Tina River Hydropower Development Project

P-2 Biodiversity Management Plan (BMP)

PREPARED BY STANTEC FOR

TINA RIVER HYDROPOWER LIMITED | JUNE 2023

Stantec

Executive Summary

The Tina River Hydropower Development Project (TRHDP; the Project) is the first large utility-scale renewable energy project to be developed in the Solomon Islands. The Project developer is Tina Hydropower Limited (THL), who have entered into a 30-year Power Purchase Agreement with Solomon Power. The development will result in direct and indirect impacts to terrestrial and aquatic biodiversity values. These are mostly associated with vegetation and habitat clearance, edge effects and changes to the hydrological regime of the Tina River. The aim of the P-2 Biodiversity Management Plan (BMP) is to outline the mitigation measures that will be applied to manage these impacts, following the mitigation hierarchy of avoid, minimise, and restore biodiversity values, with any residual impacts to be offset.

Key conservation-significant species associated with the Project Area include three flora, two avifauna and one bat species in terrestrial habitats, and four macroinvertebrates from the Tina River. These taxa were found to trigger Critical Habitat according to the International Finance Corporation Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. Critical Habitat that retained ecological function and composition and was considered largely pristine supported these trigger species.

The Project has the potential to impact terrestrial and aquatic biodiversity values; however, the majority of these impacts can be managed via the implementation of the mitigation hierarchy. During the construction phase of the Project, key mitigation measures will comprise minimising vegetation clearance, wildlife shepherding and salvage during clearing, and propagation of native plants for revegetation. Standard construction management will also be implemented, including erosion and sediment control, traffic management, and hazardous chemical and waste management.

During the operational phase of the Project, best practice environmental management will continue to be implemented. In the Tina River, environmental flows (e-flows) will be maintained with the release of water downstream of the dam and powerhouse, while a trap and haul system will be utilised to aid fish passage into the upper catchment. Detailed mitigation measures are provided in the BMP and related Environmental and Social Management Plans (ESMPs).

Following the implementation of these mitigation measures it is acknowledged that there will be some residual impacts that remain from the development and operation of the Project. For terrestrial biodiversity, this includes vegetation clearance, habitat loss and edge effects due to for the construction of temporary and permanent infrastructure, while for aquatic biodiversity values, this comprises reduced migration pathways for fish upstream of the reservoir and changes in hydrology downstream of the dam in the Tina River.

Terrestrial and aquatic offsets will be required to account for these residual impacts and will include protection and restoration of habitat within Core Land and ongoing management of the upper Tina River catchment. This will result in a net gain of biodiversity values and will contribute to benefits including protection of areas of Solomon Islands Rainforest, parts of the Guadalcanal Watershed Key Biodiversity Area, and remaining Critical Habitat. Offset activities within Core Land will be implemented by THL, with activities outside of Core Land to be managed by SIG, supported by relevant stakeholders, including customary landowners.

Tina River Hydropower Development Project

P-2 BIODIVERSITY MANAGEMENT PLAN

June 2023

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ACRONYMS

Acronym	Definition
ADB	Asian Development Bank
AIFFP	Australian Infrastructure Financing Facility for the Pacific
AOMS	Aquatic Offset Management Strategy
AZE	Alliance for Zero Extinction Site
BAG	Biodiversity Advisory Group
BMP	Biodiversity Management Plan
BOOT	Built, Own, Operate and Transfer
CBD	Convention on Biological Diversity
CESMP	Construction Environmental and Social Management Plan
CFP	Concessional Finance Partner
CH	Critical Habitat
CHA	Critical Habitat Area
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLO	Community Liaison Officer
CR	Critically Endangered
DBMP	Drill and Blast Management Plan
DD	Data Deficient
DESCP	Drainage, Erosion and Sediment Control Plan
DIA	Direct Impact Area
EAAA	Ecologically Appropriate Area of Analysis
EFMP	Environmental Flows Management Plan
EIS	Environmental Impact Statement
EN	Endangered
EOO	Extent of Occurrence
ESIA	Environmental and Social Impact Assessment
ESMP	Environment and Social Management Plan
ESS	Environmental and Social Safeguards
FAMMP	Fish, Algae, and Macro-Invertebrate Monitoring Plan
FCP	Forest Clearance Plan
FFMP	Flora and Fauna Monitoring Plan
FPP	Fish Passage Plan
GPS	Global Positioning System
GRM	Grievance Redress Mechanism
HEC	Hyundai Engineering Corporation Limited
HMMP	Hazardous Materials Management Plan

Acronym	Definition
HSE	Health, Safety and Environment
IA	Implementation Agreement
IBA	Important Bird and Biodiversity Area
IBAT	Integrated Biodiversity Assessment Tool
IFMP	Invasive Flora Management Protocol
IMP	Influx Management Plan
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
K-water	Korea Water Resources Corporation
LC	Least Concern
m asl	Metres above sea level
MECDM	Ministry of Environment, Climate Change, Disaster Management and Meteorology
MMERE	Ministry of Mines, Energy and Rural Electrification
MW	Mega Watt
NT	Near Threatened
NVMP	Noise and Vibration Management Plan
OE	Owner's Engineer (Stantec New Zealand)
PA	Protected Area
PO	Project Office
PCRRMP	Post Construction Rehabilitation and Revegetation Management Plan
PPA	Power Purchase Agreement
RoW	Right of Way
RR	Restricted Range
SECP	Stakeholder Engagement and Communication Plan
SIEA	Solomon Islands Electricity Authority
SMP	Security Management Plan
SIG	Solomon Islands Government
STMP	Spoil and Topsoil Management Plan
TA	Technical Assistance
TBA	To be appointed
TCLC	Tina Project Area Company
THL	Tina Hydropower Limited
TMP	Traffic Management Plan
TOMS	Terrestrial Offset Management Strategy
Project	Tina River Hydro Development Project (the Project)
VU	Vulnerable
WMPSPP	Waste Management and Point Source Pollution Plan

GLOSSARY

Term	Definition
Biological Diversity	means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (Convention on Biological Diversity 2006).
Biological Resources	Includes genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity (Convention on Biological Diversity 2006).
Critical Habitats	Critical Habitats (IFC, 2012) are areas with high biodiversity value, including: (i) habitat of significant importance to Critically Endangered or Endangered species; (ii) habitat of significant importance to endemic and/or restricted range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened or unique ecosystems; and/or (v) areas associated with key evolutionary processes
Ecosystem Services	Ecosystem services (IFC, 2012) are the benefits that people, including businesses, derive from ecosystems. Ecosystem services are organized into four types: (i) Provisioning services, which are the products people obtain from ecosystems; (ii) Regulating services, which are the benefits people obtain from the regulation of ecosystem processes; (iii) Cultural services, which are the nonmaterial benefits people obtain from ecosystems; and (iv) Supporting services, which are the natural processes that maintain the other services.
In-situ Conservation	Means the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties (Convention on Biological Diversity 2006).
Modified Habitats	Modified habitats (World Bank 2019) are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area’s primary ecological functions and species composition.
Natural Habitats	Natural habitats (World Bank 2019) are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area’s primary ecological functions and species composition.
Protected Area	A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.” For the purposes of this Performance Standard, this includes areas proposed by governments for such designation (World Bank Group 2019).

1. INTRODUCTION

1.1 Background

The Tina River Hydropower Development Project (TRHDP; the Project) is the first large utility-scale renewable energy project to be developed in the Solomon Islands. The Project developer is Tina Hydropower Limited (THL), established by Korea Water Resources Corporation (K-Water) and Hyundai Engineering Company (HEC); the latter is the engineering, procurement, and construction (EPC) contractor. The Project is managed by a dedicated government Project Office (PO) within the national Ministry of Mines, Energy and Rural Electrification (MMERE) and is financed by the Solomon Island Government (SIG), plus six different financiers (Concessional Finance Partners; CFPs).

The Project is located on the central island of Guadalcanal and will support the development of renewable energy to supply electricity to Honiara and consists of four key components:

- A 15-megawatt (MW) hydropower facility, including the dam, reservoir, tunnel and powerhouse;
- 21.5 kilometers (km) of access roads;
- 44 km of 66 kilovolt (kV) transmission line (associated facility), consisting of two parallel lines of 22 km long; and
- Technical assistance to the Solomon Island Government to implement the scheme.

The hydropower facility is located within Core Land that has been acquired for the Project (Figure 1-1). Core Land includes the dam, reservoir[1], headrace tunnel, powerhouse, access roads (Lot 2 and 3), spoil disposal sites and associated temporary infrastructure. The existing access road to the north (Lot 1), disposal site 0 and workers accommodation camp occur outside of Core Land. Project infrastructure located within Core Land and Lot 1 are collectively referred to as the Project Area (Figure 1-1).

Main works construction includes the permanent and temporary infrastructure associated with the dam and reservoir on the Tina River, intake and headrace tunnel, as well as the powerhouse 4.5 km downstream, electrical switchyard and transmission line (Figure 1-1). Temporary facilities required for construction include a workers accommodation camp, site office, concrete batch plants and crusher plants, explosives magazine and stockpile/spoil disposal areas (Figure 1-1). A detailed Project description is available in the P-1 Construction Environmental and Social Management Plan (P-1 CESMP).

The revised Environmental and Social Impact Assessment (ESIA) for the Project (THL 2019) requires the preparation of environmental and social management plans (ESMPs) for dam safety, construction, operation, and monitoring. This document comprises the P-2 Biodiversity Management Plan (BMP) and is one of the sub-plans required under the P-1 CESMP. The P-2 BMP applies to both the construction and operational phases of the Project. It will be reviewed and updated (where required, with CFP approval) prior to the commercial operation date when the full suite of operational plans have been completed.

The BMP addresses environmental and social impacts within and outside of Core Land. Mitigation and management actions are the responsibility of HEC during construction and THL during operation, unless stated otherwise. Actions associated with protection of the upper catchment are the responsibility of SIG. It is anticipated that THL, HEC and SIG will require support from specialist ecologists and local communities to implement the BMP.

[1] Due to a survey error, a section of the reservoir totalling 6.47 ha currently falls outside of Core Land. SIG is aware of this issue.

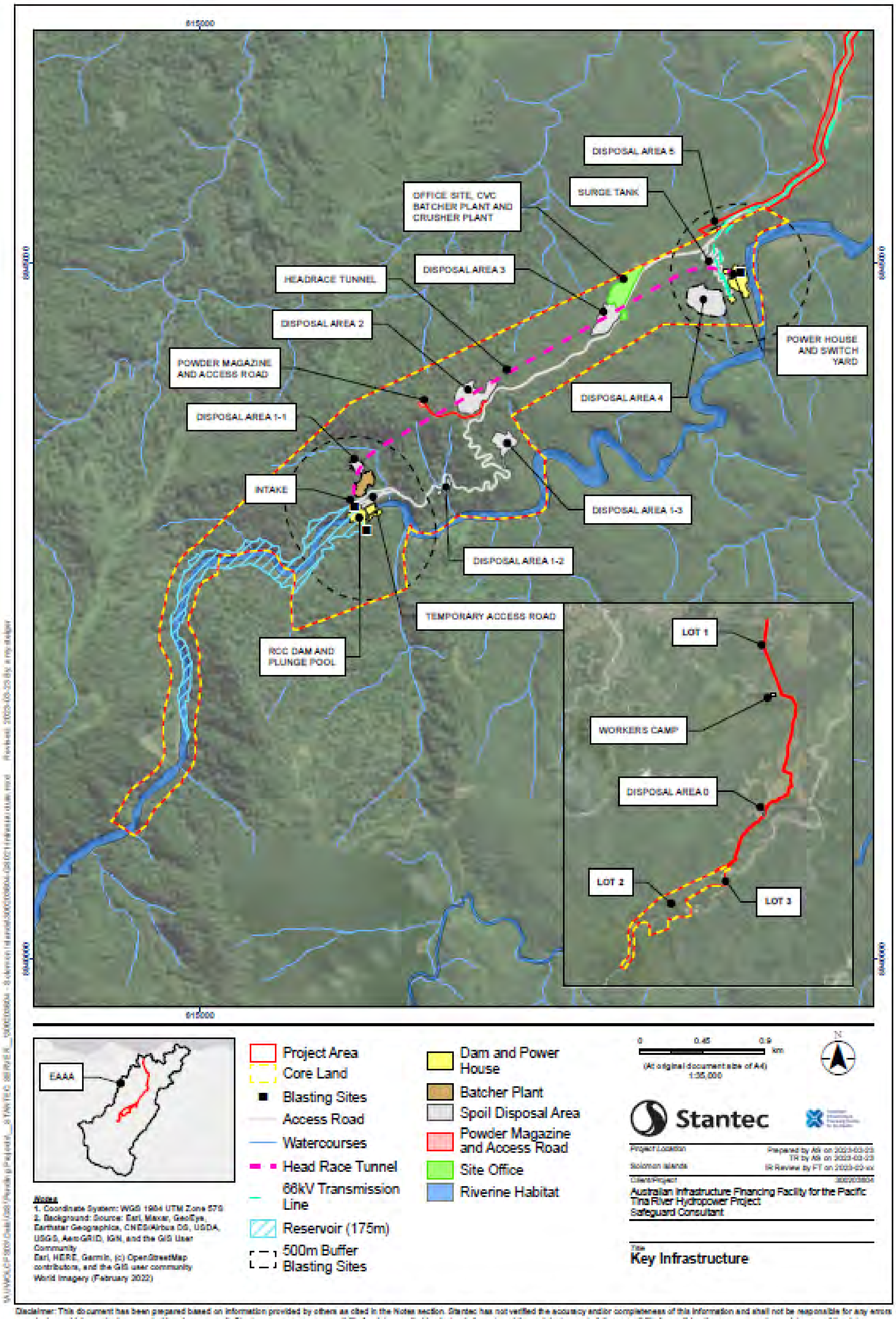

Figure 1-1: Overview of infrastructure components within the Project Area (as of March 2023).

1.2 Aim, Objectives and Scope

The aim of the BMP is to outline the mitigation measures that will be applied to manage terrestrial and aquatic biodiversity values for the Project. The objectives of the BMP apply to biodiversity management and are as follows:

1. To apply the mitigation hierarchy of avoid, minimise, mitigate, restore, and where residual impacts remain offset, adverse impacts of the Project on terrestrial and aquatic ecosystems.
2. To protect and, where possible, enhance remaining significant habitats within Project Area and Core Land.
3. To protect and, where possible, improve the survival of globally threatened species within Project Area and Core Land, through management and the control of invasive species.
4. To achieve no net loss of Natural Habitat and achieve a net gain of Critical Habitat impacted by the Project.

The BMP applies to the construction and operation of the hydropower facility including access roads, and the Project's temporary and permanent infrastructure. Biodiversity management of the transmission line corridor is the responsibility of Solomon Power and will be managed under separate plans due for completion in mid-2023.

1.3 Biodiversity Risks and Impacts

A comprehensive discussion of the impacts of the Project are discussed in the ESIA (THL 2019). The development of the Project will result in direct and indirect risks and impacts to terrestrial and aquatic biodiversity values. During construction, this includes vegetation and habitat clearance, mortality of fauna, and edge effects, with earthworks also generating noise, vibration, and light pollution, and potential erosion and sediment discharges. During operation, there will be changes to the hydrological regime of the Tina River, with a barrier to fish passage created by the reservoir and dam, and alteration of downstream environmental flows (e-flows). During both Project phases, impacts may be caused by vehicle movement along roads, pollution of soil and water, accidental introduction of invasive species, illegal clearing, and logging, hunting or collection of wildlife.

The BMP quantifies these potential impacts through the assessment of habitat that is likely to support high terrestrial and aquatic biodiversity values and conservation significant species, identifying measures to avoid, minimise, impacts, and restore biodiversity, where required, adhering to the mitigation hierarchy. Following the application of mitigation measures, residual impacts require the offsetting. Biodiversity offsets are addressed in the Terrestrial and Aquatic Offset Management Strategies (TOMS and AOMS).

1.4 Standards, Timeframe and Structure

To address the aim and objectives, the BMP adheres to the ESIA (THL 2019), relevant legal requirements and frameworks, and follows applicable national, international standards and guidelines (Annex P-2-1), predominantly the International Finance Corporation Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC GN6; World Bank Group 2019). The BMP is required to be approved by the CFPs before main works can begin (tentatively scheduled for mid-2023) and will remain applicable throughout the construction and operational phases of the Project.

The structure and layout of the BMP is as follows:

- Terrestrial and aquatic ecology review summary and Critical Habitat Assessment (CHA);
- Project impacts and associated mitigation measures, monitoring and evaluation, and residual impacts and offsetting;
- Community consultation, and the strategy and engagement process for key stakeholders; and

- Implementation of the BMP over the life of the Project, including responsibilities, budget and timeline for management and monitoring activities.

2. METHODOLOGY

2.1 Ecology Review and Critical Habitat Assessment

Terrestrial and aquatic ecology baseline information and data was reviewed to inform the development of the BMP, and included desktop studies, spatial data records and databases, and field survey work and associated technical reports, the findings of which are presented in Annex P-2-2. Numerous surveys have been conducted within the Project Area, Tina River, and surrounds, beginning in 2010, up until 2022, typically focussing on ecosystems within Core Land. The ecology review was used to identify potentially conservation significant communities and species for the Critical Habitat Assessment (CHA), and where relevant, experts were also consulted for additional input (Annex P-2-2).

The CHA was undertaken according to IFC GN6 (World Bank Group 2019), with the comprehensive assessment and associated methodology presented in Annex P-2-2. Terrestrial and aquatic Ecologically Appropriate Areas of Analysis (EAAA) were derived, considering watersheds, habitat units and riverine reaches, based on existing spatial datasets and satellite imagery (Annex P-2-2). The CHA followed the three high-level steps comprising an ecology review, verification of information and refinement, and Critical Habitat determination.

Conservation significant communities, terrestrial flora and fauna, and aquatic biota identified from the ecology review were screened against the relevant criteria and thresholds (World Bank Group 2019) (Annex P-2-2). Habitats within the terrestrial and aquatic EAAA were classified as Modified, Natural, and/or Critical, following the definitions outlined in Table 2-1. The results of the ecology review and CHA were used to develop targeted mitigation measures and management actions for the Project.

Table 2-1: CHA classifications and definitions (World Bank 2019) relevant to the Project.

Classification	Definition
Modified Habitat	Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition (excluding habitat that has been converted in anticipation of the Project). Modified habitats may include areas managed for agriculture, forest plantations, reclaimed (i.e. process of creating new land from sea or other aquatic areas for productive use) coastal zones, and reclaimed wetlands.
Natural Habitat	Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition
Critical Habitat	Critical habitats are areas with high biodiversity value, including: (i) habitat of significant importance to Critically Endangered and/or Endangered species (as per ICUN); (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

2.2 Biodiversity Impacts, Mitigation, Monitoring and Offsets

To protect terrestrial and aquatic biodiversity values from risks and impacts associated with the Project the mitigation hierarchy (World Bank Group 2019) was applied. Management and mitigation measures in the BMP have considered the phase of the Project, direct and indirect impacts, as well as the practicality of implementation. Appropriate monitoring plans were also developed to target conservation significant communities and species.

Where residual impacts from the Project remained, offsetting was applied to both Natural Habitat (and Critical Habitat, to achieve no net loss and net gain in biodiversity, respectively. The offset accounting considered temporary and permanent impacts to terrestrial biodiversity values, and changes in fish passage and hydrology for aquatic biodiversity values, following IFC GN6 (World Bank Group 2019) principles. The offset documents are presented in the TOMS (Annex P-2-3) and AOMS (Annex P-2-4).

The level of community consultation completed to date has been documented, and the strategy for future engagement has been discussed. Roles and responsibilities for implementation and high-level budget allocations for management actions and monitoring requirements have also been developed.

3. ECOLOGY REVIEW SUMMARY

3.1 Terrestrial EAAA, Land Use and Habitat Units

The EAAA derived for terrestrial biodiversity values comprises four separate watersheds that intersect the Project Area, which extends from the upper catchment of the Tina River to the northern coastline, comprising a total area of 33,078.18 ha, excluding the riverine habitat (Figure 3-1). A total of 12 habitats have been identified within the EAAA ranging from Undisturbed Primary Forest in the upper catchment which are in largely pristine condition, to substantially modified areas of Agricultural Cropping and Development and Habitations, which occupy low-lying areas (Figure 3-2, Table 3-1). Forested areas in the lower catchment may also be subject to legal and illegal logging activities, while palm oil plantations are also prevalent.

Within the Project Area, seven habitat units have been identified (Myknee Ecological Consulting 2020), the descriptions of which are provided in Table 3-1. Most of the Project Area comprises Undisturbed Primary Forests and Disturbed Secondary Forest, while the northern section is characterised by Remnant Forest and Undisturbed Primary Forest, with Riparian and Cliff Habitat along the margins of the Tina River (Figure 3-3). Solomon Islands Rainforest, which comprises Montane Forest (>600 m asl) and Lowland Forest corresponds to Undisturbed Primary Forest in the EAAA and Project Area (Pauku 2009; TRHDP 2017).

There are also several culturally significant *Tambu* sites that are known to occur within or adjacent to Core Land (TRHDP pers. comm. 2023). Two of these sites are in proximity to the access roads; the local place names of which are Bela and Kabi. There are also another three sites; Babaruhuvia, Babalangisi, and Makaravatumosa (ibid.) upstream and downstream of the Project dam.

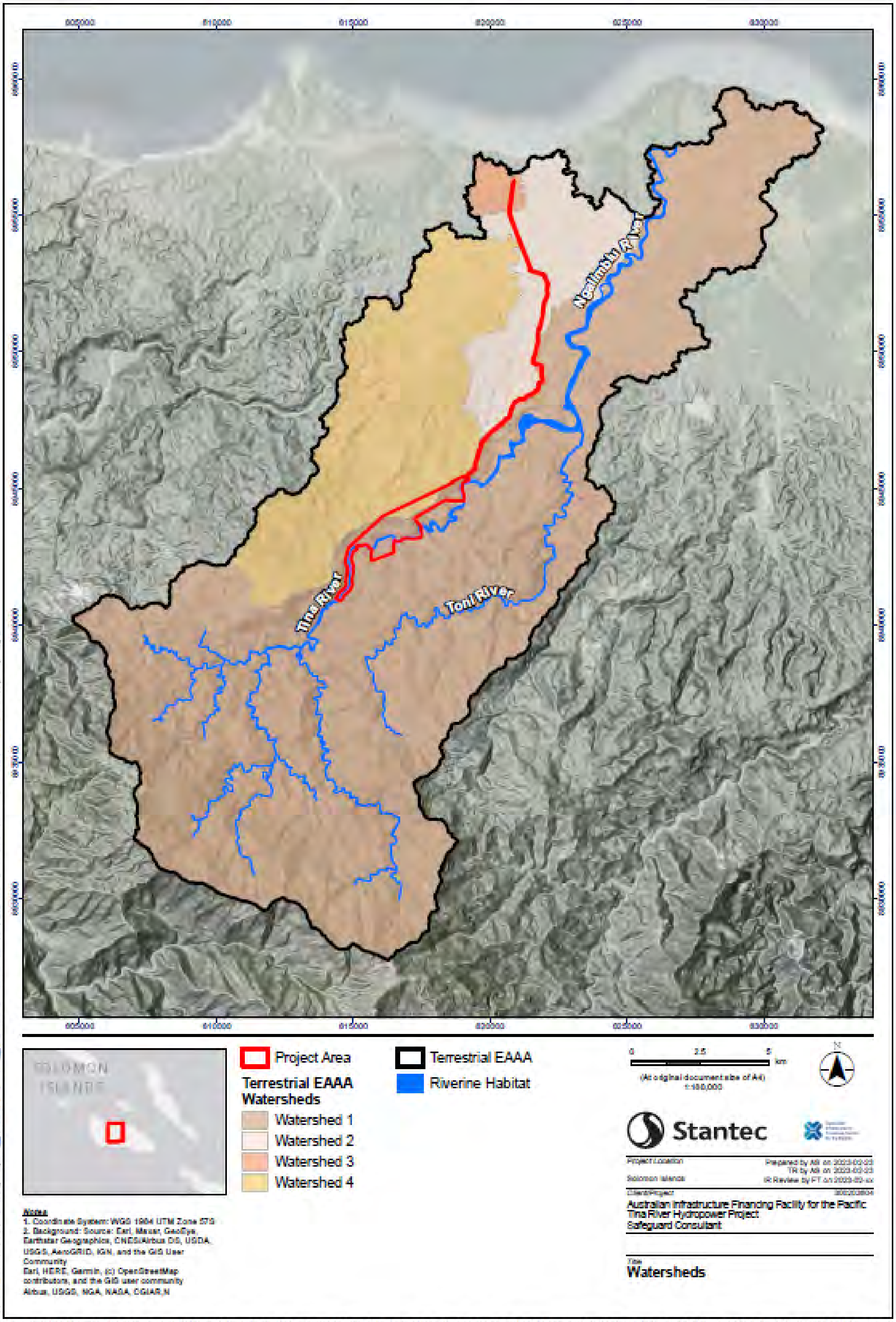

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Figure 3-1: Terrestrial EAAA showing the watersheds that intersect the Project Area.

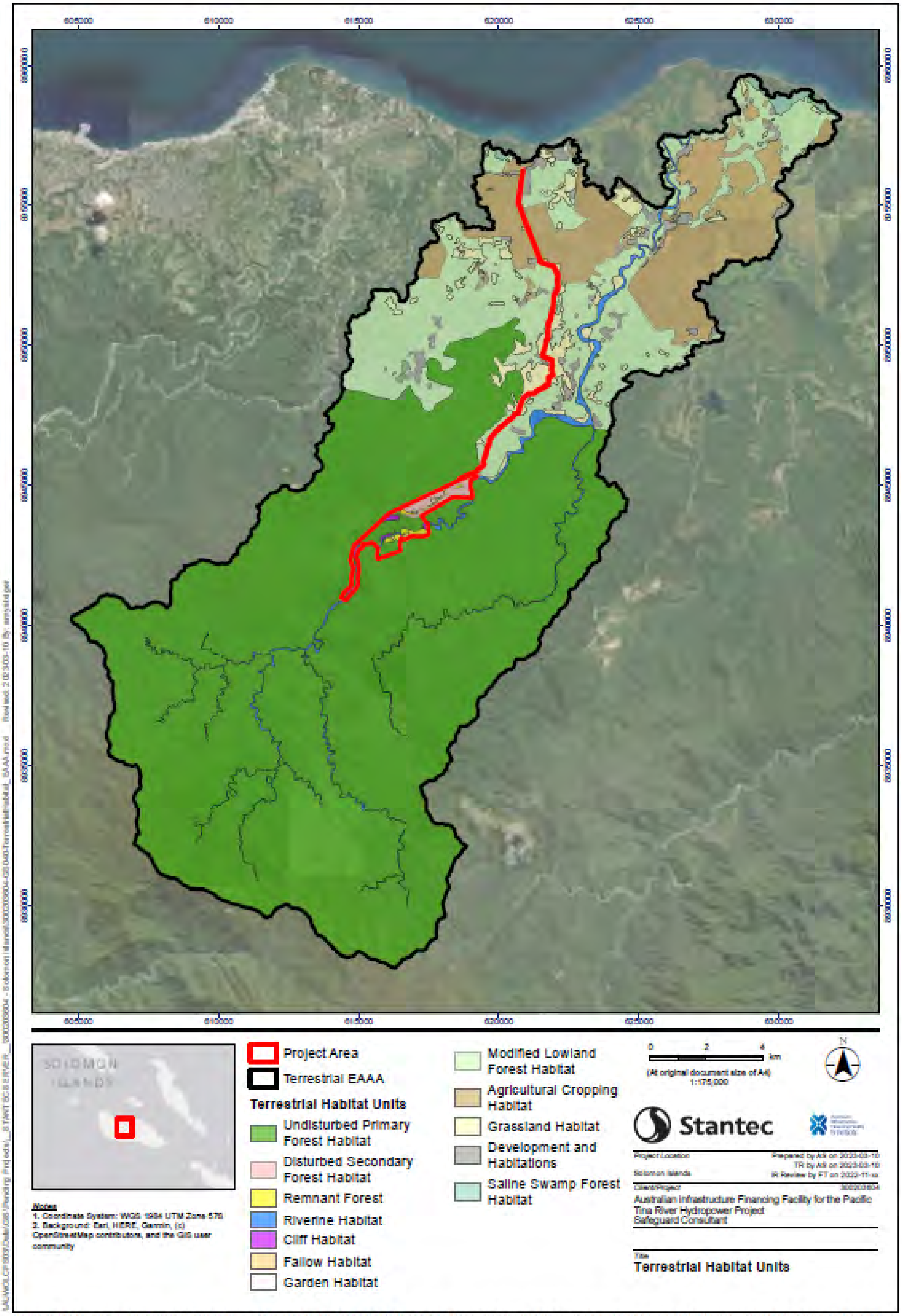

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Figure 3-2: Terrestrial EAAA and associated habitat units in relation to the Project Area.

