Appendix 14.1

List of bird species observed in the Vlašić Wind Farm Site

List of bird species observed in the Vlašić Wind Farm site, the concession area (OP 1-9) and the reference point (OP K1 and K2)

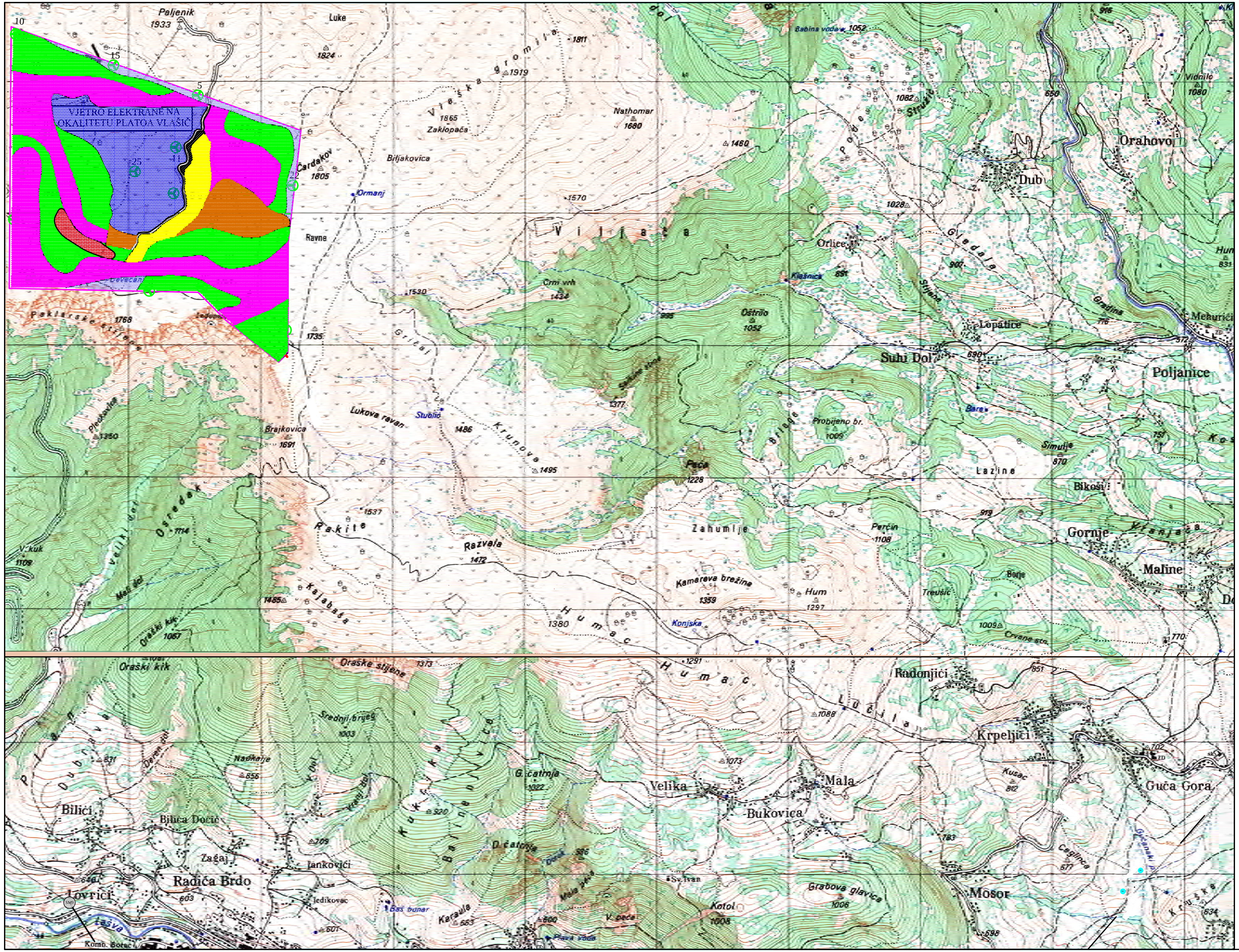
No.	Species	nest	Vantage points (VP)										
			1	2	3	4	5	6	7	8	9	K1	K2
1	***Ciconia nigra*** **(Black Stork)**					+							
2	***Platalea leucorodia*** **(Eurasian Spoonbill)**								+				
3	***Pernis apivorus*** **(European Honey-buzzard)**						+	+		+	+	+	
4	***Gyps fulvus*** **(Eurasian Griffon)**								+				
5	***Circaetus gallicus*** **(Short-toed Snake-eagle)**	(i)		+	+				+	+	+	+	+
6	***Circus aeruginosus*** **(Western Marsh-harrier)**			+					+				
7	***Circus cyaneus*** **(Northern Harrier)**				+		+			+			+
8	***Circus pygargus*** **(Montagu's Harrier)**			+	+	+	+	+	+	+	+	+	+
9	***Accipiter gentilis*** **(Northern Goshawk)**	(c)	+					+				+	+
10	***Accipiter nisus*** **(Eurasian Sparrowhawk)**	(c)	+					+				+	+
11	***Buteo buteo*** **(Common Buzzard)**	c	+	+	+	+		+	+	+	+	+	+
12	***Buteo rufinus*** **(Long-legged Buzzard)**		+						+		+	+	
13	***Buteo lagopus*** **(Rough-legged Hawk)**					+	+						
14	***Aquila pomarina*** **(Lesser Spotted Eagle)**							+					
15	***Aquila chrysaetos*** **(Golden Eagle)**	c	+	+		+	+	+		+		+	+
16	***Aquila pennata*** **(Booted Eagle)**	(i)						+		+			
17	***Pandion haliaetus*** **(Osprey)**		+										
18	***Falco naumanni*** **(Lesser Kestrel)**			+							+		
19	***Falco tinnunculus*** **(Common Kestrel)**	c	+	+	+	+	+	+	+	+	+	+	+
20	***Falco vespertinus*** **(Red-footed Falcon)**		+			+	+	+	+	+	+	+	+
21	***Falco subbuteo*** **(Hobby)**	(c)	+	+			+	+		+	+	+	+
22	***Falco peregrinus*** **(Peregrine Falcon)**	(c)							+	+		+	
23	*Alectoris graeca* (Rock Partridge)	c	+	+		+	+	+			+	+	+
24	*Coturnix coturnix* (Common Quail)									+			
25	*Crex crex* (Corncrake)	(c)	+										
26	***Grus grus*** **(Common Crane)**				+		+			+			
27	*Charadrius morinellus* (Eurasian Dotterel)								+			+	+

No.	Species	nest	Vantage points (VP)										
			1	2	3	4	5	6	7	8	9	K1	K2
28	*Scolopax rusticola* (Eurasian Woodcock)		+	+									
29	*Columba livia* (Rock Dove)	(c)	+						+				
30	*Columba livia f. domestica* (Domestic Pigeon)	(c)		+									
31	*Columba palumbus* (Common Wood-pigeon)	(c)	+	+	+	+		+					+
32	*Cuculus canorus* (Common Cuckoo)	(c)	+	+									+
33	*Bubo bubo* (Eurasian Eagle-owl)	c					+						
34	*Glaucidium passerinum* (Eurasian Pygmy-owl)	(c)	+										
35	*Athene noctua* (Little Owl)	c	+	+									
36	*Strix aluco* (Tawny Owl)	(c)	+										
37	*Strix uralensis* (Ural Owl)	(c)	+										
38	*Aegolius funereus* (Boreal Owl)	(c)	+										
39	*Caprimulgus europaeus* (Eurasian Nightjar)	(i)	+	+									
40	*Apus apus* (Common Swift)							+	+	+	+		
41	***Merops apiaster* (European Bee-eater)**		**+**						**+**				**+**
42	*Upupa epops* (Eurasian Hoopoe)	(c)	+	+									
43	*Jynx torquilla* (Eurasian Wryneck)	c	+	+									
44	*Dryocopus martius* (Black Woodpecker)	c	+	+		+							
45	*Dendrocopos major* (Great Spotted Woodpecker)	c	+	+									
46	*Dendrocopos leucotos* (White-backed Woodpecker)	c	+	+		+							
47	*Picoides tridactylus* (Three-toed Woodpecker)	c		+									
48	*Lullula arborea* (Wood Lark)	(i)	+	+									
49	***Alauda arvensis* (Eurasian Skylark)**	c	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**	**+**
50	*Eremophila alpestris* (Horned Lark)	c						+	+			+	+
51	*Ptyonoprogne rupestris* (Eurasian Crag-martin)	c						+					
52	*Hirundo rustica* (Barn Swallow)	(c)	+					+	+	+		+	
53	*Delichon urbicum* (Common House Martin)	(c)						+					
54	*Anthus trivialis* (Tree Pipit)	c	+	+									+
55	*Anthus pratensis* (Meadow Pipit)		+	+		+	+		+	+	+	+	+
56	*Anthus cervinus* (Red-throated Pipit)								+				

No.	Species	nest	Vantage points (VP)										
			1	2	3	4	5	6	7	8	9	K1	K2
57	*Anthus spinoletta* (Water Pipit)	c		+	+	+	+	+	+	+	+	+	+
58	*Motacilla alba* (White Wagtail)	(c)	+	+				+			+		
59	*Troglodytes troglodytes* (Winter Wren)	(c)	+	+									
60	*Prunella modularis* (Hedge Accentor)	c	+	+									
61	*Prunella collaris* (Alpine Accentor)	c						+				+	
62	*Erithacus rubecula* (European Robin)	c	+	+									
63	*Phoenicurus ochruros* (Black Redstart)	c	+	+	+	+	+	+	+	+	+	+	+
64	*Phoenicurus phoenicurus* (Common Redstart)	(c)	+										
65	*Saxicola rubetra* (Whinchat)	(c)	+	+	+		+		+		+	+	+
66	*Oenanthe oenanthe* (Northern Wheatear)	c	+	+	+	+	+	+	+	+	+	+	+
67	*Monticola saxatilis* (Rufous-tailed Rock-thrush)	(c)	+										
68	*Turdus torquatus* (Ring Ouzel)	c	+	+				+					
69	*Turdus merula* (Eurasian Blackbird)	(c)	+	+									
70	*Turdus pilaris* (Fieldfare)	(i)	+	+									
71	*Turdus philomelos* (Song Thrush)		+	+									
72	*Turdus iliacus* (Redwing)			+									
73	*Turdus viscivorus* (Mistle Thrush)	(c)	+	+		+							
74	*Sylvia curruca* (Lesser Whitethroat)	(c)	+										
75	*Sylvia atricapilla* (Blackcap)	(c)	+										+
76	*Phylloscopus collybita* (Common Chiffchaff)	(c)	+	+									+
77	*Regulus regulus* (Goldcrest)	(c)		+									
78	*Regulus ignicapilla* (Common Firecrest)	c	+	+									
79	*Aegithalos caudatus* (Long-tailed Tit)	(i)	+	+									
80	*Parus montanus* (Willow Tit)	c	+	+									
81	*Parus cristatus* (Crested Tit)	c	+	+									
82	*Parus ater* (Coal Tit)	c	+	+									+
83	*Parus caeruleus* (Blue Tit)	(c)	+										
84	*Parus major* (Great Tit)	c	+	+									+
85	*Sitta europaea* (Wood Nuthatch)	(c)	+	+									

No.	Species	nest	Vantage points (VP)										
			1	2	3	4	5	6	7	8	9	K1	K2
86	*Tichodroma muraria* (Wallcreeper)	c						+					
87	*Certhia familiaris* (Eurasian Tree-creeper)	c		+									
88	*Oriolus oriolus* (Eurasian Golden-oriole)		+										
89	*Lanius collurio* (Red-backed Shrike)	(c)	+	+							+		
90	*Lanius excubitor* (Northern Grey Shrike)		+										
91	*Garrulus glandarius* (Eurasian Jay)	(c)	+	+									+
92	*Pica pica* (Black-billed Magpie)	(c)	+										
93	*Nucifraga caryocatactes* (Spotted Nutcracker)	c	+	+				+					+
94	***Pyrrhocorax graculus* (Yellow-billed Chough)**	c					**+**	**+**	**+**	**+**		**+**	**+**
95	*Coloeus monedula* (Western Jackdaw)	(c)	+	+									
96	*Corvus corone/cornix* (Hooded Crow)	(c)	+	+	+	+	+	+	+	+	+	+	+
97	*Corvus corax* (Common Raven)	(c)	+	+	+	+	+	+	+	+	+	+	+
98	*Sturnus vulgaris* (Common Starling)	(c)	+										
99	*Fringilla coelebs* (Chaffinch)	c	+	+									+
100	*Serinus serinus* (European Serin)	c	+	+									
101	*Carduelis carduelis* (European Goldfinch)	(c)	+	+									
102	*Carduelis spinus* (Eurasian Siskin)	(i)	+	+									
103	*Carduelis cannabina* (Eurasian Linnett)	c	+	+	+	+	+	+	+	+	+	+	+
104	*Loxia curvirostra* (Red Crossbill)	c	+	+									
105	*Pyrrhula pyrrhula* (Eurasian Bullfinch)	c	+	+									
106	*Coccothraustes coccothraustes* (Hawfinch)	c		+									
107	*Emberiza cia* (Rock Bunting)	(c)	+	+									
	Total number of species	**37 (45)**	**75**	**64**	**15**	**20**	**21**	**31**	**27**	**24**	**22**	**27**	**34**
			88			**54**						**39**	
	Number of target species	**5 (6)**	**11**	**9**	**7**	**8**	**11**	**13**	**13**	**13**	**10**	**14**	**13**
			17			**25**						**16**	

Appendix 14.2
Map of Habitats (1:25,000)



LEGENDA / LEGEND

klasa: Elyno - Seslerietea Br. - Bl. 48

- Festacetum pungentis (bosniacae)
- Hypochoereto - Festucetum amaethystinae
- Seslerietalia juncifoliae 1930
- Scabiosetum silenifoliae Lakušić et al 1979
- Alchemilo - Phyteumetum pseudorbicularis
- Seslerio - Gentianetum dinaricae

klasa: Mollinio - Arrhenateretea

klasa: Caricetea curvalae Br. - Bl. 48

- Aurantio - Nardetum strictae
- Violeto - Festucetum fallacis H - at 60

KONCESIONO PODRUČJE VJETROPARKA "VLAŠIĆ"
CONCESION AREA OF THE WIND FARM "VLAŠIĆ"

MARK	CHANGE

ENERGOINVEST
SEKTOR INŽENJERING ZA DALEKOVODE-SIDV
Sarajevo - Bosna i Hercegovina

FOUNDED	M.Kapo
DESIGNED BY	Prof.Biology A.Cerić
DRAWN BY	BScGeol.Eng.A.Džinić
CHECKED BY	Prof.Biology A.Cerić
APPROVED BY	BScArch.Eng.B.Čongo
M. 25000	O

Tehnical Assistance for
Wind Farm Vlašić Travnik - B&H
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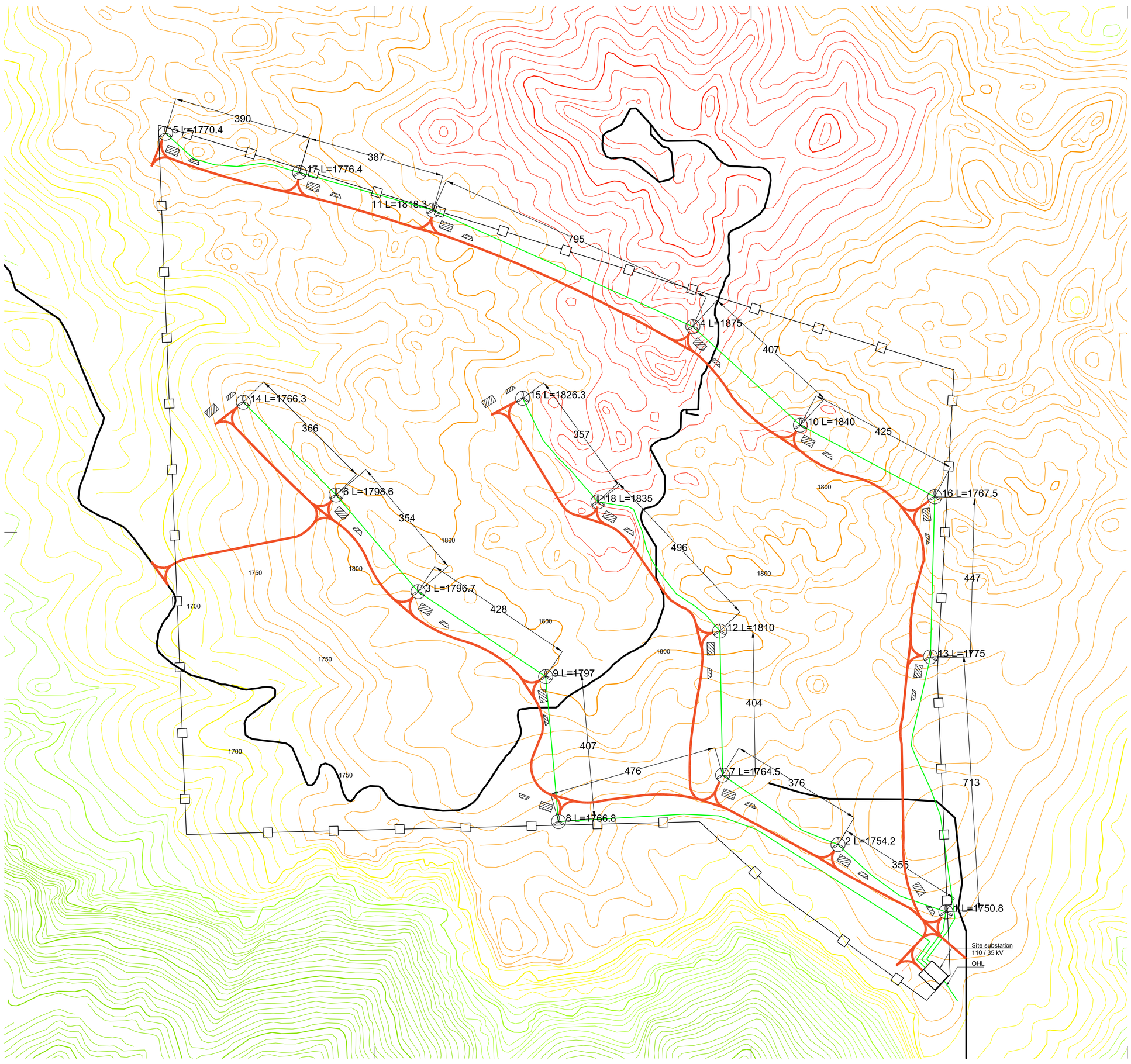
Environmental and Social Impact Study
Chapter 14. Appendices
Appendix 14.2 Map of Habitates

D

Appendix 14.3

Layout of Internal Site Roads



Layout L4			
		UTM (north)-WGS84 Zone:33	
WTG No	Z	Easting	Northing
1	1750.8	711206	4905566
2	1754.2	710905	4905754
3	1796.7	709733	4906460
4	1875.0	710500	4907200
5	1770.4	709028	4907740
6	1798.6	709504	4906730
7	1764.5	710583	4905918
8	1766.8	710125	4905818
9	1797.0	710056	4906223
10	1840.0	710800	4906925
11	1818.3	709775	4907525
12	1810.0	710575	4906350
13	1775.0	711163	4906278
14	1766.3	709245	4906989
15	1826.3	710025	4907000
16	1767.5	711175	4906725
17	1776.4	709402	4907630
18	1835.0	710235	4906711

Note:

Coordinate System: UTM (north) - WGS84 Zone: 33

Legend:

- Wind turbine
- Underground cable
- Existing road
- New road
- Hammerhead
- Hardstand
- Concession area boundary

References:

A049908-ELC-DWG-003 Wind Farm layout 4
Export and Array Power System
Single Line Diagram

VER.	DATE	DESCRIPTION	DESIGNED	CHECKED	APPROVED

JP ELEKTROPRIVREDA BIH d.d.

VLAŠIĆ Wind Farm

Wind Farm layout 4
Cable installation and access roads
Plan
.

DESCRIPTION
.

PROJECT NO.	A049908
DESIGNED	ABR / JYKL
CHECKED	SVJE
APPROVED	ABR
SCALE	1:5000
DATE	06.04.2016
DOCUMENT NO.	VERSION
A049908-ELC-DWG-001	1

COWI

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2800 Kongens Lyngby
Denmark

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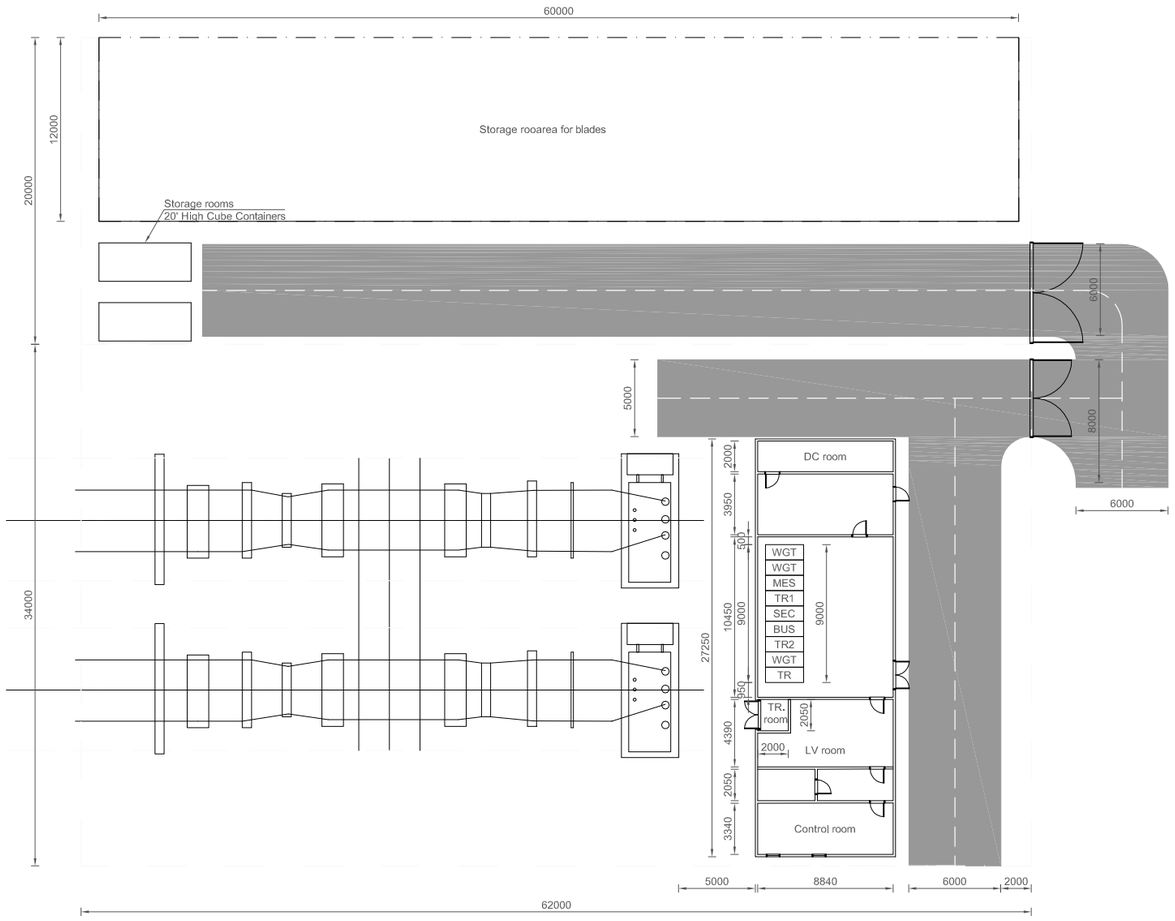
Appendix 14.4

Layout of Site Substation



Notes:

1. All dimensions are in mm

References:

A049908-ELC-DWG-001	Wind Farm layout 4 Cable installation and access roads Plan
A049908-ELC-DWG-003	Wind Farm layout 4 Export and Array Power System Single Line Diagram

VER.	DATE	DESCRIPTION	DESIGNED	CHECKED	APPROVED

VLAŠIĆ Wind Farm

Wind Farm layout 4
Site Substation
Layout
.

DESCRIPTION

.

