretch is 2km long. The existing forest tracks which will be upgraded to the access tracks largely fall within the risk zone. There are also 5 weekend houses and 1 abandoned house in the zone.

Potential ice throw and ice fall receptors include: local residents (people living or visiting their properties in Crni Vrh area), forest loggers, hunters, people involved in recreation (trekkers, walkers), people in vehicles travelling the public road No. 161 and the WPP staff (including operational maintenance staff and visitors).

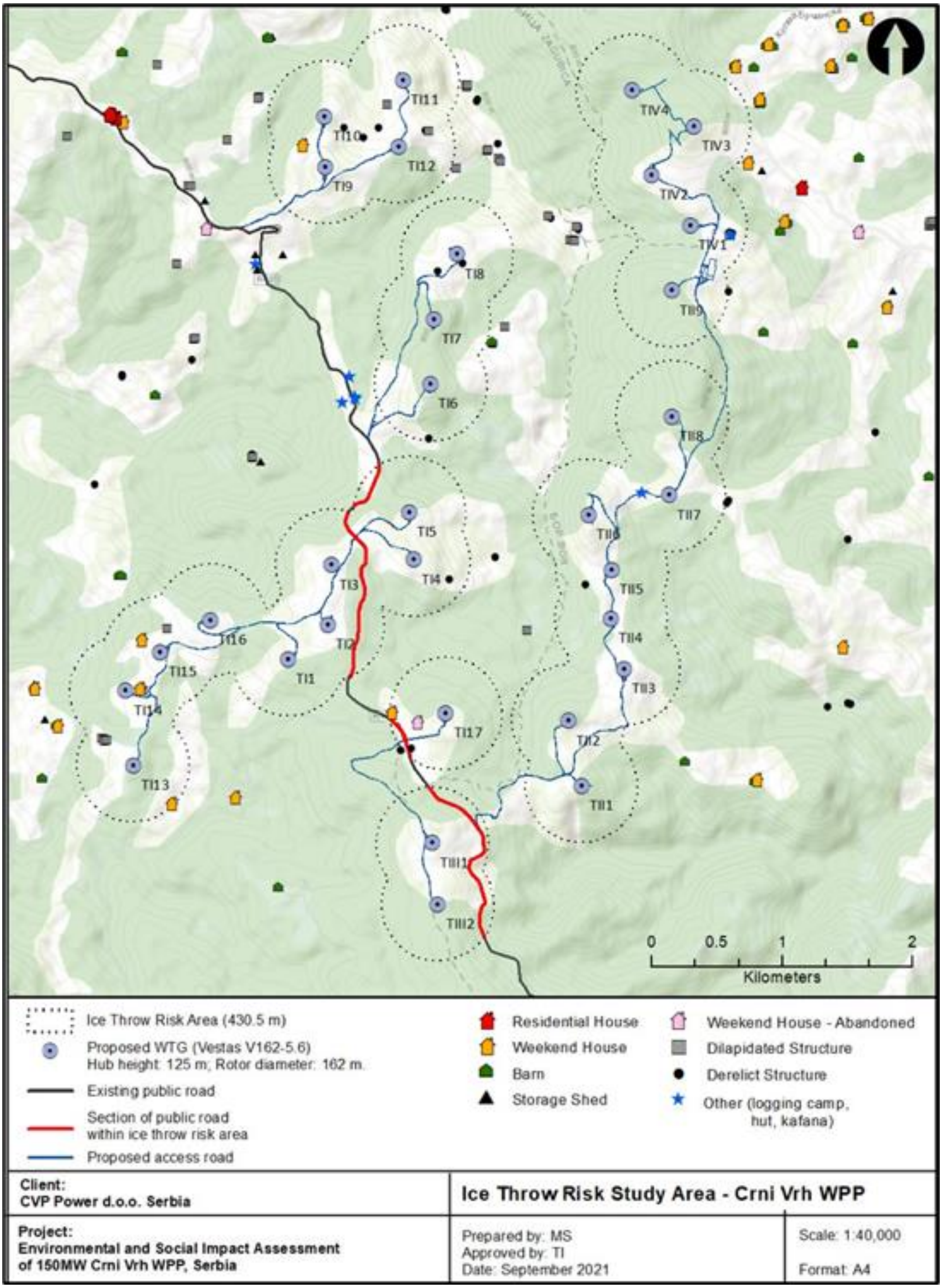

Figure 14-17 Ice Throw Risk Study Area

14.7.3.1 Exposure of Receptors

Exposure of people to ice throw in Crni Vrh will largely depend on weather conditions during the icing days. The mountain does not attract many visitors in winter as snow and ice on roads in combination with dense fog and harsh wind create unpleasant conditions. For instance, in the peak season the nearby ski centre attracts up to 200 daily visitors.

The most regular pedestrian visitors in January and February are local hunters participating in the game hunting season, primarily on weekends. The daily presence of forest loggers is possible as well as occasional presence of people checking their properties. A conservative assumption is that up to 30 pedestrians might be present at the development site on weekends in the icing period, provided that the weather allows (no rain, sleet, snowdrift, etc.). Fewer people are present on weekdays.

The mountain pass section of the state road No. 161 (Bor Reservoir – Žagubica) is generally known in Serbia as one of the most challenging roads to drive in snow season. Glaze ice, frozen rain or snow drifts combined with persistent fog create difficult driving conditions (see Figure 14-18 below). The traffic load is low; the average annual daily traffic is 530 vehicles and presumably lower during snow season.

The road is categorised as the lowest, 3rd level priority for winter maintenance meaning that snow is cleared only after 1st and 2nd level roads have been de-iced or cleared. As a lowest priority, the road is not gritted. This results in the road being closed during and after snowdrifts and subject to lorry and bus driving restrictions.

A well-known accident dates from February 2012 when a local bus from Žagubica was stuck for five hours in a three-metre snowdrift before being rescued. The location was close to the proposed WTG T1-3 (‘Krst’).[59]

Driving on this road in winter conditions already requires reduced speed and alertness.

Figure 14-18 Winter Driving Conditions on the Public Road No. 161 in Crni Vrh [60]

Ice-damaged trees sometimes fall over the road causing blockages. An illustration of the conditions on the road in Crni Vrh area during the cold spell in December 2014 is shown on Figure 14-19.

[59] https://www.novosti.rs/vesti/srbija.73.html%3A365988-Spaseni-putnici-iz-zavejanog-autobusa-na-Crnom-vrhu
[60] https://istmedia.rs/pogledajte-video-put-ka-zagubici-glava-u-torbi/

Figure 14-19 Public Road No. 161 Blocked by Trees in Crni Vrh Area in December 2014 [60]

14.7.4 Impact Assessment

The key principle for the acceptable risk of ice throw is that the Crni Vrh WPP should not significantly increase the risk to public compared to the daily risk in society.

The fatality risk acceptance thresholds adopted within this assessment (described in section 7.3.6) are illustrated on Figure 14-20:

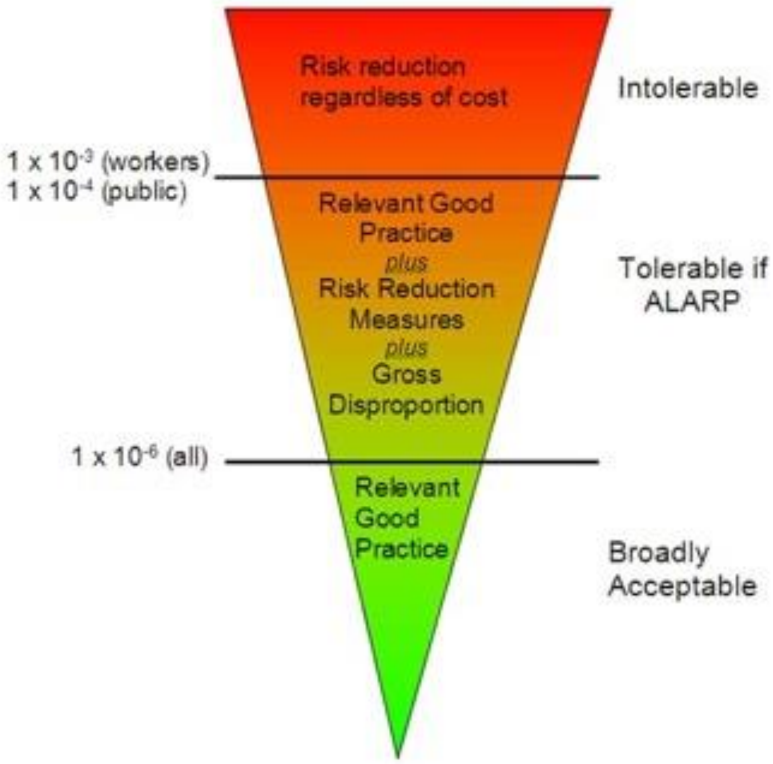

Figure 14-20 Risk Reduction According to the ALARP Principle [61]

[61] Source: www.railssa.com

To put the risk in context, the annual average individual risk of being killed by a lightning strike in Serbia is 2.5 x 10^{-6} (2.5 per 1 million) and in a traffic accident is 8.1 x 10^{-5} (8.1 per 100,000).[62] This estimate is based on all people living in Serbia, irrespective of how much they are exposed to these hazards.

14.7.4.1 Modelling Results

One of the key uncertainties related to prediction of ice fragment strikes is the performance of the installed IPS in Crni Vrh conditions. Both potential OEMs (Nordex, Vestas) have limited experience with the icing conditions in the Balkans, hence the efficiency of ice removal remains uncertain at this stage.

To compensate for this uncertainty, the numerical model has taken a conservative approach and considered an ice fragment weighing 0.5kg as the most representative, i.e. most frequent size. The international research data suggest that with an appropriate IPS, 95% of ice fragments weigh below 0.5kg.[63]

The ice throw modelling results in the form of risk contour plot are presented on Figure 14-21. The contour plot represents the probability of one ever-present 1m^2 area being struck by an ice fragment assuming 32 days of icing per year. For instance, each 1m^2 within the 0.001 risk contour has 1 in 1,000 chances of being struck during winter.

It is evident from the map that the ice throw distance depends on the terrain topography and turbine position. For the majority of turbines, 90% of 0.5kg ice fragments are predicted to fall between 150 and 180m from the turbine base, but there are exceptions for positions on steep slopes (e.g. 250m from TI-6, 220m from TI-11 and TI-10). The remaining 10% of ice drops are predicted to occur at around 350m from the majority of turbines, again with exceptions on steep terrain where it extends to up to 450m (TI-10, TI-11, TII-6).

For ice fragments smaller than 0.5kg the ice throw range is presumed to be shorter.

The Ice Throw Assessment Report is provided as Appendix F.

The risk contours indicate how hazardous an area is. They do not take into account the actual time people are present within the area, the presence of trees or structures that may provide shelter or action people might take to mitigate an ice throw event.

To evaluate the acceptable risk, localised individual risk per annum (LIRA) is calculated. Assuming that all strikes are 100% fatal, the individual risk for an unprotected person (20cm x 50cm = 0.1m^2) who permanently stands at a fixed position within the 10^{-3} contour area (say 300m from a turbine) is:

LIRA = 0.001 x 0.1m^2 x 1.0 = 0.0001 = 10^{-4} (1 fatality in 10,000 years)

Fatality Risk for a Hunter

In reality, people will not be permanently present in the ice throw risk area. During the average icing period of 32 days, a hunter who visits the site on weekends and spends 30 minutes/day in the 10^{-3} ice throw risk zone will be exposed 0.5 h/day x 8 days = 4 hours. The probability that he is present 300m from a turbine during the icing period is therefore: 4 hours / (32 days x 24 hours) = 0.005. The individual risk per annum for a hunter, assuming that 100% strikes are fatal will be:

IRPA = LIRA x 0.005 x 1.0 = 0.0001 x 0.005 x 1.0 = 5x10^{-7} (5 fatalities in 10 million years)

Compared to the risk acceptance threshold, this risk is tolerable and in the lower ALARP region (10^{-6} – 10^{-7}). However, the individual risk will not be equally distributed over the whole area but will depend on the wind direction at the moment of ice throw. A person standing in a downwind sector will be under higher risk than someone standing upwind. Common measures to further reduce the risk are recommended.

Material Damage Risk

The proposed small car park (4 cars, 50m^2) near the substation compound would be situated 280m from the turbine TII-9. The ice throw risk in this area is calculated to 10^{-3} (0.001 strikes per m^2 per winter). Assuming that the wind direction aligned with this area occurs 10% of the time during icing conditions and that 100% of ice fragments cause damage, the resulting probability for the car park being struck would be:

0.001 x 50m^2 x 0.1 x 1.0 = 0.005 strikes per winter (1 strike per 200 winters)

As the risk of material damage should be reduced, installation of a roof over the car park is recommended.

[62] Based on the information in the public domain: 15 fatalities per annum caused by a lighting strike assuming that 6 million people live in Serbia. The 5-year average rate of road deaths in Serbia is 81 per 1 million inhabitants.
[63] Cattin R., Tiefgraber M., Heimo A., 2014 - Wind turbine ice throw studies in the Swiss Alps.

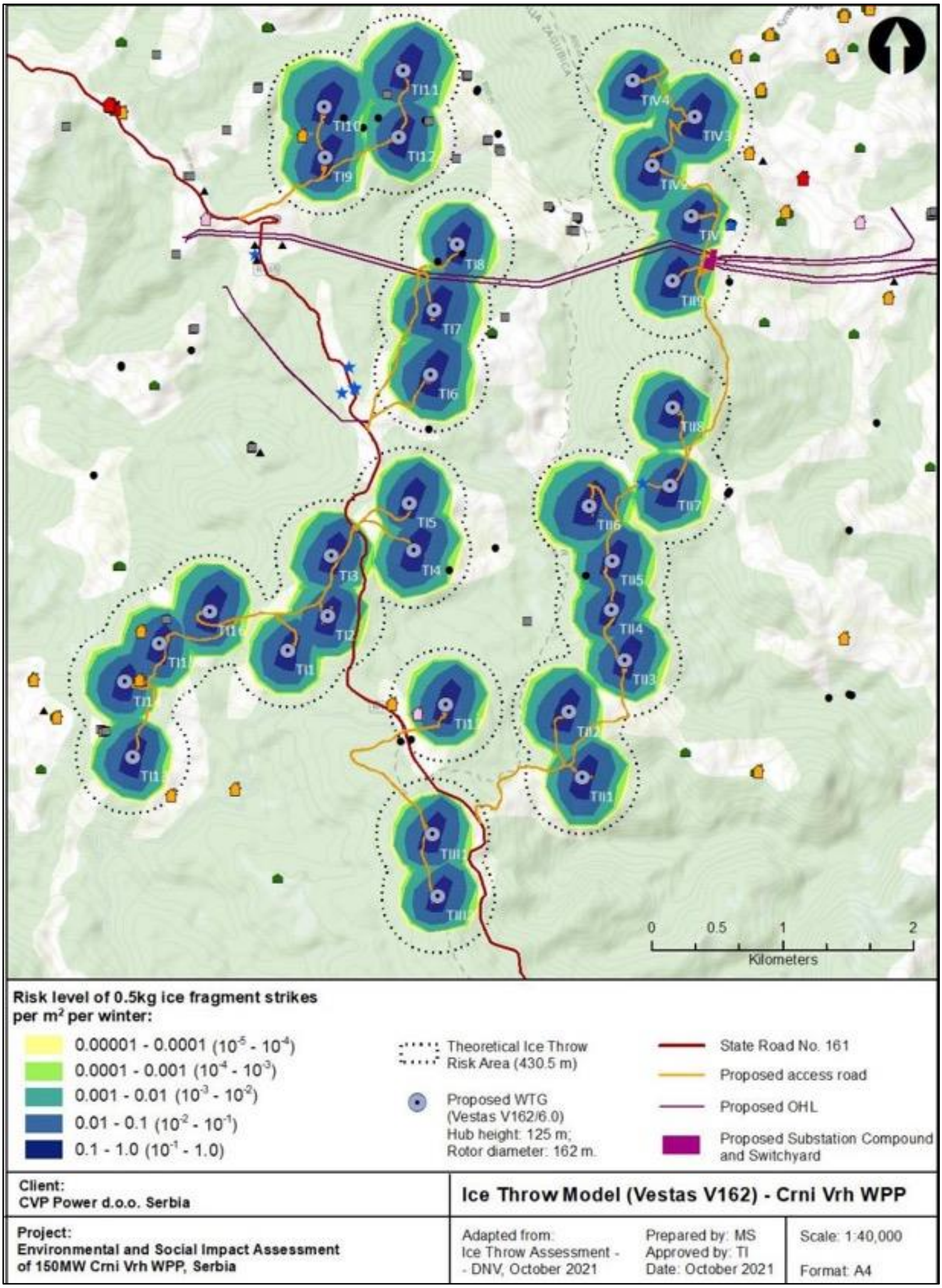

Figure 14-21 Ice Throw Risk Contour Plot

Strike Risk for Vehicle Travelling the Public Road

The 900m long stretch of the public road No. 161 falls within the risk area of 10^{-3} (Figure 14-22). Assuming the conservative driving speed in adverse weather conditions (30km/h), a vehicle would take 108 seconds to transit the 900m-long section.

The daily exposure of a single vehicle would be: 108 seconds / 86,400 seconds per day = 0.00125.

Assuming the conservative traffic volume of 500 vehicles per day, the probability of individual vehicle being struck by an ice fragment would depend on the impact area and the probability of a turbine alignment with the road. The windshield area is estimated to $2m^2$. Assuming that the wind direction aligns turbines TI-2 and TI-3 with the road 30% of the time, the individual risk for a vehicle being struck is:

$$0.001 \times 500 \times 0.00125 \times 0.30 \times 2 = 0.000375 \text{ strikes per winter (1 strike per 2,667 winters)}$$

Fatality Risk for Travellers on the Public Road

An ice fragment thrown from a turbine has to have the energy of 140J to penetrate the windshield (this is equivalent to a steel ball of 2.25kg). Strikes on the rear windows have not been considered in the analysis. The relation between Individual Risk and strike probability above the given energy limit for a car driver has been combined to 0.01.[64]

Assuming that the average number of passengers in a vehicle is 1.5, the total daily number of exposed people would be: 500 vehicle x 1.5 people = 750. The individual daily risk for a car passenger to be fatally hit by an ice fragment is therefore:

$$IRPA = (0.000375 \times 0.01) / 750 = 5 \times 10^{-9}$$

Compared to the risk acceptance threshold, this risk is broadly acceptable. The exposure of passengers who travel the road more than once daily will be higher, increasing the risk of being struck. Good practice measures to mitigate the risk are recommended.

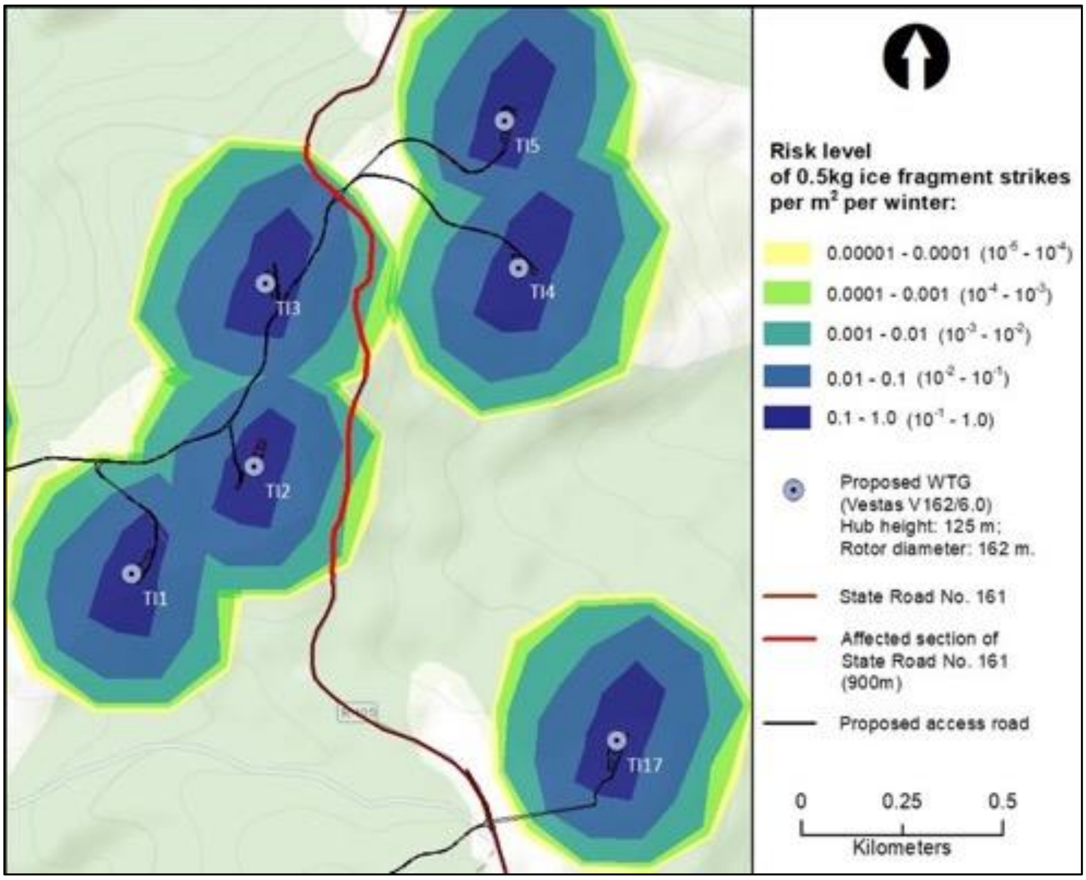

Figure 14-22 Ice Throw Risk Contours for Public Road No. 161

[64] Bredesen, Rolv Erlend, Refsum Helge Ausland - Methods for Evaluating Risk Caused by Ice Throw and Ice Fall from Wind Turbines and Other Tall Structures

The stretch of the road No. 161 within the ice throw risk area of the proposed turbine TI-3 is shown on Figure 14-23 (the K1 met mast is also visible).

Figure 14-23 Stretch of the Public Road No. 161 within the Ice Throw Risk Area

The ice fall modelling results suggest that 90% of 0.5kg ice fragments is predicted to fall at around 100m from the turbine base, except the positions on steep slopes where it is up to 120m (TI-6, TI-11, TI-10). The remaining 10% of ice drops are predicted to fall at around 180m from the majority of turbines, again with exceptions in steep areas where it extends to up to 200m (TI-10, TI-11, TII-6).

14.7.5 Impacts Summary

The ice throw hazard area at the development site includes areas up to 350m from the turbines, a 900m-long section of the public road, proposed access tracks between the turbines and a car park near the substation compound. The presence of pedestrians and vehicles in Crni Vrh during the icing period is considered to be limited due to the mostly unpleasant weather conditions. The calculated ice throw risk levels are tolerable on the condition that risk reduction measures are implemented.

14.7.6 Proposed Mitigation/ Control Measure

An Ice Throw and Ice Fall Management Plan should be developed to set out the operational and technical measures to prevent and mitigate the risk for public and WPP personnel. The Plan should cover the following topics:

- Danger zones at the site: Warning signs should be posted at the site entrance, along the access tracks at least 350m from the turbines, and along the affected section of the public road. Fog and poor visibility conditions should be taken into account, flashlights and audible signs should be considered. The danger signs should be removed outside the winter season to prevent habituation of people to the hazard;
- Health & safety protocols: Permanent or mobile structural protection should be provided where necessary (roof protection at the car park and turbine entrance). Working procedures should be established to define movement at the site in the icing period, PPE, precautions before maintenance personnel access the turbines, etc.
- Contracts with residents: Affected users of summer houses should be contractually obligated not to visit their properties during winter. At the time of writing, the level of compensation has been agreed at four properties and contracts have been signed.
- Education and communication: Information meetings should be held with residents, hunters and loggers to change their behaviour in the long-term. Text messaging during critical periods should be considered. The ice throw issue should be carefully communicated in social media to inform but not to create fear;
- An incident response procedure should be implemented with clearly defined responsibilities and tasks. The procedure should cover accidents for both 1st, 2nd, and 3rd party.

Provided that all reasonably practical mitigation measures are implemented, the proposed Crni Vrh will not increase the risk to public and the residual risk will remain similar to the daily risk in society.

14.7.7 Conclusions

A summary of impacts on the landscape character during operation of the WPP is provided in Table 14-29.

<table>
<tr><td>Impact or Opportunity:</td><td colspan="2">Risk of fatality for general public or the WPP personnel due to turbine ice throw or ice fall.</td><td>Ref. No.:</td><td>47</td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="4"><s>Positive</s>/ Negative
Direct/ <s>Indirect</s>
<s>Temporary</s>/ <s>Short-term</s>/ <s>Medium-term</s>/ <s>Long-term</s>/ Permanent
Local/ <s>National</s>/ <s>Regional</s></td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="4">Develop and implement an Ice Throw and Ice Fall Management Plan to set out the operational and technical measures to prevent and mitigate the risk for public and WPP personnel. The Plan should cover the following topics:
Danger zones at the site: Warning signs should be posted at the site entrance, along the access tracks at least 350m from the turbines, and along the affected section of the public road. Fog and poor visibility conditions should be taken into account, flashlights and audible signs should be considered. The danger signs should be removed outside the winter season to prevent habituation of people to the hazard;
Health & safety protocols: Permanent or mobile structural protection should be provided where necessary (roof protection at the car park and turbine entrance). Working procedures should be established to define movement at the site in the icing period, PPE, precautions before maintenance personnel access the turbines, etc.
Contracts with residents: Affected users of summer houses should be contractually obligated not to visit their properties during winter. The appropriate compensation should be considered;
Education and communication: Information meetings should be held with residents, hunters and loggers to change their behaviour in the long-term. Text messaging during critical periods should be considered. The ice throw issue should be carefully communicated in social media to inform but not to create fear;
An incident response procedure should be implemented with clearly defined responsibilities and tasks. The procedure should cover accidents for both 1st, 2nd, and 3rd party.</td></tr>
<tr><td>Residual Impact:</td><td colspan="4">The residual risk of fatality due to ice throw should remain similar to the daily risk in society.</td></tr>
<tr><td>Residual Impact Rating:</td><td><s>Substantial Beneficial</s>
<s>Moderate Beneficial</s>
<s>Minor Beneficial</s>
<s>Negligible Beneficial</s></td><td>No Change</td><td colspan="2"><s>Negligible Adverse</s>
<s>Minor Adverse</s>
<s>Moderate Adverse</s>
<s>Significant Adverse</s></td></tr>
</table>

Table 14-29 Ice Throw and Ice Fall Impact Assessment

14.8 Community Health, Safety and Security

The assessment of turbine fire risk and ice-throw risk is provided in sections 14.9 and 14.7, respectively.

During the operation phase, public safety and security risks are related to unauthorised access, turbine collapse or failure, and blade shear or breakage.

14.8.1 Impact Assessment

14.8.1.1 Unauthorised Access

While the access to the site would not be restricted, the wind turbines would be designed to prevent unauthorised access. The substation is fenced off and locked unauthorised access is possible. Other buildings at the site are also secured.

Additional management measures should be applied so the risk of unauthorised access and vandalism is reduced to **negligible**.

14.8.1.2 Turbine Collapse or Failure

Occurrences of turbine collapse are extremely rare. The turbine design would be based on the local ground conditions and the seismic setting of the area.

It is unlikely that persons will be in the vicinity of the WPP during conditions which may lead to turbine collapse and the distance of 500m to the nearest residential property will eliminate any risk. Based on the above information we have determined that the potential risk of turbine collapse leading to injury or property damage is considered to be **negligible** and is not assessed further.

14.8.1.3 Blade Shear or Breakage

The turbines would be designed in accordance with all relevant industry standards and guidelines and would be appropriate for the environmental conditions and wind regime in Crni Vrh.

The turbines would be subject to a routine programme of inspection and maintenance based on industry best-practice and the turbine manufacturer's guidance and recommendations throughout their operating life.

Blade shear or breakage is a rare occurrence and injury as a result of blade shear or breakage is rarer still. It is unlikely that persons will be in the vicinity of the WPP during conditions which may lead to blade shear/breakage and distance of 500m to the nearest residential property will minimise any risk. The potential risk of blade shear or breakage leading to injury or property damage is considered to be negligible and is not assessed further.

The risks of public injury or damage due to very low probability events such as blade shear/breakage or turbine collapse are considered to be **negligible**.

14.8.2 Impacts Summary

The wind turbines and substation compound are designed to prevent unauthorised access. Additional management measures would be needed to minimise the risk of vandalism.

It is unlikely that persons will be in the vicinity of the WPP during conditions which may lead to blade shear/ breakage and distance of 500m to the nearest residential property will minimise any risk.

14.8.3 Proposed Mitigation/ Control Measure

14.8.3.1 Unauthorised Access

In addition to security measures implemented by design (turbines designed to prevent unauthorised access, fenced off substation), management measures should be in place to eliminate the risk for the onsite staff and infrastructure:

- Each turbine access door should be locked;
- Access to turbine tower ladders should be prevented;
- The substation should be fenced off and locked; and
- Signposts should be erected detailing the potential dangers of unauthorised access.

Provided that the technical and management measures to prevent unauthorised access are applied, the risk of vandalism and injury should be negligible.

14.8.4 Conclusions

A summary of potential community health, safety and security risks during the WPP operations is provided in Table 14-30.

<table>
<tr><td>Impact or Opportunity:</td><td colspan="2">Unauthorised access of local residents (highly sensitive receptor) during the operation phase.</td><td>Ref. No.:</td><td>48</td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="4">~~Positive~~/ Negative
Direct/ ~~Indirect~~
~~Temporary~~/ Short-term/ ~~Medium-term~~/ ~~Long-term~~/ Permanent
Local/ ~~National~~/ ~~Regional~~</td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="4">Each turbine access door should be locked;
Access to turbine tower ladders should be prevented;
The substation should be fenced off and locked; and
Signposts should be erected detailing the potential dangers of unauthorised access.</td></tr>
<tr><td>Residual Impact:</td><td colspan="4">The risk of vandalism or injury due to unauthorized access should be negligible.</td></tr>
<tr><td>Residual Impact Rating:</td><td>~~Substantial Beneficial~~
~~Moderate Beneficial~~
~~Minor Beneficial~~
~~Negligible Beneficial~~</td><td>No Change</td><td colspan="2">~~Negligible Adverse~~
~~Minor Adverse~~
~~Moderate Adverse~~
~~Significant Adverse~~</td></tr>
</table>

Table 14-30 Unauthorised Access Risks during Operation

14.9 Wildfire and Forest Fire

During the operation phase, key issues related to fire risk would include the risk that a wildfire could damage the WPP infrastructure and the risk that a wind turbine or transformer could catch fire that could spread to nearby areas and cause a forest fire.

14.9.1 Mitigation by Design

Wind turbines are designed with structural fire protection aimed to minimise the fire risk to nearby areas. The turbines are equipped with comprehensive fire detection and warning systems, integrated to SCADA:

- The operating temperature of individual components is monitored in the nacelle. If limit values are exceeded the affected systems are switched off. Remote monitoring is automatically informed of the failure of individual components and the turbine can be automatically shut down. This includes the automatic shut down if ambient temperature exceeds the safe operating range (40º C);
- The turbine design includes integrated lightning, earthing and overvoltage protection. The blades are fitted with multiple lightning receptors that conduct the lightning to the tower and safely into the ground. The electronic components within the nacelle have lightning protection.

14.9.2 Impact Assessment

Power generation and electrical equipment (wind turbines, power transformers, switchyard, transmission lines) have the fire potential. Per Serbian Law on Fire Protection, wind turbines are in the lowest, third category of fire risk (the first being the highest). Substations and switchyards are in the second category of fire risk.

Fires in modern wind turbines as a result of malfunctioning or electrical faults are considered to be extremely rare events.

Due to their height and exposure, wind turbines are prone to direct lightning strikes. The presence of turbines with their lightning protection systems is likely to reduce the risk of wildfire starting as a result of a lightning strike. Despite the incidence of lightning strike starting a turbine fire being very low, some very low residual risk remains.

Other fire risks occur during routine maintenance which involves hot work, especially in wildfire season in summer months.

All combustible components of the turbine are located high above the ground in the nacelle and blades. Nacelle and blade fires are short-lived, they last a couple of hours until all fuel (oil, carbon, fibre-glass) is burnt. Possibilities of extinguishing a nacelle fire from the ground are limited so the key is to prevent burning debris falling on nearby vegetation, starting a forest fire. This is provided by designing appropriate setbacks around the turbines and substation compound. At the same time, the setbacks present a defendable space around the WPP infrastructure in case of a wildfire.

14.9.2.1 Fire Setbacks and Fire Breaks

The initial setback, i.e. 'asset zone' around each turbine is proposed to include the turbine foundation, crane pad and hardstanding. The asset zone is a fuel-free space, cleared of vegetation. The hardstandings at the site are proposed not to be reinstated after the construction, which would normally be done in a low wildfire risk area. Once the hardstandings are cleared for the construction, they would remain free of vegetation throughout the operation. This would add additional defendable space around each turbine. Each tower would be surrounded by a minimum 25m wide vegetation-free zone, with gravel to ground-level.

By law, the proposed substation must be situated on a gravelled area with no surrounding vegetation to minimise the spread of fire. The power transformers must be provided with concrete bunds of sufficient capacity to contain the oil in case of leakage and reduce the risk of oil catching fire.

The existing narrow forest tracks will be upgraded to 7m-wide gravel-surfaced access roads. The access roads will create fire breaks which will reduce the risk of fire spreading from one ridge to the other. The roads will improve the accessibility of the site, facilitating potential wildfire suppression activities.

14.9.2.2 Fire Protection Infrastructure

By law, fire protection infrastructure at the site is required for the substation compound. The technical details are part of the 'Design for Building Permit' and subject to approval by the fire safety authority.

It is mandatory to have an on-site source of water supply with capacity and pressure sufficient for fire suppression for 2 hours. A gravity underground water tank is proposed on a high ground area, 250m south-west of the compound, adjacent to the WTG TII-9.

The substation compound is at a distance of more than 1.3km from a nearby residential property. The risk of a transformer fire leading to injury or property damage is **negligible**.

14.9.2.3 Wildfire Monitoring System

Wildfire monitoring system will be installed at the site and its proximity. The type and locations of monitoring equipment (CCTV, drones, watchtowers) will be decided based upon the consultation with 'Serbia Forests' – the institutional stakeholder in charge for wildfire monitoring in Crni Vrh.

