Critical Habitat Assessment; Iluka Resources Areas 1 and 5 Mining Lease, Sembehun Haul Road, Sierra Leone

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Report date: February 2019

Citation: Serckx, A., Lindon, A., Williams, G., Katariya, V., Livingstone, S.R, and Starkey, M. (2019). *Critical Habitat Assessment; Iluka Resources Areas 1 and 5 Mining Lease, Sembehun Haul Road, Sierra Leone*. The Biodiversity Consultancy Ltd, Cambridge, UK.

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Executive Summary

This report is the preliminary Critical Habitat Assessment (CHA) for the existing mining concession (Area 1 Mining Lease) and the construction of Sembehun Haul Road in southern Sierra Leone under development by Sierra Rutile, a subsidiary of Iluka Resources. This report includes a review of the existing CHA of the Sembehun Mineral Sands Project located in Area 5 Mining Lease. The Area of Analysis used encompasses Area 5, so the findings of this report are applicable to that area as well as to Area 1.

The CHA applies the revised PS6 Guidance Note, published in February 2019 (IFC 2019) and is based on existing documentation, including the Project ESHIAs and earlier baseline studies, interpretation of global and regional datasets (e.g. the IUCN Red List of Threatened Species), and consultation with internationally renowned specialists (for plants, amphibians, turtles and freshwater fish). PS6 criteria and thresholds for Critical Habitat have been applied for two ecologically-defined Areas of Analysis: one for terrestrial features and one for aquatic features (see Section 2.1).

Main findings

The assessment found that the Project is operating in Critical Habitat, due to the presence of:

- **One species (Western Chimpanzee) qualifies for Critical Habitat.**
- **Seven species are *likely* to qualify for Critical Habitat under Criteria 1-3**, including 2 species of birds and 5 species of freshwater fish. Some of these fish species qualify under more than one criterion (Sections 3.1, 3.2 and 3.3).
- A further **31 species *possibly* qualify for Critical Habitat**, including four terrestrial mammals, one aquatic mammal, two reptiles, two amphibians, one bird, two freshwater plants, 14 freshwater fish, one marine fish, two insects and two decapods. Based on available information, it is not possible to assess whether these species are likely to qualify for CH or not (Sections 3.1, 3.2 and 3.3).
- The AoA also potentially qualifies for Critical Habitat under **Criterion 4** because of the importance of **mangroves** habitats (Section 3.4).
- An additional **11 species** were identified as species of **stakeholder concern**. These species do not qualify as Critical Habitat, but they may be of national or international interest and/or concern (Section 3.6).
- The Project direct footprint does not overlap with legally protected areas nor internationally recognised areas (LPA/IRA). However, a number of LPA/IRAs are located within the AoA including: Sherbro River Estuary Marine Protected Area (MPA), Yawri Bay (IBA, MPA and EBSA) and Sewa-Wanje protected area (Section 3.7). The Yawri Bay IBA qualifies as Critical Habitat, while the MPAs include mangroves which qualify as Critical Habitat.

Critical Habitat-qualifying species (Criteria 1-3) are summarised in Table 1. Full details are presented in Section 3, in Appendix 2 and in an accompanying spreadsheet.

Table 1: Summary table of species qualifying under Criteria 1, 2 and/or 3

Taxa	Scientific name	English name	IUCN Cat.	CH-criteria	Presence in AoA*	CH screening result
Mammal (terrestrial)	***Pan troglodytes verus***	**Western Chimpanzee**	**CR**	**1**	**Confirmed**	**CH**
	Cephalophus jentinki	Jentink's Duiker	EN	1	Reported	Possible CH
	Piliocolobus badius	Western Red Colobus	EN	1	Reported	Possible CH
	Cercopithecus diana	Diana Monkey	VU	1	Reported	Possible CH
	Colobus polykomos	Black-and-white Colobus	VU	1	Reported	Possible CH
Mammal (aquatic)	*Sousa teuszii*	Atlantic Humpback Dolphin	CR	1	Potential	Possible CH
Reptile	*Crocodylus suchus*	West African Nile Crocodile	NE	1	Reported	Possible CH
	Mecistops cataphractus	(West African) Slender-snouted Crocodile	CR	1	Potential	Possible CH
Amphibian	*Conraua alleni*	Allen's Slippery Frog	VU	1	Reported	Possible CH
	Arthroleptis aureoli	Freetown Long-fingered Frog	EN	1	Potential	Possible CH
Bird	***Psittacus timneh***	**Timneh Parrot**	**EN**	**1**	**Recorded**	**Likely CH**
	Calidris ferruginea	**Curlew Sandpiper**	**NT**	**3**	**Reported**	**Likely CH**
	Tringa tetanus	Common Redshank	LC	3	Reported	Possible CH
Plant (aquatic)	*Ledermanniella aloides*	-	VU	1	Potential	Possible CH
	Stonesia heterospathella	-	DD	2	Potential	Possible CH
Fish (freshwater)	*Chiloglanis polyodon*	-	CR	1, 2	Potential	Possible CH
	Epiplatys fasciolatus ssp. zimiensis	-	EN	1, 2	Potential	Possible CH
	Epiplatys fasciolatus ssp. josianae		CR	1, 2	Recorded	Possible CH
	Epiplatys njalaensis	**-**	**EN**	**1, 2**	**Recorded**	**Likely CH**
	Ladigesia roloffi	-	EN	1, 2	Potential	Possible CH
	Enteromius liberiensis	-	EN	1, 2, 3	Potential	Possible CH
	Marcusenius meronai	-	EN	1, 2	Potential	Possible CH
	Notoglanidium maculatum	**-**	**EN**	**1, 2**	**Potential**	**Likely CH**
	Notoglanidium thomasi	**-**	**EN**	**1, 2**	**Potential**	**Likely CH**
	Scriptaphyosemion bertholdi	**-**	**EN**	**1, 2**	**Potential**	**Likely CH**
	Enteromius bagbwensis	**-**	**VU**	**2**	**Reported**	**Likely CH**
	Mastacembelus taiaensis	-	VU	2	Potential	Possible CH
	Coelotilapia joka	-	VU	2	Potential	Possible CH
	Leptocypris taiaensis	-	VU	2	Potential	Possible CH
	Scriptaphyosemion roloffi	-	NT	2	Potential	Possible CH
	Mochokiella paynei	-	LC	2	Potential	Possible CH
	Chrysichthys johnelsi	-	LC	3	Potential	Possible CH
	Ophichthus leonensis	-	DD	2, 3	Potential	Possible CH
	Scriptaphyosemion chaytori	-	DD	2	Potential	Possible CH
Fish (marine)	*Rhynchobatus luebberti*	African Wedgefish	EN	1, 2	Potential	Possible CH
Insect	*Pseudagrion mascagnii*	-	CR	1, 2	Potential	Possible CH
	Elattoneura dorsalis	Yellow-fronted Threadtail	VU	2	Potential	Possible CH
Decapod	*Afrithelphusa leonensis*	-	DD	2	Potential	Possible CH
	Afrithelphusa afzelii	-	DD	2	Potential	Possible CH

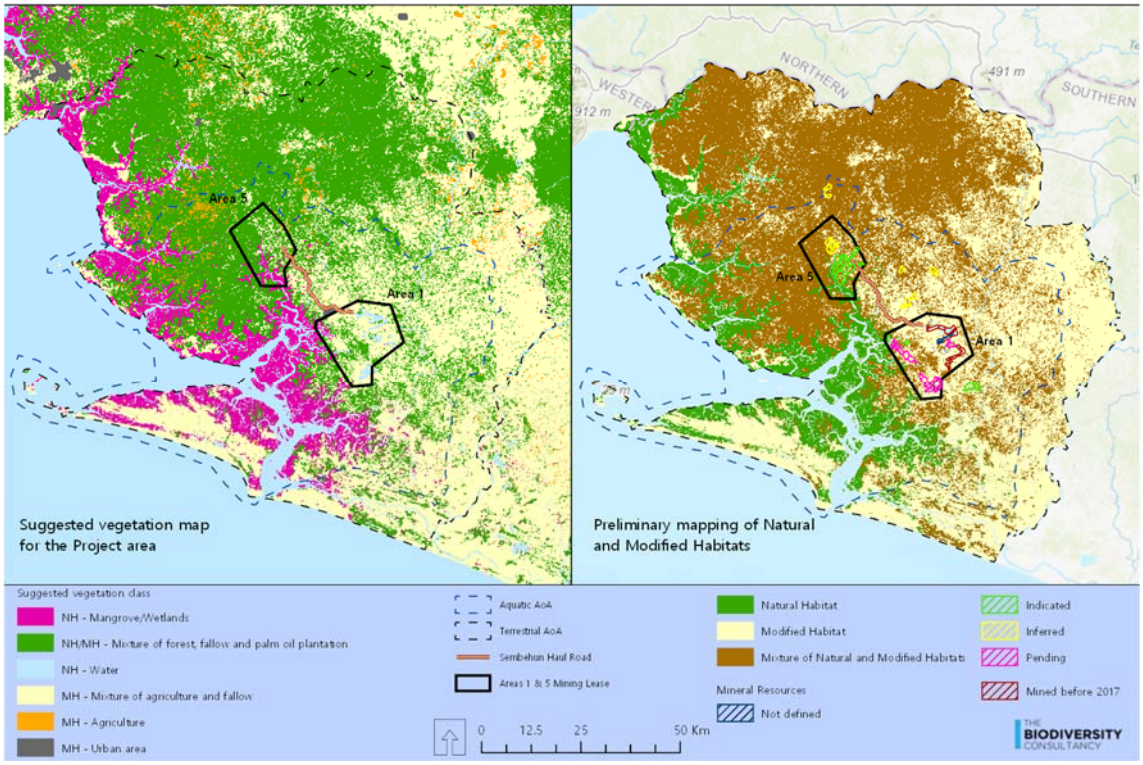

Figure 1 : Preliminary map of Natural and Modified Habitats in the terrestrial AoA (a map zoomed in the Project area is provided in Section 3.8.2). Vegetation classes representing Natural or Modified Habitats have been combined on the right. The class 'mixture of forest, fallow and oil palm' is a mixture of Natural and Modified Habitats.

Recommendations and next steps

While there is limited data for some species, this assessment clearly shows that both Area 1 and Area 5 are situated in a landscape that contains a number of species and an ecosystem that qualify as Critical Habitat.

These findings are sufficient to provide high-level recommendations for on-going operations and the closure of Area 1. It would be prudent for the Project to consider that all likely and potential Critical Habitat-qualifying features are in fact present and to design habitat-focused mitigation measures accordingly. The Project has the option of conducting further surveys to confirm the status of these features.

For chimpanzees, additional surveys are required to adequately develop mitigation measures for on-going and planned operations and for a closure plan specific to the species as detailed in the primate survey report.

For Area 5 and the Haul Road, overlaying the infrastructure and mining plan on the map of Critical Habitat will enable an assessment of whether further avoidance is feasible. Where

impacts on Critical Habitat are anticipated, further surveys may be appropriate to confirm the features potentially impacted and the nature and scale of those impacts.

The report provides an outline of some key potential mitigation measures that could be considered and further developed within a **Biodiversity Action Plan**. These measures focus on avoidance and minimisation of impacts on habitats that support the Critical Habitat-qualifying species.

1 Introduction

1.1 Purpose of the report

This report is the preliminary Critical Habitat Assessment (CHA) for two components of an existing mining concession (Area 1 Mining Lease) and the construction of Sembehun Haul Road in southern Sierra Leone under development by Sierra Rutile Ltd (SRL), a subsidiary of Iluka Resources Limited (Iluka). This report includes a review of the existing CHA of the Sembehun Mineral Sands Project located in Area 5 Mining Lease. For both components, the Project is aiming to align with International Finance Corporation (IFC) Performance Standards to achieve best practice for the Project, including Performance Standard 6 (PS6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC 2012a).

The aim of this report is to:

(1) Identify Critical Habitat-qualifying biodiversity associated with the Project;

(2) Outline the implications of the CHA for the Project; and

(3) Identify the recommended next steps.

1.2 IFC PS6

The objectives of PS6 are to protect and conserve biodiversity; maintain benefits from ecosystem services; and promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.

PS6 provides guidance on how best to identify three classes of area based on (i) vegetation condition ('quality' or 'state') and (ii) significance for biodiversity (Table 2). PS6 uses the term 'habitat' to refer to these areas, rather than the actual vegetation within them. These three area classes are:

- Modified Habitat;
- Natural Habitat; and
- Critical Habitat (with Critical Habitat a subset of Modified and Natural Habitat).

Area condition is classified as either **Natural** or **Modified** based on the extent of human modification of the ecosystem. The threshold for classifying habitat as Modified rather than Natural is high: whereby only the most heavily disturbed habitats would be classified as Modified. Monoculture forestry plantations, arable fields and urban areas show "substantial modification" and would be classed as Modified; selectively logged tropical forest usually retains most original species and ecological processes and would in most cases be considered Natural Habitat.

Areas of **high biodiversity value** are termed **Critical Habitat** by the IFC PS6 and require an assessment for the presence of Critical Habitat, considering the principles of threat (vulnerability)

and geographic rarity (irreplaceability). A CHA, therefore, is a process for identifying significant biodiversity risks associated with the Project.

Identification of Critical Habitat is independent of the state of the habitat: Critical Habitat-qualifying biodiversity may be present even in heavily degraded Modified Habitat, such as rare frogs in human modified urban landscapes.

Table 2: Summary of the PS6 scheme for classifying areas

Three classes of area identified in PS6		Condition of the area	
		Natural	**Modified**
Significant types or quantities of biodiversity (Critical Habitat-qualifying features)	**Present**	Critical Habitat	Critical Habitat
	Absent	Natural Habitat	Modified Habitat

1.2.1 New Guidance Notes in 2019

IFC published updated Guidance Notes for PS6 in February 2019 (IFC 2019). The essence of the CHA remains unchanged, but the thresholds to meet Critical Habitat (CH) criteria 1-3 have been updated and a quantitative threshold has been added for Criterion 4 (see Section 2.2 and Appendix 1). Additional guidance has been added, including the following:

- Critical, Natural and Modified Habitats should be mapped within a CHA (GN26);
- Projects in UNESCO Natural and Mixed World Heritage Sites and/or sites that fit the designation criteria of the Alliance for Zero Extinction are not acceptable for financing (unless they are specifically designed to contribute to the conservation of the area) (GN54);
- Project where great apes may occur must consult the Great Apes Specialist Group as early as possible to assist in the determination of the occurrence of great apes in the project's area of influence. Any area where great apes occur is likely to be treated as Critical Habitat. Projects in such areas will be acceptable only in exceptional circumstances, and individuals from the IUCN Great Apes Specialist Group must be involved in the development of any mitigation strategy (GN71).

This CHA uses the revised Guidance Note 6 to identify biodiversity features likely to qualify for Critical Habitat. As a result, there is a chance that CH-qualifying biodiversity features might be different in comparison to those that were identified in the previous CHA undertaken for the Sembehun Mineral Sands Project in Area 5 (Earth Systems & ECS Sierra Leone 2018). However, as there is limited quantitative data available for the surveys undertaken in Areas 1 and 5 and along the planned road and the key changes in the Guidance Notes concern the criteria thresholds, the findings of the Area 5 existing CHA and this CHA are comparable and the review of the existing CHA using the new Guidance Notes is appropriate (Section 5).

1.3 The Project

SRL is a leading Sierra Leonean mineral sands company which was acquired by Australia-based mining company Iluka Resources Ltd (Iluka) in December 2016 (Iluka 2019). SRL is now a wholly owned subsidiary of Iluka (Sierra Rutile Limited 2019). SRL operates mining activities in their leases located about 30 km from the Atlantic Ocean and 135 km southeast of Freetown, between Moyamba and Bonthe Districts, in the Southern Province of Sierra Leone (Figure 2). The only mining lease currently operated by SRL is Area 1.

For over 50 years, SRL has operated in Mine Lease Area 1 (Area 1), which covers an area of c. 290 km^2. Primary operations include dredge (wet) and dry mining activities, processing operations (floating and land-based concentrators), a mineral separation plant, and transport of product to the Nitti Port where it is barged along approximately 37 km of the Sherbro River Estuary and shipped offshore. Area 1 also includes an extensive network of ponds, power generation facilities, accommodation, offices, a clinic and roads (SRK Consulting 2018a). Current operations are developed under an existing Environmental Licence (reference number EPA-SL030).

Due to the acquisition of SRL by Iluka, the company seeks to align the following activities with IFC standards:

- Expansion of dry mining operations in Area 1 to include new deposits. All operational expansions will be undertaken within the footprint of the existing operations(SRK Consulting 2018a). SRL plans to progressively end mining operations in Area 1 (exact timeline to be confirmed) and a Mine Closure Plan has been prepared (SRK Consulting 2018b).
- Start mining the Sembehun deposits, located in Mine Lease Area 5 (Area 5), some 20 km northwest of Area 1. This is known as the Sembehun Mineral Sands Project, and the area is currently a green field. In addition to the construction of mining infrastructure (e.g. open-cut mines, dredge mine, in-pit Mobile Mining Units, land-based Wet Concentrator Plants, Mineral Separation Plant (MSP), site access roads, accommodation camps), two water supply dams will be built within Area 5 and some villages that will require resettlement to locations both within Area 5 and immediately outside. The estimated Life of Mine (LoM) for Area 5 is 12 years (Earth Systems & ECS Sierra Leone 2018).
- Construct a haul road between Area 1 and Area 5 (c. 30 km) to enable the transportation of Heavy Minerals Concentrate (HMC) from the Sembehun deposits in Area 5 to the MSP in Area 1. Based on the results of a road alignment alternative analysis which took into consideration engineering, social and environmental aspects, including biodiversity, the selected haul road alignment will partially follow an existing road and partially divert from it. It will include a 150m bridge over the Gbangbaia River and other minor infrastructures (e.g. culverts) to cross swamps (CEMMATS 2017).
- Install a power transmission line, from the existing power station at Area 1 to a transformer located in Area 5. The transmission line will follow the haul road alignment, except in the proximity of the Area 1 power station where it will deviate for approximately 2km (CEMMATS 2017).

- In compliance with Sierra Leonean regulations, SRL commissioned Environmental, Social, Health Impact Assessment (ESHIA) studies for i) the current operations and proposed expansion activities in Area 1 (SRK Consulting 2018c), ii) the new Sembehun Mineral Sand Project in Area 5 (Earth Systems & ECS Sierra Leone 2018)[1], and iii) the haul road, bridge infrastructure and power transmission line (CEMMATS 2017).
- In this current CHA assignment, the Project refers to Area 1 and activities/infrastructures located within it (including the Nitti Port), Area 5 and activities/infrastructures located within it, and the haul road (including the bridge and the power transmission line). The Project does not include other associated infrastructures outside the Project footprint (e.g. barge transportation channel along the estuary, offshore vessel loading point, or other mine leases SRL may own in the surrounding area).

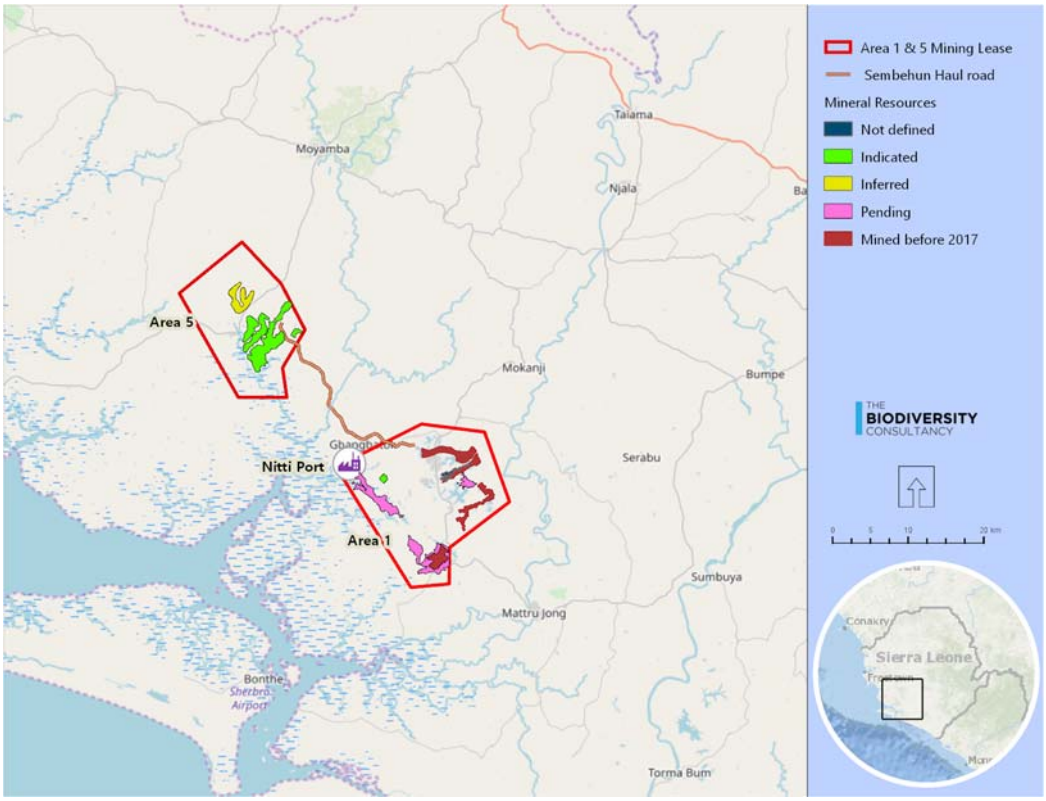

Figure 2: Map of the project areas

2 Approach to the CHA

Biodiversity which potentially meets the thresholds for Critical Habitat (IFC 2019) was identified by:

1. Development of an **appropriate scale for assessment** to undertake the analysis for biodiversity;

[1] This refers to the Biodiversity Management Plan (BMP) of the ESHIA since TBC did not receive the full ESHIA report.