PROJECT NO.	A049908
DESIGNED	ABR / ABR
CHECKED	ERM
APPROVED	ABR
SCALE	-
DATE	29.01.2016
DOCUMENT NO.	VERSION
A049908-ELC-DWG-005	0.1

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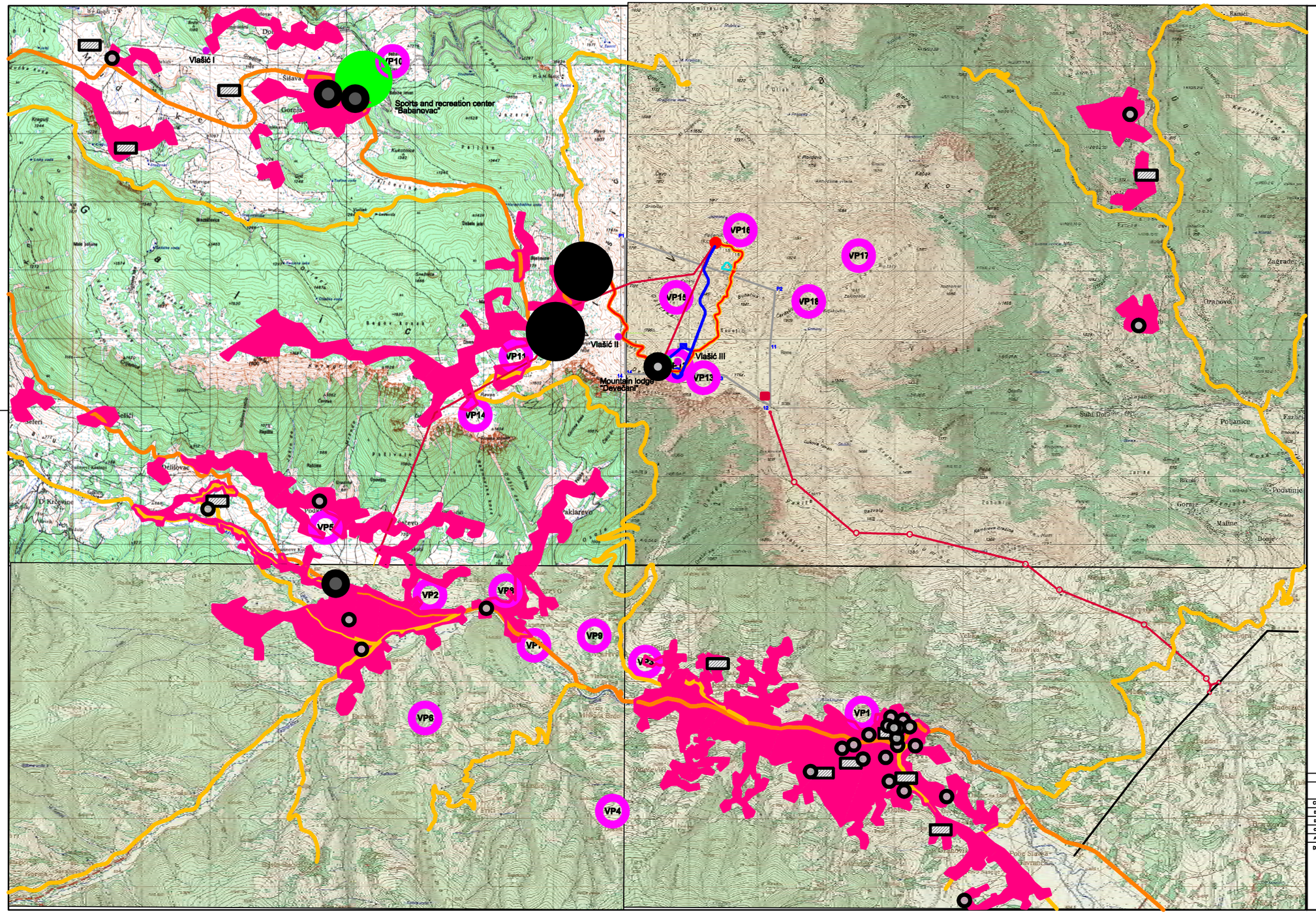
jykl Thu, 21 Jan 2016 15:15:33 O:\A045000\A049908\6_CAD\02_WIP\Sheet\A049908-ELC-DWG-005.dwg

Appendix 14.5

Synthesis Map of the Current State of the Environment (1:25,000)



SOCIO-ECONOMICAL ENVIRONMENT

1) Settlements and Population

Impacts on Settlements and Population

2) Sacral Objects and Cemeteries

- Sacral objects
- Cemeteries

Impacts on Sacral Objects and Cemeteries

Direct impacts

Indirect impacts

3) Public buildings

Impacts on public buildings

Direct impacts

4) Infrastructure

- Existing roads
- Proposed transport route
- Proposed transformer station
- Proposed grid connection
- Approximate route of the existing underground low voltage (LV) cable
- Existing overhead cable line 10 kV
- Existing telecommunication station
- Existing optical cable under the existing road
- Location for proposed tower and facility of the BH Telecom
- Approximate route of the local water supply
- Water reservoir
- Water wellspring with servis station and drinking fountain for livestock
- Wind monitoring mast

Impacts on Infrastruktura

Direct impacts

LANDSCAPE

1) View Point VP1

DATE	NAME	DESCRIPTION OF REVISION	REVISION INDEX	DATE	NAME
				CHECKED BY	

CUSTOMER: ELEKTROPRIVREDA BIH - SARAJEVO

DESIGNED BY	GS.16	BSc.Arch.Eng. B. Čengo	
DRAWN BY		V. Mujanović	
CHECKED BY		BSc.Arch.Eng. B. Čengo	
APPROVED BY		BSc.Arch.Eng. B. Čengo	

SCALE 1:25.000 DIN A

ENERGOINVEST, d.d.
SEKTOR ENERGOINŽENJERING

DESCRIPTION:

Tehnical Assistance for
Wind Farm Vlašić Travnik - B&H

Draft Final Report

Environmental and Social Impact Study

Chapter 14. Appendixes

Appendix 14.5 Syntesis map of the curent state of the environment

DRAWING No.

SHEET: 1/1

REV.

CAD:

Appendix 14.6

Map of Woodlands and Hunting Area

KARTA ŠUMSKIH ZEMLJIŠTA I LOVNOG PODRUČJA
MAP OF WOODLANDS AND HUNTING AREA

OPĆINA TRAVNIK
TRAVNIK MUNICIPALITY

M 1:25.000

LEGENDA / LEGEND :

- *Lovno-uzgojni objekat / Hunting and breeding facilities*
- *Lovno-turistički objekat / Hunting and tursm facilities*
- *Medvjed / The Bear*
- *Divlja svinja / The Boar*
- *Vuk / The Wolf*
- *Lisica / The Fox*
- *Srna / The Roe Deer*
- *Jazavac / The Badger*
- *Jastreb / The Hawk*
- *Suri orao / The Golden Eagle*
- *Zec / The Rabbit*
- *Šume bukve / The Beech Forests*
- *Šume hrasta / The Oak Forests*
- *Šume bukve i jele sa smrčom, šume bukve i smrče / The Beech and Fir forests with Spruce, Beech and Spruce Forests*
- *Šume smreče, šume jele i smreče (planinske) / The Forests of Spruce, Fir and Spruce Forests (mountain)*
- *Šume smreče (subalpske) / The Forests of Spruce (subalpine)*
- *Zasadi (kulturi) Crnmora / Land of Sawmills culture*
- *Ostale površine (šibljaci, pašnjaci, čistine, krš i sl.) / Other areas (shrubs, meadows, clearnings, debris and etc.)*
- *OpćinaTravnik / Travnik Municipality*
- *Entitet / Entity*
- *Kanton / Canton*
- *Posjed / Property*
- *Asfalt / Asphalt*
- *Makadam / The Gravel Road*

Appendix 14.7

Summary of Impacts and Mitigation Measures

1. SUMMARY OF IMPACTS AND MITIGATION MEASURES

1.1 Introduction

The following chapter provide a summary of the impact assessment detailed in *Chapter 5* along with associated mitigation measures that have been described in *Chapter 6*.

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

- Substantial Beneficial
- Moderate Beneficial
- Minor Beneficial
- Negligible Beneficial
- No Change
- Negligible Adverse
- Minor Adverse
- Moderate Adverse
- Significant Adverse

Where the summary of the impact is variable, such as where the impact is variable over a number of individual receptors, this can be expressed as a band of potential impacts. For example, a visual impact may be dependent on the position/location of individual receptors. In such a case, the impact may include:

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

Rather than list each of the potential impact levels, the residual impact will be expressed as 'No Change – Moderate Adverse', where the impacts include those presented in the text (in this case 'No Change – Moderate Adverse) and those in between on the impact scale (in this case 'Negligible Adverse and Minor Adverse').

The following summaries are divided into the three phases of the project; Construction, Operation and Decommissioning. Within each section the impacts, associated management and mitigation measures and significance of the residual effects are presented in the same order as the impacts are presented in *Chapter 5*. That is, with the key potential impacts associate with each phase of the project, followed by less significant issues.

1.2 Summary of Construction Phase Impacts and Mitigation Measures

Ecology & Nature Conservation: Habitats			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Loss of subalpine and alpine grassland.	Limit the amount of land take for the use of construction activities	Loss of subalpine and alpine grassland.	**Significant Adverse**
Ecology & Nature Conservation: Fauna			
Disturbance to mammals and reptiles.	Undertake necessary surveys prior to construction in order to identify and avoid disturbance. Relocate species as appropriate to suitable habitat that has been identified for this purpose.	Disturbance to some individuals/loss of habitat.	**Minor Adverse**
• **Birds**			
Disturbance to breeding birds during vegetation clearance.	Time vegetation clearance to avoid the breeding season.	Breeding birds will not be disturbed	**Minor Adverse**
Disturbance to birds, incurred as a result of increasing levels of noise and vibration.	Respect the buffer zones that are in place and carry out works outside the bird breeding season.	Noise levels will be controlled to minimise disturbance to birds	**Minor Adverse**
• **Bats**			
Noise, vibration and light disturbance to roosting, commuting and foraging bats	Minimise construction work between dusk and dawn. Restrict artificial lighting to required areas only.	Some noise, vibration and light disturbance to roosting, commuting and foraging bats, but implementation of appropriate measures will limit the effect.	**Minor Adverse-Significant Adverse**

LANDSCAPE AND VISUAL IMPACT			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Visual Impacts on views for vehicle travellers. Including numerous locations throughout the study area often associated with locations between	Undertake all activities to reduce disturbation of the landscape character	Views from main M5 highway would be limited to vehicle travellers travelling east westwards towards the development. Views would be fleeting due to speed of	**Minor - Moderate Adverse**

villages and settlements from varying hierarchy of roads/lanes and tracks in the area. Impacts associated with short term activities during construction such as crane and plant machinery movement during wind turbine and electricity pylon installation.		travel and intervening vegetation alongside the road. Views from small tracks between villages within close proximity of the development would be most severely affected; however these are infrequently used.	
Visual Impact on views from people in work including receptors at varying distances from the scheme, ranging from immediate to in excess of 5 km (Travnik and Turbe). Impacts associated with short term construction activities such as turbine and pylon installation processes.	No specific mitigation measures	Views of the scheme would vary, from direct views of the temporary construction activities and direct views of the assembled turbines. In areas views are disrupted by intervening vegetation and few vantage points are available due to the low lying and level landform.	**Minor - Moderate Adverse**

TRAFFIC AND TRANSPORT			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Increased heavy vehicles traffic both locally and regionally.	Use of designated managed traffic routes only. Heavy construction traffic will be subject to a traffic management plan, as necessary.	Slight delays to other road users but otherwise no effects	**Negligible Adverse**

NOISE			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Noise from construction activities.	Use of Best Practicable Means during construction to prevent/manage noise emissions. For example, undertaking piling during day light hours only.	Construction noise to the local environment	**Negligible Adverse - Minor Adverse**
Noise from construction traffic	Access routes to the site are defined with the smallest number of properties in proximity to it.	There may be noise/vibration increases at residential properties in proximity to the chosen access routes.	**Minor Adverse**

SOCIO-ECONOMIC IMPACTS			
IMPACTS TO LAND USE			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Reduction in land available for sheep grazing.	Minimise the amount of land occupied during construction. Position WTGs near edges of land plots to optimize land use. Upon the completion of construction activities, fully reinstate the land not permanently occupied. Compensation for privately owned land to be executed.	Approx. 0,015 km2 of land will remain unavailable for shep grazing after construction. Possibility of impacts on livelihoods discussed in separate section below.	**Minor Adverse**
Difficulties in accessing land as a result of increased traffic and access track upgrades	Develop and implement a traffic management plan. Provide timely information to users of land of when access to their land might be more difficult (e.g. scheduled access track upgrades) Establish and implement a community grievance mechanism	Individuals may still occasionally experience difficulties in accessing land. Possibility of impacts on livelihoods discussed in separate section below.	**No impact - Negligible Adverse**
EMPLOYMENT AND PROCUREMENT OPPORTUNITIES			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Creation of direct employment opportunities Approximately 100 people will be employed during construction, most of which will be either local (approx. 20%) or national staff (approx. 50%) and international labour (approx. 30%).	Put in place 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.	Employment opportunities generated for both local and national staff. Impacts on livelihoods discussed in separate section below.	**Moderate Beneficial**

	Provide a grievance mechanism for workers. Implement a training programme for the local workforce to enable them to take advantage of the opportunities available.		
Creation of indirect employment opportunities, associated with: • the project's supply chain • spending of project employees in local communities	Procure goods and services locally wherever possible	Economic benefits to the local and national economy. Impacts on livelihoods discussed in separate section below.	**Minor Beneficial**
Creation of employment related expectations among the local population	Continue to provide timely and transparent information regarding employment opportunities related to the Project	Individuals may hold unrealistic employment expectations concerning the Project.	**Negligible Adverse**
IMPACTS ON LIVELIHOODS			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Economic displacement may occur during construction for the following categories of people: • Persons who are using the land plots which have been or will be acquired for the project, but who are not owners of land, and whose sheep grazing may be affected by construction. • Persons who are using the land plots which will be crossed during the transport and installation of WTGs in their future locations or other land which may be disrupted during construction, whose sheep grazing may be affected.	Minimise the amount of land occupied/disrupted during construction Provide timely information to users of land of when construction is planned to begin and how lost land for sheep grazing and damages will be compensated Compensate all users of land for lost sheep grazing and any other damages at full replacement value, in accordance with the Federal BiH Law on Expropriation. Fully reinstate the land after disruption. Establish and implement a grievance Mechanism.	Livelihoods will be maintained and in some instances potentially improved.	**Minor Adverse**
Loss of livelihoods as a result of loss of land available for sheep grazing	Minimise the amount of land occupied	Livelihoods will be maintained and in some instances potentially improved.	**Minor Adverse**

	during construction Upon the completion of construction activities, fully reinstate the land not permanently occupied Compensation for privately owned land to l executed.		
Financial gain for farmers from sale of their land to EP BiH in the form of compensation with which they could buy replacement land	Purchase and compensation	Financial gain for landowners who sell their land through appropriation.	**Minor Beneficial**
Improvements for local economies as a result of employment	No mitigation needed.	Improvements for local economies as a result of employment	**Minor Beneficial**
Loss of livelihoods as a result of transport and increased traffic Negligible with potential to rise to low adverse if any businesses along transport routes are identified.	Provide timely information to people/households located along selected transport route about the transport plan and possible impacts as well as foreseen mitigation measures. Compensate any business losses full replacement value, in accordance with the Federal BiH Law on Expropriation Establish and implement a grievance mechanism	Proposed mitigation should be enough to at least restore livelihoods, if not improve them.	**No impact**
Potential for land values to inrease in the project area.	No mitigation necessary.	Potential for increased land values in the project area.	**Minor Beneficial**
COMMUNITY HEALTH, SAFETY AND SECURITY			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Potential influx of workers into the Project area, further impacting on community health, safety and security (law and order issues)	Encourage contractors to hire local workforce, i.e. give preference to suitably qualified and experienced applicants from the local communities. Enforce workers code of conduct. Cooperate and coordinate with local health and safety facilities.	Potential for occasional incidents on community health, safety and security. Such incidents could lead to tensions between the community and EP BiH.	**Minor Adverse**
Increase in traffic (bringing equipment and materials to the site and employee	Provide timely information to people/households located along	Accidents involving local community members will have serious effects on the individual or his/her household and could	**Minor Adverse - Moderate Adverse**

travel) could lead to more accidents in the local communities and reduced quality of life.	selected transport route and consult on mitigation measures. Develop and implement a traffic management plan. Workers code of conduct (guidance on safe driving). Cooperate and coordinate with local health and safety – security facilities	lead to tensions between the community and EP BiH	
IMPACTS ON INFRASTRUCTURE			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Improved access to parcels of land as a result of upgrading and widening of access tracks prior to construction	No mitigation needed.	Improved access to parcels of land as a result of upgrading and widening of access tracks prior to construction	**Minor Beneficial**
Damage to road surfaces during transport of heavy machinery	Preparation of roads for heavy transport before construction. Restoration of roads to at least preconstruction level where damage arises	No residual effects	**No impact**

HEALTH, SAFETY AND PUBLIC NUISANCE			
Impact	**Proposed MitigationMeasure**	**Residual Impact**	**Residual Impact Rating**
Industrial accidents associated with the construction of the wind farm. Potential for serious injury or death, particularly associated with falls from height and electrocution.	Implementation of an appropriate health and safety management system for all personnel on site.	Small residual risk of accident.	**Minor Adverse**
Accidents associated with construction traffic, both on and off site associated with both workers and members of the public.	Implementation of traffic management plan. This includes ensuring vehicles are driven within speed limits and with care on public roads, as well as on site.	No residual effects.	**No impact**
Risks to the public and also workers associated with unauthorised site access. Risk of injury to those entering the site unauthorised and also risks to workers as a result of the unauthorised access.	Implementation of appropriate signage and site security.	No residual effects.	**No impact**

GROUND AND WATER			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Accidental release of fuels, oils, chemicals, hazardous materials, etc., to the ground, groundwater and/or surface water.	Appropriate procedures and protocols to be established and monitored for materials delivery and handling	Reduced likelihood of accidental release of fuels, oils, chemicals, hazardous materials, etc., to the ground, groundwater and/or surface water.	**Minor adverse**
Accidental discharge of sanitary wastewater to ground, groundwater and/or surface water.	Measures to be in place to prevent accidental releases including locating waste water management systems away from open water and assurance that appropriate containment both primary and secondary is in place.	None	**No impact**
Discharge of pollutants in water used for plant, equipment and vehicle washing to ground	Washing activities will take place on areas with appropriate containment and procedures and protocols will be established and monitored to ensure that the preventative measures are efficient	Potential for accidental release of pollutants to the ground during washing activities will be minimised	**Minor adverse**
Increase of sediment load in natural aquatic receptors resulted from direct runoff disposal	Minimisation of excavations during construction Temporary drainage grooves and sedimentation ponds for surface runoff collection	Minimised sediment load	**Minor adverse**

ARCHAEOLOGY AND CULTURAL HERITAGE			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
There are no registered archaeological or cultural heritage sites within the project area, however the archaeological features in the area have not been investigated fully and chance finds during construction are possible. Findings will increase knowledge of cultural heritage but unnecessary damage will be a negative impact.	In case of chance finds, all works will be immediately halted and the Commission for the Protection of Cultural and Historical Heritage will be notified to issue necessary measures, in accordance with the legislative of BiH.	If chance finds are encountered - potential for slowing down construction or changes in the project footprint. Any findings will increase knowledge of archaeological and cultural heritage.	**Minor Beneficial – Minor adverse**

AIR EMISSIONS			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Dust emissions during construction and ground works	Construction Environmental Management Plan to include procedures for: • water spraying roads and dusty materials stockpiles • sheeting vehicles carrying dusty materials on leaving the site to prevent materials being blown from the vehicles • speed limits on unmade surfaces on site to limit dust	Dust propagation will be limited to construction area and will not influence local community. However workers should be supplied with dust masks especially in dry days.	**Minor Adverse**
Emissions from generators and vehicles	Assurance that all engines operate to national standards and are fully maintained, particularly to prevent the release of black smoke.	Minor emissions from engines.	**Minor Adverse**

1.3 Summary of Operational Phase Impacts and Mitigation Measures

Ecology & Nature Conservation: Habitats			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
There will be no further impacts on the habitats once the wind farm has been constructed.	N/A	N/A	**No impacts**
Ecology & Nature Conservation: Fauna			
• **Birds**			
Collision risk of birds with wind turbines	Post Construction monitoring. Targeted turbine shutdown during certain seasonal and daily migrations, if necessary.	Collision risk of birds with wind turbines - The baseline data and associated research has concluded that the proposed turbines are not expected to have a significant collision impact on bird populations. However, due to the protected status of some species, the significance level is considered minor adverse.	**Minor Adverse**
Disturbance/displacement/barrier effect of birds from wind farm	No mitigation is proposed	It is considered that some species are likely to be displaced from the wind farm. However, there is plentiful alternative of grasslands in the surrounding area and therefore this displacement is not expected to have a significant impact.	**Minor Adverse**
Collision risk with OHLs (Overhead Power Line)	Installation of visual aides to mark OHL, and diverters for birds if needed	Collision risk with OHLs (Overhead Power Line)	**Negligible Adverse - Minor Adverse**
• **Bats**			
Collision risk with turbine blades	Post Construction monitoring. Targeted turbine shutdown during certain weather conditions (See Mitigation Measures, *Chapter 6*).	Reduced collision risk with turbine blades	**Minor Adverse – Significant Adverse**

LANDSCAPE AND VISUAL IMPACT			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Effects on Landscape Character Change to the landscape character of the site and its immediate surroundings due to the introduction of the tall industrial structures in the rural and predominantly high lying, open landscape.	Turbine layout designed to take account of landscape features. Turbines to be a colour which is unobtrusive in the landscape, using a neutral matt colour. Corporate logos, lettering and motifs to be avoided.	The turbines and electricity pylons would introduce modern dominant elements to the landscape which would contrast with the character of the rural landscape and become the dominant feature and characteristic of the landscape.	**Minor Adverse – Moderate Adverse**
Visual Impacts on views from villages and hamlets Operational phase would see the introduction of large scale features that, from certain locations, would occupy a large proportion of the view from residential properties. Properties on the edge of villages will have views of wind turbines in the development area and potential views of the electricity pylons depending on orientation and location of receptor within a given settlement.	All planting to comprise native plant species to reflect the local landscape character. Turbines to be a colour which is unobtrusive, such as a neutral matt colour (pale grey) to blend with the muted colours of the surrounding landscape and predominant sky colours. Corporate logos, lettering and motifs to be avoided.	Residual impact varies according to receptor location and perception; most significant visual impact experienced by receptors on edge of village settlements toward development, within the immediate area including receptors within; Turbe, Ovčarevo, Paklarevo, Galica	**Minor Adverse – Moderate Adverse (dependent on settlement location, orientation and perception)** Most significant effects are likely by settlements Turbe, Ovčarevo, Paklarevo, Galica
Visual impacts on views of vehicle travellers Including numerous locations throughout the study area often associated with locations between villages and settlements from varying hierarchy of roads/lanes and tracks in the area.	The application of a programme of advanced mitigation planting by roads. All planting should comprise native plant species to reflect the local landscape character. Turbines to be a colour which is unobtrusive, such as a neutral matt colour (pale grey) to blend with the muted colours of the surrounding landscape. Corporate logos, lettering and motifs to be avoided.	Views from main M5 highway would be limited to vehicle travellers travelling east westwards towards the development. Views would be fleeting due to speed of travel and intervening vegetation alongside the road. Views from village link roads would be restricted to a limited number of road sections and direction of vehicle travellers. Views from tracks between villages within close proximity of the development would be most severely affected; however these are infrequently used.	**Minor Adverse - Moderate Adverse** Most significant effects are likely by settlements Travnik and Turbe
Visual impact on views associated with people who are working	The proposed turbines will be a colour which is unobtrusive in the landscape.	Visual impact on views associated with people who are working. Impact on views	**Minor Adverse - Moderate Adverse**

	Masts will be finished using a neutral matt colour such as a pale grey to blend with the muted colours of the surrounding landscape and predominant sky colours. Corporate logos, lettering and motifs will be avoided.	would vary according to distance of the worker from site and their work activity.	Most significant effects are likely by settlements Travnik, Turbe, Ovčarevo, Paklarevo, Galica and Šišava