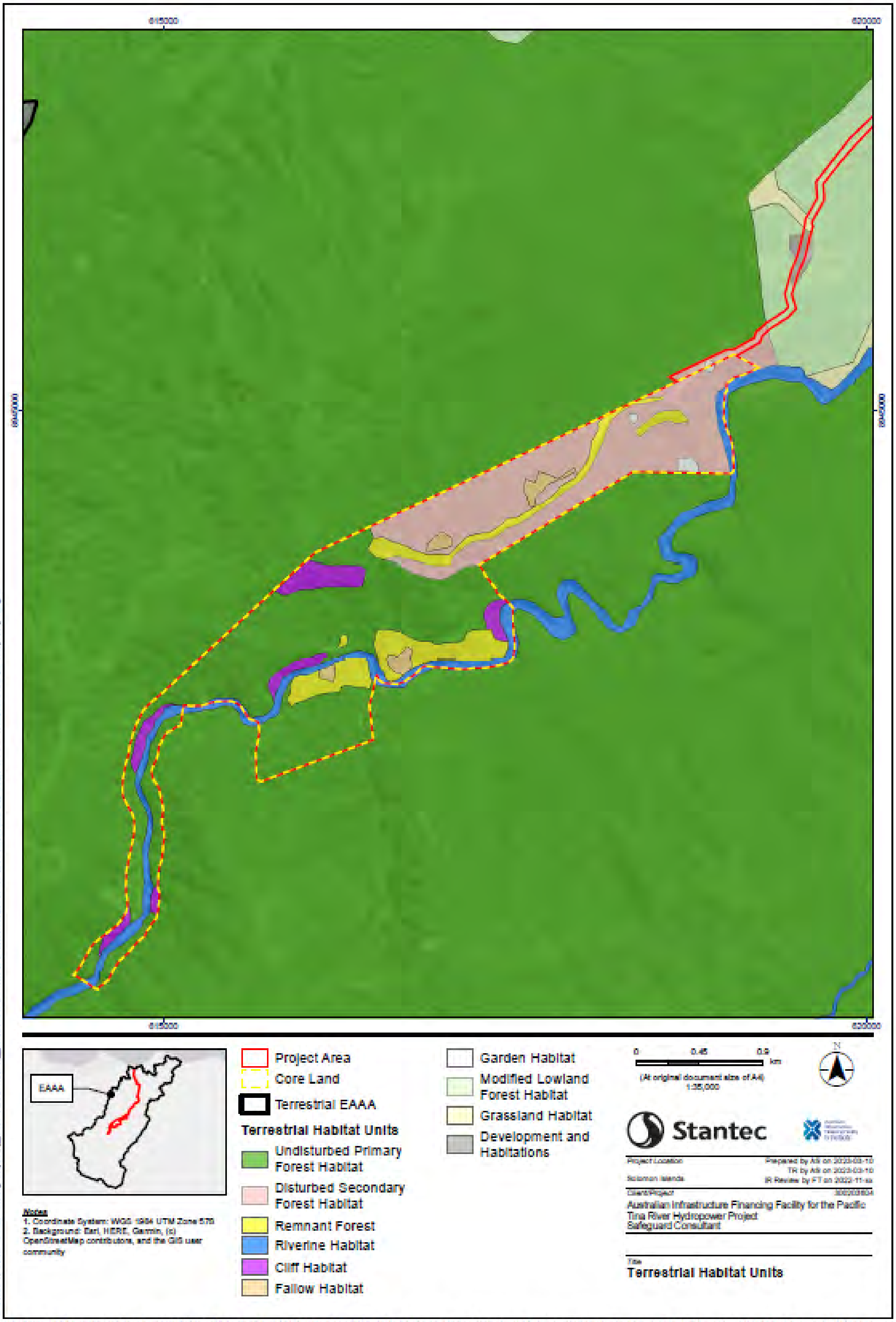

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Figure 3-3: Terrestrial habitat units within the Project Area and Core Land.

Table 3-1: Summary of terrestrial (T) habitat units within the EAAA, Project Area and Core Land.

Habitat Unit	Description (Source: TRHDP 2017; Pauku 2009)	Habitat Unit	Description (Source: TRHDP 2017; Pauku 2009)
Undisturbed Primary Forest Habitat 	Undisturbed Primary Forest habitat comprises forested areas that have almost no disturbance from human activities, are intact and considered in pristine condition. This includes Lowland (<600 m) and Montane Forest (>600 m). This habitat has high ecological and values, supporting a wide variety of species. Primary Undisturbed Forest is characterized by tall canopy trees, although regrowth species are common due to impacts from infrequent cyclones. Common species of Lowland Forest include *Ficus* sp., *Dysoxylum excelsum* and *Cyathea* sp. (Tree Fern), while Montane Forest comprises *Syzygium* sp., *Metrosideros* sp., *Ardisia* sp., *Ficus*, *Rhododendron*, *Dacrydium* spp., *Podocarpus pilgeri*.	**Disturbed Secondary Forest Habitat** 	Disturbed Secondary Forest Habitat comprises forested areas that have undergone relatively recent disturbance from human activities including logging and timber extraction, and is not as pristine, with regenerated shrub and tree growth. Due to these disturbances, this habitat has moderate ecological values, with key functions affected by deforestation and degradation. However, regeneration of shrubs and trees occurs rapidly where soil is available. These areas are dominated by regrowth species such as *Ficus* sp., *Pometia pinnata* and *Calophyllum* sp. Shrubs include *Macaranga* sp. Common non-indigenous species include *Alpinia purpurata*, and *Calamus* sp.
Remnant Forest Habitat 	Remnant Forest Habitat comprises forested areas that have undergone extensive disturbance although still support remaining large trees such as *Canarium* sp. nut trees. This habitat supports a variety of species but is modified by anthropogenic activities and has moderate ecological values. Increasing light has also modified plant composition beneath the canopy.	**Riverine Habitat** 	Riverine Habitat (including Riparian Habitat) is associated with Tina River and associated waterways. This habitat has high ecological values supporting species (including insects and amphibians) that are dependent on the riverine environment, particularly in the upper catchment (considered pristine). Flows and substrates are variable in the upper catchment (large boulders and pebbles), becoming more homogenous (sand and gravel) in the lower catchment (refer to Section 3.2). These areas may support epiphytic plants and orchids, vines (climbers and creepers shrubs) as well as fern trees in limited areas of the Tina River; however, the typically steep slopes are usually characterised by forest.
Cliff Habitat 	Cliff Habitat occurs on and adjacent to very steep vertical slopes, typically adjacent to the river system. This habitat may be fed by smaller tributaries and waterfalls. It has high ecological values as it hosts unique species that may utilise the cliffs for foraging and breeding. They are also relatively pristine and have not been modified. Vegetation commonly found in these areas comprises ferns, figs, palms and epiphytic orchids. Specific indicator species of Cliff Habitat includes *Pholidota* sp., *Macaranga* sp., *Timonius timon*, and *Alpinia purpurata*.	**Fallow Habitat** 	Fallow Habitat are areas that have been cultivated in the past but have been left to fallow. This habitat is similar to Remnant Forest; however, has undergone complete cultivation and has subsequently been left to fallow or regrow. It has low ecological values and hosts minimal species.
Garden Habitat 	Garden Habitat comprises smaller areas of cultivated areas for food crops. Garden Habitat is of low ecological value and is heavily modified. However, it may provide foraging habitat for opportunistic species such as reptiles and insects.	**Modified Lowland Forest Habitat** 	Low-lying areas (typically <100 m asl) comprising forest trees (often re-growth or secondary species), fruit and invasive species. It has comparatively lower ecological values due to disturbance activities and habitations.
Agricultural Cropping Habitat 	Agricultural Cropping Habitat comprises large expanses of agricultural lands in low-lying areas, and includes cultivated crops, grasses, or palm oil plantations. This habitat is of low ecological value as they have been heavily modified and comprise homogenous cultivations.	**Development and Habitations** 	Development and Habitations, referring to habitats within and surrounding villages, including roads and access tracks. Domesticated animals may also be associated with this habitat and can threaten native wildlife, while invasive plant species (such as *Mikania micrantha*) can also proliferate these areas. This habitat has low ecological values as it is heavily modified.
Grassland Habitat 	Grassland Habitat comprises areas dominated by grasses that cover low lying hills. This habitat is of low to moderate ecological value and is typically modified, located adjacent to roads or habitations. Common species include *Pennisetum polystachyon*, *Pueraria lobata*, *Sida rhombifolia* and *Mimosa pudica*. The invasive species *Mikania micanthra* is also usually present.	**Saline Swamp Forest Habitat** 	Saline Swamp Forest Habitat is subject to tidal influence in low-lying areas in proximity to the coast, occurring in estuaries and along the foreshore. This habitat has specific values associated with the coastal/estuarine environment and may be subject to anthropogenic disturbance. Examples of common species include *Barringtonia asiatica*, *Calophyllum inophyllum*, *Casuarina equisetifolia*, and *Pandanus* spp., and species of mangroves.

Note that detailed habitat mapping is unavailable for the broader terrestrial EAAA, and habitat classification has been based on the satellite imagery layer (Sentinel-2 10 m land cover time series).

3.2 Aquatic EAAA, Riverine Habitat and Reaches

The EAAA for aquatic biodiversity values that was derived for the Project consists of the entire Tina River. This includes four sub-catchments that extend from the upper catchment of the Tina and Toni Rivers to the coast of the Ngalimbiu River, comprising a total area of 538.06 ha (Figure 3-4). The Tina River has a larger upper catchment and is a more substantial system than the Toni River, the confluence of which becomes the Ngalimbiu River, before flowing out to meet the ocean (Figure 3-4).

The river systems have been separated into reaches (Figure 3-4) according to elevation within the catchment and disturbance (Table 3-2). The Upper and Mid Riverine Reaches of the Tina and Toni Rivers are relatively pristine, and are characterised by a diverse range of habitats, substrates, and flows, and are typically surrounded by Undisturbed Primary Forest. There are faster flowing riffles in the upper catchment, with the prevalence of larger boulders and with limited submerged vegetation (FRC environmental 2021; 2022).

Downstream in the Ngalimbiu River flows are more moderate, with the riverbed comprising finer material, characterised by emergent vegetation and invasive species, and limited habitat diversity. This is associated with a higher level of anthropogenic disturbance from habitations and agriculture, including intensive fishing practices closer to the coast (FRC environmental 2021; 2022).

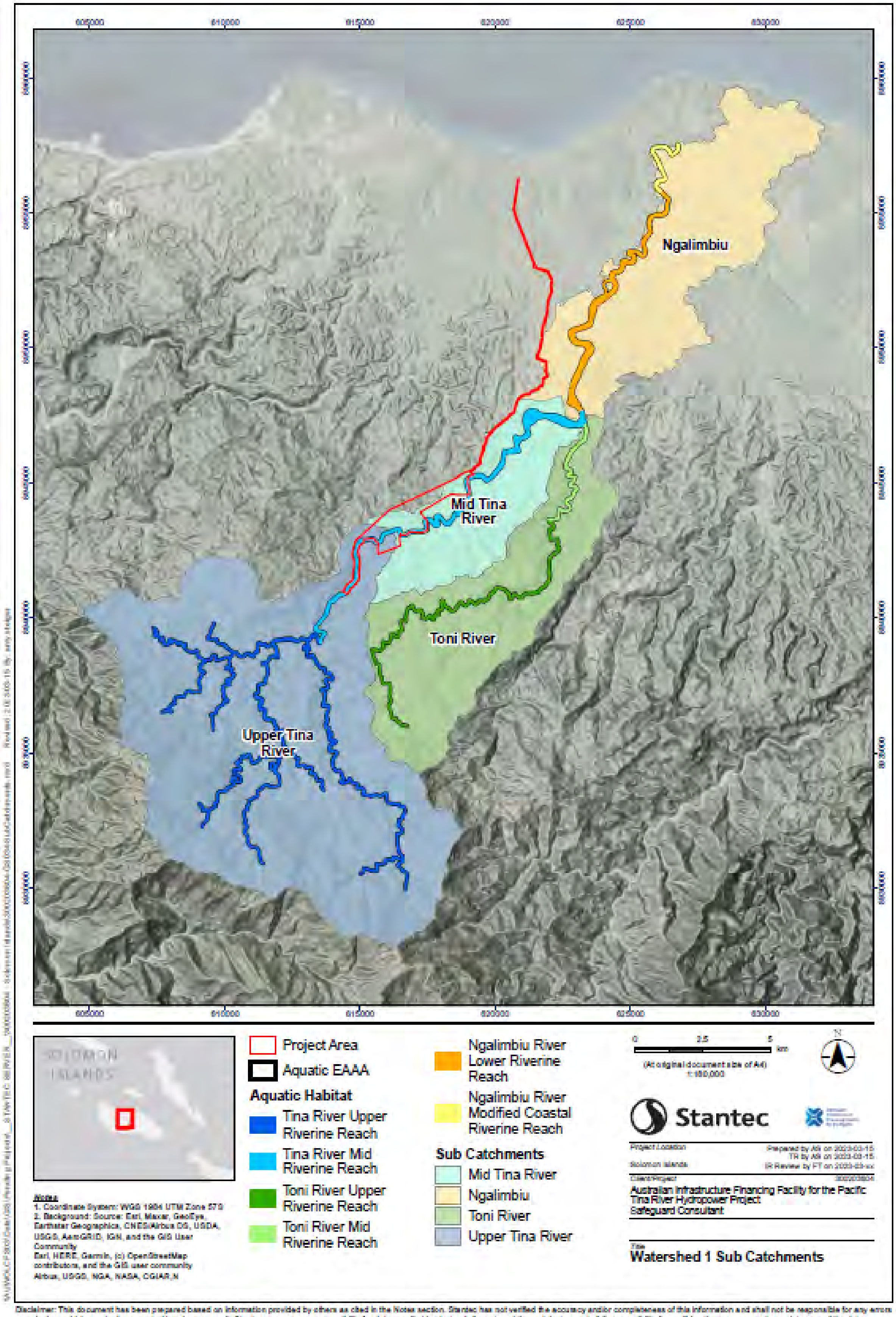


Figure 3-4: Riverine reaches of the aquatic EAAA showing sub catchments of the Tina, Toni, and Ngalimbiu Rivers, in relation to the Project Area.

Table 3-2: Summary of aquatic (A) riverine reaches within the EAAA for the Tina, Ngalimbiu, and Toni Rivers.

River System	Riverine Reach	Description (Source: FRC environmental 2022)
Tina River	**Upper Riverine Reach** 	The Upper Riverine Reach of the Tina River comprises numerous smaller, narrow tributaries (approximately 10 m wide), which converge into a well-defined channel (up to 35 m wide), has stable banks and steep-sided slopes. The river and its tributaries are a perennially flowing waterway, which varies over the wet and dry seasons. High quality habitat in the upper catchment is attributed to diverse substrate (large boulders, cobbles, small pebbles, sand, and gravel), flow, depth, and surrounding native vegetation (native forest). The area is pristine, which corresponds to high ecological values that support rich macroinvertebrate and fish communities.
	Mid Riverine Reach 	The Mid Riverine Reach of the Tina River comprises a well-defined channel (up to 50 m wide)), which is mildly braided, with irregular meanders and low, stable banks with low to steep-sided slopes. The river is a perennially flowing waterway, which varies over the wet and dry seasons. High quality habitat is attributed to diverse substrate (large boulders, cobbles, small pebbles, sand, and gravel), flow, depth, and surrounding native vegetation (native forest). The mid catchment area is relatively pristine, upstream, becoming more disturbed downstream, which corresponds to moderate to high ecological values that can support rich macroinvertebrate and fish communities.
Ngalimbiu River	**Lower Riverine Reach** 	The Lower Riverine Reach of the Ngalimbiu River comprises a well-defined channel (up to 80 m wide), which has highly stable low banks. The river is a perennially flowing waterway, which varies over the wet and dry seasons. Habitat comprises mostly cobbles, pebbles sand and gravel, with native forest surrounds interspersed with invasive shrub and grass species. Anthropogenic disturbance in the lower catchment is higher with habitations and cropping or plantations becoming more prevalent. This corresponds to moderate to lower ecological values and less diverse macroinvertebrate and fish communities.
	Coastal Riverine Reach 	The Coastal Riverine Reach of the Ngalimbiu River comprises a well-defined channel (up to 70 m wide), which has highly stable low banks. The river is a perennially flowing waterway, which varies over the wet and dry seasons. Habitat transitions to from smaller pebbles and sand to silt and sand closer to the coast. There is a higher level of anthropogenic disturbance of the surrounding land, while this part of the river is subject to intense fishing practices, with the pest species mosquitofish also known this area. This corresponds to lower ecological values and less diverse macroinvertebrate and fish communities.
Toni River	**Upper Riverine Reach** 	The Upper Riverine Reach of the Toni River likely comprises similar characteristics to the upper catchment of the Tina River and is in largely pristine condition, with surrounding native vegetation (including forest and riparian species). Substrate composition, flow and depth vary, with channel width less than the Tina River (<30 m wide). As the upper catchment area is largely undisturbed, this corresponds to high ecological values that are likely to support rich macroinvertebrate and fish communities.
	Mid Riverine Reach 	The Mid Riverine Reach of the Toni River likely comprises similar characteristics to the mid catchment of the Tina River. This part of the river is also subject to low to moderate disturbance from logging and habitations, with surrounding native vegetation (including forest and riparian species), with a low density of weeds. Substrate composition, flow and depth vary, although typically there are fewer large boulders downstream, and the maximum channel with is approximately 30 m. Ecological values likely range from moderate to high and can also support rich macroinvertebrate and fish communities.

3.3 Summary of Significant Communities and Species

The detailed ecology review of terrestrial and aquatic biodiversity values is presented in Annex P-2-2, based on publicly available literature and data and surveys commissioned for the Project, as well as consultation with relevant experts. A total of 275 terrestrial flora species and 163 fauna species have been recorded, or are considered likely to occur, in the Project Area. In comparison, from the Tina and Ngalimbiu River system, a total of 134 algae, 14 macrophytes, 143 macroinvertebrates (including 26 macrocrustaceans) and at least 125 fish species have been recorded.

Conservation significant communities and taxa identified during the ecology review are provided in Table 3-3 (terrestrial ecosystems) and Table 3-4 (aquatic ecosystems), and include IUCN listed species and those defined as trigger species (World Bank Group 2019). Key communities included the Solomon Islands Rainforest (Lowland and Montane Forest) (Figure 3-5), the Alliance for Zero Extinction (AZE) and Important Bird Areas (IBA), which occur in the Project Area and southern extent of the terrestrial EAAA, respectively (Figure 3-5).

A total of four plants (including Solomon Islands Rainforest flora), seven mammals, 14 birds, 16 amphibians and reptiles were also identified as potential terrestrial Critical Habitat trigger species (Table 3-3), while four macroinvertebrates, one macrocrustacean, and five fish taxa (including eDNA results) (Table 3-4) were identified as potential aquatic Critical Habitat trigger species. These conservation significant communities and taxa were subsequently screened against Critical Habitat criteria and thresholds (Annex P-2-2), in accordance with IFC GN6 (World Bank Group 2019), resulting in the final, reduced subset of trigger species presented in Section 4.

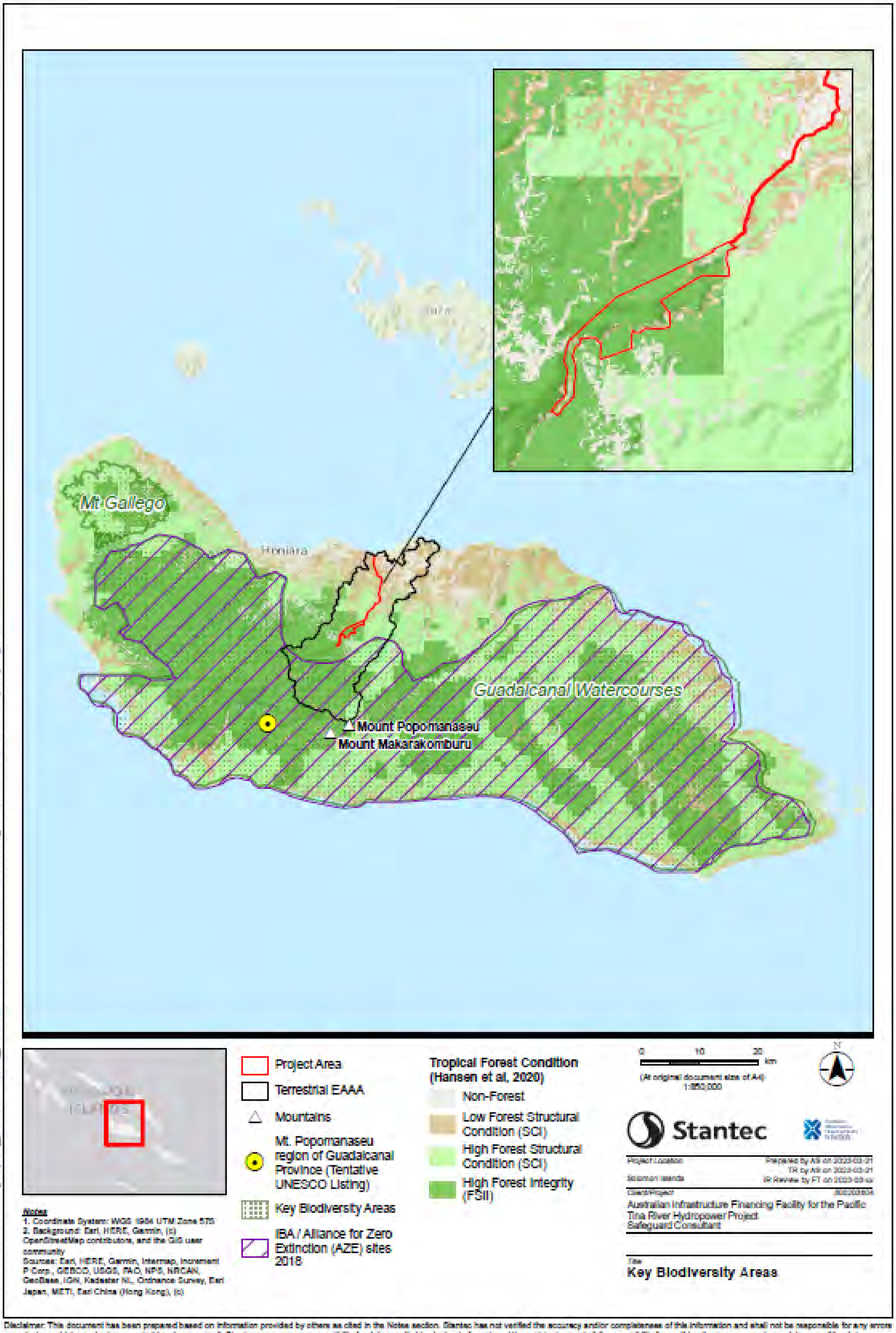


Figure 3-5: Map of KBAs, IBA and likely extent of Solomon Islands Rainforest (FSII) on Guadalcanal in the context of the Project Area (Source: http://www.keybiodiversityareas.org/site/mapsearch).

Table 3-3: Conservation significant vegetation communities, flora and fauna species identified from the ecology review, were considered for the CHA, in relation to the EAAA and Project Area.

Scientific Name	Common Name	IUCN Status[2]	Habitat Type[3]	Known Distribution [4]	Restricted Range[5],[6]	Records from within the Project Area
Vegetation Communities						
Solomon Islands Rainforest		N/A	UF, R	SI	N/A	This ecoregion includes Montane Forest and Lowland Forest, corresponding to Undisturbed Primary Forest habitat above and below 600 m asl (including Riparian Forest habitat). In the Project Area, due to lower elevation, this corresponds to Primary Undisturbed Forest Habitat (Lowland Forest).
Flora						
Calophyllum vitiense	Calophyllum	LC	UF, DF	-	Yes, EOO ~ 23,980 km^2	Recorded during pre-clearance surveys for Access Road Lot 2-2 and Lot 2-3.
Actinodaphne solomonensis+	Actinodaphne+	CR	UF, DF	-	Yes, EOO ~ 4 km^2	Recorded during the ESIA 2017 biodiversity surveys at the Power Plant 2 site and recorded during Myknee Ecological Consulting's Terrestrial Biodiversity and Critical Habitat Revision Survey in 2020.
Cryptocarya medicinalis+	Cryptocarya+	CR	UF, DF	SI	Yes, EOO ~ 4 km^2	Recorded during the ESIA 2017 biodiversity surveys at the Power Plant 2 site and recorded during Myknee Ecological Consulting's Terrestrial Biodiversity and Critical Habitat Revision Survey in 2020.
Pterocarpus indicus+	Rosewood+	EN	UF	-	DD	Recorded during the ESIA 2017 biodiversity surveys at the Access Road 2, Access Road 3, Cliff 2, Upper Stream 1, Upper Stream 3 and recorded during Myknee Ecological Consulting's Terrestrial Biodiversity and Critical Habitat Revision Survey in 2020 and HEC 2021 survey. Recorded during pre-clearance surveys.
Mammals						
Uromys porculus	Guadalcanal Rat	CR	UF	G	Species is endemic to Guadalcanal therefore extent of occurrence is assumed to be 5,302 km^2	No, unlikely to occur. Not recorded since 1888 (Oceania 2019),
Pteralopex atrata	Guadalcanal Monkey-faced Bat	EN	UF, GH	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km^2.	Likely to occur. Elevational limit <400 m and it has been recorded approx. 20 km from site 2016–2019) (Oceania 2019).
Uromys rex	King Rat	EN	UF	G	Yes, EOO is estimated to be ~5000 km^2.	Likely to occur. Signs recorded 6 km from site in 2015 (Oceania 2019). FCP (C3) – Likely. Captured in 1987 and 1989 in Poha Valley, Poha River Catchment and Gold Ridge (Matepono River catchment). Matepono River catchment is immediately east of Tina River Catchment.
Dobsonia inermis	Solomons Bare-backed Fruit-bat	LC	UF, DF, GH	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km^2.	Likely to occur. Recorded approx. 20 km from site 2016–2019) (Oceania 2019).
Pteropus woodfordi	Dwarf Flying-fox	LC	UF, DF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km^2.	Likely to occur. Recorded approx. 20 km from site 2016–2019) (Oceania 2019).
Hipposideros dinops	Fierce Leaf-nosed Bat	VU	UF	Indonesia, Papua New Guinea Solomon Islands	DD; The Fierce Leaf-nosed Bat is not endemic to Solomon Islands as IUCN (2023) notes that this species is present on the islands of Bougainville (Papua New Guinea), Choiseul, New Georgia, Nggatokae Island, Santa Isabel, San Jorge, and Malaita (all in the Solomon Islands). This species extent of occurrence is unknown.	Likely (recorded approx. 20 km from site 2016–2019).
Melonycteris fardoulisi	Fardoulis' Blossom Bat	NT	UF, DF, GH	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km^2.	Likely to occur. Recorded approx. 20 km from site 2016–2019) (Oceania 2019).

[2] Conservation status is a per IUCN 2022. The IUCN Red List of Threatened Species. Version 2022-1. <https://www.iucnredlist.org>
[3] As defined in Section 4.2.1 and based on habitat mapping prepared by Myknee 2020. UF= Undisturbed Primary Forest, DF = Disturbed Secondary Forest, R = Riparian, RF= Remnant Forest, FH = Fallow Habitat, GH = Garden Habitat, C = Cliff Habitat
[4] SI = Solomon Islands, G = Guadalcanal
[5] Restricted range definition is equivalent to 'endemicity' for terrestrial vertebrates and plants and is defined as those species having an Extent of Occurrence (EOO) of less than 50,000 km^2 (World Bank Group 2019). Solomon Islands total area is 28,896 km^2.
[6] EOO data from IUCN 2022.
+ Indicates species associated with Solomon Islands Rainforest ecoregion.

Scientific Name	Common Name	IUCN Status[2]	Habitat Type[3]	Known Distribution [4]	Restricted Range[5,6]	Records from within the Project Area
Avifauna						
Ceyx nigromaxilla	Guadalcanal Dwarf Kingfisher	LC	UF, DF	G	Yes, species is endemic to Guadalcanal therefore extent of occurrence is assumed to be 5,302 km².	Recorded during ESIA Scoping Study at Res 3, Dam 4. Observed during FCP:C3.
Coracina papuensis elegans	White-bellied Cuckooshrike	LC	UF, DF, R, GH, FH	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Recorded at TL4 and Kambi Tabu site during biodiversity survey. Call and flyover in vicinity of Lot 1 area during and recorded in Lot 2-2 and Lot 2-3 during pre-clearance surveys.
Eurystomus orientalis solomonensis	Oriental Dollarbird	LC	DD	SI	Sub-species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Not recorded during surveys.
Cacomantis variolosus addendus	Brush Cuckoo	LC	DD	SI	Sub-species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Not recorded during surveys.
Centropus milo	Buff-headed Coucal	LC	UF, DF, R, GH	SI	Yes, EOO is estimated to be 46,900 km².	Recorded during ESIA Scoping Study at TL3, TL4, TL5, Acc.1, PP1, Dam2 and at the power house site during Myknee Ecological Consulting's survey and recorded during pre-clearance surveys at the Magazine area, disposal area 2 and 3, Lot 2-2, Lot 2-3.
Guadalcanaria inexpectata	Guadalcanal Honeyeater	LC	UF (montane)	G	Yes, EOO is estimated to be 1,400 km²	Recorded during pre-clearance surveys at Powder Magazine Area, DA-2 and 3, Lot 2-1 and Lot 2-3. Biodiversity element triggering KBA criteria.
Myzomela melanocephala	Black-headed Myzomela	LC	UF, GH	SI	Yes, EOO is estimated to be 10,200 km².	Recorded during ESIA scoping study at Dam2, Dam4, Upp.2. Observed during FCP:C3.
Pachycephala implicata	Guadalcanal Hooded-Whistler	LC	UF	G	Yes, EOO is estimated to be 930 km²	Recorded during Myknee Ecological Consulting's survey at Reference Site. Observed during pre-clearance survey carried out by Hyundai in 2021.
Pachycephala pectoralis cinnamomea	Golden Whistler	LC		SI	Sub-species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Recorded during ESIA scoping study at PP2, Res.2, Res.4, Dam2.
Hypotaenidia philippensis christophori	Buff-banded Rail	LC	DD	SI	Sub-species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Recorded during the scoping survey at TL3.
Hypotaenidia woodfordi	Guadalcanal Rail	LC	UF, GH	G	Yes, EOO is estimated to be 6500 km².	Observed during Entura 2011 biodiversity survey (TL1 and TL3) and ESIA scoping study (TL1 and TL3). Observed during preclearance surveys in Lot 2-1 and Lot 2-2.
Ninox jacquinoti granti	Guadalcanal Boobook	NT	UF, DF	Papua New Guinea (Bougainville) Solomon Islands	Yes, EOO is estimated to be 6600 km².	Recorded during Myknee Ecological Consulting's survey at the Reference Site. Presence recorded during preclearance surveys at Powder Magazine Area , DA-2, DA-3, Lot 2-1 and Lot 2-3.
Ducula brenchleyi	Chestnut-bellied Imperial Pigeon	NT	UF, DF, R	SI	Yes, EOO is estimated to be 38,500 km².	No recorded occurrences within Project Area but is considered 'likely' to occur.
Zosterops rendovae	Grey-throated White-eye	LC	UF	Papua New Guinea (Bougainville) Solomon Islands	Yes, EOO is estimated to be 11,300 km2.	No recorded occurrences in the Project Area but considered likely to occur.
Reptiles and Amphibians						
Acutotyphlops infralabialis	Red Blind Snake	DD	UF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Not recorded during surveys.
Ramphotyphlops becki	Beck's Blind Snake	DD	UF	G	Species is endemic to Guadalcanal therefore extent of occurrence is assumed to be 5,302 km²	Not recorded during surveys.
Cornufer bufoniformis	Warty Webbed Frog	LC	UF, DF, R, W, GH	Papua New Guinea (Bougainville) Solomon Islands	Yes, EOO is estimated to be 28,226 km².	Recorded during Myknee's survey at Vurapokilo Stream. Call heard during pre-clearance surveys.
Cornufer malukuna	Malukuna Webbed Frog	LC	UF, DF, R, W	G	Yes, EOO is estimated to be 27,175 km2.	Recorded during biodiversity surveys at Upp.2, Camp #1, Vurapokilo Stream.