14.9.2.4 Local Fire Fighting Capabilities

The closest fire brigade is located in Žagubica, 20km by the road No. 161. Assuming the rate of travel of 60km/h the turnout time to the site boundary is 20 minutes. The fire brigade in Bor is 28km away with the assumed turnout time of 30 minutes. It has around 40 firefighters.

Both Bor and Žagubica fire brigades have been recently supported from the EU funds, investing in vehicles for wildfire suppression and training.

14.9.3 Impacts Summary

The development site is situated within an area of wildfire risk. The wildfire during the operation can result in moderate to major adverse impact and additional management and mitigation measures would be necessary, besides the routine ('best practice') fire prevention measures.

14.9.4 Proposed Mitigation/ Control Measure

An Operation Fire Management and Response Plan should be developed prior to commencement of the WPP operation. The statutory stakeholders 'Serbia Forests' and fire departments from Žagubica and Bor should be consulted for the Plan development. The framework for the Plan should include but not be limited to:

- Vegetation management procedure in 'asset zone';
- Installation and maintenance of wildfire prevention signs (in liaison with 'Serbia Forests') at relevant points;

- Wildfire monitoring system (CCTV, drones, watchtowers) should be installed based upon the consultation with 'Serbia Forests' – the institutional stakeholder in charge for wildfire monitoring in Crni Vrh.
- Monitoring of fire weather risk: During the wildfire season (especially in July and August) both short-term and long-term weather predictions should be monitored. The Fire Weather Index provided by the Serbian national weather service (RHMI) should be monitored on daily basis and site personnel should be informed of the risk;
- Safe working and emergency procedures should be developed and strictly implemented during prolonged dry periods and high-speed winds, especially in summer;
- The WPP personnel should be trained in causes and prevention of wildfires and response;
- Equipment for initial fire response should be available at the site. All vehicles should carry fire-extinguishers and personnel should be trained to use it. Appropriate additional fire suppression equipment should be considered to be held at the site during periods when the wildfire risk is 'Extreme' (e.g. mobile water tanks);
- Fire response procedure should be clearly defined including actions to be taken by the WPP personnel, informing the fire brigade, health and safety protocols, evacuation from the site, etc;
- WPP operation protocols during wildfire should be defined (remote shut down of turbines, position and pitch of blades, etc.).

14.9.5 Conclusions

A summary of effects related to wildfire and fire risks during the operation of the proposed WPP is provided in Table 14-31.

Impact or Opportunity:	Damage of the WPP infrastructure due to wildfire or spreading of fire from the WPP infrastructure to nearby areas, causing a forest fire.	**Ref. No.:**	49
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	An Operation Fire Management and Response Plan should be developed prior to commencement of the WPP operation. The statutory stakeholders 'Serbia Forests' and fire departments from Žagubica and Bor should be consulted for the Plan development. The framework for the Plan should include but not be limited to: • Vegetation management procedure in 'asset zone'; • Installation and maintenance of wildfire prevention signs (in liaison with 'Serbia Forests') at relevant points; • Wildfire monitoring system (CCTV, drones, watchtowers) should be installed based upon the consultation with 'Serbia Forests' – the institutional stakeholder in charge for wildfire monitoring in Crni Vrh. • Monitoring of fire weather risk: During the wildfire season (especially in July and August) both short-term and long-term weather predictions should be monitored. The Fire Weather Index provided by the Serbian national weather service (RHMI) should be monitored on daily basis and site personnel should be informed of the risk; • Safe working and emergency procedures should be developed and strictly implemented during prolonged dry periods and high-speed winds, especially in summer; • The WPP personnel should be trained in causes and prevention of wildfires and response; • Equipment for initial fire response should be available at the site. All vehicles should carry fire-extinguishers and personnel should be trained to use it. Appropriate additional fire suppression equipment should be considered to be held at the site during periods when the wildfire risk is 'Extreme' (e.g. mobile water tanks);		

	• Fire response procedure should be clearly defined including actions to be taken by the WPP personnel, informing the fire brigade, health and safety protocols, evacuation from the site, etc; • WPP operation protocols during wildfire should be defined (remote shut down of turbines, position and pitch of blades, etc.).		
Residual Impact:	The risk of fire should be negligible.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-31 Fire and Wildfire Risk during Operation

14.10 Traffic and Transport

Once operational, the amount of traffic associated with the Crni Vrh WPP would be minimal, limited to occasional maintenance works. The number permanent staff at the site would be very low.

14.10.1 Impact Assessment

The service and maintenance trips to the site would predominantly include light vehicles for routine maintenance, safety checks and repair, visiting the site a couple of times per month.

Heavy good vehicles and access cranes for heavier maintenance and repairs would be occasionally needed. Due to a low number of HGV trips, the local road network or baseline traffic flows are not expected to be affected. The maintenance works are not likely to disrupt the access to logging areas, hunting or wild plant harvesting.

Access to the site of heavy vehicles would be provided via the established access roads.

The annual average daily traffic on local roads is medium to low and their sensitivity to congestion is considered to be low. The occasional traffic of heavy vehicles would present an effect of a low magnitude resulting in **negligible adverse** impact.

14.10.2 Impacts Summary

The impact of maintenance and repair vehicles during the operation phase is not considered to be significant.

14.10.3 Proposed Mitigation/ Control Measure

A Transport Management Plan for the operation phase should be developed and implemented to define access routes for maintenance vehicles and management measures for heavy vehicles to prevent disruption of local traffic.

As long as appropriate established routes are used and management measures are implemented, the residual impact during the operational phase is considered to be negligible adverse.

14.10.4 Conclusions

A summary of traffic impacts on the road network during the operation phase is provided in Table 14-32.

Impact or Opportunity:	Increased traffic of maintenance and repair vehicles along low-sensitive local roads during the WPP operation.	**Ref. No.:**	50
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A Transport Management Plan for the operation phase should be developed and implemented to define access routes for maintenance vehicles and management measures for heavy vehicles to prevent disruption of local traffic.		

Residual Impact:	The operation traffic would not have a significant impact on local traffic and road network.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-32 Traffic Impact on the Road Network during the Operation Phase

14.11 Environmental Pollution

During the operational phase, it will be necessary to provide facilities, equipment and management controls to protect land quality, groundwater, and surface water from sources of pollution. These sources of pollution will originate from the maintenance of the WTGs and electricity transformers. These maintenance activities will:

- Create limited volumes of hazardous and non-hazardous waste.
- Require the storage and handling of hazardous materials including oils, greases and aerosols (e.g. spray lubricant).
- Generate small quantities of domestic wastewater from staff welfare facilities.

It is therefore necessary to protect the soil, groundwater and surface water from pollution that could occur from the accidental release of hazardous materials or hazardous waste and the release of domestic wastewater from the septic tanks.

The construction of the WTG foundations, maintenance pads and access tracks could change local surface run-off patterns.

14.11.1 Impact Assessment

The hazardous waste that will be generated during WPP maintenance includes waste oil (hydraulic, lubricating, transformer oil), cooling fluids, contaminated absorbents (rags), waste electric and electronic equipment, batteries, and waste packaging containing residues of contaminating materials. The regular operation of the Crni Vrh WPP would not generate in significant waste volumes, measured in kilogrammes year rather than tonnes. The largest volumes of waste will be generated during the periodic maintenance of WTGs, such as the change of gearbox oil, or major equipment failure. Under Serbian regulations, all waste streams must be recycling or disposed to a licensed facility. Improper storage, treatment or disposal of waste generated during operations may be a source of contamination on and off the WPP site. Depending on the waste properties and volume, this may result in **moderate adverse** significance impact.

The O&M Contractor is expected to hold waste on site with a short-term, interim storage facility (closed and secured, with impermeable floor). It is likely that these wastes will be removed from site every few months due to the small quantities involved. Non-hazardous waste would comprise metal scrap, packaging waste, paper, and municipal waste. These materials will be held in containers provided by the recycling or waste disposal companies.

The hazardous materials necessary for the operation of the WPP will include:

- Insulating oil in power transformers: each power transformer contains about 22 tonnes of insulating oil, i.e. about 66 tonnes in total. By law, each power transformer must be provided with reinforced concrete bunds of sufficient capacity to contain the oil in case of leakage (at least 110% of the total volume of oil). The oil containment bunds must be sealed and must not be connected to any sewer system or septic tank. In case of an accidental release (or fire), the likelihood that the oil would not be contained in the bunds is negligible. The transformers will be maintained by a licensed contractor who would dispose of the maintenance waste.
- Gear oil, hydraulic oil, grease and transformer oil within WTGs: Maintenance technicians will monitor the levels of oil within the WTG on a regular basis and will top-up the systems as an when required. It is expected that small quantities of these oils (say 20 x 25l drums) will be held on site in a purpose-built storage facility. These drums will need to be transported to the WTGs as needed in the technicians' vans. The gearbox in each WTG holds around 500 litres of oil. Accidental leakage or release of oil in a turbine will be contained inside the tower. WTGs have sensors to detect loss in fluid and automatically shut down. The gearbox oil is normally changed every four or five years as part of

the regular O&M activities. This periodic change of oil is undertaken by specialist contractors who use purpose-built tankers that hold fresh oil and the waste oil removed from the WTG.

- Diesel fuel in the backup power generator: The backup power generator will be installed on a paved surface. Diesel fuel (ca. 250 litres) will be manually refilled to the generator by the WPP technicians.

The effect on soil quality (low sensitive receptor) of a spillage of a hazardous liquid is likely to be long-term but localised, affecting the area of the release and as such is considered to be of a low magnitude. The impact significance is assessed as **minor adverse**. Potential for contaminants to enter groundwater depends on the aquifer sensitivity and type and quantity of the released contaminant. In that respect, the shallow aquifer formed within the fractured subsurface layer is medium sensitive as it is being used for private water supply. Volumes of hazardous materials (oil, diesel fuel) stored at the site would be limited. Accidental release of oil or diesel fuel to the ground would affect a local subsurface area and would be an effect of a medium magnitude. The potential contamination would result in a **moderate adverse** impact.

The subsurface layer is underlain by a non-permeable volcanic bedrock providing a barrier to deeper groundwater horizons which are considered to be low sensitive to contaminant propagation. The effect magnitude would be negligible, resulting in **negligible adverse** impact.

There is the potential for accidental spillage/ loss of hazardous liquids during the WPP maintenance. The pathway between any direct discharges from the site and watercourses is limited – both the transformer compound and WTG areas are proposed more than 250m from the Lipa River and the ephemeral/ intermittent streams. The risk that any releases would find their way into surface water during the operational phase of the WPP is considered to be low.

Building of the turbine foundations, crane pads, access roads and substation compound could create impermeable and semi-permeable areas that could limit the existing natural infiltration which could increase the surface run-off rate. However, the permeability of brown forest soil at the site is moderate. The site area is not prone to flooding. The extension of the access tracks and the creation of surface run-off drainage ditches can alter surface runoff patterns by diverting natural drainage into new areas. This could locally increase run-off volumes and could increase levels of soil erosion (medium sensitive). A detailed site drainage design would be developed as part of the 'Design for Building Permit', subject to approval by the national Ministry of Construction. The design will detail the drainage of turbine foundations, crane pads and access roads, including the type of road surface to discharge run-off into the greenfield areas of the site.

The surface water run-off from the substation compound is proposed to be discharged into a gravel-bed detention pond (50m^3) to attenuate the run-off. The potential of the proposed WPP infrastructure to significantly alter the run-off pattern at the site or affect fluvial morphology downstream of the site is considered to be low. A small car park area will have 4 parking spaces and an oil separator has been proposed for potentially contaminated runoff. The treated effluent would be discharged to the detention pond.

The operation of the WPP would generate relatively small volumes of process and domestic wastewater. As there is no sewerage system in the area, an internal domestic sewage network would be built including the septic tank.

14.11.2 Impacts Summary

The proposed Crni Vrh WPP would affect the land and groundwater quality only in case of an accidental release during maintenance activities, waste handling and storage, or sanitary wastewater leakage and release. Potential releases of hazardous materials to the ground would be **minor adverse** impact on soil and **moderate adverse** impact on the shallow groundwater aquifer.

The volume of waste generated during the operation will be small. Improper storage, treatment or disposal of waste generated during operations may be a source of contamination on and off the Project site. Depending on the waste properties and volume, this may result in **moderate adverse** significance impact.

Stormwater run-off from the substation compound area would be discharged to a gravel-bed detention pond. Process and domestic wastewater effluent from the site would be directed to an internal sewage system and watertight septic tank. Potential releases of hazardous materials would be limited to accidental releases during maintenance activities. It is unlikely that there will be any direct discharges of contaminated effluent from the site to surface water recipients on-site.

14.11.3 Proposed Mitigation/ Control Measure

The control measures listed in the Summary Tables below should form part of the ESMMP:

Provided that the mitigation measures are implemented, there should be no residual impact of surface water or drainage patterns at the site.

Provided that the control measures are implemented, there should be no residual impact on land and groundwater during the operation.

Provided that the control measures are implemented, residual impacts of waste generation should be negligible.

14.11.4 Conclusions

A summary of potential waste generation impacts during the WPP operations is provided in Table 14-33:

<table>
<tr><td>Impact or Opportunity:</td><td colspan="2">Generation of waste during operation and maintenance activities.</td><td>Ref. No.:</td><td>51</td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="4"><s>Positive</s>/ Negative
Direct/ <s>Indirect</s>
<s>Temporary</s>/ <s>Short-term</s>/ <s>Medium-term</s>/ <s>Long-term</s>/ Permanent
Local/ <s>National</s>/ <s>Regional</s></td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="4">A Waste Management Plan should be developed and implemented, incorporating hierarchy principles: reduce, reuse or recycle whenever possible;
Hazardous waste should be stored in a dedicated, closed and secured area, segregated and properly labelled. Spillage protection should be provided. Per Serbian law, hazardous waste shall not be stored longer than 12 months on site;
The O&M Contractor should be required to remove all waste from the turbine sites and to separate the interim waste storage facility on-site;
The O&M Contractor should be required to keep and maintain waste records and to engage licensed waste transporters and treatment/disposal facilities;
Compliance of the O&M Contractor with waste regulations should be periodically checked.</td></tr>
<tr><td>Residual Impact:</td><td colspan="4">Residual impact of waste generation should be negligible.</td></tr>
<tr><td>Residual Impact Rating:</td><td><s>Substantial Beneficial</s>
<s>Moderate Beneficial</s>
<s>Minor Beneficial</s>
<s>Negligible Beneficial</s></td><td><s>No Change</s></td><td colspan="2">Negligible Adverse
<s>Minor Adverse</s>
<s>Moderate Adverse</s>
<s>Significant Adverse</s></td></tr>
</table>

Table 14-33 Waste Generation during Operation

The summary of potential land and groundwater impacts during the operation is provided in Table 14-34 and Table 14-35.

Impact or Opportunity:	Accidental releases of hazardous materials or hazardous waste to land (low sensitive) and groundwater (medium sensitive receptor) during the operation.	**Ref. No.:**	52
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A Hazardous Material Management Plan should be prepared and implemented. Potential polluting materials (fuels, oils, chemicals) should be stored in dedicated storage areas equipped with secondary containment and other measures to retain any leakage; An Emergency Response Plan (including spill management) should be implemented, addressing any common risks or impacts, defining response, responsibilities, equipment training needs for staff at the site, etc; Hazardous waste should be stored in a dedicated, closed and secured area, segregated and properly labelled. Spillage protection should be provided. Per Serbian law, hazardous waste shall not be stored onsite longer than 12 months; Spill kits should be stored at key locations on site and staff should be trained in their use; Spill kits should be available to the servicing staff during turbine maintenance. Procedural controls should be applied during draining and filling of oil in turbines; Power transformers and associated bunds should be controlled as part of the regular maintenance and inspection regime. The bunds should be regularly cleaned from rainwater and other debris. If the rainwater is contaminated, it should be managed as hazardous waste by a licensed contractor; The oil separator should be regularly maintained and its efficiency periodically tested.		
Residual Impact:	There should be no release of hazardous materials or waste to the ground.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-34 Impact of Accidental Releases of Hazardous Materials to Land and Groundwater during Operation

Impact or Opportunity:	Leakage or release of domestic wastewater from the septic tanks to land (low sensitive) and groundwater (medium sensitive receptor) during the operation.	**Ref. No.:**	53
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	The septic tank(s) should be emptied at regular intervals by a licensed contractor and disposed at an appropriately licensed disposal facility. The integrity of the sewage system and septic tanks should be periodically tested (once in 5 years per law).		
Residual Impact:	There should be no leakage or release from the sewer system.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-35 Domestic Wastewater impact to Land and Groundwater during Operation

A summary of effects related to surface water and wastewater during the operation of proposed WPP is provided in the tables below.

Impact or Opportunity:	Alteration of surface water run-off pattern and change of fluvial morphology downstream of the site.	**Ref. No.:**	54
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** ~~Direct~~/ **Indirect** ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	The site drainage should be designed to mimic natural drainage conditions at the site; The drainage system should maximise infiltration and attenuation rather than direct discharge to natural watercourses or gullies; Infiltration to the soil should be maximised. Nearby vegetation areas should be used as buffers, where possible. The velocity of surface water run-off to be reduced / attenuated; The access roads and turbine bases should be regularly inspected to ensure no unacceptable erosion is taking place. Remedial measures should be taken if erosion is noted.		
Residual Impact:	There should be no impact on drainage patterns at the site.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-36 Impact of Surface Water Run-off Pattern during Operation

Impact or Opportunity:	Direct discharge of untreated domestic wastewater to a surface watercourse off-site (medium sensitive).	**Ref. No.:**	55
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	The septic tanks should be regularly drained by a licensed contractor and the effluent discharge to a local sewage system off-site; The integrity of the sewage system and septic tanks should be periodically tested (once in 5 years per law); During longer duration maintenance activities portable toilets should be provided to the service staff.		
Residual Impact:	There should be no residual impact on surface water.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-37 Wastewater Impact during Operation

14.12 Ecosystem Services

14.12.1 Impact Assessment

The priority ecosystem service – private water supply is not anticipated to be affected during the WPP operation as no water abstraction facilities will be used for water supply at the site. Provided that the mitigation measures related to PWS during the construction phase are implemented, there will be no impact on private water supply during the operation.

Once operational, the Crni Vrh WPP would occupy in the long run ca. 2.5% of the total Project area. Out of 70 hectares which will be temporarily occupied during construction, 33 hectares will be available again for use after construction is completed. Commercial logging, herb/ mushroom picking and hunting will be possible to continue. However, these are the non-priority ecosystem services and not relevant for the assessment.

14.12.2 Impacts Summary

Provided that the mitigation measures related to PWS during the construction phase are implemented, there will be no impact on private water supply during the operation.

14.12.3 Proposed Mitigation/ Control Measure

No mitigation is needed, other than those proposed in the construction phase.

14.12.4 Conclusions

A summary of effects related to the impact on ecosystem service during the operation of the proposed WPP is provided in table below.

Impact or Opportunity:	Disruption of private water supply as a priority ecosystem service (a highly sensitive receptor) during the operational period.	**Ref. No.:**	56
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary/ Short-term/ Medium-term/~~ **Long-term**/ ~~Permanent~~ **Local**/ ~~National/ Regional~~		
Impact Mitigation or Opportunity Enhancement:	Provided that the mitigation measures related to PWS during the construction phase are implemented, there will be no impact on private water supply during the operation. No additional mitigation measures are proposed.		
Residual Impact:	There will be no residual impact on ecosystem services.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-38 Impact on Ecosystem Services during Operation

14.13 Electromagnetic Interference

Within the site boundary, the proposed WTGs and associated underground cables will be a source of electromagnetic fields, in addition to the existing electricity transmission infrastructure on site (the 110 kV and 220 kV OHLs) and the substation compound.

Wind turbines blades and generators could potentially interfere with electromagnetic signals (or radio waves) transmitted as part of telecommunication systems (radio and television broadcast, mobile phones, radars, etc.). This depends on the proximity of the WTG to the signal and the path.

14.13.1 Impact Assessment

The strength of electromagnetic fields rapidly diminishes as the distance from the source is increased; at a distance of 100m the strength of the electromagnetic field is reduced to acceptable levels.

The substation and the 110 kV OHL are the most significant electromagnetic field sources within the site. The substation is proposed more than 1,300m from the nearest residential receptor (weekend house W1). The receptor closest to the OHL is the weekend house W12, 300m away (the legal setback is 30m).

Serbian regulatory requirements for design and operation of overhead lines and substations require calculation and assessment of non-ionising radiation (electrical and magnetic fields) to be included in the design. On-site measurements of electrical and magnetic fields and their compliance with the approved design are one of prerequisites to obtain the Operation Permit.

WTG electrical equipment is encased within the turbine and situated more than 100m above ground level. The closest weekend houses are located between 500 and 600m from the WPP site. Due to the distance and shielding involved there will be **no impact on public health from electromagnetic fields**.

Wind turbines are produced in accordance with International Electrotechnical Commission (IEC) technical standards for manufacturers, and their electromagnetic compatibility is strictly measured and tested. The sensitive components are shielded to prevent them being either transmitters or receivers of electromagnetic interference. The electromagnetic disturbance from modern turbines is considered to be **negligible**.

During the statutory consultation for the Crni Vrh WPP Zoning Plan development, state telecommunication services providers (radio and television signal) and mobile operators reported that potential electromagnetic interference with their infrastructure is not expected.

No negative impact of the proposed Crni Vrh WPP is expected related to EM signal interference.

14.13.2 Impacts Summary

No impact on public health due to exposure to electromagnetic radiation is expected given the distance to the nearby receptors. The emission of electromagnetic disturbances from the Crni Vrh WTGs is considered to be negligible.

14.13.3 Proposed Mitigation/ Control Measure

No specific mitigation measures are proposed related to electromagnetic interference and radiation.

There will be no residual impact on public heath from electromagnetic fields. There will be no interference with telecommunication services.

14.13.4 Conclusions

A summary of potential community health, safety and security risks during the WPP operations is provided in Table 14-39 and Table 14-40.

Impact or Opportunity:	Impact on public health of local residents (highly sensitive receptor) due to exposure to electromagnetic radiation.	**Ref. No.:**	57
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** ~~Direct~~/ **Indirect** ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Mitigation is embedded in the design. No additional mitigation measures are proposed.		
Residual Impact:	There will be no impact of electromagnetic radiation on public health.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-39 Electromagnetic Radiation Impacts

Impact or Opportunity:	Electromagnetic interference to telecommunication signals (low sensitive receptor).		Ref. No.:	58
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** ~~Direct~~/ **Indirect** ~~Temporary~~/ ~~Short-term/Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Mitigation is embedded in the design. No additional mitigation measures are proposed.			
Residual Impact:	The emission of electromagnetic disturbances from the Crni Vrh WTGs should be negligible.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 14-40 Electromagnetic Interference Impacts

14.14 Aviation Safety and Radar Systems

Due to their physical size wind turbines have the potential to impact the aviation safety and the operation of radar systems.

The competent authorities in Serbia for aviation are SMATSA (air traffic control), the Directorate for Civil Aviation (air traffic safety) and the Ministry of Defence (military air traffic). The institutional stakeholder in charge for weather radars is the Republic Meteorological Institute of Serbia (RHMI).

14.14.1 Impact Assessment

During the statutory consultation for the WPP Zoning Plan the civil aviation stakeholders confirmed that no structures for civil air traffic (radar systems, civil airports, etc.) are present within or in the proximity to the WPP site.

However, wind turbines are potential obstructions for air traffic; if not properly marked and lighted they can potentially have a significant adverse impact.

Per Serbian Law on Air Traffic, all structures higher than 100m are considered to be an obstruction for civil air traffic and as such shall be properly marked and lighted in line with the ICAO standards.

The rules for marking and lighting of turbines will be provided by the civil aviation authority for the Location Permit and will be incorporated to the Project design.

During the Zoning Plan development, the national meteorology stakeholder – RHMI indicated that the proposed WPP can potentially affect the normal operation of a weather radar system at the nearby weather station 'Crni Vrh'. Given that the proposed WTGs are between 2km and 10km of the radar system there is the potential for radar clutter, signal blockage or interference, i.e. misidentification of weather features or false radar estimates.

By law, wind turbines are not allowed within a 10km radius of weather radar systems. The exception can be made in hilly and mountainous areas if turbine height to blade tip is below the basis of radar hemisphere. Consequentially, RHMI required an impact study on the radar system.

The Study prepared by an independent specialist concluded that:

(1) the potentially affected weather radar system is 50 years old and used primarily for hail detection and short-term weather forecast;

(2) there are other weather radar systems in the country that can successfully cover the Crni Vrh area;

(3) the potential wind turbine clutter would be low and possible to resolve by readily available mitigation measures.

The Study concluded that the proposed WPP would not have a significant impact on the weather radar system and recommended to RHMI to approve the Project.[65]

In April 2021, RHMI formally approved the WPP project under the following conditions: (1) the WTG height to blade tip must not exceed 206m, (2) CVP are obliged to support RHMI with an annual payment of up to 5,000 EUR to mitigate the effects to the radar system 'Crni Vrh'. The initial payment period is ten years and may be shortened or extended, depending on the observed effects.

14.14.2 Impacts Summary

The air traffic safety regulator confirmed that **no aviation impacts** are expected from the proposed Crni Vrh WPP, provided that wind turbines are marked and lighted in accordance with ICAO standards and Serbian regulation.

The meteorology stakeholder confirmed that the potential impact on the weather radar system would be **negligible** and approved the proposed WPP provided that CVP financially supports the mitigation measures.

14.14.3 Proposed Mitigation/ Control Measure

During the preparation of the WPP design, CVP will provide the Civil Aviation Directorate with geographic coordinates and elevation of each proposed WTG in order to obtain the rules for marking and lighting of turbines. The Directorate will issue the rules in line with the ICAO standards.

Provided that the turbines are adequately marked and lighted, there would be no residual impact of the Crni Vrh WPP on aviation.

CVP agreed to financially support the mitigation of potential effects on the weather radar system.

14.14.4 Conclusions

A summary of effects with regards to the aviation impacts from the proposed WPP is provided in Table 14-41 and Table 14-42.

<table>
<tr><td>Impact or Opportunity:</td><td colspan="2">Impact on aircraft safety (highly sensitive receptor).</td><td>Ref. No.:</td><td>59</td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="4"><s>Positive</s>/ Negative
Direct/ <s>Indirect</s>
<s>Temporary</s>/ <s>Short-term</s>/ <s>Medium-term</s>/ <s>Long-term</s>/ Permanent
Local/ <s>National</s>/ <s>Regional</s></td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="4">Apply legally required obstruction marking and lighting of turbines for daylight and night visibility and reduced visibility conditions.</td></tr>
<tr><td>Residual Impact:</td><td colspan="4">There should be no residual impacts on aircraft safety.</td></tr>
<tr><td>Residual Impact Rating:</td><td><s>Substantial Beneficial</s>
<s>Moderate Beneficial</s>
<s>Minor Beneficial</s>
<s>Negligible Beneficial</s></td><td>No Change</td><td colspan="2"><s>Negligible Adverse</s>
<s>Minor Adverse</s>
<s>Moderate Adverse</s>
<s>Significant Adverse</s></td></tr>
</table>

Table 14-41 Aviation Impacts

[65] Kostić Aleksandar, 2021 – Study on Impact of Wind Turbines in Crni Vrh on Weather Radar Mitsubishi RC 34-A

Impact or Opportunity:	Impact on the weather radar system at the Crni Vrh national weather station (low sensitive receptor).	**Ref. No.:**	60
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	CVP agreed to financially support the mitigation of potential effects on the weather radar system.		
Residual Impact:	The residual impact on the weather radar should be negligible adverse.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 14-42 Impact on Weather Radar System

15 Decommissioning - Impact Assessment and Mitigations

15.1 Introduction

This Chapter describes the assessment and mitigation of the decommissioning impacts identified within the Scoping Study. The impact topics are presented in the order of significance identified by the Scoping Study. A summary of the impacts identified and recommended mitigation or control measures are presented in one or more tables at the end of each topic section. These impacts, mitigations and control measures are consolidated in a single table in Chapter 16. The Decommissioning impact summary table (see section 16.2) is linked to the Environmental and Social Monitoring and Management Plan (ESMMP) presented in Chapter 17. The ESMMP will be used as the basis of the Decommissioning Environmental and Social Management Plan (DESMP). The DESMP will include a series of subsidiary, topic specific Management Plans (see Chapter 17) that will describe the procedures and controls required to manage the impacts in line with the Project Applicable Requirements (see section 6.1).

The Scoping Study categorised the decommissioning impacts of the Crni Vrh WPP as:

Significance Level One Issues

- Ecology and Nature Conservation – woodland habitats of conservation concern, woodland plant species of conservation concern (orchids in particular), birds, bats, and other woodland fauna;
- Socio-economic.

Significance Level Two Issues

- Ecology and Nature Conservation – habitats other than woodland of conservation concern and their plant species of conservation concern;
- Traffic and Transport.

Significance Level Three Issues

- Ecology and Nature Conservation – non-woodland fauna species of conservation concern other than birds and bats;
- Landscape and Visual;
- Construction Noise;
- Archaeology and Cultural Heritage;
- Surface Water and Effluent;
- Land and Groundwater;
- Air Quality;
- Community Health Safety and Security.

15.2 Ecology and Nature Conservation

The impacts of the decommissioning on ecological features could be only very generally assessed at this stage as the nature and the scale of future works is not known. Generally, works during decommissioning are similar to those during the construction, and the effects would be similar to and no greater than those of the construction. Only when a plan for the future of the Project becomes available (towards the end of its operational life) will it be possible to assess sensibly the impacts of the decommissioning activities.

However, the NPC (IfNC 2021b, see Table 6 8) requires that" upon *completion of the WPP operational phase, all structures and equipment must be removed, and the site must be completely restored*". Furthermore, the same general legal obligations imposed by the Law on Nature Protection (Official Journal of RS, No. 36/2009, 88/2010, 91/2010 - correction, 14/2016, 71/2021) applied during the construction must be adopted during decommissioning. Adherence to general legal requirements, all applicable NPC (IfNC 2020, 2021a, b, see Table 6 8 and section 7.3.3.1.1), and generic GIIP during the decommissioning must be ensured through the Project Management Plans (DESMP).

Therefore, considering possible magnitude of the impact (lower that from construction), and providing that the adherence to general legal requirements, NPC, GIIP is ensured, **negligible impac**t at the most of the Project decommissioning on any ecological feature is considered highly likely.

15.3 Landscape and Visual

The future baseline is likely to include new mining areas in the wider vicinity of the WPP site which would give additional industrial character to decommissioning the existing landscape.

15.3.1 Impact Assessment

15.3.1.1 Impacts on Landscape Character and Fabric

During the decommissioning, the site would temporarily become again a "construction site" where the sequence of activities would be a reverse of the construction phase. Initially the cranes would dominate the site during the dismantling of turbine blades, nacelles and towers, and would successively be replaced by hydraulic breakers, excavators and dump trucks. This would have a short-term, reversible, **minor adverse** impact to the landscape character and fabric.

Upon completion of the decommissioning and restoration process, wind turbines and other aboveground structures would be removed. Crane pads and turbine foundations would be partially removed and the areas backfilled and restored. Access roads would most likely be left to use by local farmers. The landscape would be successfully restored to its baseline agricultural character which would result in **no change** compared to the pre-development phase.

15.3.1.2 Visual Impacts

During the decommissioning activity, the initial phase of turbine dismantling would involve large cranes that would be visible to a wider range of receptors. Later stages would only have intermittent visibility, mostly from the nearby roads. The duration of the decommissioning phase effects would be short-term and localised resulting in a low magnitude of change and a **minor adverse** impact for local residents and **negligible adverse** impact for road users.

15.3.2 Impacts Summary

The short-term effect on the landscape character would be minor adverse, but upon the site restoration, the landscape would be returned to its baseline character which would result in no change. The visual impact during the decommissioning would be minor for local residents in the close site vicinity and negligible for all other residents and local road users.

15.3.3 Proposed Mitigation/ Control Measure

Similar to the construction phase, the landscape impact mitigation measures should be the following:

- Existing vegetation should be suitable protected; land clearance/vegetation removal should be minimised as far as possible;
- Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required;
- Stockpiling of debris should be avoided; the decommissioning site should be maintained in good condition;
- The disturbed areas should be successively restored and reinstated.

Provided that the mitigation measures are implemented, there would be no change compared to the current baseline conditions.

No specific measures are proposed to mitigate the visual effects of the decommissioning works. The residual impact would be minor adverse for local residents and negligible adverse for local road travellers.

15.3.4 Conclusions

The summary of potential landscape and visual impacts during the decommissioning phase is provided in Table 15-1 and Table 15-2.

Impact or Opportunity:	Impact on landscape character and fabric (medium sensitive receptor) during decommissioning.	**Ref. No.:**	62
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~**/ Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Existing vegetation should be suitable protected; land clearance/vegetation removal should be minimised as far as possible; Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; Stockpiling of debris should be avoided; the decommissioning site should be maintained in good condition; The disturbed areas should be successively restored and reinstated.		
Residual Impact:	Upon completion of the decommissioning, the site would be reverted to the pre-existing baseline condition.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 15-1 Impact on Landscape Character and Fabric during Decommissioning

Impact or Opportunity:	Visual impact on local residents and road users, including highly sensitive residential receptors in the north-east and south-west, during decommissioning.	**Ref. No.:**	63
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ Temporary/ Short-term/ ~~Medium-term~~**/ ~~Long-term~~**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	No specific mitigation measures are proposed.		
Residual Impact:	Short-term and localised impact, affecting mostly the residents in the north-east and south-west and would decrease with the distance.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 15-2 Visual Impact during Decommissioning

15.4 Socio-Economic

Socio-economic impacts associated with decommissioning activities will be similar to those during the construction phase and have been grouped under the following headings:

- Impacts to land use
- Employment and procurement opportunities
- Impacts on livelihoods
- Impacts on infrastructure

15.4.1 Impact Assessment

Land Use

The dismantling of the WTGs will make about 5 ha of land available for other use. The sensitivity of local users of land is determined as being low as a small area of land will be freed up, while the magnitude of this impact is considered to be low, resulting in the significance of the impact being assessed as **negligible beneficial**.

Employment Opportunities

The dismantling of WTGs, disposal of materials and reinstatement of land will generate some direct and indirect employment opportunities. A part of those opportunities will be available for local people. The sensitivity of individuals who will get employment is medium, however the magnitude is low, as in the construction phase, which is why this impact is assessed as **minor beneficial**.

