MOTT MACDONALD

Neretvica sHPP

Critical Habitat Assessment

30 October 2017

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Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	18 Oct 2017	C. Figueira I. Bray	M. Coroi	S. Howard	First Issue (following memo)
B	27 Oct 2017	C. Figueira I. Bray	M. Coroi	Lucy Morton	Second Issue
C	30 Oct 2017	S. Howard	Lucy Morton	Lucy Morton	Third issue addressing EBRD comments

Document reference: 383409 | xx | c

Information class: Standard

Contents

1 Introduction

1.1 Project Background

PE Elektroprivreda Bosne i Hercegovine ("EPBiH" or "the Company"), a public utility responsible for generation, distribution and sale of electricity in Bosnia and Herzegovina is planning to construct and operate 15 small hydropower plants ("sHPP") and associated infrastructure (collectively "the Project") on the Neretvica river in the Konjic Municipality in the Bosnian Federation. The combined installed capacity of these run-of-river plants would be approximately 26MW. The location of Project is shown in Figure 1 and the Project components are shown in Figure 2.

The Company is seeking finance from the European Bank for Reconstruction and Development (EBRD). As part of the environmental and social impact assessment (ESIA) process, a critical habitat assessment (CHA) is needed to evaluate the presence of habitats and species of conservation interest (biodiversity features) that qualify as critical habitat under EBRD Performance Requirement (PR) 6[1] [2]. In addition, priority biodiversity features are identified which although a level below critical habitat, require careful consideration during the project assessment and impact mitigation.

1.2 Aims and Objectives

The aim of this document is to determine any priority biodiversity features, in particular those which meet criteria for critical habitat, which have the potential to be impacted by the proposed Project and whether outlined mitigation measures will be effective to meet EBRD PR6 requirements. This was achieved through the following objectives:

- Undertake a desk study and field surveys for legally protected and internationally recognised areas and priority biodiversity features which may be affected by the Project, in particular those which have the potential to trigger critical habitat requirements (**Chapter 2**).
- Undertake a CHA of the identified priority biodiversity features to determine if criteria are met for critical habitat following EBRD PR6 criteria (**Chapter 3**).
- Assess the likely potential impacts of the Project on priority biodiversity features which meet critical habitat criteria and outline possible mitigation measures (**Chapter 4**).

[1] EBRD (2014). Environmental and Social Policy. European Bank for Reconstruction and Development.

[2] EBRD (2016). Guidance Note: EBRD Performance Requirement 6. European Bank for Reconstruction and Development.

Figure1: Project location

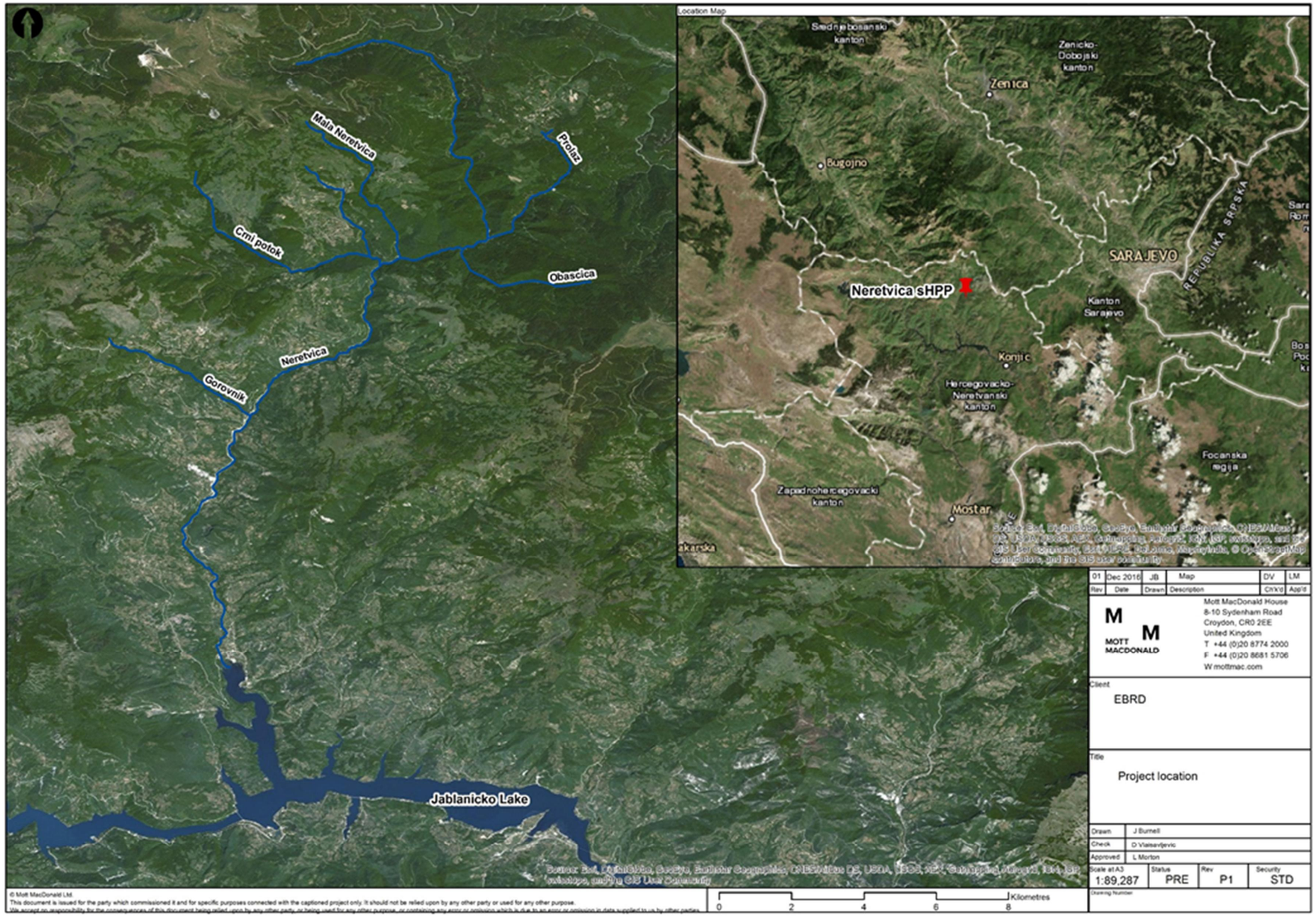
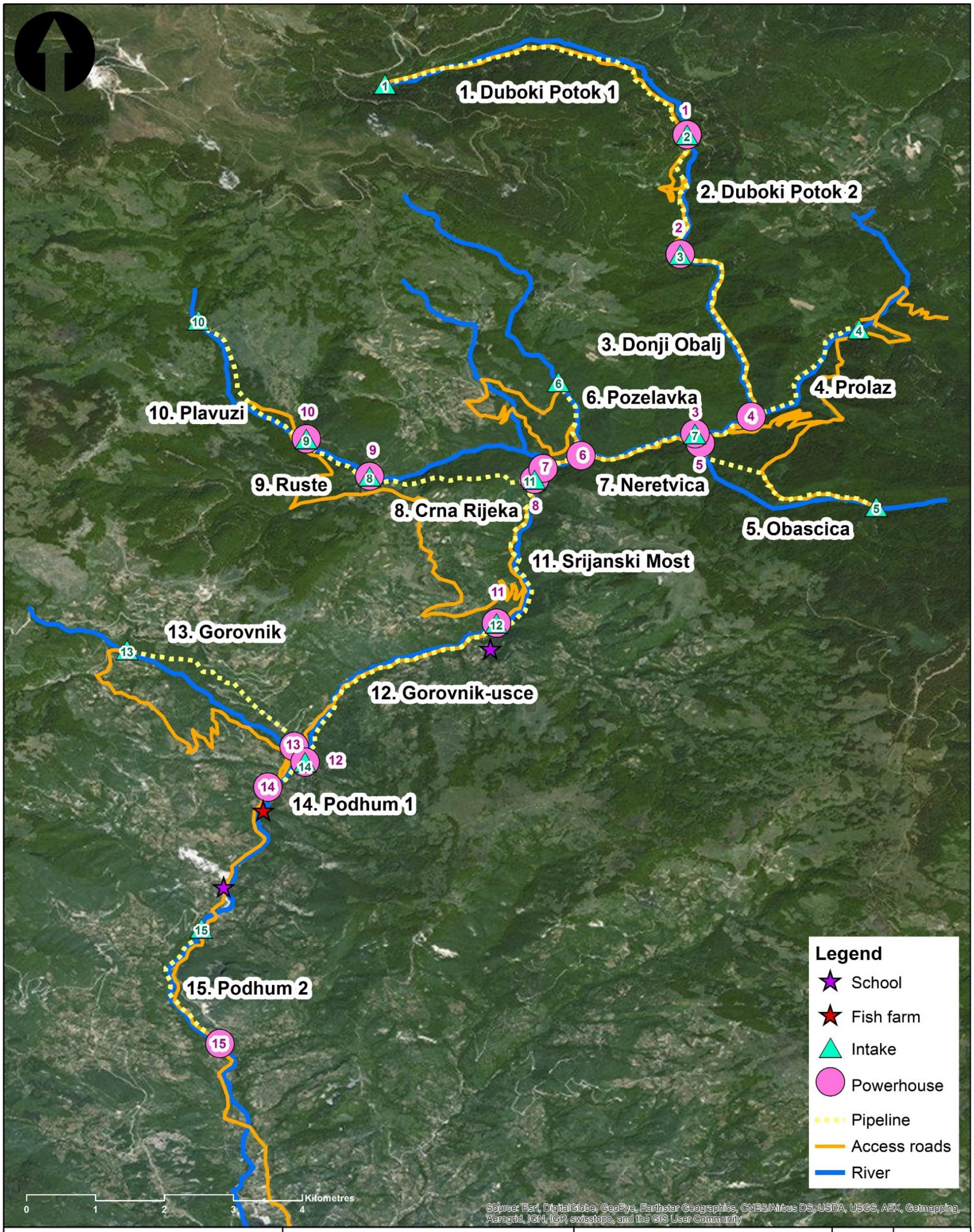


Figure 2: Project components



2 Biodiversity Baseline

2.1 General Approach and Methodology

In order to inform the CHA, biodiversity baseline surveys were undertaken in 2016 and 2017 including a desk study and field surveys. The latter were carried out by regional biodiversity experts commissioned by Mott MacDonald who also provided support with detailed knowledge of national legislation, protected species and habitats.

2.1.1 Study Area

The biodiversity baseline desktop study and surveys were undertaken within the areas defined in Table 1. Further details are given in Sections 2.1.2 to 2.1.4 below and Section 3.2.1 with regards to the critical habitat study area (CHSA).

Table 1: Study area definitions

Name	Definition
Project footprint	Land take supporting Project infrastructure.
Project area	Development boundary area including Project footprint.
Project study area (PSA) (aquatic)	The Neretvica catchment including tributaries and up to its mouth in the Jabanicko lake.
Project study area (PSA) (terrestrial)	Terrestrial habitats within Project area and surrounding landscape to 500m.
Critical habitat study area (CHSA)	The Neretvica catchment including tributaries and intervening terrestrial areas up to its mouth in the Jablanicko lake (this is the equivalent to the Discrete Management Unit referred to in IFC Guidance Note (GN) 6).
Area of endemism	Dinaric Alps: Croatia, Bosnia and Herzegovina, Serbia, Montenegro and Albania.