Scientific Name	Common Name	IUCN Status[2]	Habitat Type[3]	Known Distribution [4]	Restricted Range[5,6]	Records from within the Project Area
Cyrtodactylus biordinis	Guadalcanal Bow-fingered Gecko	LC	UF	G	Yes, EOO is estimated to be 5,336 km².	Not recorded during surveys.
Emoia flavigularis	Yellow-throated Skink	LC	UF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Observed during pre-clearance surveys at Lot 2-2, Lot 2-3.
Sphenomorphus bignelli	-	LC	UF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Not recorded during surveys.
Sphenomorphus concinnatus	Elegant Forest Skink	LC	UF, DF, GH	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Not recorded during surveys.
Sphenomorphus cranei	Crane's Skink	LC	UF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Not recorded during surveys.
Tribolonotus schmidti	Schmidt's Crocodile Skink	LC	UF	G	Species is endemic to Guadalcanal therefore extent of occurrence is assumed to be 5,302 km²	Recorded in the Powerhouse and tunnel area during pre-clearance surveys.
Salomonelaps par	Solomons Coral Snake (Solomons Red Krait)	LC	UF, GH	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Recorded in Lot 2-2, and Lot 2-3 during pre-clearance surveys.
Hypsilurus macrolepis	Solomons Tree Dragon	NT	UF, GH	SI	Species only known from Makira and associated islands and is likely a misidentification.	Recorded at Vurapokilo Stream during biodiversity surveys, however this is likely a misidentification, with reptile distribution in the Solomon Islands relatively well known.
Cyrtodactylus salomonensis	Solomons Bent-toed Gecko	NT	UF	SI	Yes, EOO is estimated to be 9,999 km².	Recorded at Vurapokilo Stream (upper area) during biodiversity surveys and recorded in Lot 2-2 and Lot 2-3 during pre-clearance surveys.
Corucia zebrata	Prehensile-tailed Skink (Solomon Island Prehensile-tailed Skink)	NT	UF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Not recorded during surveys.
Loveridgelaps elapoides	Solomon's Small-eyed Snake	VU	UF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Not recorded during surveys but considered likely as per the FCP.
Cornufer myersi	Myers Wrinkled Ground Frog	LC	UF	SI	Yes, EOO is estimated to be 4,300 km².	Not recorded during surveys.

Table 3-4: Conservation significant aquatic biota species identified from the ecology review, which were considered for the CHA, indicating records from the Project Area.

Scientific Name	Common Name	IUCN Status	Habitat Type (migration pattern)	Known Distribution	Restricted Range / New Records*	Local Records and Habitat (FRC 2021; 2022; Golder Associates 2009; Albert *et al.* 2016)
Macroinvertebrates						
Orphninotrichia sp. 1	Trichoptera; caddisflies	Not evaluated	Freshwater	Australia	Yes	Upper and mid reaches of the Tina River (relatively pristine), supporting diverse habitats
Prosopistoma sedlaceki	Ephemeroptera; mayflies	Not evaluated	Freshwater	New Guinea and Solomons (Guadalcanal)	Yes	Upper and mid reaches of the Tina River and Sutakama Rivers (relatively pristine), supporting diverse habitats
Rhagovelia brownii	Hemiptera; true bugs	Not evaluated	Freshwater	Endemic to Guadalcanal	Yes	Upper reach of the Tina River (relatively pristine), supporting diverse habitats. Other records from rivers in mid to lower catchments on Guadalcanal (within 60 km)
Xylochironomus sp. 1	Chironomidae; nonbiting midges	Not evaluated	Freshwater	Australia	Yes	Upper reach of the (relatively pristine), supporting diverse habitats
Crustaceans						
Caridina intermedia	Freshwater prawn	Not evaluated	Marine; freshwater; brackish	Solomon Islands (Choiseul, Guadalcanal, Isabel, Kolombangara, Vella Lavella); PNG (New Britain)	No	Mid to lower reaches of the Tina/Ngalimbiu River system and more broadly across Guadalcanal and along the coast
Fish						
Hypseleotris cf *guentheri*	Gudgeon	Not evaluated	Marine; freshwater; brackish (amphidromous)	Solomon Islands and PNG	No	Mid to lower reaches of the Tina/Ngalimbiu River system, mid reach of the Sutakama River and Matepono River on Guadalcanal
Rhyacichthys guilberti	Loach goby	DD	Marine; freshwater; brackish (amphidromous)	New Guinea, Solomon Islands and Vanuatu	No	Upper to lower reaches of the Tina/Ngalimbiu River system and Matepono River on Guadalcanal
Schismatogobius essi	Goby	Not evaluated	Freshwater+	Solomon Islands and West New Britain (PNG)	No	Mid to lower reaches of the Tina River and upper reach of Sutakama River
Schismatogobius hoesei	Scaleless goby	LC	Freshwater+	NW Australia, Papua New Guinea and Solomon Islands	No	Mid reach of Tina River and upper reach of Sutakama River
Schismatogobius vanuatuensis	Vanuatu Schismatogobius	DD	Freshwater+	New Guinea, Solomon Islands and Vanuatu	No	Upper and mid reaches of the Tina River system

Note * indicates based on available data and literature and following precautionary approach. + distribution extends beyond the Solomon Islands and limited information suggests these are known migratory (diadromous) species.

4. CRITICAL HABITAT ASSESSMENT

4.1 Terrestrial Critical Habitat Assessment

Based on the screening process against the IFC GN6 (World Bank Group 2019) criteria and thresholds (Annex P-2-2), one vegetation community (Solomon Islands Rainforest), three flora (*Actinodaphne solomonensis, Cryptocarya medicinalis and Pterocarpus indicus*), two avifauna (*Guadalcanaria inexpectata* and *Pachycephala implicata*) and one bat (*Pteralopex atrata*), species triggered Critical Habitat (Table 4-1, Figure 4-1).

The following classifications were applied in accordance with the IFC GN6 definitions for CHA (World Bank Group 2019) to the EAAA and Project Area:

- **Critical/** Natural Habitat, comprising areas that are largely pristine (including the Solomon Islands Rainforest ecoregion), or have only been slightly disturbed due to logging, although still support primary ecological function and terrestrial species composition. This includes Undisturbed Primary Forest, Remnant Forest, and Cliff Habitat, supporting trigger species including Actinodaphne (*Actinodaphne solomonensis*), Cryptocarya (*Cryptocarya medicinalis),* Rosewood (*Pterocarpus indicus*), King Rat (*Uromys rex*), Guadalcanal Honeyeater (*Guadalcanaria inexpectata*) and Guadalcanal Hooded-Whistler (*Pachycephala implicata*) (Table 4-1).
- **Critical/** Modified Habitat, comprising Disturbed Secondary Habitat in the Project Area, which while subject to logging activities, still supports trigger species including Actinodaphne (*Actinodaphne solomonensis*), Cryptocarya (*Cryptocarya medicinalis),* and Rosewood (*Pterocarpus indicus*) and Guadalcanal Monkey-faced Bat (*Pteralopex atrata*) (Table 4-1).
- Modified Habitat, comprising areas that have been subject to anthropogenic disturbance including logging or agriculture activities, and development, resulting in substantial modification of primary ecological function and terrestrial species composition. This includes Fallow, Garden, Modified Lowland Forest, Agricultural and Cropping, Development and Habitations, Grassland and Saline Swamp Forest Habitats, which do not support trigger species (Table 4-1).

The CHA and trigger species were subsequently used to inform management and mitigation of terrestrial biodiversity values that may be impacted by the Project (Section 5).

Table 4-1: Summary of the Terrestrial (T) CHA for the Project, according to habitat unit and conservation significant communities and species.

Habitat Assessment	Habitat Unit	Justification for Assessment	Communities or Species Triggering Critical Habitat	Total TEAAA (ha)	Total Project Area (ha)	Total Area Core Land (ha)
Critical/Natural	Undisturbed Primary Forest	• Supports undisturbed forest with intact canopy in pristine condition that provides habitat for a range of trigger species	Vegetation • Solomon Islands Rainforest Flora • Actinodaphne (*Actinodaphne solomonensis)* • Cryptocarya (*Cryptocarya medicinalis*) • Rosewood (*Pterocarpus indicus*) Fauna • King Rat (*Uromys rex*) • Guadalcanal Honeyeater (*Guadalcanaria inexpectata*) • Guadalcanal Hooded-Whistler (*Pachycephala implicata*)	22,421.60	184.21	184.21
Critical/Modified	Disturbed Secondary Forest	• Supports mid-succession secondary forest with intact canopy that provides habitat for a range of trigger species; however, has been subject to logging activities	Flora • Actinodaphne (*Actinodaphne solomonensis)* • Cryptocarya (*Cryptocarya medicinalis*) • Rosewood (*Pterocarpus indicus*) Fauna • Guadalcanal Monkey-faced Bat (*Pteralopex atrata*)	127.11	123.47	119.67
Critical/Natural	Remnant Forest	• Supports mature Ngali nut trees that provide habitat for trigger species	Fauna • King Rat (*Uromys rex*)	44.92	44.92	44.92
Critical/Natural	Cliff Habitat	• Supports unique ecosystems niche habitats and refugia for potential trigger species	Flora • Cryptocarya (*Cryptocarya medicinalis*)	21.79	21.79	21.79
Modified	Fallow Habitat	• Comprises minor areas of modified habitat that is unlikely to support trigger species	• N/A	8.07	8.07	8.07
Modified	Garden Habitat	• Comprises minor areas of modified habitat that is unlikely to support trigger species	• N/A	2.27	2.27	2.05
Modified	Modified Lowland Forest Habitat	• Comprises modified habitat of regrowth or secondary species and weeds that is unlikely to support trigger species	• N/A	5,355.18	13.22	0.00
Modified	Agricultural Cropping Habitat	• Comprises homogenous cultivations that are unlikely to support trigger species	• N/A	3,570.56	10.50	0.00
Modified	Development and Habitations	• Comprises heavily modified areas for habitation, with invasives and domesticated animals, unlikely to support trigger species	• N/A	548.66	8.75	0.00
Modified	Grassland Habitat	• Comprises grasses typically near roads or habitations with invasives, unlikely to support trigger species	• N/A	842.35	32.16	0.00
Modified	Saline Swamp Forest	• Subject to tidal influence and marine connectivity, with anthropogenic disturbance, unlikely to support trigger species	• N/A	135.68	0.00	0.00
TOTAL				**33,078.18**	**449.37**	**380.72**
TOTAL CRITICAL HABITAT				**22,615.42**	**374.40**	**370.60**

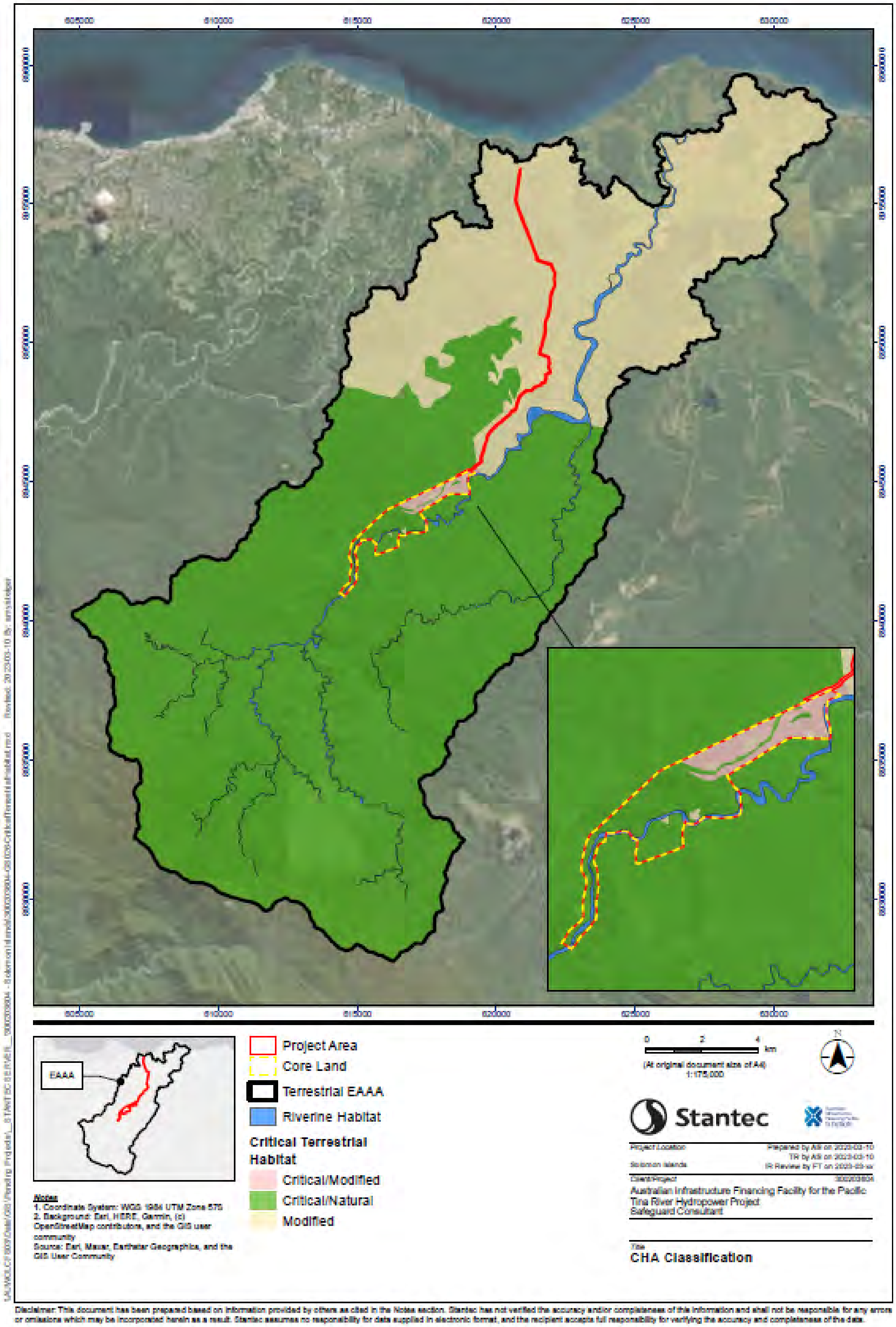


Figure 4-1: Terrestrial Critical, Natural and Modified Habitat within the terrestrial EAAA.

4.2 Aquatic Critical Habitat Assessment

Based on the screening process against the IFC GN6 (World Bank Group 2019) Thresholds and Criteria (Annex P-2-2), a total of four macroinvertebrate taxa (*Rhagovelia browni, Orphninotrichia* sp. 1, *Xylochironomus* sp. 1 and *Prosopistoma sedlaceki*) in the Tina River system triggered Critical Habitat (Table 4-2, Figure 4-2). Fish did not trigger Critical Habitat as there were no conservation significant listed species identified and the distribution of taxa was not restricted (Annex P-2-2).

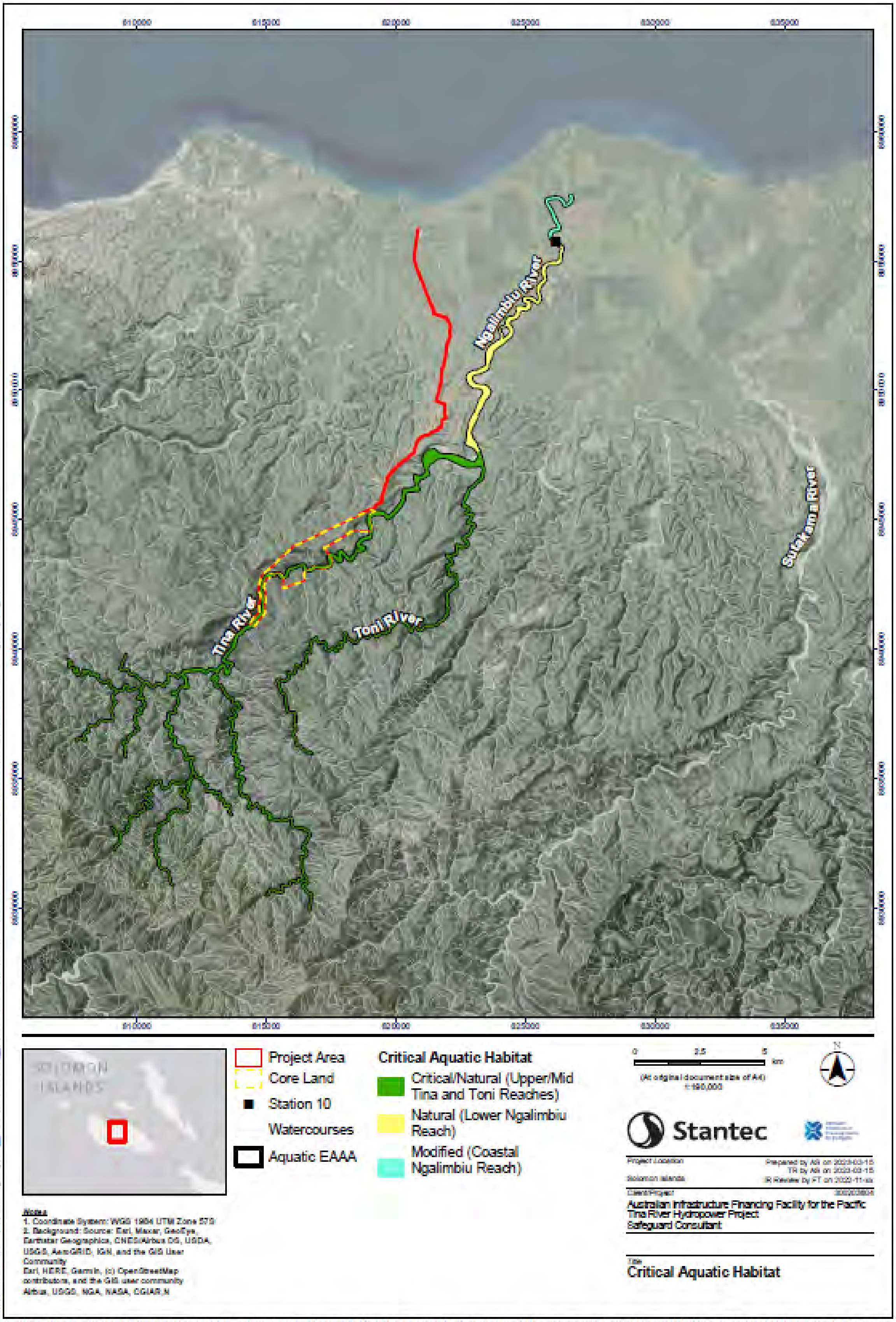
The following classifications were applied in accordance with the IFC GN6 definitions for CHA (World Bank Group 2019):

- **Critical** /Natural Habitat, comprising the Upper Reach and Mid Riverine Reaches of the Tina River and Toni River (outside of the Project Area), which are in largely pristine condition, and support diverse habitats surrounded by mostly intact forest. These reaches support primary aquatic functions and assemblages, and several restricted range (based on available data) macroinvertebrate trigger species including the caddisfly *Orphninotrichia* sp. 1, the true bug *Rhagovelia browni* and the non-biting midge *Xylochironomus* sp. 1 (nonbiting midges), mayfly *Prosopistoma sedlaceki* (Table 4-2).
- Natural Habitat, comprising the Lower Riverine Reach (outside of the Project Area), of the Ngalimbiu River. This section of the river is largely unmodified (although there is development in the surrounds) and mostly retains aquatic functions and composition; however, does not support trigger species (Table 4-2).
- Modified Habitat, comprising the Modified Coastal Riverine Reach of the Ngalimbiu River, which is heavily modified due to habitations and intensive fishing practices, with invasive weeds and mosquito fish (Table 4-2), and does not support trigger species.

The CHA and trigger species were subsequently used to inform management and mitigation of terrestrial biodiversity values that may be impacted by the Project (Section 5).

Table 4-2: Summary of the Aquatic (A) CHA for the Project, according to riverine reaches and conservation significant species.

River System	Habitat Classification	Riverine Reach	Justification for Assessment	Species Triggering Critical Habitat	Total AEAAA (ha)	Total Project Area (ha)c	Total Core Land (ha)
Tina River	**Critical/**Natural	Upper Riverine Reach	• Supports three trigger species of range restricted macroinvertebrates in high quality habitat (pristine), with diverse substrate (boulders, pebbles, and sand), flow, depth, and surrounding native forest vegetation	• *Rhagovelia browni* (true bug) • *Orphninotrichia* sp. 1 (caddisfly) • *Xylochironomus* sp. 1 (nonbiting midge)	152.98	0.00	0.00
	Critical/Natural	Mid Riverine Reach	• Supports one trigger species of range restricted macroinvertebrate high quality habitat (pristine), with diverse substrate (boulders, pebbles, and sand), flow, depth, and surrounding native forest vegetation	• *Prosopistoma sedlaceki* (mayfly)	165.13	28.24	28.24
Ngalimbiu River	Natural	Lower Riverine Reach	• Largely unmodified river habitat, with moderate to lower quality habitat (habitation and disturbance in surrounds), with more homogeneous substrate (sand and gravel), and some invasive vegetation	• NA	135.23	0.00	0.00
	Modified	Modified Coastal Riverine Reach	• Unlikely to support trigger species due to comparatively lower quality habitat (habitation and disturbance), more homogeneous substrate (sand and gravel), and invasive vegetation	• NA	18.94	0.00	0.00
Toni River	**Critical/**Natural	Upper Riverine Reach	• Likely to support trigger species of range restricted macroinvertebrates in similar habitat to upper and mid reaches of Tina River	• Likely supports above trigger species	43.23	0.00	0.00
	Critical/Natural	Mid Riverine Reach	• Likely to support trigger species of range restricted macroinvertebrates in similar habitat to mid reaches of Tina River (more disturbance from habitation and/or logging)	• Likely supports above trigger species	22.43	0.00	0.00
TOTAL					**537.94**	**28.24**	**28.24**
TOTAL CRITICAL HABITAT					**318.11**	**28.24**	**28.24**



Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Figure 4-2: Aquatic Critical, Natural and Modified Habitat within the aquatic EAAA.

5. MITIGATION, MONITORING AND OFFSETTING

5.1 Mitigation Hierarchy

The BMP for the Project follows the mitigation hierarchy (World Bank Group 2019) avoid, minimise, or mitigate impacts to biodiversity values and restore these values where possible. The following sections provide a summary of the Project impacts to terrestrial and aquatic biodiversity based on the CHA outcomes, with targeted mitigation and monitoring measures for implementation by the various stakeholders throughout the Project phases of construction and operation. While the majority of risks can be effectively mitigated, where residual impacts remain, offsetting is proposed (Annex P-2-3 and Annex P-2-4). Offsetting for terrestrial and aquatic biodiversity values for the Project has followed the principles of no net loss for Natural Habitat and net gain for Critical Habitat (World Bank Group 2019), in the form of land management and catchment conservation.

5.2 Project Impacts and Mitigation

Potential direct and indirect impacts of the Project on biodiversity values and corresponding appropriate mitigation and management measures are summarised in Table 5-1, dependent on phase (design, construction and operation).

Specific to terrestrial biodiversity values these impacts include:

- Loss of fauna and flora habitat or individuals, fragmentation, or modification from vegetation clearing;
- Loss of topsoil and erosion from vegetation clearing during construction;
- Injury or mortality of fauna individuals (fauna) due to vehicle strike or hunting and poaching;
- Light, noise, fugitive dust, and vibrations causing degradation of habitat or disrupting fauna behaviour;
- Pollution of soils and habitats with waste or contaminants during construction and operation;
- Illegal logging or induced clearing of Critical Habitat within Core Land;
- Spread of invasive species (weeds and animal pests) resulting in reduced native vegetation cover or alteration of habitat; and
- Incomplete vegetation rehabilitation of temporary infrastructure areas.

Specific to aquatic biodiversity values these impacts include:

- Loss of habitat and species from the release of sediments or contaminants during construction and pollution of the Tina River (surface waters and sediments) during operation;
- Loss of habitat or species due to changes in e-flows downstream of the reservoir and dam during operation and subsequent changes to sedimentation;
- Fish entrapment or mortality, during migration from powerhouse turbines;
- Creation of a physical barrier from the reservoir and dam to fish passage upstream and downstream to complete reproductive cycle; and
- Accidental or deliberate introduction of aquatic invasive species, resulting in degradation of habitat and loss of species.

The associated mitigation and management measures that have been developed for the potential risks and impacts, dependent on the phase of the Project, are presented in Table 5-1. Most of these measures will be implemented during the construction phase and continue into the operational phase of the Project, during which time, additional actions will also be introduced.

During the construction phase of the Project, key mitigation and offset measures for will comprise:

- Establishment of a Core Land Conservation Area and protection of the Upper Tina River catchment, to preserve and enhance biodiversity values;
- Monitoring and management of threatened species and habitats;
- Minimising clearance of habitat through careful design and best practice construction methods;
- Identifying and protecting flora and fauna through wildlife shepherding and salvage during clearance, and propagation of native plants for revegetation;
- Revegetation of 66.29 ha of cleared habitat associated with construction activities and temporary infrastructure;
- Implementing good industry practice in the form of construction environmental management (including erosion and sediment control, traffic management, hazardous chemical, and waste management), as detailed in the ESMPs.

During the operational phase, key mitigation and offset measures will include:

- Ongoing protection of the Core Land Conservation Area and Upper Tina River catchment, to preserve and enhance biodiversity values (refer TOMS and AOMS);
- Monitoring and maintenance of revegetated areas;
- Monitoring and management of threatened species and habitats;
- Implementing good industry practice in the form of environmental management (including speed limits, hazardous chemical, and waste management);
- Maintenance of e-flows in the dewatered section of the river; and
- Maintenance of upstream fish passage via a trap and haul system.

The detailed management of these impacts are also provided in the following ESMPs, and are cross referenced in Table 5-1 and comprise:

- Vegetation clearance: C-3 Forest Clearance Plan; C-4 Post Construction Rehabilitation and Revegetation Plan (PCRRP) and C-9 Spoil and Topsoil Management Plan.
- Management of hunting: P-3 Stakeholder Engagement Plan; P-5 Influx Management Plan; P-9 Workers Code of Conduct;
- Management of worker behaviour: P-9 Workers Code of Conduct; P-11 Traffic Management Plan;
- Access control: P-5 Influx Management Plan;
- Management of illegal logging: C-3 Forest Clearance Plan; P-3 Stakeholder Engagement Plan; P-5 Influx Management Plan;
- Topsoil management: C-9 Spoil and Topsoil Management Plan; C10 Drainage, Erosion and Sediment Control Plan;
- Management of invasive species: M-3 Fish, Algae, and Macro-invertebrate Monitoring Plan; M-5 Flora and Fauna Monitoring Plan;
- Biodiversity monitoring: M-1 Suspended Sediment Monitoring Plan; M-2 Water Quality Monitoring Plan; M-3 Fish, Algae, and Macro-invertebrate Monitoring Plan; M-5 Flora and Fauna Monitoring Plan; and
- Waste management: P-12 Waste Management Point Source Pollution Plan; P-13 Hazardous Material Management Plan; P-14 Spill Prevention and Emergency Response Plan.

Monitoring programs have been developed to assess the effectiveness of mitigation measures for terrestrial and aquatic biodiversity values, targeting conservation significant specie (Section 5.2). However, some residual impacts from the Project will remain from vegetation clearing and changes to the hydrological regime, discussed in Section 5.2.