Livelihoods

During decommissioning, economic displacement may occur for persons who are using the land plots disturbed during dismantling and transport of WTGs and site clearance, whose trees may be affected. The sensitivity of individually affected land users is medium, while the magnitude of the impact is considered low. The significance of the impact is assessed as **minor adverse**.

15.4.2 Impacts Summary

The most positive socio-economic impacts related to the decommissioning phase are those related to the creation of employment opportunities; however, these will be short term. Minor economic displacement of users of land is possible, however with proper mitigation all risks will be reduced. The amount of land which will be available for use again, after decommissioning is no more than 5 ha, which is negligible.

15.4.3 Proposed Mitigation/ Control Measure

Land Use

Maximise the amount of land which can be used again and fully restore all previously used land to its original condition. With that, at least 5 ha will be available for use again.

Employment and Procurement Opportunities

- Announce employment opportunities locally and encourage women to apply;
- Implement transparent and fair recruitment procedures;
- Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations;
- Provide a grievance mechanism for workers;
- Procure goods and services locally whenever possible.

If the above measures are implemented, more local people will be employed and more goods procured locally, enhancing the positive impact.

Livelihoods

The potential for economic displacement and generally any loss of livelihood, as a result of loss of land available for use will be mitigated by undertaking the following measures:

- Minimise the amount of land occupied / disrupted during construction;
- Compensate all users of land for lost crops and any other damages at full replacement value;
- Fully reinstate the land after disruption;
- Establish and implement a grievance mechanism.

If the above measures are implemented, it is expected that no one will be economically displaced by the project and the impact will be reduced to negligible.

15.4.4 Conclusions

A summary of socio-economic impacts during decommissioning is provided in the tables below.

Impact or Opportunity:	Land rehabilitated and available for use by individual users (low sensitive receptors).		**Ref. No.:**	64
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Maximise the amount of land which can be used again, fully restore all previously used land to its original condition.			
Residual Impact:	Approximately 5 ha of land will be available for use again.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 15-3 Land Rehabilitated and Available for Agricultural Use

Impact or Opportunity:	Employment opportunities for local residents (medium sensitive receptors) during the decommissioning activity.		**Ref. No.:**	65
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Announce employment opportunities locally and encourage women to apply; Implement transparent and fair recruitment procedures; Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations; Provide a grievance mechanism for workers.			
Residual Impact:	More local people are employed than originally anticipated.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 15-4 Employment Opportunities during Decommissioning

Impact or Opportunity:	Involuntary economic displacement of users of land (medium sensitive receptors).	**Ref. No.:**	66
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Minimise the amount of land disrupted land and damages Compensate all users of land for lost crops and any other damages at full replacement value Fully reinstate the land after disruption Establish and implement a grievance mechanism.		
Residual Impact:	No one will be economically displaced by the project.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ **Negligible Beneficial**	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 15-5 Involuntary Economic Displacement of Users of Land

15.5 Noise

15.5.1 Impact Assessment

Noise can occur during decommissioning from the dismantling of turbines and associated infrastructure and from breaking out any part of the turbine bases which are above ground. Traffic noise increases can occur on local roads due to the removal of turbine components.

15.5.2 Impacts Summary

Noise during decommissioning will be similar to that assessed for construction noise although lower in overall impact as there will be lower numbers of HGVs involved and no concrete pours.

15.5.3 Proposed Mitigation/ Control Measure

Noise from construction equipment must comply the maximum noise levels specified in the Serbian law. Best practicable means will be used to control noise and vibration in accordance with a decommissioning environmental management plan.

15.5.4 Conclusions

A summary of potential noise impacts during the decommissioning phase is provided in Table 15-7.

Impact or Opportunity:	Increase of noise due to the dismantling of the turbines and the associated infrastructure. Increase traffic noise on local roads due to HGV movements.	**Ref. No.:**	67
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary/~~ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A decommissioning environmental management plan will be prepared to manage all environmental impacts including noise. Any large abnormal loads will be coordinated with the highway authorities.		
Residual Impact:	No significant residual impact for short-term activity.		

Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 15-6 Noise Impact - Decommissioning

15.6 Traffic and Transport

Future road infrastructure and associated traffic volumes in the Study Area are likely to increase compared to the current baseline.

15.6.1 Impact Assessment

The decommissioning of the Crni Vrh WPP would generate substantially lower number of traffic movements compared to the construction phase. It is possible that the turbine components would be broken down on site, removing the need for the abnormal loads transport. The dismantled and demolished material would be transported off-site using standard HGVs. The overall effect would be temporary with a medium magnitude of change, resulting in a **minor adverse** impact.

15.6.2 Impacts Summary

The decommissioning transport is expected to generate substantially lower number of traffic movements which would result in a minor adverse impact on the road network and associated traffic.

15.6.3 Proposed Mitigation/ Control Measure

An assessment should be undertaken at an appropriate time to determine whether the turbine components would be broken down and removed by standard heavy vehicles; Should the components be removed for reuse a separate transport assessment should be conducted.

A Decommissioning Transport Management Plan should be developed and implemented to establish the routes for the decommissioning traffic, necessary arrangements and schedule restrictions, notification of public, contractor speed limits, transport within the site, wheel cleaning and dirt control, etc.

Provided that the Decommissioning Transport Management Plan is successfully implemented, the residual impact should be negligible adverse.

15.6.4 Conclusions

A summary of potential transport impacts during the decommissioning phase is provided in Table 15-7.

Impact or Opportunity:	Increase of heavy vehicles traffic on local and regional roads (medium sensitive receptors) leading to congestion and nuisance.		Ref. No.: 68
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ **Regional**		
Impact Mitigation or Opportunity Enhancement:	An assessment should be undertaken at an appropriate time to determine whether the turbine components would be broken down and removed by standard heavy vehicles; Should the components be removed for reuse a separate transport assessment should be conducted. A Decommissioning Transport Management Plan should be developed and implemented to establish the routes for the decommissioning traffic, necessary arrangements and schedule restrictions, notification of public, contractor speed limits, transport within the site, wheel cleaning and dirt control, etc.		
Residual Impact:	The residual impact on congestion and nuisance should not be significant.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~

	~~Minor Beneficial~~ ~~Negligible Beneficial~~		~~Moderate Adverse~~ ~~Significant Adverse~~

Table 15-7 Transport Impact during the Decommissioning

15.7 Environmental Pollution

Uncontrolled air emissions would present a source of pollution during the decommissioning activities. Generation of large volumes of waste would present a significant environmental issue if not managed properly.

15.7.1 Impact Assessment

15.7.1.1 Air Pollution

The decommissioning phase would not involve excavation works which would be the major source of dust emission during the WPP construction. The emission of dust would be limited and negligible adverse for the receptors and crops within the radius of 500m of the site. The exhaust emissions from the machinery and equipment would contribute to the existing traffic emissions at the local roads. The effect would be short-term and **negligible adverse**.

The air emission during the decommissioning can be controlled by the adoption of similar measures to those implemented during the construction.

15.7.1.2 Generation of Decommissioning Waste

The WPP decommissioning would generate significant volumes of waste (steel, cast iron, concrete, copper, electronics, rubber, oil, fibre glass, resin, etc.). The majority of waste is fit for reuse or recycling and is not considered to present a significant environmental impact if managed properly (if uncontrolled, it could result in a **significant adverse** impact). Currently, the commercial recycling of composite materials is limited due to technological and economic constraints. It is reasonable to expect that in 25-30 years' time, commercial recycling technologies for the blade material will develop to avoid incineration or landfilling and reduce the environmental footprint of the project.

15.7.2 Impacts Summary

The impact of dust emission and exhaust emission from the decommissioning machinery is considered to be negligible adverse. The decommissioning would generate significant volumes of waste which should be managed in accordance with the waste hierarchy to prevent any significant adverse impacts.

15.7.3 Proposed Mitigation/ Control Measure

15.7.3.1 Air Pollution

A range of measures that should be implemented include: dust suppression (watering and sprinkling), covering of transport vehicles carrying the dusty material, barriers where needed to protect receptors from dust, speed limits on transport roads including dirt tracks, regular maintenance of machinery and vehicles, etc.

With the control measures employed, any emissions would be of a temporary nature minimising any potential for a nuisance to occur. The residual impact would be negligible adverse.

15.7.3.2 Generation of Decommissioning Waste

A Decommissioning Waste Management Plan should be developed and implemented to maximise reuse and recycling and minimise waste disposal to landfill. The Plan should include procedures for waste segregation, interim storage, engagement of licensed waste operators for transport, treatment and safe disposal.

With the appropriate waste management practice implemented, the impact of the decommissioning waste should be negligible adverse.

15.7.4 Conclusions

The summary of potential environmental pollution during the decommissioning stage is provided in Table 15-8 and Table 15-9.

Impact or Opportunity:	Dust emission during decommissioning works and exhaust emissions from machinery and vehicles to weekend houses in the vicinity (highly sensitive receptors).	**Ref. No.:**	69
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Dust suppression techniques (watering and sprinkling) should be applied; Transport vehicles carrying the dusty material should be covered; Barriers should be erected where needed to protect receptors from dust; Speed limits should apply on transport roads including dirt tracks; Regular maintenance of machinery and vehicles should be provided.		
Residual Impact:	Dust propagation should be limited to the decommissioning area and should not influence the local community.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 15-8 Air Emission Impact during Decommissioning

Impact or Opportunity:	Generation of decommissioning waste.	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ **Regional**		
Impact Mitigation or Opportunity Enhancement:	A Decommissioning Waste Management Plan should be developed and implemented to maximise reuse and recycling and minimise waste disposal to landfill. The Plan should include procedures for waste segregation, interim storage, engagement of licensed waste operators for transport, treatment and safe disposal.		
Residual Impact:	With appropriate reuse and recycling of waste, the residual impact of the decommissioning waste should not be significant.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 15-9 Generation of Waste during Decommissioning

15.8 Land and Groundwater Quality

The decommissioning phase would have the potential to affect the local ground conditions in case of (1) a poorly executed removal of concrete bases and hardstanding areas and (2) an accidental release of hazardous substances contained in the transformers and wind turbine components.

15.8.1 Impact Assessment

15.8.1.1 Impact on Ground Conditions

The decommissioning activity could affect the local ground conditions if a complete removal of concrete base would not be followed by appropriate reinstatement techniques including backfilling. The turbine foundations and crane pads would most likely be only partially removed (typically to 1m below ground level) and the remaining area would be backfilled. The site is moderately prone to erosion and the partial removal of foundations might create ground instability issues or unwanted pathways for groundwater.

An appropriate assessment of ground conditions should be conducted prior to the decommissioning.

15.8.1.2 Accidental Soil and Groundwater Contamination

Transformers and other wind turbine components contain hazardous substances (oil and lubricants). If not controlled properly during the decommissioning, accidental release of these substances can contaminate the local soil and groundwater. Given the volume of insulation oil in the power transformers, accidental release during the removal would present a high magnitude effect and a significant adverse impact on the local agricultural soil, and a medium magnitude effect and a moderate adverse impact on the shallow groundwater aquifer.

Measures should be employed to reduce the risk for soil and groundwater posed by the dismantling and removal operations.

15.8.2 Impacts Summary

The impact of concrete foundations on ground conditions is not considered to be significant, however, an appropriate assessment of ground conditions should be conducted prior to the decommissioning. Potential releases of hazardous substances from the power transformers and wind turbine components would be a significant adverse impact on the local agricultural soil and moderate adverse impact on the shallow groundwater aquifer.

15.8.3 Proposed Mitigation/ Control Measure

15.8.3.1 Impact on Ground Conditions

An assessment should be undertaken at an appropriate time to determine the degree of removal of concrete foundations and subsurface structures, taking into account potential changes over the project lifetime. Based on the assessment, appropriate reinstatement and revegetation techniques should be defined and executed.

Provided that the mitigation measures are implemented, there should be no residual impact on local ground stability.

15.8.3.2 Accidental Release of Hazardous Substances

Appropriate working procedures should be implemented to drain hazardous substances from the transformers and wind turbine components under a controlled method, to safely store them on site and to recycle them or dispose of appropriately;

A Decommissioning Emergency Response Plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc.

Provided that the control measures are implemented, there should be no contamination of land and groundwater at the site.

15.8.4 Conclusions

The summary of potential land and groundwater impacts is provided in Table 15-10 and Table 15-11.

Impact or Opportunity:	Impact of concrete bases on ground conditions (medium sensitive receptor).	**Ref. No.:**	71
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	An assessment should be undertaken at an appropriate time to determine the degree of removal of concrete foundations and subsurface structures, taking into account potential changes over the project lifetime. Based on the assessment, appropriate reinstatement and revegetation techniques should be defined and executed.		
Residual Impact:	There should be no residual impact on local ground stability.		

Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 15-10 Impact on Ground Conditions during Decommissioning

Impact or Opportunity:	Accidental release of hazardous substances from the power transformers and wind turbine components to land (low sensitive) and groundwater (medium sensitive receptor).		Ref. No.:	72
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Appropriate working procedures should be implemented to drain hazardous substances from the transformers and wind turbine components under a controlled method, to safely store them on site and to recycle them or dispose of appropriately; A Decommissioning Emergency Response Plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc.			
Residual Impact:	There should be no contamination of land and groundwater at the site.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 15-11 Land and Groundwater Impact during Decommissioning

15.9 Surface water and Wastewater

Future climate projections predict more frequent heavy rainfall events, especially during summer.

15.9.1 Impact Assessment

The decommissioning works would generate sediment transport and silty surface runoff although considerably less than during the construction phase, due to a smaller scale of anticipated ground disturbance. Uncontrolled discharge of sediment run-off into the local watercourses (medium sensitive receptor) could deteriorate their water quality. If uncontrolled, the magnitude of effect is considered to be medium resulting in a **minor adverse** impact.

Sanitary wastewater from workers domestic facilities has a high organic load and should not be discharged into the local watercourses.

15.9.2 Impacts Summary

The decommissioning works would generate sediment transport and silty surface runoff although considerably less than during the construction phase, due to a smaller scale of anticipated ground disturbance. The impact is assessed as minor adverse prior to mitigation.

15.9.3 Proposed Mitigation/ Control Measure

Proposed mitigation measures are similar to those during the construction phase:

- Procedure for works during heavy rainfall should be developed and implemented;
- Silty and potentially contaminated runoff from the decommissioning site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including

appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary;

- Hazardous materials or waste should not be stored in the vicinity of the watercourses;
- In the areas where hazardous materials and waste will be stored, secondary containment should be provided to retain any leakage; Spillage kits should be provided at key locations on site and in particular at refuelling areas, and staff should be trained to use them.
- Sanitary facilities should be regularly inspected and wastewater disposed of by a licensed contractor;
- Sanitary wastewater should not be discharged to the local watercourses.

Provided the proposed measures are implemented there should be no residual impact of wastewater during the decommissioning phase.

15.9.4 Conclusions

A summary of effects related to wastewater impacts during the decommissioning of the proposed Crni Vrh WPP is provided in Table 15-12.

Impact or Opportunity:	Uncontrolled discharge of silty or contaminated runoff or sanitary wastewater to medium sensitive watercourses during the decommissioning works.	**Ref. No.:**	73
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Procedure for works during heavy rainfall should be developed and implemented; Silty and potentially contaminated runoff from the decommissioning site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary; The local watercourses should be protected from surface run-off discharge. Hazardous materials or waste should not be stored in the vicinity; In the areas where hazardous materials and waste will be stored, secondary containment should be provided to retain any leakage; Spillage kits should be provided at key locations on site and in particular at refuelling areas, and staff should be trained to use them. Sanitary facilities should be regularly inspected and wastewater disposed of by a licensed contractor; Sanitary wastewater should not be discharged to the local watercourses.		
Residual Impact:	There should be no impact on surface water during the decommissioning phase.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 15-12 Wastewater Impact during Decommissioning

15.10 Community Health, Safety and Security

Similar to the construction phase, health, safety and security of local residents may be affected during the decommissioning activity by: (1) the increase in traffic flows of heavy vehicles and increase of traffic accident risks, (2) unauthorised access to the site and security risks especially during the operation of cranes.

Future baseline in terms of population and settlements in the Study Area cannot be reliably predicted, but it should be noted that the long-term population growth projections for Serbia (and Eastern Serbia) suggest further decline. Based upon the existing trend, it is reasonable to expect that the local population will at least slightly decrease.

15.10.1 Impact Assessment

15.10.1.1 Impact on Traffic Safety

The decommissioning traffic volumes would be substantially lower than those during the construction phase. Along the road No. 161 near Brestovac Spa and Bor Reservoir, additional HGV traffic may increase the risk of accidents for the local community. This has the potential to be a low magnitude effect with a **minor adverse** significance.

Other sections of the road No. 161 run outside settlements and the decommissioning traffic along the rest of the route would have a low magnitude effect with a **minor to negligible adverse** significance.

15.10.1.2 Unauthorised Access

Safety and security risks for local community may arise from unintentional or intentional entrance to the site, including potential contact with structures or excavations posing safety hazards. If not controlled, the impact is assessed to be **moderate adverse**.

15.10.2 Impacts Summary

Increased traffic flows of heavy vehicles during the decommissioning phase are considered to present a minor adverse impact on local residents and visitors near Brestovac Spa and Bor Reservoir. If unmitigated, unauthorised access to the decommissioning site can have a moderate adverse impact on the safety of local residents.

15.10.3 Proposed Mitigation/ Control Measure

15.10.3.1 Traffic Safety

A Road Safety Management Plan should be developed and implemented (as part of a wider Decommissioning Transport Management Plan) to define traffic safety procedures including but not limited to: details on vulnerable road users along the route, speed controls, training programmes and licences for all drivers, maintenance of vehicles, monitoring of the road condition (removal of dirt and debris). Discussions with the local community should be held, if necessary.

As a result of the proposed measures, the risk of the traffic accidents should be negligible for local residents.

15.10.3.2 Unauthorised Access

- All reasonable measures should be taken to ensure that no unauthorised person enters the decommissioning site;
- Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community;
- A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors.
- Provided that the management measures are implemented, there should be no security risk for the local residents.

15.10.4 Conclusions

A summary of effects related to community health, safety and security impacts during the decommissioning of the proposed Crni Vrh WPP is provided in Table 15-13, Table 15-14.

Impact or Opportunity:	Traffic safety risk for local residents (highly sensitive receptor) due to increased traffic flows.	**Ref. No.:**	74
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A Road Safety Management Plan should be developed and implemented (as part of a wider Decommissioning Transport Management Plan) to define traffic safety procedures including but not limited to: details on vulnerable road users along the route, speed controls, training programmes and licences for all drivers, maintenance of vehicles, monitoring of the road condition (removal of dirt and debris). Discussions with the local community should be held, if deemed necessary.		
Residual Impact:	There should be no traffic safety risk for local residents.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 15-13 Impact on Traffic Safety during Decommissioning

Impact or Opportunity:	Security risk for local residents (highly sensitive receptor) due to unauthorised access to the decommissioning site.	**Ref. No.:**	75
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	All reasonable measures should be taken to ensure that no unauthorised person enters the decommissioning site; Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community; A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors.		
Residual Impact:	There should be no security risk for local residents.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 15-14 Impact on Public Security during Decommissioning

16 Summary of Impacts, Mitigations and Control Measures

16.1 Introduction

This Chapter presents a consolidated list of the impacts assessed and mitigations discussed in Chapters 13 to 15 inclusive. This consolidated list has then been used as the basis of the ESMMP presented in Chapter 17.

16.2 Construction Impacts

Construction - Ecology and Nature Conservation				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
1	Loss or destruction of habitats and populations of Bug Orchid and Burnt Orchid	The impact of loss or destruction of habitats and populations of Bug Orchid (Anacamptis coriophora) and Burnt Orchid (Neotinea ustulata) has been assessed as significant negative. To prevent this impact, any construction works and the access of construction machinery and personnel in the two fragments of Balkan-mountain hay meadows where these populations are present must be avoided. Accordingly, the following measures are proposed: • Siting of OHL towers in the habitats of these populations must be avoided (this has already been adopted within the off-site OHLs Zoning Plan). • Fencing and marking of areas of the habitats of these populations during the construction must be installed, which should be implemented through the CESMP.	No (or negligible at the most) loss or destruction of valued (or any other protected species) populations and their habitats due to construction.	Negligible Adverse.

Construction - Ecology and Nature Conservation				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
2	Loss or destruction of habitats and populations of Common Clubmoss	The impact of loss or destruction of habitat and population of Common Clubmoss (Lycopodium clavatum) has been assessed as significant negative. To prevent this impact, any access of construction machinery and personnel in the single fragment of humid meadow where this population is present must be avoided, as well any changes of the fragment's hydrological regime. Specific mitigations required are: • Fencing and marking of area of the habitat of this population during the construction must be installed, which should be implemented through the CESMP. • Any drainage interventions/ measures along particular section of the site track in the vicinity of the habitat of this population must be avoided, which should be implemented through the Project planning documents and CESMP.	No disturbance/ displacement nor accidental/ incidental mortality due to construction of any valued population, negligible at the most of any other protected species' population.	Negligible Adverse
3	Loss or destruction of habitat and population of Small Pearl-Bordered Fritillary	The impact of loss/ destruction of habitats and population of a butterfly species, the Small Pearl-Bordered Fritillary (Boloria selene), has been assessed as significant negative. To prevent this impact, any construction works and the access of construction machinery and personnel in the four fragments of humid habitats where this population is present must be avoided, as well any changes of the fragments' hydrological regime. Accordingly, the following measures are included within the ESMMP and implemented via the CESMP: • Widening of the tracks at the expense of the habitats of this population must be avoided. • Fencing and marking of area of the habitats of this population during the construction must be installed. • Any drainage interventions/ measures along particular sections of the site tracks adjacent to the habitats of this population must be avoided.	Negligible loss of habitats of insignificant value for all occurring (including valued) bird populations to or due to construction.	Negligible Adverse

Construction - Socio-Economic				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
4	Reduced amount of land for use by individual users (low sensitive receptors), up to 70 ha in total.	Minimise land that is used/ occupied during construction, compensate any damages to land and crops, preserve all topsoil.	In total 35 ha of land will remain permanently unavailable for use after construction. This means that about 98% of the site (2,706 ha) will remain available for use.	Negligible adverse.
5	Loss of 7 structures of four households (low sensitive receptors).	Acquire structures through voluntary transactions at full replacement cost, without applying depreciation. These structures will be demolished.	Owners of structures have no losses and have gains from receiving compensation.	Negligible beneficial.
6 and 7	Employment opportunities for local residents and procurement opportunities for local companies (medium sensitive receptors).	Announce employment opportunities locally and encourage women to apply; Implement transparent and fair recruitment procedures; Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations; Provide a grievance mechanism for workers. Procure goods and services locally whenever possible.	More local people are employed than originally anticipated. More goods are procured locally than originally anticipated.	No change.

Construction - Socio-Economic				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
8	Involuntary economic displacement of users of land (low sensitive receptors).	Minimise the amount of land occupied / disrupted during construction; Aim to acquire land through amicable agreements to the extent possible; Compensate all affected land and any assets on it, at full replacement cost; Determine whether each household whose land has been acquired for service and/or access roads has been economically displaced and if the household is vulnerable. Develop concrete measures to assist households who have been economically displaced (additional compensation, assistance to restore livelihoods) and those who have been identified as being vulnerable (assistance to restore livelihoods and any other measures depending on the type of vulnerability). Fully reinstate the land after disruption; Establish and implement a grievance mechanism.	No one will be economically displaced by the project and people have gains from receiving compensation (and, if needed, assistance).	Minor beneficial.
9	Increased livelihoods of local households (medium sensitive receptors).	Encourage local employment and procurement to enhance local spending.	More local spending than originally anticipated and better living standard of local households.	No change.
10	Impacts on tourism activities, further causing loss of livelihoods in the Bor lake and spa area (medium sensitive receptors).	In the Traffic Management Plan consider ways of avoiding impacts on local tourism to the extent possible. Present the Traffic Management Plan (and grievance mechanism) to local businesses operating in the Bor lake and spa area, for suggestions and comments. Establish and implement a grievance mechanism.	Some short-term impacts on tourism (traffic congestions and delays) are to be expected.	Negligible adverse.

Construction - Socio-Economic				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
11	Enhanced land use for local land owners (medium sensitive receptors) as a result of improved access tracks.	Regular maintenance of access tracks.	Improved land use for local landowners.	Negligible Beneficial.
12	Damages to road surfaces on roads used by local residents (medium sensitive receptors).	Preparations of roads for heavy transport before construction. Prompt restoration of roads to at least pre-construction level Maintenance of roads during construction.	Although some road damages are to be expected in the short term, regular maintenance will provide improved access to land and land use for local owners and overall good relations with local communities	Negligible adverse.

Construction - Traffic and Transport				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
13	Impact on community severance and driver delay along the road No. 161 between Brestovac Spa and Bor Reservoir (medium-sensitive communities), especially in summer months during tourist season.	A Construction Traffic Management Plan (CTMP) should be developed in consultation with Roads of Serbia, Traffic Police Department in Bor and the Town of Bor. The CTMP should include arrangements with authorities, procedures related to off-site and on-site traffic, notification of local communities, route signing, timing restrictions to mitigate congestion and nuisance (especially in summer season), procedures during adverse weather conditions, road condition monitoring, feedback mechanism for complaints/inquiries, etc.	No significant residual impacts are anticipated during the construction transportation for the project. Minor driver delays as a result of temporary road closures or slow movement of HGVs. Increase of traffic flows of heavy vehicles would add to the risk of road wear and tear.	Minor adverse.

Construction - Landscape and Visual				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
14	Impact on the medium sensitive landscape character and fabric during construction.	All ground disturbances should be confined (where possible) to the construction compound, access tracks, turbine base areas, substation compound, routes for underground cables and OHL pylons. Existing vegetation should be suitable protected; land clearance/vegetation removal should be minimised as far as possible; Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; Stockpiling of excavated material or construction debris should be avoided; the construction site should be maintained in good condition; The areas disturbed during the construction should be successively restored and reinstated.	A minor portion of the landscape character and fabric would be temporarily affected.	Minor Adverse.
15	Visual impact on local residents, road users, people working in the area and people involved in recreation during construction, including highly sensitive residential receptors in the vicinity of the site (NE, SW).	No specific mitigation measures are proposed. Mitigation of the impact on the landscape character would mitigate the visual impact as well.	Short-term and localised impact, affecting mostly the residents immediately north-east and south-west of the site and would decrease with the distance.	Moderate to minor adverse.

Construction - Noise				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
16	Noise and vibration generated from construction activity on the WPP site including making access tracks and turbine hardstanding, concrete pours and the erection of the WTGs.	Noise from construction plant is limited by Serbian Law. A CESMP will be prepared which will detail measures to control noise. Construction work will typically occur during daytime hours only.	Short-term audible noise during construction.	Negligible Adverse

Construction - Noise				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
17	Construction traffic including HGVs on local roads	Abnormal loads must be co-ordinated with the highway authorities. The increase in HGVs will cause a minor adverse impact due to the increased noise from traffic.	Short-term traffic noise	Minor Adverse

Construction - Archaeology and Cultural Heritage				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
18	Damage of archaeological artefacts or features by the construction works.	CVP should promptly inform the competent institute about the commencement of earthworks; During the construction, archaeological supervision of works will be mandatory in the areas of foundations, cranes pads, cable routes, and access roads of the following WTGs: TI-9, TI-10, TI-16, TI-1, TI-2, TI-3, TII-2, TII-3, TII-8, TI-17, TIII-1, TIV-3, TIV-4; In case of valuable findings, the archaeological rescue excavation will be conducted; A chance finds procedure should be developed and workers trained to implement it. In case of chance finds, all work should be immediately halted and the area protected until the competent institute secures the findings.	If chance finds are encountered - potential for slowing down construction. Any findings will increase knowledge of archaeological and cultural heritage.	Minor Beneficial.

Construction - Land and Groundwater Quality				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
19	Destabilisation erosion of soil (medium-sensitive receptor) and sediment build up during the earthworks.	A Soil Erosion and Sediment Control Plan should be developed and implemented to ensure that best management practice principles are applied during the construction: • Earthworks should be staged and sequenced in order to limit the area of exposed soil; • Open earthworks should be progressively and rapidly stabilised (e.g. use of mulch, aggregate, geotextile); • Sediment control measures should be employed. Run-off should be controlled by interception, diverting or conveying to stabilised areas, across slopes at a minimum gradient; • All slopes and areas of bare soil should be stabilised before the beginning of snow season. Installation of snow barriers should be considered to reduce the erosion on particularly sensitive disturbed areas; • Integrity and effectiveness of erosion control and sediment treatment devices should be monitored; • Upon completion of the construction, the original slope and drainage pattern should be re-established, to the extent possible.	No significant residual impacts of soil erosion are anticipated provided that the mitigation is applied.	Negligible Adverse.

Construction - Land and Groundwater Quality				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
20	Loss, compaction or degradation of forest soil (medium sensitive receptor) during construction.	Removed topsoil should be stored adjacent to the excavated area and later used to cover backfilled areas; Topsoil removal and stockpiling should be halted if topsoil is saturated with water; soil compaction and long-term damage to soil structure will be avoided by handling soils that are in a suitably dry condition and not during wet weather; Removed topsoil should be preserved for re-use; Topsoil stockpiles should have adequate height and slope gradient and their erosion should be prevented by controlled compacting to the level that presents no threat of development of anaerobic processes; Excavations and areas of exposed soils should be reinstated as soon as practicable once construction works are complete at a certain area.	Loss, compaction or degradation of forest soil within the project footprint.	Negligible Adverse.
21	Contamination of soil (low-sensitive) and groundwater (medium-sensitive receptor) due to accidental release of hazardous materials or waste.	Storage of fuels, oils, chemicals, and liquid waste materials should be carried out in designated, dedicated areas, equipped with spillage protection; Fuelling and maintenance of machinery and vehicles should be carried out in a designated area with available spill kits and drip trays; Appropriate working procedures should be implemented to minimise the risk of accidental release during storage and handling of hazardous materials, washing down of plant and equipment and fuelling and maintenance of machinery and vehicles; Emergency response plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc.	There should be no residual impact of soil and groundwater contamination.	No Change.

Construction - Surface Water and Wastewater				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
22	Uncontrolled discharge of silty or contaminated runoff to local watercourses (medium sensitive) during construction.	Procedure for works during heavy rainfall should be developed and implemented; Silty and potentially contaminated runoff from the construction site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary. Single-point discharges that may lead to erosion and scour should be avoided. Excavations' face should be kept minimal to avoid the exposure of exposed surfaces to natural conditions. In the areas where hazardous materials and waste will be stored, secondary containment should be provided to retain any leakage; Spillage kits should be provided at key locations on site and in particular at refuelling areas, and staff should be trained to use them.	There should be no residual impact of sediment transport and surface runoff at the site.	No Change.
23	Uncontrolled release of cement-based products to local watercourses (medium sensitive) during construction.	If concrete batching is undertaken at the site, a designated area should be provided at a safe distance from watercourses. No discharge of cement-contaminated water to the construction drainage system or to any watercourse must be allowed; Concrete batching wastewater should be treated in sedimentation ponds and reused where possible; Concrete washout should be conducted in designated areas, lined to prevent infiltration to the subsurface and covered to prevent the collection of rainfall; Solidified content cleaned down from lorry chute should be cleared from the site and disposed of with other construction waste.	There should be no residual impact of concrete batching wastewater on local watercourses.	No Change.

Construction - Surface Water and Wastewater				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
24	Disturbance of stream banks (medium sensitive receptor) during construction.	During the installation of underground cables beneath the Lipa River and the Antonijev Kladenac stream, the cable pipeline should be buried deep enough so that it is not exposed due to scour during high flows; Wherever possible, a minimum 15 metre buffer zone should be maintained between the works area and a watercourse including the ephemeral/ intermittent streams. No storage of material or parking of machinery must be allowed in the buffer zone; After cable installation, the natural width, depth and bed material of the stream should be restored and the banks re-establish with native riparian vegetation.	There should be no disturbance of stream banks.	No change.
25	Uncontrolled discharge of sanitary wastewater from workers domestic facilities to local watercourses (medium sensitive receptor).	Sanitary facilities should be regularly inspected and wastewater disposed of by a licensed contractor; Sanitary wastewater should not be discharged to local watercourses.	There should be no impact of sanitary wastewater to local watercourses.	No Change.

Construction - Environmental Pollution				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
26	Dust emission during construction works and exhaust emissions from machinery and vehicles to weekend and residential houses in the vicinity (highly sensitive receptors).	Dust suppression techniques (watering and sprinkling) should be applied: • Transport vehicles carrying the dusty material should be covered; • Topsoil stripping should be undertaken close to the period of excavation; • Barriers should be erected where needed to protect receptors from dust; • Speed limits should apply on transport roads including dirt tracks;	Dust propagation should be limited to construction area and should not influence the local community.	Negligible Adverse.

Construction - Environmental Pollution				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
		• Regular maintenance of machinery and vehicles should be provided.		
27	Cross-contamination at the site by the excavated contaminated soil in the area of Gornja Lipa open cast pit.	A Contaminated Material Management Plan should be implemented as part of the CESMP to ensure that the excavated soil is segregated from the adjacent-underlying soil to avoid potential cross-contamination. The soil stockpiles should be covered with sheeting and protected from surface run-off. If suitable, the soil should be re-used to backfill the excavated area. Any surplus excavated soil should be safely disposed within the mine area.	There should be no cross-contamination at the site.	No Change.

Construction - Ecosystem Services				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
28	Impact on private water supplies (high-sensitive receptor) due to disturbance of the groundwater regime during excavation.	A Private Water Supply Management Plan (PWSMP) should be developed to include: • Identification of PWS down-gradient of the excavation/dewatering areas including the source of their water feeding, its catchment, distribution infrastructure and supply; • Risk Assessment: Potential of excavation/ dewatering or road construction to affect the quantity, quality or continuity of water at the receptor and appropriate mitigation to avoid or reduce the risk; • Provision of temporary or permanent alternative water supplies, if necessary. A permanent alternative source should be comparable or better to the current source and may include a groundwater borehole, or an alternative water spring/source with pipe infrastructure; • Monitoring of PWS should be undertaken during and after the excavation/dewatering phase to ensure that	There should be no significant residual impact on the users of private water supplies.	Minor Adverse.