Source: Mott MacDonald

2.1.2 Desk study

A detailed desk-based review of available information from national and international sources was undertaken. This included the following:

- International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species (http://www.iucnredlist.org)
- European Red Lists for amphibians, bees, birds, butterflies, dragonflies, freshwater fishes, mammals, Lycopods and ferns, molluscs, grasshopper, crickets and bush-crickets, reptiles, saproxylic beetles, vascular plants(http://ec.europa.eu/environment/nature/conservation/species/redlist)
- The Bern Convention on the Conservation of European Wildlife and Natural Habitats
- Annex I, II and Annex IV of the EU Habitats Directive (http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm)
- Protected Planet (https://www.protectedplanet.net)
- Fishbase (http://www.fishbase.org/search.php)
- BirdLife International Data Zone (http://www.birdlife.org/datazone/home)
- Terrestrial and freshwater ecoregions within the Study Area (http://wwf.panda.org/about_our_earth/ecoregions)

Information on the following nature conservation areas (existing or proposed) within or near the Study Area was also collected and reviewed:

- Ramsar Sites
- Key Biodiversity Areas (KBA)
- Important Bird Areas (IBA)
- Endemic Bird Areas (EBA)
- Important Plant Areas (IPA)
- Nationally protected areas

2.1.3 Aquatic Biodiversity Surveys

Aquatic biodiversity surveys were undertaken within the Neretvica river catchment by Blue Rivers in 2016 and 2017. The locations of the surveys are showing in Figure 3; the surveys carried out included:

- Fish surveys (November 2016; May 2017; September 2017)
- White-clawed crayfish surveys (May 2017)
- Macroinvertebrate species (May 2017; September 2017)
- Freshwater habitat mapping (May 2017; September 2017)

2.1.4 Terrestrial Biodiversity Surveys

Terrestrial biodiversity surveys were undertaken for plants and habitats in June/July 2017 and fauna (mammals, birds, reptiles, amphibians and invertebrates) in July 2017. The surveys were undertaken during two visits over five days and targeted 22 predetermined locations within the PSA (see Figure 3). The surveys were carried out by Enova and Professor Doug Đug (Faculty of Natural Science, Ichthyology and Fishing Centre).

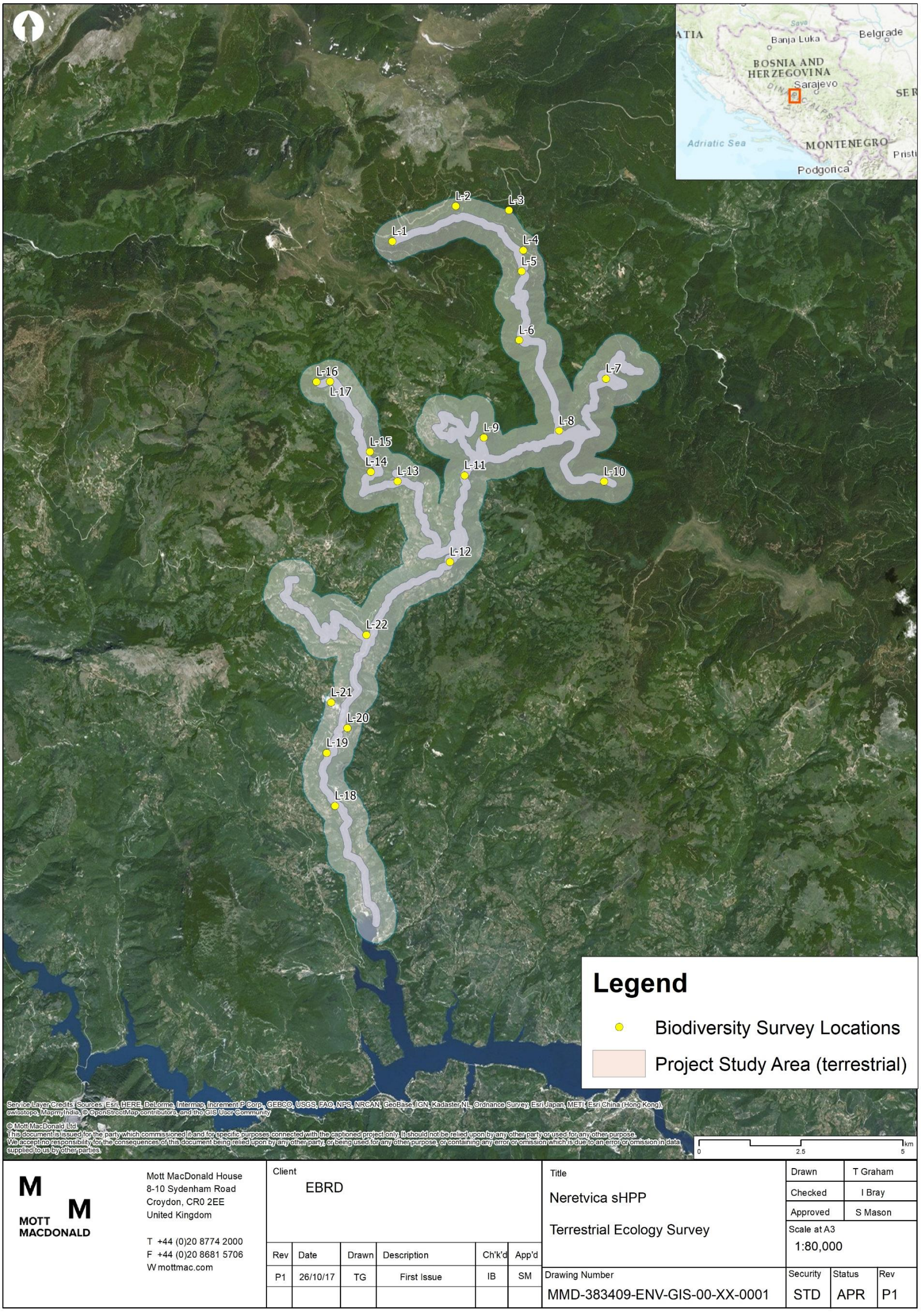
Key terrestrial habitats and species were targeted which may be affected by the Project and in accordance with EBRD PR6 criteria for determining priority biodiversity features. Direct observations were noted, as well as assessments of habitat suitability to support key species based on their known ecological requirements and distribution. Information on habitats was used to ground-truth satellite imagery, which has been used to determine the habitats present within the Project Area as part of the ESIA.

Figure 3: Aquatic surveys sampling locations

Number	SHPP
1	SHPP Duboki potok 1
2	SHPP Duboki potok 2
3	SHPP Donji Obalj
4	SHPP Prolaz
5	SHPP Obascica
6	SHPP Pozelavka
7	SHPP Mala Neretvica
8	SHPP Crna Rijeka
9	SHPP Ruste
10	SHPP Plavuzi
11	SHPP Srijanski Most
12	SHPP Gorovnik-usce (river Neretvica)
13	SHPP Gorovnik (river Gorovnik)
14	SHPP Podhum 1
15	SHPP Podhum 2

Source: Blue Rivers, 2017

Figure 4: Location of Project Study Area and biodiversity survey sites



MOTT MACDONALD Mott MacDonald House 8-10 Sydenham Road Croydon, CR0 2EE United Kingdom T +44 (0)20 8774 2000 F +44 (0)20 8681 5706 W mottmac.com	Client: EBRD					Title: Neretvica sHPP Terrestrial Ecology Survey	Drawn: T Graham Checked: I Bray Approved: S Mason Scale at A3: 1:80,000
	Rev	Date	Drawn	Description	Ch'k'd / App'd	Drawing Number: MMD-383409-ENV-GIS-00-XX-0001	Security: STD Status: APR Rev: P1
	P1	26/10/17	TG	First Issue	IB / SM		

2.2 Results

2.2.1 Legally Protected and Internationally Recognised Areas

The proposed Project is not located within any Natura 2000, legally protected or other internationally recognised areas (Emerald Sites, Ramsar Sites, Important Plant Areas, Important Bird Areas and Prime Butterfly Areas). The closest legally protected areas to the Project are located at Blidinje and Prokosko lake. Blidinje is a 35,800ha protected landscape located approximately 10.5km southwest of the Podhum 2 powerhouse while Prokosko lake is a 2,119ha nature monument located approximately 10km northwest of the intake for Duboki Potok 1. See Figure 5 for the locations of these protected areas relative to the Project site.

In Bosnia and Herzegovina there are no officially designated Natura 2000 sites as these have not yet been established as the country is not an EU candidate or associated member that is committed to establishing this conservation sites network. To date the country has identified potential Natura 2000 sites, which correspond with those identified as part of the EMERALD network[3].

The closest proposed Natura 2000 site (based on data obtained from the on-line Natura 2000 viewer for Bosnia and Herzegovina[4]) is the mountain Vranica (3.5km north of Neretvica river) which currently has no official status of protection but is proposed to become a national park and protected landscape. However, it should be noted that this boundary has not yet been fixed and an alternative proposal extends further south which would include two sHPP sites: Duboki Potok 1 and 2 (Prof. Samir Đug, pers comm.).

The canyon of the Neretva river has no official status of protection. It should be noted that it is being proposed to become a protected landscape on the national level in the FBiH Draft Spatial Plan for 2008-2028[5] but this document is still at the draft stage and it has not yet been defined which parts of the Neretva river basin will be protected, if any. No reference to the Neretvica river was made in that document.

It is important to note that although not within a specific Key Biodiversity Area, the Neretvica river is within the Mediterranean Basin Biodiversity Hotspot, known for its globally important biodiversity. It is part of the eastern Adriatic corridor that runs through Bosnia and Herzegovina, Croatia and Montenegro and the area is notable for the many karstic streams, springs and cave systems, and the associated polje ' s (depressions typical in karstic regions – often containing marshes or small lakes) important to a number of freshwater species, many of which are endemic (Darwall et al., 2014)[6].