TRAFFIC AND TRANSPORT			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Increased heavy vehicles traffic both locally and nationally, leading to congestion, damage to roadways	Restricting delivery hours to reduce noise nuisance; avoid heavy truck movements in the night hours. Considering whether deliveries should be scheduled to avoid peak times to reduce congestion.	The traffic has the potential to contribute to congestion and lead to complaints due to noise/vibration nuisance on a local basis.	**Negligible Adverse**

NOISE			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Noise from wind farm operation at receptors outside the site – Levels below permitted values, but increases in noise expected.	None required as below permitted levels.	Noise levels at receptors outside the site below permitted values, but increases in noise expected.	**Minor Adverse**
The mountain lodge „Devečani“, will experience noise levels that are above permitted values. Mountain lodge is occasionally in use, mostly weekends and holidays.	To monitor levels and to take remedial action (e.g. by modifying turbine speeds) should the noise levels cause significant complaint.	The mountain lodge „Devečani“, will experience noise levels that are above permitted values.	**Moderate Adverse**

SOCIO-ECONOMIC IMPACTS
IMPACTS TO LAND USE

Impact	Proposed Mitigation Measure	Residual Impact	Residual Impact Rating
Reduction in land available for sheep grazing. The total amount of land which will be occupied during construction is approx. 0,015 km2. (of which approx. 0,005 km2 only until decommissioning).	Compensation for privately owned land will be undertaken during the construction phase	Approx. 0,01 km^2 of land will remain permanently unavailable for sheep grazing	**Negligible Adverse**
Imposition of minor use restrictions on land available for sheep grazing	Confine use restrictions only to areas needed for the safe operation of wind farms and easy access for repairs and maintenance.	Imposition of minor use restrictions on land available for sheep grazing	**Negligible Adverse**
EMPLOYMENT AND PROCUREMENT OPPORTUNITIES			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Creation of direct employment opportunities Approximately 5 individuals (a few local and international, but mostly national) will be contracted by EP BiH during the operational phase of the project.	Put in place transparent and fair recruitment procedures.	Creation of direct employment opportunities for approximately 5 individuals	**Negligible Beneficial**
Creation of indirect employment opportunities, associated with: • the project's supply chain • spending of project employees in local communities	Procure goods and services locally wherever possible	Creation of indirect employment opportunities, associated with: • the project's supply chain • spending of project employees in loc communities.	**Negligible Beneficial**
IMPACTS ON LIVELIHOODS			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**

Economic hardship. Persons who are using the land plots which will be crossed during repairs of WTGs may be economically displaced if their income from livestock are affected.	Minimise the amount of land occupied / disrupted during repairs Compensate all users of land for lost income from livestock and any other damages at full replacement value, in accordance with the Federal BiH Law on Expropriation Fully reinstate the land after disruption Implement a grievance mechanism	No impact	**No impact**
REVENUE GENERATION FOR THE LOCAL GOVERNMENT / COMMUNITY			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Increased revenue for Travnik Municipality due to payment of fee which can be used for community benefit schemes	Ensure all payments are made in a timely and transparent manner.	Increased revenue for Travnik Municipality due to payment of fee which can be used for community benefit schemes	**Minor beneficial**
Enhanced tourism opportunities for local communities due to interest in turbine development	Support tourism related initiatives from local communities through the EP BiH	Local economic development	**Minor Beneficial**
EP BiHs presence in the Travnik Municipality may attract foreign and domestic investments in the municipality and the wider area	Continued support and lobbying for investments in the project area	Local economic development	**Moderate Beneficial - Minor Beneficial**

IMPACTS ON INFRASTRUCTURE			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Improved access to pastural plots as a result of regular maintenance of access tracks needed to access WTGs for repairs and maintenance	Regular maintenance of access tracks	Improved access to pastural plots as a result of regular maintenance of access tracks needed to access WTGs for repairs and maintenance.	**Minor Beneficial**

HEALTH, SAFETY AND PUBLIC NUISANCE			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Industrial accidents associated with the operation of the wind farm. Potential for serious	Implementation of an appropriate health	Minimal risk of serious accident	**Minor Adverse**

injury or death, particularly associated with falls from height and electrocution.	and safety management system for all personnel on site.		
Accidents associated with traffic, both on and off site associated with both workers and members of the public.	Accidents associated with traffic are not acceptable and all efforts will be made to prevent them. This will include implementation of traffic management plan. This includes ensuring vehicles are driven within speed limits and with care on public roads, as well as on site.	No impacts	**No impacts**
Risks to the public and also workers associated with unauthorised site access. Risk of injury to those entering the site unauthorised and also risks to workers as a result of the unauthorised access.	Implementation of appropriate signage and site security.	No impacts	**No impacts**

GROUND AND WATER			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Accidental release of fuels, oils, chemicals, hazardous materials, etc., to the ground, groundwater and/or surface water.	Appropriate procedures and protocols to be established and monitored for materials delivery and handling	Accidental release during delivery of materials to the site leading to contamination of water	**Minor adverse**
Accidental discharge of sanitary wastewater to ground, groundwater and/or surface water.	Measures to be in place to prevent accidental releases including locating waste water management systems away from open water and assurance that appropriate containment both primary and secondary is in place.	None	**No impact**

ELECTRIC AND MAGNETIC FIELDS			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Perception that electric and magnetic fields could cause health impacts. Evidence suggests that this is only possible with very high exposure levels.	Location of the electric and magnetic sources are not situated adjacent to public residences.	Whilst there is no actual effect from electromagnetic influences, there may still remain a perception that this is the case.	**Negligible**

ELECTROMAGENTIC INTERFERENCE			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Potential for disruption of aviation radar and radio systems	Wind farm situated away from main airport and flight paths	None	**No impact**
Potential for disruption of public telecommunications	Situation and design (including materials design) to minimise disruption. Relevant authorities stated that no disruptions are expected.	None	**No impact**

1.4 Summary of Decommissioning Phase Impacts and Mitigation Measures

Ecology & Nature Conservation: Habitats			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Ecology & Nature Conservation: Fauna			
• **Birds**			
Disturbance to breeding birds during decommissioning.	Clearing of vegetation conducted out of the breeding season.	Breeding birds within the work area will not be disturbed.	**No impact**
Displacement of bird during deconstruction.	No mitigation proposed. However, abundant alternative habitat is available, including the habitat created during construction.	Displacement of bird during deconstruction.	**Negligible Adverse - Minor Adverse**
• **Bats**			
Noise, vibration and light disturbance to roosting, commuting and foraging bats.	Minimise construction work between dusk and dawn. Restrict artificial lighting to required areas only.	Noise, vibration and light disturbance to roosting, commuting and foraging bats.	**Negligible Adverse**

LANDSCAPE AND VISUAL IMPACT			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Landscape would be restored to existing condition	None	**No change *compared with the baseline conditions*** once the site has been fully and successfully restored thus reverting back to its pre-existing baseline condition.	**No impact**

TRAFFIC AND TRANSPORT			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Increased heavy vehicles traffic both locally and nationally	Traffic management and site access to avoid built up areas or areas where traffic may cause nuisance or disruption. Restricting delivery hours to reduce noise	The traffic has the potential to contribute to congestion and lead to complaints due to noise/vibration nuisance on a local basis.	**Minor Adverse**

	nuisance; avoid heavy truck movements in the night hours Considering whether deliveries should be scheduled to avoid peak times to reduce congestion. Heavy construction traffic will be subject to a traffic management plan, as necessary.		

NOISE			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Noise from decommissioning of wind turbines – Potential adverse impact from removing parts of turbine foundations.	Use Best Practicable Means.	Noise from decommissioning of wind turbines	**No impact**
Noise from decommissioning traffic - Potential for minor adverse noise and vibration impacts.	Traffic management procedure.	Noise/vibration increases at residential properties in proximity to the chosen access routes.	**Minor Adverse**

SOCIO-ECONOMIC IMPACTS			
IMPACTS TO LAND USE			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Increase in land available for sheep grazing use and no more use restrictions on land. Upon dismantling of WTGs, another 0,005 km2 (out of 0,015 km2) will become available for sheep grazing use. At the same time, use restrictions which existed on 0,02 km2. of land will cease to exist.	None	Increase in land available for sheep grazing use and no more use restrictions on land. Upon dismantling of WTGs, another 0,005 km2 (out of 0,015 km2) will become available for sheep grazing use. At the same time, use restrictions which existed on 0,02 km2. of land will cease to exist.	**Minor Beneficial**
EMPLOYMENT AND PROCUREMENT OPPORTUNITIES			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
The dismantling of WTGs, disposal of materials and reinstatement of land will generate some direct and indirect	Same as for construction impacts	Employment for local people.	**Minor Beneficial**

employment opportunities. A part of those opportunities will be available for local people.			
IMPACTS ON LIVELIHOODS			
Impact	**Proposed Mitigation Measure**	**Residual Impact**	**Residual Impact Rating**
Economic hardship. Persons who are using the land plots which may be crossed during dismantling and transport of WTGs and site clearance, may be economically displaced if their incom from livestock is affected.	Same as for construction impacts	Economic hardship. Persons who are using the land plots which may be crossed during dismantling and transport of WTGs and site clearance, may be economically displaced if their incom from livestock is affected	**Minor adverse**
Restoration of private ownership over land on which WTGs were constructed Owners of land and/or their escendants will have the possibility to regain full ownership of land after decommissioning of WTGs for a fee in accordance with the Federal BiH Law on Expropriation	This provision should be included in the lease contracts signed between EP BiH and the owners and registered with the courts.	None.	**No impact**

HEALTH, SAFETY AND PUBLIC NUISANCE			
Impact	**Proposed MitigationMeasure**	**Residual Impact**	**Residual Impact Rating**
Industrial accidents associated with the decommissioning of the wind farm. Potential for serious injury or death, particularly associated with falls from height and electrocution.	Implementation of an appropriate health and safety management system for all personnel on site.	Risk of serious accident due to industrial accidents.	**Minor Adverse**
Accidents associated with decommissioning traffic, both on and off site associated with both workers and members of the public.	Implementation of traffic management plan. This includes ensuring vehicles are driven within speed limits and with care on public roads, as well as on site.	None	**No impact**
Risks to the public and also workers associated with unauthorised site	Implementation of appropriate signage and site security.	None	**No impact**

access. Risk of injury to those entering the site unauthorised and also risks to workers as a result of the unauthorised access.			

Appendix 14.8

Photodocumentation of the Study Area

Figure 1. View of Paklarske stijene

Figure 2. View from Devečanske stijene

Figure 3. View of Vlašić plateau (Devečani)

Figure 4. Grazing common in Vlašić....

Figure 5. Road to Galica

Figure 6. View of the villages at the foot of the Vlašić plateau, Turbe and Varošluk

Figure 7. View from the Vlašić mountain on Lašva valley

Figure 8. View of Devečanske and Paklarske stijene from the village Paklarevo

Figure 9. Vlašić plateau, above Devečani (concession area)

Figure 10. Relay on Vlašić (view of the Vlašić peak, above Devečani, Paljenik 1.943,00 m a.s.l.)

Figure 11. Galica on Vlašić

Figure 12. View of Mrazišće and Galica

Figure 13. Devečani plane on Vlašić (view from the relay)

Figure 14. Galica on Vlašić

Figure 15. View from Galica to Paljenik

Figure 16. View from Galica to Devečani plateau

Figure 17. View from Devečani plateau on Lašva valley

Figure 18. Devečani plateau

Figure 19. Vlašić plateau (Devečani)

Figure 20. And another view of Devečani plateau

Figure 21. View from Paljenik (below the relay)

Figure 22. Paklarske stijene

Appendix 14.9

Landscape Assessment Methodology

1. Landscape

1.1 Assessment methodology

The first stage in the assessment established the existing character and value of the landscape in the study area. This included an assessment of landform, land cover, seasonal and permanent habitat value and historical and cultural heritage. Based on this information, determined through desktop studies, examination of topographic map data and site surveys, the land was divided into areas of distinct, recognizable and common character called landscape character areas (LCA).

Landscape character is the result of interactions between different elements such as geology, soils, vegetation, and cultural and historical and current human influences that are unique to different areas.

The desktop study undertaken included a review of relevant planning policies and an initial desk-based mapping exercise was carried out to identify landscape character areas within the 5 km radius study area.

Field assessment was carried out between November 2014. and November 2015. to confirm and verify the broad character areas identified through the desk study.

Assessment of Effects on Landscape Character: Methodology

Landscape effects are derived from physical changes to the landscape that may cause a change in character and how the landscape is experienced and valued.

The significance of effects on landscape character is the result of a combination of magnitude of change and the sensitivity of the landscape to accept the change that is predicted to occur.

Through an assessment of sensitivity and magnitude of effects on landscape character, judgments were made as to whether the effects, as a result of the introduction of a wind farm, are significant or not significant, as follows below.

Sensitivity of Landscape Character

Landscape sensitivity can be described as the extent to which the character of a landscape is able to accommodate change. Key landscape attributes that are likely to influence the sensitivity of a given landscape to wind farm development include:

- ***Scale and enclosure***: Includes the assessment of landscape size and breadth of views i.e. whether the landscape is open or enclosed, or views are close, medium or long range. An assessment of the size of the landscape and elements within it such as tree cover or man made elements such as houses or pylons provides an understanding of how large structures such as turbines might appear in relation to their landscape;
- ***Complexity & Order***: The understanding of the complexity of a landscape, whether it has a simple composition, such as open moorland or complex composition: such as a rugged landscape that contains many peaks or a mosaic of land use. These elements

can help to determine how development will relate or contrast with its character. A wind farm development is more likely to be accommodated within landscapes that contain simple lines than a complex landscape containing many components;

- ***Manmade Influence:*** Turbines are likely to relate well to landscapes that contain other existing, large-scale elements such as buildings and especially where there is an existing vertical emphasis, such as silos, chimneys, towers or cranes. Although an extensive mix or overlapping of different vertical elements may lead to visual confusion. Wind farm development may also relate to working landscapes such as intensively managed farmlands or afforested areas;
- ***Skyline***: The skyline can determine how the turbines relate or contrast with its character i.e. whether the turbines would be viewed against the presence of existing vertical structures or against a simple, empty horizon. In a landscape where there are few vertical elements, the turbines may form a focal point in the landscape, contrasting with the horizontal lines of the horizon and therefore may be an appropriate addition to the character of the landscape in which it is viewed. In contrast, in or within a landscape that contains many existing vertical elements, the turbines may increase the sense of clutter and visual confusion and therefore may have a negative impact on landscape character;
- ***Remoteness and Tranquility***: Introduction of turbines will not only result in physical effects on the landscape, but together with the movement of blades and noise may impact on the perceived sense of remoteness and tranquility within a particular landscape;
- ***Visual Sensitivity:*** Influenced by landform, tree/woodland and building cover, the number and type of people likely to perceive any change and potential for any mitigation measure;
- ***Visual Interruption:*** Views towards turbines may be contained by landform and from natural and manmade features, which impact on the sensitivity of a particular landscape;
- ***Quality***: Influenced by the quality of the existing landscape in terms of its physical state, its intactness and its ability to repair after loss;
- ***Value***: The value attributed to the landscape is an important factor to be considered when assessing the sensitivity of a given landscape. This has been derived through the application of the topographic map landscape assessment and classification. In applying the topographic map, as described in the chapter above, the landscape can be classified into individual character areas with each valued by applying the following criteria:

  Outstanding: Landscapes, which are outstanding by nature of their scenic quality, which are aesthetically pleasing with a strong sense of place. They may also contain sites of historic, cultural geological or natural habitat importance. These areas may be of national or international importance.

  High: Landscape with scenes of picturesque quality, which are aesthetically pleasing. They may also contain rare or historic features have some notable cultural association, important geological features or contain a large proportion

of high quality habitats. These landscapes may be of regional or county importance.

Moderate: Landscapes with scenes of picturesque quality, which are aesthetically pleasing. Some characteristic features remain unaffected but others are fragmented and/or spoilt. Area may contain a network of habitats (e.g. Local Nature Reserve); historic or geological features. These areas may be of local importance.

Low: Landscapes with limited aesthetically pleasing scenes. Few characteristics remain unaffected and may be highly fragmented or spoilt. Very little coherent character and a weak sense of place. Historic and geological features, cultural associations and habitats of overall little or no importance.

Magnitude of Change on Landscape Character

The magnitude of change on landscape character is the degree of change that will result through the introduction of the wind farm development and will be dependent on a number of factors, including:

- The degree to which the elements that determine the landscape character of an area will be altered by the wind farm development. Generally the magnitude of change will be higher if the existing elements within the landscape are removed or significantly altered.
- The number of turbines and their prominence within the view. The greater the number of turbines visible or prominent, generally the greater the magnitude of change.
- Whether effects are "direct" or "indirect". A "direct" effect can be described as an effect that would be attributed to the wind farm itself, including both physical effects and visual effects. An "indirect" effect can be defined as a secondary effect that cannot be directly attributed to the wind farm itself, but arises as a consequence of its development.
- The distance between the wind farm and the specific landscape character area. Generally at greater distances the magnitude of change is lower.

For the purpose of clarity within the assessment, the magnitude of change on landscape character is classified as follows:

- ***High Magnitude***: The wind farm will be immediately apparent and will result in substantial loss or major alteration to key elements of the landscape resource to the extent that there is a fundamental change to landscape character.
- ***Medium Magnitude***: The wind farm will be apparent and will result in loss or alteration to key elements of the landscape resource to the extent that there is a partial or visible change to landscape character.
- ***Low Magnitude***: The wind farm will be a minor element and will result in minor loss or alteration to key elements of the landscape resource to the extent that may be some slight perception of change to landscape character.

- ***Negligible Magnitude***: The wind farm will not be visible and will result in very minor loss or alteration to key elements of the landscape resource and there will be no fundamental change to landscape character.

Significance of Effects on Landscape Character

The assessment of significance of effects is based upon whether effects are major, high moderate, moderate, minor or minor-negligible, which is determined through the correlation between the points considered within the sensitivity appraisal (*The sensitivity of the landscape character*) and the factors that influence the magnitude of change upon it (*Magnitude of Change on Landscape Character*). From this, conclusions can be drawn as to whether effects on landscape character are either significant or not significant.

- ***Major***: (i) If the development will result in the loss (or creation) of a considerable number of existing positive features (or the extent of these), which contribute to the landscape character or quality of the character area, e.g. hedgerows or mature trees or buildings of local character to the extent that the quality of the Landscape Character Area (LCA), will be reduced (or increased); (ii) If the development will have detracting (orenhancing) effect upon the distinctive and valued landscape characteristics of the LCA; (iii) If the development will cause the loss (orcreation) of a landscape type which is scarce in the regional or national context; and/or (iv) If the LCA is highly sensitive and the magnitude of the impact is high.
- ***High-Moderate***: If the development will result in some loss (or creation) of landscape features, which contribute to the existing landscape character or quality, leading to some loss of integrity.
- ***Moderate***: If the development will result in some loss (or creation) of landscape features, which contribute to the existing landscape character or quality, but the overall integrity of the LCA is maintained.
- ***Minor***: If the development could be integrated within the existing landscape without the loss of essential features which contribute to landscape character and quality.
- ***Minor-negligible***: If the development could be integrated into the existing landscape eather without having a material adverse effect or, conversely, by having an enhancing effect upon the distinctive and valued landscape characteristics of the LCA.

Significant effects occur when effects on the character of the landscape are to the degree that landscape character is subsequently defined or considerably influenced by the presence of the wind farm development.

Effects are defined as not significant when changes to the character of the landscape are to a degree that its existing baseline characteristics rather than the proposed wind farm subsequently define the landscape character.

Assessment of Effects on Visual Amenity: Methodology

Impacts on visual amenity relate to changes in the composition of views and people's responses to these changes, as a result, effects of wind farm development can be perceived as being either adverse, neutral or positive depending on whether or not individuals are disposed towards wind farm development. It is evident from research and publications on public attitudes that opinions vary greatly, ranging from strongly adverse to strongly positive, depending on the type and nature of effects and individual perceptions. Given this broad school of opinion, definitive judgments as to whether effects are adverse, neutral or positive are not made within the visual assessment.

A total of 18 viewpoints[1] were selected from within the 5 km study area to represent various receptor groups. These included locations frequented by members of the public such as settlements and dwellings, important roadways, public rights of way, picnic areas and popular viewpoints.

To assist in the selection of viewpoints and to aid the assessment of visual impacts within the study area a Zone of Theoretical Visibility (ZTV) was produced to establish where all, or part of the site and proposed turbines, are likely to be visible from. A ZTV is a map of where and how many wind turbines will theoretically be visible from all parts of the study area. It is used for the visual impact assessment because the turbines will be the most visible element of the proposed wind farm development, particularly during the operational period.

A study area of 5 km, from the outer-most turbines was considered to be appropriate for this assessment, as visual impacts at a distance greater than this were considered to be not significant, given the topography of the landscape.

Through the assessment of sensitivity and magnitude of effects on visual amenity, judgments were made as to whether the effects, as a result of the introduction of a wind farm, were significant or not significant.

Sensitivity of Effects on Visual Amenity

The sensitivity of the viewpoint is dependent of a number of factors that includes the importance of the view, the value of the view and the nature of the receptor experiencing the view. The importance of the view will be predominately greater and therefore of greater sensitivity from locations that are frequented by a large number of people, from a recognized tourist location, facility or route, such as footpaths, holiday routes, or visitor centre.

Attractive views with scenic qualities will predominately have a greater value and sensitivity than a view that may contain detracting elements. Value may also be increased from viewpoints that are within a designated landscape such as a protected area.

[1] *In BiH there are no institutions that are responsible for the determination of characteristic points of the landscape assessment. Therefore, the designer of the ESIA, has determined the characteristic view points of the landscape, based on his own experience.*

For the purpose of clarity within the assessment, the sensitivity of effects on visual amenity is classified as follows:

- ***High Sensitivity***: Residents where their main view is orientated towards the development or people undertaking recreation where the landscape within which the development is seen as the primary reason for attraction (e.g. walkers, hikers, horse riders, cyclists, scenic route users). Receptors are more likely to be within a recognised designated landscape and could be attracted to visit more frequently, or stay for longer by virtue of the view.
- ***Medium Sensitivity***: Outdoor workers (farm and forest workers etc.) and people undertaking recreational pursuits where the landscape within which the development is seen as not the primary reason for attraction (e.g. golfers, water based activities, theme and adventure parks, historic sites, park sand gardens, minor road users). Residents with indirect or secondary views towards the development. Receptors are less likely to be within a recognised designated landscape and could be attracted to visit more frequently or stay for longer by virtue of the facilities and features of the particular attraction.
- ***Low Sensitivity:*** People travelling through the landscape (by car, train, bus etc). Users of indoor work places and indoor community facilities. Receptorsare unlikely to be within a recognised designated landscape and are most likely to be present at a given viewpoint by virtue of some other need or necessity unrelated to the landscape.

Magnitude of Effects on Visual Amenity

The magnitude of change relates to the scale of change to the view that will result following the construction of the wind farm. The magnitude of change depends on a number of variables, which include:

- The distance between the receptor and the wind farm. In general terms the greater the distance, the lower the magnitude of change, as the wind farm will become less evident or significant within the view.
- The number of turbines and extent of the wind farm that will be visible. Predominately the fewer turbines that are visible, the less the magnitude of effect.
- The proportion of the view that is affected by the wind farm. If the extent of the view is occupied by turbines then the magnitude of effects are likely to be higher than if turbines are visible within only a small proportion of the view.
- The scale and character of the landscape in which the wind farm will be viewed. Effects may be greater in an intimate, small-scale landscape where the turbines are dominant within the landscape as opposed to a simple, large scale landscape where the turbines may be viewed at a more appropriate scale.
- Duration and number of views available. If the viewer is travelling through the landscape, where views are limited or restricted to brief glimpses in duration, then the magnitude of effects of visual amenity is likely to be reduced.

For the purpose of clarity within the assessment, the magnitude of effects on visual amenity is classified as follows:

- ***High Magnitude***: Where the development results in a consequential or dominant and immediately apparent feature of the view that affects and changes the overall character of the view and to which other features become subordinate.
- ***Medium Magnitude***: Where the development forms a visible and recognisable new element within the overall view and is readily noticed by the viewer without changing the overall nature of the view.
- ***Low Magnitude***: The development will constitute an inconsequential component of the wider view, which might be missed by the casual observer. Awareness of the development will not have a marked effect on the overall quality of the view.
- ***Negligible Magnitude***: The development will be barely perceptible or imperceptible and will have no marked effect on the overall quality of the view.