Construction - Ecosystem Services				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
		the baseline water quality and quantity in PWS is reinstated. The monitoring should last at least 6 months with monthly sampling from the water source and point of supply.		

Construction - Community Health, Safety and Security				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
29	Traffic safety risk for local residents and visitors (highly sensitive receptors), especially in summer, in the area of Brestovac Spa and Bor Reservoir due to increased traffic flows.	A Road Safety Management Plan should be developed and implemented (as part of a Construction Transport Management Plan) to define traffic safety procedures including but not limited to: details on vulnerable road users along the route, speed controls, training programmes and licences for all drivers, maintenance of vehicles, monitoring of the road condition (removal of dirt and debris). Consultation with local traffic police should be held related to potential traffic control measures in the area of Brestovac Spa and Bor Reservoir, in order to decrease the risk for pedestrians crossing the road and their exposure to drivers overtaking HGVs in prohibited places. Temporary signing should be used to highlight the presence of construction traffic. Discussions with the communities of Brestovac Spa and Bor Reservoir should be held in the pre-construction phase to raise awareness on traffic risks during the construction. Temporary signing should be considered along the road No. 161 within the development site to prevent drivers previously accustomed to the low traffic to take unnecessary risks.	There should be no traffic safety risk for local residents and visitors.	No Change.

Construction - Community Health, Safety and Security				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
30	Security risk for local residents, loggers, hunters, wild plant pickers (high-sensitive receptor) due to unauthorised access to the construction site.	All reasonable measures should be taken to ensure that no unauthorised person enters the construction site; Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community; A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors. Provided that the management measures are implemented, there should be no security risk for the local community.	There should be no security risk for local community.	No Change.
31	Spread of COVID-19 among the local community (highly sensitive receptor).	A COVID-19 Management Plan should be developed and implemented. Besides establishing the controls in the workplace, the Response Plan should include measures to prevent the transmission in the local community. The Management Plan should establish a hierarchy of controls to limit the spread of COVID-19, including technical controls (testing, cleaning and disinfection, immunisation, separation of infected employees), management procedures (communication, training, work instructions, contact with local community, absence from work) and personal protective equipment.	There should be no risk of spread of COVID-19 in the local community.	No Change.

Construction – Fire/ Wildfire				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
32	Increased fire/ wildfire risk during construction, especially during prolonged dry periods in summer.	A Construction Fire Prevention and Response Plan should be developed in consultation with the statutory stakeholders: • Monitoring of fire weather risk: During the wildfire season (especially in July and August) weather	The residual risk of fire/ wildfire risk should be negligible, there should be no impact on construction site.	Negligible Adverse.

Construction – Fire/ Wildfire				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
		predictions and the Fire Weather Index should be monitored on daily basis and site personnel should be informed of the risk; • Safe working and emergency procedures should be developed and strictly implemented during prolonged dry periods and high-speed winds, especially in summer. This should particularly include all hot work (e.g. grinding, cutting, welding) as well as operation of earth-moving equipment and vehicles; • Restrictions should be considered for activities on days when wildfire hazard is 'Extreme'. Activities that should be banned or taken with precaution should be identified; • Pre-wetting of working areas should be considered during the days when the fire danger is 'High' or 'Extreme'; • Routes for construction traffic should be clearly defined to prevent driving through grass and igniting dry vegetation; • Vehicles and machinery should have diesel engines and should be regularly cleaned from accumulated vegetation and other flammable material. Equipment checks to prevent malfunction should be ensured; • Smoking should be allowed only in dedicated areas; • The construction personnel should be trained in causes and prevention of wildfires and response; • Fire-fighting equipment should be provided at the site and personnel trained to use it. Appropriate additional fire suppression equipment should be considered during periods when the wildfire risk is 'Extreme' (e.g. mobile water tanks); • Fire response procedure should be clearly defined including actions to be taken by the construction personnel, informing the fire brigade, health and safety protocols, evacuation from the site, etc.		

16.3 Operational Impacts

Operation - Ecology and Nature Conservation				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
33	Mortality of valued populations of Western Barbastelle Bat resident population.	Conditional shutdown programme for Western Barbastelle Bat resident population. The preliminary shutdown programme must be prepared for implementation at WTGs I1, I10, I12, II1, II6, II10, III1 and III2, from 15 March until 15 November, from sunset until sunrise when all the following wheatear thresholds are met: • wind speed (measured from nacelle) 6 m/s or bellow, • temperature 10°C or above, • no heavy rainfall. The proposed shutdown programmes would only be implemented if unsustainable mortality of the particular population is recorded by the post-construction monitoring mortality surveys. In such a case, immediate implementation of the shutdown programme is crucial to effectively mitigate fatalities. Therefore, shutdown programmes must be prepared and ready for implementation should they be needed. The conditional shutdown programmes should be implemented through OESMP.	Negligible to minor negative regional and not significant.	No change

Operation - Ecology and Nature Conservation				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
34	Operational mortality of valued populations of Leisler's Bat resident and migratory populations.	Conditional shutdown programme for Leisler's Bat resident and migratory population. The preliminary shutdown programme must be prepared for implementation at WTGs I10, I12 and II10, from 15 March until 15 November, from sunset until sunrise when all the following wheatear thresholds are met: • wind speed (measured from nacelle) 6 m/s or bellow, • temperature 10°C or above, • no heavy rainfall. The proposed shutdown programmes would only be implemented if unsustainable mortality of the particular population is recorded by the post-construction monitoring mortality surveys. In such a case, immediate implementation of the shutdown programme is crucial to effectively mitigate fatalities. Therefore, shutdown programmes must be prepared and ready for implementation should they be needed. The conditional shutdown programmes should be implemented through OESMP.	Negligible to minor negative regional and not significant.	Minor Adverse.
35	The NPC habitat management requirements will result in a significant gain in valued Balkan-mountain hay meadows within the site.	No specific mitigation needed (other than adherence to legal requirements, NPC, and generic GIIP). The NPC (IfNC 2021b) habitat management requirement (to be implemented through OESMP) will lead to a gain in Balkan-mountain hay meadows at the site. This will also benefit grassland-associated species. Monitoring (to be implemented through OESMP): targeted bat surveys to determine the significance of habitat gain and inform adaptive management as to maximise positive effects yet not increasing collision risk.	Positive impact of habitat gains due to NPC habitat management requirements, though of indeterminable significance (to be determined by Monitoring).	Minor Beneficial.

Operation - Socio-Economic				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
36	Land rehabilitated and available for use to individual users (low sensitive receptors).	Maximise the amount of land which can be used again, fully restore all previously used land to its original condition.	At least 33 ha will be available for use in the same way as before the project.	No change.
37 and 38	Employment opportunities for local residents and procurement opportunities for local companies (medium sensitive receptors).	As for construction related employment, the contracting of any individuals for the operation of the WPP will follow principles of international best practice. To foster the creation of indirect employment opportunities, the Project will continue to procure goods and services locally whenever possible.	More local people are employed and more goods are procured locally than originally anticipated.	No change.
39	Involuntary economic displacement of users of land (low sensitive receptors).	Minimise the amount disrupted land and damages; Compensate all users of land for lost trees and any other damages at full replacement cost; Fully reinstate the land after disruption; Establish and implement a grievance mechanism.	No one will be economically displaced by the project.	Negligible beneficial.
40	Revenue generation for local government and communities (Žagubica: medium and Bor: low sensitive receptor).	Ensure that all payments are made in a timely and transparent manner.	Regular payments into the municipal budget will provide some stability in the long term and will enable the municipality to make more significant investments for the benefit of local residents.	Minor to moderate beneficial.
41	Support for local initiatives and development (medium sensitive receptors).	Ensure that calls for proposals are organised regularly and increase the amount of financing if feasible.	Provide local organisations with sustainable financing opportunities which will enable them to plan and implement more sustainable projects.	Moderate beneficial.
42	Regular maintenance of access tracks to enhance land use by local land owners (medium sensitive receptors).	Regular maintenance of access tracks.	Improved land use for local land owners, leading to maintained positive relationships with the local population.	No change.

Operation - Landscape and Visual				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
43	Impact on the landscape character (medium sensitive receptor).	Mitigation embedded in the design. Landscape compensatory and enhancement measures should include: • Compensatory planting, on or off site; the location and design to be agreed with 'Serbia Forests'. To be aimed to achieve objectives (e.g. water catchment management, erosion control, landscape improvement, etc.); • Enhancing of pastures and meadows or creation of new grassland habitats (in conjunction with the habitat management and mitigation measures); • Creation of new recreational areas on or off site; • Enrichment of impoverished or degraded landscapes (e.g. agricultural landscapes); • Maintenance and monitoring of the measures during medium-term establishment for a minimum of 5 years upon completion of the WPP.	Significant effects in the immediate vicinity of the development site, introducing the tall industrial structures into a low-developed natural landscape. In the wider context of 5km and beyond the effect would be minor to negligible adverse.	Moderate Adverse.
44	Impact on visual receptors (highly sensitive) in the north-east and south-west, within 2km of the site.	Bespoke mitigation planting should be considered near a small number of houses in the north-east and south-west from which there would be an open view at a distance of less than 2km. Specific consultation should be undertaken with the affected people and where possible, targeted screening by woodland planting should be considered.	Targeted screening should reduce the visual impact to moderate to minor adverse.	Moderate to Minor Adverse.

Operation – Shadow Flicker				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
45	Shadow flicker effects at four weekend houses (medium sensitive) in the vicinity of the proposed development site.	Develop and implement a Shadow Flicker Mitigation Plan that should include: • Provision of information to affected people on timing and duration of the effect; • Procedure for addressing a complaint received from a receptor and how the shadow flicker occurrence should be verified and mitigation defined; • Mitigation measures (installation of screening structures or planting of vegetative buffers); • Monitoring of mitigation effectiveness; • Shut-down of individual turbines if measures prove to be ineffective.	The residual shadow flicker should not exceed the recommended thresholds.	Negligible Adverse.

Operation - Noise				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
46	Without mitigation the WPP would exceed noise limits at several residential locations.	The design evolution of the project has removed four turbines to mitigate the impacts at properties to the north-east. Embedded mitigation will be included in the form of serrated trailing edges fitted to the turbine blades. In addition, it will be possible to operate the turbines in reduced noise modes (with some loss in electrical power). Properties with noise levels exceeding the Serbian night-time limit will be offered compensation so that the sound insulation of the properties can be improved.	Some audible noise	An impact of moderate significance is predicted at four properties.

Operation – Ice Throw and Ice Fall				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
47	Risk of fatality for general public or the WPP personnel due to turbine ice throw or ice fall.	Develop and implement an Ice Throw and Ice Fall Management Plan to set out the operational and technical measures to prevent and mitigate the risk for public and WPP personnel. The Plan should cover the following topics: • Danger zones at the site: Warning signs should be posted at the site entrance, along the access tracks at least 350m from the turbines, and along the affected section of the public road. Fog and poor visibility conditions should be taken into account, flashlights and audible signs should be considered. The danger signs should be removed outside the winter season to prevent habituation of people to the hazard; • Health & safety protocols: Permanent or mobile structural protection should be provided where necessary (roof protection at the car park and turbine entrance). Working procedures should be established to define movement at the site in the icing period, PPE, precautions before maintenance personnel access the turbines, etc. • Contracts with residents: Affected users of summer houses should be contractually obligated not to visit their properties during winter. The appropriate compensation should be considered; • Education and communication: Information meetings should be held with residents, hunters and loggers to change their behaviour in the long-term. Text messaging during critical periods should be considered. The ice throw issue should be carefully communicated in social media to inform but not to create fear; • An incident response procedure should be implemented with clearly defined responsibilities and tasks. The procedure should cover accidents for both 1st, 2nd, and 3rd party.	The residual risk of fatality due to ice throw should remain similar to the daily risk in society.	No Change.

Operation - Community Health, Safety and Security				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
48	Unauthorised access of local residents (high sensitive receptor) during the operation phase.	Each turbine access door should be locked; Access to turbine tower ladders should be prevented; The substation should be fenced off and locked; and Signposts should be erected detailing the potential dangers of unauthorised access.	The risk of vandalism or injury due to unauthorized access should be negligible.	No Change.

Operation – Wildfire and Fire Risk				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
49	Damage of the WPP infrastructure due to wildfire or spreading of fire from the WPP infrastructure to nearby areas, causing a forest fire.	An Operation Fire Management and Response Plan should be developed prior to commencement of the WPP operation. The statutory stakeholders 'Serbia Forests' and fire departments from Žagubica and Bor should be consulted for the Plan development. The framework for the Plan should include but not be limited to: • Vegetation management procedure in 'asset zone'; • Installation and maintenance of wildfire prevention signs (in liaison with 'Serbia Forests') at relevant points; • Wildfire monitoring system (CCTV, drones, watchtowers) should be installed based upon the consultation with 'Serbia Forests' – the institutional stakeholder in charge for wildfire monitoring in Crni Vrh. • Monitoring of fire weather risk: During the wildfire season (especially in July and August) both short-term and long-term weather predictions should be monitored. The Fire Weather Index provided by the Serbian national weather service (RHMI) should be	The risk of fire should be negligible.	No change.

Operation – Wildfire and Fire Risk				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
		monitored on daily basis and site personnel should be informed of the risk; • Safe working and emergency procedures should be developed and strictly implemented during prolonged dry periods and high-speed winds, especially in summer; • The WPP personnel should be trained in causes and prevention of wildfires and response; • Equipment for initial fire response should be available at the site. All vehicles should carry fire-extinguishers and personnel should be trained to use it. Appropriate additional fire suppression equipment should be considered to be held at the site during periods when the wildfire risk is 'Extreme' (e.g. mobile water tanks); • Fire response procedure should be clearly defined including actions to be taken by the WPP personnel, informing the fire brigade, health and safety protocols, evacuation from the site, etc; • WPP operation protocols during wildfire should be defined (remote shut down of turbines, position and pitch of blades, etc.).		

Operation - Traffic and Transport				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
50	Increased traffic of maintenance and repair vehicles along low-sensitive local roads during the WPP operation.	A Transport Management Plan for the operation phase should be developed and implemented to define access routes for maintenance vehicles and management measures for heavy vehicles to prevent disruption of local traffic.	The operation traffic would not have a significant impact on local traffic and road network.	Negligible adverse.

Operation - Environmental Pollution				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
51	Generation of waste during operation and maintenance activities.	A Waste Management Plan should be developed and implemented, incorporating a waste management hierarchy: reduce, reuse or recycle whenever possible; The O&M Contractor should be required to remove all waste from the turbine sites and to separate the waste on-site; The O&M Contractor should be required to keep and maintain waste records and to engage licensed waste transporters and treatment/disposal facilities; Compliance of the O&M Contractor with waste regulations should be periodically checked.	Residual impact of waste generation should be negligible.	Negligible Adverse.

Operation - Land and Groundwater Quality				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
16	Accidental releases of hazardous materials or hazardous waste to land (low sensitive) and groundwater (medium sensitive receptor) during the operation.	Potential polluting materials (fuels, oils, chemicals) should be stored in dedicated storage areas equipped with secondary containment and other measures to retain any leakage; Hazardous waste should be stored in a dedicated, closed and secured area, segregated and properly labelled. Spillage protection should be provided. Per Serbian law, hazardous waste shall not be stored onsite longer than 12 months; Spill kits should be stored at key locations on site and staff should be trained in their use; Spill kits should be available to the servicing staff during turbine maintenance. Procedural controls should be applied during draining and filling of oil in turbines; An Emergency Response Plan (including spill management) should be implemented, addressing any	There should be no release of hazardous materials or waste to the ground.	No Change.

Operation - Land and Groundwater Quality				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
		common risks or impacts, defining response, responsibilities, equipment training needs for staff at the site, etc; Power transformers and associated bunds should be controlled as part of the regular maintenance and inspection regime. The bunds should be regularly cleaned from rainwater and other debris. If the rainwater is contaminated, it should be managed as hazardous waste by a licensed contractor; The oil separator should be regularly maintained and its efficiency periodically tested.		
17	Leakage or release of domestic wastewater from the septic tanks to land (low sensitive) and groundwater (medium sensitive receptor) during the operation.	The integrity of the sewage system and septic tanks should be periodically tested (once in 5 years per law). The septic tanks should be emptied in regular intervals by a licensed contractor.	There should be no leakage or release from the sewer system.	No Change.

Operation - Surface Water and Wastewater				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
54	Alteration of surface water run-off pattern and change of fluvial morphology downstream of the site.	The site drainage should be designed to mimic natural drainage conditions at the site; The drainage system should maximise infiltration and attenuation rather than direct discharge to natural watercourses or gullies; Infiltration to the soil should be maximised. Nearby vegetation areas should be used as buffers, where possible. The velocity of surface water run-off to be reduced / attenuated; The access roads and turbine bases should be regularly inspected to ensure no unacceptable erosion is taking	There should be no impact on drainage patterns at the site.	No Change.

Operation - Surface Water and Wastewater				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
		place. Remedial measures should be taken if erosion is noted.		
55	Direct discharge of untreated domestic wastewater to a surface watercourse off-site (medium sensitive).	The septic tanks should be regularly drained by a licensed contractor and the effluent should be discharged to a local sewage system off site; The integrity of the sewage system and septic tanks should be periodically tested (once in 5 years per law); During longer duration maintenance activities portable toilets should be provided to the service staff.	There should be no residual impact on surface water.	No Change.

Operation – Ecosystem Services				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
56	Disruption of private water supply as a priority ecosystem service (a highly sensitive receptor) during the operational period.	Provided that the mitigation measures related to PWS during the construction phase are implemented, there will be no impact on private water supply during the operation. No additional mitigation measures are proposed.	There will be no residual impact on ecosystem services.	No change.

Operation - Electromagnetic Interference				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
57	Impact on public health of local residents (high sensitive receptor) due to exposure to electromagnetic radiation.	Mitigation is embedded in the design. No additional mitigation measures are proposed.	There will be no impact of electromagnetic radiation on public health.	No change.

Operation - Electromagnetic Interference				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
58	Electromagnetic interference to telecommunication signals (low sensitive receptor).	Mitigation is embedded in the design. No additional mitigation measures are proposed.	The emission of electromagnetic disturbances from the Crni Vrh WTGs should be negligible.	No change.

Operation – Aviation and Radar Systems				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
59	Impact on aircraft safety (high sensitive receptor)	Apply legally required obstruction marking and lighting of turbines for daylight and night visibility and reduced visibility conditions.	There should be no residual impacts on aircraft safety.	No Change.
60	Impact on the weather radar system at the Crni Vrh national weather station (low sensitive receptor).	CVP agreed to financially support the mitigation of potential effects on the weather radar system.	The residual impact on the weather radar should be negligible adverse.	Negligible Adverse.

16.4 Decommissioning Impacts

Decommissioning - Ecology and Nature Conservation				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
61	Cannot be clearly described at ESIA stage.	-	-	-

Decommissioning - Landscape and Visual				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
62	Impact on landscape character and fabric (medium sensitive receptor) during decommissioning.	Existing vegetation should be suitable protected; land clearance/vegetation removal should be minimised as far as possible; Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; Stockpiling of debris should be avoided; the decommissioning site should be maintained in good condition; The disturbed areas should be successively restored and reinstated.	Upon completion of the decommissioning, the site would be reverted to the pre-existing baseline condition.	No change.
63	Visual impact on local residents and road users, including highly sensitive receptors in the north-east and south-west, during decommissioning.	No specific mitigation measures are proposed.	Short-term and localised impact, affecting mostly the residents in the north-east and south-west and would decrease with the distance.	Negligible adverse.

Decommissioning - Socio-Economic				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
64	Land rehabilitated and available for use by individual users (low sensitive receptors).	Maximise the amount of land which can be used again, fully restore all previously used land to its original condition.	Approximately 5 ha of land will be available for use again.	No change.
65	Employment opportunities for local residents (medium sensitive receptors) during the decommissioning activity.	Announce employment opportunities locally and encourage women to apply; Implement transparent and fair recruitment procedures; Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations; Provide a grievance mechanism for workers.	More local people are employed than originally anticipated.	No change.
66	Involuntary economic displacement of users of land (medium sensitive receptors).	Minimise the amount of land disrupted land and damages Compensate all users of land for lost crops and any other damages at full replacement value Fully reinstate the land after disruption Establish and implement a grievance mechanism.	No one will be economically displaced by the project.	Negligible beneficial.

Decommissioning - Noise				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
67	Noise from the dismantling of turbines and associated infrastructure.	Noise from construction plant is limited by Serbian Law. A decommissioning environmental management plan will be prepared which will detail measures to control noise. Decommissioning work will typically occur during daytime hours only.	Some audible noise	Negligible

Decommissioning - Traffic and Transport				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
68	Increase of heavy vehicles traffic on local and regional roads (medium sensitive receptors) leading to congestion and nuisance.	An assessment should be undertaken at an appropriate time to determine whether the turbine components would be broken down and removed by standard heavy vehicles; Should the components be removed for reuse a separate transport assessment should be conducted. A Decommissioning Transport Management Plan should be developed and implemented to establish the routes for the decommissioning traffic, necessary arrangements and schedule restrictions, notification of public, contractor speed limits, transport within the site, wheel cleaning and dirt control, etc.	The residual impact on congestion and nuisance should not be significant.	Negligible adverse.

Decommissioning - Environmental Pollution				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
69	Dust emission during decommissioning works and exhaust emissions from machinery and vehicles to weekend houses in the vicinity (highly sensitive receptors).	Dust suppression techniques (watering and sprinkling) should be applied; Transport vehicles carrying the dusty material should be covered; Barriers should be erected where needed to protect receptors from dust; Speed limits should apply on transport roads including dirt tracks; Regular maintenance of machinery and vehicles should be provided.	Dust propagation should be limited to the decommissioning area and should not influence the local community.	Negligible adverse.

Decommissioning - Environmental Pollution				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
70	Generation of decommissioning waste.	A Decommissioning Waste Management Plan should be developed and implemented to maximise reuse and recycling and minimise waste disposal to landfill. The Plan should include procedures for waste segregation, interim storage, engagement of licensed waste operators for transport, treatment and safe disposal.	With appropriate reuse and recycling of waste, the residual impact of the decommissioning waste should not be significant.	Negligible adverse.

Decommissioning - Land and Groundwater Quality				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
71	Impact of concrete bases on ground conditions (medium sensitive receptor).	An assessment should be undertaken at an appropriate time to determine the degree of removal of concrete foundations and subsurface structures, taking into account potential changes over the project lifetime. Based on the assessment, appropriate reinstatement and revegetation techniques should be defined and executed.	There should be no residual impact on local ground stability.	No change.
72	Accidental release of hazardous substances from the power transformers and wind turbine components to land (low sensitive) and groundwater (medium sensitive receptor).	Appropriate working procedures should be implemented to drain hazardous substances from the transformers and wind turbine components under a controlled method, to safely store them on site and to recycle them or dispose of appropriately; A Decommissioning Emergency Response Plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc.	There should be no contamination of land and groundwater at the site.	No change.

Decommissioning - Surface water and Wastewater				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
73	Uncontrolled discharge of silty or contaminated runoff or sanitary wastewater to medium sensitive watercourses during the decommissioning works.	Procedure for works during heavy rainfall should be developed and implemented; Silty and potentially contaminated runoff from the decommissioning site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary; In the areas where hazardous materials and waste will be stored, secondary containment should be provided to retain any leakage; Spillage kits should be provided at key locations on site and in particular at refuelling areas, and staff should be trained to use them. Sanitary facilities should be regularly inspected and wastewater disposed of by a licensed contractor; Sanitary wastewater should not be discharged to the local watercourses.	There should be no impact on surface water during the decommissioning phase.	No change.

Decommissioning - Community Health, Safety and Security				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
74	Traffic safety risk for local residents (high sensitive receptor) due to increased traffic flows.	A Road Safety Management Plan should be developed and implemented (as part of a wider Decommissioning Transport Management Plan) to define traffic safety procedures including but not limited to: details on vulnerable road users along the route, speed controls, training programmes and licences for all drivers, maintenance of vehicles, monitoring of the road condition (removal of dirt and debris). Discussions with the local community should be held, if deemed necessary.	There should be no traffic safety risk for local residents.	No change.

Decommissioning - Community Health, Safety and Security				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
75	Security risk for local residents (high sensitive receptor) due to unauthorised access to the decommissioning site.	All reasonable measures should be taken to ensure that no unauthorised person enters the decommissioning site; Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community; A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors.	There should be no security risk for local residents.	No change.

17 Mitigation, Management and Monitoring of Environmental and Social Impact

17.1 Project Delivery Environmental and Social Management System

The impact mitigations and management controls required by this ESIA are summarised in the Environmental and Social Management and Monitoring Plan, or "ESMMP", and will be delivered within the framework of the Project Environmental and Social Management System or "ESMS".

An ESMS General Requirements document will be prepared; this document will describe the over-arching framework and organisation of the integrated environmental, social, health and safety management system that will be applied to the Crni Vrh WPP. The aim of the ESMS is to ensure that the Crni Vrh WPP is constructed and operated in compliance with Serbian law and in line with international best practice (the Applicable Requirements). The ESMS General Requirements is the equivalent to the System Manual in terms of ISO 14001.

The ESMS General Requirements document will describe:

- The operational standards that will be applied to the Project, referred to as the "Applicable Standards";
- CVP policy for environmental management, occupational health & safety, labour management, and community health, safety and security;
- Organisation, roles and responsibilities;
- The framework and delivery of the management plans;
- Contractor management;
- Procedures for ensuring ESMS compliance, including inspection and monitoring, audit and review, and internal and external reporting;
- ESMS non-compliance, employee grievance and community grievance;
- ESMS administration.

The initial focus of the General Requirements document will be on the construction phase of the project.

The mitigation, monitoring and performance improvement measures described within the ESMMP will be delivered through the ESMS Management Plans. The ESMS will include three, high level Management Plans: Construction Environmental and Social Management Plan ("CESMP"), Operation Environmental and Social Management Plan ("OESMP") and Decommissioning Environmental and Social Management Plan ("DESMP").

The ESMMP presented below has been divided into three sections: construction, operation and decommissioning (see Table 17-2, Table 17-3, Table 17-4). The division of the ESMMP is intended to ensure that the impacts and mitigations identified within this ESIA (Chapter 16) are clearly linked to the CESMP, OESMP and DESMP. The authors of the ESMS Management Plans should not need to re-interpret the ESIA but simply reference the ESMMP. The ESMMP is the bridging document between the ESIA and Project ESMS.

The SEP remains a separate, standalone document that should be read in conjunction with the CESMP, OESMP and the DESMP. The SEP is considered to be a 'living document' which will be reviewed, updated and edited to reflect the requirements of construction, operation and decommissioning.

The CESMP, OESMP and DESMP will include a number of sub-plans that describe the facilities, equipment and management actions for each the risks or impacts identified. The sub-plans are listed in the following sections.

17.1.1 CESMP sub-plans

The CESMP should be prepared and implemented before the start of construction and may include the following sub-plans:

- Contractor ESHS Site Management Plan;
- Local Recruitment & Employment Plan.
- Occupational Health and Safety Plan;

- Site Mobilisation Management Plan;
- Earthen Material Management Plan;
- Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management);
- Dust Management Plan;
- Noise and Vibration Management Plan;
- Biodiversity Management Plan;
- Chance Find Procedure;
- Construction Transport and Road Safety Management Plan;
- Security Management Plan (if appropriate);
- Community Health and Safety Plan (which should consider Ice Throw and Ice Fall);
- Emergency Preparedness and Response Plan (which should consider Forest Fire and Wildfire);
- Communicable Diseases Management Plan (if appropriate).

17.1.2 OESMP Sub-plans

On the transition from construction to operation the General Requirements document will be revised to reflect the changing contractual arrangements and management structure. It is not yet known if CVP will appoint different contractors to operate the WPP, maintain the WTGs and to maintain the Balance of Plant.

An OESMP will be prepared and implemented prior to the start of commercial operation and should take into consideration any lessons learned from the construction phase of the Project. The OESMP will be in place for the whole of the operating life of the WPP but is expected to reviewed annually.

The OESMP will include a requirement for each contractor to develop an ESHS Management Plan that covers the areas of their responsibility. In addition, the OESMP will include a number of operational management sub-plans that may include:

- OHS Management Plan;
- Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management);
- Shadow Flicker Management Plan;
- Noise and vibration Management Plan;
- Community Health and Safety Management Plan;
- Community Grievance Procedure (the basic procedure will be the same as for the construction phase but the contact names and numbers may be different);
- Landscape Management Plan;
- Emergency Preparedness and Response Plan;
- Biodiversity Management Plan (including any requirement for land management as well as Mortality Survey).

17.1.3 DESMP Sub-Plans

Towards the end of the operational life of the WPP, the owner and operators will decide if the WTGS will be upgraded or replaced (re-powering) or if the WPP will cease operation. Should the WPP be closed then a DESMP will be prepared.

On the transition from operation to decommissioning the General Requirements document will be revised to reflect the changing contractual arrangements and management structure.

A DESMP will be prepared and implemented prior to the start of decommissioning and should take into consideration any lessons learned from the construction phase of the Project. The DESMP may include the following sub-plans:

- Decommissioning and disassembly of the WTGs;

- Decommissioning and removal of the transformers, sub-station and interconnector (if appropriate);
- Removal of underground cables;
- Removal of any buildings and all foundations;
- Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management);
- Material recycling;
- Land restoration.

17.2 Environmental and Social Management and Monitoring Plan

A programme of Environmental and Social Monitoring will be undertaken to monitor the delivery of the ESMMP and to verify the effectiveness of the ESMS. The objectives of the monitoring program are to:

- Record non-compliance and to ensure that remedial action is agreed and implemented
- Evaluate the effectiveness of the ESMS Management Plans and identify any shortcomings.
- Allow refinement and enhancement of mitigation measures to further reduce impacts.
- Allow identification unforeseen issues and to develop additional Management Plans as necessary.

The monitoring will be comprised of weekly inspections and quarterly audits during construction and monthly semi-annual / annual audits during operation (frequencies will be determined). A number of Key Performance Indicators ("KPIs") will be established. Table 17-1 outlines the proposed monitoring programme and possible KPIs.