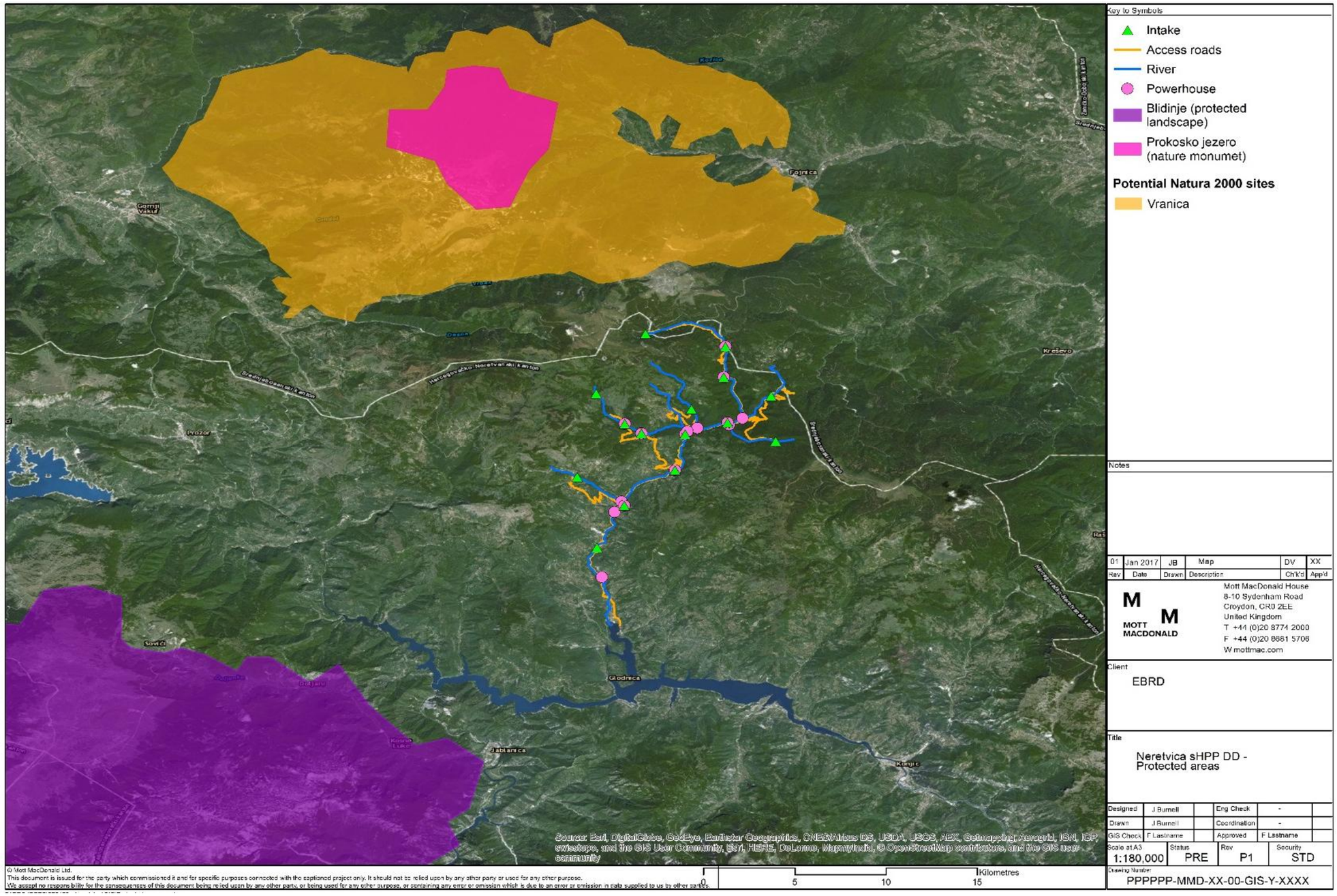
[3] USAID Country Biodiversity Analysis: Bosnia and Herzegovina, July 2016, produced by Enova

[4] http://www.arcgis.com/apps/Viewer/index.html?appid=aa4ceb4a4d734623a06b37ac304191dc

[5] http://www.attract-see.eu/sites/default/files/National_attractiveness_report_Bosnia%20and%20Herzegovina.pdf

[6] Darwall, W., Carrizo, S., Numa, C., Barrios, V., Freyhof, J. and Smith, K. (2014). Freshwater Key Biodiversity Areas in the Mediterranean Basin Hotspot: Informing species conservation and development planning in freshwater ecosystems. Cambridge, UK and Malaga, Spain: IUCN. x + 86pp

Figure 5: Location of Legally Protected and Internationally Recognised Areas.



2.2.2 Aquatic species

White-clawed crayfish

White-clawed crayfish surveys were carried out in May 2017 and September 2017. During the spring surveys, two individuals were caught at the mouth of the Gorovnik and Crna Rijeka. In autumn, a total of 26 individuals were caught and another 20 were observed in the river. Highest concentrations were recorded in the Gorovnik river where White-clawed crayfish were observed along the whole river length.

Fish community

Fish surveys were carried out at the locations shown in Figure 3. A total of 670 fish were caught belonging to 16 species. A species list and distribution is presented in Table 2. Species of conservation interest, their conservation status and potential to trigger critical habitat are presented in Table 3 (Section 3). During the desk study other species were identified that could also occur in wider catchment (Neretva river). The presence of these species was not confirmed in the CHSA during the recent surveys and will not be considered further in this assessment. These other species are listed in Appendix A.

Table 2: Fish species and their distribution in the Neretvica river

	Name in English	Latin name	Distribution in the Neretvica catchment
1	Brown trout	*Salmo trutta*	Everywhere in Neretvica and its tributaries
2	Neretvian chub	*Leuciscus (Squalus) svallize*	Mouth of Neretvica
3	Chub	*Squalius cephalus*	Mouth of Neretvica
4	Crucian carp	*Carassius auratus gibelio*	Mouth of Neretvica
5	Carp	*Cyprinus carpio*	Mouth of Neretvica
6	Adriatic minnow	*Phoxinellus alepidotus*	From Podhum 2 down to the mouth of Neretvica
7	Eurasian minnow	*Phoxinus lumaireu*	From Podhum 1 down to the mouth of Neretvica
8	Appearing tench	*Tinca tinca*	Mouth of Neretvica
9	Neretvan bleak	*Alburnus neretvae*	Mouth of Neretvica
10	Bleak	*Alburnus alburnus*	Podhum 2 down to the mouth of Neretvica
11	Sprilin	*Alburnoides bipunctatus*	Mouth of Neretvica
12	Balcan barbel	*Barbus balcanicus*	From Podhum 2 down to the mouth of Neretvica
13	Neretvan spined loach	*Cobitis narentana*	From Podhum 2 down to the mouth of Neretvica
14	Bullhead	*Cottus gobio*	From Podhum 1 down to the mouth of Neretvica
15	Pumpkinseed	*Lepomis gibbosus*	Mouth of Neretvica
16	Pike-perch	*Sander lucioperca*	Mouth of Neretvica

Macroinvertebrates community

Approximately, 100 species of macroinvertebrates were recorded. These included Insecta, which was the dominant group (89-95%), Trichoptera (30-35%), Ephemeroptera (21- 5%), Plecoptera (18-22%), Diptera (12-15%) and others (11-15%). Of these species, two (mayflies) were identified in BiH for the first time: *Ecdyonurus macani* and *Paraleptophlebia werneri*. In addition, two species classified as critically endangered (CR) in the Red Book of BiH[7] were recorded within the for Neretva basin (*Glossosoma neretvae* and *Chaetopteryx bosniaca*) as

[7] http://www.fmoit.gov.ba/ba/page/81/zascarontita-prirode#

well as two species classified as rare (*Drusus bosnicus* and *D.klapaleki*). *Gammarus bosniacus* (Amphipoda) which is classified as vulnerable (VU) in the Red Book of BiH was also recorded.

The conservation status and distribution of these species according with the 2017 surveys results is:

- *Drusus bosnicus*: Rare conservation status in BiH, found at sHPP Duboki potok 1, sHPP Prolaz.
- *D. klapaleki*: Rare conservation status in BiH, found at sHPP Duboki potok 1, sHPP Prolaz.
- *Chaetopteryx bosniacaI*: CR conservation status in BiH , found at sHPP Duboki potok 1, sHPP Prolaz.
- *Glossosoma neretvae*: CR conservation status in BiH – almost endangered, found at sHPP Podhum 2.
- *Gammarus bosniacus*: VU conservation status in BiH. Can be found along the whole Neretvica up to sHPP Podhum 2 as well as in all tributaries.

2.2.3 Terrestrial habitats and species

A total of 15 terrestrial habitat types were identified within the PSA. This included six habitats listed on Annex II of the Habitats Directive, which are considered to be priority biodiversity features, as follows:

- Luzulo-Fagetum beech forests (code 9110)
- Illyrian *Fagus sylvatica* forests (Aremonio-Fagion) (code 91K0)
- Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (code 6430)
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Pandion, *Alnion incanae, Salicion albae*) (code 91E0)
- Mountain hay meadows (code 6520)
- Alpine rivers and their ligneous vegetation with *Salix elaeagnos* (code 3240)

In addition, mammals, birds, reptiles, amphibians and invertebrates for which direct evidence or where there is the potential to occur in the PSA, and which could either trigger critical habitat (see Table 4 in Chapter 3) and/or are considered to be priority biodiversity features, were also identified (see Table 6 in Chapter 4). No plants or species from other taxonomic groups were identified which meet these criteria.

3 Critical Habitat Assessment

3.1 Background Information

A CHA was undertaken to determine if biodiversity features are present within the Project Area which may trigger critical habitat following criteria outlined in EBRD PR6.

Critical habitat is a description of the most significant and highest priority areas for biodiversity conservation. It takes into account both global and national priority setting systems and builds on the conservation biology principles of 'vulnerability' (degree of threat) and 'irreplaceability' (rarity or uniqueness). Determination of critical habitat is based upon quantitative thresholds of biodiversity priority which are largely based on globally accepted precedents such as IUCN Red List[8] (IUCN, 2017) criteria and Key Biodiversity Area (KBA) thresholds.

In terms of quantitative thresholds, EBRD PR6[9] [10] guidance defers to IFC PS6[11] [12] methodology, which distinguishes two categories of critical habitat as outlined below. Whilst PR6 does not explicitly follow these categories, for the purposes of this assessment the term 'significant' is considered to be that which meets Tier 1 or Tier 2 conditions within corresponding PS6 criteria:

- Tier 1 critical habitat of highest importance, in which development is generally very difficult to implement and offsets are generally not possible except in exceptional circumstances.
- Tier 2 critical habitat of high importance, in which development can be implemented through appropriate planning and mitigation. Offsets may be possible under some circumstances under Tier 2.

In line with EBRD Guidance Note 6, the identification and characterisation of critical habitat should include the following steps:

1. Definition of the study area;
2. Stakeholder consultation and initial literature review;
3. In-field data collection and verification of available information;
4. Confirmation of biodiversity likely to meet critical habitat; and
5. Determination of critical habitat status (of each study area).

Under EBRD PR6 the most sensitive biodiversity features are defined as critical habitat and include the following:

I. Highly threatened or unique ecosystems;
II. Habitats of significant importance to endangered or critically endangered species;
III. Habitats of significant importance to endemic or geographically restricted species;
IV. Habitats supporting globally significant (concentrations of) migratory or congregatory species;
V. Areas associated with key evolutionary processes;

[8] IUCN website accessed June 2017, http://www.iucnredlist.org/

[9] EBRD (2014). Environmental and Social Policy. European Bank for Reconstruction and Development.

[10] EBRD (2016). Guidance Note: EBRD Performance Requirement 6. European Bank for Reconstruction and Development.

[11] IFC (2012). Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. International Finance Corporation, World Bank Group.

[12] IFC (2012). Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. International Finance Corporation, World Bank Group

VI. Ecological functions that are vital to maintaining the viability of biodiversity features described (as critical habitat features).

The project type, impacts and proposed mitigation are not relevant in the CHA process. Paragraph GN66 in IFC Guidance Note 6 states: 'The definition of the critical habitat and the impacts of a particular project are two unrelated concepts. The definition of the critical habitat is based on the presence of high biodiversity values whether or not a project is to be undertaken in that habitat.'

Endangered or critically endangered species are listed in IUCN Red List of Threatened species. However, habitats and species identified in other lists may also constitute critical habitat. Within the context of this project, this also includes species listed as endangered or critically endangered on relevant EU and national species Red Lists and Bern Convention.

Under EBRD criteria for critical habitat, EU Habitats Directive Annex IV species (animal and plant species of community interest in need of strict protection) are also triggers of critical habitat where there is habitat of significant importance to them.