2. Collection and verification of **available information** on biodiversity from global datasets, notably IBAT, and site-specific data from ESIAs, baseline surveys, literature review, specialist consultation and analysis; and
3. **Assessment against IFC criteria** and thresholds for species and ecosystems to identify which biodiversity features may qualify the area as Critical Habitat.

2.1 Spatial scale of assessment

A CHA is carried out at the landscape scale, '*ecologically appropriate area of analysis to determine the presence of critical habitat for each species with regular occurrence in the project's area of influence, or ecosystem, covered by Criteria 1-4*' (see Section 2.2). '*The boundaries of this area take into account the distribution of species or ecosystems (within and sometimes extending beyond the project's area of influence) and the ecological patterns, processes, features and functions that are necessary for maintaining them*'. Therefore, an Area of Analysis (AoA) is identified at a landscape scale, considering large-scale ecological processes where appropriate, and are often much larger than the project concession or lease area itself. This precautionary approach ensures all Project risks are taken into consideration, and demonstrates transparency to relevant stakeholders.

A preliminary review of the region's ecology is carried out during the identification of an AoA. This highlights any potential Critical Habitat-qualifying biodiversity which might be present, and informs delineation of an AoA at an appropriate scale. The AoA is designed to ensure that the significance of the project landscape is appropriately evaluated from the perspective of biodiversity; it is not a management unit and the choice of AoA does not place any management obligations on the project.

In this assessment, two AoAs were identified to capture the ecological differences between terrestrial and aquatic biodiversity.

2.1.1 Terrestrial Area of Analysis

The Project area is located in a mosaic of natural (e.g., mangroves, gallery and lowland forests, inland swamp valleys) and modified habitats (agricultural land, mined areas). There are no clear ecological boundaries, but a general pattern of habitats that are more natural and forested towards the northwest and more degraded towards the southeast of the Project area. A number of species of conservation concern are known to be present in the area, including the Western Chimpanzee (*Pan troglodytes ssp. verus)* and the Timneh Parrot (*Psittacus timneh)*. To capture this habitat heterogeneity and to make sure highly mobile species are appropriately captured by the terrestrial AoA, a minimum of 20 km radius buffer was applied around Project infrastructure. The following areas were included within the AoA:

- The islands off the Sherbro River Estuary, which are known to contain important biodiversity features (e.g. mangroves, birds): The Sherbro River Estuary is mainly associated with marine species (e.g. turtles). However, it is appropriate to include it in the terrestrial AoA as it includes ecosystems and the range of species for which the assessment was conducted under the terrestrial threshold (e.g., mangroves, birds). As it

is located in the direct proximity of the Project and has clear connectivity with the project area via watercourses, it is considered to be part of the same ecological unit.

- The Yawri Bay Important Bird Area (IBA): Although located c. 20km from Area 5, the IBA is directly connected with the Project infrastructure by a river flowing from Area 5 to the IBA (see Figure 4). The IBA might therefore be impacted by the Project through water pollution or contaminant runoff. As for the Sherbro River Estuary, its inclusion in the terrestrial AoA is deemed appropriate as it is associated with ecosystems and species assessed under the terrestrial threshold[2]. The Project may include human resettlement and possible influx of people from other nearby villages. District limits were therefore also used to define the AoA to cover possible impacts in the north of the AoA.

The selected AoA measures c. 10,000 km^2 and is bordered by i) the coast (including islands) to the south, ii) the Yawri IBA to the northwest, ii) the Southern District boundary to the north, iv) existing roads to the north-east, and v) the Sewa River and one of its tributaries to the east and down to the estuary (Figure 3).

[2] Note that even if the inclusion of these 2 areas is precautionary and ensures that the assessment includes all areas potentially impacted by the Project, it has not led to the inclusion of species that would not have been flagged as possibly Critical Habitat otherwise.

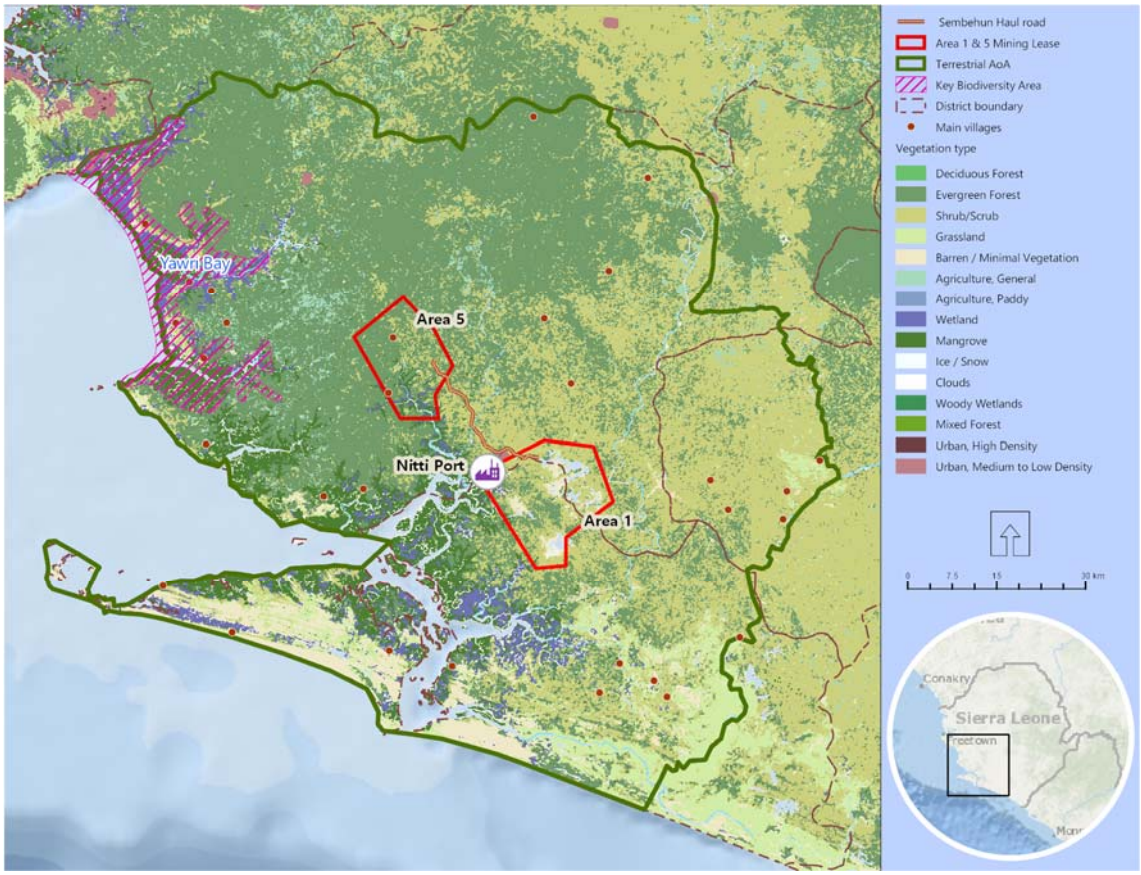

Figure 3: Terrestrial AoA

2.1.2 Aquatic Area of Analysis

The aquatic AoA includes freshwater, coastal, and marine nearshore biodiversity features. The main aquatic features include mangroves, fishes, aquatic mammals and reptiles (sea turtles, crocodiles), and potentially amphibians and other invertebrates (Earth Systems & ECS Sierra Leone 2019a). Project infrastructure overlaps with two large river catchments – Gbangba and Jong – and with Kagboro creek, a smaller independent water course. Downstream of the Project, the Sherbro River Estuary receives waters from the Jong Basin and is gazetted as a marine protected area (Sherbro River Estuary MPA). While the Sherbro River Estuary is not directly connected with Project infrastructure, connectivity via watercourses means Project impacts could plausibly extend into this area, for example via water pollution from upstream of the Jong Basin, where the Project is located, or by maritime activities of the Project. It was therefore included in the AoA[3].

The selected aquatic AoA covers c. 6,000 km^2 and includes i) the Sherbro River Estuary, and its islands, up to c.15 km from the coastline, ii) the entire catchment of Kagboro creek, iii) the

[3] Note that no species endemic to the Sherbro River Estuary have been identified and therefore included in this assessment. The estuary is mostly associated with turtles, identified as species of stakeholder concern as they are nesting along the coast and use mangroves for foraging.

coastal section of the Gbangba catchment and iv) the downstream part of the Jong catchment (Figure 4). The selected upstream limits for both the Gbanga and Jong catchment correspond to the Northern boundaries of the Chiefdoms directly affected by the Project (Lower Banta and Upper Banta). Given the scale and nature of this Project, the portions of the catchments beyond these Chiefdom boundaries are not considered to provide additional relevant information on aquatic biodiversity sensitivities, which are already captured by the existing selected aquatic AoA.

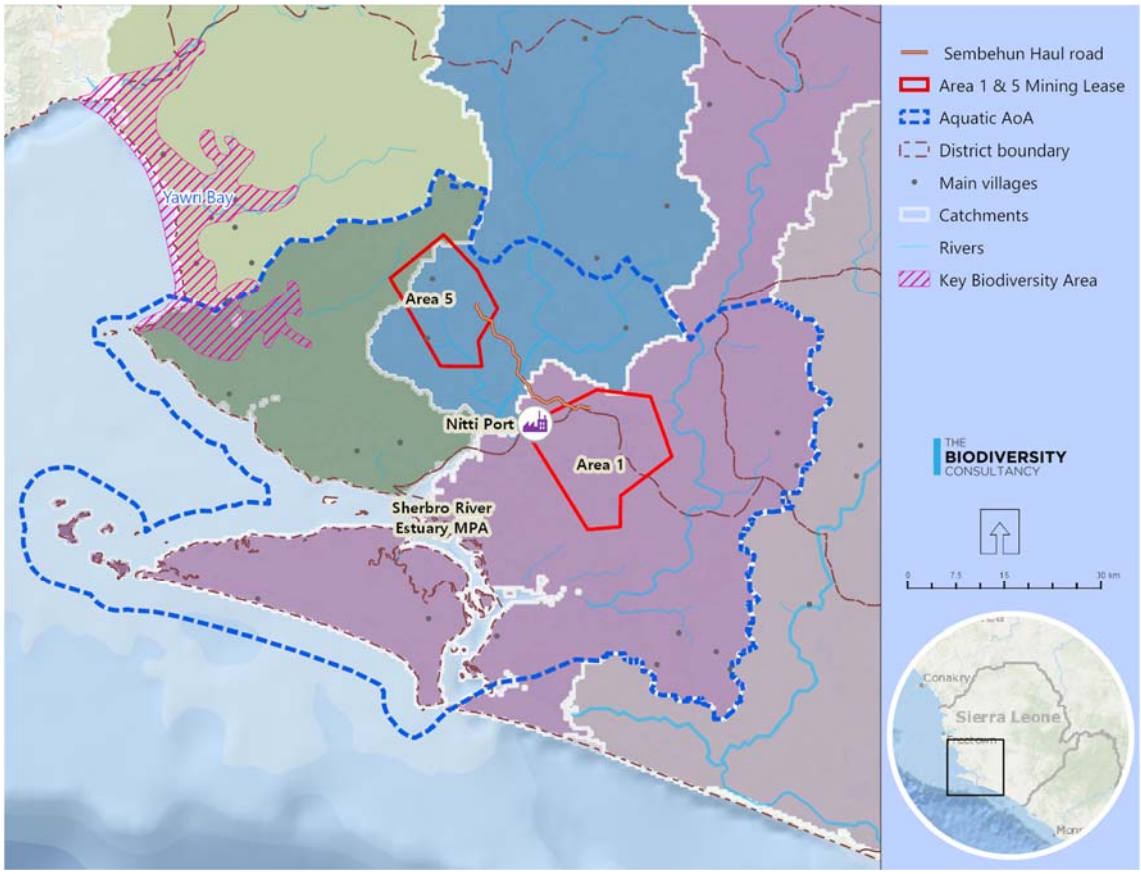

Figure 4: Aquatic AoA

2.2 IFC Criteria for CHA

PS6 has four criteria with defined quantitative thresholds (see below and Appendix 1):

- Criterion 1: Critically Endangered and Endangered species;
- Criterion 2: Restricted-range Species;
- Criterion 3: Migratory/congregatory Species; and
- Criterion 4: Highly threatened and/or unique ecosystems.

The thresholds for the first three criteria are expressed as percentages of global and national population sizes, combined with minimum numbers of reproductive units[4]. The threshold for the last criterion is based upon percentage of global extent. In reality, species' populations are often poorly known, so the first three criteria are often – at least in part – also assessed as percentages of global distributions.

There is also one qualitative criterion:

- Criterion 5: Key Evolutionary Processes.

This criterion aims support the conservation of species diversity within a landscape, and to recognise processes that drive speciation, and genetic diversity within species, to ensure the evolutionary flexibility of a system. These evolutionary processes are captured by certain structural features of a landscape, including landscapes with high spatial heterogeneity, environmental gradients, connectivity between habitats and sites of demonstrated importance to climate change adaptation.

2.2.1 Criterion 1: Critically Endangered and Endangered species

Areas qualifying for this criterion support:

a. Globally-important concentrations of IUCN Red-listed Critically Endangered or Endangered species (>0.5% of the global population and >5 reproductive units of a CR or EN species);

b. Globally-important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds under (a); or

c. As appropriate, areas containing important concentrations of a nationally/regionally-listed EN or CR species

Quantitative data for the list of candidate species in the AoA were screened against PS6 thresholds (IFC 2019). In the absence of information on species' populations, the screening was based on the proportion of a species' distribution in the AoA. When information was unclear, a precautionary approach was taken.

This assessment also considered any subspecies and sub-populations that are individually assessed on the IUCN Red List.

[4] The IUCN KBA Standard uses the following definition for *reproductive unit*: "the minimum number and combination of mature individuals necessary to trigger a successful reproductive event at a site (Eisenberg 1977). Examples of five reproductive units include five pairs, five reproducing females in one harem, and five reproductive individuals of a plant species."

2.2.2 Criterion 2: Restricted-range species

Areas qualifying for this criterion hold ≥10% of the global population size and ≥10 reproductive units of a restricted-range species. "Restricted-range" refers to a species' extent of occurrence (EOO), and is defined according to its habitat:

- For **terrestrial vertebrates** and **plants**, a restricted-range species is a defined as those that have an EOO of less than 50,000 km^2;
- For **marine systems**, restricted-range species are provisionally being considered those with an EOO of less than 100,000 km^2;
- For **coastal**, **riverine** and **other aquatic species** in habitats that do not exceed 200 km width at any point (e.g., rivers), restricted-range is defined as having a global range less than or equal to 500 km linear geographic span (i.e., the distance between occupied locations furthest apart). There are limited data on occupied locations of freshwater and marine species, and limited availability of those data. As such, for freshwater species this was calculated by measuring the distance the two furthest points of the catchment(s) in which the species is present. For coastal species, it was calculated by measuring the longest axis of the distribution range of the species. For freshwater species in particular, this approach may underestimate the number of restricted-range species, since they may not occupy entire catchments within which they occur. To address this, careful consideration was also given to freshwater species where linear geographic span was less than 600 km.

The AoAs were screened for overlap with restricted-range species' maps from the IUCN Red List. Any such species were compared with the recommended thresholds for Criterion 2 (IFC 2019). As for Criterion 1 species, the screening was preferentially based on the proportion of a species' population in a given area, but often – owing to limited data – on the proportion of a species' global distribution.

2.2.3 Criterion 3: Migratory and congregatory species

Areas qualifying for this criterion support either:

a. ≥ 1 % of the global population of a migratory or congregatory species at any point of the species' lifecycle and on a cyclical or otherwise regular basis; or

b. ≥10 % of the global population of a species during periods of environmental stress.

Data for the list of candidate species in the AoAs were screened against PS6 thresholds (IFC 2019), based on the proportion of a species' population in a given area. Information from Important Bird Areas and Key Biodiversity Areas was sometimes available to support this assessment, but often it was necessarily based on expert opinion backed up by available literature. Additional information on the use of the AoA by the species – e.g., if the AoA is a stop-over or bottleneck within the species' migratory route (TBC 2018) – was also compiled to assess whether the area represented Critical Habitat.

2.2.4 Criterion 4: Highly threatened and/or unique ecosystems

Areas qualifying under this criterion hold ≥5% of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN (see Appendix 1 for details on IUCN criteria) or other areas not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning. Screened ecosystems were identified checking the list of ecosystems assessed by the IUCN (IUCN 2019) and using the list of ecosystems in Sierra Leone presented in the National Biodiversity Strategy and Action Plan (Environment Protection Agency 2017).

2.2.5 Criterion 5: Areas associated with key evolutionary processes

The key factor defining this criterion is '*the structural attributes of a landscape*'. Although key evolutionary processes may operate at various spatial scales, in the sense of PS6 these are usually considered at a relatively fine scale rather than broad biogeographic regions (e.g., an unusual outcrop of a rock type that holds unique and endemic plant assemblages). No quantitative thresholds exist for this criterion, so there is a reliance on expert opinion and qualitative value judgement.

2.2.6 Internationally recognized areas

GN54 (IFC 2019) states that '*certain internationally recognized areas of high biodiversity value may be recognized as Critical Habitat and should be given special attention during assessments. Examples include the following*:

- *Areas that meet the criteria of the IUCN's Protected Areas Categories Ia, Ib and II (Dudley 2008);*
- *Key Biodiversity Areas (KBAs), which encompass Important Bird and Biodiversity Areas (IBAs)*'.

A full list of qualifying types of internationally recognised areas is given in footnote 17 of PS6 (IFC 2012a). These Internationally Recognized Areas (IRAs) present in the AoA were screened and the IRAs associated with CH-qualifying species were identified as Critical Habitat.

2.3 Natural Habitat and Modified Habitat

2.3.1 Review of the existing land use maps of the Project area

The Project has developed land use maps for Areas 1 and 5 (CEMMATS 2012 p.63; Earth Systems & ECS Sierra Leone 2019b) which were overlaid by vegetation type data collected in the field. The accuracy of the existing mapping was checked qualitatively as only few ground points were available and were not distributed evenly over the land use maps.

2.3.2 Preliminary mapping of Natural and Modified Habitats

Several land cover maps are available for the Project area. The use of peer-reviewed maps is recommended as they have been created with ground-truthed data and have been reviewed by

experts. However, for this Project, most freely-available layers are inappropriate for identifying Natural and Modified Habitats as:

- The 1km-resolution Global Cover map of 2009 (ESA 2009) has too coarse a resolution. Therefore, none of the remnant forest patches are visible.
- The 300m-resolution map of 2010 (ESA 2010) clearly over-represent forests in the Project area.

A 30m-resolution land cover map of 2013 from MDA Information Systems LLC was available online on ArcGIS (MDA 2013) and was used to create the preliminary mapping the Natural and Modified Habitats. Even if not peer-reviewed, this map was the closest to the land use maps provided by the Project and the habitat points collected in the field. It should however be noted that:

- the Forest vegetation class is likely to be over-estimated and should be considered as a mixture of fallow and forest patches;
- the Shrub and Grassland classes are likely to represent agriculture and fallow instead of Natural Habitat;
- the Minimal vegetation class is likely to represent agriculture.