Table 17-1 Potential Project KPIs

KPI:	Parameter:	Frequency:	Target:
Fugitive dust and particles	Visual observation	Daily	Zero
Ambient noise and vibration	Construction limits: 70 dBA	Noise measurements to be taken in the event of a valid complaint being received.	Compliance
Flora and fauna protection	Visual observation	Weekly	No damage to areas identified in the Biodiversity MP
Fauna (including birds and bats) protection	Visual observation	Weekly (April-July)	No vegetation removal and earthworks during wildlife breeding season
Provision and use of PPE	Inspection	Daily	Full compliance
Near Miss/ Accident/ Incident	Number	Monthly	No target set
HSE Observation	Number	Monthly	No target set
Safety tool box meeting	Number	Monthly	No target set
Safety Inspections	Number	Monthly	No target set
Water consumption	Cubic metres (m^3)	Monthly	No target set
Road traffic accidents	Number of accidents	Monthly	Zero

Table 17-2 Elements of the ESMMP that must Link to the CESMP

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
1	Construction Management (ESMS)	A Construction Environmental and Social Management Plan (CESMP) should be prepared and implemented before the start of construction. The CESMP should include: • Contractor ESHS Site Management Plan; • Occupational Health and Safety Plan; • Site Mobilisation Management Plan; • Earthen Material Management Plan (including consideration of Soil Erosion and Sediment Control); • Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management); • Dust Management Plan; • Noise Management Plan; • Biodiversity Management Plan; • Construction Transport and Road Safety Management Plan; • Community Health and Safety Plan (which should consider Ice Throw and Ice Fall); • Security Management Plan (if appropriate); • Emergency Preparedness and Response Plan (which should consider Forest Fire/ Wildfire); • Chance Find Procedure; • Communicable Diseases Management Plan (if appropriate at the time of construction). The content of these Management Plans (MPs) is described within topic specific sections of this ESMMP.	ESMS General Requirements CESMP	CVP EPC BoP	(Monthly) ESHS reports prepared by the contractors.	Throughout construction.
2	Employment, local hiring and workforce management	Develop and implement a Local Recruitment and Employment Plan to promote the employment of local workers, and in particularly women. " Local" is defined as living within 40km of the site. The LREP should: • Identify the job roles required and set targets as appropriate. Use targets to measure the success of the LREP.	CESMP Stakeholder Engagement Plan. Community Grievance Mechanism Workers Grievance mechanism Stakeholder engagement activities.	CVP Community Liaison Officer (CLO) EPC BoP	CGM Log. WGM log. Corrective Action Reports. Number of local people employed on the Project.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Announce employment opportunities locally in a timely manner and encourage women to apply. • Clearly communicate to the community the employment estimates, timeframes and skills requirements. • Periodically the EPC contractor will publish a list of required roles and will review the list of interested persons. The CLO should make sure this information is disclosed to the communities. The most suitable individuals will be invited for interview and, if suitable, will be offered a job. • CVP should consider how to invest in skills training to enable greater employment of local population during the construction and operation. • Investigate local sourcing and procurement opportunities to promote sustainable small business development. • Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations. • Provide a grievance mechanism for workers. • Encourage local employment and procurement to enhance local spending.	Number of grievances recorded. Monthly workforce statistics. Agreement to provide support to local businesses		Training places provided and completed.	
3	Livelihood restoration	Most of the land required for the construction and operation of the WPP has been obtained through voluntary agreement, however, involuntary economic displacement can occur through expropriation of land for access roads carried out by the municipalities or through damages to land or crops during construction. All of the affected landowners and farmers working within the construction area will be provided with information prior to land acquisition and the start of construction, regarding the Community Grievance Mechanism or “CGM”. The WPP developer and/or the construction contractors, as relevant, will implement the following mitigation measures: • Minimise the amount of land occupied / disrupted during construction; • Aim to acquire land through amicable agreements to the extent possible; • Compensate all affected land and any assets on it, at full replacement cost; • Determine whether each household whose land has been acquired for service and/or access roads has been	SEP CESMP CGM	CVP Community Liaison Officer	CGM logs.	Monthly

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		economically displaced and if the household is vulnerable. • Develop concrete measures to assist households who have been economically displaced (additional compensation, assistance to restore livelihoods) and those who have been identified as being vulnerable (assistance to restore livelihoods and any other measures depending on the type of vulnerability). • Fully reinstate the land after disruption. • Establish and implement the CGM.				
4	Construction Management	Each of the main construction contractors (CVP or EPC, and BoP) must develop and implement a Contractor ESHS Management Plan. Each MP must consider: • The scope of contractor activities and responsibilities during construction; • the ESHS responsibilities placed upon them by their contract, the project ESMS and the CESMP; • how the minimum requirements of the CESMP and its sub-plans are applied to their activities; • the construction programme and the ESHS risks of the main construction activities; • CVP (or the EPC) must describe organisation and layout of the construction compound; in particular the location of material and waste stores; • location and access to local hospitals and other healthcare services (including ambulance services); • location and access to local fire-fighting services.	CESMP SEP Location Permit	CVP EPC BoP	ESHS reports prepared by the contractors. CGM logs.	Monthly, throughout construction.
5	Occupational Health and Safety	Prepare and implement an Occupational Health and Safety Management Plan. The OHS MP must: • Comply with the Project Applicable Requirements. • Provide workers with appropriate personal protective clothing such as helmets, safety boots, gloves, dust masks, ear mufflers, overalls, and safety harnesses for working at height. • Strictly enforce the use of the Personal Protective Equipment to minimise the accidents. • Provide fully equipped First Aid Kit and sanitary facilities on site, including water for drinking and bathing, at all times.	Occupational Health and Safety MP. Construction Traffic MP. Emergency Preparedness and Response Plan. PPE procured and being used by the workers Fire extinguishing facilities on site First aid kit on site Signage installed on site.	CVP EPC BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs. Record of accidents and near misses Corrective Action Reports Grievance mechanism forms.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Provide appropriate fire extinguishers and train personnel in their use. • Establish a permit to work system for all high-risk activities (i.e. hot works, confident space, working at high etc.) • Train employees on the importance of occupational health and safety requirements and develop work instruction. • Monitor, evaluate and record all training activities, tool-box-talks, risk assessments, provision of PPE, and the investigation of all incidents and near-misses. • Undertake regular inspection to ensure compliance with OHS MP. • Report and investigate all incidences of accidents or near misses and keep proper records of the actions taken. • Promote Covid-19 Awareness (if appropriate). • Provide appropriate traffic safety training to all drivers (employers and contractors) as part of their induction and on an on-going basis.				
6	Mobilisation and Enabling Works	Prepare and implement a Construction Mobilisation Plan before any works begins on site. This MP must consider: • Establishment of the construction compound, car parking and lay-down areas; • Transport of heavy equipment to site; • The construction of site access points, the initial widening of existing tracks and the new tracks; • The demolition of any structures owned by CVP; • Clearance and levelling of construction areas (including the stripping and storage of top soil); • Provision of fuels, water, wastewater storage and electricity to the construction compound; • Establishment of welfare and first aid facilities; • Worker accommodation and welfare. In addition, the Zoning Plan requires that: • Areas of particularly sensitive habitats of conservation concern (pastures, woodland, grassland etc.), should be preserved.	CESMP Earthen Material Management Plan (including consideration of Soil Erosion and Sediment Control) Workers Grievance Mechanism PPE procured and being used by the workers Fire extinguishing facilities on site First aid kit on site	CVP EPC BoP	(Monthly) ESHS reports prepared by the contractors. WGM log.	Prior to, and during mobilisation.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Construction works are prohibited: - during the wildlife breeding season; - in the bed of watercourses, including removal of riverside vegetation; - if causing changes in the morphology and hydrology which may impact functionality of the ecological corridors; - during the days when they will cause long-term water turbidity. If during the night the water in the watercourses clears satisfactorily, the works can continue next day; - if causing water turbidity for more than 5 consecutive days.				
7	Groundworks: General	All ground disturbances should be confined (where possible) to the construction compound, access tracks, turbine base areas, substation compound, routes for underground cables and OHL pylons. • Existing vegetation should be suitable protected; land clearance/vegetation removal should be minimised as far as possible; • Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; • Stockpiling of excavated material or construction debris should be avoided; the construction site should be maintained in good condition; • The areas disturbed during the construction should be successively restored and reinstated. The Contractor ESHS MPs must take into account the following requirements for the Location Permit: • No construction work is allowed in areas with high concentration of birds and bats, particularly in areas of their roosts, and foraging and nesting areas. • Existing roads should be used as much as possible. Degradation of natural, semi-natural or agricultural habitats should be avoided. • Stockpiles of earthen material/ spoil must be protected from erosion and dust generation and finally properly disposed off-site.	CESMP Earthen Material Management Plan (including consideration of Soil Erosion and Sediment Control) Workers Grievance Mechanism	CVP EPC BoP	(Monthly) ESHS reports prepared by the contractors. WGM log.	Prior to start of Construction.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• New access tracks shall not cause instabilities or erosion. • Cable trenches and turbine foundations should be properly backfilled to keep out burrowing animals and prevent attracting raptors. • Upon completion of the construction, all degraded areas must be restored (excluding planting near the turbines and access tracks). • Disposal of organic or construction waste is prohibited at the site. • All roads used for heavy transport, such as delivery of crushed stone, steel, concrete, and turbine components will, where necessary, be widened or the alignment changed on some bends before the start of construction. • On the completion of construction, the access roads will be repaired. The standard of repair will be agreed with the municipality. • Access tracks will be upgraded and surfaced with crushed stone. This surface will be maintained throughout the lifespan of the WPP. A procedure for works during heavy rainfall should be developed and implemented; • Silty and potentially contaminated runoff from the construction site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary. • Single-point discharges that may lead to erosion and scour should be avoided. • Excavations' face should be kept minimal to avoid the exposure of exposed surfaces to natural conditions. During the installation of underground cables beneath the Lipa River and the Antonijev Kladenac stream, the cable pipeline should be buried deep enough so that it is not exposed due to scour during high flows. • Wherever possible, a minimum 15 metre buffer zone should be maintained between the works area and a watercourse including the ephemeral/ intermittent streams. No storage of material or parking of machinery must be allowed in the buffer zone.				

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• After cable installation, the natural width, depth and bed material of the stream should be restored and the banks re-establish with native riparian vegetation. There is the risk of cross-contamination at the site by the excavated contaminated soil in the area of Gornja Lipa open cast pit. • The contractors must ensure that the excavated soil is segregated from the adjacent-underlying soil to avoid potential cross-contamination. The soil stockpiles should be covered with sheeting and protected from surface run-off. If suitable, the soil should be re-used to backfill the excavated area. Any surplus excavated soil should be safely disposed within the mine area.				
8	Groundworks: management of excavated materials	Develop and implement an Earthen Material Management Plan. The EMMP should consider: • Earthworks are sequenced in order to limit the area of exposed soil; • Open earthworks are progressively and rapidly stabilised (e.g. use of mulch, aggregate, geotextile); • Store the top 30cm of topsoil and subsoil separately from areas excavated. Removed topsoil should be preserved for re-use and stored adjacent to the excavated area; • The soil stockpiles should be covered with sheeting and protected from surface run-off. If suitable, the soil should be re-used to backfill the excavated area; • Topsoil removal and stockpiling should be halted if topsoil is saturated with water; soil compaction and long-term damage to soil structure will be avoided by handling soils that are in a suitably dry condition and not during wet weather; • Sediment control measures should be employed. Run-off should be controlled by interception, diverting or conveying to stabilised areas, across slopes at a minimum gradient; • Topsoil stockpiles should have adequate height and slope gradient and their erosion should be prevented by controlled compacting; • All slopes and areas of bare soil should be stabilised before the beginning of snow season. Installation of	CESMP Construction Mobilisation Management Plan	CVP EPC BoP	(Monthly) ESHS reports prepared by the contractors.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		snow barriers should be considered to reduce the erosion on particularly sensitive disturbed areas; • Integrity and effectiveness of erosion control and sediment treatment devices should be monitored; • Excavations and areas of exposed soils should be reinstated as soon as practicable once construction works are complete at a certain area. • Upon completion of the construction, the original slope and drainage pattern should be re-established, to the extent possible.				
9	Groundworks: site restoration	Develop and implement a Site Restoration Management Plan. This MP must ensure compliance with the following requirements of the Location Permit: • Only native plants should be used in restoration of degraded areas. Introduction of invasive species is prohibited. • Any mitigation planting should be with native species, suitably protected, maintained and monitored during medium-term establishment for a minimum of 5 years upon completion of the proposed WF. • Limit damage to forest land by keeping the construction areas and roads to a minimum. Impose a strict requirement that vehicles remain on the roads or within the construction areas at all times. • All ground disturbances should be confined (where possible) to the construction compound, access tracks, turbine base areas, substation compound, routes for underground cables and OHL pylons. • Existing vegetation should be suitable protected; land clearance/vegetation removal should be minimised as far as possible; • Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; • Stockpiling of excavated material or construction debris should be avoided; the construction site should be maintained in good condition; • The areas disturbed during the construction should be successively restored and reinstated. In addition:	CESMP Construction Mobilisation Management Plan Earthen Material Management Plan	CVP EPC BoP	(Monthly) ESHS reports prepared by the contractors.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Remove in a timely manner all the construction machinery, equipment and vehicles that are not in use and keep them in specific locations within the Project site. • Reinstate agricultural land once construction areas (including the construction compound) and roads are no longer required. • Conduct a demobilisation audit prior to EPC leaving site to ensure that site conditions are acceptable for handover to the operations team. Where possible, establish native vegetation by natural revegetation in excavated areas immediately after final disturbance. Stockpiles of stripped topsoil with be used for revegetation as it contains native seeds. • Identify potential invasive species and action taken to clear these species if they occur in or around areas designated for vegetation clearance prior to construction. • Consider the implementation of a community benefits strategy to ensure that any visual impacts on the local population is offset by an appropriate level of community benefit.				
10	Pollution Management Control: Non-hazardous solid wastes	Prepare and implement a Pollution Prevention and Control Plan. The PPCP should include consideration of the management and storage of non-hazardous materials and waste and must: • Segregate site wastes by separating hazardous waste from non-hazardous waste. • Train workers on solid waste management practices described in the Storage & Management of Waste MP. • Segregate all solid wastes at source. Provide facilities for proper handling, segregation and storage of wastes at designated points within the construction compound. • Dispose all construction wastes that cannot be recycled or reused to a licensed solid waste disposal site using a licensed refuse handler. • Provide adequate number of properly contained litter bins and containers properly marked with type of wastes. • Strictly prohibit burning or dumping of any wastes at the site. • Perform regular inspection of solid waste management practices onsite.	Storage & Management of Waste MP Quantity of solid waste generated. Quantity of solid waste correctly disposed to licensed disposal sites.	CVP EPC BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Construction. Monitoring carried out during weekly site inspections.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.				
11	Pollution Management Control: Hazardous materials / wastes	Prepare and implement a Pollution Prevention and Control Plan. The PPCP should include consideration of the management and storage of hazardous materials and waste and must: • Storage of fuels, oils, chemicals, and liquid waste materials should be carried out in designated, dedicated areas, equipped with spillage protection; • Fuelling and maintenance of machinery and vehicles should be carried out in a designated area with available spill kits and drip trays; • Appropriate working procedures should be implemented to minimise the risk of accidental release during storage and handling of hazardous materials, washing down of plant and equipment and fuelling and maintenance of machinery and vehicles; • Emergency response plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc; • Segregate site wastes by separating hazardous waste from non-hazardous waste; • Provide facilities for proper handling, segregation and storage of hazardous wastes at designated points within the construction compound and provide supplies to clean-up of minor spill; • Ensure the hazardous waste collection containers are emptied at appropriate intervals to prevent overflow; • All fuel, oil and chemical storage is stored in a designated secure area. Hoses and valves are checked regularly for signs of wear and ensure that they are turned off and securely locked when not in use; • For heavy equipment, a fuel tanker will be brought to site at a pre-defined time to refuel this equipment at site. Drip trays will be installed under refuelling points; • Containers of hazardous materials should be located on impermeable surfaces with controlled drainage away from natural water courses;	Storage & Management of Wastes MP Storage and Management of Hazardous Materials MP. Quantity of Hazardous Waste generated. Quantity of Hazardous Waste disposed.	CVP EPC BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Secondary containment must be provided for all liquid hazardous materials and should be sufficient to contain 110% of the volume of liquids to be stored within. They should also be roofed to stop contamination of rainwater run-off; • Train site workers on proper hazardous waste management; • Incorporate drip trays at machinery, equipment and area prone to contamination by leakage of hazardous materials such as oil and fuel; • Regular maintenance of all equipment and machines used onsite so as to minimise leakage of hazardous materials; • Strictly prohibit illegal disposal of hazardous wastes onsite; • Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.				
12	Pollution Management Control: Dust Control	Prepare and implement a Dust Management Plan. The DMP should identify strategies to manage dust on the road during the execution of the Project and include: • Transport vehicles carrying the dusty material should be covered/ sheeted; • Topsoil stripping should be undertaken close to the period of excavation; • Provision of designated wash down area to spray and wash wheel spokes, tyres and around the wheel opening of all vehicles entering and exiting the construction compound; • Barriers should be erected where needed to protect receptors from dust; • Regular maintenance of vehicles and construction equipment with emission controls; • If necessary, use water to dampen down on-site roads and excavations to reduce dust; • Maximum speed limit of 20kph in place on site; • Communicate project risk to local communities and address concerns accordingly. Monitor any complaints filed (via grievance mechanism) from local stakeholders	Transport and Road Safety MP Dust MP CGM and WGM Grievances received.	CVP EPC BoP	Monthly ESHS reports prepared by the contractors Inspection reports Record of traffic accidents and near misses CGM and WGM logs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		as an additional tool to monitor dust management measures.				
13	Pollution Management Control: Water and Wastewater	Develop and implement a Water and Wastewater Management Plan that will: • Ensure there is proper and adequate welfare/ sanitation facilities at the site during construction; • Welfare facilities must be provided with septic tank. A specialist contractor must regularly empty the septic tank(s). The wastewater must be disposed off-site to a designated facility by a contracted waste handler in compliance with Serbian regulations; • Any chemical toilets provide at working areas must be provided and managed by a specialist contractor; • Sanitary wastewater should not be discharged to local watercourses. Specifically prohibit the illegal disposal of wastewater into watercourses or to open land; • Ensure regular inspection of wastewater management practices within the construction areas to check for compliance.	Water and Wastewater Management Plan Quantity of wastewater disposed by a licensed waste carrier	CVP EPC BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
14	Pollution Management Control: Concrete Batching Plant	If concrete batching is undertaken at the site, it is the responsibility of the owner to ensure that the plant is appropriately permitted. All emissions and discharges from batching plant must comply with the standards required by IFC Guidelines. In addition: • A designated area should be provided at a safe distance from watercourses; • No discharge of cement-contaminated water to the construction drainage system or to any watercourse must be allowed; • No discharge of cement-contaminated water to the construction drainage system or to any watercourse must be allowed; • Concrete batching wastewater should be treated in sedimentation ponds and reused where possible; • Concrete washout should be conducted in designated areas, lined to prevent infiltration to the subsurface and covered to prevent the collection of rainfall; • Solidified content cleaned down from lorry chute should be cleared from the site and disposed of with other construction waste.	Water and Wastewater Management Plan	CVP EPC BoP Provider and operator of the batch plant	Site Inspection Reports	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
15	Construction noise and vibration	Develop and implement a Noise and Vibration Management Plan that: • Adopt and follow best practicable means to ensure that the quietest available plant and construction techniques are used. • Where appropriate, micro-siting of construction equipment is to be undertaken to ensure construction noise impacts are minimised and equipment is located as far as possible from noise sensitive receptors. • Routing of project construction traffic shall be through the main highway and short section of unmarked road to site. • Construction activities will be scheduled, unless otherwise agreed, from Monday to Saturday 08:00 to 22:00. Provide prior information to the community of construction activities outside of these times (such as concrete pouring), or any planned noisy activity that is likely to exceed the permitted noise levels. • Ensure the use of protective personal equipment at all times while on site and noise reduction techniques such as silencers and ear mufflers to employees • Should a noise compliant be received, either during construction, it should be managed through the CGM. An investigation of the complaint will be undertaken and noise measurements undertaken if appropriate. If the noise complaint is valid then a mitigation plan will be agreed with the complainant. Mitigation measures should consider the provision of double glazing or noise screening.	CESMP Number of noise complaints received.	CVP EPC BoP	Monthly ESHS reports prepared by the contractors.	Prior to start of Construction. Monitoring carried out following a complaint. Mitigation work to be carried out as and when identified.
16	Biodiversity Management - habitats and plant species of conservation concern, birds, bats, and other fauna of concern	Develop and implement a Biodiversity Management Plan (BMP) to ensure adherence to legal requirements and generic GIIP through the CESMP. Ensure implementation of specific mitigation to prevent the impact on valued populations of plant and butterfly species and their habitats: • Routing of the widened site tracks must avoid identified valued habitats/population. • Any drainage interventions/ measures along particular sections of the site tracks adjacent to identified valued habitats/population must be avoided.	CESMP BMP	CVP EPC BoP	(Monthly) ESHS reports prepared by the contractors	Throughout construction.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Fencing must be installed in the areas of the identified valued habitats/ population. The Location permit requires that: • No construction work is allowed in areas with high concentration of birds and bats, particularly in areas of roosts, foraging and nests areas. • Existing roads should be used as much as possible. Degradation of natural, semi-natural or agricultural habitats should be minimised. • Only native plants should be used in restoration of degraded areas. Introduction of invasive species is prohibited. • Vegetation removal and earthworks are not allowed during the wildlife breeding season (April-July). In addition, the BMP must ensure that: • Areas of sensitive habitat must be fenced off during construction to prevent damage from construction vehicles; • Open wet areas at the site should be properly drained to minimise the concentration of insects which might attract birds and bats; • Provide training and advice to ensure that construction and maintenance staff (and contractors) are aware of legal requirements and other ecology and nature conservation aspects of the CESMP and capable to implement them; • Develop a Procedure to be applied in the event that nests/ roosts/ lairs are discovered during construction or maintenance works. This procedure should include the requirement to develop a response/ mitigation plan; • In case of chance find or incident, the work should be halted and the area protected and the matter reported immediately to the Nature Conservation for appropriate action. • Ensure implementation of the Conditional targeted WTG shutdown programmes through the OESMP. Shutdown programmes must be prepared and ready for instant implementation, though will not have to be applied unless needed (if unsustainable mortality of the particular valued bat populations is recorded by the mortality surveys).				

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
17	Loss or destruction of habitats and populations of Bug Orchid and Burnt Orchid	The impact of loss or destruction of habitats and populations of Bug Orchid (*Anacamptis coriophora*) and Burnt Orchid (*Neotinea ustulata*) has been assessed as significant negative. To prevent this impact, any construction works and the access of construction machinery and personnel in the two fragments of Balkan-mountain hay meadows where these populations are present must be avoided. Accordingly, the following measures are proposed: • Siting of OHL towers in the habitats of these populations must be avoided (this has already been adopted within the off-site OHLs Zoning Plan). • Fencing and marking of areas of the habitats of these populations during the construction must be installed, which should be implemented through the CESMP.	CESMP BMP	CVP EPC BoP	(Monthly) ESHS reports prepared by the contractors	Throughout construction.
18	Loss or destruction of habitats and populations of Common Clubmoss	The impact of loss or destruction of habitat and population of Common Clubmoss (*Lycopodium clavatum*) has been assessed as significant negative. To prevent this impact, any access of construction machinery and personnel in the single fragment of humid meadow where this population is present must be avoided, as well any changes of the fragment's hydrological regime. Specific mitigations required are: • Fencing and marking of area of the habitat of this population during the construction must be installed, which should be implemented through the CESMP. • Any drainage interventions/measures along particular section of the site track in the vicinity of the habitat of this population must be avoided, which should be implemented through the Project planning documents and CESMP.	CESMP BMP	CVP EPC BoP	(Monthly) ESHS reports prepared by the contractors	Throughout construction.
19	Loss or destruction of habitat and population of Small Pearl-Bordered Fritillary	The impact of loss/ destruction of habitats and population of a butterfly species, the Small Pearl-Bordered Fritillary (Boloria selene), has been assessed as significant negative. To prevent this impact, any construction works and the access of construction machinery and personnel in the four fragments of humid habitats where this population is present must be avoided, as well any changes of the fragments' hydrological regime. Accordingly, the following measures are included within the ESMMP and implemented via the CESMP: • Widening of the tracks at the expense of the habitats of this population must be avoided.	CESMP BMP	CVP EPC BoP	(Monthly) ESHS reports prepared by the contractors	Throughout construction.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Fencing and marking of area of the habitats of this population during the construction must be installed. • Any drainage interventions/ measures along particular sections of the site tracks adjacent to the habitats of this population must be avoided.				
20	Traffic and transport management	Undertake a pre-construction route survey to establish the road condition. The survey should include a swept path analysis and bridge assessment. Consultation will be required with services / utility providers to determine the exact location of any underground and overhead services / utilities and prior to removal or re-alignment of any overhead cables. The movement of abnormal loads must be co-ordinated with the highway authorities. Consultation with local traffic police should be held related to potential traffic control measures in the area of Brestovac Spa and Bor Reservoir, in order to decrease the risk for pedestrians crossing the road and their exposure to drivers overtaking HGVs in prohibited places. Temporary signing should be used to highlight the presence of construction traffic. The movement of convoys of large vehicles in and around the Bor lake and spa could detrimentally impact local tourism the route planning should try to avoid this area. Once the provisional route has been prepared the CLO should hold a consultation with local business to obtain suggestions and comments. The stakeholders must be made aware of the Community Grievance Mechanism and should be provided with contact details for the CLO. Discussions with the communities of Brestovac Spa and Bor Reservoir should be held in the pre-construction phase to raise awareness on traffic risks during the construction. Temporary signing should be considered along the road No. 161 within the development site to prevent drivers previously accustomed to the low traffic to take unnecessary risks. A Construction Transport and Road Safety Management Plan (CTMP) must be prepared before the start of construction. The Plan must include: • A detailed site access route; speed controls; measures for ensuring well-maintained vehicles and access roads; procedures for ensuring appropriate training programmes and licenses are in place for all drivers;	SEP Construction Transport and Road Safety MP CGM Number of road safety briefings provided. Number of road safety complaints received. Number of driving incidents including speed violations.	CVP Transportation contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs. Inspection reports Record of accidents and near misses WGM and CGM Logs	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• procedures related to off-site and on-site transport, preferred transport routes, arrangements with authorities (including Roads of Serbia, and the Traffic Police), timing restrictions to mitigate congestion and nuisance (including noise), adverse weather conditions, road condition monitoring, and so on; Prior to the start of WTG delivery, a series of leaflets and notices should be posted making local residents and businesses aware of the dates of the convoys and the disruption that may be caused. The leaflets should include the contact details for the CLO in case anyone would like to use the Community Grievance Mechanism.				
21	Community Health and Safety	Develop and implement a Community Health & Safety Management Plan. This Plan must ensure that the site security team is aware of the need to establish good relationships with local stakeholders; the grievance mechanism for communities to voice concerns, and to ensure the respect and protection of the local community. • Working procedures should be developed and implemented to ensure the safe work in icing conditions. • All reasonable measures should be taken to ensure that no unauthorised person enters the construction site; • Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community; • A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors. • Provided that the management measures are implemented, there should be no security risk for the local community.	CESMP Community Health & Safety MP. Construction Transport and Road Safety MP Emergency Preparedness and Response Plan Provision of information through the SEP and the CGM.	CVP EPC BoP	Monthly PMC audits of the MPs. Inspection reports Corrective Action Reports Grievance mechanism forms.	Communicated prior to start of Construction. Monitoring carried out during weekly site inspections.
22	Emergency response	Prepare and implement an Emergency Preparedness and Response Plan (EPRP). The EPRP should detail methods for the detection, management and communication (internally and externally) of an emergency. • In the event of a fire, the owner must inform the fire brigade and the local Forest Management organisations. The EPRP must summarise the actions to be taken by the onsite staff, restriction of site access, exclusion zones, and training and practicing. • Work with local emergency responders to at minimum: (i) communicate EPRP; (ii) depending on level of risk	CESMP Emergency Preparedness and Response Plan Findings of Emergency Drills CGM and WGM Grievances received.	CVP EPC BoP	Monthly ESHS reports prepared by the EPC Monthly PMC audits of the MPs. Emergency Drills	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		from emergency events build local capacity to ensure appropriate local response in case of emergency. • Location and access to local hospitals and other healthcare services (including ambulance services); • Location and access to local fire-fighting services. • Communicate potential risks and ERP to those potentially most affected by emergency events. • Provide safety information to local community via the SEP. • Emergency drills must be completed.				
23	Emergency response - Fire and wildfire	The construction ERP should include a Fire Prevention and Response Procedure. This procedure should be developed in consultation with the statutory stakeholders: • Monitoring of fire weather risk: During the wildfire season (especially in July and August) weather predictions and the Fire Weather Index should be monitored on daily basis and site personnel should be informed of the risk; • Safe working and emergency procedures should be developed and strictly implemented during prolonged dry periods and high-speed winds, especially in summer. This should particularly include all hot work (e.g. grinding, cutting, welding) as well as operation of earth-moving equipment and vehicles; • Restrictions should be considered for activities on days when wildfire hazard is 'Extreme'. Activities that should be banned or taken with precaution should be identified; • Pre-wetting of working areas should be considered during the days when the fire danger is 'High' or 'Extreme'; • Routes for construction traffic should be clearly defined to prevent driving through grass and igniting dry vegetation; • Vehicles and machinery should have diesel engines and should be regularly cleaned from accumulated vegetation and other flammable material. Equipment checks to prevent malfunction should be ensured; • Smoking should be allowed only in dedicated areas; • The construction personnel should be trained in causes and prevention of wildfires and response;	CESMP Emergency Preparedness and Response Plan Findings of Emergency Drills CGM and WGM Grievances received.	CVP EPC BoP	Monthly ESHS reports prepared by the EPC Monthly PMC audits of the MPs. Emergency Drills	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Fire-fighting equipment should be provided at the site and personnel trained to use it. Appropriate additional fire suppression equipment should be considered during periods when the wildfire risk is 'Extreme' (e.g. mobile water tanks); • Fire response procedure should be clearly defined including actions to be taken by the construction personnel, informing the fire brigade, health and safety protocols, evacuation from the site, etc.				
24	Site security and access	Develop and implement a Security and Site Access Management Plan. Security provided by a private security firm. Security staff must have the appropriate qualifications and must act in compliance with relevant Serbian laws. The use of weapons of any kind, including sticks and batons, is expressly forbidden. Ensure that robust background checks are carried out staff to make sure they have not been implicated in past abuses. Site security measures: • Fencing of all construction areas, with gates and warning signs on access roads; • Control of access roads to the WTGs and associated equipment; • Fencing off maintenance and equipment storage areas; • 24hour security personnel with security cameras to prevent unauthorised entry to the site compound; • Display of contact details for emergency response services and police in the WPP offices, for use in the event of unauthorised entry.	CESMP Security and Site Access Management Plan. Provision of code of conduct for security personnel. Results of background checks for security staff. Minutes of stakeholder meetings. CGM and WGM Grievances received.	CVP Security contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs. Inspection reports CGM and WGM logs	Communicated prior to start of Construction. Monitoring carried out during weekly site inspections
25	Ecosystem Services - Impact on private water supplies	Develop and implement a Private Water Supply Management Plan to manage the risk of impacting private water supplies due to disturbance of the groundwater regime during excavation. This PWSMP should include: • Identification of PWS down-gradient of the excavation/ dewatering areas including the source of their water feeding, its catchment, distribution infrastructure and supply; • Risk Assessment: Potential of excavation/ dewatering or road construction to affect the quantity, quality or	CESMP BMP	CVP EPC BoP	(Monthly) ESHS reports prepared by the contractors	Throughout construction.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		continuity of water at the receptor and appropriate mitigation to avoid or reduce the risk; • Provision of temporary or permanent alternative water supplies, if necessary. A permanent alternative source should be comparable or better to the current source and may include a groundwater borehole, or an alternative water spring/source with pipe infrastructure; • Monitoring of PWS should be undertaken during and after the excavation/dewatering phase to ensure that the baseline water quality and quantity in PWS is reinstated. The monitoring should last at least 6 months with monthly sampling from the water source and point of supply.				
26	Archaeology and cultural heritage	Develop and implement a Chance Finds Procedure to be applied in the event that artefacts are discovered during construction. • During the construction, archaeological supervision of works will be mandatory in the areas of foundations, cranes pads, cable routes, and access roads of the following WTGs: TI-9, TI-10, TI-16, TI-1, TI-2, TI-3, TII-2, TII-3, TII-8, TI-17, TIII-1, TIV-3, TIV-4; • Train workers on the importance of archaeological and cultural resources and how to deal with them through toolbox talks. • In case of chance find, the work should be stopped immediately and the area protected and the matter reported immediately to the Department of Culture for appropriate action.	CESMP Chance Find Procedure. Number of recorded chance finds.	EPC BoP	Monthly ESHS reports prepared by the contractors	Throughout the construction works.
27	Spread of COVID-19 among the local community	Consider the preparation of a COVID-19 Management Plan. The need for such a plan will depend on the expected prevalence of Covid during the mobilisation and construction phases. The COVID-19 Management Plan should consider establishing hygiene controls in the workplace, medical services that may be required and measures to prevent the transmission in the local community. The Management Plan should establish a hierarchy of controls to limit the spread of COVID-19, including technical controls (testing, cleaning and disinfection, immunisation, separation of infected employees), management procedures (communication, training, work instructions, contact with local community, absence from work) and personal protective equipment.	CESMP Covid 19 MP (if required)	CVP EPC	Monthly ESHS reports prepared by the contractors.	Throughout the construction works.