Areas identified as critical habitat are considered to hold the highest level of irreplaceable (existing in few places) and vulnerable (at high risk of being lost) biodiversity features.

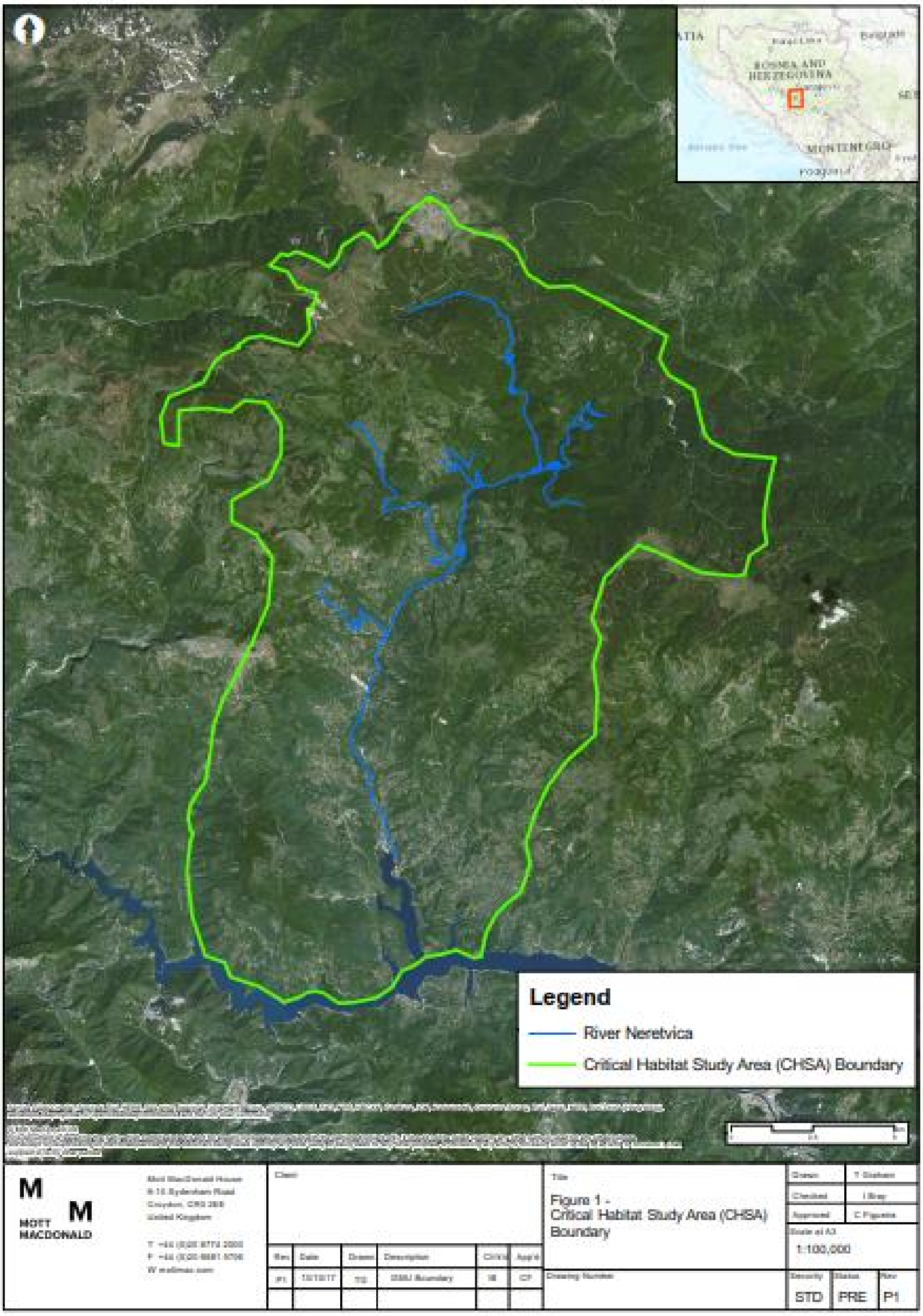
3.2 Determination of Critical Habitat

3.2.1 Introduction

In order to conduct a CHA, a study area needs to be defined. The extent of this is dependent on the biodiversity features of interest and ecological functions that support them which can be different for each feature. The CHSA is independent of the Project Area and zone of influence and can include a larger geographical area (Figure 6). This area is equitable to the concept of the Discreet Management Unit (DMU) used by IFC Guidance Note 6 and therefore follows the same criteria in its determination.

The CHSA for the Project is considered to be the water catchment of the Neretvica river (see Figure 6).

Figure 6: Location of CHSA



3.2.2 Critical Habitat Assessment

To determine whether the Project is located within critical habitat, a comprehensive literature review supported by field surveys undertaken by regional biodiversity experts was undertaken (see Chapter 2). An assessment of potential priority species which may trigger critical habitat for the following criteria is presented in Table 3 (aquatic species) and Table 4 (terrestrial species). A detailed assessment for two aquatic species (Adriatic minnow and White-clawed crayfish) is given in Appendix B.

- Habitats of significant importance to endangered or critically endangered species
- Habitats of significant importance to endemic or geographically restricted species
- Habitats supporting globally significant (concentrations of) migratory or congregatory species

A summary of the biodiversity features which are considered to trigger critical habitat as well as conditions which meet the following criteria is presented in Table 5:

- Highly threatened ecosystems
- Areas associated with key ecological processes
- Ecological functions that are vital to maintaining the viability of biodiversity features described (as critical habitat features)

Table 3: Aquatic species of conservation interest, that can occur in the CHSA

Taxonomic group	Name	IUCN	EUR IUCN	Habitats Directive1	B & H Red List	Endemic or Range Restricted	Presence in 2016/2017 surveys	Notes	Potential for CH	Justification
Fish	Adriatic trout *Salmo obtusirostris*	EN	-	-	CE	Yes	Nov 2016– not recorded May 2017- not recorded Sep 2017 - - not recorded	*S. obtusirostris* occurs in only four catchments in: Bosnia and Herzegovina (Neretva catchment); Croatia and Montenegro. Adriatic basin in Krka. The total area of occupancy (AOO) is estimated to be less than 500km². This species inhabits cold streams and small rivers, usually in deep, quiet places and is found at high altitude13. This description is consistent with the records in Neretvica basin.	No	The presence of this salmonid species was not confirmed during the September surveys. Individuals captured before are identified as different morphotypes of trout (*Salmo trutta*).
Fish	Marble trout *Salmo marmoratus*	LC	-	Annex II	CE	Yes	Not recorded.	It is restricted to southern Switzerland, northern Italy and the Adriatic basin of Slovenia14. Molecular data suggest that populations identified as *Salmo marmoratus* from Neretva catchment (Bosnia-Herzegovina, Croatia)15 and other records from Croatia, Montenegro, Bosnia and Albania may be other subspecies of Adriatic trout16 .	No	Not recorded in 2016 and 2017 May and September. The presence of this species is not confirmed in the Neretvica catchment.
Fish	Spotted minnow, *Delminnichthys adspersus* or	-	VU	-	-	Yes	Not recorded.	This species is endemic to BiH.	No	Not recorded

[13] Crivelli, A.J. 2006. *Salmo obtusirostris*. The IUCN Red List of Threatened Species 2006: e.T19862A9056634. http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T19862A9056634.en. Downloaded on 03 July 2017

[14] Crivelli, A.J. 2006. *Salmo marmoratus*. The IUCN Red List of Threatened Species 2006: e.T19859A9043279. http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T19859A9043279.en. Downloaded on 03 July 2017.

[15] Fishbase accessed on 03 July 2017

[16] Fishbase accessed on 03 July 2017

Taxonomic group	Name	IUCN	EUR IUCN	Habitats Directive1	B & H Red List	Endemic or Range Restricted	Presence in 2016/2017 surveys	Notes	Potential for CH	Justification
	Phoxinellus adsespersus									
Fish	Adriatic minnow *Phoxinellus alepidotus*	EN	-	-	EN	Yes	Nov 2016 – Yes[2] May 2017 – Yes[2] Sep 2017- Yes	This species is endemic to B&H and Croatia. Individuals identified that fit the morphological characteristics of the Adriatic minnow. Individuals caught differ from any other representatives by lack of scales, which is a special feature of *P. alepidotus*. This species is found at three, possibly four locations in Croatia and Bosnia-Hercegovina with a continuing decline in area of occupancy (AOO) owing to water abstraction; decline in habitat quality owing to agricultural pollution and introduced species; and, a decline in the number of subpopulations as the subpopulation in the Cetina river basin is thought to be now extinct.[17] Occur in lowland water bodies; in spring 2017 this species was recorded near Phodum 2 and at the mouth of Neretvica in autumn.	Yes	The presence of this species is confirmed in the Neretvica catchment. Given the restricted distribution and decreasing trend it is possible that this species meets the criteria for Critical Habitat.
Invertebrates (Tricopter)	*Drusus bosnicus*	-	-	-	CE	NI	May and Sep 2017 - Yes	Very little information is available for this species. It was identified with high confidence during the 2017 surveys in the Neretvica river	Yes	Presence confirmed in the CHSA. It is potentially a first record for the Neretva catchment. Tier 1 and Tier 2 criteria need to be investigated at the national/regional scale
Invertebrates (Tricopter)	*D. klapaleki*	-	-	-	CE	NI	May and Sep 2017 - Yes	Very little information is available for this species. It was identified with high confidence during the 2017 surveys in the Neretvica river.	Yes	Presence confirmed in the CHSA. It is potentially a first record for the Neretva catchment. Tier 1 and Tier 2 criteria need to be investigated at the national/regional scale

[17] Crivelli, A.J. 2006. *Phoxinellus alepidotus*. The IUCN Red List of Threatened Species 2006: e.T39273A10181170. http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T39273A10181170.en. Downloaded on 03 July 2017

Taxonomic group	Name	IUCN	EUR IUCN	Habitats Directive1	B & H Red List	Endemic or Range Restricted	Presence in 2016/2017 surveys	Notes	Potential for CH	Justification
Invertebrates (Tricopter)	*Glossosoma neretvae*	-	-	-	Al EN	NI	May and Sep 2017 -yes	Very little information is available for this species.	Yes	Presence confirmed in the CHSA. Tier 1 and Tier 2 criteria need to be investigated at the national/regional scale
Invertebrates (Tricopter)	*Chaetopteryx bosniaca*	-	-	-	CE	NI	May and Sep 2017 -yes	Very little information is available for this species.	Yes	Presence confirmed in the CHSA. Tier 1 and Tier 2 criteria need to be investigated at the national/regional scale
Invertebrates	White-clawed crayfish *Austropotamobius pallipes*	EN		Annex II and V	EN	No	May and Sep 2017 - yes	Presence confirmed in May 2017 with the identification of two individuals and in September (26 individuals caught and measured and 20 observed during the site visit). Suitable habitat is also present at multiple locations.	Yes	Presence of a viable population is confirmed Tier 1 and Tier 2 criteria need to be investigated at the national/regional scale.

CE – Critically Endangered; EN – Endangered; Al EN – Almost Endangered; NI – No Information

Table 4: Terrestrial species of conservation interest where suitable habitat to support them is present within the Project Area.