Table 5-1: Terrestrial and aquatic biodiversity impacts, and associated mitigation and management measures for the Project, aligning with ESMPs or relevant annexes.

Action #	Project Impact / Stage C- Construction O - Operational	Management and Mitigation Actions and Measures	Timing and Frequency	Responsibility	Hierarchy	ESMP/ Annex
Terrestrial						
P-2-1	Habitat loss and loss of flora and fauna due to vegetation clearing (C)	• The design and placement of roads, temporary and permanent infrastructure will minimise the Project footprint to the extent possible, to minimise the extent (and cost) of vegetation clearance and earthworks, topsoil and spoil disposal. • Cut and fill areas will be designed to minimise the physical extent of works, with the use of geotechnical engineering, batter slopes and benching to ensure stability. • Temporary and permanent Project infrastructure will be sited away from areas of Critical Habitat and be concentrated in Modified Habitats to the extent possible. • Vegetation clearance will proceed on the basis of the requirements of C-3 FCP. This includes the need to prepare detailed maps and conduct Pre-Clearance Biodiversity Surveys within one month of the proposed vegetation clearance in each area, to identify and attempt to retain/avoid key species and habitats. • To the extent possible the following habitat features will be avoided during vegetation clearance through identification, demarcation and careful clearance and earthworks: o Threatened plant (i.e. Rosewood) and animal species (according to the IUCN Red List); o Important habitat such as significant food trees (e.g. ngali nit, strangler fig), nests and/or roosts, hollows, rocky outcrops; o Wetlands, waterways and/or standing water; o Other relevant habitat features, timber and non-timber forest products and items of cultural heritage significance. • A Final Clearance Plan will be prepared for each area showing the maximum extent of clearance, including trees and habitat to be avoided; any construction or temporal changes to avoid identified nests, breeding sites, or watercourses; and stockpile locations for waste vegetation, topsoil and spoil (on-site or at spoil disposal sites). • The full extent of vegetation clearance (as well as trees and habitat features to remain) will be clearly marked on the ground with boundary markers, flagging tape, fencing or similar. • Flora Salvage involving the collection of seeds and/or seedlings for propagation and replanting to be completed prior to clearing. • Undertake fauna salvage and shepherding as per C-3 FCP: Annex C-3-II Wildlife Shepherding Protocol. • Vegetation clearance during UXO clearance will be minimised and limited to small hand-held implements such as grubbers, machetes or loppers. No mechanised equipment such as chainsaws or bulldozers will be used.	Prior to and during construction	HEC Design Team, HEC HSE Manager	Avoid, Minimise	C-2 UXOMP C-3 FCP P-2 BMP Annex P-2-3 TOMS
P-2-2	Loss of topsoil and increased soil erosion due to vegetation clearing (C)	• Immediately prior to vegetation clearance, a Pre-Clearance Site Inspection will be undertaken with the to verify the area of clearance and any areas to be avoided as per C-3 FCP. • Topsoil will be stripped and stored separately at approved spoil disposal site for later re-use in site rehabilitation. • Subsoil and spoil will be reused onsite as fill material or disposed of at approved spoil disposal sites. Clearing operations will avoid the wet season (November to April) as much as possible to minimise the erosion hazard. • Erosion and sedimentation controls will be installed prior to vegetation clearance (or immediately following clearance when vegetation removal is required to install measures), in accordance with C-10 DESCP.	On day(s) of clearing, during construction	HEC HSE Manager	Avoid, Minimise	C-3 FCP C-10 DESCP
P-2-3	Illegal logging of trees/induced clearing within Core Land (C)	• Maintain 24/7 security presence at the entrance to Core Land to prevent unauthorised access. • Install surveillance cameras to monitor site access and potential illegal activities, including but not limited to the entrance to Core Land, the powerhouse and dam site. • Where necessary, request assistance from authorities (e.g. Solomon Islands Police Force) to evict unauthorised personnel from site. • Any areas where induced clearance occurs will be secured and revegetated at HEC's cost.	During construction	HEC Security Contractor SIPF	Avoid, Restore	P-7 SMP P-9 WCC
P-2-4	Direct mortality of fauna from vehicle strike or hunting/poaching (C, O)	• Trained spotters/catchers will be available to rescue, relocate and/or treat fauna due to injury. • Where an animal is identified, it will be given the opportunity to move by its own accord. Reasonable coercion (an action that spurs an animal on without injuring or harming it, such as using noise, light nudging of tree with machinery, pushing) can occur to encourage the animal to move. This should be carried out by spotter/catchers supervised by the nominated qualified person and not by general clearance personnel. • All vehicle movements will be confined to designated roads, access ways and work areas and must abide by speed limits as per P-11 (TMP) to minimise wildlife collisions. • Maintain 24/7 security presence at the entrance to Core Land to prevent unauthorised access. • Install surveillance cameras to monitor site access and potential illegal activities, including but not limited to the entrance to Core Land, the powerhouse and dam site. • Hunting/ collecting/ purchase of animals and plants will be monitored and controlled as per P-9 WCC.	During construction	HEC HSE Manager	Avoid, Minimise	C-3 FCP P-9 WCC P-11 TMP
P-2-5	Pollution of soil and terrestrial habitats (C, O)	• Waste minimization and reduction practices will be adopted, including awareness on the 3Rs (Reduce, Reuse, Recycle) • The use and management of hazardous materials and waste management will be as per industry good practice. Further details are provided in P-12 WMPSPP and P-13 HWMP. • Waste removal and recycling will be undertaken fortnightly, or more frequently as required, in accordance with applicable regulations and good practice. • Responses to emergencies and spills will be conducted in accordance with P-14 SPERP. • Any areas of contaminated soil will be removed and/or remediated at HEC/THL's cost (whomever is the responsible party).	During construction and operation	THL	Minimise	P-12 WMPSPP P-13 HWMP P-14 SPERP

Action #	Project Impact / Stage C- Construction O - Operational	Management and Mitigation Actions and Measures	Timing and Frequency	Responsibility	Hierarchy	ESMP/ Annex
P-2-6	Impacts of light, noise, dust, vehicles, and machinery on fauna (C, O)	• All traffic management measures identified in P-11 TMP will be implemented. Vehicle speeds will be limited to 20 km/h along access roads in accordance with the TMP to minimise dust generation and wildlife collisions. • All dust control measures identified in P-15 AQMDCP will be implemented. Water spraying for dust suppression will be undertaken during dry and windy conditions, and for all construction activities likely to generate dust. During dry periods this will be a minimum of twice per day, or more frequently if dust is observed. • All noisy activities will be undertaken in accordance with P-8 WHSP and C-11 DBMP. • A 500 m cordon will be implemented around all blasting sites. Immediately prior to blasting, C-3 FCP: Annex C-3-II Wildlife Shepherding Protocol will be implemented within the cordon to minimise impacts to wildlife. • Should fauna be injured during construction, implement C-3 FCP: Annex C-3-III Injured Wildlife Protocol.	During construction	HEC HSE Manager	Minimise	C-3 FCP C-11 DBMP C-13 NVMP P-8 WHSP P-11 TMP P-15 AQMDCP
P-2-7	Introduction of weeds and pests (C, O)	• Installation of a machinery washing station at the end of Lot 1 for washing of heavy machinery and vehicles prior to entry to Core Land, as per P-15 AQDCP. • Quarterly surveillance of weeds and pests will be undertaken as per C-4 PCRRMP. • Invasive weed and pest species will be controlled, with particular focus on revegetation sites, roadsides, and forest edges. • Non-chemical methods (manual, mechanical, physical) of weed and pest control will be used (unless there is no alternative, in which case consultation with CFPs is required as per safeguard requirements).	During construction and operation	HEC HSE Manager	Minimise	C-4 PCRRMP P-15 AQDCP
P-2-8	Incomplete rehabilitation of temporary infrastructure areas (O)	• Areas cleared for temporary facilities totalling 66.29 ha will be remediated and revegetated upon completion of use. This will include the removal of all construction equipment, temporary buildings, and waste materials. • Bare sites will be spread with topsoil and planted with vetiver grass as part of the soil stabilisation and revegetation process. • After vetiver grass has matured and soil stabilisation has been achieved, spoil disposal areas will be inter-planted with native seedlings, at a spacing of one native tree every five square metres (a minimum of 500 native plants per hectare). • Rehabilitation sites will be monitored every three months until full ground vegetation cover is achieved, thereafter six-monthly, with weed control, pest control and replacement planting undertaken, until full vegetation restoration and tree cover is achieved. • Invasive weed and pest species will be controlled, with particular focus on revegetation sites, roadsides, and forest edges. Physical, mechanical and/or chemical control methods may be used. • Adequate erosion and sediment control measures will be implemented at all rehabilitation sites to prevent the discharge of sediment. These controls will be left in place to protect revegetation/rehabilitation works until the site is stabilised and vegetation is well established.	During operation	THL (Core Land) PO (outside Core Land)	Restore	C-4 PCRRMP Annex P-2-3 TOMS
Aquatic						
P-2-9	Loss of aquatic habitat and biota from release of sediments or contaminants from construction activities (C)	• Temporary and permanent Project infrastructure (excluding the dam and powerhouse) will be sited away from streams and rivers to the extent possible, to minimise loss, piping and siltation of watercourses. • Temporary and permanent access roads will be located along ridgelines where possible, to avoid piping of streams and rivers. • Install erosion and sedimentation controls prior to vegetation clearance (or immediately following clearance when vegetation removal is required to install measures), in accordance with C-10 DESCP. • Where piping of permanent streams is required, design culverts so that they are at minimal length and gradient required (less than or equal to natural stream grade) and are sized for large flow events (1:25 ARI), to facilitate fish passage and minimise erosion. Culverts will be designed with headwalls and riprap protection at the upstream and downstream ends. • Steep roads and sections of roads (≥12% gradient), including all of Lots 2 and 3, will be designed with concrete or other seal, and frequent cross-culverts (at least every 300 metres) to minimise erosion and sedimentation in streams. • Roadside drains will be lined to prevent erosion if gradient is 6% or steeper.	During construction	HEC Design Team	Avoid, Minimise	C-8 WCMP C-10 DESCP
P-2-10	Pollution of Tina River surface waters and sediments during operation (O)	• Waste minimization and reduction practices will be adopted, including awareness on the 3Rs (Reduce, Reuse, Recycle). • The use and management of hazardous materials and waste management will be as per industry good practice. Further details are provided in P-12 (WMPSPP) and P-13 HWMP. • Waste removal and recycling will be undertaken fortnightly, or more frequently as required, in accordance with applicable regulations and good practice. • The Worker's Accommodation Camp (WAC) Sewage Treatment Plant (STP) will treat wastewater generated from all Project sites. Treated and untreated wastewater will not be discharged to surface water or roadside drains. • Responses to emergencies and spills will be conducted in accordance with P-14 SPERP. • Any areas of contaminated soil or groundwater will be removed and/or remediated at THL's cost. • One-off analysis of pesticides and heavy metals from the groundwater bores is required to confirm if these contaminants are already present in the aquifer. Samples will be taken from all three bores at the Workers Accommodation Camp (BH1, BH2, BH6). Details of parameters to be tested are included in M-2 WQMP Annex M-2-II Water sampling method. • Pre-construction monitoring for the presence of heavy metals and pesticides in Tina River was completed in 2021 and 2022. Ongoing monitoring is not required as these contaminants are not expected to be generated by the project.	During operation	HEC E&S Supervisor	Minimise	P-12 WMPSPP P-13 HWMP P-14 SPERP M-1 SSMP M-2 WQMP

Action #	Project Impact / Stage C- Construction O - Operational	Management and Mitigation Actions and Measures	Timing and Frequency	Responsibility	Hierarchy	ESMP/ Annex
P-2-11	Physical barrier to fish passage and fish entrapment/mortality (C, O)	• To facilitate both the upstream and downstream passage of fish and other aquatic fauna, all culverts will as low gradient as possible beneath the road. At least one culvert will be designed to allow for fauna passage beneath the road. Further detail is provided in C-8 WCMP. • Maintenance of upstream fish passage, via a trap and haul system. The trap will be submerged the day prior to the transfer for up to 24 hours, thereafter the trap will be raised to prevent fish mortality. Traps not to be lowered for more than 24 hours at a time as per M-3 FAMMP. • Manual netting / trapping of juvenile fish 8 x weekly during upstream migration (or once per month, 8 x per year until the migration season is better known) from downstream during the migration season, with release of fish upstream of the dam as per M-3 FAMMP. • Aquatic ecology sampling will be undertaken at 12 established monitoring sites along the Tina/Ngalimbiu River and Sutakama River, as per M-3 FAMMP Annex M-3-I Sampling sites. • Fish screens for the intake structures that minimise the entrainment of fish, considering the size and swimming ability of local species use 25mm clear spacing.	During operation	HEC Design Team HEC EHS Manager Aquatic ecologist	Minimise	P-2 BMP Annex P-2-2 AOMS M-3 FAMMP C-8 WCMP
P-2-12	Introduction of weeds and pests (C, O)	• Installation of a machinery washing station at the end of Lot 1 for washing of heavy machinery and vehicles prior to entry to Core Land, as per P-15 AQDCP. • Monitor the occurrence of invasives as part of aquatic ecology sampling across 12 sites, as per M-3 FAMMP. • Non-chemical methods (manual, mechanical, physical) of weed and pest control may be used where detected (to avoid contaminant of aquatic habitat) and practical in the vicinity of infrastructure within Core Land.	During construction and operation	HEC HSE Manager	Minimise	M-3 FAMMP P-15 AQDCP
P-2-13	E-flow or sedimentation changes impacting aquatic biota downstream of the dam (O)	• A minimum of 1 m3/sec environmental flow (eflow) will be maintained year-round between the dam and the powerhouse. During periods when inflows to the reservoir meet or exceed 3.4 m3/sec, a minimum flow of 2.4 m3/sec will be provided downstream of the powerhouse through the turbines, resulting in a total flow of 3.4 m3/sec downstream of the powerhouse. This will maintain a more natural flow regime than a constant eflow. In the case of emergency shutdown, the requirement for additional eflows at the powerhouse can be negated until normal operations resume. • Staged and gradual flow in hydropower start-up will be adopted due to avoid damage in human and habitat downstream and start-up procedure will be set up in operational ESMP including alarm system (3 locations) at the start of power generation. Modify the existing emergency siren system (currently for emergencies only) to provide alarm during normal operational startup. • In initial startup one turbine generator will be started first. Flow would initially be about 50% of the unit rated flow (i.e. about 15% of the station rated flow). Over a period of about 5 min the flow would be ramped up to 100% of unit flow (33% of station flow). The second and third units would then be progressively started with similar ramp rates. • Once the hydro facility is meeting the system electrical load the existing diesel generation may be turned off. Once this happens the rate of change of hydro load (and consequently flow) will match that of the electrical system load. • Peaking flows will be controlled to a level at which significant downstream impacts will not occur or will not occur a significant distance downstream. • Follow the typical load profile prior to shutdown (cessation of power generation) which will likely result in gradual reduction in flow, except in an emergency trip scenario when rapid shut down is required to protect Project infrastructure. • Monitor macroinvertebrate and fish communities as part of aquatic ecology sampling, across 12 sites, as per M-3 FAMMP.	During operation	THL	Minimise	P-2: BMP M-3 FAMMP Annex P-2-2 AOMS Annex P-2-6 Hydrologic and Hydraulic Assessment

5.3 Monitoring and Evaluation

Comprehensive monitoring programs have been developed to address the key Project impacts and assess the persistence of conservation significant communities and species (or suitable indicator species) within Critical Habitat for terrestrial and aquatic ecosystems, including proposed offset areas (Table 5-2).

These monitoring programs are predominantly detailed in the Terrestrial (M-5 FFMP) and Aquatic (M-1 SSMP; M-1, M-2 WQMP; and M-3 FAMMP) Monitoring Plans and have also been summarised in the BMP to ensure that the Project does not result in a net loss of biodiversity values within Natural Habitat and will result in a net gain in values for Critical Habitat. To track progress over time, survey design and methodology and have been considered so that monitoring can be assessed against the key performance indicators (KPIs) outlined in Table 5-2. It is also expected that these monitoring programs will be revised and more specific KPIs may be developed as the Project progresses, as part of adaptive management.

Reporting on KPIs will ensure that the objectives of the BMP can be met throughout the construction and operational phases of the Project (Table 5-2). Post-construction, rehabilitation of habitat will be undertaken following the removal of temporary infrastructure and will also be subject to monitoring. Restoration activities will be undertaken in accordance with the C-4 PCRRMP.

Table 5-2: Terrestrial and aquatic biodiversity monitoring design, methods, and key performance indicators (KPIs) for the Project, aligning with ESMPs or relevant annexes.

Action #	Title	Description / Target Species	Location	Survey Method	Key Performance Indicators	Timing/ Frequency	Responsibility	ESMP/ Annex
Terrestrial Flora Monitoring								
P-2-A	Flora Monitoring: Forest Cover (C, O)	Percentage cover of vegetation	• Throughout Core Land and in the upper catchment	• Utilise satellite imagery to monitor changes in vegetation cover every three months.	• No decrease in vegetation cover within Core Land outside of construction footprint	• Every 3 months during construction and operation.	HEC HSE Manager	P-2 BMP
P-2-B	Flora Monitoring: Critical Habitat Flora Species (C, O)	Actinodaphne (*Actinodaphne solomonensis*) Cryptocarya (*Cryptocarya medicinalis*) Rosewood (*Pterocarpus indicus*)	• Areas to be cleared and revegetated	Pre-clearance Surveys: • Complete targeted surveys for threatened flora species as per **C-3 Forest Clearance Plan**. Whenever a threatened species is located: • Take a GPS waypoint, collect a photographic record, and clearly mark the plant or area. • Record in the Field Data Sheet the species name, number of individuals and an estimated cover area. • Complete collection of seeds or seedlings if present. Revegetation / Rehabilitation phase: Conduct monitoring of revegetation sites for seedling survival and natural seedling regeneration. As per **C-4 and M-5**, planted and revegetated areas will be monitored monthly in the dry season following establishment, thereafter quarterly, until a full groundcover is established.	• Record all *Pterocarpus indicus*, *Actinodaphne solomonensis* and *Cryptocarya medicinalis* trees in areas to be cleared. • Avoid clearance wherever possible by modifying the clearance footprint as per **C-3 Forest Clearance Plan**. • Ensure propagation and revegetation of these species.	• Prior to vegetation clearance. • Rehabilitation monitoring monthly then quarterly. • Quarterly reporting	HEC HSE Manager Ecologist	P-2 BMP C-3 FCP M-5 FFMP
P-2-C	Flora Monitoring: Invasive Species (C, O)	The IUCN lists 287 introduced and invasive species in the Solomon Islands.[7] These include: • Merremia (*Merremia peltata*) • Paper mulberry (*Broussonetia papyrifera*) • "Mile-a-minute" (*Mikania micrantha*) • Giant sensitive plant (*Mimosa invisa*) • Shameplant (*Mimosa pudica*) • Common water hyacinth (*Pontederia crassipes*) • Devil's fig/eggplant (*Solanum* sp.) • Water morning glory (*Ipomoea aquatica*)	• Roadsides and revegetation/rehabilitation areas.	• Surveillance and weed control with a focus on the access road and rehabilitation sites. • eDNA results from biannual aquatic surveys as per **M-3 Fish, Algae and Macroinvertebrate Monitoring Plan.**	• No new invasive species are recorded on site vs. baseline and pre-clearance surveys. • No notable increase in abundance of existing invasive species at a given site. • Rehabilitation monitoring to ensure stabilisation, rehabilitation and pest control is successful.	• Opportunistic records during surveys of terrestrial flora, fauna, and revegetation sites. • eDNA biannually (twice a year) wet and dry seasons. • Quarterly monitoring and reporting.	HEC HSE Manager Ecologist	P-2 BMP C-3 FCP C-4 PCRRMP M-5 FFMP
P-2-D	Flora Monitoring: Plant Propagation and Revegetation (C, O)	Propagation of 700,000 cover crops, native species and successful revegetation of 66.29 ha	• All rehabilitation sites	• The following will be reported on a quarterly basis: o Number of seeds, plants and/or cuttings collected for propagation, recorded by species. o Number of plants planted, recorded by species. o Area replanted in hectares. o Fixed photo-point monitoring of revegetation areas. o Labour hours spent in the nursery, replanting, weed and pest control, or other maintenance activities (reported separately).	• Seeds, seedlings and cuttings collected and 700,000 plants propagated. • 66.29 ha revegetated and stabilised by Commercial Operation Date.	• Prior to vegetation clearance. • Revegetation complete by Commercial Operation Date. • Quarterly monitoring and reporting.	HEC HSE Manager Ecologist	P-2 BMP C-4 PCRRMP M-5 FFMP

[7] Pagad S, Wong L J, Myer B, Moverly D (2023). *Global Register of Introduced and Invasive Species - Solomon Islands*. Version 1.6. Invasive Species Specialist Group ISSG. Checklist dataset https://doi.org/10.15468/eepkj2 accessed via GBIF.org on 2023-06-07.

Action #	Title	Description / Target Species	Location	Survey Method	Key Performance Indicators	Timing/ Frequency	Responsibility	ESMP/ Annex
P-2-E	Flora Monitoring: Revegetation Monitoring and Maintenance (C, O)	Revegetated areas will be monitored monthly in the dry season following establishment, thereafter quarterly, until a full groundcover is established.	• All revegetation and rehabilitation areas	Routine monitoring of revegetation sites: • Conduct surveillance and weed control. • Identify areas that require stabilisation, pest control and replanting, and implement these actions. • Weed control, using physical, mechanical and/or chemical control methods may be used. • Pest control may also be required to limit plant losses.	• Maintenance conducted to ensure effective stabilisation, revegetation, weed and pest control conducted. • Full cover of vegetation achieved by Commercial Operation Date.	• Monthly maintenance in the first dry season, thereafter quarterly. • Revegetation complete by Commercial Operation Date.	HEC HSE Manager Ecologist	P-2 BMP M-5 FFMP
Terrestrial Fauna Monitoring								
P-2-F	Fauna Monitoring: Critical Habitat Mammal Species (C, O)	Targeting threatened fauna including Critical Habitat trigger species: • King Rat (*Uromys rex*) • Guadalcanal Monkey-faced Bat (*Pteralopex atrata*)	• Areas to be cleared. • Routine monitoring at a minimum of four (4) sites to be established within representative vegetation types as per **Annex M-5-1 Terrestrial monitoring sites**. • Monitoring locations are subject to change following the results of the pre-clearance surveys	Pre-Clearance Surveys Use indirect methods to confirm the presence of *Pteralopex* spp. and *Uromys rex* based on advice of Lavery (2019) and additional non-invasive options for *Pteralopex* spp. (acoustic recording, if viable): • Conduct search for chewed ngali nuts in October-January to confirm the presence of *Uromys* spp., likely to include *Uromys rex*. • Determine presence of *Pteralopex* spp. by surveying for chew plugs, created when chewing leaves, bark and tough fruits, and ejecting the tough pulp onto the forest floor. Routine Monitoring: • Plot counts: o Visual and auditory survey for *Pteralopex* spp. at a minimum of 4 set locations (refer **Annex M-5-1**) for a duration of 20 minutes. o All fauna species seen or heard are to be recorded. o A diurnal (day) and a nocturnal (night) plot count is to be undertaken at each location per survey. • Camera trap surveys: o Trial the use of 5 cameras at selected sites: (a) 1 x camera at the fauna underpass to monitor that it is effective and unobstructed. (b) 4 x cameras located along a transect at 100m spacing, secured on the trunk and/or in the canopy of mature lowland forest trees (especially *Canarium indicum*, *Canarium salomonsense* and *Dillenia salomonense*) located in Undisturbed Primary Forest. o Use a lure of fibre wadding soaked in ngali nut oil (peanut or sesame oil if unavailable) placed in a secured, perforated, canister in the field of view. o Deploy cameras at the underpass for 3 months, checked monthly. o Deploy transect cameras for 1 month duration, then move to provide a total of 3 months data at 3 separate transects within Undisturbed Primary Forest. Repeat at the same sites each survey. o Include monitoring during the fruiting season of *Canarium indicum* during September-November. o Ensure cameras are active during nocturnal hours. o All species detected are to be recorded. o If species identification of small mammals is not possible via camera recordings, trial the use of ink pad trakka tunnels and/or trapping using Elliot traps.	• No consistent declining trend in diversity and abundance of target species is detected.	• Prior to vegetation clearance during pre-clearance surveys. • Routine monitoring biannually (twice per year) wet and dry seasons. • Quarterly monitoring and reporting.	HEC HSE Manager Ecologist	P-2 BMP C-3 FCP M-5 FFMP
P-2-G	Fauna Monitoring: Birds (C, O)	Targeting threatened fauna including Critical Habitat trigger species: • Guadalcanal Honeyeater (*Guadalcanaria inexpectata*) • Guadalcanal Hooded whistler (*Pachycephala implicata*)	• Routine monitoring at a minimum of four (4) sites to be established within representative vegetation types as per **Annex M-5-1 Terrestrial monitoring sites**.	• Point Counts: o 2 km transect starting at the 4 set locations (**Annex M-5-1**), stopping every 200 m for 10 min, with species and distance of bird (0-25m, 25-50m, >50m). o Record all avifauna in addition to target species. • Optional audio recordings can also be taken during survey to provide opportunity to expand list post-survey.	• No consistent declining trend in diversity and abundance of target species is detected.	• Biannually (twice a year) wet and dry seasons. • Quarterly monitoring and reporting.	HEC HSE Manager Ecologist	P-2: BMP C-3 FCP

Action #	Title	Description / Target Species	Location	Survey Method	Key Performance Indicators	Timing/ Frequency	Responsibility	ESMP/ Annex
P-2-H	Fauna Monitoring: Invasive Species (C, O)	The IUCN lists 287 introduced and invasive species in the Solomon Islands. These include: • Feral pig (*Sus scrofa*) • Giant African snail (*Lissachatina fulica*) • Feral cat (*Felis catus*) • Cane toad (*Rhinella marina*) • Black rat (*Rattus rattus*)	• Roadsides and revegetation/rehabilitation areas.	• Prior to entry to Core Land, wash and check all vehicles, including construction equipment and machinery at the washing station for mud, seeds, plant and animal material including African Snails and their eggs (to prevent further upstream spread) and other organisms. • Assess camera trap data for presence of invasive species. o eDNA results from biannual aquatic surveys as per **M-3 Fish, Algae and Macroinvertebrate Monitoring Plan.**	• No new invasive species are recorded on site vs. baseline and pre-clearance surveys. • No notable increase in abundance of existing invasive species at a given site. • Control of invasive species where required, adhering to best practice.	• Vehicle checks daily prior to entry to Core Land. • Opportunistic records during surveys of terrestrial flora, fauna and revegetation sites. • eDNA biannually (twice a year) wet and dry seasons. • Quarterly monitoring and reporting.	HEC HSE Manager Ecologist	P-2 BMP C-3 FCP M-5 FFMP
Water and Sediment Monitoring								
P-2-I	Water and Sediment Quality (C, O)	• Standard surface water quality monitoring suite listed in the M-1 SSMP and M-2 WQMP	• Collection of additional water quality samples will be required at sites not provisioned in M-2 WQMP and only one sample from the mid-point of the given river is required. • Monitoring locations are subject to change following the results of the pre-disturbance surveys.	• Undertake water quality monitoring in accordance with M-1 SSMP and M-2 WQMP.	• Sites sampled at the required frequency for the listed parameters. • Triggers values not exceeded, and data reported to track over time. • Investigate mitigation measures where exceedances are detected and implement as required.	Water Quality: • Weekly (NTU field) • Monthly (TSS lab) • Daily sampling to be conducted following spill events or complaints, until water quality has returned to background levels. TSS: • Monthly throughout WWTP operation. Sediment Quality: • Weekly during regular flows & floods >200 m.	HEC HSE Manager Ecologist or Scientist	M-1 SSMP M-2 WQMP
Aquatic Fauna Monitoring								
P-2-J	Critical Habitat Macroinvertebrate Species (C, O)	• Caddisfly *Orphninotrichia* sp. 1 • Mayfly *Prosopistoma sedlaceki* • True bug *Rhagovelia browni* • Non-biting midge *Xylochironomus* sp. 1	• Sampling will be undertaken at 12 established sites along the Tina/Ngalimbiu River, listed in M-3 (FAMMP). • Monitoring locations are subject to change following the results of the pre-disturbance surveys.	• Macroinvertebrate samples will be collected via a dip net (250 µm mesh size) at 10 m long transects at each representative habitat at each site. • The following procedures are recommended for dislodging macroinvertebrates from the habitats and substrates: o Riffle: vigorously disturb the substrate starting at the downstream end moving upstream using a kick sampling technique, collecting suspended material in the net. o Edge and pool: Use two types of sweeping motion, the first type is sequential, short movements at right angles to the bank, dislodging macroinvertebrates from substrates, with the second movement to sweep suspended material into the net. o Macrophytes: submerged, floating and emergent plants sampled using the same edge sampling technique. • Macroinvertebrate samples will be preserved using 95 % ethanol, and transported to a suitably qualified laboratory for sorting, enumeration and identification.	• No notable temporal change in habitat or diversity and abundance of species. • No significant increase in abundance of taxa indicative of disturbance or pollution. • Reporting (including development of a template) with interpretation and suitable statistical analysis to track over time.	• Biannually (twice a year) wet and dry seasons.	HEC HSE Manager Aquatic ecologist	P-2 BMP M-3 FAMMP

Action #	Title	Description / Target Species	Location	Survey Method	Key Performance Indicators	Timing/ Frequency	Responsibility	ESMP/ Annex
P-2-K	Locally Important Fish Species (C, O)	• Gudgeon *Hypseleotris* cf *guentheri* • Loach Goby *Rhyacichthys guilberti* • Goby *Schismatogobius essi* • Scaleless Goby *Schismatogobius hoesei* • Vanuatu Schismatogobius *Schismatogobius vanuatuensis*	• Sampling will be undertaken at 12 established sites along the Tina/Ngalimbiu River, listed in M-3 FAMMP. • Monitoring locations are subject to change following the results of the pre-disturbance surveys.	• Fish will be surveyed at each site, with the exception of Site 12 using backpack electrofishing in accordance with the Commonwealth Government's Survey Guidelines for Australia's Threatened Fish (DSEWPC, 2011) collection techniques. • Backpack electrofishing will be undertaken with a minimum of 500 seconds of electrofishing conducted across all available habitat types (e.g. pool, riffle, run, willow and deep) at each site (consisting of a 100 m stretch the river). • At site 12 at the river mouth, electric fishing will not be conducted due to high salinity; however, netting by locals will continue. • Collect unknown fish species and swab the side of the fish using the specialized swab kits provided by a suitably qualified laboratory for eDNA; o Place the swab in the vial provided containing preservative and seal; o Collect a further 5-10 individuals of known fish species to swab to verify the results of the eDNA analysis; and o A suitably qualified laboratory will complete the analysis of eDNA, noting the accuracy of results are dependent on available sequencing data to detect species.	• No notable temporal change in diversity and abundance of species. • No significant increase in abundance of taxa indicative of disturbance or pollution. • Reporting (including development of a template) with interpretation and suitable statistical analysis to track over time.	• Biannually (twice a year) wet and dry seasons.	HEC HSE Manager Aquatic ecologist	P-2 BMP M-3 FAMMP
P-2-L	Aquatic Biodiversity Survey using eDNA (C, O)	• All aquatic biota where genetic sequencing exists	• Sampling will be undertaken at 12 established sites along the Tina/Ngalimbiu River, listed in M-3 FAMMP. • Monitoring locations are subject to change following the results of the pre-disturbance surveys.	• eDNA metabarcoding will be used to assess aquatic biodiversity at each site. • Samples will be analysed at a suitably qualified laboratory, noting the accuracy of results are dependent on available sequencing data to detect species.	• No notable temporal change in diversity of taxa • Reporting with interpretation and where appropriate suitable statistical analysis to track over time.	• Biannually (twice a year) wet and dry seasons.	HEC HSE Manager Aquatic ecologist	P-2 BMP M-3 FAMMP

5.4 Residual Impacts and Offsetting

5.4.1 Vegetation Clearing and Edge Effects

For terrestrial biodiversity values, vegetation clearing, for both temporary (during construction) and permanent infrastructure (operational phase) and associated edge effects (Figure 5-1), comprise the residual impacts for the Project. Permanent infrastructure includes the construction of the reservoir, dam, tunnel, roads, and transmission line for the Project, which cannot be restored, although pre-clearance surveys will avoid trigger species, and clearing will be minimised (following best practice) where possible.