Table 17-3 Elements of the ESMMP that must Link to the OESMP

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
1	Operation Management	An Operation Environmental and Social Management Plan (OESMP) should be prepared and implemented before the start of construction. The OESMP should include: • Contractor ESHS Site Management Plan; • OHS Management Plan; • Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management); • Shadow Flicker Management Plan; • Noise and vibration Management Plan; • Community Health and Safety Management Plan; • Community Grievance Procedure (the basic procedure will be the same as for the construction phase but the contact names and numbers may be different); • Landscape Management Plan; • Emergency Preparedness and Response Plan; • Biodiversity Management Plan (including any requirement for Bird and Bat Survey plus Bird and Bat Mortality Survey). The content of these Management Plans (MPs) is described within topic specific sections of this ESMMP.	ESMS General Requirements OESMP	CVP O&M BoP	(Monthly) ESHS reports prepared by the contractors.	Throughout operation.
2	Ecology and Nature Conservation	Develop and implement a Biodiversity Management Plan. The BMP must: • Ensure that maintenance staff (and contractors) are trained to ensure that they are aware of legal requirements and other nature conservation aspects of the OESMP and capable to implement them. • Ensure the implementation of the Monitoring programme (including bird and bat surveys and mortality surveys). The Location permit requires that: • Shrub and weeds growth shall be controlled in a radius of 200m from the turbines and not exceed the height of 20cm. • Post-construction mortality monitoring is required for at least 3 years. The results must be reported to the IfNC on	OESMP The OESMP will include a requirement that the vegetation on the WTG foundations is mown regularly to ensure that growth does not exceed 20cm in height. The maintenance pad should be kept clear of growth through the careful use of herbicide (applied twice annually. The remainder of the 200m radius can only be managed by CVP if they own the land. Within the areas that CVP own, the OESMP should	CVP O&M BoP	(Monthly) ESHS reports prepared by the contractors	Throughout operation.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		a regular basis. The report should include photographs of carcass, location and time of the finding, distance to the nearest WTG and record on weather conditions. • Based upon the post-construction monitoring results, in case of high fatality rates (unsustainable), curtailment of turbines should be considered. The causes of fatalities and related mitigation should be identified in consultation with the IfNC. • If regular concentration of birds or bats are recorded in the vicinity of turbines (e.g. due to the attraction to structures, trees or waste dumps), appropriate mitigation should be defined in consultation with the IfNC (including the removal of problematic structures or technical measures to prevent concentration). • Bird and mammal carcass shall be regularly removed from the site (following appropriate recording within the scope of the mortality surveys). • To protect the migratory species, the WPP must be equipped for continual monitoring of bird and bat movements over the site area.	consider how the land might be grazed to help promote the maintenance of Balkan-mountain hay meadow. The mortality survey should adopt the methodology developed by the IFC. Collision risk modelling should adopt the methodology developed by Scottish Heritage (formerly SNH).			
3	Operational mortality of valued populations of Western Barbastelle Bat resident population.	Conditional shutdown programme for Western Barbastelle Bat resident population. The preliminary shutdown programme must be prepared for implementation at WTGs I1, I10, I12, II1, II6, II10, III1 and III2, from 15 March until 15 November, from sunset until sunrise when all the following thresholds are met: • wind speed (measured from nacelle) 6 m/s or bellow, • temperature 10°C or above, • no heavy rainfall. The proposed shutdown programmes would only be implemented if unsustainable mortality of the particular population is recorded by the post-construction monitoring mortality surveys. In such a case, immediate implementation of the shutdown programme is crucial to effectively mitigate fatalities. Therefore, shutdown programmes must be prepared and ready for implementation should they be needed. The conditional shutdown programmes should be implemented through OESMP.	OESMP BMP	CVP O&M BoP	(Monthly) ESHS reports prepared by the contractors	Throughout operation.
4	Operational mortality of valued populations of Leisler's Bat resident and migratory populations.	Conditional shutdown programme for Leisler's Bat resident and migratory population. The preliminary shutdown programme must be prepared for implementation at WTGs	OESMP BMP	CVP O&M BoP	(Monthly) ESHS reports prepared by the contractors	Throughout operation.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		I10, I12 and II10, from 15 March until 15 November, from sunset until sunrise when all the following thresholds are met: • wind speed (measured from nacelle) 6 m/s or bellow, • temperature 10°C or above, • no heavy rainfall. The proposed shutdown programmes would only be implemented if unsustainable mortality of the particular population is recorded by the post-construction monitoring mortality surveys. In such a case, immediate implementation of the shutdown programme is crucial to effectively mitigate fatalities. Therefore, shutdown programmes must be prepared and ready for implementation should they be needed. The conditional shutdown programmes should be implemented through OESMP.				
5	The NPC habitat management requirements will result in a significant gain in valued Balkan-mountain hay meadows within the site.	The NPC requirement (IfNC 2021b) to control shrub and weeds growth (<20cm) within a radius of 200m from the turbines will promote the maintenance Balkan-mountain hay meadows should lead to a net gain of this habitat at the site. The presence of the grazing livestock, even for short periods of time, multiplies the abundance and diversity of invertebrate fauna which consequently leads to higher activity and diversity of the fauna. The use of livestock grazing should be considered as part of the future management of this habitat. Monitoring: targeted bat surveys to determine the significance of habitat gain and inform adaptive management as to maximise positive effects yet not increasing collision risk.	OESMP BMP	CVP O&M BoP	(Monthly) ESHS reports prepared by the contractors	Throughout operation.
6	Shadow flicker	Develop and implement a Shadow Flicker Mitigation Plan that should include: • Provision of information to effected people on timing and duration of the effect; • Any compliant received should be managed through the CGM. Following the receipt of a complaint, the developer will investigate the complaint, consider the circumstances of the how complaint and agree appropriate mitigation with the complainant; • Mitigation measures may include installation of screening structures or planting of vegetative buffers; • Monitoring of mitigation effectiveness; • Shut-down of individual turbines at selected times should the agreed mitigation measures prove to be ineffective.	OESMP Shadow Flicker Management Plan.	CVP O&M	Monthly ESHS reports prepared by the contractors. Monthly PMC audits of the MPs. Corrective Action Reports	Following complaint.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
7	Landscape	Bespoke mitigation planting should be considered near a small number of houses in the north-east and south-west from which there would be an open view at a distance of less than 2km. Specific consultation should be undertaken with the affected people and where possible, targeted screening by woodland planting should be considered. In addition, the developer should consider the application of Landscape compensatory and enhancement measures that should include: • Compensatory planting, on or off site; the location and design to be agreed with 'Serbia Forests'. To be aimed to achieve objectives (e.g. water catchment management, erosion control, landscape improvement, etc.); • Enhancing of pastures and meadows or creation of new grassland habitats (in conjunction with the habitat management and mitigation measures); • Creation of new recreational areas on or off site; • Enrichment of impoverished or degraded landscapes (e.g. agricultural landscapes); Maintenance and monitoring of the measures during should be establishment for a minimum of 5 years from the start of commercial operation.	OESMP BMP	CVP BoP	(Monthly) ESHS reports prepared by the contractors.	During the first year of commercial operation.
8	Operational Noise	The ESIA included a detailed assessment of the potential impact of operational noise on the occupants of structures within the project area of influence. As a consequence, the design of the WPP was substantially changed to remove or reduce the potential impact. Should any individual wish to raise concerns regarding noise during WPP operation, the compliant should be managed through the CGM. An investigation of the complaint will be undertaken and noise measurements undertaken if appropriate. If the noise complaint is valid then a mitigation plan will be agreed with the complainant. Mitigation measures should consider the provision of double glazing or noise screening. The Location Permit requires: • Operational noise should be monitored and controlled. In case of exceedance of legal noise limits, curtailment of turbines should be considered. If the noise level is increased due to turbine faults, the turbine must be stopped and repaired.	Community Health & Safety MP Provision of information through the SEP and the CGM.	CVP O&M BoP	Monthly PMC audits of the MPs. Inspection reports Corrective Action Reports Grievance mechanism forms.	Communicated prior to start of operation. Monitoring carried out during monthly site inspections.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
9	Socio-economic	As for construction related employment, the contracting of any individuals for the operation of the WPP will follow principles of international best practice. To foster the creation of indirect employment opportunities, the Project will continue to procure goods and services locally whenever possible. Any tax payments to local government and communities must be made in a timely and transparent manner. The operator should also support local social or environmental initiatives and development. The operator should provide local organisations with financing support which will enable them to plan and implement more sustainable projects. The regular maintenance of access tracks will improve land use by local land owners. Minimise the amount disrupted land and damage: • Compensate all users of land for lost trees and any other damages at full replacement cost; • Fully reinstate the land after disruption; • Establish and implement a grievance mechanism.	Community Health & Safety MP Provision of information through the SEP and the CGM.	CVP O&M BoP	Inspection reports Corrective Action Reports Grievance mechanism forms.	Communicated prior to start of operation.
10	Community Health and Safety	Develop and implement a Community Health & Safety Management Plan. This Plan must consider the potential impact ice throw and fall. This Plan must ensure that the site security team is aware of the need to establish good relationships with local stakeholders; the grievance mechanism for communities to voice concerns, and to ensure the respect and protection of the local community. An Emergency Preparedness and Response Plan should be developed and implemented that should detail methods for detection and communication of fire event, informing the fire brigade, actions to be taken by the onsite staff, restriction of site access, exclusion zones, and training and practicing. Working procedures should be developed and implemented to ensure the safe work in icing conditions, including the turbine shut down before maintenance. There is a risk that users of ROAD could be struck by ice thrown from the turbine blades. CVP must consider mechanisms to notify road users and local residents or the risk of ice throw. Warning signs in respect to ice throw risks should be posted at the entrance to the site. Unauthorised access to the WTGs and electrical facilities should be prevented;	Community Health & Safety MP Provision of information through the SEP and the CGM.	CVP O&M BoP	Monthly audits of the MPs. Inspection reports Corrective Action Reports Grievance mechanism forms.	Communicated prior to start of Operation. Monitoring carried out during monthly site inspections.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Each turbine access door should be locked; • Access to turbine tower ladders should be prevented; • The substation should be fenced off and locked; and • Signposts should be erected detailing the potential dangers of unauthorised access.				
11	Emergency response	Prepare and implement an Emergency Preparedness and Response Plan (EPRP). • Work with local emergency responders to at minimum: (i) communicate EPRP; (ii) depending on level of risk from emergency events build local capacity to ensure appropriate local response in case of emergency. • Communicate potential risks and the EPRP to those potentially most affected by emergency events. • Provide safety information to local community via the SEP. • Emergency drills must be completed. The EPRP should include an Ice Throw and Ice Fall Management Plan to set out the operational and technical measures to prevent and mitigate the risk for public and WPP personnel. The Plan should cover the following topics: • Danger zones at the site: Warning signs should be posted at the site entrance, along the access tracks at least 350m from the turbines, and along the affected section of the public road. Fog and poor visibility conditions should be taken into account, flashlights and audible signs should be considered. The danger signs should be removed outside the winter season to prevent habituation of people to the hazard; • Health & safety protocols: Permanent or mobile structural protection should be provided where necessary (roof protection at the car park and turbine entrance). Working procedures should be established to define movement at the site in the icing period, PPE, precautions before maintenance personnel access the turbines, etc. • Contracts with residents: Affected users of summer houses should be contractually obligated not to visit their properties during winter. The appropriate compensation should be considered; • Education and communication: Information meetings should be held with residents, hunters and loggers to change their behaviour in the long-term. Text messaging during critical periods should be considered. The ice throw	Emergency Preparedness and Response Plan Findings of Emergency Drills CGM and WGM Grievances received.	CVP O&M BoP	Monthly ESHS reports prepared by the EPC Monthly PMC audits of the MPs. Emergency Drills	Prior to start of Operation. Monitoring carried out during monthly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		issue should be carefully communicated in social media to inform but not to create fear; • An incident response procedure should be implemented with clearly defined responsibilities and tasks. The procedure should cover accidents for both 1st, 2nd, and 3rd party.				
12	Emergency response: wildfire and fire	An Operation Fire Management and Response Plan should be developed prior to the start of commercial operation. The statutory stakeholders 'Serbia Forests' and fire departments from Žagubica and Bor should be consulted for the Plan development. The framework for the Plan should include but not be limited to: • Vegetation management procedure in 'asset zone'; • Installation and maintenance of wildfire prevention signs (in liaison with 'Serbia Forests') at relevant points; • Wildfire monitoring system (CCTV, drones, watchtowers) should be installed based upon the consultation with 'Serbia Forests' – the institutional stakeholder in charge for wildfire monitoring in Crni Vrh. • Monitoring of fire weather risk: During the wildfire season (especially in July and August) both short-term and long-term weather predictions should be monitored. The Fire Weather Index provided by the Serbian national weather service (RHMI) should be monitored on daily basis and site personnel should be informed of the risk; • Safe working and emergency procedures should be developed and strictly implemented during prolonged dry periods and high-speed winds, especially in summer; • The WPP personnel should be trained in causes and prevention of wildfires and response; • Equipment for initial fire response should be available at the site. All vehicles should carry fire-extinguishers and personnel should be trained to use it. Appropriate additional fire suppression equipment should be considered to be held at the site during periods when the wildfire risk is 'Extreme' (e.g. mobile water tanks); • Fire response procedure should be clearly defined including actions to be taken by the WPP personnel, informing the fire brigade, health and safety protocols, evacuation from the site, etc;	Emergency Preparedness and Response Plan Findings of Emergency Drills CGM and WGM Grievances received.	CVP O&M BoP	Monthly ESHS reports prepared by the EPC Monthly PMC audits of the MPs. Emergency Drills	Prior to start of Operation. Monitoring carried out during monthly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		WPP operation protocols during wildfire should be defined (remote shut down of turbines, position and pitch of blades, etc.).				
13	Surface water drainage	• The site drainage should be designed to mimic natural drainage conditions at the site; • The drainage system should maximise infiltration and attenuation rather than direct discharge to natural watercourses or gullies; • Infiltration to the soil should be maximised. Nearby vegetation areas should be used as buffers, where possible. The velocity of surface water run-off to be reduced / attenuated; • The access roads and turbine bases should be regularly inspected to ensure no unacceptable erosion is taking place. Remedial measures should be taken if erosion is noted.	OESMP BMP	CVP O&M BoP	(Monthly) ESHS reports prepared by the contractors.	As part of the site restoration audit.
14	Wastewater	The septic tanks should be regularly drained by a licensed contractor and the effluent should be discharged to a local sewage system off site; Develop and implement a Water and Wastewater Management Plan that will: • Ensure there is proper and adequate welfare/ sanitation facilities at the site during construction. • Welfare facilities must be provided with septic tank. A specialist contractor must regularly empty the septic tank(s). The wastewater must be disposed off-site to a designated facility by a contracted waste handler in compliance with Serbian regulations. • Any chemical toilets provide at working areas must be provided and managed by a specialist contractor. • Specifically prohibit the illegal disposal of wastewater into the canals or on open land. • Ensure regular inspection of wastewater management practices within the construction areas to check for compliance. • The integrity of the sewage system and septic tanks should be periodically tested (once in 5 years per law). The septic tanks should be emptied in regular intervals by a licensed contractor.	Water and Wastewater Management Plan Quantity of wastewater disposed by a licensed waste carrier	CVP O&M BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Operation. Monitoring carried out during monthly inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
15	Non-hazardous solid wastes	Prepare and implement a Storage & Management of Waste Management Plan that will ensure: • Segregate site wastes by separating hazardous waste from non-hazardous waste. • Train workers on solid waste management practices described in the Storage & Management of Waste MP. • Segregate all solid wastes at source. Provide facilities for proper handling, segregation and storage of wastes at designated points within the construction compound. • Dispose all construction wastes that cannot be recycled or reused to a licensed solid waste disposal site using a licensed refuse handler. • Provide adequate number of properly contained litter bins and containers properly marked with type of wastes. • Strictly prohibit burning or dumping of any wastes at the site. • Perform regular inspection of solid waste management practices onsite. • Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.	Storage & Management of Waste MP Quantity of solid waste generated. Quantity of solid waste correctly disposed to licensed disposal sites.	CVP O&M BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Operation. Monitoring carried out during monthly site inspections.
16	Hazardous materials / wastes	Prepare and implement a Storage & Management of Waste Management Plan that will ensure that: • Storage of fuels, oils, chemicals, and liquid waste materials should be carried out in designated, dedicated areas, equipped with spillage protection. • Fuelling and maintenance of machinery and vehicles should be carried out in a designated area with available spill kits and drip trays; • Appropriate working procedures should be implemented to minimise the risk of accidental release during storage and handling of hazardous materials, washing down of plant and equipment and fuelling and maintenance of machinery and vehicles; • Emergency response plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc • Segregate site wastes by separating hazardous waste from non-hazardous waste.	Storage & Management of Wastes MP Storage and Management of Hazardous Materials MP. Pollution Incident Response Plan Quantity of Hazardous Waste generated. Quantity of Hazardous Waste disposed.	CVP O&M BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Construction. Monitoring carried out during monthly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Provide facilities for proper handling, segregation and storage of hazardous wastes at designated points within the construction compound and provide supplies to clean-up of minor spills. • Ensure the hazardous waste collection containers are emptied at appropriate intervals to prevent overflow. • All fuel, oil and chemical storage is stored in a designated secure area. Hoses and valves are checked regularly for signs of wear and ensure that they are turned off and securely locked when not in use. • For heavy equipment, a fuel tanker will be brought to site at a pre-defined time to refuel this equipment at site. Drip trays will be installed under refuelling points. • Containers of hazardous materials should be located on impermeable surfaces with controlled drainage away from natural water courses. • Secondary containment must be provided for all liquid hazardous materials and should be sufficient to contain 110% of the volume of liquids to be stored within. They should also be roofed to stop contamination of rainwater run-off. • Train site workers on proper hazardous waste management. • Incorporate drip trays at machinery, equipment and area prone to contamination by leakage of hazardous materials such as oil and fuel. • Regular maintenance of all equipment and machines used onsite so as to minimise leakage of hazardous materials • Strictly prohibit illegal disposal of hazardous wastes onsite. • Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.				
17	Occupational Health and Safety	Prepare and implement an Occupational Health and Safety Management Plan that will: • Establish a permit to work system for all high-risk activities (i.e. hot works, confident space, working at high etc.) • Train employees on the importance of occupational health and safety requirements and develop work instruction. • Provide workers with appropriate personal protective clothing such as helmets, safety boots, gloves, dust	OESMP Occupational Health and Safety MP. Emergency Preparedness and Response Plan. PPE procured and being used by the workers	CVP O&M BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs. Record of accidents and near misses	Prior to start of Operation. Monitoring carried out during monthly inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		masks, ear mufflers, overalls, and safety harnesses for working at height. • Strictly enforce the use of the Personal Protective Equipment to minimise the accidents. • Provide fully equipped First Aid Kit and sanitary facilities on site, including water for drinking and bathing, at all times. • Provision and placement of appropriate fire extinguishers and training personnel on their use • Prohibit unauthorised persons from entering the construction compound. The compound should be fenced and the entrance controlled by the security contractor. • Monitor, evaluate and record all training activities, tool-box-talks, risk assessments, provision of PPE, and the investigation of all incidents and near-misses. • Undertake regular inspection to ensure compliance with OHS MP. • Report and investigate all incidences of accidents or near misses and keep proper records of the actions taken. • Promote Covid-19 Awareness • Provide appropriate traffic safety training to all drivers (employers and contractors) as part of their induction and on an on-going basis.	Fire extinguishing facilities on site First aid kit on site Signage installed on site.		Corrective Action Reports Grievance mechanism forms.	

Table 17-4 Elements of the ESMMP that must Link to the DESMP

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
1	Decommissioning ESMS Management	A Decommissioning Environmental and Social Management Plan (DESMP) should be prepared and implemented before the start of decommissioning. The DESMP must consider: • Decommissioning and disassembly of the WTGs; • Decommissioning and removal of the transformers, sub-station and interconnector (if appropriate); • Removal of underground cables; • Materials recycling;	ESMS General Requirements CESMP DESMP	CVP Demolition Contractor	(Monthly) ESHS reports prepared by the contractors.	Throughout decommissioning.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Land restoration; The DESMP should include: • Contractor ESHS Decommissioning Site Management Plan; • Occupational Health and Safety Plan; • Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management); • Security Management Plan (if appropriate); • Emergency Preparedness and Response. The content of these Management Plans (MPs) is described within topic specific sections of this ESMMP.				
2	Decommissioning Management	Each of the main contractors must develop and implement a Contractor ESHS Management Plan. Each MP must consider: • The scope of contractor activities and responsibilities during construction; • the ESHS responsibilities placed upon them by their contract, the project ESMS and the DESMP; • how the minimum requirements of the DESMP and its sub-plans are applied to their activities; • the construction programme and the ESHS risks of the main decommissioning activities; • describe organisation of the decommissioning work; in particular the location of material and waste stores; • Location and access to local hospitals and other healthcare services (including ambulance services); • Location and access to local fire-fighting services.	DESMP SEP	CVP Demolition Contractor	ESHS reports prepared by the contractors. CGM logs.	Throughout decommissioning.
3	Occupational Health and Safety	Update the construction Occupational Health and Safety Management Plan. The OHS MP must: • Comply with the Project Applicable Requirements. • Provide workers with appropriate personal protective clothing such as helmets, safety boots, gloves, dust masks, ear mufflers, overalls, and safety harnesses for working at height. • Strictly enforce the use of the Personal Protective Equipment to minimise the accidents.	DESMP Occupational Health and Safety MP. Emergency Preparedness and Response Plan. PPE procured and being used by the workers Fire extinguishing facilities on site	CVP Demolition Contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs. Record of accidents and near misses Corrective Action Reports	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Provide fully equipped First Aid Kit and sanitary facilities on site, including water for drinking and bathing, at all times. • Provide appropriate fire extinguishers and train personnel in their use. • Establish a permit to work system for all high-risk activities (i.e. hot works, confident space, working at high etc.) • Train employees on the importance of occupational health and safety requirements and develop work instruction. • Monitor, evaluate and record all training activities, tool-box-talks, risk assessments, provision of PPE, and the investigation of all incidents and near-misses. • Undertake regular inspection to ensure compliance with OHS MP. • Report and investigate all incidences of accidents or near misses and keep proper records of the actions taken. • Promote Covid-19 Awareness (if appropriate). • Provide appropriate traffic safety training to all drivers (employers and contractors) as part of their induction and on an on-going basis.	First aid kit on site Signage installed on site.		Grievance mechanism forms.	
4	Earthworks: site restoration	Update the Site Restoration Management Plan developed prior to construction. It is important to maximise the amount of land which can be used again, fully restore all previously used land to its original condition. This MP must ensure compliance with the following requirements of the Location Permit: • Only native plants should be used in restoration of degraded areas. Introduction of invasive species is prohibited. • Any mitigation planting should be with native species, suitably protected, maintained and monitored during medium-term establishment for a minimum of 5 years upon completion of the proposed WF. • Limit damage to forest land by keeping the construction areas and roads to a minimum. Impose a strict requirement that vehicles remain on the roads or within the construction areas at all times.	DESMP	CVP Demolition Contractor	(Monthly) ESHS reports prepared by the contractors.	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• All ground disturbances should be confined (where possible) to the construction compound, access tracks, turbine base areas, substation compound, routes for underground cables and OHL pylons. • Existing vegetation should be suitable protected; land clearance/vegetation removal should be minimised as far as possible; • Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; • Stockpiling of excavated material or construction debris should be avoided; the construction site should be maintained in good condition; • The areas disturbed during the construction should be successively restored and reinstated. In addition: • Remove in a timely manner all the construction machinery, equipment and vehicles that are not in use and keep them in specific locations within the Project site. • Reinstate agricultural land once construction areas (including the construction compound) and roads are no longer required.				
5	Pollution Management Control: Non-hazardous solid wastes	Update the construction Pollution Prevention and Control Plan. The PPCP should include consideration of the management and storage of non-hazardous materials and waste and must: • Segregate site wastes by separating hazardous waste from non-hazardous waste. • Train workers on solid waste management practices described in the Storage & Management of Waste MP. • Segregate all solid wastes at source. Provide facilities for proper handling, segregation and storage of wastes at designated points within the construction compound. • Dispose all construction wastes that cannot be recycled or reused to a licensed solid waste disposal site using a licensed refuse handler. • Provide adequate number of properly contained litter bins and containers properly marked with type of wastes.	DESMP Storage & Management of Waste MP Quantity of solid waste generated. Quantity of solid waste correctly disposed to licensed disposal sites.	CVP Demolition Contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Monitoring carried out during weekly site inspections.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Strictly prohibit burning or dumping of any wastes at the site. • Perform regular inspection of solid waste management practices onsite. • Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.				
6	Pollution Management Control: Hazardous materials / wastes	Update the construction Pollution Prevention and Control Plan. It is important to maximise reuse and recycling and minimise waste disposal to landfill. An assessment should be undertaken at an appropriate time to determine the degree of removal of concrete foundations and subsurface structures, taking into account potential changes over the project lifetime. Based on the assessment, appropriate reinstatement and revegetation techniques should be defined and executed. The PPCP should include consideration of the management and storage of hazardous materials and waste and must: • Storage of fuels, oils, chemicals, and liquid waste materials should be carried out in designated, dedicated areas, equipped with spillage protection; • Fuelling and maintenance of machinery and vehicles should be carried out in a designated area with available spill kits and drip trays; • Appropriate working procedures should be implemented to minimise the risk of accidental release during storage and handling of hazardous materials, washing down of plant and equipment and fuelling and maintenance of machinery and vehicles; • Emergency response plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc; • Segregate site wastes by separating hazardous waste from non-hazardous waste; • Provide facilities for proper handling, segregation and storage of hazardous wastes at designated points within the construction compound and provide supplies to clean-up of minor spill; • Ensure the hazardous waste collection containers are emptied at appropriate intervals to prevent overflow;	DESMP Storage & Management of Wastes MP Storage and Management of Hazardous Materials MP. Quantity of Hazardous Waste generated. Quantity of Hazardous Waste disposed.	CVP Demolition Contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• All fuel, oil and chemical storage is stored in a designated secure area. Hoses and valves are checked regularly for signs of wear and ensure that they are turned off and securely locked when not in use; • For heavy equipment, a fuel tanker will be brought to site at a pre-defined time to refuel this equipment at site. Drip trays will be installed under refuelling points; • Containers of hazardous materials should be located on impermeable surfaces with controlled drainage away from natural water courses; • Secondary containment must be provided for all liquid hazardous materials and should be sufficient to contain 110% of the volume of liquids to be stored within. They should also be roofed to stop contamination of rainwater run-off; • Train site workers on proper hazardous waste management; • Incorporate drip trays at machinery, equipment and area prone to contamination by leakage of hazardous materials such as oil and fuel; • Regular maintenance of all equipment and machines used onsite so as to minimise leakage of hazardous materials; • Strictly prohibit illegal disposal of hazardous wastes onsite; • Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.				
7	Pollution Management Control: Dust Control	Update the construction Dust Management Plan to include: • Provision of designated wash down area to spray and wash wheel spokes, tyres and around the wheel opening of all vehicles entering and exiting the construction compound; • Use of properly maintained vehicles and construction equipment with emission controls; • If necessary, use water to dampen down on-site roads and excavations to reduce dust; • Maximum speed limit of 20kph in place on site; • Trucks carrying aggregates have covered loads when entering or leaving the site;	DESMP Transport and Road Safety MP Dust MP CGM and WGM Grievances received.	CVP Demolition Contractor	Monthly ESHS reports prepared by the contractors Inspection reports Record of traffic accidents and near misses CGM and WGM logs.	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• If necessary, use water to dampen down on-site roads and excavations to reduce dust; • Communicate project risk to local communities and address concerns accordingly. Monitor any complaints filed (via grievance mechanism) from local stakeholders as an additional tool to monitor dust management measures. Dust suppression techniques (watering and sprinkling) should be applied as necessary: • Transport vehicles carrying the dusty material should be covered; • Topsoil stripping should be undertaken close to the period of excavation; • Barriers should be erected where needed to protect receptors from dust; • Speed limits should apply on transport roads including dirt tracks; • Regular maintenance of machinery and vehicles should be provided.				
8	Pollution Management Control: Water and Wastewater	Update the construction Water and Wastewater Management Plan to: • Ensure there is proper and adequate welfare/ sanitation facilities at the site during construction; • Welfare facilities must be provided with septic tank. A specialist contractor must regularly empty the septic tank(s). The wastewater must be disposed off-site to a designated facility by a contracted waste handler in compliance with Serbian regulations; • Any chemical toilets provide at working areas must be provided and managed by a specialist contractor; • Specifically prohibit the illegal disposal of wastewater into the canals or on open land; • Ensure regular inspection of wastewater management practices within the construction areas to check for compliance.	DESMP Water and Wastewater Management Plan Quantity of wastewater disposed by a licensed waste carrier	CVP Demolition Contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
9	Demolition Noise and vibration	Update the construction Noise and Vibration Management Plan to:	DESMP Number of noise complaints received.	CVP Demolition Contractor	Monthly ESHS reports prepared by the contractors.	Monitoring carried out following a complaint.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Adopt and follow best practicable means to ensure that the quietest available plant and construction techniques are used. • Where appropriate, micro-siting of equipment is to be undertaken to ensure noise impacts are minimised and equipment is located as far as possible from noise sensitive receptors. • Routing of project traffic shall be through the main highway and short section of unmarked road to site. • Demolition activities will be scheduled, unless otherwise agreed, from Monday to Saturday 08:00 to 22:00. Provide prior information to the community of activities outside of these times, or any planned noisy activity that is likely to exceed the permitted noise levels. • Ensure the use of protective personal equipment at all times while on site and noise reduction techniques such as silencers and ear mufflers to employees • Should a noise compliant be received, either during construction, it should be managed through the CGM. An investigation of the complaint will be undertaken and noise measurements undertaken if appropriate. If the noise complaint is valid then a mitigation plan will be agreed with the complainant. Mitigation measures should consider the provision of double glazing or noise screening.				Mitigation work to be carried out as and when identified.
10	Traffic management	Update the Construction Transport and Road Safety Management Plan to ensure: • A detailed site access route; speed controls; measures for ensuring well-maintained vehicles and access roads; procedures for ensuring appropriate training programmes and licenses are in place for all drivers; • procedures related to off-site and on-site transport, preferred transport routes, arrangements with authorities (including Roads of Serbia, and the Traffic Police), timing restrictions to mitigate congestion and nuisance (including noise), adverse weather conditions, road condition monitoring, and so on; Prior to the start of decommissioning, a series of leaflets and notices should be posted making local residents and businesses aware of any likely disruption.	DESMP SEP Construction Transport and Road Safety MP Number of road safety briefings provided. Number of road safety complaints received. Number of driving incidents including speed violations.	CVP Demolition Contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs. Inspection reports Record of accidents and near misses WGM and CGM Logs	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
11	Emergency response	Update the construction Emergency Preparedness and Response Plan (EPRP). The EPRP should detail methods for the detection, management and communication (internally and externally) of an emergency. • In the event of a fire, the owner must inform the fire brigade and the local Forest Management organisations. The EPRP must summarise the actions to be taken by the onsite staff, restriction of site access, exclusion zones, and training and practicing. • Work with local emergency responders to at minimum: (i) communicate EPRP; (ii) depending on level of risk from emergency events build local capacity to ensure appropriate local response in case of emergency. • Location and access to local hospitals and other healthcare services (including ambulance services); • Location and access to local fire-fighting services. • Communicate potential risks and ERP to those potentially most affected by emergency events. • Provide safety information to local community via the SEP. • Emergency drills must be completed.	DESMP Emergency Preparedness and Response Plan Findings of Emergency Drills CGM and WGM Grievances received.	CVP Demolition Contractor	Monthly ESHS reports prepared by the EPC Monthly PMC audits of the MPs. Emergency Drills	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
12	Site security and access	Update the construction Security and Site Access Management Plan. Security provided by a private security firm. Security staff must have the appropriate qualifications and must act in compliance with relevant Serbian laws. The use of weapons of any kind, including sticks and batons, is expressly forbidden. Ensure that robust background checks are carried out staff to make sure they have not been implicated in past abuses. Site security measures: • Fencing of all construction areas, with gates and warning signs on access roads; • Control of access roads to the WTGs and associated equipment; • Fencing off maintenance and equipment storage areas; • 24hour security personnel with security cameras to prevent unauthorised entry to the site compound;	DESMP Security and Site Access Management Plan. Provision of code of conduct for security personnel. Results of background checks for security staff. Minutes of stakeholder meetings. CGM and WGM Grievances received.	CVP Demolition Contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs. Inspection reports CGM and WGM logs	Communicated prior to start of Construction. Monitoring carried out during weekly site inspections

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Display of contact details for emergency response services and police in the WPP offices, for use in the event of unauthorised entry.				
13	Landscape	• Existing vegetation should be suitable protected; land clearance/vegetation removal should be minimised as far as possible; • Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; • Stockpiling of debris should be avoided; the decommissioning site should be maintained in good condition; • The disturbed areas should be successively restored and reinstated.	DESMP BMP	CVP Demolition Contractor	Monthly ESHS reports prepared by the contractors.	Mitigation work to be carried out as and when identified.
14	Socio-economic	• Announce employment opportunities locally and encourage women to apply; • Implement transparent and fair recruitment procedures; • Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations; • Provide a grievance mechanism for workers.	DESMP BMP	CVP Demolition Contractor	Monthly ESHS reports prepared by the contractors.	Mitigation work to be carried out as and when identified.
15	Biodiversity and habitats	• The impacts of the decommissioning on ecological features could be only very generally assessed at this stage as the nature and the scale of future works is not known. • However, the NPC requires that" upon completion of the WPP operational phase, all structures and equipment must be removed, and the site must be completely restored". Furthermore, the same general legal obligations imposed by the Law on Nature Protection applied during the construction must be adopted during decommissioning.	DESMP BMP	CVP Demolition Contractor	Monthly ESHS reports prepared by the contractors.	Mitigation work to be carried out as and when identified.

18 Conclusion of the ESIA

18.1 Introduction

Crni Vrh Power doo, Žagubica intend to develop a new wind power plant in Eastern Serbia. The Crni Vrh WPP will include up to 32 wind turbines and have a maximum installed capacity of 158 MW. The WPP site is located in a sparsely populated mountainous area. The landscape is dominated by mountain ridges of moderate slopes and valleys and the site is characterised by woodland, open meadow and low-grade agricultural land. This area has a significant wind resource and the selected site is close to the 110 kV power grid and the interconnections will be short.

As CVP is likely to seek financial support for the project from an IFI or a major commercial bank, they have chosen to adopt Good International Industry Practice in the assessment of the environmental and social impact of the Crni Vrh WPP project. This ESIA has been prepared in line with the methodology described within IFC Performance Standard 1. The Scoping Study determined that the Crni Vrh WPP project to be defined as a Category B.

The Scoping Study indicated that there would be:

- A potentially significant direct impact on a number of protected species and in particular woodland species Potentially significant direct impact on protected bat species. Potentially significant direct impact on protected fauna species
- The project would require any acquisition of privately owned land, including forest land, which may have impacts on livelihoods of individuals and their households
- The proposed WPP will have a direct impact on the physical landscape elements on the site due to removal of land cover and introduction of new tall structures (up to 210m to blade tip) with moving elements into a confined vertical forest landscape.
- The WPP project has the potential to affect the receptors by shadow flicker and noise, given that a number of summer houses are situated within the established study area.
- The wider WPP area is prone to ice build-up. Due to the regional climate features (freezing winter temperatures combined with wind), icing events and icing on roads, and power lines is common in winter. There are summer houses within the recommended ice throw setback of 430m. Ice fall presents an OHS hazard.

The impact assessment considered each of these topics and proposed a series of design changes and control measures to mitigate these impacts.

18.2 Mitigation Through Design Change

During the preparation of this Assessment, the ESIA consultants worked in close cooperation with CVP to understand and then minimise the environmental and social impact of the WPP. The ESIA process has led to significant changes in the layout of the Project and CVP are to be applauded for their open and constructive approach to the ESIA process.

The consideration of the maximum capacity of the WPP allowed under the Zoning Plan and, in combination with the increasing capacity of the current generation of WTGs, CVP have been able to remove a number of the turbine locations suggested in the conceptual design from the final WPP design. Working with the ESIA consultants, CVP have settled on a final design that will include no more than 32 WTGs; eight of the high-impact WTGs have been removed. Specifically:

- Following the submission of the Scoping Study and discussions around potentially significant impacts and potential mitigations, CVP agreed that turbines TI18, TI19, TI20, TI21, TIV5, TII10, TIII3 and TIII4 would be removed from the scheme and that turbines TIV4, TII8 and TI17 were re-sited to areas of lower ecological risks. In addition, it was agreed that the extensive track network could be significantly reduced (by about 30%) and in large part, only existing rough tracks will be developed into site tracks.
- CVP worked proactively with the owners and occupants of properties that might be at risk of impact from noise and shadow flicker to reach mutually agreeable mitigations. This included the provision of financial compensation for any affected structures at full replacement cost, so that they may be taken out of use, or for any loss in amenity the owners may suffer.

- Agreement was reached with the owners of properties W20, W22, W23 and WA3 that their affected structures would be purchased by the Developer and will be taken out of use.
- A string of four turbines would be removed from the scheme to reduce noise levels at properties W21 and R5. The turbines removed from the scheme are: TIV1, TIV2, TIV3 and TIV4. It is noted that the removal of WTG TIV1 is expected to significantly reduce the predicted level of bat mortality.
- Residential properties W3 and W25 are potentially impacted by noise from WTGs TI-13 and TI-14. Whilst there was no need to change the layout of the WPP it is likely that this impact can be mitigated by other mitigation such as screening or running these turbines lower noise mode.
- Following the removal of turbine string IV (TIV-1, TIV-2, TIV-3, TIV-4) the shadow flicker effect on the receptors in the north-east will be completely avoided. This means that only 4 weekend houses would be affected, all in the south-west (W3, W4, W5, W24). The houses W3, W4, and W5 have vegetative screening which is likely to mitigate the flickering effects. The situation will remain under observation.

18.3 Consideration of High-Risk Issues

18.3.1 Habitats and biodiversity

The Primary Mitigations described above has ensured that almost all potential negative impacts of the Project on ecological features are avoided or significantly reduced.

The ESA concludes that there will be **no** or **not significant** impact of construction on designated sites, habitats, birds and bats. The only potential negative impact could be on the habitats and populations of three plant and one insect species populations. These species are of nature conservation value, but the potential impact on the species (through physical damage) can be readily mitigated (as listed within the ESMMP). None of these populations are susceptible to WPP operation. The residual impacts on these species are **negligible** at most.

Some bird collision fatalities from WTGs are inevitable over the operational life of the WPP. The collision risk assessment indicates that there will be a **negligible impact** on the regional populations of Short-toed Snake Eagle, Western Marsh Harrier, Eurasian Sparrowhawk, Northern Goshawk, Common Buzzard, and Long-legged Buzzard. The remaining species observed within the WPP site are considered not susceptible to collision mortality and are of insignificant nature conservation value. Although incidental single collision fatalities of these species as well cannot be completely excluded, such a low (potential) additional mortality could not affect their populations even at the site level. Some bird collision fatalities from OHLs are inevitable, though site and project-specific collision risk from Project OHLs is considered **negligible**.