Taxonomic group	Name	IUCN Red List	EUR IUCN Red List	National Red List	Habitats (HD) and Bird Directive (BD)	Endemic Range Restricted	Notes	Potential for CH	Justification
Mammals	Grey wolf *Canis lupus*	LC	-	EN	Ann II and IV HD	No		No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.
Mammals	Wild cat *Felis silvestris*	LC	LC	-	Ann IV HD	No		No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.
Mammals	Eurasian otter *Lutra lutra*	NT	-	-	Annex IV (HD)	No	A field record of Eurasian Otter was made during the ecological surveys.	No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.
Mammals	Eurasian lynx *Lynx lynx*	LC	LC	-	Ann II and IV HD	No		No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.
Mammals	Long-fingered bat *Myotis capaccinii*	VU	VU	-	Ann II and IV HD	No		No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.
Mammals	Balkan chamois *Rupicapra rupicapra balcanica*	LC	-	-	Annex IV (HD)	No		Yes	CHSA has the potential to support regionally important concentrations of this sub-species, therefore taking a precautionary approach CH is triggered (Tier 2).
Mammals	Brown bear *Ursus arctos*	LC	-	-	Annex IV (HD)	No		No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.

Taxonomic group	Name	IUCN Red List	EUR IUCN Red List	National Red List	Habitats (HD) and Bird Directive (BD)	Endemic Range Restricted	Notes	Potential for CH	Justification
Birds	Saker falcon *Falco cherrug*	EN	VU	-	Annex I (BD)	No	Nests on cliff ledges and crags; also nests in tall trees, particularly in the west of its range, occupying abandoned nests of other raptors, corvids or other birds.	No	Vagrant species to Bosnia and Herzegovina. Not likely to breed in CHSA; also, not likely to be significant location for congregations of migratory birds.
Birds	Egyptian vulture *Neophron percnopterus*	EN	VU	-	Annex I (BD)	No	Nests on cliffs, occupying caves or ledges protected by overhang; very occasionally in trees, sometimes occupying old nest of another raptor, and even more rarely reported nesting on ground or on top of termite mounds.	No	Species considered to be extinct in Bosnia and Herzegovina. Not considered likely to occur in the CHSA.
Reptiles	Mosor rock lizard *Dinarolacerta mosorensis*	VU	-	-	Annex II & IV (HD)	No		Yes	CHSA has the potential to support regionally important concentrations of this species, therefore taking a precautionary approach CH is triggered (Tier 2).
Reptiles	Smooth snake *Coronella austriaca;* Aesculapian Ratsnake *Zamenis longissimus;* Sand lizard *Lacerta agilis;* Green lizard *Lacerta viridis*; Tessellated water snake *Natrix*	LC (all)	LC (all)	-	Annex IV (HD) (all)	No (all)	Field records of Green Lizard, Tessellated Water Snake, Common Wall Lizard and Nose-horned Viper were made during the ecological surveys.	No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.

Taxonomic group	Name	IUCN Red List	EUR IUCN Red List	National Red List	Habitats (HD) and Bird Directive (BD)	Endemic Range Restricted	Notes	Potential for CH	Justification
	tessellata; Dalmatian Wall Lizard *Podarcis melisellensis*; Common wall lizard *Podarcis muralis*; nose-horned Viper *Vipera ammodytes*								
Amphibians	European green toad *Bufotes viridis;* European Tree Frog *Hyla arborea*	LC (both)	LC (both)	-	Annex IV (HD) (both)	No		No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.
Invertebrates	*Ampedus quadrisignatus*	EN	EN		-	No	This is an obligate saproxylic beetle species. The larvae develop in red-rotten heartwood of chestnut *Castanea*, oak *Quercus* and other broad-leaved tree species; generally with lucanid beetle larvae (*Aesalus* and *Ceruchus*).	Yes	CHSA has the potential to support regionally important concentrations of this species, therefore taking a precautionary approach CH is triggered (Tier 2).
Invertebrates	Goldstreifiger *Buprestis splendens*	EN	EN		-	No	This is an obligate beetle saproxylic species. This species lives in relict old growth pine Pinus forests. Larval development takes place in the dead wood of large diameter trunks (above 40 cm) and in the higher	Yes	CHSA has the potential to support regionally important concentrations of this species, therefore taking a precautionary approach CH is triggered (Tier 2).

Taxonomic group	Name	IUCN Red List	EUR IUCN Red List	National Red List	Habitats (HD) and Bird Directive (BD)	Endemic Range Restricted	Notes	Potential for CH	Justification
							portion of the tree. Host trees have to be sun-exposed.		
Invertebrates	Monk bush-cricket *Pachytrachis frater*	EN	EN	-	-	No	This species occurs at dry edges of oak forests, forest clearings and old, extensively managed orchards.	Yes	CHSA has the potential to support regionally important concentrations of this species, therefore taking a precautionary approach CH is triggered (Tier 2).
Invertebrates	*Ropalopus hungaricus*	EN	EN	-	-	No	This is an obligate beetle saproxylic species. Larvae develop under the bark of dying or dead branches and trunks of broad-leaved trees (especially Acer, rarely also in *Ficus, Fraxinus*, *Alnus, Fagus*, *Salix*), and pupate in the wood; the species prefers thick and sturdy trees.	Yes	CHSA has the potential to support regionally important concentrations of this species, therefore taking a precautionary approach CH is triggered (Tier 2).
Invertebrates	*Carabus variolosus nodulosus*	-	-	-	Ann II and IV HD	No		Yes	CHSA has the potential to support regionally important concentrations of this species, therefore taking a precautionary approach CH is triggered (Tier 2).
Invertebrates	*Eriogaster catax*	-	-	-	Ann II and IV HD	No		Yes	CHSA has the potential to support regionally important concentrations of this species, therefore taking a precautionary approach CH is triggered (Tier 2).
Invertebrates	*Cerambyx Longicorn Cerambyx cerdo*	NT	-	-	Ann II and IV HD	No	A field record of Cerambyx Longicorn was during the ecological surveys.	No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.

Taxonomic group	Name	IUCN Red List	EUR IUCN Red List	National Red List	Habitats (HD) and Bird Directive (BD)	Endemic Range Restricted	Notes	Potential for CH	Justification
Invertebrates	Balkan Goldenring *Cordulegaster heros*	NT	-	NT	Ann II and IV HD	No	A field record of Balkan Goldenring was during the ecological surveys.	Yes	CHSA has the potential to support regionally important concentrations of this species, therefore taking a precautionary approach CH is triggered (Tier 2).
Invertebrates	*Cucujus cinnaberinus;*	NT	NT	-	Ann II and IV HD			No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.
Invertebrates	Hermit beetle *Osmoderma eremita*	NT	NT	EN	Ann II and IV HD	-		Yes	CHSA has the potential to support regionally important concentrations of this species, therefore taking a precautionary approach CH is triggered (Tier 2).
Invertebrates	Scarce fritillary *Euphydryas maturna*	VU	VU	-	Ann II and IV HD	No	A field record of Scarce Fritillary was during the ecological surveys.	Yes	CHSA has the potential to support regionally important concentrations of this species, therefore taking a precautionary approach CH is triggered (Tier 2).
Invertebrates	Large copper *Lycaena dispar*	LC	LC	-	Ann II and IV HD	No		No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.
Invertebrates	Large blue *Phengaris arion*	EN	EN	EN	Ann IV HD	No		Yes	CHSA has the potential to support regionally important concentrations of this species, therefore taking a precautionary approach CH is triggered (Tier 2).
Invertebrates	Clouded Apollo *Parnassius mnemosyne*	NT	NT	-	Ann IV HD			No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.
Invertebrates	Southern Festoon *Zerynthia polyxena*	LC	LC	-	Ann IV HD	No		No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.

Taxonomic group	Name	IUCN Red List	EUR IUCN Red List	National Red List	Habitats (HD) and Bird Directive (BD)	Endemic Range Restricted	Notes	Potential for CH	Justification
Invertebrates	Rosalia Longicorn *Rosalia alpina*	LC	LC	-	Ann II and IV HD	No	A field record of Rosalia Longicorn was during the ecological surveys.	No	CHSA considered unlikely to support regionally important concentrations and loss of habitat unlikely to significantly impact the long-term survival of the species.

Table 5. Critical Habitat Trigger Features

CH as per EBRD PR6	Habitats and Species	CH requirements triggered under this criterion	Justification
(i) Highly threatened or unique ecosystems	The Neretvica catchment is not listed as Endangered or Critically Endangered by the IUCN Red List of ecosystems nor it is recognised as a priority area on regional or national plans.	No	No habitats that fit these criteria were identified in the CHSA.
(ii) Habitats of significant importance to endangered or critically endangered species	**Aquatic:** The Neretvica river supports the following Critically Endangered and/or Endangered species (including Annex IV HD): 1. Adriatic trout *Salmo obtusirostris*; IUCN Endangered, B and H Critically Endangered. 2. Adriatic minnow, *Phoxinellus alepidotus*; IUCN Endangered; B and H Endangered 3. White-clawed crayfish *Austropotamobius pallipes*; IUCN Endangered; B and H Endangered 4. Trichoptera- *Drusus bosnicus*; B and H Critically Endangered 5. Trichoptera- *D. klapaleki*; Ba nd H Critically Endangered 6. Trichoptera- *Chaetopteryx bosniaca*; B and H Critically Endangered 7. Trichoptera- *Glossosoma neretvae*; B and H Almost Endangered.	Yes	**Adriatic trout** – This species presence was not confirmed during the September surveys. All individuals captured are identified as brown trout. **Adriatic minnow** – this species is known to be present in the Neretvica catchment, one individual was identified as potentially being Adriatic minnow. **White-clawed crayfish** – this species was recorded at two locations in the Neretvica catchment and suitable habitat identified in several locations. **Trichoptera species** - Four species were identified with high confidence in the 2017 surveys. The wider distribution of these species is not known at the moment and further investigation and research on distribution and overall population size is required. Given the lack of information and using a precautionary approach it is considered that these species will trigger critical habitat.
	Terrestrial: The CHSA has the potential to support regionally important concentrations of the following Critically Endangered and/or Endangered species (including Annex IV HD) and the Project Area has suitable habitat to support them: 1. One species of mammal: Balkan Chamois (Annex IV HD) 2. One species of reptile: Mosor Rock Lizard (Annex IV HD) 3. Ten species of invertebrates: *Ampedus quadrisignatus* (EN); Goldstreifiger (EN); Monk Bush-cricket (EN); *Ropalopus hungaricus* (EN); *Carabus (variolosus) nodulosus* (Annex IV HD)*; Eriogaster catax* (Annex IV HD); Balkan Goldenring (Annex IV HD); Hermit Beetle (Annex IV HD); Scarce Fritillary (Annex IV HD); Large Blue (EN & Annex IV HD)	Yes	All species have the potential to occur in regionally significant concentrations within the CHSA. Suitable habitats to support these species have been identified within the Project Area during the terrestrial field surveys. CH considered to be triggered at Tier 2 level. Given the relatively limited amount of terrestrial habitat loss it is considered likely that CH requirements can be met through appropriate mitigation.