While revegetation of temporarily cleared areas will occur post construction, there will be a time lag during the regrowth period (30-year PPA period), until biodiversity values are maximised. During this period forestry protection and invasive weed and pest surveillance will be implemented to support and enhance restoration.

Edge effects may contribute to reduced habitat quality, via impacts such as light, noise and potential invasive species (plant and animal pests), which may be ongoing for the duration of the Project. Buffers have been applied to infrastructure and edge effects have been accounted for, which extend outside of Core Land and the Project Area, into the terrestrial EAAA (Figure 5-1).

The comprehensive TOMS is detailed in Annex P-2-3, outlining requirements for no net loss and net gain for impacts to Natural and Critical Habitat, respectively. The residual impacts from clearing and edge effects (Table 5-3) can be summarised as follows:

- Total impacted area loss comprising 114.55 ha of vegetation clearing (including suitable buffers) and edge effects of 163.28 ha, across all habitat units;[8]
- Total terrestrial Critical Habitat loss of 106.51 ha; and
- Total unimpacted area of 206.16 ha in Core Land (Figure 5-2).

Offset accounting for the Project (Annex P-2-3) has considered a range of factors affecting the loss and gain of land area (quality hectares; Qha) and can be summarised as follows:

- Quality hectares loss through vegetation clearing for permanent and temporary infrastructure and edge effects (Table 5-3) that requires offsetting (82.03 Qha);
- Quality hectares gained through revegetation of 66.29 ha of temporary infrastructure areas during construction (46.40 Qha);
- Quality hectares gained through natural regeneration of protected areas, due to increasing ecological value after 30 years (21.82 Qha); and
- Quality hectares gained through forestry protection from logging, calculated using an annual deforestation rate 0.45% (20.27 Qha).

Based on the accounting (Annex P-2-3), the total area of quality hectares loss (from clearing and edge effect) and requiring offsetting is **82.03 Qha** (Table 5-3), with **88.49 Qha** available in Core Land, resulting in net gain of 6.46 Qha and achieving 125% of the minimum offset area required. The conservation area will be established in Core Land and managed by HEC and THL during the construction and operation of the Project, respectively (Figure 5-3).

[8] The calculated area of vegetation clearance, and associated terrestrial Critical Habitat loss under the project, assumes that there would be no clearance above the future reservoir's Full Supply Level of 175 masl. If the ESIA's recommendation to clear all trees up to the Probable Maximum Flood level (187.5 masl) were to be followed, the loss of terrestrial Critical Habitat and other vegetation types would be 11.52 ha larger than accounted for in the BMP and TOMS.

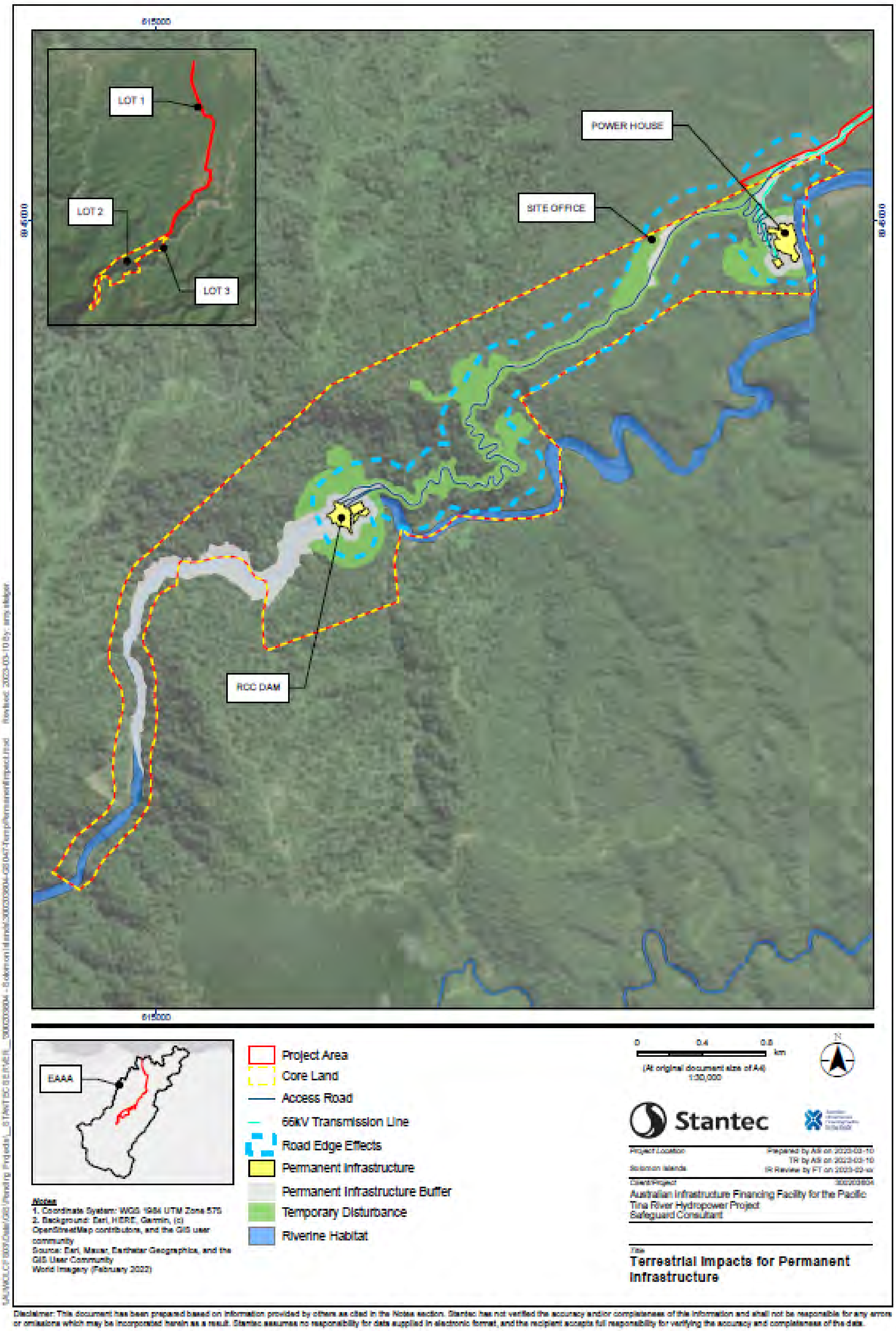


Figure 5-1: Permanent and temporary infrastructure) impacts (including buffers and edge effects for the Project within Core Land of the EAAA.

Table 5-3: Summary of terrestrial residual impacts (hectares; ha and quality hectares; Qha) for vegetation clearing associated with permanent and temporary infrastructure (including buffers) and edge effects for the Project.

Habitat Unit	CHA Classification	Total Vegetation Clearance* (ha)	Total Edge Effects** (ha)	Total Impacted Area (ha)	Available Unimpacted Core Land (ha)	Total Qha Loss Vegetation Clearance	Total Qha Loss Edge Effects
Undisturbed Primary Forest	**Critical**/Natural	40.70	52.91	72.31	131.39	36.63	5.69
Disturbed Secondary Forest	**Critical**/Modified	37.20	68.28	74.85	48.40	22.32	4.52
Remnant Forest	**Critical/**Natural	23.92	31.42	35.51	9.41	7.18	0.70
Cliff	**Critical**/Modified	4.69	2.83	6.22	15.57	4.69	0.31
Fallow	Modified	3.37	6.93	7.37	0.70	Offsetting NR	Offsetting NR
Garden	Modified	0.99	0.91	1.58	0.69	Offsetting NR	Offsetting NR
Grassland	Modified	3.68	0.00	0.00	0.00	Offsetting NR	Offsetting NR
Modified Lowland Forest	Modified	0.00	0.00	0.00	0.00	Offsetting NR	Offsetting NR
Agricultural Cropping	Modified	0.00	0.00	0.00	0.00	Offsetting NR	Offsetting NR
Development and Habitations	Modified	0.00	0.00	0.00	0.00	Offsetting NR	Offsetting NR
Saline Swamp Forest	Modified	0.00	0.00	0.00	0.00	Offsetting NR	Offsetting NR
TOTAL		**114.55**	**163.28**	**197.84**	**206.16**	**70.82**	**11.21**

Note: *Vegetation clearance comprises; permanent and temporary facilities: footprint +20 m earthworks buffer; dam/tunnel: footprint +200 m earthworks buffer; powerhouse: footprint +100 m earthworks buffer; transmission line: 20 m wide corridor. Reservoir clearance comprises inundation or clearing up to 175 m asl (full supply level). ** Edge effects comprise roads: 150 m each side (300 m total); dam: 150 m from crest; powerhouse 150 m around building; transmission line: not required as accounted for in road buffer. Unimpacted habitat comprises areas outside permanent/temporary infrastructure and edge effects across all habitat types available for offsetting. Grey font indicates habitats do not require offsetting.

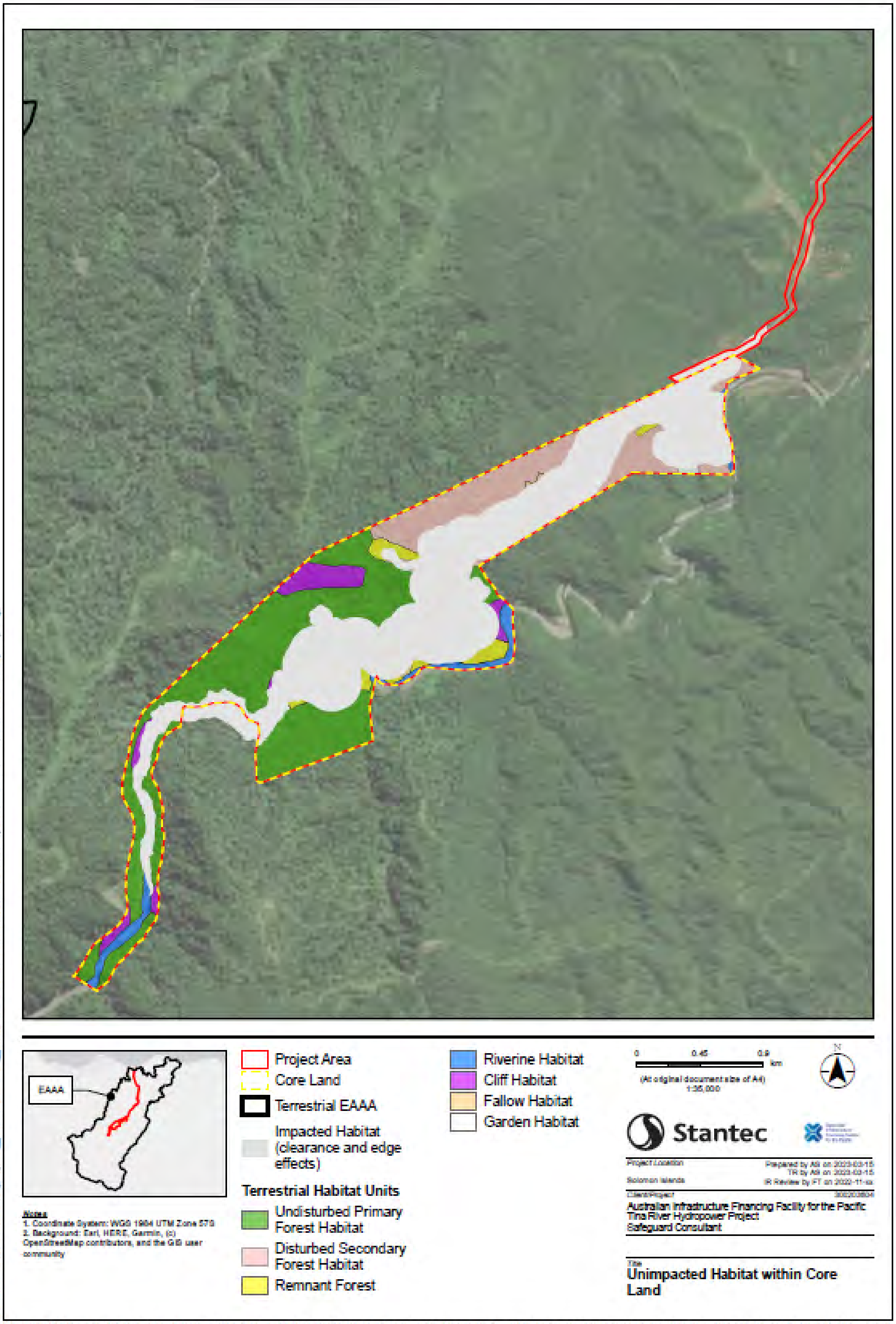


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Figure 5-2: Unimpacted area within Core Land available for the Project's terrestrial offset.

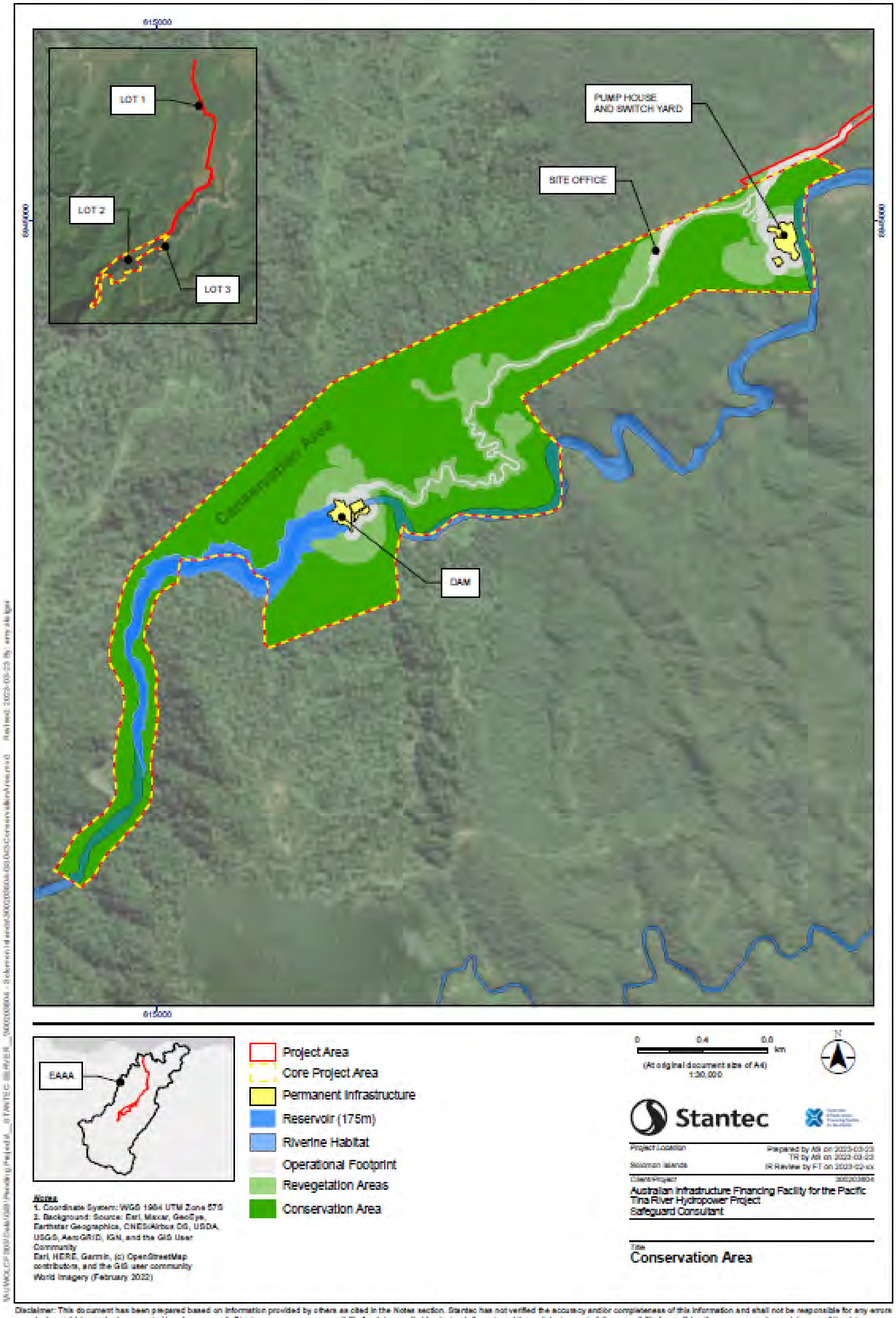

Figure 5-3: Conservation area within Core Land for the Project's terrestrial offset.

5.4.2 Changes to Migration Pathways and Hydrology

For aquatic biodiversity values, reduced migration pathways for fish upstream of the reservoir and changes in e-flows downstream of the dam in the Tina River, comprise the residual impacts for the Project, which extend outside of the Project Area into the EAAA (Figure 5-4). Within the upper catchment of the Tina River, including associated tributaries, the reservoir and dam will create a barrier to fish passage (Figure 5-4), reducing passive and active downstream migration and active upstream migration of juveniles and adults, impacting recruitment. Mitigation via trap and haul is proposed, and there may be some passage of fish (or larva) over the spillway during high flow events downstream. However, it is expected that there will be a reduction in fish recruitment upstream, with communities downstream to remain similar.

The hydrological regime of the Tina River will be modified by the operation of the Project within the reservoir and downstream of the dam, extending to the coast (Annex P-2-6). The reservoir will effectively create a lake environment upstream of the dam, and downstream of the dam there will be changes in the flow regime. The latter will be most evident in the dewatered section of the river (between the dam and powerhouse), and extend to the confluence of the Toni River (Figure 5-4), and will be more severe during dry conditions and peak operational periods (daytime) (Annex P-2-6). Downstream of the Toni River confluence, additional inflows and attenuation tend to diminish the impacts of hydropeaking (Annex P-2-6). Impacts to e-flows will be largely negated during the wet season and downstream in the Ngalimbui River. There are also no impacts expected from the Project on the Toni River (Figure 5-4).

Mitigation in affected reaches will comprise a variable e-flow, to more closely represent the natural flow regime downstream of the Project Area. A minimum e-flow release into the river of 1 m^3/s during operation year-round downstream of the dam is proposed. During periods when inflows to the reservoir meet or exceed 3.4 m^3/s, a minimum flow of 3.4 m^3/s downstream of the powerhouse will be provided, except in the case of emergency shutdowns. Due to the limited storage capacity of the reservoir, the overarching water balance tends to equalise between baseline and Project conditions over 48-to-72-hour periods. Downstream of the powerhouse, changes in water levels and top width related to hydropeaking do not significantly affect the total volume of flow when averaged across multiple days (Annex P-2-6). However, it is acknowledged that there will be permanent changes to the downstream hydrological regime of the river.

The comprehensive AOMS is detailed in Annex P-2-4, outlining requirements for Natural (no net loss) and Critical Habitat (net gain). Residual impacts to fish passage and changes to e-flows (Table 5-3) can be summarised as follows:

- Total area of 171.65 ha (63.96 km) of Critical/Natural Habitat impacting fish passage in the upper reach of the Tina River; and
- Total area of 146.46 ha (14.82 km) of Critical/Natural Habitat and 135.23 ha (12.73 km) of Natural Habitat impacted by modified flows in the mid reach of the Tina River.

The offset accounting for the Project (Annex P-2-4) considered a range of factors affecting the impacts to aquatic habitat (quality hectares) and can be summarised as follows:

- Quality hectares loss through reduced fish passage and recruitment in the upper catchment of the Tina River and a decrease in habitat quality downstream of the dam (**159.49 Qha**), comprising of **8.11 Qha** of Natural Habitat and **151.38 Qha** of Critical Habitat.

The entire length of the Tina River will be impacted by the Project's development and operation. While the Toni River provides comparable habitat, it is unavailable for offsetting due to existing mining and logging interests. The proposed offset for the Project is focused on the Tina River upper catchment (Annex P-2-4). It is expected that the protection of the upper Tina River catchment would contribute to benefits including protection of 12,008 ha of Solomon Islands Rainforest, 9,228.85 ha of the Guadalcanal Watershed Key Biodiversity Area, and prevent deforestation and sedimentation of upper catchment tributaries. The proposed Tina River upper catchment offset will be managed by the Ministry of Environment, Climate Change, Disaster Management (MECDM) on behalf of SIG.

The Project proposes an additional conservation action to address residual impacts. A Technical Assistance package is proposed to support the Ministry of Mines, Energy and Rural Electrification (MMERE) to prepare new guidelines and associated regulations to govern e-flows in the Solomon Islands. The development and enactment of national e-flow guidelines for water and sediment flows would align with international good practice and will apply to all rivers and streams throughout the Solomon Islands.

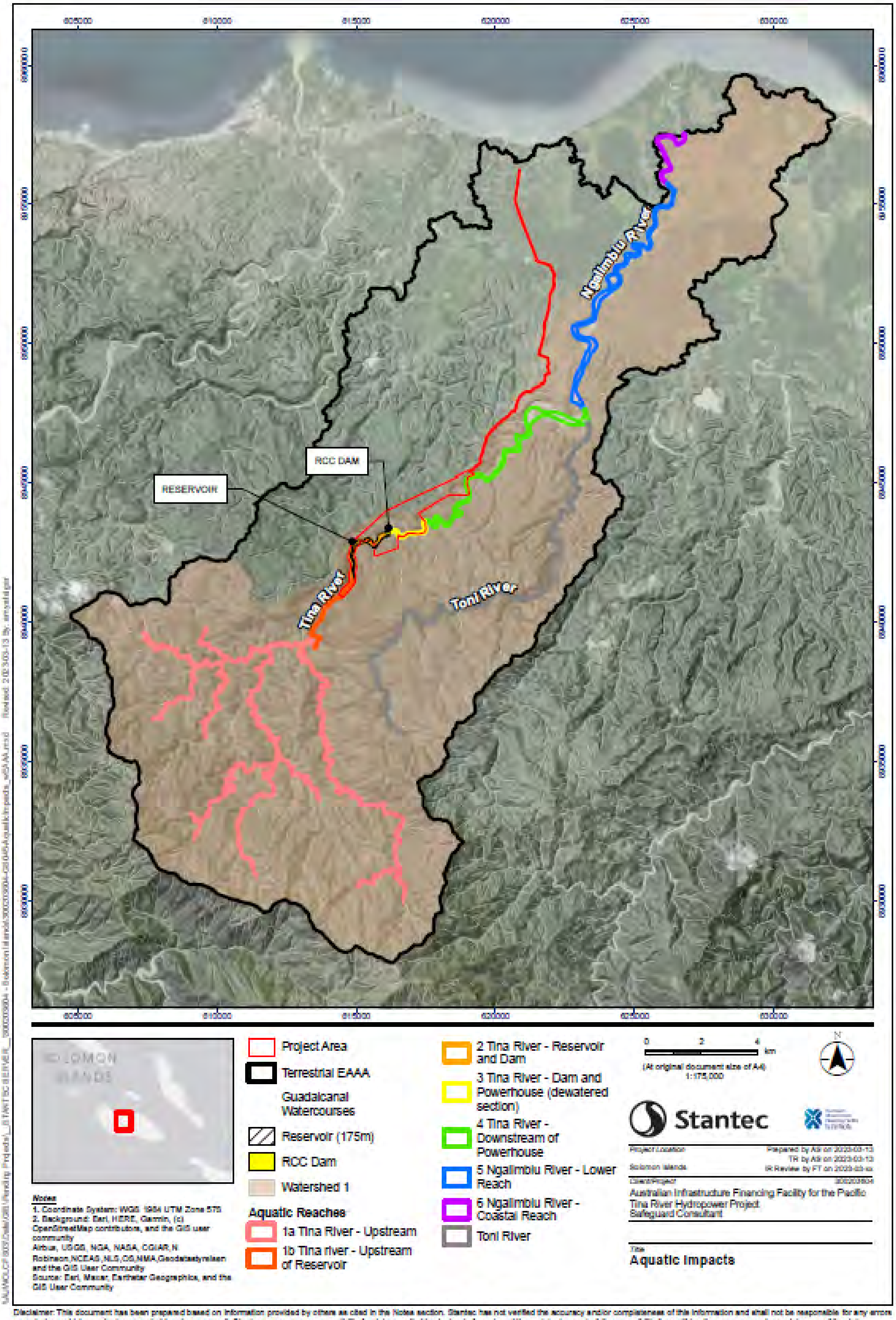

Figure 5-4: Fish migration pathway and hydrological impacts from the Project within the Tina and Ngalimbiu Rivers.

Table 5-4: Summary of aquatic residual impacts accounting for fish migration barrier in the upper catchment and e-flow changes in the mid-reach of the Tina River for the Project.

Riverine Reach	CHA Classification	Total Impacted River Area (ha)	Total Impacted River Length (km)	Baseline Habitat Quality (%)	Loss Habitat Quality (%)	Total Loss Qha	Total Loss Qkm
Tina River							
Upper Riverine Reach							
Tina River and Tributaries*	**Critical**/Natural	152.98	60.52	100	75	114.74	45.39
Mid Riverine Reach							
Upstream of Reservoir*	**Critical**/Natural	18.67	3.44	90	75	12.14	8.79
Reservoir to Dam	**Critical**/Natural	13.52	2.76	90	75	8.79	2.24
Dam to Powerhouse (Dewatered Section)	Natural	12.10	1.90	90	40	3.63	0.57
Powerhouse to Toni River Confluence	Modified	120.84	10.16	80	20	12.08	1.02
Ngalimbiu River							
Lower and Coastal Riverine Reaches							
Toni River Confluence to Modified Ngalimbiu Reach	Natural	135.23	12.73	75	6	8.11	0.76
Downstream Modified Coastal Riverine Reach	Modified	18.94	3.42	50	0	NA	NA
Toni River							
Upper Riverine Reach	**Critical**/Natural	0.00	0.00	Offsetting NR	Offsetting NR	Offsetting NR	Offsetting NR
Mid Riverine Reach	**Critical**/Natural	0.00	0.00	Offsetting NR	Offsetting NR	Offsetting NR	Offsetting NR
Total		**0.00**	0.00	Offsetting NR	Offsetting NR	Offsetting NR	Offsetting NR
TOTAL		**472.28**	**94.93**	**-**	**-**	**159.49**	**51.77**

Note * indicates due to long-term effects on fish from the reservoir and dam creating a barrier to fish migration. Downstream impacts are associated with changes to e-flows. Changes to habitat quality between baseline and Project impacts were developed based on existing catchment disturbance and outcomes of the hydrological assessment.