Some bat fatalities from operational WTGs are inevitable. The impact on the majority of bat populations from mortality caused by operating WTGs is assessed as **none** or **negligible**, and therefore **not significant**. The impact on the valued Western Barbastelle Bat resident population and Leisler's Bat resident and migratory population is assessed as **negligible to minor negative regional** and **not significant**.

The NPC habitat management requirements will increase the surface area of the valued habitat type, Balkan-mountain hay meadows. The NPC requires that shrub and weed vegetation must be removed within a radius of 200 m from the WTGs and mowed (or grazed) at a height of 20 cm. This will lead to restoration and maintenance of about 289 ha of the valued Balkan-mountain hay meadows at the site. This impact on habitats as such is assessed as **positive moderate regional**, and **significant positive**. The habitat gains for flora and fauna, including bids and bats is expected to be positive but this must be assessed and confirmed following completion of the post-construction monitoring programme.

18.3.2 Socio-economic

Socioeconomic impacts related to the construction phase are all assessed as having minor significance. Negative impacts include those in relation to land use, as up to 70 ha land will be occupied during construction, although close to 50% of it will be available for use again after construction is completed. Other negative impacts include possible economic displacement of users of land and person's whose tourism-based livelihoods can be impacted by increased project traffic, as well as damages to road surfaces. All other impacts are positive and they are in relation to compensation for old and mainly unused structures and the creation of employment and procurement opportunities, causing further positive impacts on local livelihoods, as well as in relation to the upgrading of access tracks, enabling local land owners to access their land more easily. The positive impacts are mostly short term and of a local character.

Following proposed mitigation, the residual impact rating for the key construction related impacts identified are:

- Reduced amount of land for use by individual users (low sensitive receptors), up to 70 ha in total. - Negligible adverse.
- Loss of 7 structures of four households (low sensitive receptors) - Negligible beneficial.
- Employment opportunities for local residents and procurement opportunities for local companies (medium sensitive receptors) - No change.
- Involuntary economic displacement of users of land (low sensitive receptors) - Minor beneficial.
- Increased livelihoods of local households (medium sensitive receptors) - No change.
- Impacts on tourism activities, further causing loss of livelihoods in the Bor lake and spa area (medium sensitive receptors) - Negligible adverse.
- Enhanced land use for local land owners (medium sensitive receptors) as a result of improved access tracks - Negligible Beneficial.
- Damages to road surfaces on roads used by local residents (medium sensitive receptors) - Negligible adverse.

Following proposed mitigation, the residual impact rating for the key operations phase impacts identified are:

- Land rehabilitated and available for use to individual users (low sensitive receptors) - No change.
- Employment opportunities for local residents and procurement opportunities for local companies (medium sensitive receptors) - No change.
- Involuntary economic displacement of users of land (low sensitive receptors) - Negligible beneficial.
- Revenue generation for local government and communities (Žagubica: medium and Bor: low sensitive receptor) - Minor to moderate beneficial.
- Support for local initiatives and development (medium sensitive receptors) - Moderate beneficial.
- Regular maintenance of access tracks to enhance land use by local land owners (medium sensitive receptors) - No change.

18.3.3 Landscape and Visual

The construction works would be direct, negative, temporary and short-term and would primarily affect the landscape and visual receptors within the local area. Due to the intervening landform and vegetation, the effects on the landscape character would be moderate (within 500m of each turbine) to minor adverse (as the distance from the site increases). The visual effects during construction would be major to moderate for local residents and visitors in the close site vicinity and minor for all other residents, local road users, people working in the open area and people involved in recreation.

The scale and topography of the local landscape is considered appropriate to accommodate the proposed WPP. Significant effects on landscape character would occur out to about 2km where the turbines would dominate the landscape both horizontally and vertically, creating **major to moderate adverse** impact significance. As the distance from the site increases, the turbines would appear in association with the broad-scale landform, reducing the impact significance to **minor adverse**.

The significant visual effects would be localised and confined to an area of up to 5km. The wind turbines would be clearly visible and prominent in the views of a small number of receptors - a dozen of weekend and residential houses north-east and south-west of the site and to walkers in the mountain and it would constitute **major adverse** impact significance. Beyond 5km of the site the views would be limited and intermittent due to the intervening landform and woodland, resulting in **minor to negligible adverse** visual effect.

Following proposed mitigation, the residual impact rating for the key impacts identified are:

- Impact on the medium sensitive landscape character and fabric during construction - Minor Adverse.
- Visual impact on local residents, road users, people working in the area and people involved in recreation during construction, including highly sensitive residential receptors in the vicinity of the site (NE, SW) - Moderate to minor adverse.
- Impact on the landscape character (medium sensitive receptor) - Moderate Adverse.
- Impact on visual receptors (highly sensitive) in the north-east and south-west, within 2km of the site - Moderate to Minor Adverse.

18.3.4 Shadow Flicker

The shadow flicker assessment conducted for the initially proposed 32 WTGs indicated the potential for the effect to exceed the recommended worst-case threshold of 30 hours per year at 15 properties in total, of which one is a residential house and 14 are weekend houses occupied in summer months.

Out of the 14 weekend houses, 3 are situated within the mandatory setback distance of the turbines and CVP made the agreement with owners to demolish these houses.

If CVP optimise the WPP layout to exclude the turbine string IV (TIV-1, TIV-2, TIV-3, T-IV), the shadow flicker effect on the receptors in the north-east will be completely avoided. In that case 4 weekend houses in total would be affected, all in the south-west.

The assessment was based on a conservative estimate and no account was taken of existing screening features and limited weekend house occupancy. It is therefore considered that the actual amount of shadow flickering is likely to be much less.

For the affected residential house (highly sensitive receptor) and weekend houses (medium sensitive), the **shadow flicker impact is considered to be significant**.

For the affected agricultural buildings as receptors of low to negligible sensitivity, **the impact is not considered to be significant**.

Following proposed mitigation, the residual impact rating for the key impacts identified are:

- Shadow flicker effects at one residential (high sensitive) and 15 weekend houses (medium sensitive) in the vicinity of the proposed development site - Negligible Adverse.

18.4 Consideration of Medium-Risk Issues

18.4.1 Ice throw

The ESIA has concluded that the ice throw hazard zones could be up to 350m from the turbines. There are no residential properties within these ice throw hazard zones. However, there is a 900m-long section of the public road, proposed access tracks between the turbines and a car park near the substation compound.

The presence of pedestrians and vehicles in Crni Vrh during the icing period is considered to be limited as, weather during icing periods will be very unpleasant for pedestrians and vehicle drivers. CVP are considering the use of warning signage on the section of highway during icing conditions. The calculated ice throw risk levels are tolerable on the condition that risk reduction measures are implemented.

Following proposed mitigation, the residual impact rating for the key impacts identified are:

- Risk of fatality for general public or the WPP personnel due to turbine ice throw or ice fall - No Change.

18.4.2 Traffic and Transport

The construction of the proposed Crni Vrh WPP would contribute to a significant increase (1 to 3 times) in HGVs movements along the 5km-long section of the road No. 161 between Brestovac Spa and Bor Reservoir. The potential impact on traffic and transportation would be temporary and short-term, with medium magnitude of severance during summer months and moderate magnitude of driver delay. This would result in **moderate adverse** impact on visitors and residents in the area and **moderate adverse** impact significance on drivers.

The transport of large wind turbine components (blades, tower sections, nacelle) is subject to regulation on safe abnormal loads transport and requires mandatory involvement of police escort with or without successive stopping of traffic (depending on load dimensions). Given the strict procedure that has to be implemented, the potential impact of abnormal loads transport is not considered to be a significant traffic safety risk.

Residential areas are highly sensitive receptors in terms of the traffic safety. Along the road No. 161 which would be used for the most part of the construction traffic, there is one potentially sensitive section, 5km long. The road runs next to two summer house settlements – Brestovac Spa and Bor Reservoir (see Figure 13-1). Additional HGV traffic (especially in summer) may increase the risk of accidents for the local community.

The road is narrow (6m) but has many blind bends and a speed limit of 80km/h. There are no pedestrian crossings or traffic lights that would facilitate the road crossing. During the summer season, there is an increased tourist and visitor activity in the two settlements and potential frequent crossings of the road. The increased traffic flow during the construction has the potential to produce a medium magnitude effect with **moderate adverse** significance impact.

The winding character of the road No. 161 does not provide many suitable opportunities to overtake HGVs. The entire road stretch between the spa and reservoir is marked with a single solid white line. This can lead to driver frustration and taking of unnecessary risks, potentially affecting both driver and pedestrian safety. The magnitude of effect would be medium (given the low traffic level) and the impact significance is assessed to be **moderate adverse**.

The road section within the development site has a very low traffic volume which some drivers take advantage of to speed. Numerous bends do not provide many opportunities for overtaking. During the construction phase and slow HGV traffic, some drivers might be tempted to overtake unsafely. This would increase the road safety risk to medium and result in **moderate adverse** impact significance.

Motorcyclists are present on the road No. 161. A traditional 2-day Motorcycle Meet takes place at Bor Reservoir each August, attracting both local and regional motorcyclists. The potential effect is assessed to be of a medium magnitude resulting in **moderate adverse** impact.

Following proposed mitigation, the residual impact rating for the key impacts identified are:

- Impact on community severance and driver delay along the road No. 161 between Brestovac Spa and Bor Reservoir (medium-sensitive communities), especially in summer months during tourist season - Minor adverse.
- Increased traffic of maintenance and repair vehicles along low-sensitive local roads during the WPP operation - Negligible adverse.

18.4.3 Operational Noise

The assessment has indicated that two properties will exceed the Serbian night-time noise limits: W3 and W24. However even if mitigation were applied to these locations so that the night-time limit was achieved, noise levels would still exceed the IFC noise limit which is set as the threshold for an impact of moderate significance. Discussion in regard to compensating these residents are on-going. The owner of W24 has agreed to accept financial compensation for this potential disturbance. The owner is expected to install improved sound insulation. The owner of W3 has preferred to wait until the WPP is constructed and noise impact can be confirmed.

Note also that an impact of moderate significance is also predicted at W4 and W5 even though the Serbian limits can be met at these locations.

Following proposed mitigation, the residual impact rating for the key impacts identified are:

- Without mitigation the WPP would exceed noise limits at several residential locations.

18.4.4 Forest Fire Risk

The development site is situated within an area of wildfire risk. The fire risk during the construction activity can result in **moderate to major adverse** impact and additional management and mitigation measures would be necessary, besides the routine (‘best practice’) fire prevention during construction.

Following proposed mitigation, the residual impact rating for the key impacts identified are:

- Increased fire/ wildfire risk during construction, especially during prolonged dry periods in summer - Negligible Adverse.
- Damage of the WPP infrastructure due to wildfire or spreading of fire from the WPP infrastructure to nearby areas, causing a forest fire - No change.

19 Bibliography

Agency for Traffic Safety of Serbia – Annual Traffic Accidents Database;

Anderson, R.L., Morrison, M., Sinclair, K., Strickland, D., Davis, H., Kendall, W. (1999).Studying Wind Energy/Bird Interactions: A Guidance Document. National Wind Coordinating Committee, c/o RESOLVE, Washington DC, USA, 94 pp. <https://www.nationalwind.org/wp-content/uploads/assets/archive/Studying_Wind_Energy-Bird_Interactions_-_A_Guidance_Document__1999_.pdf>.

Ancillotto, L., Festa, F., De Benedetta, F., Cosentino, F., Pejic, B., Russo, D. (2021). Free-ranging livestock and a diverse landscape structure increase bat foraging in mountainous landscapes. Agroforestry Systems, 95(2), 407-418.

APLIC, USFWS (2005). Avian protection plan (APP) guidelines. The Edison Electric Institute's Avian Power Line Interaction Committee (APLIC) & U.S. Fish and Wildlife Service (USFWS), US, 88pp. <http://www.aplic.org/uploads/files/2634/APPguidelines_final-draft_Aprl2005.pdf>

Band, W., Madders, M., Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at wind farms. *In*: Janss, G., de Lucas, M., Ferrer, M (*eds.*) Birds and Wind Farms. Quercus, Madrid, Spain, 259-275. <https://www.natural-research.org/application/files/4114/9182/2839/Band_et_al_2007.pdf>

Barataud, M. (2015). Acoustic ecology of European bats. Species, identification, study of their habitats and foraging behaviour. Muséum national d'Histoire naturelle, Paris & Biotope, Mèze, France, 352 pp.

Bart, J., Earnst, S. (2002). Double sampling to estimate density and population trends in birds. The Auk119 (1): 36-45.

Bartonička, T., Zukal, J. (2003). Flight activity and habitat use of four bat species in a small town revealed by bat detectors. Folia Zool. 52 (2): 155–166.

Battersby, J. (comp.)(2010): Guidelines for Surveillance and Monitoring of European Bats. EUROBATS Publication Series No. 5, 3rd edition. UNEP / EUROBATS Secretariat, Bonn, Germany, 95 pp.<https://www.eurobats.org/sites/default/files/documents/publications/publication_series/EUROBATS_PublSer_No5_3rd_edition.pdf>

Bennun, L., van Bochove, J., Ng, C., Fletcher, C., Wilson, D., Phair, N., Carbone, G. (2021). Mitigating biodiversity impacts associated with solar and wind energy development – Guidelines for project developers. IUCN, Gland, Switzerland & The Biodiversity Consultancy, Cambridge, UK, xxiv+231 pp. <https://portals.iucn.org/library/sites/library/files/documents/2021-004-En.pdf>

Berglund, B., Lindvall, T., Schwela, D & World Health Organization (WHO). Occupational and Environmental Health Team. (1999). Guidelines for community noise. WHO

BirdLife International (2017). European birds of conservation concern: populations, trends and national responsibilities. BirdLife International, Cambridge, UK, 172 pp. http://www.birdlife.org/sites/default/files/attachments/European%20Birds%20of%20Conservation%20Concern_Low.pdf

BirdLife International (2021a). Important Bird Areas factsheet: Derdap gorge. <http://datazone.birdlife.org/site/factsheet/3133> Accessed on 24 November 2021

BirdLife International (2021b). Important Bird Areas factsheet: Homolje. <http://datazone.birdlife.org/site/factsheet/49017> Accessed on 24 November 2021

BirdLife International (2021c). Important Bird Areas factsheet: Kucaj-Beljanica. <http://datazone.birdlife.org/site/factsheet/49022> Accessed on 24 November 2021

BirdLife International (2021d). I Important Bird Areas factsheet: Veliki krs and Stol. <http://datazone.birdlife.org/site/factsheet/49049> Accessed on 24 November 2021

BirdLife International (2021e). European Red List of Birds: Supplementary Material. Publications Office of the European Union, Luxembourg. <www.iucnredlist.org>. Accessed on 2 February 2022.

Bogdanović, N. (2017). "Kučaj i Beljanica" potencijalni nacionalni park Srbije. Master rad. Univerzitet u Nišu, Prirodno-matematički fakultet, Departman za geografiju, Niš, 73 pp.

Boonman, A., Dietz, C., Koselj, K., Runkel, V., Russo, D., Siemers, B. (2009). Limits of echolocation calls of European bats, English version May 2009. 2 pp. <http://www.batecho.eu/afbeeldingen/callcurvatureMay2009.pdf>

BPSSS (2017). Birds of Serbia – species list (1800-2015) with their occurrence and breeding categories, Version 1.2 from the 1st of February 2017. Bird Protection and Study Society of Serbia, Novi Sad, Serbia, 7 pp <http://pticesrbije.rs/wp-content/uploads/2017/03/Birds_of_Serbia.pdf>

Brigham, R.M., Kalko, E.K.V., Jones, G., Parsons, S., Limpens, H. *eds.* (2004). Bat echolocation research: tools, techniques and analysis. Bat Conservation International, Austin, Texas, USA, vii+167 pp.

Buckland, S.., Rexstad, E.A., Marques, T.A., Oedekoven, C.S. (2015). Distance sampling: methods and applications. Methods in Statistical Ecology 431, Springer, New York, USA, xv+277 pp.

Caprio, E., Patriarca, E., Debernardi, P. (2020). Bat activity and evidence of bat migration at two high elevation passes in the Western Alps. European Journal of Wildlife Research66(4): 1-14.

Cárcamo, B., Kret, E., Zografou, C., Vasilakis, D. (2011). Assessing the impact of nine established wind farms on birds of prey in Thrace, Greece. Technical Report. WWPP Greece, Athens, Greece, 93 pp.

Cel'uch, M., Kropil, R. (2008). Bats in a Carpathian beech-oak forest (Central Europe): habitat use, foraging assemblages and activity patterns. Folia Zoologica 57(4): 358.

Chamberlain, D., Freeman, S., Rehfisch, M., Fox, T., Desholm, M. (2005). Appraisal of Scottish Natural Heritage's wind farm collision risk model and its application. BTO Research Report 401. British Trust for Ornithology, Thetford, UK, 53 pp. <http://www.bto.org/sites/default/files/shared_documents/publications/research-reports/2005/rr401.pdf>

Chronic Coal Pollution: EU action on the Western Balkans will improve health and economies across Europe – HEAL, 2019 https://www.env-health.org/wp-content/uploads/2019/02/Chronic-Coal-Pollution-report.pdf;

Chronic Coal Pollution: EU action on the Western Balkans will improve health and economies across Europe – HEAL, 2019 https://www.env-health.org/wp-content/uploads/2019/02/Chronic-Coal-Pollution-report.pdf;

CIEEM (2016). Guidelines for ecological impact assessment in the UK and Ireland: terrestrial, freshwater and coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester, UK, iv+54 pp.

Collins, J. *ed.*(2016). Bat surveys for professional ecologists: good practise guidelines (3rd edition). The Bat Conservation Trust, London, 100 pp.

Comply or Close - Bankwatch (2019), https://bankwatch.org/wp-content/uploads/2019/12/comply-or-close.pdf;

Dietz, C., von Helversen, O., Nill, D. (2009). Bats of Britain, Europe and Northwest Africa. A & C Black Publishers Ltd., London, 400 pp.

Diffendorfer, J.E., Beston, J.A., Merrill, M.D., Stanton, J.C., Corum, M.D., Loss, S.R., Thogmartin, W.E., Johnson, D.H., Erickson, R.A., Heist, K.W. (2015). Preliminary methodology to assess the national and regional impact of U.S. wind energy development on birds and bats: U.S. Geological Survey Scientific Investigations Report 2015–5066. U.S. Department of the Interior & U.S. Geological Survey, Reston, Virginia, USA, vii+40 pp. <http://dx.doi.org/10.3133/sir20155066>

Dillingham, P. W., Fletcher, D. (2008). Estimating the ability of birds to sustain additional human-caused mortalities using a simple decision rule and allometric relationships. Biological Conservation 141(7): 1783-1792. <https://www.researchgate.net/profile/David_Fletcher12/publication/222420296_Estimating_the_ability_of_birds_to_sustain_additional_human-caused_mortalities_using_a_simple_decision_rule_and_allometric_relationships/links/59f2b4f3458515bfd081dc8b/Estimating-the-ability-of-birds-to-sustain-additional-human-caused-mortalities-using-a-simple-decision-rule-and-allometric-relationships.pdf>

Dillingham, P.W., Moore, J.E., Fletcher, D., Cortés, E., Curtis, K.A., James, K.C., Lewison, R.L. (2016). Improved estimation of intrinsic growth r_{max} for long-lived species: integrating matrix models and allometry. Ecological Applications 26(1): 322-333. https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1534&context=usdeptcommercepub

Dürr, T. (2021a). Bat fatalities at windturbines in Europe, Stand: 07. Mai 2021 [As of: 7 May 2021]. <https://lfu.brandenburg.de/lfu/de/aufgaben/natur/artenschutz/vogelschutzwarte/arbeitsschwerpunkte/auswirkungen-von-windenergieanlagen-auf-voegel-und-fledermaeuse/>

Dürr, T. (2021b). Bird fatalities at windturbines in Europe, Stand: 07. Mai 2021 [As of: 7 May 2021]. <https://lfu.brandenburg.de/lfu/de/aufgaben/natur/artenschutz/vogelschutzwarte/arbeitsschwerpunkte/auswirkungen-von-windenergieanlagen-auf-voegel-und-fledermaeuse/>

EBRD (2015). E&S eligibility criteria for on-shore wind power projects. European Bank for Reconstruction and Development, London, UK, 4 pp.<http://www.ebrd.com/documents/environment/env-emanual-wind-power.pdf>.

EBRD (2016). Guidance Note - EBRD Performance Requirement 6: Biodiversity Conservation and sustainable management of living natural resources. European Bank for Reconstruction and Development, London, UK, 11 pp. <http://www.ebrd.com/documents/environment/pdf-guidance-note-ebrd-performance-requirement-6.pdf>

EBRD (2019). Environmental and Social Policy. European Bank for Reconstruction and Development, London, UK, 84 pp. <https://www.ebrd.com/documents/comms-and-bis/environmental-and-social-policy.pdf>.

EEA (2016). Biogeographical regions in Europe. European Environment Agency. Copenhagen, Denmark. <https://www.eea.europa.eu/data-and-maps/figures/biogeographical-regions-in-europe-2>

EEA (2017). EUNIS habitat classification 2017 (Revised forest heathland scrub tundra). European Environment Agency. Copenhagen, Denmark. <https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification/eunis-habitat-classification-review-2017/eunis-habitat-classification-2017-revised/at_download/file>

EEA (2020). EUNIS habitat classification. European Environment Agency. Copenhagen, Denmark. <https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification>

EMS (2019). Electric Power Facilities of 110, 220 and 400 kV, Elektromreža Srbije, Belgrade, Serbia. <https://www.ems.rs/media/uploads/2017/PZU/Mapa_prenosnog_sistema.pdf>

European Commission (1993). Second report on the application of Directive No 79/409/EEC on the conservation of wild birds: COM (93), 572 final. European Commission, Brussels, Belgium, 161 pp. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:51993DC0572&from=EN>

European Commission (2010). Guidance document: Wind energy developments and Natura 2000. European Commission, Brussels, Belgium, 116 pp. <op.europa.eu/en/publication-detail/-/publication/65364c77-b5b8-4ab6-919d-8f4e3c6eb5c2>

European Commission (2020). Guidance document on wind energy developments and EU nature legislation. European Commission, Brussels, Belgium, 184 pp. <https://op.europa.eu/en/publication-detail/-/publication/2b08de80-5ad4-11eb-b59f-01aa75ed71a1>

Eurostat News Release – Share of Renewable Energy in EU (January 2020) https://ec.europa.eu/eurostat/documents/2995521/10335438/8-23012020-AP-EN.pdf/292cf2e5-8870-4525-7ad7-188864ba0c29;

Faculty of Mining and Geology (2012). Geomorphological map of Serbia. Geological Information System of Serbia, Ministry of Energy, Development and Environmental Protection of Republic of Serbia, Belgrade, Serbia. http://geoliss.mre.gov.rs/karte/geomorf300.html

Fraser, E. E., Silvis, A., Brigham, R. M., Czenze Z. J. eds. (2020). Bat Echolocation Research: A handbook for planning and conducting acoustic studies, Second Edition. Bat Conservation International, Austin, Texas, USA, xi+123 pp.

Gill, F., Donsker, D., Rasmussen, P. *eds*. (2020). IOC World Bird List (v 10.2). Doi 10.14344/IOC.ML.10.2. <http://www.worldbirdnames.org/>

Gove, B., Langston, R.H.W., McCluskie, A., Pullan, J.D., Scrase, I. (2013). Wind farms and birds: an updated analysis of the effects of wind farms on birds, and best practice guidance on integrated planning and impact assessment. Report T-PVS/Inf (2013) 15, prepared by BirdLife International on behalf of the Bern Convention. Convention on the Conservation of European Wildlife and Natural Habitats, Strasbourg, Belgium, 89pp. <http://www.birdlife.org/sites/default/files/attachments/201312_BernWindfarmsreport.pdf>

Grubač, B., Milovanović, Z. (2012). Slepi miševi Đerdapa. JP Nacionalni park Đerdap, Zavod za zaštitu prirode Srbije i Veterinarski specijalistički institut Kraljevo, Donji Milanovac, Beograd i Kraljevo, 113 pp.

Guidance: Assessing the Cumulative Impact of Onshore Wind Energy Developments, Scottish Natural Heritage (2012);

Guidelines for the Assessment of Road Traffic – UK IEMA (1993);

Guidelines on the Environmental Impact Assessment for Windfarms in Serbia – UNDP (2015);

Gullison, R. E., Hardner, J., Anstee, S., Meyer, M. (2015). Good practices for the collection of biodiversity baseline data. Multilateral Financing Institutions Biodiversity Working Group & Cross-Sector Biodiversity Initiative, 69 pp.http://www.ebrd.com/documents/environment/biodiversity-baseline.pdf

Haas, D., Nipkow, M., Fiedler, G., Schneider, R., Haas, W., Schürenberg, B. (2003). Protecting birds from powerlines: a practical guide on the risks to birds from electricity transmission facilities and how to minimise any such adverse effects. Report T-PVS/Inf (2003) 15, prepared by BirdLife International on behalf of the Bern Convention. Convention on the Conservation of European Wildlife and Natural Habitat, Strasbourg, Belgium, 33 pp. <https://wcd.coe.int/com.instranet.InstraServlet?command=com.instranet.CmdBlobGet&InstranetImage=1300705&SecMode=1&DocId=1441752&Usage=2>

HabiProt (2014-2022). Alciphron – baza podataka o insektima Srbije, <https://alciphron.habiprot.org.rs> Accessed on 5 March 2022

Haider, H.S., Oldfield, S.C., Tu, T., Moreno, R.K., Diffendorfer, J.E., Eager, E.A., Erickson, R.A. (2017). Incorporating Allee effects into the potential biological removal level. Natural Resource Modeling 30(3): e12133. <doi.org/10.1111/nrm.12133>

Hamel, P. B.Smith, W. P., Twedt, D. J., Woehr, J. R., Morris, E., Hamilton, R. B., Cooper, R. J. (1996). A land manager's guide to point counts of birds in the Southeast. General Technical Report SO-120. US Department of Agriculture, Forest Service, Southern Research Station, New Orleans, USA, 39 pp.

Hammer, M., Zahn, A., Marckmann, U. (2009). Criteria for the evaluation of species evidence based on sound recordings, Version 1 - October 2009. Coordination offices for bat protection in Bavaria, Bavarian State Office for the Environment, Augsburg, Germany 16pp.

Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B., Thompson, D. (2009). Raptors: A Field Guide for Surveys and Monitoring. 2nd Edition. The Stationery Office (TSO), Edinburgh, UK, 370 pp.

Hardner, J., Gullison, R. E., Anstee, S., Meyer, M. (2015). Good practices for biodiversity inclusive impact assessment and management planning. Multilateral Financing Institutions Biodiversity Working Group & Cross-Sector Biodiversity Initiative. http://www.ebrd.com/documents/environment/biodiversity-impact-management.pdf

Hassler, M. (2019). World Plants – Synonymic Checklists of the Vascular Plants of the World (version Nov 2018). *In*: Roskov, Y., Ower, G., Orrell, T., Nicolson, D., Bailly, N., Kirk, P.M., Bourgoin, T., DeWalt, R.E., Decock, W., Nieukerken, E. van, Zarucchi, J., Penev, L.(*eds*.). Species 2000 & ITIS Catalogue of Life – 2019 Annual Checklist, Species 2000: Naturalis, Leiden, the Netherlands. www.catalogueoflife.org/annual-checklist/2019

Hayes, J. P. (2000). Assumptions and practical considerations in the design and interpretation of echolocation-monitoring studies. Acta Chiropterologica 2(2): 225-236.

Hötker, H., Thomsen, K.-M., Jeromin, H. (2006). Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats ' facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation. Michael-Otto-Institut & NABU, Bergenhusen., Germany, 65 pp. <https://eolien-biodiversite.com/IMG/pdf/englischewindkraftstudie_1252510701.pdf >

Hundt, L. *ed.* (2012). Bat surveys: good practice guideline, 2nd edition. Bat Conservation Trust, London, UK, 99 pp.

IFC (2012a). Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts. January 1, 2012. The International Finance Corporation, Washington DC, USA, 11 pp. <https://www.ifc.org/wps/wcm/connect/8804e6fb-bd51-4822-92cf-3dfd8221be28/PS1_English_2012.pdf?MOD=AJPERES&CVID=jiVQIfe>

IFC (2012b). Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. January 1, 2012. The International Finance Corporation, Washington DC, USA, 9 pp. <https://www.ifc.org/wps/wcm/connect/3baf2a6a-2bc5-4174-96c5-eec8085c455f/PS6_English_2012.pdf?MOD=AJPERES&CVID=jxNbLC0>

IFC (2013). Good Practice Handbook – Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets. The International Finance Corporation, Washington DC, US, 102 pp. <https://www.ifc.org/wps/wcm/connect/58fb524c-3f82-462b-918f-0ca1af135334/IFC_GoodPracticeHandbook_CumulativeImpactAssessment.pdf?MOD=AJPERES&CVID=kbnYgI5>

IFC (2019). Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. January 1, 2012 (updated June 27, 2019). The International Finance Corporation, Washington DC, USA, 47 pp. <https://www.ifc.org/wps/wcm/connect/5e0f3c0c-0aa4-4290-a0f8-4490b61de245/GN6_English_June-27-2019.pdf?MOD=AJPERES&CVID=mRQjZva>

IFC (2021). Guidance Note 1: Assessment and Management of Environmental and Social Risks and Impacts. Published January 1, 2012 (updated June 14, 2021). The International Finance Corporation, Washington DC, USA, 53 pp. <https://www.ifc.org/wps/wcm/connect/6df1de8f-2a00-4d11-a07c-c09b038f947b/GN1_English_2012.pdf?MOD=AJPERES&CVID=mRQjKE9>

IFC Environmental, Health and Safety General Guidelines (2007)

IFC Environmental, Health, and Safety Guidelines for Wind Energy (2015

IFC Performance Standards on Environmental and Social Sustainability (2012

IfNC (2020). Decision (on Nature Protection Conditions) No. 020 1445/3, dated 21/7/2020. Institute for Nature Conservation of Serbia, Belgrade, Serbia.

IfNC (2021a). Decision (on Nature Protection Conditions) No. 020 12/2, dated 26/1/2021. Institute for Nature Conservation of Serbia, Belgrade, Serbia.

IfNC (2021b). Decision (on Nature Protection Conditions) No. 020 3577/2, dated 25/11/2021. Institute for Nature Conservation of Serbia, Belgrade, Serbia.

IfNC (2022). Protected natural resources of Serbia. Institute for Nature Conservation of Serbia, Belgrade, Serbia. <https://cloud.gdi.net/visios/IfNC>

International Finance Corporation (IFC) Environmental, Health, and Safety (EHS) Guidelines : Environmental Noise Management 2007

International Standards Organisation (ISO) ISO 9613-2: 1996 Attenuation of sound during propagation outdoors – Part 2: General method of calculation

IUCN (2021). The IUCN Red List of Threatened Species. Version 2020-3. <www.iucnredlist.org>. Downloaded on 12 January 2021.

Jakšić, P. (1988). Privremene karte rasprostranjenosti dnevnih leptira Jugoslavije (Lepidoptera, Rhopalocera). Jugoslavensko entomološko društvo, Zagreb.

Jakšić, P. (2006). Pregled utvrđenih vrsta dnevnih leptira borskog područja (Lepidoptera: Hesperioidea i Papilionoidea). Zbornik radova o fauni Srbije 7: 35–84.

Jakšić, P. *ed*. (2008). Prime Butterfly Areas in Serbia. HabiProt, , Belgrade, Serbia, 223 pp.

Jakšić, P., Nahirnić, A. (2014). Vodič kroz faunu dnevnih leptira Kopaonika. JP Nacionalni park Kopaonik, Kopaonik.

Jakšić, P., Tomić, Đ., Duli, R., Niketić, M., Lukač, Š. (2003). Red Data Book of Serbian Butterflies – Lepidoptera: Hesperioidea and Papilionoidea. Institute for Nature Conservation of Serbia, Belgrade, Serbia, 198 pp.

Janković, M. M., Pantić, N., Mišić, V., Diklić, N., Gajić, M. (1984). Vegetation of SR Serbia I - General part. Serbian Academy of Sciences and Arts, Department of Natural and Mathematical Sciences, Belgrade, Serbia, 408 pp.

Janssen, J.A.M., Rodwell, J.S., García Criado, M., Gubbay, S., Haynes, T., Nieto, A., Sanders, N., Landucci, F., Loidi, J., Ssymank, A., Tahvanainen, T., Valderrabano, M., Acosta, A., Aronsson, M., Arts, G., Attorre, F., Bergmeier, E., Bijlsma, R.-J., Bioret, F., Biţă-Nicolae, C., Biurrun, I., Calix, M., Capelo, J., Čarni, A., Chytrý, J. Dengler, P. Dimopoulos, F. Essl, H. Gardfjell, D. Gigante, G. Giusso Del Galdo, M., Hájek, M., Jansen, F., Jansen, J., Kapfer, J., Mickolajczak, A., Molina, J.A., Molnár, Z., Paternoster, D., Piernik, A., Poulin, B., Renaux, B., Schaminée, J.H.J., Šumberová, K., Toivonen, H., Tonteri, T., Tsiripidis, I., Tzonev, R., Valachovič, M. (2016). European red list of habitats, Part 2: Terrestial and freswater habitats. Publications Office of the European Union, Luxembourg, 44 pp.

Josifović, M. (1970-1977). Flora of Serbia I-IX. Serbian Academy of Sciences and Arts, Department of Chemical and Biological Sciences, Belgrade, Serbia.

Josimović, B., Ham, I., Čonti, A., Rućando, M., Knežević, B., Krunić, LJ., Bezbradica, LJ., Stanković, I. (2021a). Izveštaj o strateškoj proceni uticaja Plana detaljne regulacije za izgradnju visokonaponskih vodova za uvođenje postojećih DV 110 kV No. 150 (TS „Bor 1" - TS „Majdanpek 1") i DV 110 kV No. 177 (TS „Bor 2" - TS „Majdanpek 2") u objekat priključno razvodnog postrojenja PRP 110 kV „Crni vrh 1" na životnu sredinu. Elektromreža Srbije a.d., Beograd, i Crni Vrh Power d.o.o., Žagubica, 56 pp.