Significance of Effects on Visual Amenity

The assessment of significance of effects is determined through the correlation between the points considered within the sensitivity appraisal and the factors that influence the magnitude of change upon it.

Significant effects occur where the relationship of sensitivity and magnitude results in the wind farm affecting the view experience to the degree that visual amenity is subsequently defined or considerably influenced by the presence of the wind farm development.

Effects are defined as not significant where the relationship of sensitivity and magnitude results in changes to the view experience to the degree that visual amenity is not subsequently defined by the turbines, but is principally defined by the baseline elements within the view. From these locations the Wind Farm may affect the appearance of the view, though it will not define the view.

Appendix 14.10

Noise Assessment

1. NOISE

1.1 Noise

Noise generated by operational wind turbines (WT) can be one of the main environmental constraints related to wind farm operation . During operation noise from wind turbines is created as a result of air flow around the blades and tower (aerodynamic noise) as the blades rotate and also as a result of gear movement (mechanical noise). The intensity of noise generated during operation of wind turbine generators depends on:

- design and size of the turbine;
- wind speed;
- distance from the machine;
- noise in the environment (background noise).

Modern wind turbines such as the proposed Gamesa G114 – 2.5, have vastly improved in terms of noise generation. Mechanical noise resulting from wind turbine operation mainly has low frequencies from 20 Hz (noise from gears and other slowly rotating equipment) to 100 Hz (noise of electrical devices). With the distance from the wind turbines, the noise intensity decreases.. Additional noise impacts may arise if the noise is from the wind power plants is of tonal character, i.e. if the noise emission is intensive at discrete frequencies. The proposed wind turbine, Gamesa G114 – 2.5, includesan integrated active suspension system which reducesnoise and vibrations to minimal levels. In some cases where these is a "buzz" being generated fromwind turbines it becomes necessary to install new, more efficient and quieter gearboxes and reducers, which in some cases is a more expensive technical solution. Passive damping systems to reduce the noise of the wind turbines have a limiting efficiency. They operate only at certain frequencies, and this is their greatest weakness because modern wind energy converters are constantly changing their revs according to the wind speed, and thus changes the noise level, as well as its frequency.

General noise attenuation is shown in *Figure 1.* Where there is more than one turbine (as in WF Vlasic)the cumulative effect of several turbines has been taken into consideration.

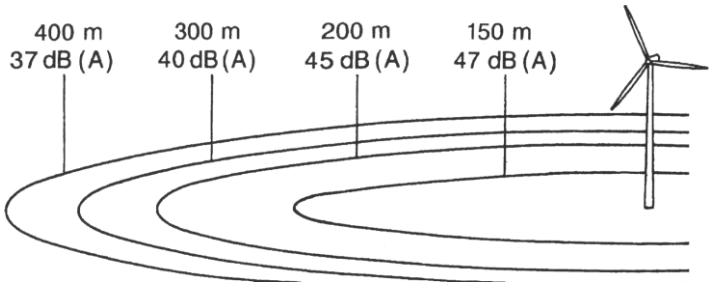


Figure 1: Sound intensity of the wind turbine at various distances from the WT tower in dB

According to the manufacturer's data, Gamesa G114 – 2.5 wind turbines, have noise emission from 97 dBA at wind speeds of 4 m/s, and from 106.5 dBA at speeds of 11 m/s. *Figure 2* is acomparative review of the various noise sources and their power for comparing the said values.

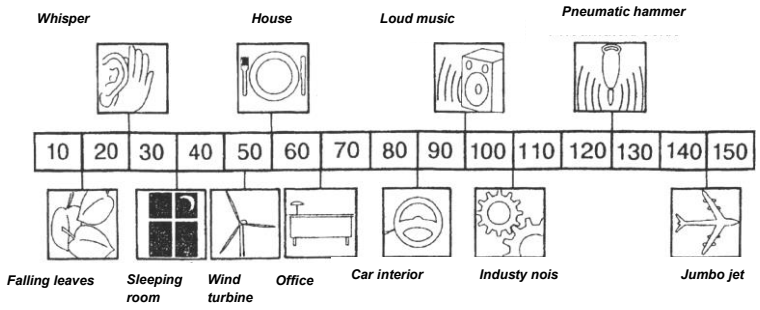


Figure2: The relative ratio of sound intensity from various sources in dB

The main characteristics of wind turbines and noise emissions

For the purpose of this assessment the turbine model Gamesa G114–2.5 has been selected based on the conclusions of the Bankable study, the noise and flicker analyses and the collision analysis performed in the birds and bats study.

The basic characteristics of the proposed wind turbines are given in the table below.

Table 1: Characteristics of the proposed wind turbines

Characteristics of wind turbines	Gamesa G114 – 2.5
Number of rotor blades	3
Maximum width of the rotor blade (m)	3.86
Angle of rotation (degrees)	0-90
The outer radius of the rotor (m)	114
Maximum speed of the rotor (rpm, U/min)	14.6
Number of wind turbines	18

Table 2 below sets out the geographical coordinates for the turbines within layout 4 (L4) which is for the wind turbine model Gamesa G114-2.5. Within the overarching noise assessment that was carried out for all turbine options, there was a total of 12 layouts that were analysed.

Table 2: Geographical coordinates of L4 proposal with 18 wind turbines

Layout L4							
		UTM (north)-WGS84 Zone:33		Geo [deg, min, sec]		Balkans MGI Zone 6	
WTG No	Z	Easting	Northing	Longitude	Latitude	Easting	Northing
1	1750.8	711206	4905566	17°38'47.29"	44°16'21.64"	6472182	4903195
2	1754.2	710905	4905754	17°38'34.01"	44°16'28.06"	6471888	4903394
3	1796.7	709733	4906460	17°37'42.18"	44°16'52.12"	6470742	4904142
4	1875	710500	4907200	17°38'17.84"	44°17'15.29"	6471536	4904853
5	1770.4	709028	4907740	17°37'12.29"	44°17'34.30"	6470085	4905446
6	1798.6	709504	4906730	17°37'32.28"	44°17'01.11"	6470524	4904420
7	1764.5	710583	4905918	17°38'19.71"	44°16'33.72"	6471572	4903570
8	1766.8	710125	4905818	17°37'58.95"	44°16'30.95"	6471111	4903487
9	1797	710056	4906223	17°37'56.43"	44°16'44.13"	6471057	4903894
10	1840	710800	4906925	17°38'30.96"	44°17'06.08"	6471826	4904568
11	1818.3	709775	4907525	17°37'45.63"	44°17'26.57"	6470823	4905205
12	1810	710575	4906350	17°38'19.99"	44°16'47.70"	6471580	4904001
13	1775	711163	4906278	17°38'46.40"	44°16'44.75"	6472165	4903908
14	1766.3	709245	4906989	17°37'20.96"	44°17'09.76"	6470274	4904688
15	1826.3	710025	4907000	17°37'56.14"	44°17'09.31"	6471054	4904671
16	1767.5	711175	4906725	17°38'47.57"	44°16'59.21"	6472193	4904354
17	1776.4	709402	4907630	17°37'28.95"	44°17'30.34"	6470454	4905323
18	1835	710235	4906711	17°38'05.17"	44°16'59.75"	6471253	4904375

Methodology for analysis of the proposed variants was made based on the noise level reduction of these wind turbines with distance, and the cumulative effect of more wind turbines within the Wind Farm. Analysis of the noise impact on the environment was carried out from two aspects namely: populated zones bordering the wind farm, and impact analysis within the boundaries of the concession area, where the mountain lodge „Devečani“ is located.

Assessment methodology

Baseline noise measurements were taken during periods of the year the when highest noise levels were expected (during summer period when there is less absorprtion of noise in nature). Using the baseline noise levels in addition to the predicted noise emission from wind turbines, a model of noise dispersion was calculated.
Input parameters for noise modeling were taken from the manufacturer based on requirements of IEC 61400-11 ed. 21 (*Wind turbine generator systems – Part 11: Acoustic noise measurement techniques; Second edition, 2002-12*).

Results from modeling were compared against limit values given in Law on noise protection of Federation of Bosnia and Herzegovina, and based on requirements of ISO 9613-2. The modelling was also compared against IFC guidelines.

A number of receptors have been identified for the purpose of this assessment. These are listed in *Table 3* along with the sensitivity of the receptor to noise and the maximum allowable levels (dBA) according to the Law on Noise protection.

Table 3: Noise receptors, their sensitivity and the maximum allowable levels

Noise receptor	Sensitivity to noise	Maximum allowable levels (dBA) (Leq)
1. The tourist zone Babanovac	Medium sensitivity	40 night / 50 day
2. Villages within 5.6 km of the proposed WF	High sensitivity	40 night / 50 day
3. Devečani Mountain lodge	Medium sensitivity	40 night / 50 day

Figure 3: identifies the location of these receptors in relation to the WF Vlasic site.

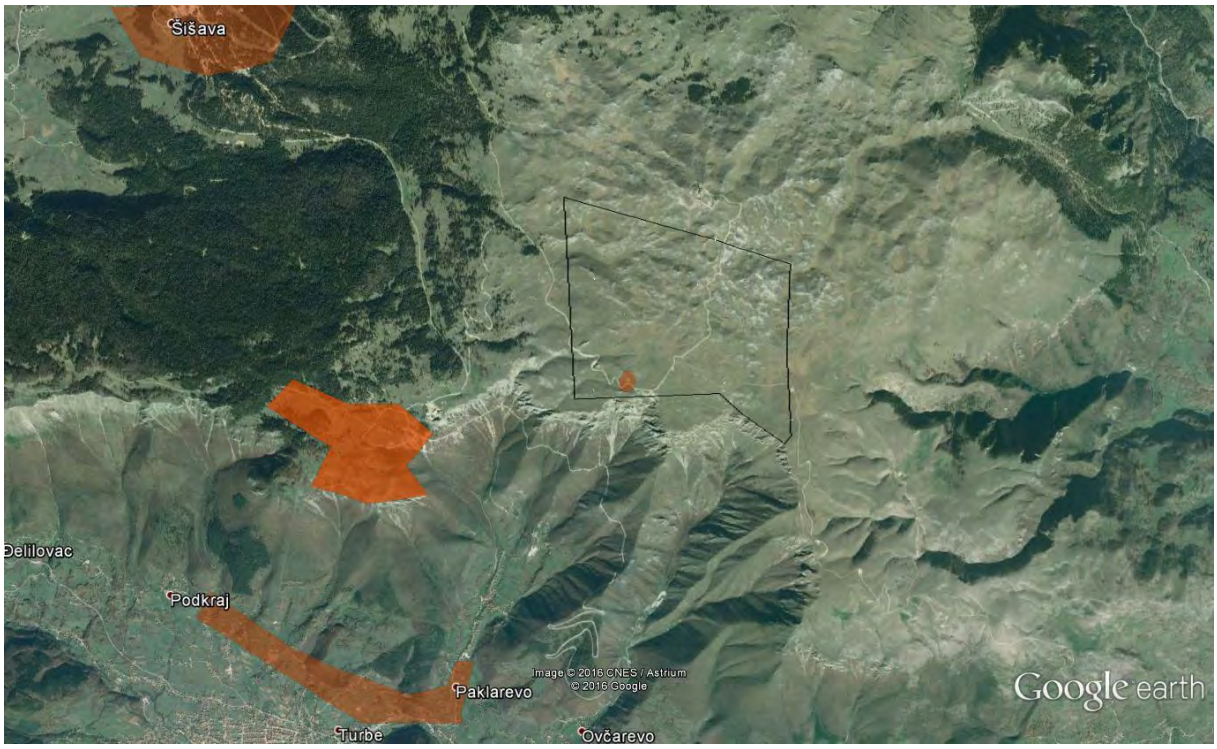


Figure 3 : Noise receptors (2 and 3)

The noise levels for the proposed wind turbines

In order to calculate noise emission levels data from the manufacturer has been used. *Table 4* shows the noise emission levels measured at 10 m height, for different wind speeds.

Table 4: Noise emission according to the manufacturer's data and IEC 61400-11

Wind speed (m/s)	Wind speed at 93.5 (m/s)	Gamesa G114-2.5 Leq (dBA)
4	5.8	97.6
5	7.2	101.9
6	8.7	105.2
7	10.0	106.5
8	11.4	106.5
9	12.9	106.5
10	14.3	106.5
11	15.7	106.5

Description of the methodology used for calculation

This noise impact assessment was completed using SoundPLAN version 7.1 computer noise modelling software which is a widely used product produced by Braunstein & Berndt GmbH, to predict the operational noise impact of each of the alternative turbine types.

Operational wind farm noise levels were predicted for all residential dwellings considered within this assessment using a three-dimensional computer noise model generated in SoundPLAN.

The SoundPLAN model implementation of ISO9613-2:1996 has been tested in-house by SoundPLAN developers to ensure calculated results are within 0.2 dB of the standard. The section below provides details of the implementation of ISO9613-2:1996 within the SoundPLAN modelling software.

Noise Prediction Model Methodology (SoundPLAN Noise Modelling Software)

The ISO9613-2:1996 propagation model predicts sound pressure level at a field point using equation [1]:

$$L_p = L_{Wpoint} + D - A_{div} - A_{atm} - A_{ground} - A_{screen} - A_{misc}$$

whereby:

- L_p is the sound pressure level at a field point;
- L_{wpoint} is the sound power level of a point source;
- D is the directivity index of the source in dB;
- A_n are the attenuation allowances for geometrical divergence, atmospheric absorption,

ground hardness, screening and miscellaneous effects.

L_{wpoint} – Point Source Sound Power Level

Sound power level data measured according to IEC-61400-11 Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques (IEC 61400-11:2006) is used. This data is expressed in terms of A-weighted decibels (dBA), for each integer multiple of the wind speed range of interest in addition to linear 1/3 octave values from 50 Hz to 10 kHz or octave band values from 63 Hz to 8 kHz.

D – Directivity Factor

The directivity factor (D) allows for an adjustment to be made to the radiated sound power level where the source is understood to radiate higher levels of sound in the direction of interest. Accordingly no directivity corrections have been used in our model.

A_{div} – Unidirectional Spherical Divergence

For ISO 9613-2:1996 a turbine is considered to be a point source radiating sound energy in a freefield. As such, sound energy propagating distance (r) will be attenuated according to the following equation:

$A_{div} = 20 \log(r) + 11\ dB$

A_{atm} – Atmospheric Absorption

Sound propagation through the atmosphere is considered to be a diabatic process in that as the wave front propagates outwards from the source, energy is converted to heat. The attenuation provided by this process is largely dependent on the relative humidity and temperature of the air through which the sound propagates.

A_{ground} – Ground Effect

The ISO9613-2:1996 standard describes three distinct ground surface types, namely hard, porous and mixed ground and states the following:

- Hard ground includes paving, water, ice, concrete and all other ground surfaces having a low porosity;
- Porous ground includes ground covered by grass, trees and other vegetation, and all other ground surfaces suitable for growth of vegetables, such as farming land;
- Mixed ground consists of both hard and porous ground.

For the purposes of this assessment the ground factors were assumed to be 0.5.

A_{screen} – Acoustic Screening

No barrier attenuation assumptions have been used within this model. It should be noted that attenuation due to topographic screening is inherently calculated by SoundPLAN from the digital terrain file.

A_{misc} – Miscellaneous Effects

No miscellaneous attenuation effects have been used within this model. Potential noise impacts in-relation to the specific operation of the proposed alternative turbine types have been assessed using this noise modelling software and the results compared to the previously measured background noise levels. The Sound Power Levels provided by the manufacturer of the various wind turbines have been incorporated into the model to show the noise generated from the operation of the wind turbines at increasing wind speeds at the nearest residential properties.

Zero state - measurements of noise levels before building the wind farm

Measurement of background noise is carried out in two locations near the closest wind farm facilities, and for the following parameters:

- noise level (dBA);
- noise level per frequency (dB) - Frequency Analysis;
- measurement of sound pressure;
- measurement of L1 peak level (dBA);
- measurement of wind speed and direction.

Measurement at each monitoring location (*see Figure 4*), has been carried out ten (10) times lasting 15 minutes for thethe summer when conditions for the propagation of noise are the most favorable (because of reduced humidity and lack of noise attenuation from snow). The presented results are given as an average value for all ten (10) measurements.

Simultaneously with measurement of the noise, the measurement of the wind speed and direction was also carried out.

Measurements were conducted in the period from 13/07/ to 27/07/2015.

The measuring equipment used

Norsonic nor 140 sound analyser

- Handheld real-time 1/1- or 1/3-octave frequency analyser;
- Measurement of A -weighted levels simultaneously with either C- or Z-weighted levels;
- Parallel detection of SPL, l_{eq}, L_{min}, L_{max}, LE and L_{peak};
- Measures L_{peak} levels up to 140 dB;
- Parallel detection of F, S and I time constant;
- USB 2.0 and High-speed RS-232 serial interface;
- SD memory card and large high speed internal memory.

Microphone

- Type: 1251;
- Serial Number: 20759; Verification code: 08-547

Calibrator for calibrating the measuring equipment with evidence of traceability:

Type 1251 number 20758, calibrated to 31/12/2016.

Noise levels at the location of mountain lodge were estimated because during the time that the preliminary noise measurements were made it was thought that the lodge would not be used after the wind farm is built.

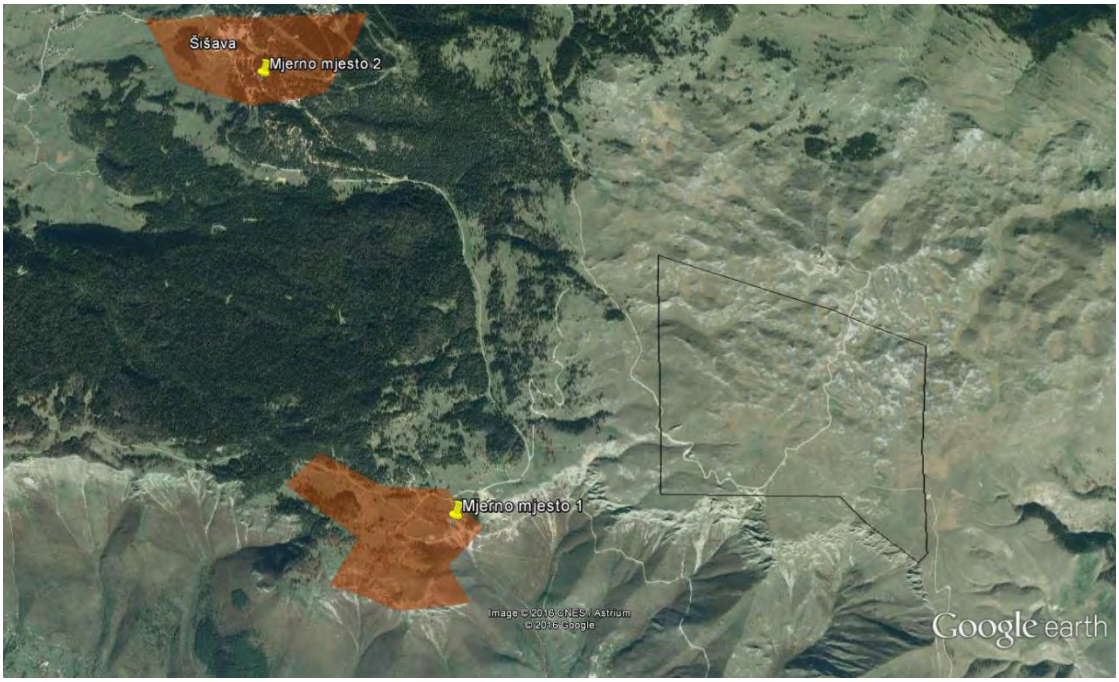


Figure 4: Noise measuring points

Baseline noise measurement results

Measuring point 1 – results of noise measurements

The geographical coordinates of the measuring point:

44°16'22.18"N
17°35'54.46"E

Table 5: The results of noise level measurements at the measurement point 1

Measurement Data : 1	
The file name	100813_0002_GLOBAL
Measured parameters	
Leq [dBA]	**32.3**
LAF(max) [dBA]	**52.4**
LAF(min) [dBA]	**23.7**
Sound pressure level above the specified in % of measurement time	**dBA**
LAF 1%	**41.9**
LAF 5%	**35.4**

LAF 10%	**31.8**
LAF 50%	**27.6**
LAF 90%	**25.3**
LAF 95%	**24.8**
LAF 99%	**24.3**

Measuring point 2 – results of noise measurements

The geographical coordinates of the measuring point:

44°18'30.62"N

17°34'30.88"E

Table 6: The results of noise level measurements at the measurement point 2

Measurement Data: 1	
The file name	**100813_0003_GLOBAL)**
Measured parameters	
Leq [dBA]	**34.0**
LAF(max) [dBA]	**39.8**
LAF(min) [dBA]	**31.0**
Sound pressure level above the specified in % of measurement time	**dBA**
LAF 1%	**37.6**
LAF 5%	**36.7**
LAF 10%	**36.0**
LAF 50%	**33.4**
LAF 90%	**31.8**
LAF 95%	**31.5**
LAF 99%	**31.1**

The calculation results

As noted, a relatively advantageous geographical position in terms of the negative impacts of noise in the endangered zones is shown in *Figure 5*. The favorable location is primarily related to altitude of the Wind Farm compared to much lower populated areas.

According to previous analysis and proposals, generated noise levels of the wind turbine generators are given in accordance with IEC 61400-11 Ed. 21 (Wind turbine generator systems - Part 11: Acoustic noise measurement techniques; Second edition, 2002-12), and certain proposed option can be considered as a source of uniform characteristics.

The following are calculations of noise maps for proposed solution. The maps provide the contributions of the Wind Farm in the case of the wind speed of 8 m/s and if all wind turbine generators are in operation.

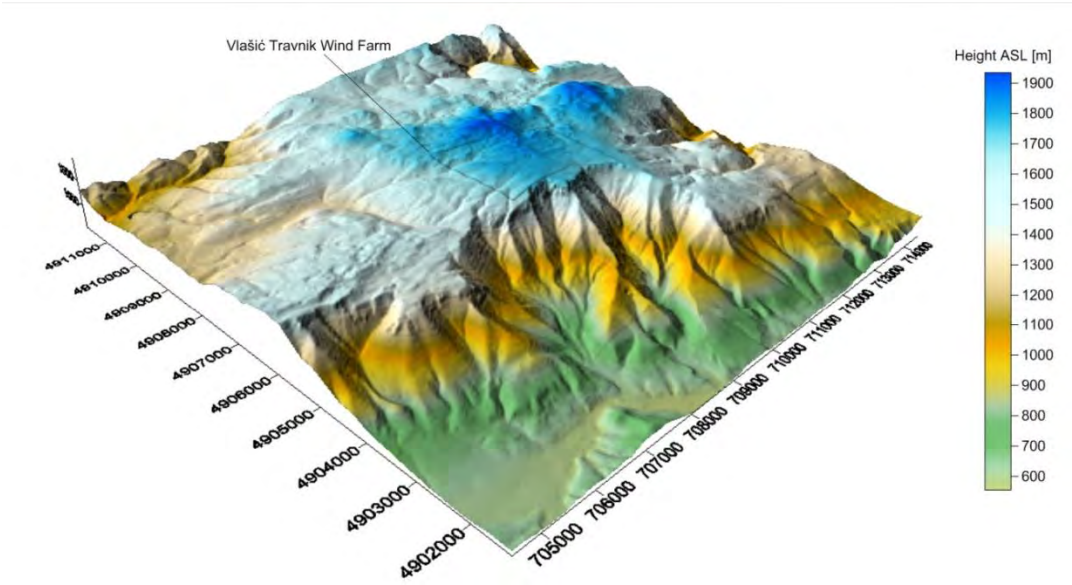


Figure 5: 3D view of the Wind Farm site

Predicted Noise Impact from wind turbines

The predicted noise impact from WF Vlasic is illustrated in *Figure 6.* The top Figure provides a map of the entire Concession area and the impact of the Vlašić Wind Farm on the wider area. The Figure below provides a larger scale noise map for the area of the mountain lodge “Devečani”.

Based on the noise modeling, there will be no influence from noise in the near villages (at identified monitoring locations (Figure 4)).