2.4 Available information

This CHA was based on existing documentation and interpretation of global and regional datasets, as well as consultation with expert stakeholder where feasible and necessary.

2.4.1 Spatial analysis

The list of biodiversity features (i.e. species, protected areas, internationally recognised areas) that overlap with the terrestrial and aquatic AoAs were extracted through the Integrated Biodiversity Assessment Tool (IBAT). These biodiversity features were assessed based on quantitative and/or qualitative information, by using global databases (e.g. the IUCN Red List spatial data layers[5], the Global Biodiversity Information Facility, GBIF) to produce a candidate list of potential Critical Habitat-qualifying features known to occur within the aquatic and terrestrial AoAs, or whose distribution intersects with the AoAs. Each potentially qualifying biodiversity feature was then screened against applicable criteria and thresholds (IFC 2019).

2.4.2 Project documents

A number of Project documents were reviewed, including biodiversity-specific baseline surveys that were carried out in and around Area 1 and Area 5, as part of the Project ESHIAs. These studies were undertaken by different entities and with a variable approach and level of details.

[5] It should be noted that IUCN range maps are not available for all species, subspecies and populations on the Red List, and that the IUCN Red List is not an exhaustive list. Many species, subspecies and populations have not yet been assessed under IUCN Red List criteria and therefore do not have threat status assigned to them. For example, there are very few global distribution maps available for the plants which are assessed on the Red List.

Available field surveys targeted mammals, birds, plants, reptiles, amphibians, aquatic ecology (fish and invertebrates) as well as community surveys with local people. None of the field studies focused on bats, and the coverage of terrestrial invertebrates focused on spiders and aquatic assemblages (invertebrates were mostly used as functional groups indicating water qualify).

The following Project documents were reviewed for appropriate data:

- Sierra Rutile Limited (SRL) revised Environmental and Social Impact Assessment (CEMMATS 2012);
- ESHIA of the Sierra Rutile Sembehun haul road, bridge and transmission line (CEMMATS 2017);
- Biodiversity Management Plan of the Sembehun Mineral Sands Project ESHIA (Earth Systems & ECS Sierra Leone 2018);
- Aquatic Ecology and Biodiversity Baseline Study of the Sembehun Mineral Sands Project ESHIA (Earth Systems & ECS Sierra Leone 2019a);
- Terrestrial Biodiversity Baseline Study of the Sembehun Mineral Sands Project ESHIA (Earth Systems & ECS Sierra Leone 2019b)
- Social Impact Assessment of the ESHIA of the Sierra Rutile Expansion Area 1 Project (SRK Consulting 2018a);
- Specialist Terrestrial, Aquatic and Wetland Ecological Studies of the ESHIA of the Sierra Rutile Expansion Area 1 Project (Scientific Terrestrial Services 2018);
- Mine Closure Plan of the ESHIA of the Sierra Rutile Project Area 1 (SRK Consulting 2018b).

2.4.3 Expert consultation

The following external experts were consulted to support the assessment of highest priority and/or lesser known species:

- **Gina Walsh**, FLORA FAUNA & MAN, Ecological Service Ltd: international expertise on freshwater species with 12 years of experience in Africa (she has previously worked with TBC in Sierra Leone as part of a field survey in catchments adjacent to and overlapping with this Project); a member of the Southern African Society of Aquatic Scientists; and accredited by the South African Council for Natural Scientific Professions as a 'Professional Natural Scientist in Ecological Science';
- **Edward Aruna**, Reptile and Amphibian Program - Sierra Leone (RAP-SL): national expert on reptiles and amphibians, including sea turtles;
- **Natalie Weber**, Associated Scientist of the Max Planck Institute for Ornithology: international expertise on bats;
- **Martin Cheek**, Royal Botanical Gardens, Kew (RGB Kew): international botanical expertise.

2.4.4 Robustness of this assessment

This assessment was conducted using the best available information from the Project area. Since almost no quantitative data was available from Project surveys, it is heavily based on data from the IUCN Red List of Threatened Species.

Species-specific information was strengthened by expert consultation in some cases. However, given the short-time period over which the assessment was conducted, some additional consultations could be considered during BAP development to refine the findings and inform the design of the surveys.

It is acknowledged that new information may change the conservation status of a species, and therefore change the assessment. For example, several of the restricted-range fish and plant species identified under Criterion 1 and/or 2 are poorly known. Further research may extend their known range, such that the significance of the Project AoA for these species is reduced, or may determine that they are not in fact new species. In addition, some taxa, particularly plants and coastal, marine and terrestrial invertebrates are poorly represented on the IUCN Red List and only limited field data was available for these features, so it is possible that further research would find species that would meet CH criteria.

However, it should be noted that whilst further research may affect individual species currently identified as Critical Habitat-qualifying, the overall assessment of Critical Habitat status will not change. This is because Critical Habitat is identified on a weakest link approach, whereby qualifying biodiversity under any criterion confirms the Project as Critical Habitat. Evaluations of formally described and well-known species under Criterion 1 are particularly robust and unlikely to change based on further work.

3 Findings for Area 1 and Sembehun Haul Road

Given the limited amount of available field data (e.g. records in the AoA and estimation of population size) and uncertainties for some species (e.g. unknown global population size or global range), it was not possible to quantitatively assess all biodiversity features against the CH-qualifying thresholds. Therefore, the analysis used a scale of probability for the biodiversity feature to qualify based on current knowledge and expert opinion:

- **Likely**: good evidence that:
  - The feature is present in the AoA; AND
  - The feature is present at levels that meets/approaches the threshold;
- **Possible**:
  - Low evidence that the feature is present in the AoA but if confirmed likely to meet the threshold; OR
  - Good evidence that the feature is present in the AoA but unclear if it would meet the threshold[6];

Species identified in this category will require additional surveys to confirm either their presence or their abundance. Recommendations are provided in Section 6.

[6] For example, the presence of the fish *Ladigesia roloffi* is not confirmed yet in the AoA (the species range provided by the IUCN Red List overlaps with the AoA but the species presence has not been confirmed during field surveys) but if the species presence is confirmed, the species is likely to qualify under Criteria 1 and 2 as 30% of its range overlaps with the AoA. Therefore, it is likely that more than 0.5% (threshold for Criterion 1) and more than 10% (threshold for Criterion 2) of the global population is present in the AoA. In opposite, the presence of the Western Red Colobus is reported in the Project area, but they are likely to be present at low density. Therefore, it is not clear if the species would meet the threshold to qualify under Criterion 1.

- **Unlikely**: reasonable evidence that the species does not meet the threshold[7];
- **Not qualifying**: Available information is clear enough to state that the species will not meet any of the thresholds for CH. Species in this category are not discussed in this report, but are listed in an accompanying excel spreadsheet.

3.1 Criterion 1: Critically-Endangered and Endangered species

One species qualifies for Critical Habitat, **five species** are likely to qualify for Critical Habitat under Criterion 1 and a further **18** species possibly qualify (Table 3). See Appendix 2 for justification.

Table 3: Criterion 1 CH-qualifying features (species likely to qualify are indicated in bold)

Taxa	Scientific name	English name	IUCN Cat.	Presence in AoA*	CH screening result
Mammal (terrestrial)	*Pan troglodytes verus*	Western Chimpanzee	CR	Confirmed	**CH**
	Cephalophus jentinki	Jentink's Duiker	EN	Reported	Possible CH
	Piliocolobus badius	Western Red Colobus	EN	Reported	Possible CH
	Cercopithecus diana	Diana Monkey	VU	Reported	Possible CH
	Colobus polykomos	Black-and-white Colobus	VU	Reported	Possible CH
Mammal (marine)	*Sousa teuszii*	Atlantic Humpback Dolphin	CR	Potential	Possible CH
Reptile	*Crocodylus suchus*	West African Nile Crocodile	NE	Reported	Possible CH
	Mecistops cataphractus	(West African) Slender-snouted Crocodile	CR	Potential	Possible CH
Amphibian	*Conraua alleni*	Allen's Slippery Frog	VU	Reported	Possible CH
	Arthroleptis aureoli	Freetown Long-fingered Frog	EN	Potential	Possible CH
Bird	*Psittacus timneh*	Timneh Parrot	EN	Recorded	**Likely CH**
Plant (freshwater)	*Ledermanniella aloides*	-	VU	Potential	Possible CH
Fish (freshwater)	*Chiloglanis polyodon***	-	CR	Potential	Possible CH
	*Epiplatys fasciolatus ssp. zimiensis***	-	EN	Potential	Possible CH
	Epiplatys fasciolatus ssp. josianae		CR	Recorded	Possible CH
	*Epiplatys njalaensis***	-	EN	Recorded	**Likely CH**
	*Ladigesia roloffi***	-	EN	Potential	Possible CH
	*Enteromius liberiensis***	-	EN	Potential	Possible CH
	*Marcusenius meronai***	-	EN	Potential	Possible CH
	*Notoglanidium maculatum***	-	EN	Potential	**Likely CH**

[7] Either the species is unlikely to be present in numbers large enough to meet the thresholds (e.g., it is unlikely that 0.5% of the global population of Green Turtle are using the AoA but the species is reported to be present in the AoA by expert), or the species is unlikely to be present in the AoA even if its range overlaps with the AoA (e.g. the range of the Blue Whale overlaps with the AoA but the species is unlikely to be present so close to the coast).

Taxa	Scientific name	English name	IUCN Cat.	Presence in AoA*	CH screening result
	*Notoglanidium thomasi***	-	EN	Potential	**Likely CH**
	*Scriptaphyosemion bertholdi***	-	EN	Potential	**Likely CH**
Fish (marine)	*Rhynchobatus luebberti*	African Wedgefish	EN	Potential	Possible CH
Insect	*Pseudagrion mascagnii***	-	CR	Potential	Possible CH

*__Confirmed__=presence confirmed onsite by TBC; __Recorded__=presence confirmed during recent surveys in the AoA; __Reported__=presence reported by expert-based judgement and/or through community surveys; __Potential__=presence considered possible given the overlap between AoA and species range and/or suitability of habitats.
**these are species that likely/possibly qualify for CH under more than one criterion.

3.2 Criterion 2: Restricted-range species

Five species are likely to qualify for Critical Habitat under Criterion 2 and a further **18 species** possibly qualify (Table 4). See Appendix 2 for justification.

Table 4: Criterion 2 CH-qualifying features

Taxa	Scientific name	English name	IUCN Cat.	Presence in AoA*	CH screening result
Fish (freshwater)	*Chiloglanis polyodon***	-	CR	Potential	Possible CH
	*Epiplatys fasciolatus ssp. zimiensis***	-	EN	Potential	Possible CH
	Epiplatys fasciolatus ssp. josianae		CR	Recorded	Possible CH
	*Epiplatys njalaensis***	-	EN	Recorded	**Likely CH**
	*Ladigesia roloffi***	-	EN	Potential	Possible CH
	*Enteromius liberiensis***	-	EN	Potential	Possible CH
	*Marcusenius meronai***	-	EN	Potential	Possible CH
	*Notoglanidium maculatum***	-	EN	Potential	**Likely CH**
	*Notoglanidium thomasi***	-	EN	Potential	**Likely CH**
	*Scriptaphyosemion bertholdi***	-	EN	Potential	**Likely CH**
	Enteromius bagbwensis	-	VU	Reported	**Likely CH**
	Mastacembelus taiaensis	-	VU	Potential	Possible CH
	Coelotilapia joka	-	VU	Potential	Possible CH
	Leptocypris taiaensis	-	VU	Potential	Possible CH
	Scriptaphyosemion roloffi	-	NT	Potential	Possible CH
	Mochokiella paynei	-	LC	Potential	Possible CH
	*Ophichthus leonensis***	-	DD	Potential	Possible CH
	Scriptaphyosemion chaytori	-	DD	Potential	Possible CH
Insect	*Pseudagrion mascagnii***	-	CR	Potential	Possible CH
	Elattoneura dorsalis	Yellow-fronted Threadtail	VU	Potential	Possible CH
Decapod	*Afrithelphusa leonensis*	-	DD	Potential	Possible CH
	Afrithelphusa afzelii	-	DD	Potential	Possible CH
Plant (freshwater)	*Stonesia heterospathella*	-	DD	Potential	Possible CH

*__Confirmed__=presence confirmed onsite by TBC; __Recorded__=presence confirmed during recent surveys in the AoA; __Reported__=presence reported by expert-based judgement and/or through community surveys; __Potential__=presence considered possible given the overlap between AoA and species range and/or suitability of habitats.
**these are species that qualify for CH under more than one criterion.

3.3 Criterion 3: Migratory and congregatory species

One species is likely to qualify for Critical Habitat under Criterion 3 and a further **4 species** possibly qualify (Table 5). See Appendix 2 for justification.

Table 5: Criterion 3 CH-qualifying features

Taxa	Scientific name	English name	IUCN Cat.	Presence in AoA*	CH screening result
Bird	*Calidris ferruginea*	Curlew Sandpiper	NT	Reported	**Likely CH**
	Tringa tetanus	Common Redshank	LC	Reported	Possible CH
Fish (freshwater)	*Enteromius liberiensis***	-	EN	Potential	Possible CH
	*Ophichthus leonensis***	-	DD	Potential	Possible CH
	Chrysichthys johnelsi	-	LC	Potential	Possible CH

*__Confirmed__=presence confirmed onsite by TBC; __Recorded__=presence confirmed during recent surveys in the AoA; __Reported__=presence reported by expert-based judgement and/or through community surveys; __Potential__=presence considered possible given the overlap between AoA and species range and/or suitability of habitats.
**these are species that qualify for CH under more than one criterion.

The Near Threatened Curlew Sandpiper has been recorded in sufficient numbers in the Yawri Bay IBA to qualify for Critical Habitat under Criterion 3: the recorded numbers from the IBA are approximately 1.5% of the lower estimate of the global population of this species. In addition, the Common Redshank has been recorded in numbers that marginally exceed the 1% threshold, if the lowest estimate of the global population is used. However, the range of global population estimates for this species is extremely large, and the counts are only very marginally over the threshold, so we consider that Common Redshank is only a possible Critical Habitat species under Criterion 3.

The AoA is located within the Eastern Atlantic Flyway[8], implying the site may be crossed by significant numbers of other species of migratory birds during the migration periods (late June to October & February to April, with variation depending on the species). To qualify under Criterion 3, the AoA must be a stop-over or a bottleneck within the migration route and more than 1% of the global population of a migratory/ congregatory species must be reported in the AoA (TBC 2018). Based on the topography of the area, it is unlikely that the area is a bottleneck for species not confined to the shoreline (for example no mountains or hills are present along the AoA, which would prevent birds from deviating the main flyway). Current data for the AoA does not allow an assessment of the importance of the site as a stop-over because the surveys focused on threatened and endemic species, they were of short duration (14 days maximum[9]) and individuals were not counted. However, since Sierra Leone has been relatively well-

[8] See for example http://datazone.birdlife.org/userfiles/file/sowb/flyways/4_East_Atlantic_Factsheet.pdf

[9] Surveys were undertaken during 14 days in July and 7 days in January in Area 1 while Area 5 was studied for 6 days in February and 11 days in April.

frequented by expert and amateur ornithologists, a major stop-over site would probably be well-known by now. Nevertheless, the Project should remain aware that it is situated on an important migratory route for birds, and detailed assessment would be appropriate if the Project plans any infrastructure or other developments that might interfere with migrating birds, such as transmission lines, large tailings ponds with untreated water or wind power generation.

3.4 Criterion 4: Highly threatened and/or unique ecosystems

A qualitative evaluation of landcover across Sierra Leone[10] shows a predominance of cropland-forest mosaics, with greater broadleaf, evergreen or semi-deciduous forest covering mainly the east and west of the country. In undegraded areas, the coastlines are bordered either by mangroves and wetlands or by shrubs/grasslands and evergreen forests. The AoA is dominated by a cropland-forest mosaic in the north while the southern part is most degraded and comprises mostly shrub (young "farm bush") and agricultural land. The coastal section of the AoA is located within the Sherbro River Estuary, which contains the largest area of mangroves of the country (Environment Protection Agency 2017).

Sierra Leone is dominated by two ecoregions[11], the Guinean Forest-Savanna Mosaic and the Western Guinean Lowland Forest, and a third ecoregion is present along the coast, the Guinean Mangroves. The AoA intersects with both the Western Guinean Lowland Forests and the Guinean Mangroves ecoregions. The Western Guinean Lowland forests is widespread (c. 200,000km^2) and is associated with several large charismatic mammal species (WWF 2017a). The Guinean Mangroves ecoregion is more restricted (c. 23,000km^2) provides important habitat for migratory birds and endangered species such as the West African manatee (WWF 2017b). PS6 Criterion 4 is not intended to be applied at the ecoregion level, so although both the Western Guinean Lowland Forest ecoregion is considered by WWF as Critical/Endangered, it does not in itself qualify as Critical Habitat *sensu* IFC PS6, in part because of their very large scale.

This high-level qualitative evaluation of the primary habitats across the AoA suggests that the mangrove ecosystem might meet the threshold for Criterion 4. Habitat mapping in the Project study area has been limited to date (Earth Systems & ECS Sierra Leone 2019b; CEMMATS 2012). Therefore, the major ecosystems highlighted by the National Biodiversity Strategy and Action Plan (Environment Protection Agency 2017) and present in the AoA were reviewed against the definitions for Criterion 4 and the Red List of Threatened Ecosystem category definitions (e.g. CR, EN etc.). Except for the mangroves, the ecosystems present in the AoA are likely to contain Critical Habitat-qualifying species, but the ecosystems in themselves do not qualify under Criterion 4.

[10] MDAUS map (MDA 2013)

[11] As described in the WWF Ecoregions assessment

Table 6: High-level qualitative assessment of ecosystems in the AoA against Criterion 4

Ecosystem		Assessment
Ecosystem type	**Summary description**	
Lowland (Evergreen and semi-deciduous) forest	• Forest with generally low tree density and species diversity per hectare. Canopy trees are at least 30m tall, with some emergent individuals reaching a height of 50-60m (WWF 2017a); • Important for some Critical Habitat-qualifying species (e.g. primates); • Widespread in Sierra Leone.	Red List of Threatened Ecosystems • **Reduction in geographic distribution** Yes but below threshold – The national deforestation rate for Sierra Leone is increasing by 0.01% each year (0.63% in 2000, 0.68% in 2005 (Statistics: Sierra Leone 2006) and 0.73% in 2010 (FAO 2010)). However, to qualify for EN or CR, the forest should have decreased by more than 50% or 80%, respectively, over the past 50 years or be projected to decrease by more than 50 or 80% over the next 50 years. Applying an increasing annual rate of deforestation over the past and the next 50 years, 24% is estimated to have been lost since 1969 and 42% of the forest will be lost by 2069. Even though this number is large, it is below the threshold to qualify as an EN ecosystem. • **Restricted geographic distribution** No – widespread habitat type • **Environmental degradation** Yes but below threshold – conversion of lowland forests to farmland and degradation due to timber extraction is a threat but not currently considered to be significant due to the wide distribution of this habitat type. A finer-grained assessment of degradation could change this evaluation • **Disruption of biotic processes or interactions** No – there is no evidence of this • **Quantitative analysis that estimates the probability of ecosystem collapse** Not possible using the currently available data, but given the widespread distribution of lowland forests, collapse is unlikely.

		Conclusion: **Unlikely to meet Criterion 4**
Gallery forest (forest along rivers and streams)	• Approx. 50 m wide strips of closed-canopy rainforest with trees to 25 m high, along rivers and streams; • Important for some Critical Habitat-qualifying species (e.g. primates); • Widespread in Sierra Leone;	Red List of Threatened Ecosystems • **Reduction in geographic distribution** Yes but below threshold – see explanation for the lowland forest • **Restricted geographic distribution** No – widespread habitat type • **Environmental degradation** Yes but below threshold – conversion of gallery forests to farmland and degradation due to timber extraction is a threat but not currently considered to be significant due to the wide distribution of this habitat type. A finer-grained assessment of degradation could change this evaluation • **Disruption of biotic processes or interactions** No – there is no evidence of this • **Quantitative analysis that estimates the probability of ecosystem collapse** Not possible using the currently available data, but given the widespread distribution of gallery forests, collapse is unlikely. Conclusion: **Unlikely to meet Criterion 4**
Mangroves	• Complex ecosystems composed by up to 5 mangrove species (which is relatively poor compared to the East African mangroves that contain 9 species) (WWF 2017b); • The Sherbro River Estuary represents the largest area with mangroves in Sierra Leone (998km^2 with an estimate of 1,721km^2 in the country) (Environment Protection Agency 2017); • The habitat is important for migratory birds, some turtles and other species like the manatee.	Red List of Threatened Ecosystems • **Reduction in geographic distribution** No – a total loss of 4.8% has been estimated between 1975 and 2013 (USGS 2014). Assuming that the rate of mangrove loss will not increasing through time, a total of 6.5% of the mangroves will be lost between 1975 and 2025 (0.13% per year), which is below the threshold to qualify as an EN ecosystem. • **Restricted geographic distribution**

		Potential – The Guinean Mangroves was estimated to be 23,420 km^2 (WWF 2017b) (the threshold for EN ecosystem 20,000km^2) is and a continuing decline of the ecosystems has been reported (USGS 2014). • **Environmental degradation** Yes, but below threshold – conversion to agriculture and urban development • **Disruption of biotic processes or interactions** No • **Quantitative analysis that estimates the probability of ecosystem collapse** Not possible using the currently available data, but collapse is unlikely. Conclusion: **Possibly meet Criterion 4** • The Guinean Mangroves have not been assessed by IUCN yet. However, the ecosystem has the potential to qualify for Endangered given its restricted geographic distribution. The AoA represents 4.4% of the total ecosystem, which is close to the threshold for qualifying under Criterion 4 (5%). Therefore, the ecosystem is considered to potentially qualify under Criterion.