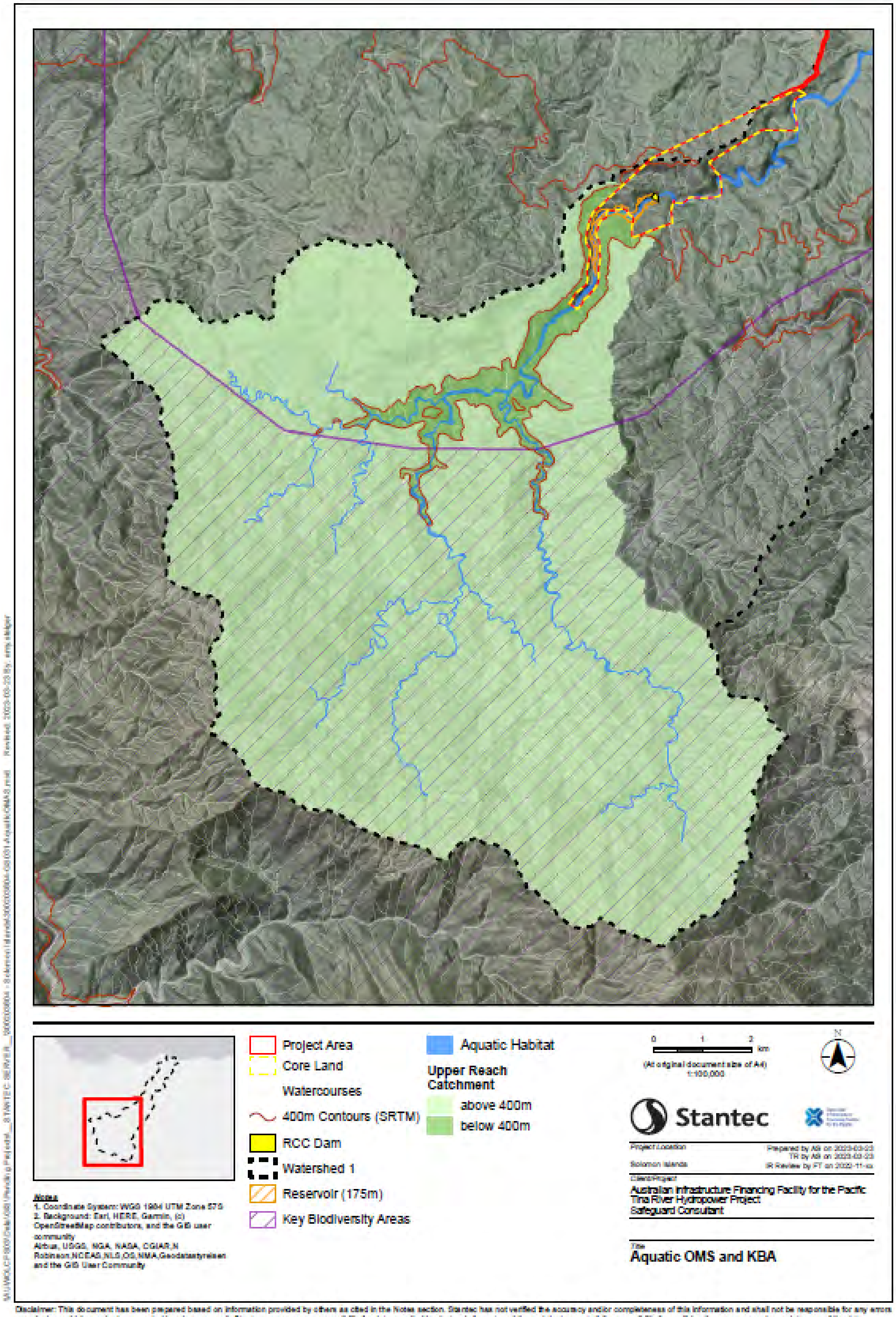

Figure 5-5: Proposed protection area in the upper catchment for the Project's aquatic offset.

6. COMMUNITY CONSULTATION AND ENGAGEMENT

6.1 Stakeholder Mapping

A wide range of stakeholders have been identified for the Project and are listed in P-3 Stakeholder Engagement and Communication Plan for the construction phase. These include but are not limited to Project Affected Peoples such as directly affected communities, communities indirectly impacted, and regional communities, National and Provincial government organisations, State owned enterprises, non-government organisations, development agencies, community organisations, media, and Project financiers (CFPs) and donor partners. Stakeholder mapping undertaken to identify the level of engagement required for each group based on their level of interest and impact is shown in Figure 6-1. The degree of interest or influence of specific groups may change over the course of the Project as issues and impacts move through pre-construction, construction, and operation.

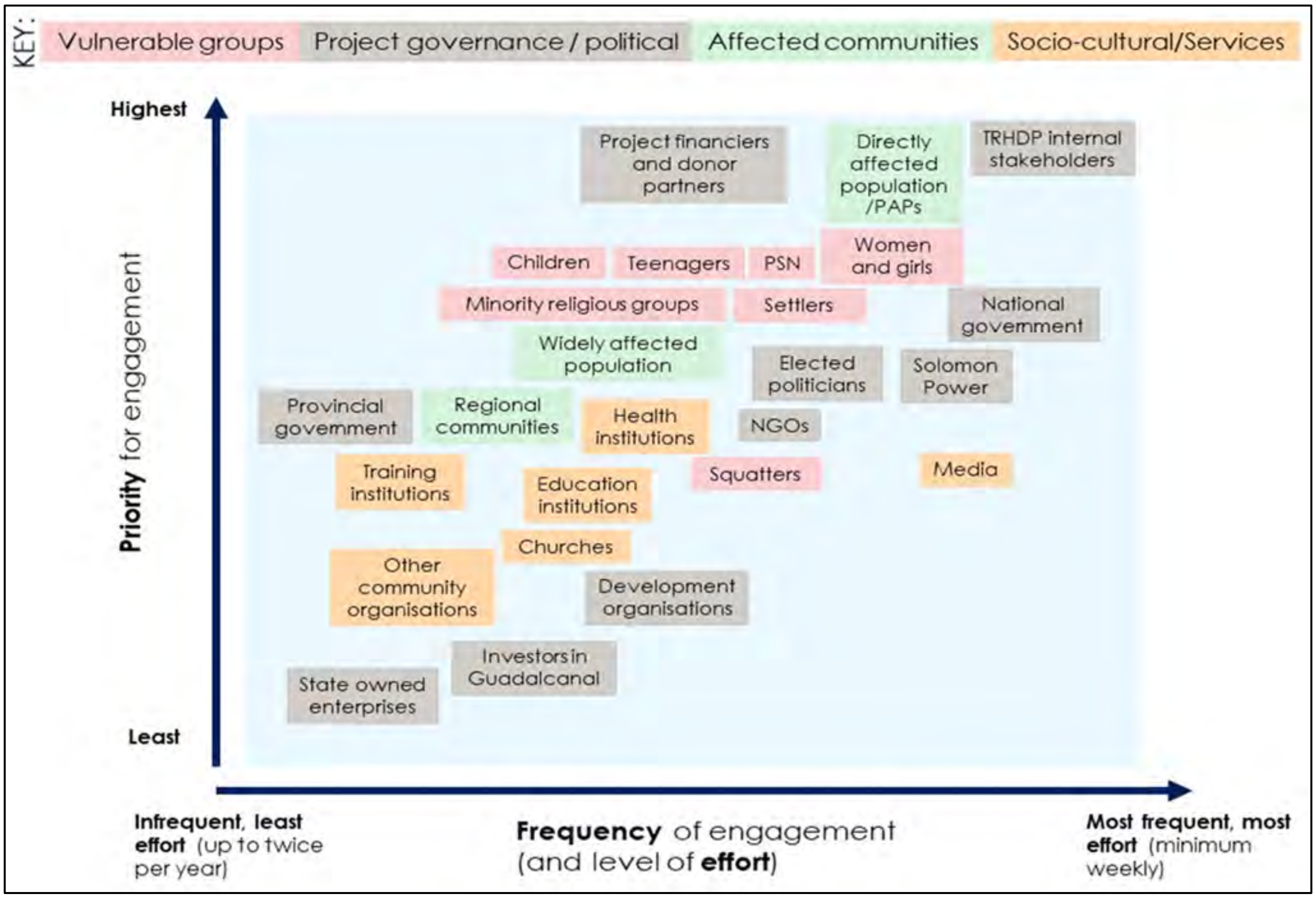

Figure 6-1: Stakeholder mapping completed for the Project.

6.2 Consultation Completed

6.2.1 Initial Stakeholder Engagement

A summary of stakeholder engagement completed in relation to the BMP development between 2021-2023 is provided in Table 6-1. A Biodiversity Action Group (BAG) was established in 2021 to provide strategic advisory and specialist advice in relation to the Project for implementing the BMP and offsets. One Biodiversity Advisory Group (BAG) meeting was convened in November 2021, hosted by HEC.

6.2.2 Public Disclosure and Feedback

As part of the consultation and disclosure process of the CESMPs, the draft BMP and associated TOMS and AOMS were disclosed on the Project website and socialized via social media and community engagement in March and April 2023 (refer section 6.2.3 below). This allowed the opportunity for community feedback to be received and incorporated into the final plans.

All approved CESMPs (including the final BMP and associated TOMS and AOMS) are to be disclosed on the Project website by the PO in June 2023. The CESMP and sub-plans will also be accessible from the HEC and THL offices. The documents will be made available in English and Korean as a minimum.

6.2.3 PO Consultation and Engagement Strategy

As part of the development and implementation of the BMP and associated offset strategies, the PO has prepared a BMP Consultation and Engagement Strategy (Annex P-2-5). The purpose of this document was to scope and commence the consultation needed to facilitate the development and implementation of the BMP, AOMS and TOMS, acknowledging that this will be an ongoing process during construction and operation of the Project. The document presents the results of stakeholder consultation undertaken by PO and THL in March and April 2023.

Outcomes of the consultation included:

- Host communities raised concerns about community benefits such as the provision of water and electricity, and resolution of past grievances. There were also some questions about the impacts of the Project on the Tina River, water quality, ecology and agricultural land.
- Upper catchment tribes consulted were generally supportive of protecting the area from mining and logging interests and at least one tribe was already well progressed in establishing a legally protected area and carbon offset site independently of the Project.

Future actions recommended for the upper catchment included:

- Engagement specifically with women, including through women-only consultation sessions.
- Developing a Management Plan for the upper catchment, working alongside a broader list of upper catchment landowners in a community-led approach.
- Pursuing options for sustainable income sources in the upper catchment through the provision of ecosystem services e.g. ecotourism, conservation, community forestry and carbon credits.

Ongoing training of workers and engagement with communities and landowners will be required to ensure effective implementation of the BMP, TOMS and AOMS. This will be the joint responsibility of THL and HEC (Core Land and associated Project impacts) and SIG (upper catchment activities).

Table 6-1: BMP consultation completed for the Project.

Date	Subject	Venue	Host	Participants	Attendance	Purpose	Remarks
05.11.2021	Biodiversity Advisory Group (BAG) inception meeting	Conference Call	HEC E & S Team / Inogen	MECDM, MoFR, PO, WB, ADB, FAO, THL, HEC, OE, INOGEN, TCLC, SINU and Local Biodiversity Specialists	Unknown	As part of the Project's commitments to responsible development, to minimize and mitigate impacts as well as offset residual impacts, the project has developed a BMP and TOMAS and AOMAS. These documents present a series of action plans and strategies to achieve the project's biodiversity objectives. One of the items identified as an action plan is the establishment of a Biodiversity Action Group (BAG). Accordingly, BAG was formed, and Its role will be mainly to support and advise the Project	THL is the implementer of the BAG and will call for meetings twice a year (after every 6 months)
19.02.2021	Community Consultation- UXO	Managikiki	HEC Team	Managikiki / Anitoch / Valesala / Senge / Namopila / Komureo / Valekocha / Habusi	Male: 36 Female: 40 Total: 76	HEC Team conducted this UXO awareness at Managkiki. The purpose is to inform Communities on UXO survey work and schedules, and other General Constructions activities related: Traffic, Road Safety, Biodiversity, WSRP etc.	Done
01.11.2021	FAO meeting	FAO OFFICE	HEC E & S Team / FAO	N/A	Male: 5 Female: 0 Total : 5	Discuss possible ways FAO can assist HEC relating to Biodiversity data and terrestrial fauna.	A MoM was written
12.11.2021	Distribution of Aquatic Survey notices	Varied	HEC social Team	Komupor / Ngalibi/ Vuramali / Tina / Senge / Namopila & Choro	Male: 2 Female: 1 Total : 3	HEC social Team consult with the community Leaders that HEC will again do aquatic survey from selected River side Communities - Komuporo,Ngalibiu Bridge, Vuramali,Namopila & Choro. The result will inform the Biodiversity Management Plan of the project.	-
03.03.2022	BMP Offset Management Strategy and Protected area	UFAO Office	FAO Team /HEC Team	NA	Male: 4 Female: 0 Total: 4	Update on the progress on the protected area process with the communities of Project upper catchment	-
14.07.2022	BMP Offset Management Strategy and Protected area	FAO OFFICE	THL/OE/HEC/FAO	NA	THL: 2 (M2 F0) HEC: 3 (M3 F0) OE: 1 (M0 F1) FAO: 1 (M1 F0) WWF: 3 (M2 F1) Total : 11	Seek information about Terrestrial area on Guadalcanal. Seek Biodiversity data on Guadalcanal province. Seek information about current protected area established by FA0.	OE Environmental Scientist was also part of the meeting.
14.07.2022	BMP Offset Management Strategy and Protected area	WWF	THL/OE/HEC/WWF	NA	THL: 2 (M2 F0) HEC 3 (M3 F0) OE 1 M0 F1) FAO (M1 F0) WWF (M2 F1) Total : 11	Seek information about Terrestrial area on Guadalcanal.	OE Environmental Scientist was also part of the meeting.
06.09.2022	Biodiversity Survey Training	HEC office	THL /HEC E & S Team	NA	THL ; 4 (M2 F2) HEC 8 (M5 F3)	WB Biodiversity Conversation specialist Conduct a training for all E & S officers.	A follow up site visit to the river mouths and Beds.
02.02.2023-14.04.2023	Community consultation and engagement activities under the BMP Consultation & Engagement Strategy	Honiara and Ngongoti	Refer Annex P-2-5	Refer Annex P-2-5	Refer Annex P-2-5	Consultation activities lead by PO in conjunction with community leaders as well as THL/HEC to articulate the draft BMP (and sub-plans) to stakeholders and hear feedback on the feasibility of implementation as described in the draft BMP.	Refer Annex P-2-5

7. IMPLEMENTATION

7.1 Core Land and Related Project Impacts

7.1.1 Construction Phase

THL has overall responsibility for implementation of all CESMPs, including the BMP and sub-plans. During the construction of access roads and main works, implementation of all plans will be led by HEC under the construction contract. THL will provide oversight of HEC, supported by the Owner's Engineer.

Prior to the commencement of main works, THL will be responsible for:

- Preparation of the Core Land Conservation Area Management Plan, to cover protection and conservation of 360 hectares of Core Land required under the TOMS.

HEC will be required to ensure adequate funding and human resources are available to implement the requirements of the BMP and TOMS. This includes:

- Implementation of the Core Land Conservation Area Management Plan, to cover protection and conservation of 360 hectares of Core Land required under the TOMS.
- Implementing agreed biodiversity management actions associated with construction impacts and mitigation, such as biodiversity surveys and monitoring, flora and fauna salvage, plant propagation and revegetation.
- Providing training of workers and engagement with stakeholders to ensure awareness of and compliance with biodiversity management, mitigation and offset requirements.
- Preparation of monthly and quarterly E&S performance reports, advising of progress, any non-conformances and required corrective actions.

HEC currently employ in-house biodiversity specialists to undertake construction management and monitoring, flora and fauna salvage etc. as required by this BMP. Consultant ecologists will be engaged to assist with specialist terrestrial and aquatic biodiversity monitoring activities. HEC also propose to engage the services of an international environmental consultancy to provide expertise and training in CESMP compliance and monitoring, including under the BMP and TOMS.

Table 7-1 provides more detail on the responsibilities for HEC and other organisations during the construction phase.

Table 7-1: BMP roles and responsibilities during construction

Organisation	Position	Responsibilities
HEC	HEC Project Manager	Ensure that adequate resources are available to implement the BMP. Ensure that all HEC staff and subcontractors understand and fulfil their BMP responsibilities.
	HEC Construction Manager	Responsibility for CESMP compliance throughout construction. Ensure that all personnel including subcontractors and vendors are adequately trained and informed on the requirements of the BMP.

Organisation	Position	Responsibilities
	HEC HSE Manager	Responsibility for biodiversity mitigation, monitoring and revegetation activities, including coordination of E&S staff and contractors, and review of data and reports. Implementation of the Core Land Conservation Area Management Plan. Ensuring required engagement with community, SIG, and other stakeholders regarding timing and management of construction activities. Convening the Biodiversity Advisory Group (BAG) on a six-monthly basis. Investigation and resolution of CESMP non-compliance. Submission of HEC Quarterly HSE monitoring reports to THL.
	HEC E&S Staff	Includes biodiversity specialists and community liaison officers. Day to day implementation of the BMP requirements including biodiversity mitigation, management, monitoring and reporting. Regular engagement with host communities to ensure awareness of BMP requirements, sharing of monitoring results and information.
	Biodiversity consultant(s)	Consultant ecologists will be engaged to assist with the implementation of terrestrial and aquatic biodiversity monitoring activities. An international environmental consultancy will be engaged to provide advice to HEC on the implementation of all CESMPs including the BMP, TOMS and AOMS. It is proposed that they will provide remote assistance and short site visits on a semi-annual basis during the construction phase, and up to quarterly when critical issue occur. The consultant will help HEC to track and manage CESMP requirements, training of staff and capacity building.
	Security contractor	Inspections of vehicles prior to entry and exit to Core Land, including ensuring vehicles have been thoroughly cleaned prior to entry. Ensuring only authorised personnel are permitted entry into Core Land. Coordination with the Solomon Islands Police Force regarding illegal activities.
THL	THL Chief Technical Officer	Responsible *inter alia* for health and safety systems, environmental and social management systems, quality assurance, monitoring and reporting.
	THL E&S Manager	Ultimate responsibility for adherence to CESMP requirements. Preparation of the Core Land Conservation Area Management Plan. Quarterly E&S reporting to PO.
OE	Stantec NZ	Monitoring and report on Project delivery, including HEC and subcontractor activities in accordance with the employer's requirements, detailed Project design, method statements, CESMPs, and related documentation. Review of HEC reports, including monthly and quarterly reports and management plans. On-site supervision and compliance monitoring throughout construction, and six-monthly environmental and social safeguards audits.
BAG	Various	Technical expert group providing oversight of BMP, TOMS and AOMS implementation through six-monthly meetings. The purpose includes a review of biodiversity conservation activities and monitoring completed in the previous six months and proposed activities for the next six months. THL will develop a Terms of Reference (ToR) and participant list for approval by THL/OE and PO/CFPs in Q3/Q4 2023.
SIG	Project Office	Oversight of THL and HEC activities to ensure compliance with the BMP, TOMS and AOMS. CFP contact point.
	MECDM	Approvals and enforcement under Solomon Island law, including compliance with Development Consents, Building Materials Permits etc.
	MMERE	Management of biodiversity impacts during reservoir impoundment, including pre-clearance surveys, flora and fauna rescue.
	Solomon Islands Police Force	Policing and enforcement relating to illegal land access, occupation, clearance and related activities within Core Land and the transmission line corridor.
	Solomon Power	Biodiversity management in the transmission line corridor outside of Core Land (if required) as per separate management plans to be developed.

7.1.2 Operational Phase

During the operational phase, THL will assume implementation of the BMP and TOMS.

Table 7-2 provides more detail on the responsibilities for HEC and other organisations during the construction phase.

Table 7-2: BMP roles and responsibilities during operation

Organisation	Position	Responsibilities
THL	THL Operations Manager	Responsibility for CESMP compliance throughout operations. Ensure that all personnel including subcontractors and vendors are adequately trained and informed on the requirements of the BMP.
	THL Chief Technical Officer	Responsible *inter alia* for health and safety systems, environmental and social management systems, quality assurance, monitoring and reporting.
	THL E&S Manager	Responsibility for biodiversity mitigation, monitoring and revegetation activities, including coordination of E&S staff and contractors, and review of data and reports. Implementation of the Core Land Conservation Area Management Plan. Ensuring required engagement with community, SIG, and other stakeholders is undertaken regarding operational activities. Convening the Biodiversity Advisory Group (BAG) on a six-monthly basis. Investigation and resolution of CESMP non-compliance. Submission of THL Quarterly HSE reports to SIG.
	THL E&S Staff	Includes environmental and social specialists. Day to day implementation of the BMP requirements including biodiversity mitigation, management, monitoring and reporting. Regular engagement with host communities to ensure awareness of BMP requirements, sharing of monitoring results and information.
	Security contractor	Inspections of vehicles prior to entry and exit to Core Land, including ensuring vehicles are clean prior to entry. Ensuring only authorised personnel are permitted entry into Core Land. Coordination with the Solomon Islands Police Force regarding illegal activities.
BAG	Various	Technical expert group providing oversight of BMP, TOMS and AOMS implementation through six-monthly meetings. The purpose includes a review of biodiversity conservation activities and monitoring completed in the previous six months and proposed activities for the next six months.
SIG	MECDM	Approvals and enforcement under Solomon Island law, including compliance with Development Consents, Building Materials Permits etc.
	Solomon Islands Police Force	Policing and enforcement relating to illegal land access, occupation, clearance and related activities within Core Land and the transmission line corridor.
	Solomon Power	Biodiversity management in the transmission line corridor outside of Core Land (if required) as per separate management plans to be developed.

7.1.3 Reporting

During construction, HEC is required to submit monthly Project reports to THL. These reports provide an overview of construction works completed within the month, a review of environmental and social safeguard implementation, any health, safety or security incidents, engineering designs, and an update on the Project schedule. The report also documents the monthly monitoring results undertaken under the various ESMPs including this BMP.

HEC also prepares a Quarterly Environmental and Social Safeguards Report for THL. This provides a detailed account of CESMP and safeguards implementation in the previous quarter. The Quarterly Environmental and Social Safeguards Report will include details of monitoring and management activities undertaken under the BMP and TOMS within Core Land.

THL prepares a Quarterly Environmental and Social Safeguards Reports for SIG. These reports cover health and safety, environmental and social issues, consultation, including any non-conformances and grievances. During the construction phase, these are largely based upon the data provided by HEC. During operations, this will be the result of THL's own work. These quarterly reports will be publicly disclosed on the Project website.

7.2 Activities Outside of Core Land

SIG (MECDM and PO) is responsible for any biodiversity management activities beyond Core Land. This includes implementation of the AOMS requirements which includes:

- Protection of the Tina River upper catchment, including development of a Memorandum of Understanding between MECDM, MMERE and MOFR restricting logging and mining activities; continued consultation with Upper Catchment landowners with a view to establish a formal conservation area; preparation of the Tina River Upper Catchment Offset Management Plan in partnership with local landowners (due Q2 2024); and forest cover monitoring and enforcement.
- Implementation of the Technical Assistance package to be provided by CFPs, including preparation of a Strategic Environmental and Social Assessment and policy support.

MECDM will be the lead agency responsible for protection of the Tina River Upper Catchment while MMERE will be responsible for the Strategic Environmental and Social Assessment and policy review. Stakeholder engagement shall be a shared responsibility.

Solomon Power will be responsible for biodiversity management in the transmission line corridor outside of Core Land (if required).

7.3 Budget and Timeline

The budget and timeline for implementation of the BMP are presented in Table 7-2. It should be noted that the key tasks and budgets developed are considered preliminary and will be revised as the Project progresses. Rates of inflation or currency fluctuations have not been accounted for but will be addressed in annual budgets to be prepared.

During construction and operation THL and HEC will be responsible for several key tasks, sharing responsibility where required.

SIG will be responsible for implementation of key tasks associated with the management of the Upper Tina River Catchment and Technical Assistance.

7.4 BMP Updates

The BMP will be subjected to review by the THL E&S Manager on a yearly basis. The BMP will be updated accordingly if the following conditions are encountered:

- The sighting of a new species of flora or fauna of conservation significance to the Project within the proposed Project location that was not observed or recorded previously;
- Proposed mitigation measures stated in this BMP are identified as unfeasible or where a more appropriate implementation measure is identified that is different from what was previously planned;

- Directive order from local government agencies;
- Advice from appointed biodiversity experts/NGOs; and
- Other conditions where adaptive management is well-justified, with actions that are different from what was planned due to previously unforeseen circumstances.

The BMP is subject to adaptive management and will be reviewed and revised in response to new data and information as it becomes available or where there are Project changes. As per the Project CESMP Management of Change Process outlined in P-1 CESMP, there are three categories of change, requiring associated actions. These actions provision for completion, review, and consultation with relevant stakeholders to implement proposed changes.

Table 7-3: Indicative budget and timeframe for implementation

Action & Responsibility	Description	Construction (USD estimate)	Operation (USD estimate)	Notes
Core Land (BMP/TOMS)				
Biodiversity management and monitoring (HEC & THL)	Construction biodiversity management	$45,000 per yr	-	Pre-clearance surveys, injured wildlife protocol, flora and fauna salvage, sediment control, mapping etc. Refer CESMP P-2, C-3, C-13, TOMS
	Terrestrial ecology surveys and monitoring	$75,000 per yr	$75,000 per yr	Targeted surveys for critical habitat flora, mammals, birds, pest species Forest cover monitoring. Refer CESMP M-5 and TOMS.
	Aquatic ecology surveys and monitoring	$150,000 per yr	$150,000 per yr	Six monthly aquatic monitoring. Refer CESMP M-3. Excludes water quality monitoring under CESMPs M-1 and M-2.
	Upstream trap and haul	-	$30,000 per yr	Assumes use of local labour / community small business
Core Land Conservation Area (HEC & THL)	<u>Core Land Conservation Management Plan:</u>			Plan establishing governance; monitoring and management activities; resources and budget.
	Draft plan (Q3 2023) Final plan (Q4 2023)	$80,000 one off	-	Assumes plan developed or reviewed by consultant.
	Annual report with task plan and budget for next year	$20,000 per yr	$20,000 per yr	To be updated when needed and reviewed every 5 years.
	<u>Staff:</u>			
	Conservation manager (new)	$75,000 per yr	$75,000 per yr	Core Land Conservation Area implementation.
	Governance lead (existing)	$20,000 per yr	-	1 x existing position. Assumes less grievances during operation.
	CLOs (2 x existing)	$40,000 per yr	$20,000 per yr	2 x construction; 1 x operation for engagement and grievances.
	Biodiversity officers (2 x existing)	$40,000 per yr	$20,000 per yr	2 x construction; 1 x operation for mitigation, monitoring, patrols.
	6 x locals for maintenance, weed and pest control, patrols (new)	$50,000 per yr	$50,000 per yr	6 x part-time roles potentially funded via CBSP tariff to form 2 x 4 person teams with BO/CLOs.
	Biodiversity consultant	$75,000 per yr	-	External oversight and training

Action & Responsibility	Description	Construction (USD estimate)	Operation (USD estimate)	Notes
	Equipment: 1 x office (existing) 1 x vehicle PPE Biodiversity monitoring equipment Weed and pest control tools, chemicals etc.	$100,000 per yr	$100,000 per yr	Equipment for implementation of Core Land Conservation Area monitoring and maintenance activities.
	Revegetation: Propagation of 700,000 plants and 66.29 ha replanting over 5 years Maintenance	$100,000 per yr	$40,000 per yr	10,000 cover crop plants per hectare plus 500 native trees and shrubs per hectare (refer C-4). MoF budgets SID$5,000 per ha for replanting accessible sites.
	Ongoing engagement activities	$20,000 per yr	$20,000 per yr	BMP/TOMS training, events and consultation for workers, host communities, other stakeholders.
Biodiversity Advisory Group (HEC & THL)	Convene technical advisory panel to review BMP, AOMS and TOMS implementation.	$10,000 per yr	$10,000 per yr	THL to develop ToR and participant list for approval of THL/OE and PO/CFPs in Q3/Q4 2023. Assumes $5k budget per meeting once every 6 months.
ESTIMATED ANNUAL COST (HEC/THL):		**$836,000 / yr**	**$630,000 / yr**	
Outside of Core Land (BMP/AOMS)				
Upper Catchment Conservation Area (MECDM)	MOU between MMERE, MOFR, MECDM	N/A (largely complete)	-	The MOU will confirm governance arrangements; access controls; monitoring and management responsibilities; resource requirements.
	Upper Catchment Management Plan (Q2 2024) Annual report with task plan and budget for next year	$80,000 one off $20,000 per yr	$20,000 per yr	To cover the 30-year PPA period, with detail for the first 5 years, including annual budget.Assumes plan developed or reviewed by consultant. To be updated when needed and reviewed every 5 years.
	Monitoring and enforcement	$90,000 per yr	$90,000 per yr	Access control and incident response. GIS forest cover mapping every 3 months
	Ongoing engagement activities	$20,000 per yr	$20,000 per yr	Annual budget for MMERE to continue engagement activities. Assumes 1 FTE.
Technical Assistance (MMERE)	Review and amendment of the River Waters Act; review and develop e-flow guidelines/policy; SESA to identify technically, financially and feasible aquatic offset options; capacity building	$3,000,000 over 5 years*	-	Assumed 5-year programme of development, funded via Technical Assistance grant. Initial work to be completed by December 2024. *Funded via Technical Assistance.
ESTIMATED ANNUAL COST (SIG sub-total):		**$746,000 / yr**	**$130,000 / yr**	
ESTIMATED ANNUAL COST (HEC/THL/SIG)		**$1,582,000 / yr**	**$760,000 / yr**	

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ANNEXES

Annex P-2-1: Legal Framework, Standards, and Guidelines Applicable to the Project.