According to the results, the noise impact on the area of the mountain lodge “Devečani” is estimated at 43.6 dBA.

Results of modeling and noise map for Gamesa G114-2.5

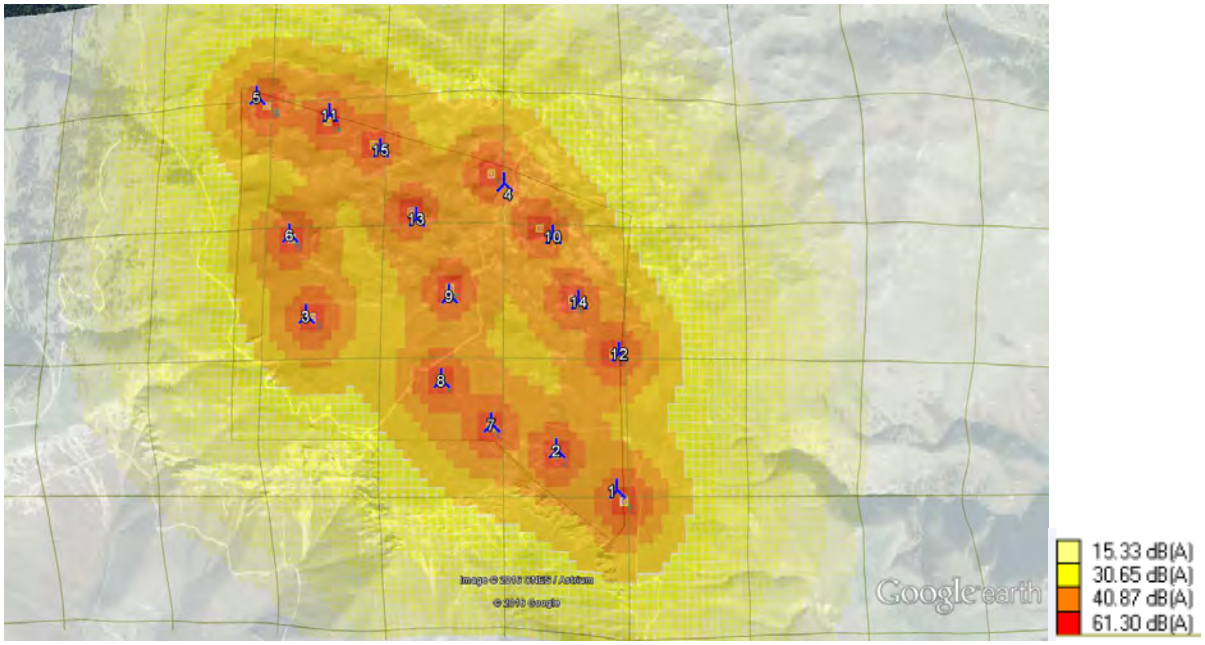


Figure 6 shows turbines 3, 8 an 9 with the noise impact on the lodge area which is identified by the dense orange spot.

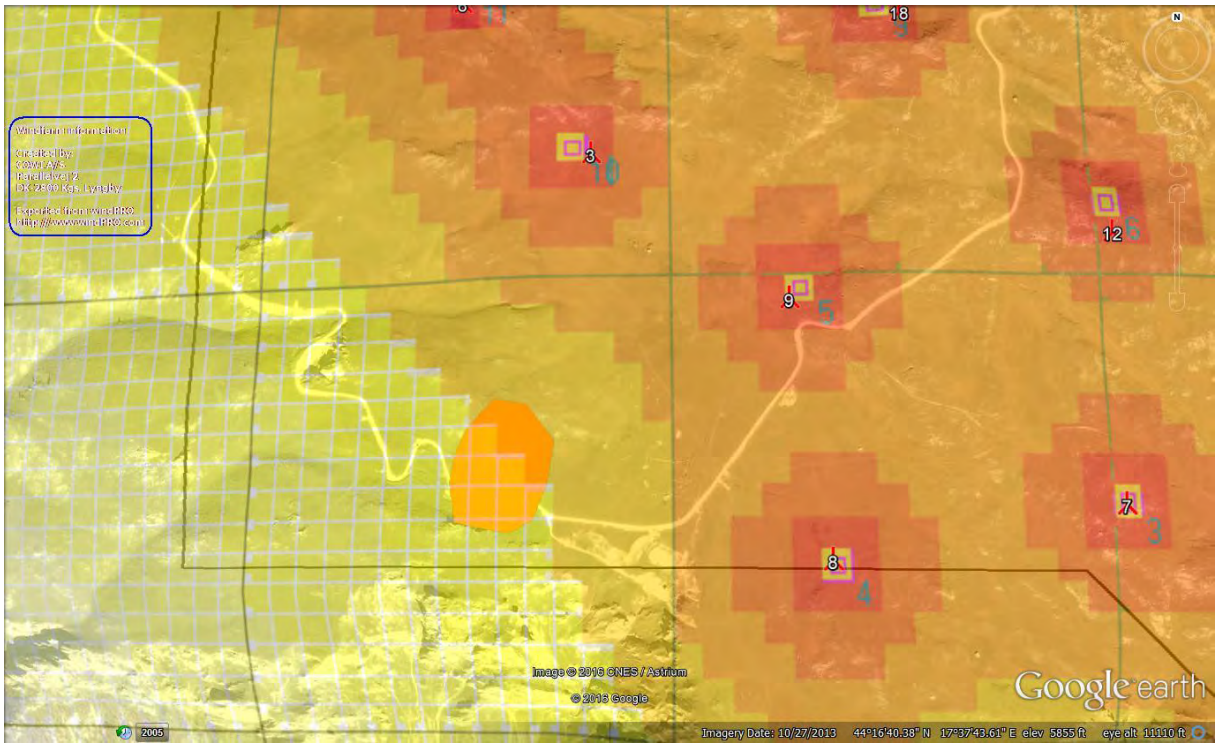


Figure 6: Noise map for 18 Gamesa G114-2.5 wind turbines

Comparison with the permissible noise levels in the environment

Based on the value of the noise from the measurement at the checkpoints and the forecast impact of the Wind Farm, taking into account as well the octave analysis and distribution on frequencies as claimed in ISO9613-2:1996, we can reach the predicted noise levels at the site after the construction of the Wind Farm.

According to the results, the noise impact on the area of the mountain lodge “Devečani” is estimated at 30.2 dBA.

Legislation and limit values of the noise intensity

In order to analyze the impact of noise on the environment, a comparison with the limit values is carried out in accordance with the Law on Noise Protection (*Official Gazette of F BiH 110/12*). *Table 7* lists maximum allowable noise levels (dBA) for various uses of land.

Table 7: Permitted levels of external noise for planning new facilities or sources of noise

AREA (ZONE)	PURPOSE OF THE AREA	MAXIMUM ALLOWABLE LEVELS (DBA)		
		EQUIVALENT LEVELS LEQ	PEAK LEVEL	
		DAY	NIGHT	L1
I	Hospital and health resort	45	40	60
II	Tourist, recreational, rehabilitation center	50	40	65
III	Clean residential, educational and health institutions, public green and recreational areas	55	45	70
IV	Trade, business, residential and residential along traffic corridors, warehouses without heavy transport	60	50	75
V	Business, administrative, trade craft, service (communal service)	65	60	80
VI	Industrial, warehouse service and transport area without housing	70	70	85

As the noise of wind turbine generator is of impulse character it is necessary to make a correction to the table below, as provided by the Law on Noise Protection.

Table 8: The correction of measured noise level before comparison with the permitted levels in Tables 3, 4 and 5

IMPACT FACTORS	CORRECTION FOR LEQ (DBA)	CORRECTION FOR LAMAX (DBA)
AIRPLANE NOISE	- 5	- 10
RAILWAY NOISE	- 5	- 10
IMPULSE NOISE	+ 5	+ 10
OUTSTANDING TONES	+ 5	+ 5

The area that is adjacent to the concession area is intended to be tourist-recreational, and accordingly the allowed noise level is prescribed for the day 50 dBA, for the night 40 dBA, and a limit peak level L1 65 dBA.

As the noise from wind turbines is of impulse character perceived by listener, to the modeled values is also necessary to add the correction coefficients of +5 dB for the modeled L_{eq} level and +10 dB for the modeled L_{Amax}.

The mountain lodge „Devečani“ is not used throughout the year and its use is limited to certain periods of the year. Periods of using the mountain lodge are limited to periods of good weather, and the weather conditions that generally are not appropriate for the operation of a wind farm. In periods when the mountain lodge is in use, the maximum wind speed are not expected, and this impact is of limited nature.

The effect of noise is also evaluated as a noise level which certain individual is subject to in time duration. In the case of the mountain lodge, the time impact of noise on listener is time-limited, and long-term exposure is not expected in this location.

So, this results in a noise level of 43.6 dB at the lodge „Devečani“ which is considered to be a no significant impact.

Appendix 14.11

H&S Management Plan

1. Health, Safety and Public Nuisance During Construction

In general, construction will be organised in consultation with the local community to ensure that community health and safety risks are minimised. Key mitigation includes:

- routing of traffic to avoid settlements where possible;
- prevention of nuisance from noise and vibration by sensitive timing of certain noisy activities;
- security and prevention of unauthorised access, particularly during tower erection and blade lifting operations.

Operational health and safety is covered in BiH by the Law on Occupational Safety and Health (*"Official Gazette of SR BiH", no. 22/90*). The law provides a framework for management of health and safety risks, in the following hierarchy:

1. avoid the risk;
2. evaluate the risk;
3. combat the risk at source;
4. adapt the work;
5. replace the activity with one of lower danger category;
6. prioritising collective measures over individual measures;
7. giving appropriate instructions to workers.

A major construction project of this nature would normally have a construction phase safety, health and environmental (SHE) plan, with a designated site manager or H&S officer to maintain, monitor and implement the plan. This would typically give a description of the project, key project data, description of communication arrangements between the operator and contractors and other parties, and include, but not be limited to, the following specific issues:

- control of access;
- induction;
- site hazard plan;
- emergency plan;
- accidents, incidents and near misses recording and reporting, and an elevation system;
- co-ordinate contractor activities;
- establish and maintain a register of risk assessments and method statements, and ensure compliance;
- receive, review and record reports and inspections of lifting equipment and accessories, plant and equipment, scaffolding, excavation and contractor's training qualifications and competency details;
- containment of substances hazardous to the environment or human health (e.g. spill kits, drip trays, integral bunded fuel storage facilities etc.);
- traffic management plan;
- health and safety documentation; and
- site supervision.

There will be a set of general site rules that must be followed by all construction workers. Examples of these are below:

- individuals must register upon arrival and sign out when departing from site;
- individuals must be site inducted before commencing work;
- alcoholic beverages and prohibited drugs will not be tolerated. Operatives taking prescribed drugs will be required to notify the site manager / H&S officer;
- the wearing of safety helmets, safety glasses, gloves, high visibility coats / vests and safety boots which provide ankle support will be mandatory while on site. Ear defenders must be carried at all times. Additional PPE shall be worn as deemed appropriate by risk assessment. Suitable work wear will be worn at all times;
- all accidents, incidents, injuries and near misses will be reported to the HSE officer. All injuries (however small) will receive medical treatment from a qualified first aider;
- the instruction or command depicted on safety signs will be complied with at all times;
- individuals will only carry out tasks for which they are competent and authorised to do. Individuals will only operate and use plant or equipment for which they are trained and authorised. Copies of all operators certificates will be retained;
- smoking will only be allowed in the designated smoking areas. Smoking inside the site establishment cabins will be strictly forbidden;
- weapons and explosives will be strictly forbidden;
- fighting, gambling, horseplay, and practical jokes will be strictly forbidden;
- any query from the general public will be politely referred to the site manager / HSE officer;
- no food will be consumed at the work area. Welfare facilities will be provided on site for the consumption of food and for personal hygiene. These will be kept clean and hygienic;
- no person under the age of 18 years will be engaged for work activities on site without the prior approval of the site manager;
- defective or suspect plant will be tagged and withdrawn from use and not used until repaired or replaced; and
- waste and debris will be cleared up as work progresses.

Contractors will ensure compliance with all relevant health, safety and environmental legislation. Verbal warnings will be issued to individuals for minor non-compliance with health and safety issues. If an individual endangers themselves or others by their actions or omissions they may be instructed by the site manager to leave site.

Some typical risks associated with the construction of a wind farm, and their management and mitigation techniques, are presented below. Measures to prevent or manage the risks are also discussed, having regard to the IFC General Environment, Health and Safety Guideline, Section 4 on Construction and Decommissioning (IFC, 2007a).

In order to deliver the requirements described above and in the following sections, it is expected that the developer and/or lead contractor will develop a management system to the requirements of the international health and safety management system standard OHSAS18001.

The same principles of management will also be adopted for environment through the implementation of a management system to the international environmental standard ISO14001.

Contractor method statements and services procurement will be undertaken under the control of a dedicated environmental, health and safety management system, adopting international standards as well as local regulatory requirements.

Working at Height and Fall Prevention

Work at height will be performed during the erection of towers and fitting of blades. This will be subject to specific health and safety risk assessments by the contractors responsible for these operations. Particular regard will be had for, but not be limited to, the following (as set out in the IFC guidelines):

- prior to undertaking work, test structure for integrity;
- implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers;
- establishment of criteria for use of 100 percent fall protection (typically when working over 2 m above the working surface but sometimes extended to 7 m, depending on the activity). The fall-protection system should be appropriate for the tower structure and movements to be undertaken including ascent, descent, and moving from point to point;
- install fixtures on tower components to facilitate the use of fall protection systems;
- provide workers with an adequate work-positioning device system. Connectors on positioning systems must be compatible with the tower components to which they are attached;
- ensure that hoisting equipment is properly rated and maintained and that hoist operators are properly trained;
- safety belts should be of not less than 15.8 mm (5/8 inch) two in one nylon or material of equivalent strength. Rope safety belts should be replaced before signs of aging or fraying of fibres become evident;
- when operating power tools at height, workers should use a second (backup) safety strap;
- signs and other obstructions should be removed from poles or structures prior to undertaking work;
- an approved tool bag should be used for raising or lowering tools or materials to workers on elevated structures; and
- avoid conducting tower installation or maintenance work during poor weather conditions and especially where there is a risk of lightning strikes.

Delivery and Removal of Materials

Deliveries and collections will be planned and adequate storage areas for material and equipment will be allocated. Waste removal, e.g. excavated soil, will be planned and sufficient temporary storage provided.

Lifting Operations

During the lifting of the tower into place, and fitting the blades and nacelle, specific health and safety risk assessments will be carried out by the contractors responsible for these operations. Particular regard will be had for, but not be limited to, the following:

- access of lifting equipment to site;
- fencing off a security area;
- control of access to operational areas;
- wind speed and direction;
- weather conditions and risk of severe weather.

Use and Maintenance of Plant and Equipment

Construction plant and equipment used on the project will be inspected by the contractor for condition and suitability and be subject to verification of maintenance certificates or records, statutory or otherwise, prior to being put to use. All equipment will carry a suitable and valid examination certificate. Operations using heavy plant and equipment will be undertaken and supervised by a suitably competent person, identified in the site SHE plan.

Ground Excavation

Normal good practice for preventing or minimising risk from ground excavations will be followed, including but not limited to:

- all operatives will wear appropriate PPE;
- suitable welfare facilities will be provided;
- staff will adopt good hygiene, no eating and smoking on site;
- contractors will adopt a suitable emergency action plan in the event of site accident;
- suitable first aid arrangements will be provided.

It is not currently thought that the ground at the project site is likely to be contaminated, but in the event that unusual ground conditions, odours or other signs of contamination are observed, a further risk assessment will be carried out to ensure that the risk to human health and the environment from such contamination is minimised.

Measures will also be taken to minimise the risk from working in confined spaces, such as trenches and pits, such as:

- slope dewatering;
- side wall support;
- gradient adjustments;
- providing safe means of access and egress;
- avoiding prolonged use of combustion equipment and ensuring proper ventilation.

Traffic Management

A traffic management system will be set up, to ensure separation of construction workers from traffic related risks, including moving machinery. Heavy plant and vehicles will be provided with audible and visible reversing alarms. All vehicle movements must follow the designated routes and be accompanied by a banksman. An appropriate site speed limit will be enforced. Private

vehicles will park in a designated area. Delivery and collection vehicles will follow the set route. All such vehicles will sign in and out of site. Individuals will wear high visibility clothing and must comply with the site traffic management system and use segregated walkways.

Storage of Plant and Materials

Plant and equipment will be stored in designated areas when not in use. Appropriate security will be provided.

Working near Live Electrical Equipment

Specific safety rules will be set up to be followed when working near live electrical equipment. A specific permit to work system will be in place for such work.

Slips, Trips and Falls

These will be avoided where possible through good housekeeping, spill prevention and clean-up, avoiding uncontrolled use of ropes and cords, proper storage of construction materials and the use of slip resistant footwear.

Manual Handling and Over Exertion

Manual handling risks will be identified through the risk assessment process undertaken at site. Suitable control measures shall be identified and detailed within contractor risk assessments and method statements to reduce the risk to individuals, including:

- training personnel to recognise weight limits and use of two person lifts or mechanical assists;
- planning of work layout to avoid manual lifting of heavy loads;
- posture improvement; and
- taking regular breaks and rotate heavy lifting jobs.

Use of Hazardous Substances

The use of hazardous substances will be in compliance with various EU Directives, including 80/1107/EEC on protection or workers from the risks related to exposure to chemical, physical and biological agents at work, and Directive 1907/2006 on the registration, evaluation, authorisation and restriction of chemicals (REACH). Appropriate health and safety assessments will be undertaken, including handling, storage, transfer and use. A register and site inventory of hazardous materials will be kept.

Nuisance from Noise and Vibration and Dust

To minimise potential noise impacts as far as possible, the following measures will be taken:

- construction activities will be planned in consultation with the local communities, so that the noisiest activities are planned during the day;
- noise barriers and source attenuation measures such as silencers will be used where appropriate;
- heavy plant will be routed to the construction site avoiding areas of habitation where possible;

- all plant and machinery will be tuned off when not in use;
- where noise exposure is anticipated, hearing protection equipment will be provided and worn by all personnel.

Airborne dust can be generated by the operation of heavy plant and machinery, excavation and the exposure of bare soil to wind. This can cause a risk to construction workers and the local community, although the distance to the nearest community receptors makes this unlikely. The following control measures are typical of construction activities:

- minimising dust form material storage and transfer using dust suppression, enclosures and covers;
- spraying roadways to minimise vehicle generated dust;
- managing emissions from mobile sources by ensuring vehicles comply with national emissions standards;
- avoiding open waste burning.

Being Struck by Objects

Measures will be in place to prevent workers being struck by objects or particles ejected from the use of machine tools. These will include:

- designated waste drop zones and/or a waste chute;
- using machine guards;
- keeping traffic ways clear to avoid machining over obstacles;
- use of temporary fall protection;
- use of appropriate PPE including eye protection, face shields and hard hats.

Fire

Emergency contact numbers will be made available in the site plan. This will include the fire and rescue service and the environmental regulator. A 24 hour spill response contract will also be in place.

Unauthorised Public Access and Vandalism

Appropriate site security will be provided, including but not limited to:

- fencing of the construction area, with gates and warning signs on access roads;
- control of access roads to the turbines and associated equipment;
- fencing off maintenance and equipment storage areas;
- 24 hour security personnel with CCTV to prevent unauthorised entry to the site;
- display of contact details for emergency response services and police in the security station, for use in the event of unauthorised entry.

2. Health, Safety and Public Nuisance During Operation

Operational health and safety is covered in BiH by the Law on Occupational Safety and Health (*"Official Gazette of SR BiH", no. 22/90*). The law provides a framework for management of health and safety risks, in the following hierarchy:

1. avoid the risk;
2. evaluate the risk;
3. combat the risk at source;
4. adapt the work;
5. replace the activity with one of lower danger category;
6. prioritising collective measures over individual measures;
7. giving appropriate instructions to workers.

In addition, the IFC have published a set of EHS Guidelines on typical industrial risks, as well as a specific guideline on health and safety risks associated with wind farms (IFC, 2007b). These are discussed further below.

Worker Health and Safety

The same health and safety mitigation as those implemented for the construction stage (*see Section 1 above*) will be followed during the operation phase.

Blade Shear or Breakage

Wind turbines can suffer from wind shear, i.e. different wind speeds at the bottom and top of the blades. This can lead to a bend of the shaft.

In the unlikely event that blade breakage occurs, the operator will ensure that debris is thoroughly removed and disposed of, and proper replacement or removal and restoration is undertaken with the appropriate level of compensation being paid to any land or livestock owner adversely affected.

Turbine Collapse

A robust and comprehensive preventative maintenance programme will be put in place to ensure that collapse does not occur through wear of critical parts such as gearboxes.

In the unlikely event that collapse occurs, the operator will ensure that debris is thoroughly removed and disposed of, and proper replacement or removal and restoration is undertaken, with the appropriate level of compensation being paid to any land or livestock owner adversely affected.

Lightning Strike and Fire

Fire resistant components will be used in construction, where possible, and preventative maintenance will be carried out minimise fire risk.

The provision of automatic fire detection systems linked to automatic shutdown systems will be installed on all turbines to allow fires to be dealt with in the shortest possible time.

All mantenance staff will receive appropriate training to inform them of fire hazards.

The area surrounding the turbines will be designated as “no smoking” and signage provided accordingly.

An emergency plan will be maintained and updated to inform training of personnel. It will include a fire prevention plan, incorporating (but not limited to):

- staff training;
- inspection and maintenance (particularly of oil condition in the transformers in the turbine and substation);
- testing and maintenance of fire control systems; and
- communication and co-operation with fire services.

In the event of a nacelle fire, the fire will be allowed to burnout, and fire fighting services will establish a safety zone to ensure secondary fires in the area surrounding the turbine are prevented.

Unauthorised Public Access and Vandalism

Security will be provided to the site at various levels, as recommended by the IFC (IFC, 2007a), including (but not limited to):

- locking of each individual turbine tower access door;
- operating a permit to work system to prevent unauthorised access;
- gates and warning signs on access roads;
- control of access roads to the turbines and associated equipment;
- fencing off maintenance and equipment storage areas; and
- dissemination of information on safety zones and the hazards posed by the turbines in the local community.

Aviation

Suitable anti-collision lighting systems will be installed on turbine nacelle, in consultation with the air regulatory traffic authorities. In order to ensure that the lighting is working correctly during operation, the owner/operator will develop and implement an appropriate maintenance programme.

Electromagnetic Interference

There are a number of potential remedies should interference to telecommunication systems become apparent. These may include (GL Wind, 2008):

- Remedies in the event of television interference during operation of the WF could include:
  - installation of higher quality or directional antenna;
  - direct the antenna toward an alternative broadcast transmitter;
  - install an amplifier;
  - relocate the antenna;
  - if a wide area is affected, consider the construction of a new repeater station.

These will be considered should the operator receive complaints about interference.

Appendix 14.12

Waste Management Plan

1. WASTE MANAGEMENT PLAN

1.1 Introduction

At Devečani site on the Vlašić plateau in Travnik municipality, it is proposed to construct a Wind Farm (WF) Vlašić for electricity generation. This *Waste Management Plan* is a part of the *Environmental Impact Study*, and is a part of the wider project documentation, which will be required to obtain an environmental permit for the planned facility at this location.

The construction of the wind power plant is likely to generate the most waste during the project. Past experiences in collecting and disposing of the construction waste gave solutions to final disposal in sanitary landfills, and the use of inert material for roads within the landfill, as well as for daily cover of biological waste. Based on experiences in EU countries, the solution for disposal of construction waste on the sanitary landfills has not proven to be the best and most cost-effective for many reasons, but the most significant was land taking of useful space for biodegradable waste disposal, as well as preventing and slowing the process of biological waste degradation.

Waste Management Regulations are changing in F BiH, with more importance being given to waste generated during construction. Construction waste is generally considered as inert waste if it does not contain any hazardous substances. However, in addition to this type of waste, it is clear that during the construction the other waste will be also formed, e.g. municipal waste in much smaller quantities.