CH as per EBRD PR6	Habitats and Species	CH requirements triggered under this criterion	Justification
(iii) Habitats of significant importance to endemic or geographically restricted species	**Aquatic:** Endemic species have been identified during the 2016 and 2017 (spring) surveys: - Adriatic minnow is found at three, possibly four locations (Cetina river basin and the Livanjsko, Glamocko, and Grahovo Polje karsts), with a continuing decline in area of occupancy (AOO) owing to water abstraction; decline in habitat quality caused by agricultural pollution and introduced species; and, a decline in the number of subpopulations as the subpopulation in the Cetina river basin is thought to be now extinct[18]. (IUCN, 2017) - crayfish in Bosnia and Herzegovina: This species was recorded as present in Livno and in Boracko Lake in the Neretva drainage in 1895 and from Gacko (Herzegovina) and Ljuta (Croatia) in 1961 (Entz 1909, Karaman 1961). These drainage systems are part of the Adriatic drainage system[19]. (Further details are provided in Appendix B)	Yes	Given the restricted distribution Adriatic minnow the presence of this species could trigger CH in parts of the catchment where they are present. Results from the August/September surveys confirmed the presence of this species in the Neretvica river.
	Terrestrial: None.	No	No suitable habitat within the PSA was identified during the terrestrial field surveys to support range restricted or endemic species to the Dinaric Alps.
(iv) Habitats supporting globally significant (concentrations of) migratory or congregatory species	**Aquatic:** Presence of trout (migratory species)	No	The brown trout is a migratory species (potamodromous species) that undertakes migration within rivers to access spawning habitats. Although endemic to Europe and widely distributed it is introduced in southern Europe and therefore it will not trigger CH. The Adriatic trout, also a migratory species, presence was not confirmed in the Neretvica river.
	Terrestrial: The CHSA is not considered to support concentrations of migratory or congregatory species.	No	The project is not located within the core area of the Mediterranean/Black Sea Flyway for birds. No significant movements or congregations of land animals are known to occur in the area.

[18] Crivelli, A.J. 2006. Phoxinellus alepidotus. The IUCN Red List of Threatened Species 2006: e.T39273A10181170. http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T39273A10181170.en. Downloaded on 03 July 2017

[19] Füreder, L., Gherardi, F., Holdich, D., Reynolds, J., Sibley, P. & Souty-Grosset, C. 2010. Austropotamobius pallipes. The IUCN Red List of Threatened Species 2010: e.T2430A9438817. http://dx.doi.org/10.2305/IUCN.UK.2010-3.RLTS.T2430A9438817.en. Downloaded on 03 July 2017.

CH as per EBRD PR6	Habitats and Species	CH requirements triggered under this criterion	Justification
(v) Areas associated with key evolutionary processes	No areas associated with key evolutionary processes were identified	No	
(vi) Ecological functions that are vital to maintaining the viability of biodiversity features described (as critical habitat features)	Appropriate sediment transport and hydrological regime that a support ecological functions and habitats for Adriatic minnow and White Clawed Crayfish. (Further details are provided in Appendix B)	Yes	Adriatic minnow and crayfish presence is confirmed. There is potential to identify river process that are important to support critical habitats.

4 Priority Biodiversity Features

In addition to the species presented in Tables 3 and 4, the study also identified a number of priority biodiversity features in the Neretvica catchment that meet EBRD PR6 criteria. These are summarised in Table 6 and 7 with an indication if their presence was confirmed during the 2017 surveys. Priority biodiversity features do not trigger Critical Habitat; however, they have a high degree of vulnerability and require consideration during project assessment and impact mitigation.

Table 6: Aquatic Priority Biodiversity Features known or with potential to occur within the PSA

Taxonomic group	Name	IUCN Red List	EUR IUCN Red List	National Red List	Habitats Directive	Notes
Fish	Neretvan spined loach, *Cobitis narentana*	VU	VU	VU	-	Presence confirmed during field surveys
Fish	Bullhead, *Cottus gobio*	LC	LC	-	Ann II	Presence confirmed during field surveys
Fish	Neretvian chub, *Leuciscus svallize*	VU	VU	VU	-	Not recorded during 2017 field surveys
Fish	South Dalmatian minnow, *Phoxinellus pstrossii*, Bosnian: *Trebinjska galovica*	VU	-	-	-	Not recorded during 2017 field surveys
Fish	Dalmatian minnow, *Delminichthys ghetaldii* or *Phoxinellus ghetaldii*, Bosnian: *Popovska galovica*)	VU	VU	-	-	Not recorded during 2017 field surveys
Fish	Spotted minnow, *Delminnichthys adspersus* or *Phoxinellus adsespersus*	VU	VU	-	-	Endemic to Bosnia and Herzegovina and Croatia. Not recorded during 2017 field surveys

Table 7: Terrestrial Priority Biodiversity Features known or with potential to occur within the PSA

Taxonomic group	Name	IUCN Red List	EUR IUCN Red List	National Red List	Habitats (HD) and Bird Directive (BD)	Notes
Habitat	Mixed Abies - Picea - Fagus woodland	-	-	-	Ann II HD	Listed on Annex I of Habitats Directive as Luzulo-Fagetum beech forests (code 9110)
Habitat	Illyrian Fagus forests	-	-	-	Ann II HD	Listed on Annex I of Habitats Directive as Illyrian *Fagus sylvatica* forests (Aremonio-Fagion) (code 91K0)
Habitat	Screens or veils of perennial tall herbs lining watercourses	-	-	-	Ann II HD	Listed on Annex I of Habitats Directive as Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (code 6430)
Habitat	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	-	-	-	Ann II HD	Listed on Annex I of Habitats Directive as Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Pandion, *Alnion incanae, Salicion albae*) (code 91E0)
Habitat	Low and medium altitude hay meadows	-	-	-	Ann II HD	Listed on Annex I of Habitats Directive as mountain hay meadows (code 6520)
Habitat	Montane river gravel low brush	-	-	-	Ann II HD	Listed on Annex I of Habitats Directive as alpine rivers and their ligneous vegetation with *Salix elaeagnos* (code 3240)
Amphibians	Yellow-bellied *toad Bombina variegata*	LC	LC	-	Ann II HD	Filed record of this species made during ecological surveys
Birds	Common kingfisher *Alcedo atthis*	LC	VU	-	Annex I BD	Filed record of this species made during ecological surveys
Invertebrates	MarshfFritillary *Euphydryas aurinia*	LC	LC	-	Ann II HD	Suitable habitat to support this species within Project Area
Invertebrates	Jersey tiger moth *Euplagia quadripunctaria*	-	-	-	Ann II HD	Suitable habitat to support this species within Project Area

Taxonomic group	Name	IUCN Red List	EUR IUCN Red List	National Red List	Habitats (HD) and Bird Directive (BD)	Notes
Invertebrates	Stag beetle *Lucanus cervus*	NT	NT	VU	Ann II HD	Field record of this species made during ecological surveys
Invertebrates	*Morimus funereus*	-	-	-	Ann II HD	Field record of this species made during ecological surveys
Invertebrates	False Comma *Nymphalis vaualbum*	LC	-	VU	Ann II HD	Suitable habitat to support this species within Project Area
Invertebrates	*Rhysodes sulcatus*	DD	-	-	Ann II HD	Suitable habitat to support this species within Project Area

5 Likely Project Impacts and Potential Mitigation

The location of a project within critical habitat does not mean that it should not proceed. However, conditions must be met as outlined in EBRD PR6 which includes no measurable adverse impacts on biodiversity features for which critical habitat is designated, a net gain for critical habitat impacted by the Project as well as no net loss for priority diversity features. Appropriate mitigation must therefore be implemented following the mitigation hierarchy (avoid, minimise, restore and offset).

A mitigation strategy has not yet been developed for the Project and details of the final design are not known. However, the sections below outline some of the key potential impacts as well as a high-level assessment of possible mitigation that could be implemented.

5.1 Project Impacts

The following key impacts are considered likely, based on professional judgement and experience, as a result of the Project.

5.1.1 Aquatic impacts:

- Reductions in water quality during construction
- Temporary and permanent loss of habitat
- Changes in hydrological patterns (seasonal and diurnal if hydropeaking occurs)
- Changes in flows between weir and power house
- Changes to sediment transport
- Weirs acting as ecological barriers preventing the movement of fish along the river.
- Changes in water quality in the main river system, especially during low flows

5.1.2 Terrestrial impacts:

- Temporary and permanent habitat loss
- Killing or injury of species during construction and operation
- Disturbance and displacement of species during construction and operation

5.2 Assessment of Potential Mitigation Measures

The design and location of the proposed weirs, powerhouses and dewatered stretches, coupled with the presence of Critical Habitats within the Project area are likely to make it difficult for the project to demonstrate compliance with PR6, paragraph 16.

Figure 7 illustrates that projects 1, 2, 3, 4, 7, 8, 11, 12, 13, 14 and 15, as designed, would impact critical habitat. If implemented these projects would need to provide mitigation measures to avoid impacting critical habitat. Figure 7 shows that projects 5, 6, 9, and 10 could be implemented without impacting critical habitat. The proposed flow regime would impact the existing hydrogeomorphology and ecology in the dewatered stretch, however these reaches do not contain critical habitat.

Following the mitigation hierarchy, consideration should be given to alternative schemes within the region. If this is not possible, mitigation measures could be considered. However, the nature of the Critical Habitat and the species present mean that the mitigation options available to this project are limited. Possible mitigation measures are described in the following sections.