3.5 Criterion 5: Areas associated with key evolutionary processes

This criterion is defined by the physical features of a landscape that might be associated with particular evolutionary processes, and/or subpopulations of species that are phylogenetically or morpho-genetically distinct and may be of special conservation concern given their distinct evolutionary history (IFC 2019) paragraph GN81). In the sense of PS6, key evolutionary processes are usually considered at a relatively fine scale rather than broad biogeographic regions.

Although in West Africa the presence of evolutionarily important forest refugia has been postulated for humid mountainous zones, it is unlikely in the lower regions where the Project is located. Based on the available data, the area does not seem to contain a large proportion of locally-endemic species which could be indicators of evolutionary processes. The AoA is therefore not considered to qualify as Critical Habitat under Criterion 5.

3.6 Other species of conservation or stakeholder concern

Eleven species of stakeholder concern were identified during the review. These species do not qualify as Critical Habitat, but they may be of national or international interest and/or concern (Table 7). See Appendix 2 for justification. It is good practice to include such species in the Project's BAP to ensure that appropriate mitigation measures are developed and applied.

Table 7: Species of stakeholder concern

Taxa	Scientific name	English name	IUCN Category	Presence in AoA*
Bird	*Necrosyrtes monachus*	Hooded Vulture	CR	Confirmed
Reptile	*Eretmochelys imbricata*	Hawksbill Turtle	CR	Reported
	Chelonia mydas	Green Turtle	EN	Reported
	Osteolaemus cf. tetraspis	African Dwarf Crocodile	VU	Reported
	Dermochelys coriacea	Leatherback	VU	Reported
	Caretta caretta	Loggerhead Turtle	VU	Reported
	Lepidochelys olivacea	Olive Ridley	VU	Reported
Mammal (terrestrial)	*Phataginus tetradactyla*	Black-bellied Pangolin	VU	Potential
	Phataginus tricuspis	White-bellied Pangolin	VU	Potential
	Smutsia gigantea	Giant Ground Pangolin	VU	Potential
Mammal (aquatic)	*Trichechus senegalensis*	African Manatee	VU	Reported

*__Confirmed__=presence confirmed onsite by TBC; __Recorded__=presence confirmed during recent surveys in the AoA; __Reported__=presence reported by expert-based judgement and/or through community surveys; __Potential__=presence considered possible given the overlap between AoA and species range and/or suitability of habitats.

In addition, during the biodiversity surveys conducted as part of the Area 5 ESHIA, an unknown fish species, probably an *Eleotris spp.*, and locally known as "Gbotior", was captured at two sites in the Project area (Earth Systems & ECS Sierra Leone 2019a). The species could not be identified at the species level by local fish specialists, therefore it is potentially a new species, which could be restricted range and hence qualify for Critical Habitat.

3.7 Protected areas and internationally recognised areas

The Project does not overlap with legally protected areas nor internationally recognised areas (LPA/IRA). However, a number of LPA/IRA are located within the AoA (Figure 5).

Sherbro River Estuary Marine Protected Area (MPA): is immediately downstream of the Project area. It covers c.283 km^2, but the exact delineations are not available. It has no IUCN management category equivalency (WDPA 2012). According to the RAMPAO (Regional network on West African Marine Protected Areas), the site is gazetted as MPA but there is no formal management plan and there are no official boundaries for the site, as for the three other identified MPAs in Sierra Leone (RAMPAO 2017)[12]. This estuary is believed to support the largest pristine mangrove forests in Sierra Leone (54% of the country's mangrove cover) and is the area with the highest population of sea turtles in Sierra Leone (Aruna, pers. comm.). The coastal area starting from Turtle and Sherbro Islands onto Turners Peninsula is particularly important for Leatherback turtles nesting together with four other turtle species (i.e. Loggerheads, Olive Ridleys, Green turtles and Hawksbills), while mangroves are used as foraging areas (Aruna, pers. comm.). The estuary is also believed to host a healthy seagrass flora.

Bonthe mangrove swamp: this nationally recognised protected area is located in the Sherbro River Estuary and has a surface of c.998 km^2 (WDPA 2019), but its precise location is unclear. The area is considered a Strict Nature Reserve (WDPA 2019), but there is no equivalency with the IUCN protected areas categories (Dudley 2008). Since it is found within the Sherbro River Estuary, this swamp is already captured by the Sherbro River Estuary MPA.

Yawri Bay is located about 15 km west of Area 5 and includes the following protected areas and areas of international concern:

- **Yawri Bay IBA / KBA** (Important Bird Area / Key Biodiversity Area): it extends over c.336 km^2 along the Atlantic Coast towards the northwest of the AoA. It is a mix of shallow coastal wetland, intertidal mudflats and mangrove swamps (14% of total mangrove swamps areas in Sierra Leone). The site was designated an IBA under criterion A4 because it was evaluated to hold congregations of ≥1% of the global population of 9 bird species[13] and hosts at least 20,000 water birds on a regular basis. It is listed as an IBA in danger due to very high human threat, including mining activities (BirdLife International 2013). Since it holds at least one and possibly two species qualifying under Criterion 3, this IBA/KBA qualifies as **Critical Habitat**.
- **Yawri Bay marine protected area (MPA)**: Similarly to the Sherbro River Estuary MPA, this MPA was identified as one of the four most important estuarine wetlands in Sierra Leone but it does not have clear boundary demarcation nor any biodiversity management plan, except bay management for fishing activities (RAMPAO 2017).

[12] In the Biodiversity Management Plan of the ESHIA for the Sembehum project (Earth Systems & ECS Sierra Leone 2018), a map of the Sherbo River Estuary MPA is provided (Figure 3-1) but it is unclear whether this was drawn based on reliable sources or not. Precautionarily, we did not attempt to draw the boundaries of this MPA given that no official boundaries are available.

[13] Based on current estimates of global population sizes, our assessment suggest only two of these species exceed the 1% threshold (see Section 3.3).

Officially, it is estimated to cover an area of c.316 km^2 including sandflats, mudflats and mangroves swamp. It is the largest bay and most productive (i.e. fish resources) coastal wetland in Sierra Leone and it provides a suitable spawning ground for fish and other marine fauna, including the five species of sea turtles and the African manatee.

- **Yawri Complex Ecologically or Biologically Significant Area (EBSA)**: EBSAs are special areas in the ocean identified under the Convention on Biological Diversity (CBD), which play an important role to support the healthy functioning of oceans and the services they provide (CBD 2019). The Yawri Complex EBSA traverses Yawri Bay, Banana and Turtle Islands and extends southward in the Sherbro Island and 10 km west off the bay into the adjacent continental shelf waters of Sierra Leone. It is categorized as a coastal marine zone of shallow depth, covering a total area of about c.245 km^2 (CBD 2015a). It includes the entire coastal and marine part of the aquatic AoA. The aquatic AoA also overlaps with a much larger EBSA, the "Zone de convergence des courants de Canarie-Guinée" – which includes a vast area spanning between Senegal and Sierra Leone and which includes a significant portion in high seas (CBD 2015b).

Forest reserves: There are a number of forest reserves (nationally protected areas) within the terrestrial AoA, along the norther boundary, at a distance of at least 30 km from Project infrastructures:

- **Kasewe Hills** (2,307 ha);
- **Singamba** (286 ha);
- **Tabe** (307 ha);
- **Moyamba Hills** (187 ha): this was not available in the IBAT dataset but is believed to be present about 15km from Area 5;
- An unnamed forest reserve, in the north-western corner of the terrestrial AoA.

There is very limited information specifically on these forest reserves (Forestry Division 2019) but most of the small forest reserves of the country have been severely degraded at the past (Brncic *et al.* 2010). Therefore, they are unlikely to still support forest habitats of good qualify and species of conservation.

Sewa-Wanje: this nationally protected area is located in the southeasternmost corner of the terrestrial AoA and outside the aquatic AoA. There is no available information on this protected area and its potential sensitivities are likely to be associated to aquatic biodiversity features rather than terrestrial features (Sewa and Wanje are two water courses).

Figure 5: Protected areas and internationally recognised areas within the AoAs. Mapping based on data from the WDPA obtained through IBAT, and maybe approximate in some cases.

3.8 Natural Habitat and Modified Habitat

As expected, field observations confirmed that the Project area (Areas 1 and 5 and along the Haul Road[14]) is used intensively by people and mainly composed of agricultural lands (Campbell et al. 2019). Five main vegetation types have been identified based on available land use maps of the Project (CEMMATS 2012; Earth Systems & ECS Sierra Leone 2019b) and field observations. A summary of the global status of each vegetation type is presented in Table 8.

Table 8: Status of the vegetation in the Project

Vegetation type	Status	Justifications
Lowland and Gallery Forest	**Natural Habitat (degraded) – used by CH-qualifying species**	Lowland and Gallery Forests (see Section 3.4 for definition of the habitat) are still present in the Project area but in very small patches and already degraded because of agriculture, charcoal production and artisanal logging (Campbell et al. 2019).

[14] Given the short period in the field, it was impossible to survey the entire AoA. Therefore, the Natural Habitat analysis is limited to Areas 1 and 5 and the Haul Road.

Vegetation type	Status	Justifications
Secondary Forest	**Natural Habitat (degraded) – used by CH-qualifying species**	Secondary forests are forests regenerating largely through natural processes after significant removal or disturbance of the original forest vegetation by human or natural causes (Odera 2002). They usually have lower canopy cover and tree species composition than lowland and gallery forests. As the latest, secondary forest is still present in the Project are but in very small patches and is degraded by the same threats.
Mangrove	**Natural Habitat – identified as potentially CH (see Section 3.4)**	Mangrove is a unique system. In western Africa, it is composed of 5 species (WWF 2017b). Many species of conservation concern are associated with it. It is also used by local communities for fishing. Based on field observations[15], mangroves seem to be relatively intact in comparison to other Natural Habitats of the landscape.
Inland Valley Swamp	**Mostly Modified Habitat**	Inland Valley Swamps are flat-bottomed and relatively shallow valleys. They are seasonally and yearly inundated depending on their location within the hydrological network. Based on field observations, most of the swamps in the Project area have been converted into rice plantation.
Agriculture	**Modified Habitat**	Agriculture is dominant in the Project area, with oil palm plantation and cassava and corn (CEMMATS 2012). People use the shifting cultivation system[16] (the 'slash-and-burn' system, i.e. they cultivate a land for a few years and then switch to another land. Abandoned lands become fallows for the next year, before being cultivated again. The complete rotation cycle has traditionally been around 10 years, but, in the Project area, the pressure on lands is so intense that people need to come back to fallow after 2 years (Campbell et al. 2019).

3.8.1 Assessing the quality of existing land use maps

Previous mapping from Area 1 (CEMMATS 2012 p.63) shows that the mining lease is mostly composed of shifting agriculture (labelled "slash-and-burn" on the mapping), with some mangroves around Nitti Port (western section of the area) and a patch of remnant forest (close to Mobimbi Hill, call 'Imperi Hills' on the mapping) in the centre of the area. The field survey confirmed the degraded status of the overall area and the vegetation distribution throughout the area. Observations in this remnant forest patch highlighted that the forest patch is now a

[15] Time spent close and within mangroves was very limited as survey target was primates.

[16] Referred as slash-and-burn agriculture in the Project documents

mixture of degraded lowland and secondary forests. It is however of high conservation importance as it is inhabited by chimpanzees.

Area 5 has not been surveyed intensively (most recces were conducted in the direct proximity of Area 5), limiting the opportunities to evaluate the quality of the existing land use map (Earth Systems & ECS Sierra Leone 2019b). However, the four collected points in Area 5 have confirmed the land use map available for the Project area.

Overall, the two land use maps seem relatively accurate, though forests and inland swamp valleys might be over-represented. Since both Lowland and Gallery forests are Natural Habitats used by CH-qualifying features, it should be considered as a Critical Habitat by the Project. It would therefore be appropriate to update the mapping, in particular if 1) project infrastructure or activities is likely to be sited in proximity, 2) they are the focus of mitigation measures.

None of the current maps differentiate between agriculture and fallow. This would been useful as chimpanzees use fallows in the landscape on a regular basis and may be necessary if the Project proceeds to developing a chimpanzee and primate conservation plan or similar. Even if Modified Habitat, this vegetation type should be considered as Critical Modified Habitat.

3.8.2 Preliminary mapping of Natural and Modified Habitats

The MDAUS map (MDA 2013) available online on ArcGIS was used to create a preliminary mapping of Natural and Modified Habitats. It is a very preliminary map showing likely vegetation classes. However, some vegetation classes represent a mixture of several vegetation types (Table 9). As a consequence, Natural Habitat is currently over-represented in the Project area and Critical Habitat cannot be mapped entirely (

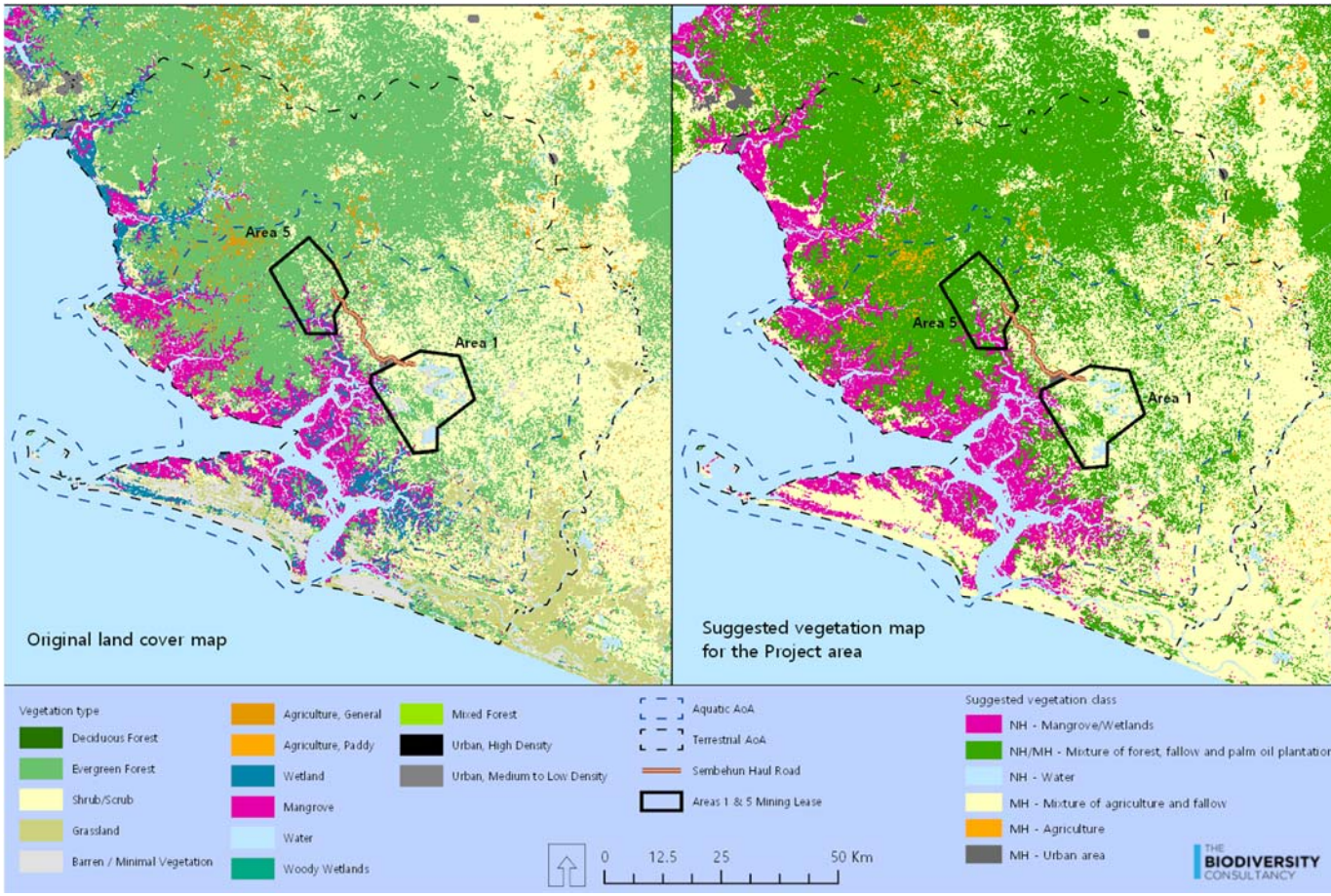

Figure 6).

Table 9: Estimated areas of vegetation classes in the Project area and equivalence with available MDAUS global land cover map

Vegetation class on the MDAUS map	Suggested accurate vegetation class	Status	Estimated area (km^2) *		
			Terrestrial AoA	Area 1	Area 5
Mangrove Wetlands	NH – Mangrove Mangrove ecosystem possibly meets CH-threshold (Criterion 4)	Likely to be represented appropriately	1,270	9	25
Deciduous Forest Evergreen Forest Woody Wetlands Mixed Forest	NH/MH – Mixture of forests, fallow and palm oil plantation Forest and fallow are areas supporting CH-values	Forests are over-represented on the map and most of it is probably palm oil plantation and fallow.	4,270	69	130

Vegetation class on the MDAUS map	Suggested accurate vegetation class	Status	Estimated area (km²) *		
			Terrestrial AoA	Area 1	Area 5
Shrub Grassland Barren / Minimal Vegetation	MH – Mixture of agriculture and fallow Fallow is an area supporting CH-value	Shrub and grassland are over-represented on the map and most of it is probably agriculture and fallow. Minimal vegetation is most probably agriculture.	3,790	190	41
Water	NH - Water	Likely to be represented appropriately	670	34	3
Agriculture, General Agriculture, Paddy	MH - Agriculture	Likely to be under-represented	240	1	2
Urban, High density Urban, Medium to low density	MH - Urban	Likely to be represented appropriately	15	0	0
* Numbers above 100 km² have been rounded to the nearest 10km²					

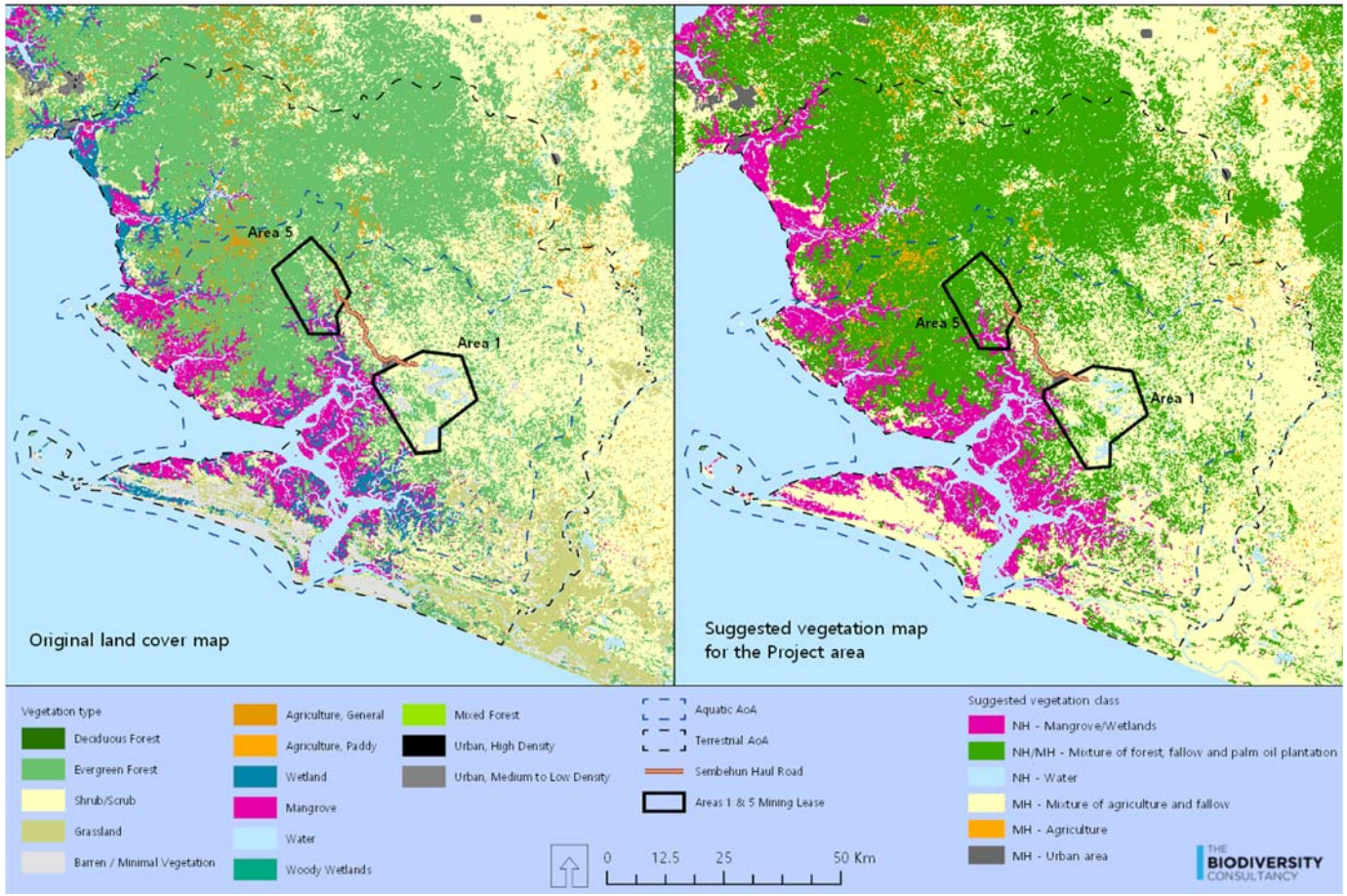

Figure 6: Preliminary map of vegetation in the AoA with assigned habitat. The class 'mixture of forest, fallow and oil palm' is a mixture of Natural and Modified Habitats.