Legislation, Standards, and Guidelines	Objectives
International Safeguards	
International Treaties, Standards, and Guidelines	
Convention on International Trade in Endangered Species Convention	The Convention on International Trade in Endangered Species Convention (CITES) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. The Solomon Islands is a signatory of the CITES convention. There are 918 species listed on the CITES convention that have been recorded within the Solomon Islands.
Convention on Biological Diversity (1992)	The Convention on Biological Diversity (1992) (CBD) is an international treaty and includes the requirement for the development of a National Biodiversity Strategy and Action Plan (NBSAP) as well as legislative measures to manage biodiversity within countries bounds. The Solomon Islands is a signatory to the CBD.
Food and Agriculture Organisation of the United Nations Code of Practice for Forest Harvesting in Asia-Pacific (1999)	It is intended to identify and encourage environmentally sound forest harvesting practices throughout the region. The Code has been developed specifically to provide a basis for sub-regional or national codes in the region, and to guide forest harvesting practices in the absence of more localised codes. It outlines key principles of improved forest harvesting in Asia and the Pacific, particularly the harvesting of timber with reduced environmental and social impacts.
CFPs Safeguards: World Bank	
World Bank Group (2018) Good Practice Handbook: Environmental Flows for Hydropower Projects	Ensuring suitable environmental flows downstream of hydropower projects is critical to protecting freshwater ecosystems and providing for community needs, but to-date there has been limited understanding of the appropriate types and level of assessment.
World Bank Operational Policy and Bank Procedure 4.01: Environmental Assessment	Sets out the general policies and principles for environmental and social protection and requirements for assessment of impacts and implementation plans and measures to mitigate or manage impacts.
World Bank Operational Policy and Bank Procedure 4.03: Performance Standards for Private Sector Activities	The aim of this policy is to facilitate Bank financing for private sector led economic development projects by applying environmental and social policy standards that are better suited to the private sector, while enhancing greater policy coherence and cooperation across the World Bank Group.
World Bank Operational Policy and Bank Procedure 4.04: Natural Habitats	Supports the protection, maintenance, and rehabilitation of natural habitats, and a precautionary approach to natural resource management. It provides that the Bank does not support projects that involve the significant conversion or degradation of critical natural habitats. It further provides that the Bank does not support projects that involve the significant conversion or degradation of (other) natural habitats unless there are no feasible alternatives for the project and its siting, and comprehensive analysis demonstrates that overall benefits from the project substantially outweigh the environmental costs.
World Bank Operational Policy and Bank Procedure 4.36: Forests	Provides for the use of forests and their associated resources to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests.
World Bank Biodiversity (2016) Biodiversity Offsets: A User Guide	Provides introductory guidance on whether, when, and how to prepare and implement biodiversity offsets for large-scale, private and public sector development projects. Also explores some of the opportunities that may exist for developing national biodiversity offset systems.
CFPs Safeguards: IFC Performance Standards	
Performance Standard 1 – Assessment and Management of Environmental and Social Risks and Impacts (January 1, 2012)	Underscores the importance of managing social and environmental performance throughout the life of a project (any business activity that is subject to assessment and management). **Impact identification and assessment.** To identify and assess social and environmental impacts, both adverse and beneficial, in the project's area of influence **Mitigation**. To avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment **Stakeholder engagement.** To ensure that affected communities are appropriately engaged on issues that could potentially affect them **Effective management.** To promote improved social and environment performance of companies through the effective use of management systems.
IFC Performance Standard 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources (January 1, 2012)	To protect and conserve biodiversity To maintain the benefits from ecosystem services To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities
CFPs Safeguards: Asian Development Bank (ADB)	
Asian Development Bank Safeguard Policy Statement (June 2009) Appendix 1, Safeguard Requirement 1: Environment	Ensures the environmental soundness and sustainability of projects. Supports the integration of environmental considerations into the project decision-making process. **Natural Habitat:** Natural habitat will not be converted or degraded unless all of a number of conditions are met, and the key requirement for mitigation measures is they are to be designed to achieve at least no net loss of biodiversity. The three conditions are: No alternatives are available Comprehensive analysis demonstrates that the overall benefits from the project will substantially outweigh the project costs, including environmental costs Any conversion or degradation is appropriately mitigated. **Critical Habitat:** Critical Habitat refers to the subset of both natural and modified habitat that deserves particular attention. Critical habitat includes areas with high biodiversity value, including habitat required for the survival of critically endangered or endangered species; areas having special significance for endemic or restricted-range species; sites that are critical for the survival of migratory species; areas supporting globally significant concentrations or numbers of individuals of congregatory species; areas with unique assemblages of species or that are associated with key evolutionary processes or provide key ecosystem services; and areas having biodiversity of significant social, economic, or cultural importance to local communities". It is stated project activities are not implemented in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated.
Asian Development Bank (2003) Handbook on Environmental Assessment Guidelines	These guidelines describe how to fulfil the requirements outlined in ADB's Environment Policy and the Operations Manual on Environmental Considerations in ADB Operations.

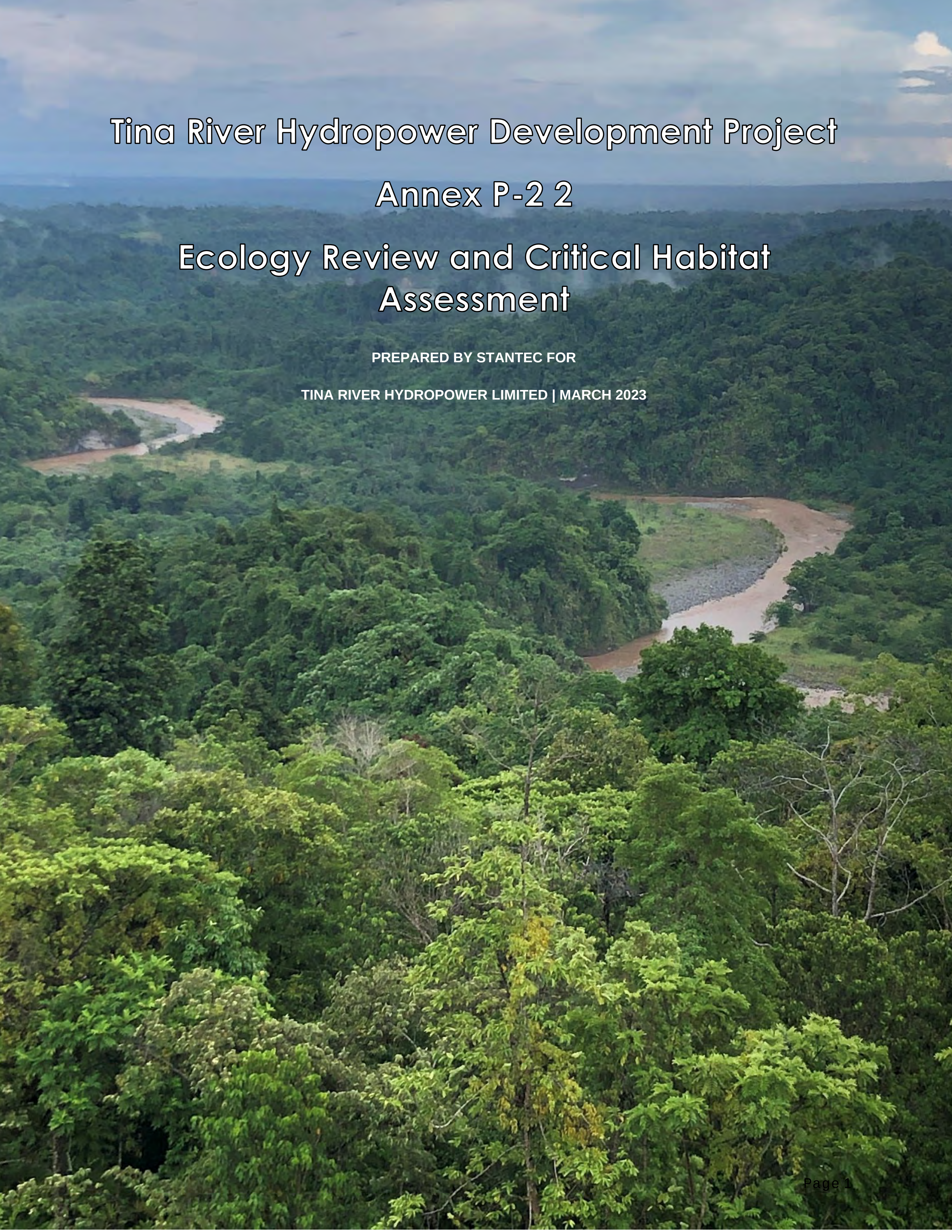
Legislation, Standards, and Guidelines	Objectives
Asian Development Bank (2006) Operations Manual: Section F1: Environmental Considerations in ADB Operations	The objectives of ADB's safeguards are to (i) avoid adverse impacts of projects on the environment and affected people, where possible; (ii) minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is impossible; and (iii) help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.
In-country Safeguards	
Solomon Islands Biosecurity Act 2013 Solomon Islands Biosecurity Regulations 2015	The scope of the Solomon Islands Biosecurity Act and its Biosecurity Regulations provide for biosecurity measures in relation with importation and exportation of animals and plants and related materials conducted by persons present in the Solomon Islands. The Act also provides with respect to administration of biosecurity control and deals with biosecurity emergencies. The Regulation sets forth a number of provisions and procedures for implementation of the Act.
Solomon Islands Environment Act 1998 Solomon Islands Environment Regulation 2008	The Project is a prescribed development under schedule 2 (section 16) of the Environment Act 1998 and, therefore, requires the preparation and submission of an Environment Impact Statement (EIS) through the Environment and Social Impact Assessment (ESIA) Process. The scope of the Environment Act and its Environment Regulations encompass a number of processes, and procedures, and the establishment of an institution, to regulate them.
Solomon Islands Fisheries Management Act 2015 Solomon Islands Fisheries Management (Prohibited Activities) Regulations 2018	The Act is concerned with the conservation, management and development of fisheries and marine resources. The Act provides a regime for licensing commercial fishing as well as for establishing fisheries management plans that can cover commercial and non-commercial fishing. The Act may become relevant to any future use of the reservoir for commercial fishing, whether as a livelihood development project for communities or otherwise. It would also be relevant if any fisheries management plan were applied to the Tina River. The Regulations lay down rules for the prohibited activities in relation to fish or fishing gear. Prohibited activities include fish for, shark finning, sell, buy, import or export.
Solomon Islands Protected Areas Act 2010	The Act sets out the process for landowners to formally protect their land. Once protected, land cannot be used for commercial logging or mining, and other uses of the land will be subject to the terms of the management plan established for the land.
Solomon Islands River Water Ordinance 1969	Provides measures for watershed control in relation to rivers and regulates the use of designated river water through permit applications.
Solomon Islands River Waters Act 1964	The River Waters Act 1964 states that it is an offence to interfere with a river, except in accordance with the terms and conditions of a permit. The Act applies to the section of the river called Ngalibiu (referred to as part of the Ngalimbiu River). A permit will, therefore, be sought from the Minister for MMERE before constructions works proceed. The process for applying for a permit involves submitting details of the proposed construction and diversion that will occur, including maps of the location in which construction will occur. The conditions for issuing a permit include a study of the current use of the river and the potential impact of the proposed interference on the river. In granting any permit, the Minister will have regard to the existing use of water and will safeguard such existing use of water as far as it appears to be practicable and consistent with the provisions and purposes of this Act. A practical application would be to submit the ESIA and proposed development plan for a permit to be issued. The law does not provide a timeframe for the permit to be issued.
Solomon Islands The Forests Act 1999	The objectives of the Act are to ensure effective and ecologically sustainable management of forest resources; promotion of a sustainable commercial timber industry, and; protection and conservation of forest resources, habitats and ecosystems including the maintenance of ecological processes and genetic diversity.
Solomon Islands Water Authority Act 1992 Solomon Islands Water Authority (Catchment Areas) Regulations LN 42 1995	This Act establishes the Water Authority as a body corporate. The objectives of the Authority include ensuring that water resources allocated for urban water supply are properly managed, distributed, allocated and used in ways which are consistent with proper water management practices and to provide water and related services to meet the needs for users in a commercial manner consistent with the overall policies of the Government. The Act is supported by the Solomon Islands Water Authority (Catchment Areas) Regulations LN 42 1995, which prohibits persons from bringing into or leaving pollutant or waste in a catchment area.
Solomon Islands Wildlife Protection and Management Act 1998	The legislation primarily protects wildlife by limiting the import of potentially harmful species, preventing the export of listed protected species and requiring a permit (for scientific research) for others. Schedule I lists the species that are prohibited to export, and Schedule II lists the regulated and controlled species for which a valid permit to export such specimen is required. The Act also empowers the Minister to make an order to approve a management programme which can include measures for the breeding or study of certain species, and the setting aside of reserved areas for their protection. There are no known orders currently in place.

Annex P-2-2: Ecology Review and Critical Habitat Assessment.

Tina River Hydropower Development Project

Annex P-2 2

Ecology Review and Critical Habitat Assessment



PREPARED BY STANTEC FOR

TINA RIVER HYDROPOWER LIMITED | MARCH 2023

Tina River Hydropower Development Project

Ecology Review and Critical Habitat Assessment

March 2023

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1. BACKGROUND

The Tina River Hydropower Development Project (TRHDP; the Project) is the first large utility-scale renewable energy project to be developed in the Solomon Islands. The Project developer is Tina Hydropower Limited (THL), who have entered into a 30-year Power Purchase Agreement with Solomon Power.

The Project comprises the hydropower facility within Lots 2 and 3 (Core Land) and includes the main works and associated permanent and temporary infrastructure, as well as the existing access road to the north (Lot 1), and disposal areas (site 0, Lot 1; and sites 1-5, Lots 2 and 3). Project infrastructure in Core Land, and the existing access road for Lot 1 are collectively referred to as the Project Area (Figure 1-1).

The development will result in direct and indirect impacts to terrestrial and aquatic biodiversity values. These are mostly associated with vegetation and habitat clearance, edge effects and changes to the hydrological regime of the Tina River. Mitigation and management measures for the Project are presented in the P-2 Biodiversity Management Plan (BMP). One of the key objectives of the BMP is to achieve no net loss of Natural Habitat and net gain in Critical Habitat.

Critical habitat is defined as areas with high biodiversity value, according to a set of defined criteria. This document provides a comprehensive review of the aquatic and terrestrial ecology of the Project Area and broader Ecologically Appropriate Areas of Analysis (EAAA) and the Critical Habitat Assessment (CHA) undertaken fort the Project, provided as an annex to the BMP. The CHA was completed in accordance with the International Finance Corporation Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC GN6; World Bank Group 2019). The structure and layout of this document is as follows:

- Consolidation and summary of available ecological data, information, and survey work for terrestrial and aquatic biodiversity values;
- Identification of conservation significant communities and species that may be impacted by the Project within the terrestrial and aquatic EAAA;
- Summary and review of previous CHAs completed for the Project; and
- Revised CHA and classification of habitats within the terrestrial and aquatic EAAA, according to the latest studies.

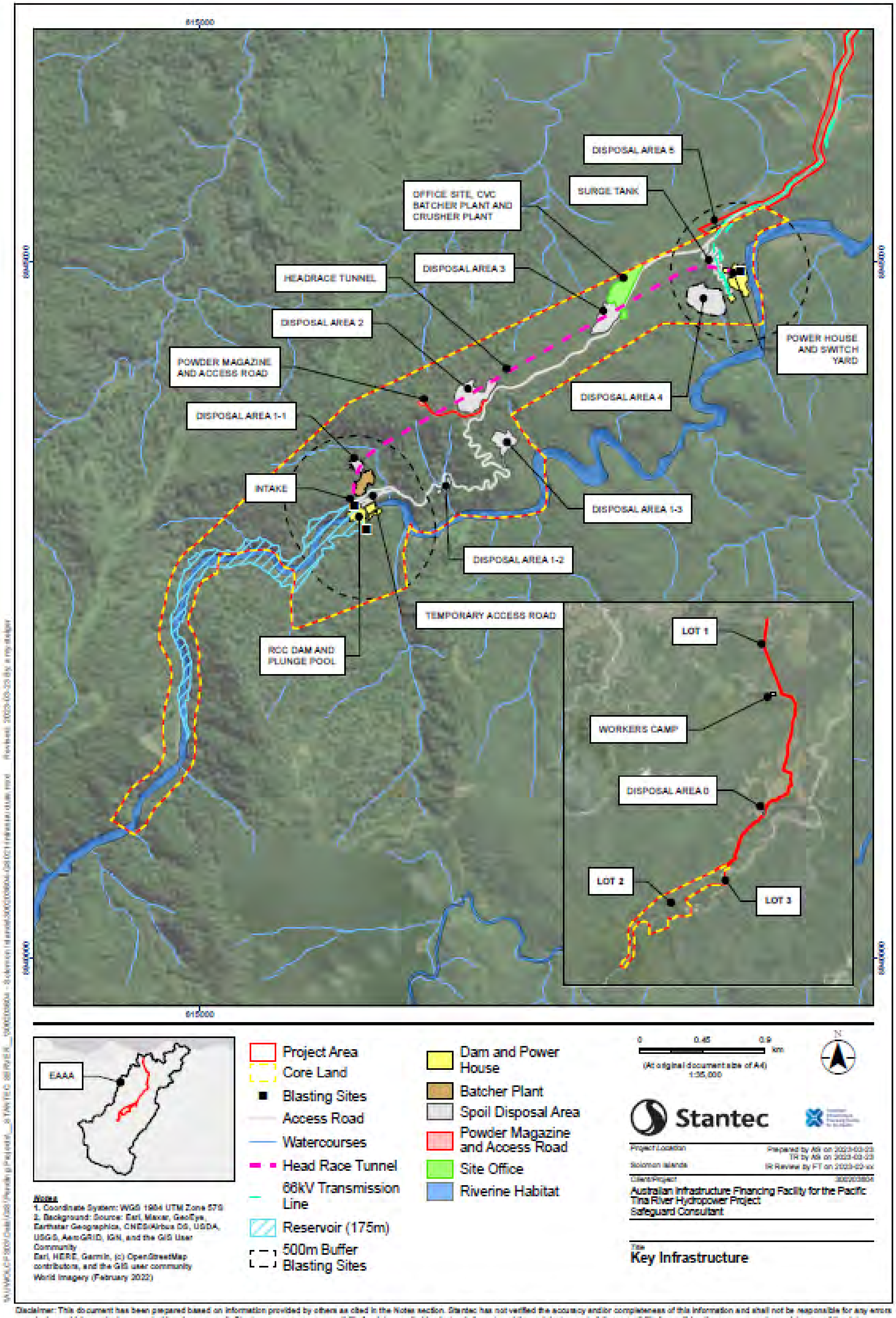

Figure 1-1: Overview of infrastructure components within the Project Area (as of March 2023).

2. METHODOLOGY

2.1 Data and Literature Review

2.1.1 Terrestrial Ecology

Terrestrial ecology literature was reviewed to inform the development of the BMP. This comprised the review of desktop studies, spatial data records, database searches, and field survey work and associated technical reports, which have been summarised in Table 2-1. Several terrestrial ecology field surveys have been completed in 2010, 2013, 2020 and most recently in 2021.

Earlier baseline field surveys focused on a wider area, while the most recent field surveys have focused on Core Land and the Project Area. The 2021 field survey included a series of pre-clearance surveys associated with sites along access roads, disposal areas and the office site for the Project. The relevant technical reports have been provided to the relevant stakeholders.

2.1.2 Aquatic Ecology

The aquatic ecology literature reviewed is summarised in Table 2-2. Several field surveys of the Tina, Ngalimbiu and Toni Rivers, have been undertaken previously, some of which were part of larger regional surveys, while others were specific to the Project. These occurred in 2011, 2013, 2014, 2016, 2020, 2021 and most recently in 2022.

While earlier studies focused on fish records, recent studies have also collected samples for the analysis of water and sediments, algae, macrophytes and crustaceans, as well as eDNA. Additional reference sites from the Sutakama River were also added to the sampling program in 2022. Technical reports have been provided to the relevant stakeholders.

2.1.3 Hydrology and River Geomorphology

Hydrology baseline information was also reviewed including information from the Environmental and Social Impact Assessment (ESIA) (THL 2019). A two-dimensional (2D) hydraulic model was also developed for the Tina and Ngalimbiu River system (Stantec 2023). Detailed terrain data was utilised where possible, supplemented by DEM and bathymetric survey data. Baseline hydrologic and hydraulic models were also developed with the associated technical report (Stantec 2023) to be provided to the relevant stakeholders.

Table 2-1: Summary of terrestrial ecology desktop reviews and field surveys of relevance to the Project.

References	Assessment Type	Survey Timing	Description
Entura & Pacific Horizons Consultancy Group (2011)	Flora and Fauna *(Field Survey)*	10 to 12 September 2010	ESIA scoping study, comprising flora and fauna survey of Tina River system, including a rapid ecological assessment survey.
THL (2019)	Flora and Fauna *(Field Survey)*	5 to 17 August 2013	ESIA flora and fauna baseline assessment, comprising field survey. A total of 24 flora stations and 22 fauna stations were assessed across three categories of sampling area (Upper Stream within undisturbed lowland forest, Middle Tina River within the potential impact area, and Transmission Line).
Oceania Ecology Group (2016)	Threatened Mammals *(Desktop Review)*	NA	Literature review and desktop assessment of impacts and mitigation for threatened mammals of Guadalcanal. The assessment reviewed information available for threatened species and proposed mitigation strategies for potential impacts from the Project.
Pilgrim (2017)	Flora and Fauna, Habitat *(Desktop Review)*	NA	ESIA critical and natural habitat assessment, to determine Project impacts, mitigation, and monitoring, with review of information from the ESIA.
Myknee Ecological Consulting (2020)	Terrestrial Ecology and Biodiversity *(Field Survey)*	4 to 7 and 12 to 14 August 2020	Targeted terrestrial ecology and biodiversity survey to clarify flora and fauna records and information within the Project Area.
HEC (2020); Taluva Bioresource Management and Consultancy (2020); Taluva Bioresource Management and Consultancy / Myknee Ecological Consulting (2021); Myknee Ecological Consulting/HEC (2021)	Biodiversity Pre-clearance Surveys (*Field Surveys*)	2020, 26-30 January 2021 (Lot 1); 16-17 September 2021 (Lot 2-1, Disposal 2 & 3, Magazine House); 1 October & 7-8 October 2021 (Access Road Lot 2-2, 2-3); 21-25 June 2021, 1-2 September 2021 (Lot 3, Powerhouse, Disposal 4 & 5); January 2020, July & September 2021 (Project Office); 20-21 May 2021 (Quarry Sites)	Field surveys carried out as a requirement prior to clearance of forest and vegetation within the Project Area.
Integrated Biodiversity Assessment Tool (IBAT) (2022)	IBAT Country Profile: Solomon Islands *(Data)*	September 2022	Additional data on protected areas and key biodiversity areas including IUCN Red List species within the Solomon Islands.
Key Biodiversity Areas Partnership (2022)	Key Biodiversity Areas Factsheets: Guadalcanal Watersheds, Mount Gallego *(Data)*	September 2022	Additional data on two Key Biodiversity Areas on Guadalcanal including site descriptions, biodiversity elements triggering KBA criteria and threats.

Table 2-2: Summary of aquatic ecology field surveys undertaken of relevance to the Project (X indicates sampling component).

Reference	Relevance	Assessment Type	Survey Timing	Description	Sampling Components						
					Water & Sediment	Phytoplankton	Periphyton	Macrophytes	Macro-invertebrates	Crustaceans	Fish
Gray (1974)	Regional study	Fish study	NA	A total of 12 sites sampled comprising estuarine sites throughout Guadalcanal (mostly north coast west of Honiara) and 2 sites in Lauvi lagoon (south coast).	-	-	-	-	-	-	X
Fannings (1990)	Study for mining industry research and development	Water quality and ecology study	Sep-Oct	A total of 15 sites sampled comprising 8 sites in Matepono River, 1 site in Ngalimbiu River (bridge) and 6 sites in adjacent watersheds.	X	-	-	-	-	X	X
Golder Associates (2003)	Mine performance report	Environmental study	Dec	A total of 8 sites sampled comprising 7 sites in Matepono River and 1 site Ngalimbiu River (bridge).	-	-	-	-	-	-	X
Polhemus *et al.* (2008)	Regional study	Fish and aquatic insect study	Nov 2004 – Aug 2005	A total of 70 sites sampled across 10 islands, with 4 sites throughout Guadalcanal and 1 site in Tina River.	-	-	-	-	X	-	X
Golder Associates (2009)	Mine performance report	Environmental study	Data not available	Ngalimbiu River (bridge) and in the Matepono River.	-	-	-	-	-	-	X
Entura (2011)	Baseline study for Project	Fish study	Sep	A total of three sites sampled in Habusi, Toni River and Horhotu.	-	-	-	-	-	-	X
BRLi (2013)	Survey for the Project	Water quality and ecology study	Jul-Aug	A total of 11 sites sampled in Tina River.	X	-	-	-	-	-	X
BRLi (2014)	Survey for the Project	Water quality and ecology study	Feb	A total of 11 sites sampled in Tina River.	X	-	-	-	-	-	X
Jowett (2016)	Survey for the Project	Water quality and ecology study	Mar and Jul	A total of 11 sites sampled in Tina River.	X	-	-	-	-	-	X
Ecological Solutions Solomon Islands (2020)	Baseline study for the Project	Aquatic study	Data not available	A total of 12 sites sampled in Tina, Toni and Ngalimbiu Rivers.	X	X	X	X	-	X	X
FRC environmental (2021)	Baseline study for the Project (wet)	Aquatic study	Nov	A total of 12 sites sampled in Tina, Toni and Ngalimbiu Rivers.	X	X	X	X	X	X	X
FRC environmental (2022)*	Baseline study for the Project (dry)	Aquatic study	Aug	A total of 15 sites sampled in Tina, Toni, Ngalimbiu u and Sutakama Rivers.	X	X	X	X	X	X	X

* includes eDNA analysis (metabarcoding and targeted fish swab samples.

2.2 EAAA and Habitat Mapping

Terrestrial and aquatic Ecologically Appropriate Areas of Analysis (EAAA) were determined for the CHA for the Project in accordance with IFC GN6 (World Bank Group 2019). An EAAA is defined as a terrestrial, freshwater or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the abiotic environment. Available satellite imagery (ESRI 2021) and digital elevation model (DEM) data based on NASA's Shuttle Radar Topography Mission SRTM (25 m contours) was used for this purpose, while also considering previous EAAA mapping by Pilgrim (2017), for the Project.

The EAAA for terrestrial biodiversity values was derived based on watersheds that intercepted the Project Area, utilising the DEM. The aquatic EAAA was derived from the ESRI satellite imagery, with riverbeds digitised and smaller tributaries traced upstream, applying a 10 m buffer to account for minor streams obscured by dense canopy cover.

In the Project Area, terrestrial habitat units were refined based on Myknee Ecological Consulting (2020), and Inogen (2021) and mapped, along with available conservation significant terrestrial flora and fauna species records from database searches or the literature. Aquatic habitat throughout the Tina (including tributaries), Ngalimbiu, Toni and Sutakama Rivers was separated into riverine reaches, according to subcatchments and associated elevation within the catchment, and anthropogenic disturbance and activities. Potentially conservation significant aquatic biota records were also mapped according to recent survey data (FRC environmental 2022), in comparison to the literature.

2.3 Conservation Significant Communities and Species

Conservation significant communities, terrestrial flora and fauna, and aquatic fauna were screened for the CHA, following IFC GN6 (World Bank Group 2019), adhering to the following definitions and categories:

- Critically Endangered – species threatened with global extinction and listed as Critically Endangered on the ICUN Red list of Threatened Species (IUCN 2022; World Bank Group 2019); and
- Endangered – species threatened with global extinction and listed as Endangered on the ICUN Red List of Threatened Species (IUCN 2022).
- Endemic/Restricted Range:
    - For terrestrial and vertebrate species, restricted-range species are defined as those species that have an Extent of Occurrence (EOO) of less than 50,000 km^2 (World Bank Group 2019); and
    - For coastal, riverine, and other aquatic species in habitats that do not exceed 200 km width at any point (for example, rivers), restricted range is defined as having a global range of less than or equal to 500 km linear geographic span (the distance between occupied locations furthest apart) (World Bank Group 2019).
- Migratory and/or Congregatory Species:
    - Migratory species are defined as any species of which a significant proportion of its members cyclically and predictably move from one geographical area to another (including within the same ecosystem) (World Bank Group 2019); and

  - Congregatory species are defined as species whose individuals gather in large groups on a cyclical or otherwise regular and/or predictable basis (i.e., species that form colonies, species that form colonies for breeding purposes and/or where large numbers of individuals gather at the same time for non-breeding purposes) (World Bank Group 2019).
- Highly threatened species or unique ecosystems (World Bank Group 2019).

The conservation significant communities and species identified were subsequently assessed against relevant criteria and thresholds for the CHA.