1.2 Legislation in waste management

In accordance with the legal obligation arising from the *Law on Environmental Protection ("Official Gazette of F BiH", no.33/03 and 38/09*) and *the Law on Waste Management* ("*Official Gazette of F BiH", no. 33/03 and 72/09)*, the operator of the plant that needs an environmental permit, shall also prepare a *Waste Management Plan*. In preparation of this document, the provisions of laws and by-laws of F BiH are respected, as well as EU Directives relating to waste management.

According to Art. 20 of the *Law on Waste Management ("Official Gazette of F BiH", no. 33/03*), the plant operator is required to determine the responsible person for waste management activities.

The preparation of the Waste Management Plan has demanded consideration of other Acts covering this area of the F BiH, for which the following strategic documents were discussed:

- *Solid Waste Management Strategy for Bosnia and Herzegovina, 2003.;*
- *Environmental Protection Strategy for the Federation of Bosnia and Herzegovina, 2009.;*
- *Federal Waste Management Plan 2012-2017, 2011;*

Also, attention was paid to regulatory guidelines adopted in this domain, including:

- *Law on Waste Management („Official Gazette of F BiH", no. 33/03 and 72/09);*
- *Regulation on Waste Categories with Lists („Official Gazette of F BiH", no. 9/05);*

- *Rulebook on waste management that is not on the list of hazardous waste or which content is unknown ("Official Gazette of F BiH", no. 9/05);*
- *Regulation on selective collection, packaging and labeling of waste ("Official Gazette of F BiH", no. 38/06);*
- *Rulebook on conditions for the transfer of waste management obligations from manufacturers and vendors to the system operator for waste collection ("Official Gazette of F BiH", no. 9/05);*
- *Rulebook on technical conditions for the protection of warehouses from explosions ("Official Gazette of SFRY", no. 24/87);*

Legislation of the European Union (EU) requires Member States, as well as those in transition, to develop The Outline of Construction Environmental Management Plan (CEMP) in accordance with the relevant directives. As such, waste management planning becomes a permanent element of public planning in all countries. Among the most important Directives are the following:

- *The Directive on Waste (2006/12/EC);*
- *The Waste Framework Directive (2008/98/EC);*
- *The Waste Landfill Directive (1999/31/EC, amended by the Ordinance (EC) 1882/2003);*
- *The Hazardous Waste Directive (91/689/EEC) amended by Directive 94/31/EC, and Regulation166/2006;*
- *Sewage Sludge Directive (86/278/EEC, amended by the Directive 91/692/EEC);*
- *Waste Incineration Directive (2000/76/EC);*
- *Directive on Packaging and Packaging Waste (94/62/EC) with amendments 2005/20/EC,2004/12/EC, 1882/2003;*
- *Directive on the disposal of waste oils (75/439/EEC, with amendment 87/101/EEC);*
- *Directive on waste from the titanium dioxide industry (78/176/EEC);*
- *Directive on the disposal of PCBs and PCTs (96/59/EC);*
- *Directive on batteries and accumulators (91/157/EC);*
- *Directive on Waste Electrical and Electronic Equipment (2002/96/EC);*
- *Regulation on shipments of waste (EC) 1013/2006;*
- *Directive on the prevention of environmental pollution by asbestos (87/217/EEC, as amended by Directive 91/692/EEC and Regulation EC 807/2003).*

During the works, different types of waste occur, especially construction waste, and it is of great importance to determine the origin and type of waste, as well as quantity, all in accordance with the applicable legislation (*Regulation on Waste Categories with Lists*, "*Official Gazette of F BiH, no. 9/05*). It is particularly important to identify hazardous waste.

In addition to the *Law on Waste Management ("Official Gazette of F BiH", no. 33/03 and 72/09*), which does not treat construction waste to a greater extent (the construction phase), management of construction waste is regulated by several by-laws. Construction waste, as a special type of

waste, in the existing legislation does not stand out as waste which need special rules, unless they contain hazardous waste (asbestos, tarred parts, storage areas for oils, paints, varnishes, etc.).

This Plan roughly estimates categories of waste types that may arise during the construction of the WF Vlašić, as well as during maintenance and use. For each estimated category, every effort will be made to provide guidelines for treatment, including the collection, transport and final disposal.

1.3 Objective

1.3.1 The main objective

The *Waste Management Plan* aims to establish a sustainable waste management system for construction and operational waste generated by the proposed Vlašić Wind Farm. Potential locations for waste disposal are identified which will significantly improve on the current practice of unregulated and uncontrolled disposal of waste.

1.3.2 Other objectives

Other objectives included within this plan include:

- identification of optimal technologies for the disposal of construction waste;
- control of flows of construction waste from the point of origin to end user.

A brief overview of terms

"Waste" means all substances and objects which the owner disposes, intends to dispose of or must dispose in accordance with the one of the categories specified in the lists of waste specified in the legal regulation;

„*Hazardous waste*" means any waste which is determined by a special regulation and which has one or more characteristics causing threat to human health and the environment, according to their origin, composition or concentration, as well as the waste that is specified in the list of waste as hazardous and regulated by implementing regulation;

„*Inert waste*" means waste that does not undergo any significant physical, chemical or biological transformations. Inert waste will not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health. The total moisture, content of pollutants in the waste and the ecotoxicity of the filtrates must be insignificant, that would not endanger the quality of surface and ground waters;

„Non-hazardous waste" means waste that is not defined as hazardous waste;

"*Municipal waste*" means waste from households, which as well as other waste by its nature or composition is similar to waste from households;

„Landfill" is a place of waste disposal for the purposes of final disposal on the surface or beneath the land surface, including: internal disposal sites (i.e. landfills where a waste producer disposes of their own waste at the place of origin) and fixed sites (more than one year), which are used for long-term waste disposal, but including: facilities where waste storage is not permitted, and the waste is prepared for further transport in order to be reused, treated or

disposed of elsewhere, and pre-storage of waste for reuse or treatment for a period, as a rule, less than three years or pre-storage of waste for disposal in period less than one year;

„The Centre for Waste Management" is a system of buildings and facilities for treatment, recovery of components and/or disposal of waste;

„Waste disposal" means any treatment or disposal of waste regulated by the Law on Waste Management;

„Waste management" is a system of activities and actions related to waste, including the prevention of waste generation, reduction of waste and its hazardous characteristics, waste treatment, planning and control of activities and processes for waste management, waste transport, establishment and operation, shut down and maintenance of waste treatment plants after shut down, monitoring, consultation and education related to activities and actions on waste management;

„Waste producer" means any person whose activities produce waste (original producer) and/or any person who carries out pre-treatment, sorting or other operations resulting in a change in physical characteristics or the composition of waste;

„Disposer" is any person to whom the waste is delivered or who carries out the disposal of such waste;

„Operator" means any natural or legal person responsible for any kind of waste management activities;

„Storage" means the placing of waste by the producer within the plant or facility, and maximum of three years in a way which excludes hazard for the environment and human health;

„Transport" is the movement of waste outside the plant;

„Recovery of components" means material and energy recovery from used products or waste in the economic system by applying certain technological processes or burning;

„Reuse" means any activity that uses the waste for the purpose for which it was originally conceived;

„Removal of the facility" means the demolition or dismantling of the building or its part, disposal of waste materials generated by demolition, the existing material, equipment and other elements

and bringing the building parcel, or part thereof in good condition. Removal of the facility shall be carried out due to physical dilapidation or major damages in curred as are sult of natural and human activities caused by natural disasters and catastrophes, or due to the construction of a new facility in accordance with the Implementation Plan. As a result of such activities in the area, construction waste is generated;

„Treatment" means the physical, thermal, chemical or biological processes, including sorting that change the characteristics of the waste in order to reduce the quantity or hazardous properties, facilitate handling or enhance recovery of waste components.

1.4 Construction and demolition waste

In order to reduce the amount of waste for disposal and final disposal, it is necessary primarily to prevent the formation of construction waste. Identification of potential waste in the early stages of construction, careful design of buildings and the area where the building is planned to be, and design of the reconstruction, enable to a large extent the prevention of construction waste generation.

Disposal of construction waste can be done in several ways:

- recycling and energy recovery (within RD/recycling yards and plants for material and/or energy recovery);
- temporary storage (as part of transfer stations);
- permanent storage (at landfills).

Waste is classified into twenty groups according to the characteristics and activities from which it comes. Groups of waste shall be marked with a six digit numbers, where the first two numbers indicate the activity in which such waste is generated, the other two numbers indicate the process in which the waste is generated, and the last two numbers indicate the part of the process from which the waste originates. In this way, the *Regulation on Waste Categories with the Lists („Official Gazette of F BiH", no.9/05*) recognizes different types of waste.

Construction and demolition waste (including excavated soil from contaminated sites), is included in the Waste Lists with key number 17.

Below is a review of the Lists of construction waste, according to Regulation *(„Official Gazette of F BiH", no.9/05):*

17	CONSTRUCTION AND DEMOLITION WASTE (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)[1]
17 01	**concrete, brick, tiles and ceramics**
17 01 01	concrete
17 01 02	bricks
17 01 03	tiles and ceramics
17 01 06*	mixtures or some fractions of concrete, bricks, tiles and ceramics containing hazardous substances
17 01 07	mixtures or some fractions of concrete, bricks, tiles and ceramics different than those mentioned in17 01 06
17 02	**wood, glass and plastic**
17 02 01	wood
17 02 02	glass
17 02 03	plastic
17 02 04*	glass, plastic and wood containing hazardous substances or contamined with hazardous substances
17 03	**bituminous mixtures, tar and tar products**
17 03 01*	bituminous mixtures containing coal tar
17 03 02	bituminous mixtures different than those mentioned in 17 03 01
17 03 03*	coal tar and tar products
17 04	**metals (including their alloys)**
17 04 01	copper, bronze, brass
17 04 02	aluminum
17 04 03	lead
17 04 04	zinc
17 04 05	iron and steel
17 04 06	tin
17 04 07	mixed metals
17 04 09*	waste from metal contaminated by hazardous substances
17 04 10*	cables containing oil, coal tar and other hazardous substances
17 04 11	cables different than those mentioned in 17 04 10
17 05	**earth (including earth extracted from contaminated sites), stone and sludge waste excavated with dredge**

[1] *Regulation on Waste Categories with Lists („Official Gazette of F BiH", no. 9/05);*

17	**CONSTRUCTION AND DEMOLITION WASTE (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**[1]
17 05 03*	earth and stone containing hazardous substances
17 05 04	earth and stone other than those mentioned in 17 05 03
17 05 05*	sludge waste excavated by dredge containing hazardous substances
17 05 06	sludge waste excavated by dredge different than that mentioned in 17 05 05
17 05 07*	waste that drops off the caterpillars containing hazardous substances
17 05 08	waste that drops off the caterpillars different than those mentioned in 17 05 07
17 06	**insulation materials and construction materials containing asbestos**
17 06 01*	insulation materials containing asbestos
17 06 03*	other insulation materials consisting of or containing hazardous substances
17 06 04	insulation materials different than those mentioned in 17 06 01 and 17 06 03
17 06 05*	construction materials containing asbestos
17 08	**construction material based on gypsum**
17 08 01*	construction materials based on gypsum, contaminated by hazardous substances
17 08 02	construction materials based on gypsum, different than those mentioned in 17 08 01
17 09	**other wastes from construction and demolition**
17 09 01*	waste from construction and demolition containing mercury
17 09 02*	waste from construction and demolition containing PCB (e.g. gaskets containing PCB, floors based on resin containing PCB, glazes containing PCB and condensates containing PCB)
17 09 03*	other waste from construction and demolition (including mixed wastes) containing hazardous substances
17 09 04	mixed waste from construction and demolition different than those mentioned in 17 09 01 and17 09 02 and 17 09 03

1.5 Types of waste generated during the constrution of WF Vlašić

The majority of the waste that will be generated from WF Vlašić is likely to be mostly inert. For example, excavation works are likely to generate large quantities of soil, large pieces of stone and stone remains. In addition, it is anticipated that site clearance for access roads will generate minor volumes of timber waste, which, according to the Rulebook on waste categories with lists ("*Off. Gazette of F BiH", no. 9/05*), is categorized in Class 02 01 07.

Other waste material that may be generated during construction works include concrete, brick, tile, plaster, tiles, ceramics, glass, steel, iron and aluminium.

Waste has been classified as:

- *Simple construction waste* –use and recycling of such waste is simple with limited special restrictions. It can be used to build embankments and other civil works. In this type of waste, we include the following:
  - *Concrete debris* – waste generated from demolition of concrete structures. In the *Lists*[79] it is labeled *17 01 01*;
  - *Isolated debris of brick and tile* – resulting from demolition of structures, and it is often referred to as *„ceramic debris*". In the *Lists* it is labeled *17 01 02* – brick and *17 01 03* tiles and ceramic;
  - *Asphalt debris* – waste resulting from the removal of asphalt surfaces, including also mixed asphalt. In the *Lists* it is under code *17 03,* which includes bituminous mixtures, coal tar and tar products;
  - *Glass, plastic and wood* – according to the *Lists* it is labeled *17 02 01* – wood*, 17 02 02* – glass*, 17 02 03* – plastic;
  - *Stone waste* – construction debris that contains only stone materials, according to the *Lists* carries the code *17 05 – Soil, (including excavated soil from contaminated sites) stones and soil excavated by dredge;*
- *Mixed construction waste* – such waste is more difficult to dispose of and includes:
  - *Mineral (inert) construction waste, debris* – this waste material occurs after demolition of buildings and other structures. In the *Lists* this type of waste is covered by codes: *17 01 06* - Mixtures or some separate fractions of concrete, brick, tiles and ceramic containing hazardous substances, or 17 01 07 – Mixtures or some fractions of concrete, brick, tiles and ceramic different than those mentioned in 17 01 06;*
  - *Mineral (inert) construction waste with brick debris* – generated by demolition of buildings. According to the *Lists* it is covered by codes *17 01 06* - Mixtures or some fractions of concrete, brick, tiles and ceramic containing hazardous substances,* or *17 01 07 – Mixtures or some fractions of concrete, brick, tiles and ceramic different than those mentioned in 17 01 06 and 17 08 – Construction material based on gypsum;*
  - *Unsorted construction waste* – is mixed construction waste generated from construction and demolition of buildings, with partial participation of nonmineral substances. According to the *Lists* it was placed under code 17 09 – *Other waste from construction and demolition*.

[79] *Rulebook on waste categories with lists, "Off. Gazette of F BiH ", no. 9/05;*

- *Metal waste* - In addition to the above listed types of construction waste, whose origin is expected at the construction site, it is also important to mention the waste from the group of metals and their alloys, which is in the *Lists* under code 17 04. In this group, it is expected to be the highest amounts of iron and steel – 17 04 05, copper – 17 04 01, lead - 17 04 03, aluminum – 17 04 02 and mixed metals – 17 04 07.
- *Hazardous Waste* – hazardous waste that may arise during construction includes waste oils, bitumes, substances containing oilsIt is unlikely that asbestos will be encountered during this project as all buidlings will be new build and asbestos will not be used as a construction material.
- *Municipal Waste* - During construction a small quantity of municipal waste will be generated, which will need to be disposed of in accordance with law.

The estimated and expected types of municipal waste can be classified into the following categories:

- 13 00 00 Waste from oil and waste from liquide fuels;
- 15 00 00 Waste packaging, absorbents, absorbent materials, filter materials and protective clothing not specified in another way;
- 16 00 00 Waste not otherwise specified in the Lists;
- 17 00 00 Construction and demolition waste;
- 20 00 00 Municipal waste and similar waste from industrial facilities and craft facilities, including separate collection of fractions.

Table 1: The classification of waste that will be generated during the construction of WF Vlašić

No.	Type	Waste Code
	NON-HAZARDOUS WASTE	
1.	MIXED MUNICIPAL WASTE	
1.1	Mixed municipal waste	20 03 01

1.2	Paper and cardboard	20 01 01
1.3	Plastic	20 01 39
1.4	Wood waste	20 01 38
3.	TIRES	
3.1	Worn tires	16 01 03
4.	METALS	
4.1.	Iron and steel	17 04 05
	Copper, bronze, brass	17 04 01
	Lead	17 03 04
	Mixed metals	17 04 07
5.	MIXED CONSTRUCTION WASTE	
5.1	Concrete	17 01 0 1
5.2	Wood	17 02 01
	Glass	17 02 02
	Plastic	17 02 03
5.3	Soil, stone	17 05 04
	Soil excavated by dredge	17 05 06
	HAZARDOUS WASTE*	
1.	WASTE OILS, BITUMENS, SUBSTANCES CONTAINING OILS	
1.1	Bituminous mixtures containing coal tar	17 03 01*
1.2	Soil excavated by dredge containing hazardous substances	17 05 05*
1.3	Biodegradable hydraulic oils	13 01 12*
1.4	Mechanical oils/synthetic oils for engines, drive mechanisms and lubrication	13 02 06*
	Biodegradable oils for engines, drive mechanisms and lubrication	13 02 07*
1.5	Packaging containing residues of hazardous substances or contaminated by hazardous substances	15 01 10*
1.6	Absorbents, filter materials, absorbent materials and protective clothing contaminated with hazardous substances	15 02 02*
1.7	Mixtures of oils and fats from oil/water separators	19 08 10*
1.8	Discarded electrical and electronic equipment	20 01 35*
		20 01 36*

In accordance with the current Rulebook, the waste producer is required to classify the waste generated at the construction site.

Works compound

In the event that a temporary works compound is included within the site boundary, hazardous waste must be accounted for and managed appropriately.

At the site within which refueling and servicing of machinery will be carried out, the contractor must take into account the resulting hazardous waste. Such zone must be removed. Bituminous mixtures, which appear in a composition of the waste on the site, can arise during maintenance, i.e. paving of parts of the existing access roads, as well as construction of new ones.

1.6 Waste management plan during construction of WF Vlašić

1.6.1 Waste sorting and storage

All waste generated at the site will be sorted through the use of separate containers which will be stored in a designated location, respecting the previously mentioned principle of waste classification according to the Rulebook.

Hazardous and non-hazardous waste must be stored separately in order to reduce the cost of its disposal.

All hazardous waste must be in accordance with the regulations for the labelling of such waste. It should be temporarily stored in the prescribed manner, and then disposed of by authorized hazardous waste handlers. All waste oil generated at the site should be collected in the appropriate containers, and collected and stored separately.

Storage should be organized as follows:

- *Container for hazardous waste*

  Mixed hazardous waste *(*13 01 12*, 13 02 06* and 07*, 15 01 10*, 15 02 02*, 16 06 01*, 17 03 01*, 17 05 05* and 19 08 10*);

- *Container for non-hazardous waste*

  Mixed municipal waste (20 03 01);

- *Container or basis for non-hazardous waste*

  Mixed packaging waste which can be recycled (20 01 01, 20 01 38 and 20 01 39);

- *Container or basis for non-hazardous waste*

  Mixed metal waste which can be recycled (17 04 05).

All electric and electronic waste should be stored separately in the manner specified and finally disposed of in accordance with the legislative.

Waste oil (13 02 06* and 07*) must be stored in barrels or other suitable containers, to prevent leakage thereof into the ground water and soil. Vehicle servicing is only permitted in the service plateau, which must have a drainage system.

1.6.2 Reuse of site won material

The remains of excavated soil are suitable material for use in the construction of embankment.

Stone waste also can be utilized in a manner that is milled and crushed, and as such is used in the preparation of the cement mass necessary during construction. Any excess material from the excavation should be directed to use when carrying out construction works, and the unused portion of excavated material deposited on the other sites, which have been selected and approved by the competent authorities.

1.6.3 Waste transfer

All waste that has been sorted and collected on site will be trasfered to a waste handling or disposal facility by the contracted and licenced waste operator. When procuring waste contractors, evidence of legal compliance will be required.

1.6.4 Monitoring of waste

During construction a record must be kept of the type and volumes of waste that is being generated along with information on causes of its origin, waste storage and removal of waste.

As such a '*Record sheet*' must be maintained by the waste producers, and it is necessary for each shipment of waste to prepare it in two copies, one of which remains in its own archives, and another to the waste management operator.

This record sheet should be kept for 5 years.

The contractor is required to implement the Waste Management Plan under construction of WF Vlašić, as well as define the responsibility and monitoring of waste management.

1.7 Waste management plan during operation of the wind farm

Regular maintenance of wind turbines mainly includes remote control with built-in software, and manual maintenance, a minimum of twice a year, or more if necessary. For the duration of the maintenance, the operator is required to provide some tin barrels or similar type of containers for the temporary storage of waste generated during maintenance.

During the execution of works on repair and maintenance of the wind power plant, waste such as oily materials (rags and absorbents), waste oils, may be generated. This waste should be selectively collected, and temporarily stored and disposed of at location reserved for this purpose within the wind farm, and then that same waste should be handed over for treatment to the authorized operator for waste treatment, with whom it is necessary to conclude an agreement on the disposal of the same from the very beginning of the wind farm operation.

If during operation, leakage of grease and mineral oils occurs from the plant (machinery), it is necessary to apply absorbents, which will then be temporarily disposed of in appropriate

containers to final disposal. The same rule applies for waste fats that will be periodically removed from mechanical equipment. Lubricant/oil occasionally removed off the equipment, due to the appearance of mechanical particles or due to replacement, should be removed in the same way.

Municipal waste may be generated from maintenance workers. The site operator will be responsible for removing it from the site to appropriate waste containers such as those in the nearest urban parts of the area around the wind farm.

Waste potentially generated during maintenance of the wind turbines is shown in *Table 2*.

Table 2: Classification and location of waste that occurs in the course of maintaining wind farm

Key number	Name of waste	Place of waste generation
13	WASTE OILS AND LIQUID FUEL WASTE	
13 02	*Waste oils for engines, drive mechanisms and lubrication*	
13 02 05*	Non-chlorinated oils for engines, drive mechanisms and mineral-based lubrication	Transformer
13 02 06*	Machine oils-synthetic and biodegradable	Generator
13 02 07*	Oils for engines, drive mechanisms and lubrication	Generator
15	WASTE PACKAGING; ABSORBENTS, ABSORBENT MATERIALS, FILTER MATERIALS AND PROTECTIVE CLOTHING, NOT OTHERWISE SPECIFIED	
15 01 01	Packaging of paper and cardboard	When taking over and purchase of new spare parts
15 01 02	Plastic packaging	When taking over and purchase of new spare
15 01 04	Metal packaging	When taking over and purchase of new spare
15 01 06	Mixed packaging	When taking over and purchase of new spare
15 01 07	Glass packaging	When taking over and purchase of new spare
15 02 02*	Absorbent materials and protective clothing contaminated with hazardous materials	Cleaning rag, cleaning cloths after overhaul
20	MUNICIPAL WASTE AND SIMILAR WASTE FROM INDUSTRIAL AND CRAFT PLANTS, INCLUDING SEPARATELY COLLECTED FRACTIONS	
20 03 01	Mixed municipal waste	From maintenance staff during the maintenance of wind turbines

Waste management at the stage of the wind farm operation is shown in the following *Table 3*:

Table 3: Waste management at the stage of the wind farm operation

Key number	Type of waste	Preventive method of disposal	Temporary disposal (in accordance with statutory legislation)	The final disposal
15 01 01 15 01 02 15 01 04 15 01 06 15 01 07	Packaging of paper and cardboard Plastic packaging Metal packaging Mixed Packaging Glass packaging	Collected in handy tin barrels or PVC buckets and transported in containers to the nearest urban parts of the area around the wind farm in its own arrangement. Recycling is not done because it is a small amount, except in cases when the nearby villages offer the option of separate waste collection in municipal containers specially intended for that	YES	Disposal is done on municipal landfill
13 02 05*	Non-chlorinated oils for engines, drive mechanisms and mineral-based lubrication	Temporary storage within the wind farm, in specially designed tin barrels and transport in its own arrangement to the point of the final disposal	YES	The final disposal is carried out under the Agreement on Takeover of hazardous waste - waste oils
13 02 06* 13 02 07*	Machine oils-synthetic and biodegradable oils for engines, drive mechanisms and	Temporary storage within the wind farm, in specially designed tin barrels and transport in its own arrangement to the point of the final disposal	YES	The final disposal is carried out under the Agreement on Takeover of hazardous waste - waste oils
15 02 02*	Cleaning rag,cleaning cloths after overhaul	Temporary storage within the wind farm, in specially designed tin barrels and transport in its own arrangement to the point of the final disposal	YES	The final disposal is carried out under the Agreement on Takeover of hazardous waste

20 03 01	Mixed municipal waste	Collected in handy tin barrels or PVC buckets.	YES	Transported in containers to the nearest urban parts of the area around the wind farm in its own arrangement. Recycling is not done because it is a small amount, except in cases when the nearby villages offer the option of separate waste collection.