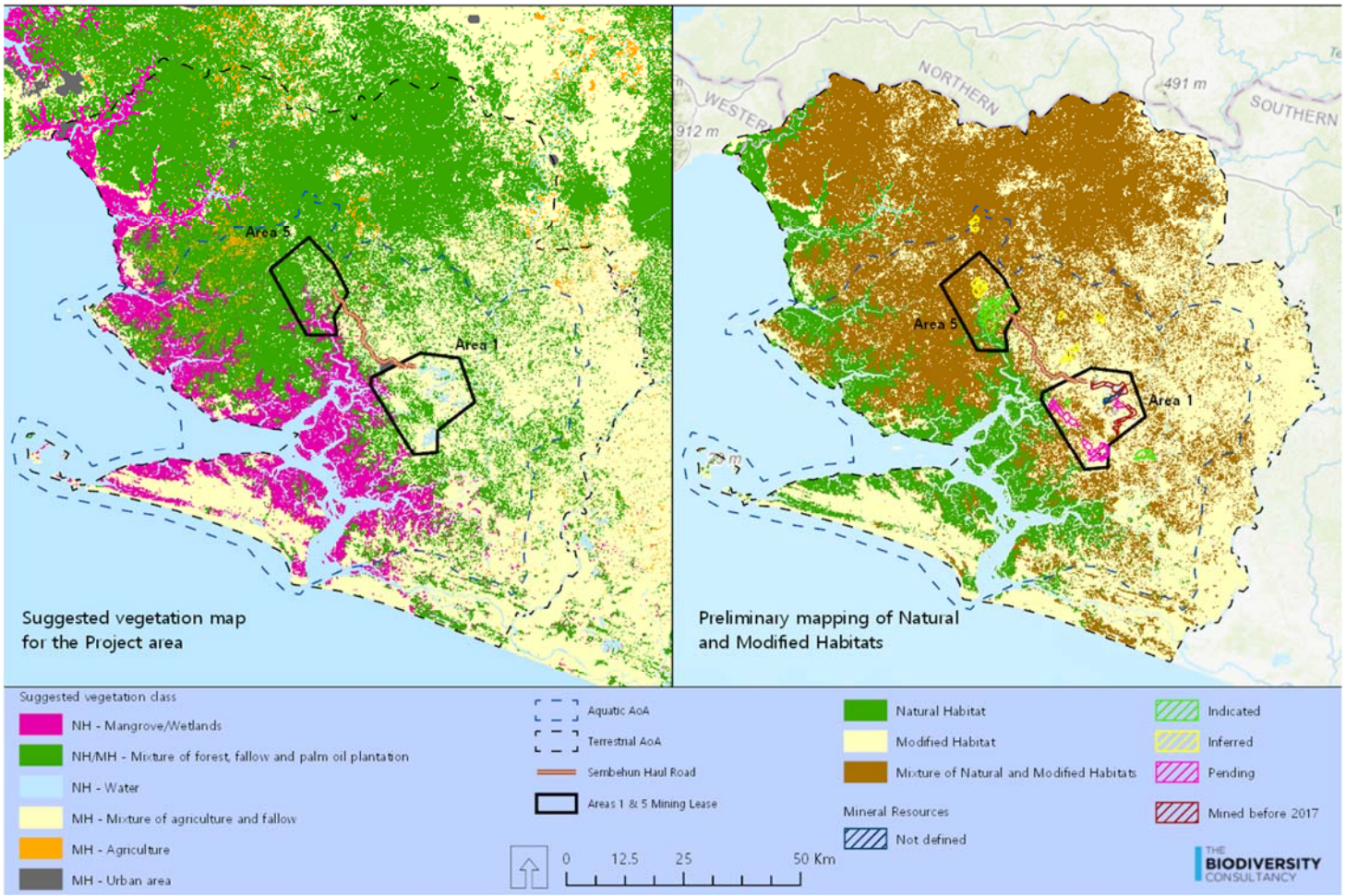

Figure 7: Preliminary map of Natural and Modified Habitats in the terrestrial AoA. Vegetation classes representing Natural or Modified Habitats have been combined on the right. The class 'mixture of forest, fallow and oil palm' is a mixture of Natural and Modified Habitats.

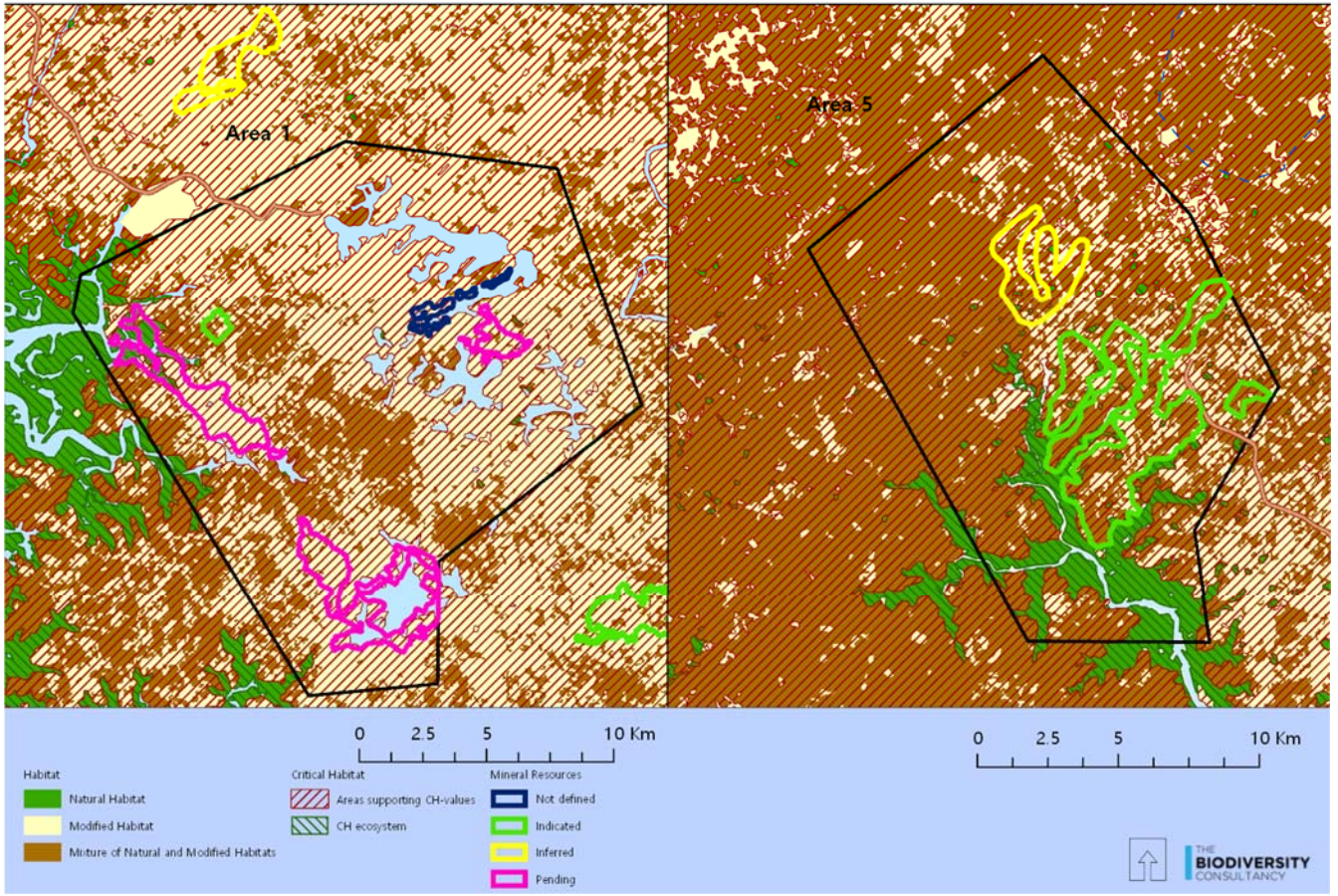

Figure 8 : Preliminary map of Critical, Natural and Modified Habitats in Areas 1 and 5 (Natural and Modified Habitats have been identified based on the suggested vegetation classes identified in Figure 7. The class 'mixture of forest, fallow and oil palm' is a mixture of Natural and Modified Habitats, the 2 first classes supporting CH-values. The 'mixture of agriculture and fallow' is Modified Habitats, the fallow supporting CH-values.

3.8.3 Recommendations

To align for IFC PS6, the Project should provide a habitat map identifying Natural, Modified and Critical Habitats for the entire AoA and not only for the mining leases. It is recommended to create this map using ground-truthed data as some habitats might be difficult to identify using satellite imagery only. For example, fallow is known to be difficult to identify on satellite imagery (M. Collins, Space Intelligence Ltd, pers. comm.) as located within active agriculture lands and often composed of small trees that might be identified as secondary forest without ground truthing. We recommend including the following classes within the habitat map:

- Lowland and Gallery Forests as associated with several CH-qualifying species (notably primates and the Western Chimpanzees). The Project should avoid developing activities in this habitat as far as feasible and protect remnant patches of forest when possible;
- Secondary Forests for the same reason;
- Mangroves as likely to be a Critical Habitat in the Project area in which Project activities should be avoided as most as possible;
- Inland Swamp Valleys. While Inland Swamp Valleys is a Natural Habitat, it should be differentiated from agricultural activities in swamps;
- Active agricultural lands, the main Modified Habitat in the landscape;
- Fallow. While fallow is a Modified Habitat too, it should be mapped properly as it is used by chimpanzees and so should be considered Critical Modified Habitat. An appropriate mapping of this vegetation could help the Project to design avoidance and reduction measures to minimise their impacts on chimpanzees (e.g. by the creation of corridors between remnant forest patches).

4 Summary of findings for Area 1 and Sembehun Haul Road

The results of the review are the following:

- **One species (Western Chimpanzee) is confirmed as qualifying for Critical Habitat.**
- **Seven species are *likely* to qualify for Critical Habitat under Criteria 1-3**, including two species of birds and five species of freshwater fish. Some of these fish species qualify under more than one criterion (Sections 3.1, 3.2 and 3.3).
- A further **31 species *possibly* qualify for Critical Habitat**, including four terrestrial mammals, one aquatic mammal, two reptiles, two amphibians, one bird, two freshwater plants, 14 freshwater fish, one marine fish, two insects and two crabs. Based on available information, it is not possible to assess whether these species are likely to qualify for CH or not (Sections 3.1, 3.2 and 3.3).
- The AoA also potentially qualifies for Critical Habitat under **Criterion 4** because of the importance of **mangroves** habitats (Section 3.4).
- An additional **11 species** were identified as species of **stakeholder concern**. These species do not qualify as Critical Habitat, but they may be of national or international interest and/or concern (Section 3.6).

- The Project direct footprint does not overlap with legally protected areas nor internationally recognised areas (LPA/IRA). However, a number of LPA/IRAs are located within the AoA: Sherbro River Estuary Marine Protected Area (MPA), Yawri Bay (IBA, MPA and EBSA) and Sewa-Wanje protected area (Section 3.7). The Yawri Bay IBA qualifies as Critical Habitat, while the MPA include mangroves which qualify as Critical Habitat.

Critical Habitat-qualifying species (Criteria 1-3) are summarised in Table 10. Full details are in and in Appendix 2.

Table 10: Summary table of species qualifying under Criteria 1, 2 and/or 3

Taxa	Scientific name	English name	IUCN Cat.	CH-criteria	Presence in AoA*	CH screening result
Mammal (terrestrial)	***Pan troglodytes verus***	**Western Chimpanzee**	**CR**	**1**	**Confirmed**	**CH**
	Cephalophus jentinki	Jentink's Duiker	EN	1	Reported	Possible CH
	Piliocolobus badius	Western Red Colobus	EN	1	Reported	Possible CH
	Cercopithecus diana	Diana Monkey	VU	1	Reported	Possible CH
	Colobus polykomos	Black-and-white Colobus	VU	1	Reported	Possible CH
Mammal (aquatic)	*Sousa teuszii*	Atlantic Humpback Dolphin	CR	1	Potential	Possible CH
Reptile	*Crocodylus suchus*	West African Nile Crocodile	NE	1	Reported	Possible CH
	Mecistops cataphractus	(West African) Slender-snouted Crocodile	CR	1	Potential	Possible CH
Amphibian	*Conraua alleni*	Allen's Slippery Frog	VU	1	Reported	Possible CH
	Arthroleptis aureoli	Freetown Long-fingered Frog	EN	1	Potential	Possible CH
Bird	***Psittacus timneh***	**Timneh Parrot**	**EN**	**1**	**Recorded**	**Likely CH**
	Calidris ferruginea	**Curlew Sandpiper**	**NT**	**3**	**Reported**	**Likely CH**
	Tringa tetanus	Common Redshank	LC	3	Reported	Possible CH
Plant (aquatic)	*Ledermanniella aloides*	-	VU	1	Potential	Possible CH
	Stonesia heterospathella	-	DD	2	Potential	Possible CH
Fish (freshwater)	*Chiloglanis polyodon*	-	CR	1, 2	Potential	Possible CH
	Epiplatys fasciolatus ssp. zimiensis	-	EN	1, 2	Potential	Possible CH
	Epiplatys fasciolatus ssp. josianae		CR	1, 2	Recorded	Possible CH
	Epiplatys njalaensis	**-**	**EN**	**1, 2**	**Recorded**	**Likely CH**
	Ladigesia roloffi	-	EN	1, 2	Potential	Possible CH
	Enteromius liberiensis	-	EN	1, 2, 3	Potential	Possible CH
	Marcusenius meronai	-	EN	1, 2	Potential	Possible CH
	Notoglanidium maculatum	**-**	**EN**	**1, 2**	**Potential**	**Likely CH**
	Notoglanidium thomasi	**-**	**EN**	**1, 2**	**Potential**	**Likely CH**
	Scriptaphyosemion bertholdi	**-**	**EN**	**1, 2**	**Potential**	**Likely CH**
	Enteromius bagbwensis	**-**	**VU**	**2**	**Reported**	**Likely CH**
	Mastacembelus taiaensis	-	VU	2	Potential	Possible CH
	Coelotilapia joka	-	VU	2	Potential	Possible CH
	Leptocypris taiaensis	-	VU	2	Potential	Possible CH

Taxa	Scientific name	English name	IUCN Cat.	CH-criteria	Presence in AoA*	CH screening result
	Scriptaphyosemion roloffi	-	NT	2	Potential	Possible CH
	Mochokiella paynei	-	LC	2	Potential	Possible CH
	Chrysichthys johnelsi	-	LC	3	Potential	Possible CH
	Ophichthus leonensis	-	DD	2, 3	Potential	Possible CH
	Scriptaphyosemion chaytori	-	DD	2	Potential	Possible CH
Fish (marine)	*Rhynchobatus luebberti*	African Wedgefish	EN	1, 2	Potential	Possible CH
Insect	*Pseudagrion mascagnii*	-	CR	1, 2	Potential	Possible CH
	Elattoneura dorsalis	Yellow-fronted Threadtail	VU	2	Potential	Possible CH
Decapod	*Afrithelphusa leonensis*	-	DD	2	Potential	Possible CH
	Afrithelphusa afzelii	-	DD	2	Potential	Possible CH

5 Review of the CHA for Area 5

5.1 Context and approach

Earth Systems (ES) and ECS Sierra Leone completed a Critical Habitat Assessment for Area 5 within the draft Biodiversity Management Plan (Earth Systems & ECS Sierra Leone 2018). TBC were asked to do a high-level review of the methods and findings of the CHA, to identify any gaps and make recommendations for any suggested updates.

The approach to this review was to look at the key steps of a CHA (as per TBC methods which have been validated by IFC), using interpretation of the IFC PS6 guidance notes (GN6). The results of the ES Area 5 CHA will be compared with results of this current CHA as a way of highlighting possible gaps (as Area 5 is included in the AOA's developed for this CHA and should be relevant for both sites).

The ES Area 5 CHA was carried out under the IFC PS6 GN from 2012, while this assessment uses the updated GN from 2019. However, any discrepancies identified in the results for this reason will not be treated as a gap, but rather understood that differing criteria were used.

5.2 Results of review - methods

Key step in CHA	Identified gap/concern
Area of Analysis (AoA)/ Discrete management Unit (DMU)	Some of the DMUs that were developed for the Area 5 CHA were not of an appropriate size. In particular the mammal / flora DMU is extremely large. This risks bringing in species not relevant to the project, especially plants. No marine areas were included in the DMUs, therefore missing out marine species that could be potentially impacted by the project.

Key step in CHA	Identified gap/concern
	The reptile / amphibian and bird DMUs are broadly appropriate, though the inclusion of the Freetown peninsula brings in species that are unlikely to occur in the Project area. The number of different DMUs could be consolidated into fewer areas for simplicity (e.g. one for terrestrial and one for aquatic species).
Data used for analysis	Up to date IBAT data was not used for the analysis. The project used the UNEP-WCMC Critical Habitat Screening layer. This may be ok for a high level screening of potential CH, but is not detailed enough for a full CHA. It is unclear if IUCN range maps have been used to produce the list of potentially qualifying species, as several EN species whose range maps overlap the DMUs are not discussed (especially various freshwater fish). External experts do not seem to have been consulted to support results/assumptions. Protected areas and internationally recognized areas section is lacking in detailed information. Missing list of documents and literature used for species or habitats to inform justification for results.
Application of criteria and thresholds	For Criteria 1-3, there is not a clear justification for how/why each species qualifies for CH with referenced information, so it is not clear how conclusion have been reached or how the thresholds have been applied. It is not clear how Criterion 2 was applied – a large number of species seem to have been included here. Migratory / congregatory bird species were assessed using percentage of global range, when in fact estimates of population in the DMU (in the Yawri IBA at least) and globally are available (from the IBA assessment and from the IUCN Red List respectively). This means that two CH-qualifying species are missed. There has been no analysis for Criteria 4 using existing vegetation mapping. This is a gap in the analysis and results. Even though the WCMC Critical Habitat Screening layer has been used, the underlying ecosystems it uses – such as mangroves – have not been assessed. Protected areas and internationally recognized areas section is lacking in any meaningful analysis.
Comparison of results	The ES Area 5 CHA's findings have a much higher number of CH qualifying species under Criteria 1-3. This seems largely to be due to 1) plants brought in due to the large DMU, and 2) a large number of birds brought in under

Key step in CHA	Identified gap/concern
	Criterion 2. It is not always clear how the species qualify as there is no justification or indication of thresholds is presented. The results are highly precautionary, which has resulted in a very long list of CH-qualifying species. Expert knowledge of the region and species appear not to have been applied to ensure the criteria and thresholds are measured against a realistic representation of the situation on the ground. There has been no analysis of Criterion 4, therefore there is a gap in understanding whether any habitats qualify as CH. There is some crossover in results with this CHA and the ES Area 5 CHA -but not consistently. A number of the species which qualify under this CHA do not appear in the ES Area 5 CHA, and vice versa.