5.2.1 Aquatic habitats and species

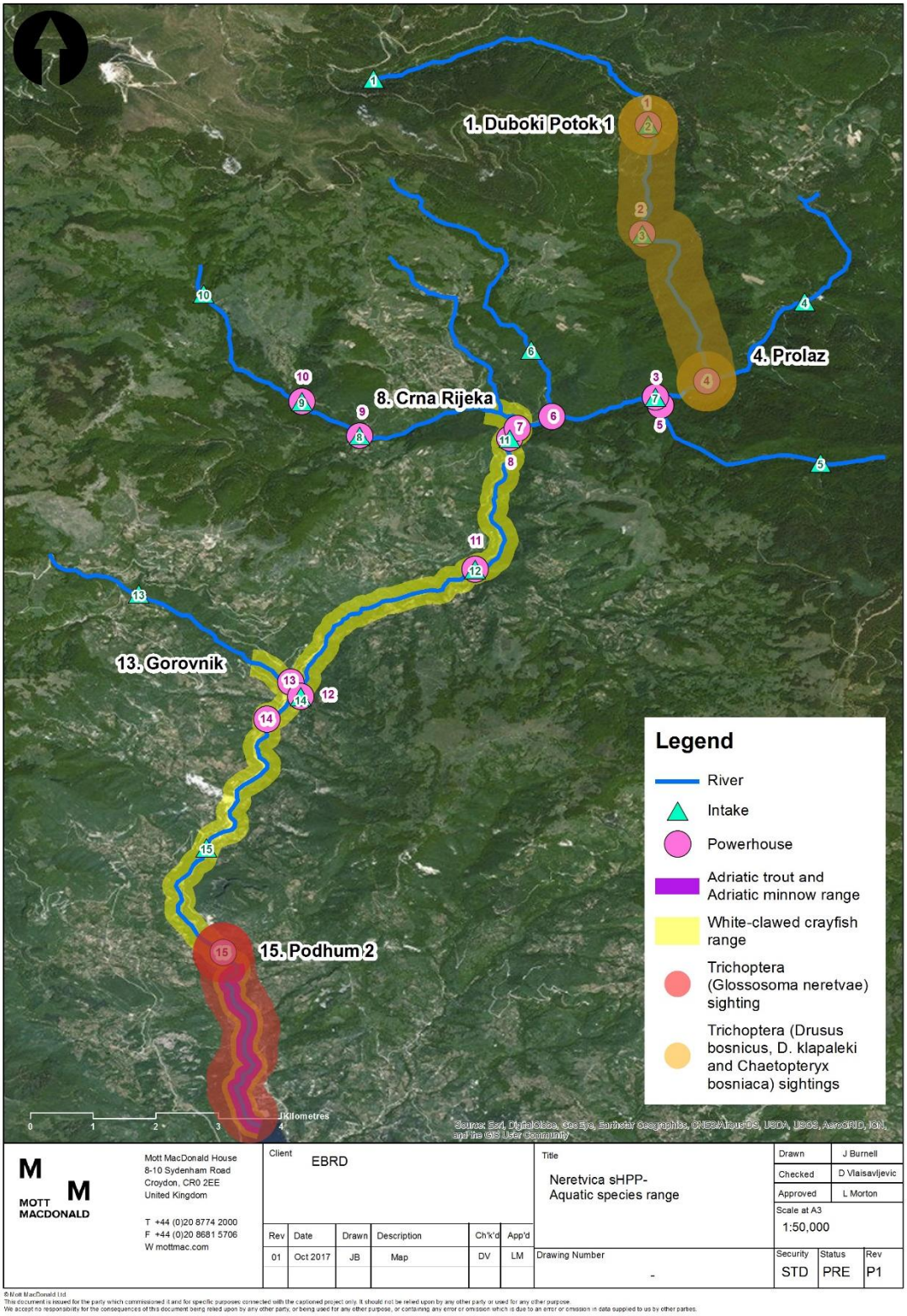
The presence of species that trigger critical habitat require that the ecological functions of the Neretvica river are sustained to ensure provision of suitable habitat. This includes providing an near natural hydrological regime and allowing for geomorphology processes such as sediment transport to occur, this will be challenging with the current scheme design. In the lower sections of the river it will also be important to ensure habitat connectivity and riparian vegetation. Potential mitigation measures for the different species are listed in Table 8. It should be noted that the habitat condition and river processes that support the presence of these species will be affected as a whole by the different weirs due to in-combination impacts. The extent of the dewatered section in the rivers directly affected by the project as a whole is considerable and could also impact species across the Neretvica catchment. Mitigation for this impact will have to include the provision of environmental flows that will ensure a hydrological regime similar to the existing natural regime.

Table 8: Mitigation measures for aquatic species

Species	Mitigation Measures	Area / sHPP affected
Adriatic trout *Salmo obtusirostris*	This species was only present in the downstream sections. To ensure habitats connectivity the provision of a fish pass (or bypass channel if feasible) at Phodum 2 should be considered. Environmental flows should be maintained close to or at natural flow levels to sustain this fish population.	Neretvica river sHPP Podhum 2 down to mouth of Neretvica
Adriatic minnow *Phoxinellus alepidotus*	This species has similar distribution to the Adriatic trout. Potentially a fish pass (or bypass channel if feasible) could mitigate for the loss of habitat connectivity. However, it is not certain a fish pass is effective for this species. A bypass channel could possibly provide better results.	Neretvica river sHPP Podhum 2 down to mouth of Neretvica
White-clawed crayfish *Austropotamobius pallipes*	The extent of this species in the Neretvica catchment is considerable. In the areas where this species is present it is important to retain a more natural flow regime which will enable the maintenance of a wetted perimeter and wetted banks vital for this species occurrence. The setting of the environmental flows will need to be reviewed to retain lateral connectivity of the river as well as ensuring that excessive sediment deposition will not occur significantly. In particular the presence of the weir at Gorovnik and the extensive dewatered section (almost all length of the river) means that the environmental flows will need to be maintained at close to or at natural flow levels to sustain this viable population.	Gorovnik river; mouth of Crna Rijeka; Neretvica river from confluence with Crna Rijeka. sHPP Crna Rijeka sHPP Gorovnik
Trichoptera *Drusus bosnicus*	No specific information is available on the requirements of these species. Generally, the species in the Drusus genus usually inhabit cold springs and spring areas of mountain streams. Their distribution seems very restricted and the permanent loss of habitat due to the construction of the weirs and low flows in dewatered reaches may result in very small populations which may	Neretvica river, Prolaz river sHPP Duboki potok 1 and sHPP Prolaz
Trichoptera *D. klapaleki*		Neretvica river, Prolaz river sHPP Duboki potok 1 and sHPP Prolaz

Species	Mitigation Measures	Area / sHPP affected
	not be viable. Avoidance of this impact would ensure the viability of these populations.	
Trichoptera *Chaetopteryx bosniaca*	No specific information is available on the requirements of these species. It was only recorded at the downstream reach of the Neretvica river. Avoidance of this impact would ensure the viability of these populations.	Neretvica river sHPP Duboki potok 1 and sHPP Prolaz
Trichoptera *Glossosoma neretvae*	No specific information is available on the requirements of this species. It has a similar distribution to the Drusus species which suggests similar habitat preference. Avoidance measures should be considered as due to the restricted distribution any permanent loss of habitat could result in the extinction of this species at this location.	Neretvica river sHPP Podhum 2

Figure 7: Locations with species that trigger critical habitat



Source: Mott MacDonald 2017

5.2.2 Terrestrial habitats and species

Whilst the extent of temporary and permanent habitat loss has not been calculated at this stage, the terrestrial footprint is not considered to be large, in particular where existing roads are used to access the proposed sHPP sites. Mitigation to restore temporary affected areas and offsite measures to offset impacts to important habitats and species could be implemented effectively to achieve no net loss for priority biodiversity features and net gain for critical habitat.

The avoidance of killing and injuring species as well as minimising disturbance and displacement can be mitigated through best practice measures. This includes avoiding vegetation clearance during sensitive periods (for example during the breeding season for birds), moving or displacing species prior to commencement of site clearance works and minimising activities which cause disturbance.

6 Conclusion

A number of critical habitats have been identified within the Project area in relation to terrestrial and aquatic ecology.

Terrestrial critical habitats are identified. However, the terrestrial footprint of the Project is not considered to be large. Mitigation measures to offset impacts to important habitats and species could be implemented effectively. These measures could achieve no net loss for priority biodiversity features and net gain for critical habitat.

Critical habitats are also triggered for several aquatic ecology features including White-clawed crayfish, Adriatic minnow and a number of aquatic invertebrates. Mitigation measures to achieve no net loss of biodiversity features and net gain for critical habitat are limited, and largely focus on maintaining a downstream flow regime similar to the natural regime at critical locations. Achieving this will be difficult under the current scheme design. As such, the design and location of the proposed weirs, powerhouses and dewatered stretches are likely to make it difficult for the project to demonstrate compliance with PR6, paragraph 16.

Appendices

A. Fish Species Present in Bosnia & Herzegovina

Fish species have been identified during the literature review as being present in the wider region. However, there is no evidence that these species are present in the CHSA and these will not be considered further. These are listed in Table A.1.

Table A.1: Fish species of conservation interest in B&H

Taxonomic group	Name	IUCN Red List	EUR IUCN Red List	National Red List	Habitats (HD)	Notes
Fish	Marble trout Salmo marmoratus	LC	LC	CE	Ann II	Not recorded during 2017 surveys
Fish	Neretvan nase, also Dalmatian nase and Dalmatian soiffe Chondrostoma knerii, Bosnian: Neretvanska podustva	VU	VU	-	-	Endemic to the Neretva river basin Not recorded during 2017 surveys
Fish	Turskyi dace Telestes turskyi, Bosnian: Turski klijen	CE	CR	-	-	Not recorded during 2017 surveys
Fish	Minnow-nase Chondrostoma phoxinus,	CE	EN	-	-	Not recorded during 2017 surveys
Fish	Adriatic dace or Balkan dace Squalius svalliz	VU	VU	-	-	Endemic to Bosnia and Herzegovina and Croatia, also to Montenegro and Albania. Not recorded during 2017 surveys
Fish	Dalmatian barbel gudgeon Aulopyge hugelii	EN	EN	-	-	Endemic to the karst area of Croatia and Bosnia-Herzegovina where it is known from the Zrmanja, Krka and Cetina rivers. It can also establish itself in lakes and has been introduced to Lakes Blidin and Busko Blato. It has also been recorded in some small rivers in Livanjsko Polje (Crivelli et al. 2006).20 Not recorded during 2017 surveys

[20] Crivelli, A.J. 2006. Aulopyge huegelii. The IUCN Red List of Threatened Species 2006: e.T61350A12466288. http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T61350A12466288.en. Downloaded on **13 October 2017**

Taxonomic group	Name	IUCN Red List	EUR IUCN Red List	National Red List	Habitats (HD)	Notes
Fish	Adriatic salmon Salmo obtusirostris	EN	EN	EN		It is restricted to a few Adriatic rivers in Croatia, Bosnia-Herzegovina and Montenegro: Krka (very rare), Jadro, Neretva, and Zeta river basins. It is introduced into the Zrnovnica21. Not recorded during 2017 surveys
Fish	Cobitis illyrica	CR	-	?	?	The species has only been recorded from Imotzki polje in Croatia (it is possibly found in the lake and the stream), where water abstraction is a serious threat to the species. The extent of occurrence is estimated to be less than 100 km², and based on the major threat of water abstraction it is only found in one location (Freyhof,et al. 2008).22
Fish	Squalius microlepis	EN	EN	?	?	L microlepis is restricted to three locations in the Neretva river basin. One small population is in a karstic stream in Livanjsko Polje and the main population is in two lakes, Buska and Mandecko lakes near Livno. The area of occupancy (AOO) is estimated to be around 10 km², and there is continuing decline in AOO and quality of habitat due to habitat destruction, pollution and water extraction. It was not recorded during 2-17 surveys

[21] Crivelli, A.J. 2006. Salmo obtusirostris. The IUCN Red List of Threatened Species 2006: e.T19862A9056634. http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T19862A9056634.en. Downloaded on **13 October 2017**.

[22] Freyhof, J. & Kottelat, M. 2008. Cobitis illyrica. The IUCN Red List of Threatened Species 2008: e.T135712A4188832. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T135712A4188832.en. Downloaded on **13 October 2017**

B. Critical Habitat Assessment for Adriatic Minnow and White-clawed Crayfish

B.1 Criteria II and III

Two aquatic species have the potential to trigger CH under criteria II and III. This is further described below with quantitative thresholds applied to determine if the CHSA is considered CH.

B.1.1 Adriatic minnow *Phoxinellus alepidotus*

The Adriatic minnow is a benthopelagic species that is endemic to Bosnia and Herzegovina and Croatia. It has IUCN conservation status «Endangered». It is a short-living species which leaves four years at the longest (Markotić et al. 2017[23]). It occurs in lowland water bodies, with little current, inhabits streams with clear water and enters subterranean karstic waters during winter or droughts. Spawn in shallower parts of streams where females probably lay 2-3 portions of eggs (various authors, Fishbase accessed on 10 October 2017; http://www.fishbase.se/summary/Phoxinellus-alepidotus.html).