Josimović, B., Karapandža, B., Paunović, M., Karapandža, I., Buzurović, U., Raković, M., Kanački, F., Knežević, B., Krunić, Lj., Bezbradica, Lj., Stanković, I. (2021b). Izveštaj o strateškoj proceni uticaja Plana detaljne regulacije područja vetroelektrane „VE Crni vrh" na teritoriji Grada Bora na životnu sredinu. Crni Vrh Power d.o.o., Žagubica, 105 pp.

Kalezić, M., Tomović, Lj, Džukić, G. (2015). Red Book of Fauna of Serbia I – Amphibians. University of Belgrade, Faculty of Biology & Institute for Nature Conservation of Serbia. Belgrade, Serbia.

Kanuch, P., Danko, Š., Celuch, M., Krištín, A., Pjenčák, P., Matis, Š., Šmídt, J. (2008). Relating bat species presence to habitat features in natural forests of Slovakia (Central Europe). Mammalian Biology 73(2): 147-155.

Langston, R.H.W., Pullan, J.D. (2003). Windfarms and birds: an analysis of the effects of wind farms on birds, and guidance on environmental assessment criteria and site selection issues. Report T-PVS/Inf(2003)12E, by BirdLife International to the Council of Europe, Bern Convention on the Conservation of European Wildlife and Natural Habitats. RSPB/BirdLife in the UK, Strasbourg, France, 58 pp. <https://wcd.coe.int/wcd/com.instranet.InstraServlet?command=com.instranet.CmdBlobGet&InstranetImage=1713295&SecMode=1&DocId=1441704&Usage=2>

Law on Environmental Noise Protection, Official Journal of RS Nos. 36/2009, 88/2010

Law on Environmental Protection (Official Journal of RS No. 135/04, 36/09, 43/11 and 14/16)

Limpens, H.J.G.A. (2010). Educational material for 3 day/night Workshop on Identification of bats in flight and the survey of bats with a bat detector. Stichting Vleermuis-Onderzoek / NABU Projektgrupe Fledermauserfassung Niedersachsen / Eco Consult & Project Management.

Lina, P.H.C. (2017). Common Names of European Bats, 2nd edition. EUROBATS Publication Series No. 7. UNEP / EUROBATS Secretariat, Bonn, Germany, 104 pp. http://www.eurobats.org/sites/default/files/documents/publications/publication_series/EUROBATS_PublSeries_No7_2nd_edition_2017.pdf

Maes, D., Verovnik, R., Wiemers, M., Brosens, D., Beshkov, S., Simona, B., Jaroslaw, B., Cantú-Salazar, L., Louis-Francis, C., Sue, C., Dincă, V., Djuric, M., Dušej, G., Elven, H., Franeta, F., Garcia-Pereira, P., Geryak, Y., Goffart, P., Gór, Á., Hiermann, U., Höttinger, H., Huemer, P., Jakšić, P., John, E., Kalivoda, H., Kati, V., Kirkland, P., Komac, B., Kőrösi, Á., Kulak, A., Kuussaari, M., L'Hoste, L., Lelo, S., Mestdagh, X., Micevski, N., Mihoci, I., Mihut, S., Monasterio-León, Y., Morgun, D.V., Munguira, M.L., Murray, T., Nielsen, P.S., Ólafsson, E., Õunap, E., Pamperis, L.N., Pavlíčko, A., Pettersson, L.B., Popov, S., Popović, M., Pöyry, J., Prentice, M., Reyserhove, L., Ryrholm, N., Šašić, M., Savenkov, N., Settele, J., Sielezniew, M., Sinev, S., Stefanescu, C., Švitra, G., Tammaru, T., Tiitsaar, A., Tzirkalli, E., Tzortzakaki, O., Swaay, C.A.M. van, Viborg, A.L., Wynhoff, I., Zografou, K., Warren, M.S. (2019). Integrating national Red Lists for prioritising conservation actions for European butterflies. Journal of Insect Conservation. 23: 301–330. <https://doi.org/10.1007/s10841-019-00127-z>

Marckmann, U., Pfeiffer, B. (2020). Bestimmung von Fledermausrufaufnahmen und Kriterien für die Wertung von akustischen Artnachweisen: Teil 1 – Gattungen Nyctalus, Eptesicus, Vespertilio, Pipistrellus (nyctaloide und pipistrelloide Arten), Mopsfledermaus, Langohrfledermäuse und Hufeisennasen Bayerns. Bayerisches Landesamt für Umwelt (LfU), Augsburg, 86 pp.

Marković, J. Đ. (1980). Regionalna geografija SFR Jugoslavije. Građevinska knjiga, Beograd, 938 pp.

Matvejev, S. D., Puncer I. J. (1989). Map of biomes – landscapes of Yugoslavia. Natural History Museum Belgrade Supplementa, Special issue 36: 1-76.

McCrory, j., Lowry, S., McCormick, D. (2015). EirGrid evidence based environmental studies. Study 3: Bats – literature review and evidence based field study on the effects of high voltage transmission lines on bats in Ireland, December 2015. EirGrid plc, Dublin, Ireland, 125pp. <http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Evidence-Based-Environmental-Study-3-Bats.pdf>

Milovanović, Z. (2020a). Izveštaj: Podaci o pticama i slepim miševima prikupljeni u periodu oktobar 2019 – jul 2020. godine za potrebe analize održivosti lokacija vetroturbina na području planirane vetrolektrane „VE Crni vrh". Crni Vrh Power d.o.o., Žagubica, 58 pp.

Milovanović, Z. (2020b). Analiza uticaja planirane vetroelektrane „VE Crni vrh" na ptice i slepe miševe. Crni Vrh Power d.o.o., Žagubica, 105 pp.

MoEP (2020). Notice on the procedure for initiating the protection of the Kučaj–Beljanica Nature Park. Ministry of Environmental Protection, Belgrade, Serbia. <https://www.ekologija.gov.rs/lat/obavestenja/zastita-

prirode/obavestenje-o-postupku-pokretanja-zastite--parka-prirode-%E2%80%9Ekucaj-beljanica%E2%80%9D>

MoEP (2022). Decision (No. 353-02-3437/2021-03, dated 2/2/2022). Ministry of Environmental Protection, Belgrade, Serbia.Municipalities and Regions of Serbia - Republic Institute for Statistics (2020);

NASA Fire Information for Resource Management System: https://firms.modaps.eosdis.nasa.gov/map/;

Niel, C., Lebreton, J. D. (2005). Using demographic invariants to detect overharvested bird populations from incomplete data. Conservation Biology 19(3): 826-835. <https://conbio.onlinelibrary.wiley.com/doi/pdf/10.1111/j.1523-1739.2005.00310.x?casa_token=Ymoqp5JoyJcAAAAA:VJ8bOi3Mr8bOsI6ISuTDtQY2Txha1qFlxrPvJS5Ma6mxi8Yaopkd46N1LqOqTEd9K5qPa05-nrpSLKt3>

Niketić, M., Tomović, G. (2018). Annotated Checklist of Vascular Flora of Serbia I. Lycopodiopsida, Polypodiopsida, Gnetopsida, Pinopsida i Liliopsida. Monographs DCXC (10), Serbian Academy of Sciences and Arts, Department of Chemical and Biological Sciences, Belgrade, Serbia, 294 pp. <https://dais.sanu.ac.rs/bitstream/id/42892/bitstream_42892.pdf>

Obrist, M. K., Boesch, R., Flückiger P. F. (2004). Variability in echolocation call design of 26 Swiss bat species: consequences, limits and options for automated field identification with a synergetic pattern recognition approach. Mammalia 68 (4): 307-322.

Official Journal of EU [1992/43/EEC]. Council directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Official Journal of the European Union L 206 (22.7.1992): 7-50. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043&from=EN>

Official Journal of EU [2009/147/EC]. Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version): Official Journal of the European Union L 20: 7-25. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0147&from=EN

Official Journal of RS (135/2004). Law on Environmental Impact Assessment. Official Journal of the Republic of Serbia 135/2004, Belgrade, Serbia.

Official Journal of RS (31/2005). Regulation on control of the use and traffic of wild flora and fauna. Official Journal of the Republic of Serbia 31/2005, Belgrade, Serbia.

Official Journal of RS (69/2005a). Code of regulations on the contents of the request on the need for an impact assessment and contents of the request for determination of the scope and contents of the environmental impact assessment study. Official Journal of the Republic of Serbia 69/2005, Belgrade, Serbia.

Official Journal of RS (69/2005b). Code of regulations on the contents of the environmental impact assessment study. Official Journal of the Republic of Serbia 69/2005, Belgrade, Serbia.

Official Journal of RS (69/2005c). Code of regulations on the work of the technical commission for the evaluation the environmental impact assessment study. Official Journal of the Republic of Serbia 69/2005, Belgrade, Serbia.

Official Journal of RS (69/2005d). Code of regulations on the procedure of public review, presentation and public hearing regarding the environmental impact assessment study. Official Journal of the Republic of Serbia 69/2005, Belgrade, Serbia.

Official Journal of RS (22/2007). Regulation on Amendments to the Regulation on control of the use and traffic of wild flora and fauna. Official Journal of the Republic of Serbia 22/2007, Belgrade, Serbia.

Official Journal of RS (102/2007a). Law on the ratification of the Convention on the Conservation of European Wildlife and Natural Habitats. Official Journal of the Republic of Serbia - „International treaties" 102/2007, Belgrade, Serbia.

Official Journal of RS (102/2007b). Law on the ratification of the Convention on the Conservation of Migratory Species of Wild Animals. Official Journal of the Republic of Serbia - „International treaties" 102/2007, Belgrade, Serbia.

Official Journal of RS (38/2008). Regulation on Amendments to the Regulation on control of the use and traffic of wild flora and fauna. Official Journal of the Republic of Serbia 38/2008, Belgrade, Serbia.

Official Journal of RS (114/2008). Regulation on Determining the List of Projects for Which an Impact Assessment Is Mandatory and the List of Projects for Which an Impact Assessment May Be Required. Official Journal of the Republic of Serbia 114/2008, Belgrade, Serbia.

Official Journal of RS (36/2009a). Law on Nature Protection. Official Journal of the Republic of Serbia 36/2009, Belgrade, Serbia.

Official Journal of RS (36/2009b). Law on Amendments to the Law on Environmental Impact AssessmentNature Protection. Official Journal of the Republic of Serbia 36/2009, Belgrade, Serbia.

Official Journal of RS (5/2010). Code of regulations on the declaration and protection of Strictly Protected and protected wild species of plants, animals and fungi. Official Journal of the Republic of Serbia 5/2010, Belgrade, Serbia.

Official Journal of RS (9/2010). Regulation on Amendments to the Regulation on control of the use and traffic of wild flora and fauna. Official Journal of the Republic of Serbia 9/2010, Belgrade, Serbia.

Official Journal of RS (35/2010). Code of regulations on the declaration and protection of Strictly Protected and protected wild species of plants, animals and fungi. Official Journal of the Republic of Serbia 35/2010, Belgrade, Serbia.

Official Journal of RS (72/2010). Code of regulations on the special technical and technological solutions that enable unhindered and safe communication of wild animals. Official Journal of the Republic of Serbia 72/2010, Belgrade, Serbia.

Official Journal of RS (32/2016). Code of regulations on Amendments to the Code of regulations on the declaration and protection of Strictly Protected and Protected wild species of plants, animals and fungi. Official Journal of the Republic of Serbia 32/2016, Belgrade, Serbia.

Official Journal of RS (98/2016). Code of regulations on Amendments to the Code of regulations on the declaration and protection of Strictly Protected and Protected wild species of plants, animals and fungi. Official Journal of the Republic of Serbia 98/2016, Belgrade, Serbia.

Official Journal of RS (13/2018a). Law on the ratification of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA). Official Journal of the Republic of Serbia - „International treaties" 13/2018, Belgrade, Serbia.

Official Journal of RS (13/2018b). Law on the ratification of the Agreement on the Conservation of Populations of European Bats. Official Journal of the Republic of Serbia - „International treaties" 13/2018, Belgrade, Serbia.

Official Journal of RS (71/2021). Law on Amendments to the Law on Nature Protection. Official Journal of the Republic of Serbia 71/2021, Belgrade, Serbia.

Official Gazzete of the City of Bor (29/2021a). Decision on the adoption of the Zoning Plan for the construction of high-voltage lines forthe introduction of existing OHL 110 kV no. 150 (TS "Bor 1" - TS "Majdanpek 1") and OHL 110 kV no. 177 (TS "Bor 2" - TS "Majdanpek 2") to the switchboard facility 110 kV "Crni vrh 1". Official Gazzete of the City of Bor29/2021, Bor, Serbia.

Official Journal of the City of Bor (29/2021a). Decision on the adoption of the Zoning Plan for the area of the "VE Crni Vrh" wind farm on the territory of the town of Bor. Official Gazzete of the City of Bor29/2021, Bor, Serbia.

Papadatou, E., Butlin, R. K., Altringham, J. D. (2008). Identification of bat species in Greece from their echolocation calls. Acta Chiropterologica 10: 127-143.

Paunović, M., Karapandža, B., Ivanović, S. (2011). Bats and environmental impact assessment – methodological guidelines for environmental impact assessment and strategic environmental impact assessment. Wildlife Conservation Society "MUSTELA", Belgrade, Serbia, 142 pp. https://www.researchgate.net/publication/266555086_BATS_AND_ENVIRONMENTAL_IMPACT_ASSESSMENT_Methodological_guidelines_for_environmental_impact_assessment_and_strategic_environmental_impact_assessment

Paunović, M. Karapandža, B., Budinski, I., Stamenković, S. (2020). Bats (Mammalia, Chiroptera) of Serbia. Monographs DCXCIII (13), Serbian Academy of Sciences and Arts, Department of Chemical and Biological Sciences & Natural History Museum in Belgrade, Belgrade, Serbia, 601 pp.

Pavlović, P., Kostić, N., Karadžić, B., Mitrović, M. (2017). The soils of Serbia. Springer, Dordrecht, Netherlands, 225 pp.

Pejić, B., Budinski, I., Karapandža, B., Paunović, M. (2017). The first record of European free tailed bat Tadarida teniotis (Rafinesque, 1814) in Serbia. Bulletin of the Natural History Museum Belgrade 10: 105-111.

Petrov, B. M. (1992). Mammals of Yugoslavia (Insectivores and Rodents. Bulletin of the Natural History Museum, Supplementum 37, 186 pp.

Pearce-Higgins, J.W., Stephen, L., Langston, R.H., Bainbridge, I.P., Bullman, R. (2009). The distribution of breeding birds around upland wind farms. Journal of Applied Ecology 46(6): 1323-1331. <https://besjournals.onlinelibrary.wiley.com/doi/pdf/10.1111/j.1365-2664.2009.01715.x>

Pfalzer, G., Kusch, J. (2003). Structure and variability of bat social calls: implications for specificity and individual recognition. J. Zool. Lond. 261: 21–33.

Photography and Photomontage in Landscape and Visual Impact Assessment - The Landscape Institute, Advice Note 01/11, March 2011, and consultation draft 2018;

Poirazidis, K. (2017). Systematic Raptor Monitoring as conservation tool: 12 year results in the light of landscape changes in Dadia-Lefkimi-Soufli National Park. Nature Conservation 22: 17-50. <https://doi.org/10.3897/natureconservation.22.20074>.

Popović, M., Vasić, N., Koren, T., Burić, I., Živanović, N., Kulijer, D., Golubović, A. (2020). Biologer: an open platform for collecting biodiversity data. BDJ 8: e53014. <https://doi.org/10.3897/BDJ.8.e53014>

Popović, M., Verovnik, R. (2018). Revised checklist of the butterflies of Serbia (Lepidoptera: Papilionoidea). Zootaxa 4438, 501–527. <https://doi.org/10.11646/zootaxa.4438.3.5>

Prinsen, H. A. M., Smallie, J. J., Boere, G. C., Píres, N. comp. (2012). Guidelines on how to avoid or mitigate impact of electricity power grids on migratory birds in the African-Eurasian region. AEWA Conservation Guidelines No. 14, CMS Technical Series No. 29, AEWA Technical Series No. 50, CMS Raptors MOU Technical Series No. 3, Bonn, Germany, 47pp. <http://www.unep-aewa.org/sites/default/files/publication/ts50_electr_guidelines_03122014.pdf>

Pryor SC, et al. (2011) Analyses of possible changes in intense and extreme wind speeds over northern Europe under climate change scenarios

Pryor SC, et al. (2011) Analyses of possible changes in intense and extreme wind speeds over northern Europe under climate change scenarios

Puzović, S. (2007a). Dalekovodi kao strukturni faktor staništa ptica. Doktorska disertacija, PMF, Departman za biologiju i ekologiju, Novi Sad, [Powerlines as a structural factor of bird habitats. PhD Thesis, University of Novi Sad, Faculty of Sciences, Department of Biology and Ecology], Novi Sad, Serbia, 306 pp.

Puzović, S. (2007b). Gnežđenje ptica na visokonaponskim dalekovodima u Srbiji [Bird nesting on high voltage powerlines in Serbia]. Zaštita prirode 58 (1-2): 141-155.

Puzović, S., Sekulić, G., Stojnić, N., Grubač, B., Tucakov, M. (2009). Important bird areas in Serbia. Ministry of Environment and Spatial Planning & Institute for Nature Protection of Serbia & Provincial Secretariat for Environmental Protection and Sustainable Development, Belgrade, Serbia, 279 pp.

Puzović, S., Radišić, D., Ružić, M., Rajković, D., Radaković, M., Pantović, U., Janković, M., Stojnić, N., Šćiban, M., Tucakov, M., Gergelj, J., Sekulić, G., Agošton, A., Raković, M. (2015). Ptice Srbije: procena veličina populacija i trendova gnezdarica 2008-2013. Društvo za zaštitu i proučavanje ptica Srbije i Prirodno-matematički fakultet, Departman za biologiju i ekologiju, Univerzitet u Novom Sadu [Birds of Serbia: Breeding Population Estimates and Trends for the Period 2008-2013. Bird Protection and Study Society of Serbia, and Department of Biology and Ecology, Faculty of Sciences, University of Novi Sad], Novi Sad, Serbia, 159 pp.

Radišić, D. (2021). Occurrences. In: Mesaroš, G. (ed.). Portal za kartiranje biološke raznovrsnosti Srbije – BioRas. <http://extra.bioras.petnica.rs/index.php?-action=list&-table=_zsitja&-cursor=0&-skip=0&-limit=30&-mode=find&-edit=1&species_owner_group=%3D8&MGRS_10k=EP79> Retrieved on 22 April 2021.

Radišić, D., Vasić, V., Puzović, S., Ružić, M., Šćiban M., Grubač, G., Ante Vujić, A. *eds*. (2018). The Red Book of the Fauna of Serbia III – Birds. Institute for Nature Conservation of Serbia, University of Novi Sad, Faculty of Sciences, Department of Biology and Ecology, Bird Protection and Study Society of Serbia, Belgrade, Serbia, 552 pp.

Regulation on Noise Indicators, Limit Values, Noise Indicators Assessment Methods, Annoyance and Harmful Effects of Environmental Noise (Official Journal of RS No 75/10)

Reichenbach, M., Handke, K., Sinning, F. (2004). Der Stand des Wissens zur Empfindlichkeit von Vogelarten gegenüber Störungswirkungen von Windenergieanlagen. Bremer Beiträge für Naturkunde und Naturschutz 7: 229-243.

Republički geodetski zavod (2020). Geosrbija: Katastar. Republički geodetski zavod, [Geoserbia: Cadastre. Republic Geodetic Authority], Belgrade, Serbia. https://a3.geosrbija.rs/katastar

Roads of Serbia – Annual Traffic Count Database;

Robinson, R. A. (2020). BirdFacts: profiles of birds occurring in Britain & Ireland. British Trust for Ornithology (BTO), Thetford, UK. <http://www.bto.org/birdfacts>, Accessed on 28 January 2020

Rodrigues, L., Bach, L., Dubourg-Savage, M.-J., Goodwin, J., Harbusch, C. (2008). Guidelines for consideration of bats in wind farm projects. EUROBATS Publication Series No. 3 (English version): UNEP/EUROBATS Secretariat, Bonn, Germany, 51 pp. http://www.EUROBATS.org/sites/default/files/documents/publications/publication_series/pubseries_no3_english.pdf

Rodrigues, L., Bach, L., Dubourg-Savage, M-J., Karapandža, B., Kovač, D., Kervyn, T., Dekker, J., Kepel, A., Bach, P., Collins, J., Harbusch, C., Park, K., Micevski, B., Minderman, J. (2015). Guidelines for consideration of bats in wind farm projects - Revision 2014. EUROBATS Publication Series No. 6 (English version), UNEP/EUROBATS Secretariat, Bonn, Germany, 133 pp. <http://www.EUROBATS.org/sites/default/files/documents/publications/publication_series/pubseries_no6_english.pdf>

Rosenstock, S. S., Anderson, D. R., Giesen, K. M., Leukering, T., Carter, M. F. (2002). Landbird counting techniques: current practices and an alternative. The Auk 119 (1): 46-53.

Ruddock, M., Whitfield, D. (2007). A review of disturbance distances in selected bird species. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage. 181pp. <https://www.nature.scot/sites/default/files/2018-05/A%20Review%20of%20Disturbance%20Distances%20in%20Selected%20Bird%20Species%20-%20Natural%20Research%20Ltd%20-%202007.pdf>

Rulebook on The Methods of Noise Measurement, Content and Scope of the Noise Measurement Reports (Official Journal of RS No 72/10)

Russo, D., Jones, G. (2002). Identification of twenty-two bat species (Mammalia: Chiroptera) from Italy by analysis of time-expanded recordings of echolocation calls. J. Zool. Lond. 258: 91-103.

Safner, T., Likić, J., Mesarić, M., Miletić, M., Knežević, S., Marić, L. (2010). Nature protection and wind farm development in Serbia. United Nations Development Programme (UNDP), Belgrade, Serbia, 74 pp.

http://www.rs.undp.org/content/dam/serbia/Publications%20and%20reports/English/UNDP_SRB_Nature%20Protection%20and%20Wind%20Farm%20Development%20in%20Serbia.pdf?download

Sarić, M. (1992).Flora Flora of Serbia I. Serbian Academy of Sciences and Arts, Department of Chemical and Biological Sciences,Belgrade, Serbia.

Savić, I. R., Paunović, M., Milenković, M., Stamenković, S. (1995): Diversity of Mammal Fauna (Mammalia) of Yugoslavia with an overview of species of international importance. *In:* Stevanović, V., Vasić, V. (*eds.*) The biodiversity of Yugoslavia with an overview of species of international importance. Faculty of Biology & Ecolibri, Belgrade, Serbia: 517–554.

Second National Communication of the Republic of Serbia under the UNFCCC - Ministry of Environment, 2017 https://www.klimatskepromene.rs/wp-content/uploads/2017/12/Drugi-izvestaj-o-promeni-klime-SNC_Srbija.pdf;

Seibold, S., Buchner, J., Bässler, C., Müller, J. (2013). Ponds in acidic mountains are more important for bats in providing drinking water than insect prey. Journal of Zoology, 290(4): 302-308.

Simić, D., Pullen, V., Ivanović, S., Cvetković, S., Tošović, M. (2010). Guidelines on the environmental impact assessment for wind farms. United Nations Development Programme (UNDP) Serbia, Ministry of Environmental Protection and Spatial Planning of the Republic of Serbia], Belgrade, Serbia, 64 pp <https://www.scribd.com/doc/116656164/UPUTSTVO-ZA-PROCENU-UTICAJA-VETROELEKTRANA-NA-%C5%BDIVOTNU-SREDINU>

Siting and Designing Windfarms in the Landscape, Version 3a, Scottish Natural Heritage (August 2017);

SNH (2000). Guidance: Windfarms and birds – Calculating a theoretical collision risk assuming no avoiding action. Scottish Natural Heritage, Battleby, UK, 10 pp. <https://www.nature.scot/sites/default/files/2017-09/Guidance%20Note%20-%20Windfarms%20and%20birds%20-%20Calculating%20a%20theoretical%20collision%20risk%20assuming%20no%20avoiding%20action.pdf>

SNH (2005). Guidance – Survey methods for assessing the impacts of onshore wind farms on bird communities. Scottish Natural Heritage, Battleby, UK, 50 pp. <https://tethys.pnnl.gov/sites/default/files/publications/SNH-2005.pdf>

SNH (2009). Guidance Note: Guidance on Methods for Monitoring Bird Populations at Onshore Wind Farms. Scottish Natural Heritage, Battleby, UK, 26pp. <https://www.nature.scot/sites/default/files/2017-09/Guidance%20note%20-%20Guidance%20on%20methods%20for%20monitoring%20bird%20populations%20at%20onshore%20windfarms.pdf>

SNH (2012). Guidance – Assessing the cumulative impact of onshore wind energy developments. Scottish Natural Heritage, Battleby, UK, 41 pp. <https://www.nature.scot/sites/default/files/2019-11/Guidance%20-%20Assessing%20the%20cumulative%20impact%20of%20onshore%20wind%20energy%20developments.pdf>

SNH (2014a). Guidance – Flight Speeds and Biometrics for Collision Risk Modelling. Scottish Natural Heritage, Battleby, UK, 4 pp. <https://www.nature.scot/sites/default/files/2018-09/Wind%20farm%20impacts%20on%20birds%20-%20Flight%20Speeds%20and%20Biometrics%20for%20Collision%20Risk%20Modelling.pdf>

SNH (2014b). Guidance – Recommended bird survey methods to inform impact assessment of onshore wind farms. Scottish Natural Heritage, Battleby, UK, 37 pp. https://www.nature.scot/sites/default/files/2017-09/Guidance%20note%20-%20Recommended%20bird%20survey%20methods%20to%20inform%20impact%20assessment%20of%20onshore%20windfarms.pdf

SNH (2016). Guidance: Assessment and mitigation of impacts of power lines and guyed meteorological masts on birds. Version 1. Scottish Natural Heritage, Battleby, UK, 11pp. <https://www.nature.scot/sites/default/files/2017-06/A2047189%20-%20SNH%20-

%20Assessment%20and%20mitigation%20of%20impacts%20of%20power%20lines%20and%20guyed%20meteorological%20masts%20on%20birds%20-%20guidance%20-%20July%202016.pdf>

SNH (2017). Recommended bird survey methods to inform impact assessment of onshore wind farms, Version 2. Scottish Natural Heritage, Battleby, UK, 37 pp. <https://www.nature.scot/sites/default/files/2018-06/Guidance%20Note%20-%20Recommended%20bird%20survey%20methods%20to%20inform%20impact%20assessment%20of%20onshore%20windfarms.pdf>

SNH (2018a). Assessing significance of impacts from onshore wind farms outwith designated areas. September 2018 v2. Scottish Natural Heritage, Battleby, UK, 13 pp. <https://www.nature.scot/sites/default/files/2018-02/Guidance%20-%20Assessing%20the%20significance%20of%20impacts%20on%20bird%20populations%20from%20onshore%20wind%20farms%20that%20do%20not%20affect%20protected%20areas.pdf>

SNH (2018b). Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model. Version 2 – February 2018. Scottish Natural Heritage, Battleby, UK, 4 pp. https://www.nature.scot/sites/default/files/2018-09/Wind%20farm%20impacts%20on%20birds%20-%20Use%20of%20Avoidance%20Rates%20in%20the%20SNH%20Wind%20Farm%20Collision%20Risk%20Model.pdf

Stevanović, V. (1992). Floristička podela teritorije Srbije sa pregledom viših horiona i odgovarajućih flornih elemenata. In: Sarić, R. (ed.), Flora Srbije 1. Srpska akademija nauka i umetnosti: 47–56, Beograd.

Stevanović V. *ed*. (1999). Red Book of Flora of Serbia 1 – Extinct and Critically Endangered Taxa. Ministry for the Protection of Natural Resources and the Environment & Faculty of Biology, University of Belgrade, Belgrade, Serbia, 566 pp.

Stevanović, V. (2012). Flora of Serbia II. Serbian Academy of Sciences and Arts, Department of Chemical and Biological Sciences,Belgrade, Serbia.

Stevanović, V., Stevanović, B. (1995). Basic climatic, geological and pedological factors of the biodiversity of the terrestrial ecosystems of Yugoslavia. *In:* Stevanović, V., Vasić, V. (*eds.*) The biodiversity of Yugoslavia with an overview of species of international importance. Faculty of Biology & Ecolibri, Belgrade, Serbia: 75-95.

Stevanović, V., Vasić, V. (1995). An overview of anthropogenic factors threatening the biodiversity of Yugoslavia. *In:* Stevanović, V., Vasić, V. (*eds*): The biodiversity of Yugoslavia with an overview of species of international importance. Faculty of Biology & Ecolibri, Belgrade, Serbia: 19-37.

Swaay, van C., Cuttelod, A., Collins, S., Maes, D., Munguira, M.L., Šašić, M., Settele, J., Verovnik, R., Verstrael, T., Warren, M., Wiemers, M., Wynhoff, I. (2010). European Red List of Butterflies. Publications Office of the European Union, Luxembourg.

The IFI Dataset of Default Grid Factors v2.0 (July 2019) https://unfccc.int/sites/default/files/resource/Harmonized_Grid_Emission_factor_data_set.pdf;

Šćiban, M., Rajković, D., Radišić, D., Vasić, V., Pantović, U. (2015). Birds of Serbia – Critical list of species. Institute for Nature Conservation of Vojvodina Province and Bird Protection and Study Society of Serbia, Novi Sad, Serbia, 196 pp.

The Rulebook on Noise Emitted by the Equipment Used in the Open Space (Official Journal of RS No 01/13 of 04.01.2013)

Tomović, Lj., Kalezić, M, Džukić, G. (2015). Red Book of Fauna of Serbia II - Reptiles. University of Belgrade, Faculty of Biology & Institute for Nature Conservation of Serbia.

Tucakov, M. (2011). Tamiš River Valley - Dynamic Floodplain. IUCN, Belgrade, Serbia and Bird Protection and Study Society of Serbia, Novi Sad, Serbia, 48 pp. <https://www.researchgate.net/profile/Marko_Tucakov/publication/292126538_Tamis_River_Valley_-_Dynamic_Floodplain/links/56a8f85e08ae2df82164fdb7/Tamis-River-Valley-Dynamic-Floodplain.pdf>

Tutin, T. G., Burges, N. A., Chater, A. O., Edmondson, J. R., Heywood, V. H., Moore, D. M., Valentine, D. H., Walters, S. M., Webb. D. A. (1993).Flora Europaea, ed. 2.1. Cambridge University Press, Cambridge, UK.

Tutin, T. G., Heywood, V. H., Burges, N. A., Moore, D. M., Valentine, D. H., Walters, S. M., Webb, D. A. (1968-1980). Flora Europaea, Vol. 2-5. Cambridge University Press, Cambridge, UK.

Tutin, T. G., Heywood, V. H., Burges, N. A., Valentine, D. H., Walters, S. M., Webb, D. A.(1964). Flora Europaea, Vol. 1. Lycopodiaceae to Platanaceae. Cambridge University Press, Cambridge, UK.

UK Department of Trade & Industry. The Working Group on Noise from Wind Turbines (1996) ETSU-R-97, The Assessment and Rating of Noise from Wind Farms

UK Department of Transport (1988) Calculation of Road Traffic Noise (CRTN)

UK Institute of Acoustics (2013) A Good Practice Guide to the application of ETSU-R-97 for the assessment and rating of wind farm noise

UK Standards for Highways, Design Manual for Roads & Bridges (2020) LA 111 Noise and Vibration

UN Development Programme (UNDP) Guidelines on the Environmental Impact Assessment for Wind Farms June 2010

Visual Representation of Windfarms Version 2.2, Scottish Natural Heritage (February 2017);

Voigt, C.C, Azam, C., Dekker, J., Ferguson, J., Fritze, M., Gazaryan, S., Hölker, F., Jones, G., Leader, N., Lewanzik, D., Limpens, H.J.G.A., Mathews, F., Rydell, J., Schofield, H., Spoelstra, K., Zagmajster, M. (2018). Guidelines for consideration of bats in lighting projects. EUROBATS Publication Series No. 8. UNEP/EUROBATS Secretariat, Bonn, Germany, 62 pp. <http://www.eurobats.org/sites/default/files/documents/publications/publication_series/WEB_EUROBATS_08_ENGL_NVK_19092018.pdf>

Wade, P.R. (1998). Calculating limits to the allowable human-caused mortality of cetaceans and pinnipeds. Marine Mammal Science 14: 1–37. https://www.academia.edu/download/45674861/j.1748-7692.1998.tb00688.x20160516-21856-qsat77.pdf

WCSP (2021). World Checklist of Selected Plant Families. Facilitated by the Royal Botanic Gardens, Kew. <http://wcsp.science.kew.org/> Accessed on 28 November 2021

WFO (2021): World Flora Online. <http://www.worldfloraonline.org> Accessed on 28 November 2021

WHO Regional Office for Europe Environmental Noise Guidelines for the European Region 2018

Wiemers, M., Balletto, E., Dincă, V., Fric, Z.F., Lamas, G., Lukhtanov, V., Munguira, M.L., van Swaay, C.A.M., Vila, R., Vliegenthart, A., Wahlberg, N., Verovnik, R. (2018). An updated checklist of the European Butterflies (Lepidoptera, Papilionoidea). ZooKeys 811, 9–45. https://doi.org/10.3897/zookeys.811.28712

Wind Energy Projects in Cold Climates – IEA Wind (2011);

World Bank Group (2007). Environmental, health and safety guidelines for electric power transmission and distribution. April 30, 2007. The World Bank Group, Washington D.C., USA, 23pp. http://www.ifc.org/wps/wcm/connect/66b56e00488657eeb36af36a6515bb18/Final%2B-%2BElectric%2BTransmission%2Band%2BDistribution.pdf?MOD=AJPERES&id=1323162154847

World Bank Group (2015). Environmental, health and safety guidelines for wind energy. August 7, 2015. The World Bank Group, Washington D.C., USA, 36 pp. <http://www.ifc.org/wps/wcm/connect/2c410700497a7933b04cf1ef20a40540/FINAL_Aug+2015_Wind+Energy_EHS+Guideline.pdf?MOD=AJPERES>

Zečević, M. (2002). Fauna leptira Timočke krajine (istočna Srbija). DŠIP “BAKAR” Bor, Narodni muzej Zaječar, Zaječar.

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