5.3 Comparison of results – CH- qualifying features

Table 11 below shows the species considered as confirmed, likely or possible Critical Habitat in this report compared to the Area 5 assessment. A further set of species were considered as CH only in the Area 5 assessment, but not considered CH in this report. The list of species and justification on why they were not considered CH by TBC is provided in Appendix 3. These are principally plants, brought in due to the large DMU, and birds, brought in under Criterion 2.

Table 11 : Comparison of species considered as confirmed, likely or possible Critical Habitat in this report compared to the Area 5 assessment.

Taxa	Scientific name	English name	IUCN Category	CH-criteria in this report	Considered CH in Area 5 CHA
Mammal (terrestrial)	*Pan troglodytes verus*	Western Chimpanzee	CR	1	Yes
	Cephalophus jentinki	Jentink's Duiker	EN	1	Yes
	Piliocolobus badius	Western Red Colobus	EN	1	Yes
	Cercopithecus diana	Diana Monkey	VU	1	No
	Colobus polykomos	Black-and-white Colobus	VU	1	No
Mammal (aquatic)	*Sousa teuszii*	Atlantic Humpback Dolphin	CR	1	No
Reptile	*Crocodylus suchus*	West African Nile Crocodile	NE	1	Yes
	Mecistops cataphractus	(West African) Slender-snouted Crocodile	CR	1	Yes
Amphibian	*Conraua alleni*	Allen's Slippery Frog	VU	1	No
	Arthroleptis aureoli	Freetown Long-fingered Frog	EN	1	Yes
Bird	*Psittacus timneh*	Timneh Parrot	EN	1	Yes
	Calidris ferruginea	Curlew Sandpiper	NT	3	No
	Tringa tetanus	Common Redshank	LC	3	No
Plant (freshwater)	*Ledermanniella aloides*	-	VU	1	No
	Stonesia heterospathella	-	DD	2	No
	Chiloglanis polyodont	-	CR	1, 2	No

Taxa	Scientific name	English name	IUCN Category	CH-criteria in this report	Considered CH in Area 5 CHA
Fish (freshwater)	*Epiplatys fasciolatus ssp. Zimiensis*	-	EN	1, 2	No
	Epiplatys fasciolatus ssp. Josianae	-	CR	1, 2	No
	Epiplatys njalaensis	-	EN	1, 2	No
	Ladigesia roloffi	-	EN	1, 2	Yes
	Enteromius liberiensis	-	EN	1, 2, 3	No
	Marcusenius meronai	-	EN	1, 2	No
	Notoglanidium maculatum	-	EN	1, 2	Yes
	Notoglanidium thomasi	-	EN	1, 2	No
	Scriptaphyosemion bertholdi	-	EN	1, 2	Yes
	Enteromius bagbwensis	-	VU	2	No
	Mastacembelus taiaensis	-	VU	2	No
	Coelotilapia joka	-	VU	2	Yes
	Leptocypris taiaensis	-	VU	2	No
	Scriptaphyosemion roloffi	-	NT	2	No
	Mochokiella paynei	-	LC	2	No
	Chrysichthys johnelsi	-	LC	3	No
	Ophichthus leonensis	-	DD	2, 3	No
	Scriptaphyosemion chaytori	-	DD	2	No
Fish (marine)	*Rhynchobatus luebberti*	African Wedgefish	EN	1, 2	No
Insect	*Pseudagrion mascagnii*	-	CR	1, 2	No
	Elattoneura dorsalis	Yellow-fronted Threadtail	VU	2	No
Decapod	*Afrithelphusa leonensis*	-	DD	2	No
	Afrithelphusa afzelii	-	DD	2	No

5.4 Summary and recommendations

As described above, we consider that the Area 5 CHA has several inconsistencies and errors in application of PS6 criteria and thresholds and as such does not constitute a good basis for developing a biodiversity mitigation strategy. Since 1) the AoA used in this report covers Area 5, 2) the Area 5 analysis does not seem to have been based on any additional data over that used for this assessment and 3) the Area 5 analysis was based on an older version of GN6 than the one the Project has chosen to use, we suggest that rather than attempting to update or revise the Area 5 assessment, the findings of this report are used instead.

6 Key recommendations and next steps

While there is limited data for some species, this assessment clearly shows that both Area 1 and Area 5 are situated in a landscape that contains a number of species and an ecosystem that qualify as Critical Habitat.

These findings are sufficient to provide high-level recommendations for on-going operations and the closure of Area 1. It would be prudent for the Project to consider that all likely and possibly Critical Habitat-qualifying features are in fact present and to design habitat-focused mitigation measures accordingly. The Project has the option of conducting further surveys to confirm the status of these features.

Table 12 below provides an outline of some key potential mitigation measures that could be considered and further developed within a **Biodiversity Action Plan**.

For chimpanzees, additional surveys are required to adequately develop mitigation measures for on-going and planned operations and for a closure plan specific to the species as detailed in the primate survey report (Campbell *et al.* 2019).

For Area 5 and the Haul Road, overlaying the infrastructure and mining plan on the map of Critical Habitat will enable an assessment of whether further avoidance is feasible. Where impacts on Critical Habitat are anticipated, further surveys may be appropriate to confirm the features potentially impacted and the nature and scale of those impacts.

Given the large number of species qualifying for Critical Habitat, the Project could undertake a **risk-based prioritisation exercise** as an input into scoping the BAP. The prioritisation process applies a risk-based approach (based on the likelihood of impact by the Project and the consequence of any impact for their conservation status) to identify the appropriate level of management effort and actions for each biodiversity feature. This could be done as part of development of the Project's BAP, and should involve appropriate stakeholders.

The BAP should ideally be informed by a Residual Impact Assessment for Critical and Natural Habitat. This will help the Project to assess how to achieve net gains should the Project aim for full PS6 alignment. A Monitoring and Evaluation Plan will further be required to demonstrate that the Project achieves net gains.

Table 12: Key recommendations for CH-qualifying biodiversity (species highlighted in bold are confirmed in the AoA)

Biodiversity features	Species*	Area 1	Haul Road and Area 5
CH-qualifying ecosystems			
Mangroves	Associated with several species of stakeholder concern (i.e. sea turtles, manatee)	• Develop good practices for on-going operations focusing on avoidance of further impacts and minimization of any ongoing indirect impacts • Develop a mangrove component in the closure plan developing specific actions to ensure that the mangroves will be exploited sustainably and protected by the local community	• Develop good practices for operations focusing on avoiding direct and indirect impacts • Engage with local communities to improve understanding of mangrove uses • Undertake surveys to identify most important sites for biodiversity • Develop a plan for sustainable management of the mangroves and protection of the most important sites for biodiversity
CH-qualifying species			
Primates	Western Chimpanzee**, Diana Monkey*, Black-and-White Colobus*, Western Red Colobus*	• Undertake surveys to understand species distribution and identify key botanical species for feeding and sleeping • Develop good practices for on-going operations (e.g. minimize risk of disease transmission) • Incorporate findings into a primate closure plan, developing specific actions for the species, e.g. identify important sites for the species and develop protection measures in partnership with the community, rehabilitate area with key plants for the species, ensure corridors between forest patches are maintained, develop measures to reduce hunting • See additional recommendations in the Primate Survey report	• Periodically check updates in the species IUCN Red List status and update the CHA if necessary • Undertake surveys to understand species density and distribution and habitat use, map important habitats • **Avoidance measures**: avoid important sites for the species for project development (i.e., infrastructure, mining, resettlement and settlement of in-migrating people) • **Minimisation measures**: develop measures to avoid direct contacts between workers and primates, ensure corridors between forest patches are maintained, develop measures to reduce hunting • See additional recommendations in the Primate Survey report
Other Terrestrial mammals	Jentink's Duiker*	*The species is unlikely to be present in Area 1 as restricted to forest with low human pressure*	• Confirm presence / absence by including as a target species in field surveys

Biodiversity features	Species*	Area 1	Haul Road and Area 5
			If presence confirmed: • **Avoidance measures**: avoid important sites for the species for project development • **Minimisation measures**: ensure corridors between forest patches are maintained, develop actions to minimize hunting
Aquatic mammals	African Manatee*, Atlantic Humpback Dolphin	*The Nitti Port is located in Area 1 but will be kept using when operating in Area 5.* • Consider undertaking surveys to confirm species presence in the port and in the estuary • Develop good practices for on-going operations focusing on avoiding collisions, pollution and disturbance due to Project activities	As per Area 1
Non-migratory birds	Timneh Parrot*, Hooded Vulture*	• Develop and implement good practice for ongoing operations for bird protection, including a ban on employees or contractors purchasing or keeping parrots as pets • Identify and avoid impacts on parrot roosting sites • Ensure the closure plan includes provision for maintenance	As per Area 1
Migratory birds	Curlew Sandpiper, Common Redshank	• Ensure the closure plan includes the protection of intact wetlands (no conversion into agriculture) and avoidance of any ongoing downstream impacts likely to affect shoreline habitats	• **Avoidance measures**: avoid activities that could reduce water quality in catchments upstream of the Yawri IBA and other shoreline habitats

Biodiversity features	Species*	Area 1	Haul Road and Area 5
Crocodile	Slender-snouted Crocodile (potential), African Dwarf Crocodile*, West African Nile Crocodile*	• Engage with experts[17] to understand the likelihood of presence in the area	• Periodically check updates in the species the IUCN Red Status and update the CHA if necessary • Undertake surveys targeting rivers in gallery forests to confirm presence in the area (consider using an eDNA survey) • If presence confirmed, engage with stakeholders to develop a species action plan
Sea Turtles	Hawksbill Turtle*, Green Turtle*, Leatherback*, Loggerhead Turtle*, Olive Ridley*	• Engage with experts to improve understanding of foraging and nesting areas • Develop good practice for ongoing operations • Ensure the closure plan includes protection of areas important for the species	• Engage with experts to improve understanding of current monitoring activities in the area and develop joined monitoring if meaningful • **Avoidance measures**: avoid foraging and nesting sites for project development • **Reduction measures**: develop good practices for operations, engage with fishermen to minimize bycatch of the species
Amphibians	*Arthroleptis aureola, Conraua alleni*	No further action required	• Periodically check updates in the species IUCN Red List status and update the CHA if necessary • Avoidance measures: avoid clearance of forest habitats during construction activities. If significant areas of forests (including degraded forests) are to be cleared, target these species during pre-construction surveys and evaluate on a case-by-case analysis if additional mitigation measures are needed for the species.

[17] M. Shirley, an expert of the species, is traveling to Sierra Leone in June 2019. It is recommended to the Project to engage with him so that he could visit the Project area to confirm/inform the species presence.

Biodiversity features	Species*	Area 1	Haul Road and Area 5
Freshwater fish	*Chiloglanis polyodon, Epiplatys fasciolatus ssp. zimiensis, Epiplatys njalaensis*, Ladigesia roloffi, Enteromius liberiensis, Marcusenius meronai, Notoglanidium, maculatum, Notoglanidium thomasi, Scriptaphyosemion bertholdi, Enteromius bagbwensis, Mastacembelus taiaensis, Coelotilapia joka, Leptocypris taiaensis, Scriptaphyosemion roloffi, Mochokiella paynei, Chrysichthys johnelsi, Ophichthus leonensis, Scriptaphyosemion chaytori, Epiplatys fasciolatus ssp. josianae*	• Develop and implement good practice for ongoing operations for preservation of water quality, such as protected buffer areas around streams • Ensure the closure plan includes the improvement of water quality	• Develop good practice for construction, such as the management of erosion risk • Develop and implement good practice for ongoing operations for preservation of water quality, such as protected buffer areas around streams
Marine fish	African Wedgefish	No further actions required	No further actions required
Insects / Crabs	*Pseudagrion mascagnii, Elattoneura dorsalis, Afrithelphusa leonensis, Afrithelphusa afzelii*	Same as for freshwater fish	• Undertake surveys along water streams to confirm the presence of the species • Develop good practices to avoid and reduce impacts on water streams
Freshwater plant	*Ledermanniella aloides, Stonesia heterospathella*	Same as for freshwater fish	Same as for insects / decapods

*presence was reported (by experts or local communities); ** presence was confirmed.

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Appendix 1 IFC criteria and comparison between the 2019 and 2012 Guidance Note

Criteria	GN6 2012		GN 2019
	Tier 1	Tier 2	
Criterion 1: Critically Endangered (CR)/ Endangered (EN) Species	(a) Habitat required to sustain ≥ 10 percent of the global population of a CR or EN species/subspecies where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species. (b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.	(c) 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 where that habitat could be considered a discrete management unit for that species/ subspecies. (d) Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. (e) As appropriate, habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.	(a) areas that support globally-important concentrations of an IUCN Red-listed EN or CR species (>0.5% of the global population AND >5 reproductive units[18] of a CR or EN species); (b) Areas that support globally-important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds under (a). (c) As appropriate, areas containing important concentrations of a nationally or regionally-listed EN or CR species. IFC GN6 provides the following guidance on Criterion 1: • Species threatened with global extinction and listed as CR and EN on the IUCN Red List of Threatened Species shall be considered as part of Criterion 1[19]. • The inclusion of species in Criterion 1 that are listed nationally/regionally as CR or EN in countries that have adhered to

[18] Reproductive units: The IUCN KBA Standard uses the following definition for reproductive unit: "the minimum number and combination of mature individuals necessary to trigger a successful reproductive event at a site (Eisenberg 1977). Examples of five reproductive units include five pairs, five reproducing females in one harem, and five reproductive individuals of a plant species."

[19] Available at https://www.iucnredlist.org/

			IUCN guidance[20], shall be determined on a project-by-project basis in consultation with competent professionals.
Criterion 2: Endemic/ Restricted Range Species	(a) Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species (e.g., a single-site endemic). IFC GN6 provides the following guidance on Criterion 2: • An endemic species is defined as one that has ≥ 95 percent of its global range inside the country or region of analysis • A restricted-range species is defined as: o For terrestrial vertebrates, extent of occurrence of 50,000 km^2 or less. o For marine systems, extent of occurrence of 100,000 km^2 or less. o For freshwater systems, standardized thresholds have not been set at the global level. However, an IUCN study of African freshwater biodiversity applied thresholds of 20,000 km^2 for crabs, fish, and molluscs and 50,000 km^2 for odonates (dragonflies and damselflies). These can be taken as approximate guidance, although the extent to which they are applicable to other taxa and in other regions is not yet known.	(b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgment.	Areas that regularly hold ≥10% of the global population size AND ≥10 reproductive units of a species. IFC GN6 provides the following guidance on Criterion 2: • An endemic species is defined as restricted-range. Restricted range refers to a limited extent of occurrence (EOO). • For **terrestrial vertebrates** and **plants**, a restricted-range species is a defined as those species that have an EOO less than 50,000 km^2. • For **marine systems**, restricted-range species are provisionally being considered those with an EOO of less than 100,000 km^2.[21] • For **coastal**, **riverine** and **other aquatic species** in habitats that do not exceed 200 km width at any point (e.g., rivers), restricted-range is defined as having a global range less than or equal to 500 km linear geographic span (i.e., the distance between occupied locations furthest apart).[22]

[20] See http://www.nationalredlist.org

[21] See (Edgar *et al.* 2008)

[22] (IUCN 2016)

	o For plants, restricted-range species may be listed as part of national legislation. Plants are more commonly referred to as "endemic," and the definition provided in paragraph GN79 would apply. Particular attention should therefore be paid to endemic plants of smaller countries which are likely, by definition, to be globally rarer and therefore of higher overall priority		
Criterion 3: Migratory/ Congregatory Species	(a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle where that habitat could be considered a discrete management unit for that species.	(b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment. (c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. (d) For species with large but clumped distributions, a provisional threshold is set at ≥5 percent of the global population for both terrestrial and marine species. (e) Source sites that contribute ≥ 1 percent of the global population of recruits.	(a) areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle. (b) areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress. <u>IFC GN6 provides the following guidance on Criterion 3:</u> • Migratory species are defined as any species of which as significant proportion of its members cyclically and predictably move from one geographical area to another (including within the same ecosystem). • Congregatory species are designed as species whose individuals gather in large groups on a cyclical or otherwise regular and/or predictable basis.

Criterion 4: Highly Threatened and/or Unique Ecosystems	IFC GN6 (paragraph 90-93): • Those at risk of significantly decreasing in area or quality; • Those with a small spatial extent; and/or • Those containing unique assemblages of species including assemblages or concentrations of biome-restricted species. • Areas determined to be irreplaceable or of high priority/significance based on systematic conservation planning techniques carried out at the landscape and/or regional scale by governmental bodies, recognized academic institutions and/or other relevant qualified organizations (including internationally-recognized NGOs) or that are recognized as such in existing regional or national plans, such as the National Biodiversity Strategy and Action Plan (NBSAP), also qualify as critical habitat per Criterion 4 (IFC 2012b, paragraph GN90).	(a) areas representing ≥5% of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN. (b) other areas, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning. <u>IFC GN6 provides the following guidance on Criterion 4:</u> The IUCN is developing a Red List of Ecosystems, following an approach similar to the Red List for Threatened Species[23]. The client should use the Red List of Ecosystems where formal IUCN assessments have been performed. Where formal IUCN assessments have not been performed the client may use assessments using systematic methods at the national/regional level, carried out by governmental bodies, recognized academic institutions and/or other relevant qualified organizations (including internationally-recognized NGOs).
	IUCN Red List of Threatened Ecosystems (Eight Criteria)[24]: • **Collapsed (CO):** An ecosystem is Collapsed when it is virtually certain (Table 3) that its defining biotic or abiotic features are lost from all occurrences, and the characteristic native biota are no longer sustained. Collapse may occur when most of the diagnostic components of the characteristic native biota are lost from the system, or when functional components (biota that perform key roles in ecosystem organisation) are greatly reduced in abundance and lose the ability to recruit • **Critically Endangered (CR):** An ecosystem is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered. It is therefore considered to be at an extremely high risk of collapse.	

[23] For further information see https://www.iucnrle.org/

[24] TBC was already using these criteria to identify ecosystems qualifying for Criterion 4 even if not specifically mentioned in the 2012 Guidance Notes.

	• **Endangered (EN):** An ecosystem is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered. It is therefore considered to be at a very high risk of collapse • **Vulnerable (VU):** An ecosystem is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable. It is therefore considered to be at a high risk of collapse. • **Near Threatened (NT):** An ecosystem is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future. • **Least Concern (LC):** An ecosystem is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widely distributed and relatively undegraded ecosystems are included in this category. • **Data Deficient (DD):** An ecosystem is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of collapse based on decline in distribution, disruption of ecological function or degradation of the physical environment. Data Deficient is not a category of threat, and does not imply any level of collapse risk. Listing of ecosystems in this category indicates that their situation has been reviewed, but that more information is required to determine their risk status. • **Not Evaluated (NE):** An ecosystem is Not Evaluated when it is has not yet been evaluated against the criteria. • CR, EN and VU are nested categories, so that a CR ecosystem also meets the criteria for EN and NT. Methodology for applying these criteria is given in Rodriguez *et al.* (2015)
Criterion 5: Key evolutionary processes	This criterion is defined by the physical features of a landscape that might be associated with particular evolutionary processes, and/or subpopulations of species that are phylogenetically or morpho-genetically distinct and may be of special conservation concern given their distinct evolutionary history (IFC 2012, paragraph GN95) and (IFC 2019, paragraph GN 81). Maintaining these key evolutionary processes has become a major focus of biodiversity conservation, since it can ensure the evolutionary flexibility in a system, which is especially important in a rapidly changing climate. Examples of key evolutionary processes are: • Landscapes with high spatial *heterogeneity* are a driving force in speciation as species are naturally selected on their ability to adapt and diversify. • *Environmental gradients*, also known as ecotones, produce transitional habitat which has been associated with the process of speciation and high species and genetic diversity.