Prior to this study, this species was known to occur at three, possibly four locations in B&H and Croatia (and not within the CHSA). Major threats include water extraction, drought, water pollution (fertilizers and pesticides from intensive agriculture), dam construction and introduced fish species. Due to these pressures, its area of occupancy is thought to be declining. A decline in the number of subpopulations (as the subpopulation in the Cetina river basin, in Croatia, is thought to be now extinct) also results in a decrease in this species resilience to further pressure. Limited data suggest that its decline in the last 10 years is likely to continue due to water abstraction and introductions of exotic species (Criveli et al. 2006)[24].

At the largest population know site in Grahorsko polje (Bosnia-Herzegovina), it is particularly vulnerable due to the ordinary chub (*Squalius cephalus*) that was introduced into the Korana river from the Danube delta some eight or nine years ago. The larger specimens of chub feed on the Adriatic minnow which was until recently the only species present and which had no natural enemy (Jelić, et al. 2008)[25].

This species differs from any other representative of *Phoxinus* by absence of scales. It was recorded in two different locations in the Neretvica river: in the mouth of Neretvica during autumn 2016 (by underwater filming) near Podhum 2 in spring 2017 and in the mouth of Neretvica in autumn 2017.

The distribution in the Neretvica river, according with the 2017 surveys, is considered to be limited to downstream to Podhum 2 to the mouth of the Neretvica, four individuals were recorded in total.

This species was identified with the potential to trigger CH under two different criteria:

[23] Markotić I, ĆaletaM and Glamuzina B 2017 Age Structure of the Endemic Fish *Phoxinellus pseudalepidotus* (Cyprinidae) from Mostarsko Blato (Neretva River Basin, Bosnia and Herzegovina) European International Journal of Science and Technology (6) 5:50-56

[24] Crivelli, A.J. 2006. *Phoxinellus alepidotus*. The IUCN Red List of Threatened Species 2006: e.T39273A10181170. http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T39273A10181170.en.

[25] Jelić Dušan, Duplić Aljoša, Ćaleta Marko, Žutinić Petar (2008): Endemic Fish Species of the Adriatic Basin, The Croatian Environment Agency, Zagreb, 78 pages

- Habitats of significant importance to endangered or critically endangered species - defined as areas supporting species at high risk of extinction (Critically Endangered and Endangered species) on the IUCN Red list of Threatened species or equivale national and regional systems). The Adriatic minnow fits this criteria with a population accessed as declining.
- Habitats of significant importance to endemic or geographically restricted species - areas holding a significant proportion of the global range or population of species qualifying as restricted range under Birdlife or IUCN criteria.

Quantitative thresholds have been developed by IFC under PS6 for Critically Endangered and Endangered Species (Criterion 1 under IFC PS6) and Endemic and Restricted-range species (Criterion 2 under IFC PS6). These have been tested against the data available for this species the results are present in Table B.1.

Table B.1– EBRD Critical Habitat Criteria – Adriatic minnow

ii) Habitats of significant importance to endangered or critically endangered species		
Tier 1	Habitat required to sustain >= 10% of the global population of a CR and EN species /subspecies where there are known, regular occurrences of the species and where that habitat could be considered a CHSA for that species	The population is limited to a short section of the Neretvica river which has been identified as a CHSA for the aquatic species including the Adriatic Minnow. The presence of the Jablanico lake may present a boundary to the distribution area of this species as it is known to inhabit flowing waters (albeit low moving). However, the Adriatic minnow is present in the Neretva basin and a trigger to two KBA located in other tributaries of the Neretva river. No abundance numbers for this species populations is available. Given the wider distribution of this species in B&H and Croatia it is unlikely that the population in the Neretvica river constitutes 10% of the global population.
	Habitat with known, regular occurrences of CR and EN species where habitat is one of 10 or fewer CHSA globally for this species.	The data collected for this project is the first known record for this river. Individuals were caught both in all three sampling occasions so it is reasonable to assume that this species occurs regularly at this location. The Neretvica river is understood to be one CHSA for this species. This species is described to be present at potentially four locations: Cetina river basin and to the Livanjsko, Glamocko, and Grahovo Polje karsts (none located in the CHSA). However, it is possible that this species is already extinct in the Cetina basin. Given its restricted distribution and continuing decline it is not clear if the Neretvica river will constitute one of ten CHSAs. However, a precautionary approach is used here - this criterion may be met by this species and Tier 1.
Tier 2	Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally important concentrations of a Red-listed EN species	NA – this species status is Endangered and there is a population present albeit of small size.
	Habitat of significance importance to CR or EN species that are wide-ranging and /or whose population distribution is not well known	NA – this Endangered species does not present a wide ranging and its global distribution is reasonably known.
	As appropriate habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.	Given that only a small population was recorded in Neretvica river in 2017 is it not considered that this river sustains nationally or regionally important concentrations of this species.
iii) Habitats of significant importance to endemic or geographically restricted species		
Tier 1	Habitat known to sustain>= 95% of the global population of an endemic or restricted range species where that habitat could	There is no evidence that supports this criterion. The Adriatic minnow has restricted distribution. However suitable habitat in the Neretvica river is limited to the downstream slow flowing reaches. This habitat is considered suitable to

ii) Habitats of significant importance to endangered or critically endangered species

	be considered a CHSA for that species (e.g a single endemic)	support an existing small but viable population. The presence of the Jablanicko lake may present a barrier to this population as it is known to inhabit flowing waters (albeit low moving). And there is no evidence that this population is connected to other populations present in the Neretva catchment. No abundance data for this species is available but it is known that this species stronghold is in Grahorsko polje. Given the wider distribution of this species in B&H and Croatia it is unlikely that the population in the Neretvica river constitutes 95% of the global population. As there is no reliable data on the population abundance or extent, a surrogate was used. The proportion of the CHSA area was calculated and equals to 2.9% of the global population.
Tier 2	Habitat known to sustain >= 1% but <95% of the global population of an endemic or restricted range species/subspecies where that habitat could be considered a CHSA for that species, where data is available or based on expert judgement.	Given the lack of data in describing the size of this population in its area of distribution and restricted distribution (only present in four or possibly three locations) it is not possible to assume that the population present in the Neretvica river is less than that 1% of the total population. Again, a precautionary approach is is used here - it is concluded that it is likely that the population recorded in the Neretvica river meets this criterion and Tier 2. The CHSA area proportion in relation to the global distribution is 2.9% and to the national distribution of this species (B&H) equals to 17.5%.

B.1.2 White-clawed crayfish *Austropotamobius pallipes*

White-clayed crayfish is the most ancient species in the family Astacidae. In Miocene, there were no such barriers as Alps or Pyrenees, so this specie has a wide distribution throughout Europe (Blue Rivers, 2017). It was previously thought that the western limit of the species range was in Portugal (though it is now thought to be Extinct there), but is now north‐western Spain. Montenegro is the easterly limit, whilst Spain and Scotland are the southerly and northerly limits respectively (Souty‐Grosset et al. 2006).

It has been assessed by IUCN as “endangered” under criterion A2ce. This species has been listed under the EU Habitats Directive Annex II and IV and therefore requires the designation of special areas of conservation for its protection. It has also been listed under Appendix III of the Bern Convention.

In B&H, *A. pallipes* lives mainly in Neretva basin, partly in Una and Tsetina basins (Trozit-Borovac, 2011, Trozit-Borovac, 2012, in Blue Rivers 2017). This species was recorded at elevations from 180 m to 1204 m, but the highest number of habitats is located at 300-600 m asl. Saprobity index, identified by composition of macroinvertebrates and phytobenthos, showed that it can live in clean and slightly polluted water (Trozit-Borovac, 2011, in Blue Rivers 2017). Taking into account indirect data, more than 2/3 White-clawed crayfish of Neretva basin is concentrated in Neretvica basin (Blue Rivers 2017). Figure B.2 shows this species distribution in relation with the CHSA. Table B.2 shows the results of the Critical Habitat Criteria applied to this species.

Figure B.2: Crayfish distribution

Source: Fűreder et al. (2006)[26]

Crayfish was recorded in the Neretvica river and tributaries both is spring and autumn 2017. They were concentrated in deeper areas with slow flow and large amount of plant detritus.

[26] Füreder, L., Gherardi, F., Holdich, D., Reynolds, J., Sibley, P. & Souty-Grosset, C. 2010. *Austropotamobius pallipes*. The IUCN Red List of Threatened Species 2010: e.T2430A9438817. http://dx.doi.org/10.2305/IUCN.UK.2010-3.RLTS.T2430A9438817.en. Downloaded on **17 October 2017**.

Highest concentrations were found on the Gorovnik river and Crna Rijeka river. In the Neretvica river highest concentrations were found at Phodum 1 and Phodum 2.

Table B.2– EBRD Critical Habitat Criteria – Crayfish

ii) Habitats of significant importance to endangered or critically endangered species		
Tier 1	Habitat required to sustain >= 10% of the global population of a CR and EN species /subspecies where there are known, regular occurrences of the species and where that habitat could be considered a CHSA for that species	The crayfish global population has a wide range, being present in 11 European countries. The Neretvica catchment constitutes only a small proportion of his geographically range (approximately 0.017%. For this reason, it is reasonable to assess that the Neretvica river sustain less than 10% of the global population.
	Habitat with known, regular occurrences of CR and EN species where habitat is one of 10 or fewer CHSA globally for this species.	As above, given the wide distribution of this species it is reasonable to estimate that across Europe there are more than 10 CHSAs.
Tier 2	Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally important concentrations of a Red-listed EN species	The Neretvica river population is estimated to constitute 2/3 of the total population of the Neretva catchment. It is estimated that the habitat present is of regional importance.
	Habitat of significance importance to CR or EN species that are wide-ranging and /or whose population distribution is not well known	The Neretvica river population is estimated to constitute 2/3 of the total population of the Neretva catchment. Although it is estimated that the habitat present is of national importance, given this species large area of distribution it is not expected to be global importance.
	As appropriate habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.	The Neretvica river population is estimated to constitute 2/3 of the total population of the Neretva catchment. Consequently, it is concluded that the population present in the Neretvica river is of regional importance and its loss could compromise the survival of this species in the Neretva catchment.

B.1.3 Summary

CHSA Critical habitat status:

(ii) Habitats of significant importance to endangered or critically endangered species

Tier 1: Yes, due to the presence of the Adriatic minnow

Tier 2: Yes, due to the presence of crayfish

(iii) Habitats of significant importance to endemic or geographically restricted species

Tier 1: No

Tier 2: Yes, due to the presence of the Adriatic minnow

B.2 Ecological Functions

The Adriatic minnow and crayfish presence is confirmed in the Neretvica river. Both species have been assessed as endangered by IUCN and global populations are declining. The Adriatic minnow favour habitats of slow flowing waters and substrates composed mostly by gravel, sand as well lower contributions of cobbles and pebbles (taking in consideration survey sites survey results in 2017).

White=-clawed crayfish preferred habitat has similar substrate composition. In 2017 surveys live individuals were found during diving in habitats outside of the main riverbed, characterizing by small and middle size sand and gravel sediments with some share of detritus and hiding places made of boulders and tree debris. Being mostly present at the downstream reaches of the Neretvica rivers and tributaries, it is of extreme importance that geomorphological processes are sustained. These are important to replenish downstream reaches with suitable amounts of sediment and vegetation debris that are transported from upstream reaches.

Results from 2017 confirmed the presence of viable populations of the two species. An appropriate flow regime needs to be maintained to support all life stages of these two species. In particular, the White-clawed crayfish results showed the presence of a balanced population composed by both juvenile and adult individuals indicating the presence of a healthy population.