1.8 Waste management plan for decommissioning of WF Vlašić

The average service life of wind turbines is about 20 years. After termination of operation, the wind turbines are dismantled and the individual parts of a wind turbine are recycled, and some are disposed of at landfills.

Table 4 presents waste arising from the decomissioning of wind turbines.

Table 4: Classification and location of waste that occurs in the phase of decommissioning

Key number	Name of waste	Place of waste generation
17	CONSTRUCTION AND DEMOLITION WASTE (INCLUDING EXCAVATED SOIL FROM POLLUTED/CONTAMINATED LOCATIONS)	
17 01	*Concrete, brick, tiles and ceramics*	
17 01 01	Concrete	From the foundations of wind turbines
17 02 02	Glass	Glass fibers of turbine blades
17 04	*Metals (including alloys)*	
17 04 01	Copper, bronze, brass	From cables that connect turbines and transfer the electricity
17 04 05	Iron and steel	Parts of turbine (rotor, gearbox, generator, frame-mask of control system, tower)
20	MUNICIPAL WASTE AND SIMILAR WASTE FROM INDUSTRIAL AND CRAFT PLANTS, INCLUDING SEPARATELY COLLECTED FRACTIONS	

20 03 01	Mixed municipal waste	Place of disassembly – workers at the disassembly

Management of waste generated after dismantling the wind farms or wind turbines is shown in the following *Table 5*:

Table 5: Waste management at the stage of dismantling the wind farm

Key number	Type of waste	Preventive method of disposal	Temporary disposal (in accordance with statutory legislation)	The final disposal
17 01 01	Concrete	Temporary storage within the wind farm, at the a specially determined and marked site to its final disposal	YES	Concrete can be reused as crushed
17 02 02	Glass		YES	The final disposal is carried out under the Agreement on Takeover of material for recycling with authorized companies
17 04 01	Copper, bronze, brass		YES	
17 04 05	Iron and steel		YES	
20 03 01	Mixed municipal waste	Collected in appropriate waste containers	YES	Transported in containers to the nearest urban parts of the area around the wind farm in its own arrangement. Recycling is not done because it is a small amount, except in cases when the nearby villages offer the option of separate waste

Appendix 14.13

Monitoring Plan

1. MONITORING PLAN

1.1 Ecology (primarily birds and bats)

Monitoring is an integral part of the nature protection system, and also a part of the guidelines of the European Union, and under the provisions of the *Habitats Directive (92/43/EC)* and *the Birds Directive (Directive 2009/147/EC).*

In terms of the Law on Nature Protection, monitoring is monitoring of the state of nature, or parts of biological and landscape diversity. In the case of the Vlašić Wind Farm, monitoring includes environmental monitoring, in this specific case, intended for its most vulnerable species - birds and bats.

1.1.1 Monitoring of ornithofauna

The most vulnerable among birds are birds of prey. Of the 26 registered priority species of birds, 20 species are birds of prey. Otherwise, they are considered threatened species, and as such strictly protected. Their large numbers in the study area is the result of the interaction of several factors, among which stand out as the most important, the presence of optimally suitable habitats and significant trophic base.

It is necessary to carry out continuous monitoring of the fauna of birds (and bats) and of their respective ecological functions at the Wind Farm site, and in particular, to monitor constantly the mortality rate of these specimens. A minimum of two years continual monitoring is required in order to be able to assess the effects of the wind farm on bird populations.. Also, this is the only way to work constantly on improving and implementation of the mitigation measures and to reduce negative impacts of the project, and to timely identify and implement the necessary changes in the operation and use of the area, (*Paunović et al. 2011, Gove and others. 2013, Rodrigues et al. 2015*).

Monitoring should include a two-year cycle of regular site visits and search of the area around the wind turbines, in order to determine the number of possible suffered and killed birds.

The results and analysis of all monitoring activities for ornithofauna should be submitted to the competent institution for the environmental protection.

This monitoring involves the use of transect method, during spring (organized two visits, the first in mid-April and the second in mid-May), according to the very specific routes and methods. Also, in order to cover the entire state, special attention should be paid to the period of migration, both in spring and autumn. Comparing the parameters of the zero state of the nesting population of birds, we will be able to assess the impact of the Wind Farm on the local nesting population.

During monitoring, particular attention should be focused on Paklarske stijene and the southern part of the concession area, where activities of birds are the most conspicuous, especially the golden eagle and common buzzard, nesting birds whose nests are nearby, and whose activity is extremely high (critical altitude zone). When monitoring, attention should be paid to the wind turbines near the "buffer" zone, as well as in the "buffer" zone - the zone of wind turbines 11 and 18.

This monitoring includes recording the activity of birds around wind turbines. For each wind turbine, activity is recorded every half hour. It should record for each observed specimen:

- species;

- number of specimens;
- behavior (flying, walking or stationary);

In the case of recorded flight, it is necessary to register:

- direction of flight;
- distance from the wind turbine;
- height in relation to the wind turbine (below the blade level, in the blade level, on the edge of blade coverage, above the blade tip);

The area around the wind turbines must be searched in looking for injured or dead birds, and to record for every bird: species of bird, evaluate the age, number of specimens, condition, estimate the time of death, to record by GPS the location of suffering of the specimen, position and distance in relation to the existing wind turbines;

The purpose of the monitoring is:

- Checking assumptions of the prepared environmental impact assessment, and determination of the significance of deviations from the envisaged impacts;
- Testing the effectiveness of mitigation measures (e.g., removal of operational parameters to minimize bird mortality); and,
- Identifying potential critical wind turbines and, if necessary, a determination of further operational parameter, to reduce bird mortality.

1.1.2 Monitoring of bats

Also, as in the case of bird populations, monitoring of bats during the Wind Farm operation will be carried out for at least two years. The aim is to determine a direct impact (mortality) on the current population of bats, as well as possible changes in the wider area, which could occur by placing wind turbines in operation. Monitoring program should be conducted at least in the period from March to October, with at least four field days per month. Even though the mentioned start of bats monitoring is designed after the usual end of winter hibernation period, due to bad weather conditions, it is necessary to adjust the time of monitoring with activities of bats, considering that it can sometimes be delayed, (as was the case during the monitoring of zero state of bats).

During monitoring, particular attention will be focused on Paklarske stijene and the southern part of the concession area, where activities of bats are the most conspicuous, especially those who have their shelters on the southern cliffs and whose activity is extremely high. When monitoring, attention should be paid to the wind turbines near the "buffer" zone, as well as in the "buffer" zone - the zone of wind turbines 11 and 18.

In order to collect information about the actual impacts of the Wind Farm, at the same location, it is necessary to:

- Monitor the activity of bats with BAT detector on the specified transect routes. This process should also be conducted at the locations from the period of investigation for purposes of zero state, at the locations of wind turbines, but in the immediate vicinity thereof. Speaking about the period of time, it is necessary to cover the period of migration (spring and autumn), and the highest activity and reproduction period (spring, summer). Transect method can be implemented with a combination of capture with meshes, and telemetric monitoring and other available methods;

- When monitoring pay attention to possibly changed conditions of habitat. Specifically, we must not allow the growth of shrub vegetation in the area of the Wind Farm, because it may attract bats, which would only increase the percentage of bats suffering on site. In this connection, it is necessary to determine possible activity of bats along the newly formed structures in space (access roads, intersections, the newly formed ponds intended for turning the bats from the path of the Wind Farm, etc.). Given that the concession area is in the area of subalpine and alpine pastures and that most of the recorded species are exactly species of open habitats, in order to preserve them, it is necessary to do everything to retain the habitat in its original form. In this respect, monitoring should also include this segment of protecting the population, and indicate timely failures;
- As is well known that the greatest activity of bats was recorded in the zone of Paklarske stijene, special attention, during the monitoring, should be paid to this area, as well as the cave Ledenica, and other identified speleological structures, in order to be able with certainty to gain insight into the dynamics of these populations in the area of the Wind Farm;
- Determining mortality is necessary in a radius equal to the height of wind turbines, but not less than 70 meters around the individual wind turbine, so as to search the area under each wind turbine (combined search using ultrasonic detector, to be undertaken on the night prior to the survey);
- In case of finding a dead bat, it is necessary to: record the species of bats, assess age, number of specimens, condition, estimate the time of death, record with GPS the location of the suffering of specimen, position and distance compared to existing wind turbines;

The purpose of the monitoring is:

- Checking assumptions of the prepared environmental impact assessment, and determination of the significance of deviations from the envisaged impacts;
- Testing the effectiveness of mitigation measures (e.g., removal of operational parameters to minimize bat mortality); and
- Identifying potential critical wind turbines and, if necessary, a determination of further operational parameter, to reduce bat mortality.

Depending on the results of monitoring, the need for continuation of monitoring will be determined or additional protective measures will be undertaken. In the case of the great mortality of bats, it is necessary to anticipate the implementation of all protection measures, including also adjustment and/or limitation of wind turbines operation in the time of greatest activity of bats, or during the spring and autumn seasonal migration, as well as daily migration to the hunting habitat.

Finally, if necessary, the owner of the Wind Farm (EPBiH) can submit to the relevant institutions (Federal Ministry of Tourism and Environmental Protection), the results of monitoring and all conducted analysis.

1.2 Noise

Due to the nature of noise, tonal, and the possibility of an increase in noise level with the time, it is necessary to predict the measurement action immediately after the construction and monitoring noise in the vicinity of the most vulnerable facilities during operation. The campaign

measurement, and making noise maps shall be made immediately after the construction and commissioning of wind farms. Control measurements on characteristic places, and in relation to the created noise map is necessary to carry out every two years and report about it to the competent Ministry. Monitoring of noise during the construction phase will not be necessary, except in cases of complaints.

1.3 Socio-Economic

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

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

Another key activity that requires monitoring is the reinstatement of land upon completion of construction activities, and later after decommissioning. Proper reinstatement is key to ensuring that people can continue to use their land and expect the same quality of sheep grazing, so that their livelihoods do not suffer.

The same applies to restoration of roads. This needs to be monitored at the end of constriction, to ensure that all roads have been reinstated to at least pre construction level. The same applies during operations, concerning road repairs and maintenance.

Similarly, the execution of compensation payments for lost areas used for sheep grazing and damages must be monitored to ensure that it is being paid in a timely manner, so as to prevent any loss of livelihoods. If businesses are affected by increased traffic, their losses must be compensated and this too must be monitored to ensure livelihoods are improved or at least restored to the previous level.

1.4 Health, Safety and Public Nuisance

There is no proposal for any specific monitoring associated with Health, Safety and Public Nuisance. However, it is expected that the management systems implemented for construction and operation will incorporate appropriate communications processes to receive communications from internal and external stakeholders, to implement a non-conformance and corrective action process to record issues reported by internal and external stakeholders. Also to incorporate audits to review the Health and Safety Performance during all phases of the project and encompassing work undertaken by all workers associated with the project, particularly those that are involved with site work.

Transport management procedures will include an audit process to ensure that the construction traffic is adopting the appropriate transport routes and that health, safety and public nuisance issues are not being caused. To incorporate senior management review of the health and safety performance and improvements where necessary to ensure international level best practice.

Implementation of the management arrangements will be part of the Environmental and Social Action Plan (ESAP).

1.5 Surface Water, Effluent and Land and Ground Quality

There is no proposal for any specific monitoring associated with surface water, effluent and land and ground quality. For land and ground quality we are proposing occasional inspections rather than conventional monitoring of the operation of wind farm, as provided for in the mitigation measures and activities.

However, it is expected that the management systems implemented for construction and operation will incorporate appropriate training for all personnel involved in the handling of hazardous materials as well as appropriate communications processes to receive communications from internal and external stakeholders, including that associated with reporting releases of hazardous materials to the environment. Also to ensure implementation of a non-conformance and corrective action process to record issues reported by internal and external stakeholders.

To hold audits to review the environmental performance during all phases of the project and encompassing storage, containment and use of all hazardous substances so as to prevent emissions to the environment. To incorporate senior management review of the environmental performance and improvements where necessary to ensure international level best practice. An accidental spillage procedure will be drafted and put in place prior to construction beginning.

Implementation of the management arrangements will be part of the Environmental and Social Action Plan (ESAP).

Appendix 14.14

Gap Analysis

Environmental Gap Analysis

A gap analysis has been carried out to identify whether current environmental legislation in BiH aligns with EU wide environmental legislation, including the SEA Directive 2001/42/EC, the EIA Directive 85/337/EC as amended, the Birds Directive 2009/147/EC, and the Habitats Directive 92/43/EEC. In addition, attention has been paid to EIB Statement of Environmental and Social Principles and Standards, the EIB Environmental and Social Practices Handbook, and the EIB Source book on EU Environmental.

Table 1 lists the environmental requirements that have been split into the following areas:

- Environmental Impact Assessment;
- Strategic Environmental Assessment;
- Disclosure of environmental information and public participation;
- Protection of water quality;
- Soils;
- Waste;
- Environmental Noise;
- Protection of Air Quality;
- Nature Conservation and Biodiversity;
- Cultural Heritage

Table 2 lists BiH Environmental Standards and compares them against EU Standards in respect to air quality, noise and vibration and water quality.

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Table 1 Gap analysis of Environmental Legislation in Europe and BiH

EU Environmental Requirements/EIB requirements (Reference and Date)	Brief summary of scope	Relevance to Vlasic Wind Farm Development (reference to relevant section of EU requirement)	Corresponding BiH Act, Regulations, Order (reference)	Outline of any gaps/ additional requirements in BiH legislation	Percentage of Implementation the EU Directives into FB&H Legislation[1]
ENVIRONMENTAL IMPACT ASSESSMENT					
Environmental Impact Assessment (EIA) Directive 2011/92/EU as amended by Directive 2014/52/EU	The EIA Directive sets out the process through which significant environmental effects of proposed developments are identified and assessed. EIA is required for development that falls within Annex I or Annex II descriptions. In summary the EIA procedure follows the following stages; **Scoping** - the developer may request the competent authority to say what should be covered by the EIA information to be provided by the developer; **EIA report – Annex IV** - the developer must provide information on the environmental impact; **Consultation** - the environmental authorities and the public (and affected Member States) must be informed and consulted; **Decision making** - the competent authority decides, taking into consideration the results of consultations. The public is informed of the decision afterwards and can challenge the decision before the courts.	**Annex II:** projects included in Annex II are subject to EIA as determined by Member States in accordance with Articles 5-10. Installations for the harnessing of wind power for energy production (wind farms) are included within Annex II. Projects are therefore screened by Member States, based on criteria in Annex III, to determine whether EIA is required. **Annex II.A:** Information to be provided by the Developer on the projects listed in Annex II: 1. A description of the project, including in particular: (a) a description of the physical characteristics of the whole project and, where relevant, of demolition works; (b) a description of the location of the project, with particular regard to the environmental sensitivity of geographical areas likely to be affected. 2. A description of the aspects of the environment likely to be significantly affected by the project. 3. A description of any likely significant effects, to the extent of the information available on such effects, of the project on the environment resulting from: (a) the expected residues and emissions and the production of waste, where relevant; (b) the use of natural resources, in particular soil, land, water and biodiversity.	Law on Environmental Protection, (*Official Gazette of F BiH, no. 33/03,), Article No. 56.* (*Projects are Subject Environmental Impact Assessment*) as well as amended by this Law *("Official Gazette of F BiH", no. 38/09), Article No 20.;* The Regulation on facilities subject to obligatory EIA and facilities, which may be constructed and operated only with a valid environmental permit, ("*Official Gazette of the Federation of Bosnia and Herzegovina*" *no. 19/04), Article No. 6.* (*Plants and Facilities for which the Environmental Impact Assessment Carried out on the Basis of Checks of the Federal Ministry, Paragraph 1, Item 1) (Power plants), Sub item 4*); Law on Environmental Protection, (*Official Gazette of F BiH, no. 33/03,), Articles No. 12. – 21. (Integrated Protection, Soils, Water, Air, Biosphere, Keeping the built environment, Dangerous substances and technologies, Waste, Noise and Vibration, Radiation); Article No. 53.* (*Projects are subject Environmental Impact Assessment*) as well as amended by this Law *("Official Gazette of F BiH", no. 38/09), Article No 54a.*	No details of the construction site organization are required in BiH legislation. This obligation is placed on the construction contractor to [provide this information. Differences between BiH legislation and EU legislation/EiB requirements are determined by the Federal Ministry of Environment and Tourism. The structure of the ESIA Study is different and more prescriptive in BiH. The first part must include a description of the baseline for all parameters being assessed. The second part considers potential impacts. In the third part mitigation measures for all impacts are to be included. According to the F BiH legislation, there is no request for preparation of the Stakeholder Engagement Plan (SEP) and Environmental and Social Action Plan (ESAP) as well as GAP Analysis. Current legislation on environmental protection in FBiH does not contain details stated in the context of the Directive	**No Datas** The responsible institutions have not provided information on the current transposition and implementation status for this Directive.
		Article 3			

[1] *Activity 1.3 Progress Monitoring of the transposition and implementation of the environmental and climate acquis, Environment and Climate Regional Accession Network (ECRAN), Preliminary Progress Report , Bosnia and Herzegovina,15 June 2015*

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		1. The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors: (a) population and human health; (b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC; (c) land, soil, water, air and climate; (d) material assets, cultural heritage and the landscape; (e) the interaction between the factors referred to in points (a) to (d). 2. The effects referred to in paragraph 1 on the factors set out therein shall include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned.	Law on Environmental Protection, (*Official Gazette of F BiH, no. 33/03,), Article No. 53.* (*Projects are subject Environmental Impact Assessment*), *Articles No. 75.-81.,* as well as amended by this Law *("Official Gazette of F BiH", no. 38/09), Article No. 30. and 31.*		
STRATEGIC ENVIRONMENTAL ASSESSMENT					
Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (SEA Directive)	To assess the environmental effects of plans and programmes.	The SEA Directive applies to plans and programmes which are subject to preparation and/or adoption by public authorities or which are required by legislative, regulatory or administrative provisions. The development of Vlasic wind farm is at project level and therefore the SEA Directive does not apply.	Law on Environmental Protection, (*Official Gazette of F BiH, no. 33/03*); *Articles No.51 (Strategic Environmental Assessment) and 52., as well as* amended by this Law *("Official Gazette of F BiH", no. 38/09), Articles No. 14. and 15.*	Articles 51 and 52 define competence, content and the facilities responsible for preparation of the Strategic Environmental Assessment during preparation of the spatial planning documentation; Article 14: "Authorities responsible for the preparation of spatial planning documentation and the authorities responsible for the development of plans, programs and strategies in the field of agriculture, fisheries, forestry, energy, mining and industry, transport, waste management, water management and of which the contents can have a negative impact on the environment - bound develop a strategic environmental assessment." Article 15 defines the content of the Strategic Environmental Assessment.	**74%**
DISCLOSURE OF ENVIRONMENTAL INFORMATION AND PUBLIC PARTICIPATION					

EU Environmental Requirements/EIB requirements (Reference and Date)	Brief summary of scope	Relevance to Vlasic Wind Farm Development (reference to relevant section of EU requirement)	Corresponding BiH Act, Regulations, Order (reference)	Outline of any gaps/ additional requirements in BiH legislation	Percentage of Implementation the EU Directives into FB&H Legislation[1]
Directive 2003/4/EC on public access to environmental information. Aarhus convention	This Directive implements the provisions of access to information set out in the Aarhus convention. The Directive establishes the right of the public to environmental information.	Environmental information supplied by the Developer in the process of applying for development consent must be made available to the public to allow members of the public to express their opinion before any development consent is granted. The 'public concerned' includes those who have an interest in the environmental decision-making procedures, such as NGOs. Public consultation is also a requirement under the EIA Directive 2011/92/EU as amended by Directive 2014/52/EU.	Law on Free Access to Information in Federation of Bosnia and Herzegovina (*"Official Gazette of FBiH", No. 32/01*), *Article No. 4.;* Law on Environmental Protection, ("*Official Gazette of F BiH", no. 33/03*), *Articles No. 61.* (*Poblic consultation*) and *62.*, as well as amended by this Law *("Official Gazette of F BiH", no. 38/09),* but in this *a*mendments there are *no change*, in relation with above mentioned Articles.	BiH legislation does not require prior public consultation, but public consultation.	**65 %**
PROTECTION OF WATER QUALITY					
Water Framework Directive 2000/60/EC and daughter directives such as Directive 2008/105/EC (quality standards for Water Directive) and Directive 2006/118/EC (protection of groundwater)	Provides a framework for integrated management of inland surface waters and groundwater, to achieve long-term protection of water resources.	Article 4(i) Member States shall implement the necessary measures to prevent deterioration of the status of all bodies of surface water, subject to the application of paragraphs 6 and 7 and without prejudice to paragraph 8; Assessment carried out under EIA Directive can be used to determine whether water quality status is being maintained. However, the provisions of Directive 2000/60/EC are distinctly more stringent that those of Directive 85/337/EEC.	The Law on Water; ("*Official Gazette of F BiH", no. 70/06*), the whole Law; Rulebook on the method of determining the conditions for determining the sanitary protection zones and protective measures for water sources for public water supply of the population, ("*Official Gazette of F BiH*", *no. 88/12*), the whole Rulebook; Rulebook on procedure and measures in cases of accidents on water and coastal wetlands (*Official Gazette of F BiH", no. 71/09*), *Articles No. 16. and 17.* Regulation on Dangerous and Harmful Substances in Water, *("Official Gazette of F BiH", no. 43/07*), the whole Regulation; Decision on Characterization of Surface and Ground Waters, Reference Requirements and parameters for the Assessment of Water Status and Water Monitoring, *("Official Gazette of F BiH", no.1/14*), *Annex 2* this Decision.		**95 %**
EU Floods Directive 2007/60/EC	Requires Member States to assess if all water courses and coastlines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk.	Member States are required to assess activities that have the potential effect of increasing flood risks. The wind farm construction therefore needs to avoid increasing flood potential risk.	The Law on Water; *("Official Gazette of F BiH", no. 70/06*), *Articles No. 21.-28., 40, 85.-87., 90.-94.* and *96.*		**83%**

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EU Bathing Water Directive 2006/7/EC	Sets out the provisions for monitoring, classification and management of bathing water quality in the EU with the purpose of preserving, protecting and enhancing the environment and protecting human health.	Compliments Directive 2000/60/EC. Article 4 sets out the Bathing Water Quality Assessment requirements. Not relevant unless there are bathing waters that may be affected by the Wind Farm.	The Law on Water; *("Official Gazette of F BiH", no. 70/06), Articles No. 44. (Use of water)* and *72. (Water bodies intended for recreation);* Decision on Characterization of Surface and Ground Waters, Reference Requirements and parameters for the Assessment of Water Status and Water Monitoring, *("Official Gazette of F BiH", no.1/14*), *Annex 2 and 7* this Decision. Regulation on Dangerous and Harmful Substances in Water, ("*Official Gazette of F BiH", no. 43/07*), *Article No. 5*; Regulation on Classification of Waters and Coastal Sea Waters within the Borders of Former Socialist Republic of Bosnia and Herzegovina, *("Official Gazette of SR BiH", no. 19/80*), *Article No. 2*;		**21%**
SOILS					
There is no EU Directive relating to soils			Law on Concessions, *("Official Gazette of BiH", no. 32/02*); Law on Amendments to the Law on Concessions, ("Official Gazette of BiH", no. 56/04); The Law on Agricultural Land, ("Official Gazette of F BiH", no. 52/09); Rulebook on Determination of the Allowable Amount of Hazardous Materials into Soil and Test Methods thereof, ("Official Gazette of F BiH", no. 72/09); Decree on unique methodology for categorization of agricultural land ("Official Gazette of F BiH", no. 78/09); FBiH Law on Spatial Planning and Land Use, ("Official Gazette of F BiH", no. 02/06); Law on Amendments and Supplements to the FBiH Law on Spatial Planning and Land Use, ("Official Gazette of F BiH", no. 72/07, 32/08, 4/10, 13/10) Decree on unique methodology for preparation of the spatial planning documents ("Official Gazette of F BiH", no. 63/04 and No. 50/07); Law on Mining, ("Official Gazette of F BiH", no. 26/10);	Considering that BiH is not an EU are governed by the entities, therefore there are no laws on national member and that there is no EU Directive relating to soils, national laws and bylaws apply. The requirements for soil management and spatial planning level relating to soils. In terms of wind farm development, crucial is the Law on Agricultural land as well as Law on Spatial Planning and Land Use. According to the mentioned laws, building is allowed only on land of 7-8 quality categories, and potentially 5 and 6. This is also related to the protection of landscape.	-