	• *Edaphic interfaces* are specific juxtapositions of soil types (e.g., serpentine outcrops, limestone and gypsum deposits), which have led to the formation of unique plant communities characterized by both rarity and endemism. • *Connectivity* between habitats (e.g., biological corridors) ensures species migration and gene flow, which is especially important in fragmented habitats and for the conservation of metapopulations. This also includes biological corridors across altitudinal and climatic gradients and from "crest to coast." • Sites of demonstrated importance to *climate change adaptation* for either species or ecosystems are also included within this criterion.

Appendix 2 CH-qualifying species and justification

Scientific name	Common name	IUCN Category	Presence in the AoA	CH screening result	Criteria	Justification for screening
Mammals (terrestrial)						
Cephalophus jentinki	Jentink's Duiker	EN	Reported by local communities	Possible CH	1a	Rare, uncommon and patchily distributed throughout its range (Côte d'Ivoire, Guinea, Sierra Leone and Liberia), the total population is likely to be below 2000 mature individuals, with a 20% decline expected over the 2 next generations. It mainly inhabits primary high forest with low human pressure (e.g. protected areas) but may enter adjacent secondary forests and farmlands. In has been reported in the Western Area Forest Reserve - north of the terrestrial AoA and close to north-west border of Yawri IBA (Garriga 2012) - and in Mokanji Hills, located within the terrestrial AoA (IUCN SSC Antelope Specialist Group 2016). No information is available on the estimated population in Sierra Leone. The species was not recorded in reviewed Project documentation. Given the small overall population size, the presence of 10 individuals within the terrestrial AoA (c. 0.5% of total estimated population and >5 reproductive units) would be sufficient for the species to qualify for CH. The species possibly qualifies for CH under Criterion 1.
Cercopithecus diana	Diana Monkey	VU (A2cd)	Reported by local communities	Possible CH	1b	The IUCN Primate Specialist Group has indicated that this species is of high stakeholder concern and its IUCN status may be upgraded in 2019, because it is highly threatened by hunting and habitat loss. It is a mostly arboreal species living in the canopy of primary and old secondary lowland moist forest, and riverine and gallery forest. It is rare in degraded forest. There are no population estimates but the species appears to be rare and declining throughout its range (Oates *et al.* 2016a). The species has not been recorded in the AoA but it was reported by local communities in February 2019 (Campbell *et al.* 2019). The AoA covers more than 4% of the species EOO. Therefore, once the species status is uplisted, it is likely that the AoA will support more than 0.5% of the population of the species. For this reason, the species possibly qualifies for CH under Criterion 1.
Colobus polykomos	Black and White Colobus	VU (A2cd)	Reported by communities	Possible CH	1b	The IUCN Primate Specialist Group has indicated that the species is of high stakeholder concern and that its IUCN status may be upgraded in 2019, because it is highly threatened by hunting and habitat loss. The species prefers rainforest and forest galleries, but can be found in secondary forests and rarely in degraded habitats. Population status is unknown but believed to be highly fragmented (Oates *et al.* 2008). The species has not been recorded in the AoA but it was reported by local communities in February 2019 (Campbell *et al.* 2019). The AoA covers 2.6% of the species EOO. Therefore, once the species status is uplisted, it is likely that the AoA will support more than 0.5% of the population of the species. For this reason, the species possibly qualifies for CH under Criterion 1.
Pan troglodytes verus	Western Chimpanzee	CR	Confirmed	**CH**	1	This is a species of high stakeholder concern, because it is highly threatened throughout its range. It requires special considerations and engagement with appropriate experts if thought likely to be present in an area - GN73 of (IFC 2019). In Sierra Leone the estimated population is c. 5,500 individuals (the second largest population after Guinea), with more than half living outside protected areas (Brncic *et al.*

Scientific name	Common name	IUCN Category	Presence in the AoA	CH screening result	Criteria	Justification for screening
						2010). The species presence has been confirmed in the AoA, but the density appears to be low due to the poor habitat quality present in the area, and probably combined with a low but sustained hunting pressure on this species (Campbell *et al.* 2019). As stated in GN73 of (IFC 2019) "any areas where there are great apes is likely to be treated as critical habitat". For these reasons, the species qualifies for CH under Criterion 1.
Phataginus tetradactyla	Black-bellied Pangolin	VU (A4d)	Potential	Stakeholder concern	-	The species is declining due to hunting and is of high stakeholder concern (IUCN SSC Pangolin Specialist Group). There is less than 0.4% of the known global distribution of this VU species within the AoA, which if lost, would not result in change of the IUCN Red List status to EN or CR. This species would not qualify the area as CH.
Phataginus tricuspis	White-bellied Pangolin	VU (A4d)	Potential	Stakeholder concern	-	The species is declining due to hunting and is of high stakeholder concern (IUCN SSC Pangolin Specialist Group). There is less than 0.2% of the known global distribution of this VU species within the AoA, which if lost, would not result in change of the IUCN Red List status to EN or CR. This species would not qualify the area as CH.
Piliocolobus badius	Upper Guinea Red Colobus	EN	Reported by local communities	Possible CH	1a	This species is of high concern for stakeholders and the IUCN Primate Specialist Group indicated that the species is likely to be upgraded to CR. The species occurs in fragmented populations within Sierra Leone. There are no overall population estimates but the species appears to be declining throughout the majority of its range, due to habitat loss and hunting. It is an arboreal species found in a variety of forest types, with a preference for primary old growth forests (Oates *et al.* 2016b). It was not recorded in the study area, but the Sembehun BMP estimates that the species may occur in low density in forest habitats when the canopy persists and if hunting pressure is low (Earth Systems & ECS Sierra Leone 2018). The species was also reported by local communities during the February 2019 site visit (Campbell *et al.* 2019). The terrestrial AoA represents >3% of the known EOO and includes forest habitats, therefore it is possible that the AoA may support 0.5% of the global population of the species. The species possibly qualifies for CH under Criterion 1.
Smutsia gigantea	Giant Ground Pangolin	VU (A4d)	Potential	Stakeholder Concern	-	The species is declining due to hunting and is of high stakeholder concern (IUCN SSC Pangolin Specialist Group). The loss of the AoA is unlikely to change the IUCN status of the species given the small proportion of the distribution range (less than 0.3%) within the AoA.
Mammals (aquatic)						
Sousa teuszii	Atlantic Humpback Dolphin	CR	Potential	Possible CH	1a	This species lives exclusively in shallow waters (<30m) off the Atlantic coast of Africa between Mauritania and Angola, and has a preference for deltas, estuaries, sandbanks and mangrove areas. The global population is fragmented and is estimated to be fewer than 3,000 individuals in total, with 1,500 mature individuals only. There are no confirmed records in Sierra Leone, Liberia, Cote d'Ivoire and Ghana, which is likely due to incomplete research coverage (Collins *et al.* 2017), but an interview-based survey reported its presence in Sierra Leone (Moore *et al.* 2010). The Sherbro estuary is potentially a suitable habitat for the species, and the occurrence for as low as 10 individuals (a single pod) would meet the thresholds of

Scientific name	Common name	IUCN Category	Presence in the AoA	CH screening result	Criteria	Justification for screening
						Criterion 1 (0.5% of global population and >5 reproductive units). This species possibly qualifies for CH under Criterion 1.
Trichechus senegalensis	African Manatee	VU	Reported by local communities and experts	Stakeholder concern	-	The species occurs in coastal marine waters, brackish estuaries and adjacent rivers along the coast of western Africa. Global population is estimated at 10,000 individuals. Its presence has been confirmed in the Sherbro estuary (Keith 2007). The species is considered of stakeholder concern in most West African countries, including Sierra Leone and is a regional conservation strategy (Dodman *et al.* 2008). Local communities reported the presence of the species in the AoA (Campbell *et al.* 2019) and confirmed that the Sherbro estuary supports suitable habitats, such as seagrass and mangroves, both in terms of breeding and feeding grounds (Earth Systems & ECS Sierra Leone 2018). The presence of manatees has also been confirmed in the estuary in close proximity to the Project Area by Tacugama (Garriga, pers. comm.). However, there is less than 0.3% of the known global distribution of this VU species within the AoA, which if lost, would not result in change of the IUCN Red List status to EN or CR. This species is unlikely to qualify the area as CH under Criterion 1.
Reptiles						
Caretta caretta	Loggerhead Turtle	VU (A2b)	Reported by experts	Stakeholder Concern	-	This is a migratory species of high stakeholder concern. The species comprises 10 distinct subpopulations. The global population is unknown but the number of annual nesting females are estimated at 36,000-67,000. The global population has undergone a decrease but the extinction of the species at the global level is considered highly unlikely in the short and medium term. The species nests on sandy beaches (Casale & Tucker 2017). It has not been recorded by Project studies but the Sherbro estuary is the area with the highest population of sea turtles in Sierra Leone (RAMPAO 2017). In particular, the coastal areas starting from Turtle and Sherbro Islands onto Turners Peninsula are important nesting sites for sea turtles (including Loggerhead turtles), while the mangrove areas are used as foraging grounds (Aruna, pers. comm.). However, there is less than 0.5% of the known global distribution of this VU species within the AoA, which if lost, would not result in change of the IUCN Red List status to EN or CR. This species would not qualify the area as CH under Criterion 1. Similarly, it is unlikely that the area would support >1% of the global population on a regular basis, so the species is unlikely to qualify the area as CH under Criterion 3.
Chelonia mydas	Green Turtle	EN	Reported by experts	Stakeholder Concern	-	This is a migratory species of high stakeholder concern. It is widely distributed but globally threatened and its global population is decreasing (Seminoff 2004). It has not been recorded by Project studies but the Sherbro estuary is the area with the highest population of sea turtles in Sierra Leone (RAMPAO 2017). In particular, the coastal areas starting from Turtle and Sherbro Islands onto Turners Peninsula are important nesting sites for sea turtles (including Green turtles), while the mangrove areas are used as foraging grounds (Aruna, pers. comm.). It is considered unlikely that the AoA supports 0.5% of the global population of the species, so the species is unlikely to qualify the area as CH under Criteria 1 and 3.

Scientific name	Common name	IUCN Category	Presence in the AoA	CH screening result	Criteria	Justification for screening
Crocodylus suchus	West African Nile Crocodile	NE	Reported by local communities	Possible CH	1a	The Nile Crocodile (*C. niloticus*) is widespread within Africa, living in waters in open habitats. However, a recent genetic study has shown that the species should be split into two species: the East African Nile Crocodile (*C. niloticus*), still relatively widespread throughout east, central and south Africa, and the West African Nile Crocodile (*C. suchus*), restricted to West Africa as it has already disappeared from other African regions (Hekkala *et al.* 2011). This new species hasn't been evaluated yet by the IUCN Red List but is likely to be listed as CR given its small remaining range and the threats on the species. It lives in waters of forested areas or in more open habitats and their presence has been reported in the Project area (Earth Systems & ECS Sierra Leone 2019b). To qualify for CH under Criterion 1, there would need to be 0.5% of minimum estimated global population in the AoA. As there is no information about the global population, this cannot be excluded without proper surveys onsite, therefore the species possibly qualifies for CH under Criterion 1.
Dermochelys coriacea	Leatherback Sea Turtle	VU (A2bd)	Reported by experts	Stakeholder Concern	-	This is a migratory species of high stakeholder concern. The species comprises 7 distinct subpopulations. The global population is unknown but it is thought to have undergone important decrease. In the short term, the species is expected to recover so that it may no longer qualify as a IUCN threatened species, and nearly 99% of the global population will be contained in the Northwest Atlantic based on current available data (Wallace *et al.* 2013). It has not been recorded by Project studies but the Sherbro estuary is the area with the highest population of sea turtles in Sierra Leone, especially for leatherback turtles (RAMPAO 2017) (Aruna, pers. comm.). In particular, the coastal areas starting from Turtle and Sherbro Islands onto Turners Peninsula are important nesting sites for sea turtles, while the mangrove areas are used as foraging grounds (Aruna, pers. comm.). However, there is less than 0.5% of the known global distribution of this VU species within the AoA, which if lost, would not result in change of the IUCN Red List status to EN or CR. This species would not qualify the area as CH under Criterion 1. Similarly, it is unlikely that the area would support >1% of the global population on a regular basis, so the species is unlikely to qualify the area as CH under Criterion 3.
Eretmochelys imbricata	Hawksbill Turtle	CR	Reported by experts	Stakeholder concern	-	This is a migratory species of high stakeholder concern. It is widely distributed but globally threatened and its global population is decreasing (Mortimer & Donnelly 2008). It has not been recorded by Project studies but the Sherbro estuary is the area with the highest population of sea turtles in Sierra Leone (RAMPAO 2017) (Aruna, pers. comm.). In particular, the coastal areas starting from Turtle and Sherbro Islands onto Turners Peninsula are important nesting sites for sea turtles (including hawksbill turtles), while the mangrove areas are used as foraging grounds (Aruna, pers. comm.). it is unlikely that the AoA supports >0.5% of the global population of the species, therefore the species is unlikely to qualify the area as CH under Criteria 1 and 3.
Lepidochelys olivacea	Olive Ridley	VU (A2bd)	Reported by experts	Stakeholder concern	-	This is a migratory species of high stakeholder concern. The species has a circumtropical distribution, with nesting occurring throughout tropical waters on coastal sandy beaches (Abreu-Grobois *et al.* 2008). It has not been recorded by Project studies but the Sherbro estuary is the area with the highest population of sea turtles in Sierra Leone (RAMPAO 2017) (Aruna, pers. comm.). In particular, the coastal areas starting

Scientific name	Common name	IUCN Category	Presence in the AoA	CH screening result	Criteria	Justification for screening
						from Turtle and Sherbro Islands onto Turners Peninsula are important nesting sites for sea turtles (including Olive Ridleys) while the mangrove areas are used as foraging grounds (Aruna, pers. comm.). However, there is less than 0.5% of the known global distribution of this VU species within the AoA, which if lost, would not result in change of the IUCN Red List status to EN or CR. This species would not qualify the area as CH under Criterion 1. Similarly, it is unlikely that the area would support >1% of the global population on a regular basis, so the species is unlikely to qualify the area as CH under Criterion 3.
Mecistops cataphractus	(West African) Slender-snouted Crocodile	CR	Potential	Possible CH	1a	This is a species of high stakeholder concern. It mainly inhabits forested and densely vegetated river bodies. West African populations have recently been confirmed to be a different taxon compared to the Central Africa populations (Shirley *et al.* 2018). The population is highly fragmented due to severe habitat loss and fragmentation, is thought to have lost 70-90% of their population in 3 generations, particularly in West Africa (Shirley 2014). The population of West Africa Slender-snouted Crocodile is unlikely to exceed 1,500 individuals. In Project surveys, the species was not recorded nor reported during interviews, and its presence is considered highly unlikely (Earth Systems & ECS Sierra Leone 2019b). To qualify for CH under Criterion 1, there would need to be at least 7 mature individuals (0.5% of minimum estimated global population) in the AoA. This cannot be excluded without proper surveys onsite, therefore the species possibly qualifies for CH under Criterion 1.
Osteolaemus cf. tetraspis	African Dwarf Crocodile	VU (A2cd)	Reported by local communities	Stakeholder concern	-	The species is of stakeholder concern (IUCN Crocodile Specialist Group) and the IUCN assessment is quite outdated (Crocodile Specialist Group 1996). Eaton (2010) published an update on the species status and conservation, stating that this species is highly threatened by hunting, as well as habitat loss. It is present in Western and Central Africa but the West African populations seem to be evolutionary distinct. The species was reported to be present in the AoA by local communities, but the size of the population cannot be estimated. It is unlikely that the loss of the AoA would result in an upgrade of the Red List status to EN or CR. Therefore, the species does not qualify for CH under Criterion 1.
Amphibians						
Conraua alleni	Allen's Slippery Frog	VU (B2ab)	Reported by expert	Possible CH	1b	The species is forest-dependent. Its distribution is severely fragmented and in continuing decline. The IUCN Red List assessment is out of date and requires updating (Rödel & Schiøtz 2004). Its AOO was considered likely to be less than 2,000 km^2, however it is likely to be a species assemblage (Rödel & Schiøtz 2004) and so the AOO of individual taxa may be much less. It was not recorded by Project studies but its presence in the AoA was confirmed during another study in 2017 (Aruna, pers. comm.). Its presence is considered more likely in the landwards areas of the AoA since it is not found in saline areas (Aruna, pers. comm.). The species has been recorded in other parts of Sierra Leone (Aruna, pers. comm.). Given the outdated IUCN red list assessment (VU in 2004), the fact that the 'species may in fact be several taxa, the loss of the AoA may upgrade the IUCN status of the species, therefore it possibly qualifies for CH under Criterion 1.

Scientific name	Common name	IUCN Category	Presence in the AoA	CH screening result	Criteria	Justification for screening
Arthroleptis aureoli	Freetown long-fingered frog	EN	Potential	Possible CH	1a	The range of this EN and restricted-range species does not overlap with the AoA since the species is officially known from the Freetown peninsula forests only (Schiøtz & Rodel 2004). The last species record was in 1963, but the species was recently found in surveys in other parts of Sierra Leone and Guinea (E Aruna, pers. comm.). These records have not been included in the IUCN red list assessment yet, suggesting that the species is likely to be more common and distributed than currently thought. It is unclear if these new records would result in a downgrade of the species IUCN status and/or if the actual EOO is actually larger than 50,000 km^2 (restricted-range threshold). The species is associated with forest habitats and forest streams, and recent records suggest it can survive in degraded habitats (Aruna, pers. comm.). Given the presence of forests and degraded forests in the AoA, the presence of the species in the AoA cannot be excluded. If the presence in the AoA is confirmed, it is possible that the AoA would support >0.5% of the global population of the species, so the species possibly qualifies for CH under Criterion 1. At this stage, and even if the range increase is taken into consideration, there is no reasonable evidence that >10% of the global population may be found in the ApA, so the species is unlikely to qualify for CH under Criterion 2.
Birds						
Necrosyrtes monachus	Hooded Vulture	CR	Recorded during surveys	Stakeholder concern	-	This species is widespread in sub-Saharan Africa but the population is undergoing rapid decline with an estimated 83% decline over three generations is expected (Ogada & Buij 2011) due to intentional and indiscriminate poisoning, trade for traditional medicine, hunting, habitat loss and potentially avian influenza. The global population is estimated to be a maximum of 197,000 individuals (BirdLife International 2017a). The species was recorded in the AoA (CEMMATS 2017) but no estimates of population are available and the species is considered unlikely to be nesting in the AoA (Earth Systems & ECS Sierra Leone 2018). For the species to qualify for CH, the terrestrial AoA would need to support at least 985 individuals (>0.5% of global population), which is considered unlikely given that there is only 0.08% of the EOO inside the AoA. The species is unlikely to qualify for CH under Criterion 1.
Psittacus timneh	Timneh Parrot	EN	Recorded during surveys	**Likely CH**	1a	The species was recently uplisted to EN because it is subject to heavy trapping pressure and habitat loss, and is suspected to be declining rapidly over three generations (47 years). It is endemic to the eastern parts of the moist Upper Guinea forests and bordering savannas. The largest populations are thought to be in Cote d'Ivoire and Liberia. The global population is not well known, but could be less than100,000 based on a 2016 estimation (and 11,000-18,000 individuals in Sierra Leone based on a 1992 estimation) (BirdLife International 2017b). It typically inhabits dense forest, but individuals have been observed at forest edges, clearings, gallery forest, mangroves, wooded savannah, cultivated areas, and even gardens, although it is not clear whether these are self-sustaining populations (BirdLife International 2017b). It was recorded within the AoA in at least three locations (10-15 individuals at each location) and community surveys confirmed that the species is threatened by expanding illegal live avian pet trade in the area (Earth Systems & ECS Sierra Leone 2018). There are no population estimates within the AoA. Since the

Scientific name	Common name	IUCN Category	Presence in the AoA	CH screening result	Criteria	Justification for screening
						AoA covers 3.54% of the known EOO, the AoA may support >0.5% of the species global population. For this reason, the species is likely to qualify for CH under Criterion 1.
Calidris ferruginea	Curlew Sandpiper	NT	Reported	**Likely CH**	3	The global population of this migratory species is estimated to number c.1,085,000-1,285,000 individuals (BirdLife International 2017c). To qualify for CH under Criterion 3, the AoA should support c.10,000-13,000 individuals (1% of global population) on a regular basis. The Yawri IBA, included in the AoA, was considered to support c. 16.600 individuals according to the estimate of 1987-1994 (BirdLife International 2013). Even if this assessment is outdated, it highlights the importance of the Yawri IBA for the species. The species is likely to qualify for CH under Criterion 3.
Tringa tetanus	Common Redshank	LC	Reported	Possible CH	3	The global population is estimated to number c.1,300,000-3,100,000 individuals (BirdLife International 2016). To qualify for CH under Criterion 3, the AoA should support c.13,000-31,000 individuals (1% of global population) on a regular basis. The Yawri IBA, included in the AoA, was considered to support c. 14.000 individuals according to the estimate of 1987-1994 (BirdLife International 2013), close to the lowest population estimate. Even if this assessment is outdated, it highlights the importance of the Yawri IBA for the species. The species possibly qualifies for CH under Criterion 3.
Invertebrates						
Afrithelphusa afzelii	-	DD	Potential	Possible CH	2	This species is known only from two specimens in Sierra Leone, collected in the 1950s. The exact locality of the collection is not known. Therefore, its distribution was mapped over the entire country by the IUCN. Based on that distribution, the species is considered to be restricted range. Pending additional information, the species possibly qualifies under Criterion 2.
Afrithelphusa leonensis	-	DD	Potential	Possible CH	2	This species is known only from three specimens collected in one locality. Based on this locality, IUCN has drawn a probable distribution map, 45% of it overlapping with the terrestrial AoA. This probable distribution suggests that the species would be restricted range (the distance between the furthest points of the catchments is c.250 km). If field surveys confirm the presence of the species, it is likely that the AoA will include at least 10% of the global population given the overlap between its distribution and the AoA. Pending additional information, the species possibly qualifies under Criterion 2.
Elattoneura dorsalis	Yellow-fronted Threadtail	VU (B1ab)	Potential	Possible CH	2	This species is endemic to Sierra Leone, where it has been recorded from four locations. It is associated with forest streams in lowland forest (K. Dijkstra 2010). One of these locations is Kasewe, on the northern boundary of the AoA. Using the catchment in which the species has been reported as the boundaries of its distribution, the species is restricted range (the distance between the furthest points of the catchments is c.400 km). Given the AoA is already quite degraded, it is unlikely that the loss of the AoA would result in change of the IUCN Red List status to EN or CR. Therefore, the species does not qualify under Criterion 1. However, more than 10% of the global population might be present in the AoA. Therefore, the species possibly qualifies for CH under Criterion 2.
Pseudagrion mascagnii	-	CR	Potential	Possible CH	1a, 2	The species is only known from a type pair collected in 2004 at Regent, in the hills of the peninsula just south of Freetown (Sierra Leone), about 30 km northwest of the terrestrial AoA. However, IUCN has drawn

Scientific name	Common name	IUCN Category	Presence in the AoA	CH screening result	Criteria	Justification for screening
						a probable distribution map, which overlaps with the terrestrial AoA (K.-D. B. Dijkstra 2010). This probable distribution suggests that the species would be restricted range (the distance between the furthest points of the catchments is c.300 km). There is no information on habitat preferences and since its habitat lies in the suburbs of Freetown and is expected to deteriorate in the future (K.-D. B. Dijkstra 2010), the species was listed as CR until new records indicate that it can be downgraded. Since 23% of the probable distribution overlaps with the AoA, it is likely that the AoA would be inhabited by more than 10% of the global population. Therefore, pending field surveys, the species possibly qualifies under Criteria 1 and 2.
Plants (aquatic)						
Ledermanniella aloides	-	VU (D2)	Potential	Possible CH	1b	The species should be considered as EN according to Kew Garden experts. It is a small tropical herb that grows on rocks in river rapids. It has a large area of distribution (from Sierra Leone to Central Africa) but records of the species to date are limited to five or six sites (Diop 2010). These limited records are likely due to limited surveys for aquatic plants throughout the region. The species was not recorded by Project studies but no surveys targeted aquatic plants. The confirmation of its presence would imply that the species meets the threshold for Criterion 1 (0.5% of the global population being in the AoA) given the small amounts of records of the species. Precautionarily, the species possibly qualifies under Criterion 1.
Stonesia heterospathella	-	DD	Potential	Possible CH	2	This aquatic plant is known from 3 catchments in Sierra Leone and Guinea. The species does not strictly follow the definition of a restricted range species (i.e. the distance between the 2 furthest points of the catchments in which the species is found is estimated to 525km while the threshold is 500km) but the species was incorporated in the screening to be precautionary. It is a rheophyte (i.e. lives in fast moving water currents) and lives attached to submerged rocks or wood in rushing water in rapids or falls of streams and rivers. As not much is known about the distribution of the species and the species has very specific habitat requirement, it is not clear if the 6% of the distribution range overlapping with the AoA could represent 10% of the global population. Precautionarily, the species possibly qualifies for CH under Criterion 2.
Fish						
Chiloglanis polyodon	-	CR	Potential	Possible CH	1a, 2	This species is only known from the holotype recorded in the upper Bagbe River in Northern Sierra Leone, where it was found in fast-flowing running waters (Bousso & Laleye 2010). The IUCN Red List map indicates that the species might be present in the entire Gbangbaia catchment but the species has not previously been recorded in the AoA. As the Bagbe catchment measures less than 500km, the species is restricted range. Pending surveys confirming its presence, the species possibly qualifies for CH under Criteria 1 and 2.
Chrysichthys johnelsi		LC	Potential	Possible CH	3	The species is found in wetlands of West Africa. Not much is known on the species but the fish expert indicates the species is migratory, moving from the mouths of large rivers to upstream in a basin for quite a large distance. No information on the population size is available but, as the 1.2% of the distribution range is within the AoA, it is considered that more than 1% of the population might be present in the AoA. Therefore, the species possibly qualifies for CH under Criterion 3.

Scientific name	Common name	IUCN Category	Presence in the AoA	CH screening result	Criteria	Justification for screening
Coelotilapia joka	-	VU	Potential	Possible CH	2	This species is found in catchments in Sierra Leone and Liberia. The maximum distance between the most distant points of its catchments in which it is found is c.450 km, therefore the species is restricted range. The species was not recorded in the AoA but its presence cannot be excluded. It is unlikely that the loss of the AoA would result in the change of the IUCN Red List status to EN or CR, so the species is unlikely to qualify for CH under Criterion 1. However, since 7.1% of its distribution range overlaps with the AoA, the species possibly qualifies under Criterion 2 as the AoA might support approx. 10% of the global population.
Enteromius bagbwensis	-	VU	Reported by expert	**Likely CH**	2	This species is currently known from two catchments in Sierra Leone, located directly north and south of the aquatic AoA. However, it was reported from the Jong and Sewa rivers (Walsh, pers. comm.), which would significantly increase the size of the species range. It is unlikely that the loss of the AoA would result in change of the IUCN Red List status to EN or CR, so the species would not qualify the area as CH under Criterion 1. However, the maximum distance between its most distant catchments is c.300 km, therefore the species is restricted range. Taking into account the species range increase, the AoA would likely support more than 10% of the global population. The species is considered likely to qualify the areas as CH under Criterion 2.
Enteromius liberiensis	Carp	EN	Potential	Possible CH	1a, 2, 3a	This species is currently known from three catchments in Sierra Leone and Liberia (Entsua-Mensah 2018). It has a coastal plains distribution and is found in both stream and lake conditions. While not confirmed in Gbangbaia and Jong catchments, it is likely to be present as it has been recorded in the catchments directly north and south of the aquatic AoA. The maximum distance between most distant catchments is c.400 km, therefore the species is restricted range. If the presence of the species were confirmed in the AoA, the AoA would be likely to support 10% of the global distribution of the species therefore the species possibly qualifies the area as CH under Criteria 1, 2 and 3.
Epiplatys fasciolatus ssp. zimiensis	-	EN	Potential	Possible CH	1a, 2	This endangered species is found in catchments of Sierra Leone and Liberia. The species was recently surveyed in streams of the Bagbe catchment (i.e., the catchment directly south of the AoA, Walsh, pers. comm.), therefore it is likely to be present in the AoA too. The maximum distance between most distant catchments is c.350 km, therefore the species is restricted range. The actual EOO is probably bigger but is likely to remain below 500km. If the species is reported in the AoA, it is likely that the AoA supports more than 10% of the global population of the species, therefore the species possibly qualifies for CH under Criteria 1 and 2.
Epiplatys fasciolatus ssp. josianae	-	CR	Recorded during surveys	Possible CH	1a, 2	Based on the IUCN Red List, this Critically Endangered species is found in one catchment of Sierra Leone, outside the AoA (Laleye 2010). However, the species was recorded during the Sembehum ESHIA aquatic ecology surveys (Earth Systems & ECS Sierra Leone 2018). The fish expert consulted for this work (Gina Walsh), considers that it is possible that the species is present in the AoA even if a mis-identification of *Epiplatys fasciolatus ssp. zimiensis* is more likely. To be precautionary, the presence of the species should not be excluded. The species is restricted-range as the distance between locations further apart of the known catchment and the AoA is below 500km. If the species presence is confirmed, it is likely that the

Scientific name	Common name	IUCN Category	Presence in the AoA	CH screening result	Criteria	Justification for screening
						AoA supports more than 10% of the global population of the species, therefore the species possibly qualifies for CH under Criteria 1 and 2.
Epiplatys njalaensis	-	EN	Recorded during surveys	**Likely CH**	1a, 2	This endangered species is found in catchments of Sierra Leone and Liberia. The type locality is in the Jong catchment (Njala) and the species was recorded during the Sembehum ESHIA aquatic ecology surveys (Earth Systems & ECS Sierra Leone 2018). Fish expert consulted during this CHA indicated that the species might be a complex of several species, with slightly different distributions (Walsh, pers. comm.). The maximum distance between known most distant catchments is c.200 km. Including Jong catchment, the distance is higher, but remains below 500km, therefore the species is restricted range. It is likely that the AoA supports more than 10% of the global population of the species, therefore the species is considered likely to qualify the area as CH under Criteria 1 and 2.
Ladigesia roloffi	-	EN	Potential	Possible CH	1a, 2	This endangered fish species is only known from one location in Jong catchment and is considered to occur in the entire catchment by the IUCN Red List. It is possibly present in one other location in Liberia. The species is restricted-range as Jong catchment has a length below 100km. It was not recorded by Project studies. Given its currently known distribution, the species possibly qualifies for Criteria 1 and 2 as approx. 30% of its range might be in the AoA.
Leptocypris taiaensis	-	VU (D2)	Potential	Possible CH	2	This species is found in 3 catchments in Sierra Leone and Guinea. The maximum distance between the most distant points of each of its catchments is c. 400 km, therefore the species is restricted range. Given the limited information on its distribution, it is likely that the species is also found in additional catchments of Sierra Leone. It is unlikely that the loss of the AoA would result in change of the IUCN Red List status to EN or CR. Therefore, the species is unlikely to qualify under Criterion 1. However, the species possibly qualifies under Criterion 2 as the AoA might be inhabited by approx. 10% of the global population (7.1% of its known distribution range overlaps with the AoA).
Marcusenius meronai	-	EN	Potential	Possible CH	1a, 2	This species is currently known from two catchments in Sierra Leone (Bagbe/Sewa and Seli/Rokel - Walsh, pers. comm.). While not confirmed in Gbangbaia and Jong catchments, it is likely to be present as it has been recorded in the catchments directly north and south of the aquatic AoA. The maximum distance between the most distant points of the catchments in which it is found is c.300 km, therefore the species is restricted range. If the species presence was confirmed in the AoA, it would likely support >10% of the global distribution of the species. Precautionarily, the species possibly qualifies CH under Criteria 1 and 2.
Mastacembelus taiaensis	-	VU (B1ab+2ab; D2)	Potential (Mastacembalus spp. recorded during surveys)	Possible CH	2	This species is found in catchments in Sierra Leone and Guinea. The maximum distance between the most distant points of the catchments in which it is found is c.350 km, therefore the species is restricted range. Mastacembelus spp. individuals were recorded during the Sembehun ESHIA aquatic surveys (Earth Systems & ECS Sierra Leone 2018). It is unlikely that the loss of the AoA would result in a change of the IUCN Red List status to EN or CR. However, since 8.5% of the species' range overlaps with the AoA, the species possibly qualifies as CH under Criterion 2 as the AoA might support approx. 10% of the global population.

Scientific name	Common name	IUCN Category	Presence in the AoA	CH screening result	Criteria	Justification for screening
Mochokiella paynei		LC	Potential	Possible CH	2	The species is currently listed as LC but requires updating. It is only known from one type locality, the Kasewe Forest Reserve, north-eastern of the aquatic AoA. The IUCN has drawn a probable distribution map, 31% of which overlapping with the AoA. Not much is known about the ecology and habitat use of the species. If the presence of the species within the AoA was confirmed, the species would qualify for Criterion 2 (>10% threshold).
Notoglanidium maculatum	-	EN	Potential	**Likely CH**	1a, 2	This endangered fish species is endemic to Sierra Leone where it is found in wetlands close to the coast. It is demersal, i.e. it lives close to the bottom of the water, but not much additional information is available about its ecology and habitat use. The species is consumed by the local population. No estimate of population size is available. The species complies with the definition of a RR species (IFC 2019) as it is only found in a small number of catchments and the further distance between these catchments is lower than 500km. As 45% of the species distribution range is in the AoA, it is highly likely that more than 0.5% of the global population (threshold of Criterion 1) or even more than 10% of the global population (threshold for Criterion 2) is within the AoA. Therefore, the species is likely to qualify under both Criteria 1 and 2.
Notoglanidium thomasi	-	EN	Potential	**Likely CH**	1a, 2	This endangered fish species is endemic to Sierra Leone where it is currently known from at least 3 catchments. The maximum distance between most distant catchments is c.350 km, therefore the species is restricted range. Since c. 28% of its distribution range overlaps with the AoA, it is highly likely that more than 0.5% of the global population (threshold of Criterion 1) or even more than 10% of the global population (threshold for Criterion 2) is within the AoA. Therefore, the species is likely to qualify under Criteria 1 and 2.
Ophichthus leonensis		DD	Potential	Possible CH	2,3	This species is very rare and its ecology is unknown. Based on the genus, the species is assumed to be neritic (i.e. only found in the shallow part of the sea near a coast and overlying the continental shelf). The fish expert (Gina Walsh) indicated that the species might be catadromous (i.e. the species spawns in the sea but juveniles grow into adults in the river before migrating back in the see). As per other eels, the species might be congregatory too. IUCN considers that the species might be endemic to the waters bordering and within Sierra Leone. Therefore, the species is considered to be restricted-range. It is difficult to assess the proportion of the distribution range in the AoA but the species possibly qualifies as CH under Criterion 2 and potentially Criterion 3, since 3.5% of its range is within the AoA.
Rhynchobatus luebberti	African Wedgefish	EN	Potential	Possible CH	1a	This species is found in coastal waters of Western Africa and has undergone significant decline due to overfishing. It is a species of regional stakeholder concern (Compagno & Marshall 2006). The species was not recorded in the AoA but its presence is possible given the ecological value of the Sherbro estuary. The AoA may support more than 0.5% of the species global population since there is more than 1% range overlap. The species possibly qualifies for CH under Criterion 1.
Scriptaphyosemion bertholdi		EN	Potential	**Likely CH**	1a, 2	This endangered fish species is endemic to Sierra Leone where it is currently known from at least 3 catchments. The maximum distance between most distant catchments is c.320 km, therefore the species is restricted range. Since c. 7% of its distribution range overlaps with the AoA, it is likely than more than 0.5% of the global population (threshold of Criterion 1) is within the AoA. Precautionarily, it is considered

Scientific name	Common name	IUCN Category	Presence in the AoA	CH screening result	Criteria	Justification for screening
						that 10% of the global population (threshold for Criterion 2) may also be found within the AoA. The species is likely to qualify under Criteria 1 and 2.
Scriptaphyosemion chaytori	-	DD	Potential	Possible CH	2	The species is restricted range (i.e. the distance between the 2 further points of the catchments in which the species is found is smaller than 500km). c.4% of the EOO is found within the AoA, which is below the 10% threshold for Criterion 2. However, recent surveys undertaken in Sierra Leone have shown that the species might be a complex of several species. Therefore, it is possible that their range is more restricted than previously thought. Precautionarily, the species possibly qualifies for CH under Criterion 2.
Scriptaphyosemion roloffi	-	NT	Potential	Possible CH	2	The species is known from catchments in Sierra Leone and Liberia. It is found mainly in shallow and stagnant parts of pools, brooks, swamps and small streams in the coastal rain forest. The maximum distance between most distant catchments is c.450 km, therefore the species is restricted range. The species possibly qualifies for CH under Criterion 2 as the AoA might support 10% of the species global population (6.7% of its range overlaps with the AoA).

Appendix 3 Species that qualify for CH in the existing CHA for Area 5 but not according to TBC justification

Taxa	Scientific name	Common name	IUCN Cat.	CH in Area 5	TBC screening	Justification for TBC screening
Mammals	*Genetta johnstoni*	Johnston's Genet	NT	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.307,000 km^2)
	Cercocebus atys	Sooty Mangabey	NT	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.316,000 km^2)
	Procolobus verus	Olive Colobus	NT	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.402,000 km^2)
	Perodicticus potto	West African Potto	LC	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.714,000 km^2)
	Hybomys planifrons	Miller's Striped Mouse	LC	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.239,000 km^2)
Birds	*Necrosyrtes monachus*	Hooded vulture	CR	Criterion 1 (Tier 2)	Stakeholder concern	To meet the 0.5% population threshold in Criterion 1, about 985 individuals should be present in the AoA. This is considered unlikely given that 0.08 of the EOO overlaps with the AoA.
	Apalis sharpii	Sharpe's Apalis	LC	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.386,000 km^2)
	Hylopsar cupreocauda	Copper-tailed Starling	NT	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.345,000 km^2)
	Laniarius turatii	Turati's Boubou	LC	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.134,000 km^2)
	Picathartes gymnocephalus	White-necked Rockfowl	VU	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.388,000 km^2)
Amphibians	*Pseudhymenochirus merlini*	-	LC	Criterion 2 (Tier 2)	Unlikely	This water-dependent species is not restricted range (the distance between furthest points of the catchments in which the species is found is larger than 500 km). In addition, it is unlikely than 10% of the global population is present in the AoA as c. 6% of the distribution range overlaps with the aquatic AoA.
	Astylosternus occidentalis	-	LC	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.185,000 km^2)
	Odontobatrachus natator	Sierra Leone Water Frog	NT	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.113,000 km^2 and distance between furthest points larger than 500 km)
	Phrynobatrachus tokba	-	LC	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.187,000 km^2)
Reptiles	*Cophoscincopus simulans*	-	LC	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO is c.256,000 km^2)
Fish (freshwater)	*Epiplatys barmoiensis*	-	LC	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (length between furthest distant points is c. 578 km). In addition, it is unlikely than 10% of the global population is present in the AoA as c. 5.2% of the distribution range overlaps with the aquatic AoA.
	Hippopotamyrus paugyi	-	LC	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (length between furthest distant points is c. 690 km)

Taxa	Scientific name	Common name	IUCN Cat.	CH in Area 5	TBC screening	Justification for TBC screening
	Pelvicachromis humilis	-	LC	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (length between furthest distant points is c. 670 km)
	Sarotherodon occidentalis	African perch	NT	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (EOO>200,000 km^2)
	Tilapia louka	-	LC	Criterion 2 (Tier 2)	Not CH	The species is not restricted range (length between furthest distant points is c. 700 km)
Fish (marine)	*Pseudotolithus senegalensis*	Cassava croaker	EN	Criterion 1 (Tier 2)	Unlikely CH	The species was recorded in the CHA and population status is unknown, but considered unlikely to meet the 0.5% population threshold given that the AoA overlaps with 0.12% of the species EOO.
Plants	*Stylochaeton pilosus*	-	EN	Criterion 1 (Tier 2)	Unlikely CH	The species is known from 4 locations in Sierra Leone and Guinea. Only two specimens were recorded in Sierra Leone, of which the most recent was collected in 1940 (the species may be locally extinct). In Guinea, the species is restricted to *Guibourtia copallifera* forest, with an understorey of *Uvariopsis tripetala* and on granite rock (Cheek & Harvey 2013). Both the species and the preferred habitat type known to support it has not been recorded in the AoA, . It is considered unlikely to qualify for CH.
	Xysmalobium samoritourei	-	EN	Criterion 1 (Tier 2)	Not assessed	Species EOO not overlapping with AoA. Found only in a few locations in Sierra Leone and Guinea above 1,000m.
	Triclisia macrophylla	-	CR	Criterion 1 (Tier 2)	Not assessed	IUCN range not overlapping with AoA. Species only known from forests in Cameroon and Sierra Leone, but last record in Sierra Leone was in 1896. Unlikely to be present in the AoA.