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			Law on Concessions, ("Official Gazette of F BiH", no. 40/02, 61/06); Law on Environmental Protection, ("Official Gazette of F BiH", no. 33/03, 38/09); Law on Nature Protection, ("Official Gazette of F BiH", no. 33/03); Law on Agriculture, ("Official Gazette of F BiH", no. 88/07); Law on Amendments and Supplements to the Law on Agriculture, ("Official Gazette of F BiH", no. 4/10);		
WASTE					
The Waste Framework Directive 2008/98/EC	The Directive requires the permitting of all waste disposal and recovery operations subject to limited and conditional exceptions and sets out definitions and approaches which apply in all waste-related legislation. The Directive sets the baseline for waste prevention, disposal, recovery, reuse and recycling in Europe.	Article 12 relates to disposal of wastes, 'Member States shall ensure that, where recovery in accordance with Article 10(1) is not undertaken, waste undergoes safe disposal operations which meet the provisions of Article 13 on the protection of human health and the environment.' The Directive places an emphasis on prevention. All activities that are termed as disposal must operate under a permit. Annex III lists the properties of waste that renders it hazardous.	Law on Environmental Protection, ("*Official Gazette of F BiH", no. 33/03*), *Articles No. 56.* (*Projects subject to Environmental Impact Assessment*) as well as amended by this Law *("Official Gazette of F BiH", no. 38/09), Article No. 20.* The Regulation on facilities subject to obligatory EIA and facilities, which may be constructed and operated only with a valid environmental permit, ("*Official Gazette of the Federation of Bosnia and Herzegovina" no. 19/04), Article No* (*Plants and facilities for which the obligatory Environmental Impact Assessment), Paragraph 1, Item 1) (The Waste Management), Sub items 30. and 31.*; The Law on Waste Management, ("Official Gazette of F BiH", no. 33/03), *Articles No. 5.; 12., 13., 15.,16., 24., 29., 30., 36., 38.* and the whole Law as well as *a*mendments by this Law *("Official Gazette of F BiH", no. 72/09), Article No. 8.*; Rulebook on Waste Categories with Lists, ("Official Gazette of F BiH", no. 9/05), *Article No. 5.;* Rulebook on the Treatment of Waste that is not on the list of hazardous waste or which content is unknown, ("Official Gazette of F BiH", no. 9/05), the whole Rulebook; [2]Rulebook on content of adjusting waste management for existing plants for		**27%**

[2] *The last two mentioned regulations are not directly related to the aforementioned Articles of the Directive, but ultimately aim to prevent negative impacts on the environment*

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			treatment or waste disposal and activities undertaken by the competent authority, ("Official Gazette of F BiH", no. 9/05), [2]Regulations on the conditions for the transfer of waste management obligations from the producers and sellers on the system operator for waste collection, ("Official Gazette of F BiH", no. 9/05);		
Landfill Directive 1999/31/EC	The Landfill Directive defines the different categories of waste (municipal waste, hazardous waste, non-hazardous waste and inert waste) and applies to all landfills, defined as waste disposal sites for the deposit of waste onto or into land. The Directive sets out the standard procedure for accepting waste to a landfill.	Article 4 sets out the different classes of landfills that are to be assigned for different types of waste: • landfill for hazardous waste • landfill for non-hazardous waste • landfill for inert waste It is not permitted to mix these types of waste in one landfill. Article 8 sets out the conditions for issuing a landfill permit.	Law on Environmental Protection, (*"Official Gazette of F BiH", no. 33/03*), *Articles No. 19.* (*The Waste*) as well as amended by this Law *("Official Gazette of F BiH", no. 38/09), Article No. 4.* The Law on Waste Management, *("Official Gazette of F BiH", no. 33/03*), *Articles No. 3., 15., 16., 24.-26., 34., 36.,* as well as amended by this Law *("Official Gazette of F BiH", no. 72/09), Article No. 6.;* Rulebook on Waste Categories with Lists, ("*Official Gazette of F BiH", no. 9/05*), the whole Rulebook is important for realization of selective collection and disposal of waste.; Rulebook on the Treatment of Waste that is not on the list of hazardous waste or which content is unknown, ("*Official Gazette of F BiH", no. 9/05*), the whole Rulebook is important for realization of selective collection and disposal of waste; Regulation on selective collection, packaging and labelling of waste ("*Official Gazette of F BiH", no. 38/06),* the whole Regulation.	BiH legislation requires strict separation of these defined wastes. However, many of the good practices from the EU are not incorporated into BiH legislation.	**20%**
Directive 75/439/EEC Council Directive of 16 June 1975 on the disposal of waste oils	Article 2 states that Member States shall take the necessary measures to ensure that waste oils are collected and disposed of without causing any avoid able damage to man and the environment. Article 4 prohibits the discharge of waste oils into the environment including into inland surface water, groundwater, drainage systems and soils.		Law on Environmental Protection, (*"Official Gazette of F BiH", no. 33/03*), *Articles No. 13.* (The S*oil Conservation*), 14. (*The Water Protection*) as well as amended by this Law *("Official Gazette of F BiH", no. 38/09),* but in this *a*mendments there are *no change*, in relation with above mentioned Articles. The Law on Waste Management, *("Official Gazette of F BiH", no. 33/03*), *Articles No. 3.,*		**No Datas** Progress in terms of this Directive is not contained in the Report.[3]

[3]*Activity 1.3 Progress Monitoring of the transposition and implementation of the environmental and climate acquis, Environment and Climate Regional Accession Network (ECRAN), Preliminary Progress Report , Bosnia and Herzegovina,15 June 2015*

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			as well as amended by this Law *("Official Gazette of F BiH", no. 72/09),* this *a*mendments there are *no change*, in relation with above mentioned Articles. Rulebook on Waste Categories with Lists, *("Official Gazette of F BiH", no. 9/05*), *Article No. 5., Annex/Group 13 (Oil Wastes and Wastes of Liquid Fuels;* Regulation on selective collection, packaging and labelling of waste ("*Official Gazette of F BiH", no. 38/06), Articles No. 14.-27.;*		
ENVIRONMENTAL NOISE					
Directive 2002/49/EC on the assessment and management of environmental noise	Sets an EU wide approach to reducing exposure to environmental noise	This Directive sets the requirement for Member States to produce noise maps to show levels of noise exposure across the country. Annex IV sets out the minimum requirements for strategic noise mapping. The wind farm would need to be assessed within the context of existing environmental noise.	The Law on Noise Protection, ("*Official Gazette of F BiH", no. 110/12*), *Articles No.5. (The Noise Protection Measures), 9.-12., 15.*		**0%**
Directive 2003/10/EC on the protection of workers from the risks related to exposure to noise at work	Aims to protect workers from risks to their hearing by setting limits on noise levels at which preventative action is required and also exposure limits.	Article 3 requires that noise at work should be assessed and, where necessary, monitored in order to identify workers at risk from high noise exposure. Article 4-8 sets out noise exposure limits for workers	The Law on Safety on Work, ("*Official Gazette of R BiH", no. 22/90*), *Articles No. 8., 17.-19.*; The Law on Noise Protection, ("*Official Gazette of F BiH", no. 110/12*), *Articles No. 5. (The Noise Protection Measures), 10. (The use of noise protection measures in the permitting process) and 12. (The Noise from the Construction Site).*		**No Datas** Progress in terms of this Directive is not contained in the Report.[4]
PROTECTION OF AIR QUALITY					
Directive 2008/50/EC on ambient air quality and cleaner air for Europe	The Directive places a general obligation upon Member States to take the necessary measures to comply with the limit values established.	Chapter II sets out how to assess ambient air quality in relation to sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter, lead, benzene and carbon monoxide. Chapter III of Directive sets limit values of sulphur dioxide, nitrogen dioxide, PM10, PM2,5, lead, benzene and carbon monoxide in ambient air.	The Law on Air Protection, *("Official Gazette of F BiH", no. 33/03*), *Articles No. 3., 24. and 25.* as well as amended by this Law *("Official Gazette of F BiH", no.4/10), Articles No. 3*. and *6.* Rulebook on Manner of Monitoring of the Air Quality and Defining of Types of the Pollutants, the Limit Values and other Air Quality Standards, ("*Official Gazette of F BiH", no. 1/12*), *Articles No. 15.-18., 22. Paragraph 3. and 4. See Annexes VII and XI who are a part of this Rulebook.*		**94%**

[4] *Activity 1.3 Progress Monitoring of the transposition and implementation of the environmental and climate acquis, Environment and Climate Regional Accession Network (ECRAN), Preliminary Progress Report , Bosnia and Herzegovina,15 June 2015*

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			Rulebook on monitoring of air quality, (*„Official Gazette of F BiH", no. 12/05*), *Articles No. 1. and 2., but* the whole Rulebook provides preservation and control of air quality*;* Rulebook on Monitoring of Pollutants into the air, (*„Official Gazette of F BiH", no. 9/14*), *Article No.18. and 20., but* the whole Rulebook provides preservation and control of air quality *;*		
Directive 2002/88/EC of the European Parliament and of the Council of 9 December 2002 amending Directive 97/68/EC on the approximation of the laws of the Member States relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery	Directive controls the emissions from construction vehicles/machinery.	Construction vehicles and machinery used will need to comply with this Directive in terms of emissions standards.	The Law on Air Protection, *("Official Gazette of F BiH", no. 33/03), Articles No. 20. (The Motorized Vehicles), 21. (The Content of Sulfur in Fuel), 22. (The Fuel for Vehicles), 24. (The Other Volatile Organic Compounds),* as well as amended by this Law *("Official Gazette of F BiH", no. 4/10),* this amendments there are *no change*, in relation with above mentioned Articles. The Law on Basics of Traffic Safety on the Roads in BiH („Official Gazette of BiH", no. 6/06), *Article No. 231., Paragraph 1.;* Rulebook on Monitoring of Pollutants into the air, („Official Gazette of F BiH", no. 9/14), *Articles No. 7.-9.. See Annexes I and IV, who are a part of this Rulebook.*;		**No datas** Progress in terms of this Directive is not contained in the Report.[5]
NATURE CONSERVATION AND BIODIVERSITY					
Directive 2009/147/EC on the conservation of wild birds (Birds Directive)	The Directive provides a system of protection for all species of wild birds found in the EU. Member States are required to preserve, maintain or re-establish sufficient diversity and areas of habitats for wild birds. The Directive covers birds, their eggs, nests and habitats.	Annex I lists species which Member States must maintain at a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or to adapt the population of these species to that level. The species mentioned in Annex I shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution. Article 4 requires the establishment of Special Protection Areas (SPAs) for the conservation of Annex I species and states that Member States must take steps to avoid pollution or deterioration of habitats or any disturbances affecting these birds. Outside these	Law on Environmental Protection, ("Official Gazette of F BiH", no. 33/03 and 38/09), Article No. 16. (*The Preservation the biosphere*) as well as amended by this Law *("Official Gazette of F BiH", no. 38/09),* this amendments there are *no change*, in relation with above mentioned Articles. The Law on Nature Protection, *("Official Gazette of BiH" no. 66/13*), *Articles No. 6., 12., 17., 19., 22., 25., 26., 58., 64.-67., 70.-73., 77.-80., 86.-89., 90.-93.,, 96., 108.-111.*; Rulebook on the Establishment and Management of Information System for Nature Protection and Monitoring, *("Official*	Considering that BiH is not an EU member, Nature 2000 is not binding. However, the project "Support for the implementation of the Birds Directive and the Habitats Directive in BiH", aimed to improve the implementation of the guidelines from the relevant directives. The Law on Nature Protection significantly takes into account the above mentioned directives. The project Nature 2000 in Bosnia and Herzegovina still not completed, and there are no official decisions to designate the area an integral part of	**49%**

[5] *Activity 1.3 Progress Monitoring of the transposition and implementation of the environmental and climate acquis, Environment and Climate Regional Accession Network (ECRAN), Preliminary Progress Report , Bosnia and Herzegovina,15 June 2015*

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		protected areas, Member States are also to strive to avoid pollution and deterioration of habitats. All SPAs form part of the Natura 2000 single ecological network, which also includes SACs designated under Directive 92/43/EEC (see below).	*Gazette of F BiH", no. 46/05*), *Articles No. 6 Articles No. 3., 6.-14.*; Law on Environmental Protection Fund, ("*Official Gazette of F BiH", no. 33/03*), *Article No. 3., Paragraph 1., Item 6.*; Rulebook on Compensation for Damages to Wildlife, („Official Gazette of F BiH", no. 9/14), whole Rulebook; The Red List of Endangered Wildlife Species and Subspecies of Plants, Animals and Fungi („Official Gazette of F BiH", no. 7/14), whole List;	Nature 2000. Vlašić wind farm is located in the area as a planed Nature 2000, but has not yet officially declared the same. Assessment of existing protected areas or any other areas on the national territory which are potentially suitable for classification as special protection areas (SPAs) for the conservation of bird species listed in Annex I, is not determined yet. The Law on Nature protection (Official Gazette FB&H no. 66/13) is planning assessments in this regard.	
Directive 92/43/EC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive)	The Directive aims to maintain and improve biodiversity in the EU through the conservation of natural habitats and the protection of wild fauna and flora. Member States are obligated to protect identified special areas of conservation (SACs) and establish necessary conservation measures for SACs in their territory.	Annex I lists the habitats that require the establishment of Special Areas of Conservation (SACs) which are to form part of the European Network of SACs (Natura 2000). Article 6(3) states that any plan or project, not directly related to or necessary for the management of a site, that is 'likely to have a significant effect' on a designated site, either individually or cumulatively with other plans or projects, should be subject to an 'appropriate assessment of its implications for the site in view of the site's conservation obligations'. This obligation extends to SPAs designated under Directive 2009/147/EC and includes plans and projects that take place both within and outside a protected site.	The Law on Nature Protection, ("*Official Gazette of BiH" no. 66/13*), *Articles No. 6., 25.-27., 58.-62., 67.-69., 90.-93., 134., 135., 245.;* Regulation on Nature 2000 - protected areas in Europe, ("*Official Gazette of F BiH", no.41/11*), whole Regulation; Rulebook on the Establishment and Management of Information System for Nature Protection and Monitoring, ("*Official Gazette of F BiH", no. 46/05*), *Articles No. 6 Articles No. 3., 6.-14.*; The Red List of Endangered Wildlife Species and Subspecies of Plants, Animals and Fungi („*Official Gazette of F BiH", no. 7/14*), whole List;;	Considering that BiH is not an EU member, Nature 2000 is not binding. However, the project "Support for the implementation of the Birds Directive and the Habitats Directive in BiH", aimed to improve the implementation of the guidelines from the relevant directives. The Law on Nature Protection significantly takes into account the above mentioned directives. Assessment of existing protected areas or any other areas on the national territory which are potentially suitable for classification as special protection areas (SPAs) for the conservation of bird species listed in Annex I, is not determined yet. The Law on Nature protection (Official Gazette FB&H no. 66/13) is planning assessments in this regard	**48%**
The Ramsar Convention on Wetlands (Ramsar, Iran, 1971)	An intergovernmental treaty which provides the framework for national action and international cooperation for the conservation ad wise use of wetlands and their resources.	The convention recognises the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. BiH is signatory (1992) to the Convention which deals solely with the protection of wetlands.	BiH is signatory (1992) to the Convention.		-

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CULTURAL HERITAGE					
There are no European Directives related to Cultural Heritage.			The Law on the protection of properties designated as National Monuments of Bosnia and Herzegovina by decisions of the Commission to Preserve National Monuments, ("Official Gazette of F BiH", no. 2/02 and 8/02); Temporary List of National Monuments of Bosnia and Herzegovina, (Commission to Preserve National Monuments at the 15th session held on 14th June, 2000).	Sets out a definition of cultural and natural heritage and steps that are needed to ensure its protection.	-
The European Cultural Heritage Convention (1954)	This Convention aims to drive a policy of common action designed to safeguard and encourage the development of European culture;	Article 1 of the convention states that contracting Parties shall take appropriate measures to safeguard and to encourage the development of its national contribution to the common cultural heritage of Europe.	BiH is signatory		-
The UN Convention Concerning the Protection of the World Cultural and Natural Heritage (1972)	Sets out a definition of cultural and natural heritage and steps that are needed to ensure its protection.	Article 4 sets out the duties of each signatory State as ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage referred to in Articles 1 and 2 and situated on its territory.	BiH is signatory		-
UNESCO World Heritage Sites		There are no UNESCO World Heritage Sites within the study area.	BiH is signatory		-
European Convention on the Protection of the Archaeological Heritage (Revised), Valletta (1992).	The aim of the Convention is to protect the archaeological heritage as a source of the European collective memory and as an instrument for historical and scientific study	Article 2 establishes the requirement for States to set up a legal system for the protection of archaeological heritage.	BiH is signatory		-

Table 2 BiH Environmental Standards and Comparison with EU Standards

Environmental Pollutant	Exposure duration parameter	BiH Standards	EU Standards
Air quality		Regulations on Manner of Monitoring of the Air Quality and Defining of Types of the Pollutants, the Limit Values and other Air Quality Standards, ("Official Gazette of F BiH", no. 1/12);	Directive 2008/50/EC
Nitrogen Dioxide (NO_2)	1 hour	105 µg/m^3(70% of the level[6] value) – 18 exceedences permitted per year	200 µg/m^3 – 18 exceedences permitted per year
	1 year		40 µg/m^3
	1 year (protection of human health)		
	Protection of vegetation (annual average value)	24 µg/m^3(80% of the critical value)	
Nitrogen Dioxide (NO_2)			
Upper assessment level	Protection of human health (1 hour average value) Protection of human health (annual average value) Protection of vegetation (annual average value)	105 µg/m^3 (70% of the level value) – 18 exceedences permitted per year 32 µg/m^3 (80% of the level value) 24 µg/m^3 (80% of the critical value)	
Lower assessment level	Protection of human health (1 hour average value) Protection of human health (annual average value) Protection of vegetation (annual average value)	75 µg/m^3 (50% of the level value) – 18 exceedences permitted per year 26 µg/m^3 (65% of the level value) 19,5 µg/m^3 (65% of the critical value)	
NO_x	1 year (protection of vegetation)		
Sulphur dioxide (SO_2)	1 hour		350 µg/m^3 – 24 exceedences permitted per year
	24 hours		125 µg/m3 – 3 exceedences permitted per year
Sulphur dioxide	(SO_2)		
Upper assessment level	Protection of human health (daily average value) Protection of ecosystem (annual average value)	75 µg/m^3 (60% of the daily average value) – 3 exceedences permitted per year 12 µg/m^3 (60% of the daily average value)	
Lower assessment level	Protection of human health (daily average value) Protection of ecosystem (annual average value)	50 µg/m^3 (40% of the daily average value) – 3 exceedences permitted per year 8 µg/m^3 (400% of the daily average value)	
Carbon Monoxide	8 hours (maximum daily 8 hour mean)		10 mg/m^3
Carbon Monoxide			
Upper assessment level	Protection of human health (8 hours average value)	7 mg/m^3 (70% of the level value) - 18 exceedences permitted per year	
Lower assessment level	Protection of human health (8 hours average value)	5 mg/m^3 (50% of the level value) - 18 exceedences permitted per year	
PM_{10} (particulate Matter <10µm	24 hours		50 µg/m^3 – 35 exceed ences permitted per year
	1 year		40 µg/m^3
PM_{10}			
Upper assessment level	Protection of human health (24 hours average value) Protection of human health (annual average value)	35 µg/m^3 (70% of the level value) – 35 exceedences permitted per year 28 µg/m^3 (70% of the daily level value)	
Lower assessment level	Protection of human health (24 hours average value) Protection of human health (annual average value)	25 µg/m^3 (50% of the daily level value) – 35 exceedences permitted per year 20 µg/m^3 (50% of the daily level value)	

[6] *Concentration and / or quantity of pollutants in emissions from a source within a certain period, which shall not be exceeded.*

Environmental Pollutant	Exposure duration parameter	BiH Standards	EU Standards
$PM_{2.5}$ (Particulate matter < 2.5 µm)	1 year		25 µg/m^3
	Exposure concentration obligation - Average Exposure Indicator (AEI)		20 µg/m3 (AEI) Based on a three year average
$PM_{2.5}$			
Upper assessment level	Protection of human health (24 hours average value)	17 µg/m^3 (70% of the level value)	
Lower assessment level	Protection of human health (24 hours average value)	12 µg/m^3 (50% of the level value)	
Ozone	8 hour daily max. (average of last three years)		120 µg/m3 – 25 days averaged over three years
Arsenic	1 year		6 ng/m3
Arsenic			
Upper assessment level	Protection of human health (annual average value)	3,6 ng/m^3 (60% of the target[7] value)	
Lower assessment level	Protection of human health (annual average value)	2,4 ng/m^3 (40% of the target value)	
Benzene	1 year		5 µg/m3
Benzene			
Upper assessment level	Protection of human health (annual average value)	3,5 µg/m^3 (70% of the level value)	
Lower assessment level	Protection of human health (annual average value)	2 µg/m^3 (40% of the level value)	
Cadmium	1 year		5 ng/m3
Upper assessment level	Protection of human health (annual average value)	3 ng/m^3 (60% of the target value)	
Lower assessment level	Protection of human health (annual average value)	2 ng/m^3 (40% of the target value)	
Nickel	1 year		20 ng/m3
Nickel			
Upper assessment level	Protection of human health (annual average value)	14 ng/m^3 (70% of the target value)	
Lower assessment level	Protection of human health (annual average value)	10 ng/m^3 (50% of the target value)	
Polycyclic Aromatic Hydrocarbons	1 year		1 ng/m3 (expressed as concentration of Benzo(a)pyrene)
Polycyclic Aromatic Hydrocarbons			
Upper assessment level	Protection of human health (annual average value)	0,6 ng/m^3 (60% of the target value)	
Lower assessment level	Protection of human health (annual average value)	0,4 ng/m^3 (40% of the target value)	
Lead	1 year		0.5 µg/m3

7 *Level determined with the aim of avoiding more long-term harmful impacts on human health and/or on the environment at all. This level has to be achieved in a certain period, where possible.*

Environmental Pollutant	Exposure duration parameter	BiH Standards	EU Standards
Lead			
Upper assessment level	Protection of human health (annual average value)	0,35 µg/m^3 (70% of the level value)	
Lower assessment level	Protection of human health (annual average value)	0,25 µg/m^3 (50% of the level value)	
Noise and vibration		The Law on Noise Protection, ("Official Gazette of F BiH", no. 110/12); The Law on Safety on Work, ("Official Gazette of R BiH", no. 22/90);	Directive 2002/49/EC on the assessment and management of environmental noise Directive 2003/10/EC
Protection limits	Action levels		Precautionary measures, such as making hearing protectors available, must be initiated when noise levels exceed 80 dBA. Protective measures, like enforcing the use of hearing protectors, must now be initiated when noise levels exceed 85 dBA.
Exposure limits	Daily		87 dBA – is the maximum allowable daily noise exposure level, taking account of attenuation provided by hearing protectors worn by a worker
Protection limits	Daily Nightly L1	70 dB(A) 70 dB(A) 85 dB(A)	
Exposure limits	Daily	80 dB	
Highest allowed level	Daily (Leq in touristic and recreational zones) Nightly (Leq in touristic and recreational zones) L1 (in touristic and recreational zones)	50 dB(A) 40 dB(A) 65 dB(A) Note: Correction factor for Impulse noise +5 dB(A) for Leq and +10 dB(A) for LAmax	
Water Quality		The Law on Water; "Official Gazette of F BiH", no. 70/06;	Water Framework Directive, 2000/60/EC
		The Act implements the guidelines of Water Framework Directive.	Waters must maintain 'good ecological status' as defined by the Water Framework Directive. Article 4 of the WFD also calls for i) prevention any further deterioration in the status of surface and groundwater, ii) a progressive reduction in pollution from priority substances and a phasing out of emissions from priority hazardous substances for surface waters and iii) a progressive reduction in groundwater pollution, in order to reverse any significant and sustained upward trend in the concentration of any pollutant.