2.4 Critical Habitat Assessment

The CHA was undertaken in accordance with the three broad-level steps outlined in IFC GN6 (World Bank Group 2019) as follows:

- **Step 1: Stakeholder Consultation/Initial Literature Review** – summarised in the BMP, comprising terrestrial and aquatic ecology studies, and hydrological assessment undertaken for the Project. Relevant regional information was also reviewed (Section 3), while several experts were consulted including Dr Ruchira Somaweera for specialist advice on tropical reptile fauna and Dr Phillipe Keith and Dr Clara Lord for expert guidance on tropical fish. Previously, engagement with global and regional experts has also been undertaken for the Project, including with the Educational Institution Solomon Islands National University (SINU). The findings of previous CHAs completed for the Project were also reviewed (Section 5.1).
- **Step 2**: **Field Data Collection and Verification of Existing Information** – presented in Section 3 and Section 4, with all available literature, field studies, technical reports and spatial data records and mapping reviewed, collated, refined, and verified to understand biodiversity values and supporting habitats in the Project Area and EAAA. In the absence of available data, some species were identified as data deficient, or where appropriate were considered potential trigger species (applying a conservative approach).
- **Step 3: Critical Habitat Determination** – following the completion of Steps 1 and 2, conservation significant communities, areas and species were identified and assessed against the criteria and thresholds outlined in IFC GN6 (World Bank Group 2019), summarised in Table 2-3. Available records and extent of occurrence (EOOO), comprising the known distribution ranges of potential trigger species across Guadalcanal and globally were used to assess quantitative thresholds.

Following the completion of Steps 1-3, habitats and reaches within the terrestrial and aquatic EAAA respectively were classified as Modified, Natural, and/or Critical, following the definitions outlined in IFC GN6 (World Bank Group 2019), presented in Table 2-4. It should be noted that Critical Habitat may also be considered a subset of Modified or Natural Habitat (World Bank Group 2012a).

Table 2-3: CHA criteria and thresholds for conservation significant communities and species (World Bank Group 2019), where applicable to the Project.

Criteria		Threshold	Project Application
Criterion 1 – Critically Endangered and Endangered Species	1a	Areas that support globally important concentrations of an IUCN Red-listed EN or CR species (≥0.5% of the global population[1] AND ≥5 reproductive units [2]of a CR or EN species).	Relevant criterion. In accordance with IFC GN6 (World Bank 2019), EOO was used as a surrogate of global population as global population / local population data was not available.
	1b	Areas that support globally important concentrations of an IUCN Red-listed Vulnerable (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 in 1a.	Not applicable. While data exists, there is typically an extreme paucity of records available for the Solomon Islands, with species distribution and/or population data unavailable to assess against this criterion.
	1c	As appropriate, areas containing important concentrations of a nationally or regionally listed EN or CR species.	Not applicable. Local distribution records do not exist. Only global, broad distribution is provided under IUCN.
Criterion 2 – Endemic and Restricted-range	2	Areas that regularly hold ≥10% of the global population[8] size AND ≥10 reproductive units of a species.	Relevant criterion. In accordance with GN65 of IFC GN6 (World Bank 2019) EOO used as surrogate for population data. For aquatic biota, restricted and new records were applied as a precautionary approach.
Criterion 3 – Migratory and Congregatory Species	3a	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.	Not applicable. Review of potential migratory or congregatory species (THL 2019) indicated that the EAAA is unlikely to support more than 1% of the global species population.
	3b	Areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.	
Criterion 4 – Highly Threatened or Unique Ecosystems	4a	Areas representing ≥5% of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN.	Not applicable. No ecosystem types meeting the criteria for ICUN status of CR or EN have been confirmed in the EAAA.
	4b	Other areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning.	Relevant criterion. Conservation significant areas and communities, including unique ecoregions, and key/important biodiversity areas have been considered within the EAAA.
Criterion 5 – Key Evolutionary Processes	5	Qualitative. No threshold.	Not applicable. Attributes across the landscape of the EAAA that may influence evolutionary processes have not been identified or analysed to the level of detail necessary to accurately evaluate this criterion.

[1] In accordance with IFC GN6 (World Bank 2019), EOO was used as a surrogate of global population as global population/local population data was not available.
[2] The IUCN Biodiversity Areas standard defines a reproductive unit as the minimum number and combination of mature individuals necessary to trigger a successful reproductive event at a site (World Bank Group 2012).

Table 2-4: CHA classifications and definitions (World Bank 2019) relevant to the Project.

Classification	Definition
Modified Habitat	Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition (excluding habitat that has been converted in anticipation of the Project). Modified habitats may include areas managed for agriculture, forest plantations, reclaimed (i.e., process of creating new land from sea or other aquatic areas for productive use) coastal zones, and reclaimed wetlands.
Natural Habitat	Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition
Critical Habitat	Critical habitats are areas with high biodiversity value, including: (i) habitat of significant importance to Critically Endangered and/or Endangered species (as per ICUN); (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

3. TERRESTRIAL ECOLOGY REVIEW

3.1 Regional Biodiversity Context

The Solomon Islands are part of the East Melanesian Islands group, recognised as one of the most biologically important regions on earth for species richness and endemism (CEPF 2012). The islands support approximately 4,500 species of plants (Pauku & Lapo 2009), 245 species of birds, 72 species of mammals, 51 species of reptiles, and 19 species of amphibians (IBAT 2019).

The islands also contain 94 protected areas, most of which are in marine habitat and governed by local communities (IBAT 2019). There is one National Park; the Queen Elizabeth National Park near Honiara on Guadalcanal Island, outside of the Tina River catchment. The Solomon Islands also has 37 Key Biodiversity Areas (KBA) including 11 Important Bird and Biodiversity Areas (IBA) and five Alliance for Zero Extinction Sites (AZE); and 36 biodiversity hotspots (IBAT 2019).

Two of the KBAs occur on Guadalcanal Island, including the Mount Gallego KBA in the western part of the island, and the Guadalcanal Watersheds KBA (Figure 3-1). The latter covers most of the southern part of the island, including parts of the Tina River catchment. The Guadalcanal Watersheds KBA includes forest catchments and lowland valleys, as well as Mt Popomanaseu (2,330 m) and Mt Makarakomburu (2,249 m), the highest mountains in the country (UNESCO World Heritage Centre 1992-2022).

Mount Popomanaseu is also listed as a Tropical Rainforest Heritage of Solomon Islands World Heritage Site of Outstanding Universal Value, due to its rich endemic bird diversity (UNESCO World Heritage Centre 1992-2022). The Solomon Islands Rainforest ecoregion also occurs on Guadalcanal (Wikramanayake *et al.* 2002), including within the terrestrial EAAA and Project Area. It is on the tentative listing for a UNESCO World Heritage Site, containing globally outstanding biodiversity and an exceptional proportion of endemic species (UNESCO World Heritage Centre 1992-2022).

While containing high vertebrate endemism, including single-island endemics, restricted-range mammals, and bird species, a number of threats to biodiversity have been identified. There are large areas at lower elevation (<400 m asl) that are currently under threat from logging and clearing for subsistence agriculture (CEPF 2012). Introduced cats have also eliminated most native mammals on the main island of Guadalcanal (CEPF 2012).

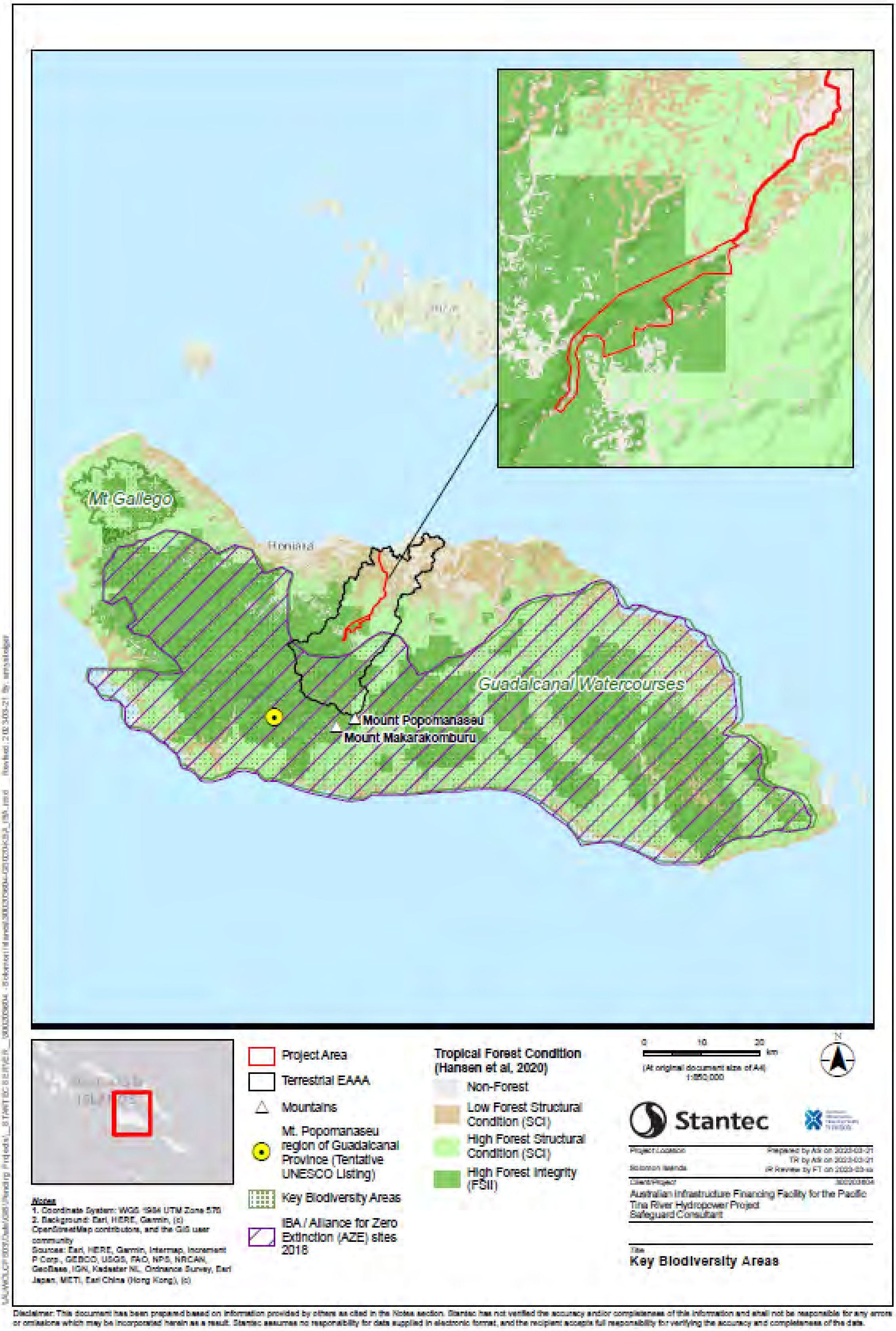

Figure 3-1: Map of KBAs, IBA and likely extent of Solomon Islands Rainforest (FSII) on Guadalcanal in the context of the Project Area (Source: http://www.keybiodiversityareas.org/site/mapsearch).

3.2 EAAA and Habitat Units

The EAAA derived for terrestrial biodiversity values comprises four separate watersheds that intersect the Project Area, which extend from the upper catchment of the Tina River to the northern coastline, comprising a total area of 33,078.18 ha, excluding the riverine habitat (Figure 3-2). A total of 12 habitats have been identified within the EAAA ranging from Undisturbed Primary Forest in the upper catchment which is in largely pristine condition, to substantially modified areas of Agricultural Cropping and Development and Habitations, which occupy low-lying areas (Figure 3-3, Table 3-1). Forested areas in the lower catchment may also be subject to legal and illegal logging activities, while palm oil plantations are also prevalent.

Within the Project Area, seven habitat units have been identified (Myknee Ecological Consulting 2020), the descriptions of which are provided in Table 3-1. Most of the Project Area comprises Undisturbed Primary Forests and Disturbed Secondary Forest, while the northern section is characterised by Remnant Forest and Undisturbed Primary Forest, with Riparian and Cliff Habitat along the margins of the Tina River (Figure 3-4). Solomon Islands Rainforest, which comprises Montane Forest (>600 m asl) and Lowland Forest corresponds to Undisturbed Primary Forest in the EAAA and Project Area (Pauku 2009; TRHDP 2017).

There are also two culturally significant sites known as 'Tambu' that occur in the Project Area, which are protected in a traditional manner (Myknee Ecological Consulting 2020). The local place names of these sites are Bela and Kambi, which are located adjacent to the access road, outside of proposed clearing areas for the Project.

The terrestrial EAAA and Project Area support potentially conservation significant communities and species, defined under the IFC GN6 (World Bank Group 2019) criteria and thresholds. This includes listed species (Endangered and Threatened) and species that may be considered range restricted, migratory or congregatory, as well as unique ecosystems. These are summarised in the subsequent sections, with the comprehensive screening of conservation significant communities and species provided in Annex 1.

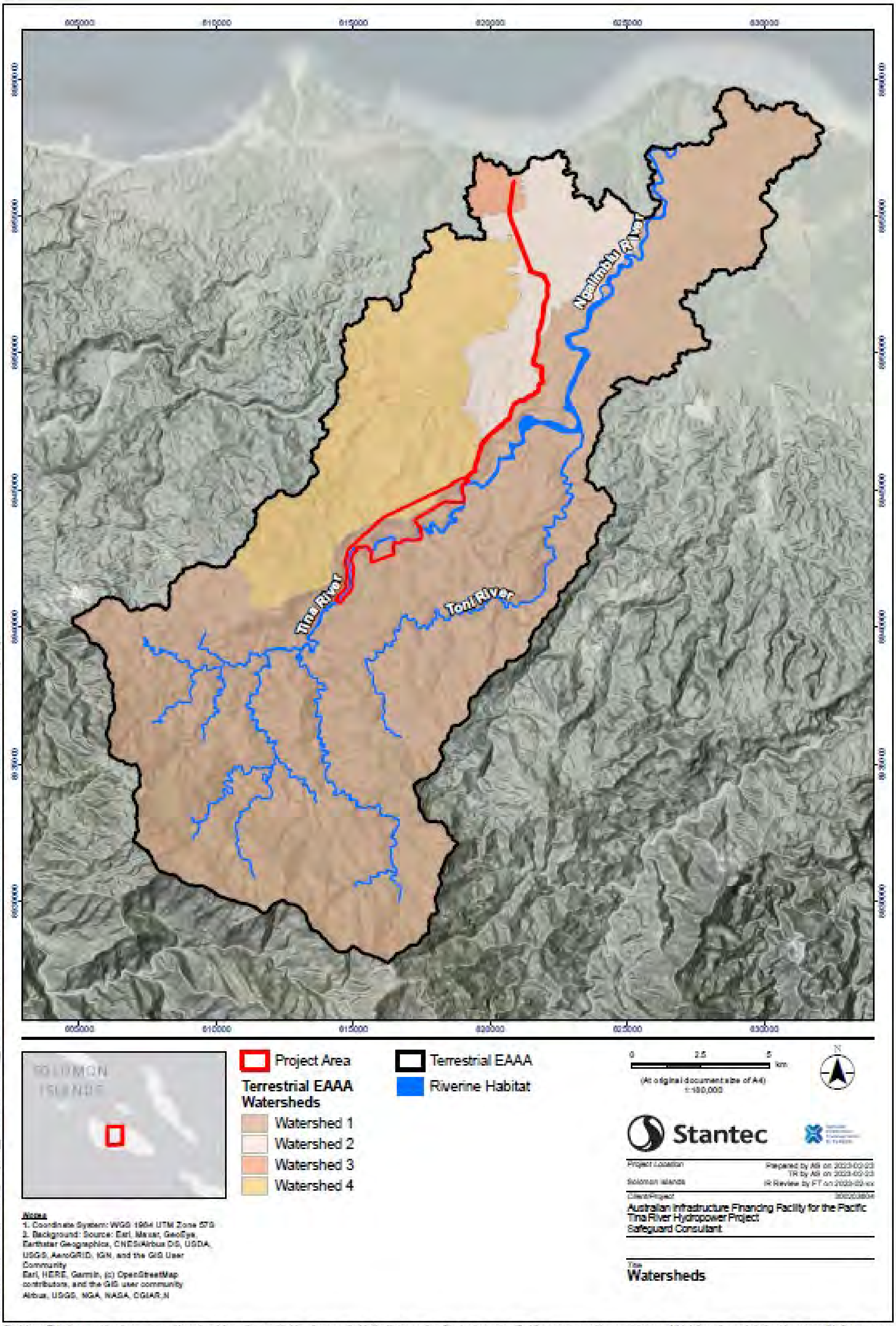

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Figure 3-2: Terrestrial EAAA showing the watersheds that intersect the Project Area.

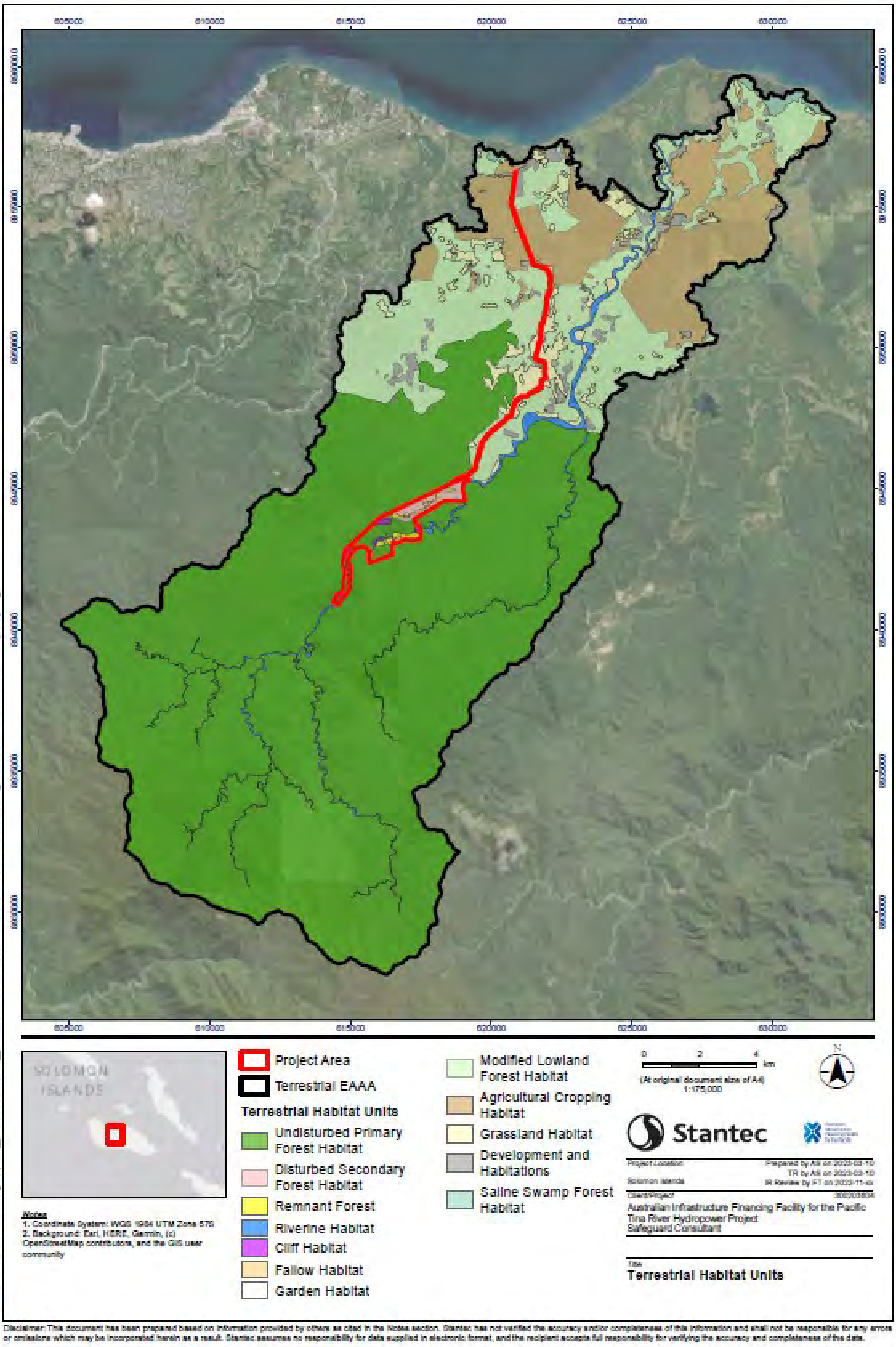

Figure 3-3: Terrestrial EAAA and associated habitat units in relation to the Project Area.

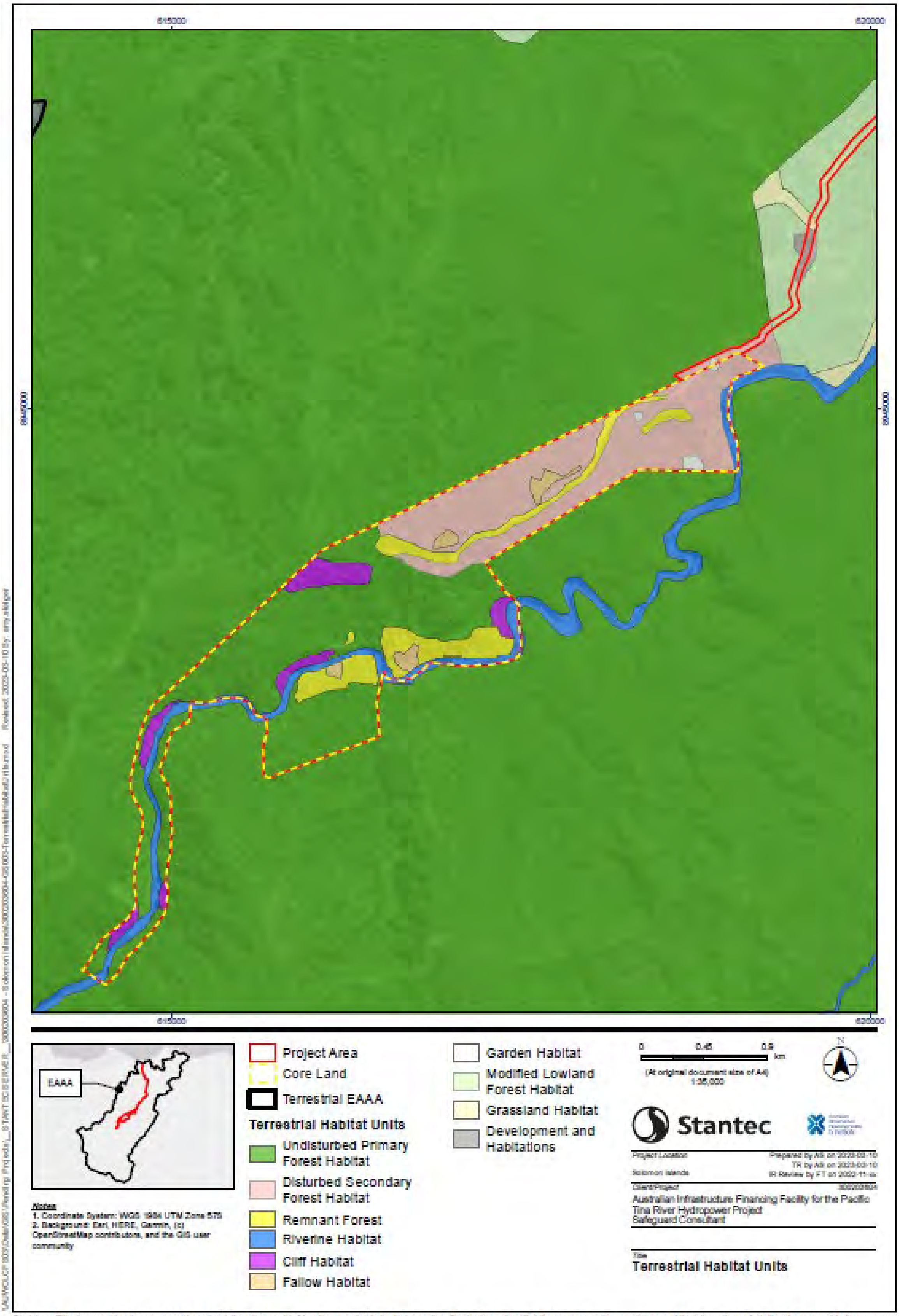

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Figure 3-4: Terrestrial habitat units within the Project Area and Core Land.

Table 3-1: Summary of terrestrial (T) habitat units within the EAAA, Project Area and Core Land.

Habitat Unit	Description (Source: TRHDP 2017; Pauku 2009)	Habitat Unit	Description (Source: TRHDP 2017; Pauku 2009)
Undisturbed Primary Forest Habitat 	Undisturbed Primary Forest habitat comprises forested areas that have almost no disturbance from human activities, are intact and considered in pristine condition. This includes Lowland (<600m) and Montane Forest (>600 m). This habitat has high ecological and values, supporting a wide variety of species. Primary Undisturbed Forest is characterized by tall canopy trees, although regrowth species are common due to impacts from infrequent cyclones. Common species of Lowland Forest include *Ficus* sp., *Dysoxylum excelsum* and *Cyathea* sp. (Tree Fern), while Montane Forest comprises *Syzygium* sp., *Metrosideros* sp., *Ardisia* sp., *Ficus*, *Rhododendron*, *Dacrydium* spp ,*Podocarpus pilgeri.*	**Disturbed Secondary Forest Habitat** 	Disturbed Secondary Forest Habitat comprises forested areas that have undergone relatively recent disturbance from human activities including logging and timber extraction, and is not as pristine, with regenerated shrub and tree growth. Due to these disturbances, this habitat has moderate ecological values, with key functions affected by deforestation and degradation. However, regeneration of shrubs and trees occurs rapidly where soil is available. These areas are dominated by regrowth species such as *Ficus* sp., *Pometia pinnata* and *Calophyllum* sp. Shrubs include *Macaranga* sp. Common non-indigenous species include *Alpinia purpurata*, and *Calamus* sp.
Remnant Forest Habitat 	Remnant Forest Habitat comprises forested areas that have undergone extensive disturbance although still support remaining large trees such as *Canarium* spp. nut trees. This habitat supports a variety of species but is modified by anthropogenic activities and has moderate ecological values. Increasing light has also modified plant composition beneath the canopy.	**Riverine Habitat** 	Riverine Habitat (including Riparian Habitat) is associated with Tina River and associated waterways. This habitat has high ecological values supporting species (including insects and amphibians) that are dependent on the riverine environment, particularly in the upper catchment (considered pristine). Flows and substrates are variable in the upper catchment (large boulders and pebbles), becoming more homogenous (sand and gravel) in the lower catchment (refer to Section 3.2). These areas may support epiphytic plants and orchids, vines (climbers and creepers shrubs) as well as fern trees in limited areas of the Tina River, however, the typically steep slopes are usually characterised by forest.
Cliff Habitat Habitat 	Cliff Habitat occurs on and adjacent to very steep vertical slopes, typically adjacent to the river system. This habitat may be fed by smaller tributaries and waterfalls. It has high ecological valuse as it hosts unique species that may utilise the cliffs for foraging and breeding. They are also relatively pristine and have not been modified. Vegetation commonly found in these areas comprises ferns, figs, palms and epiphytic orchids. Specific indicator species of Cliff Habitat includes *Pholidota* sp., *Macaranga* sp., *Timonius timon*, and *Alpinia purpurata*.	**Fallow Habitat** 	Fallow Habitat comprises areas that have been cultivated in the past but have been left to fallow. This habitat is similar to Remnant Forest; however, has undergone complete cultivation and has subsequently been left to fallow or regrow. It has low ecological values and hosts minimal species.
Garden Habitat 	Garden Habitat comprises smaller areas of cultivated areas for food crops. Garden Habitat is of low ecological value and is heavily modified. However, it may provide foraging habitat for opportunistic species such as reptiles and insects.	**Modified Lowland Forest Habitat** 	Low-lying areas (typically <100 m asl) comprising forest trees (often re-growth or secondary species), fruit and invasive species. It has comparatively lower ecological values due to disturbance activities and habitations.
Agricultural Cropping Habitat 	Agricultural Cropping Habitat comprises large expanses of agricultural lands in low-lying areas, and includes cultivated crops, grasses, or palm oil plantations. This habitat is of low ecological value as they have been heavily modified and comprise homogenous cultivations.	**Development and Habitations** 	Development and Habitations, referring to habitats within and surrounding villages, including roads and access tracks. Domesticated animals may also be associated with this habitat and can threaten native wildlife, while invasive plant species (such as *Mikania micrantha*) can also proliferate these areas. This habitat has low ecological values as it is heavily modified.
Grassland Habitat 	Grassland Habitat comprises areas dominated by grasses that cover low lying hills. This habitat is of low to moderate ecological value and is typically modified, located adjacent to roads or habitations. Common species include *Pennisetum polystachyon*, *Pueraria lobata*, *Sida rhombifolia* and *Mimosa pudica*. The invasive species *Mikania Micanthra* is also usually present.	**Saline Swamp Forest Habitat** 	Saline Swamp Forest Habitat is subject to tidal influence in low-lying areas in proximity to the coast, occurring in estuaries and along the foreshore. This habitat has specific values associated with the coastal/estuarine environment and may be subject to anthropogenic disturbance. Examples of common species include *Barringtonia asiatica*, *Calophyllum inophyllum*, *Casuarina equisetifolia*, and *Pandanus* spp., and species of mangroves.

3.3 Vegetation Communities and Flora

Based on the review of available information and flora records from the Project Area and immediate surrounds, including pre-clearance surveys, a total of 278 flora species have been recorded. Of these, two species were listed (IUCN 2022) as Critically Endangered, one as Endangered, three species as Vulnerable, and six species as Near Threatened (Annex 2). Specific to the terrestrial EAAA and Project Area, four flora species were identified as conservation significant, according to the relevant criteria and thresholds (Table 3-2).

The most widespread vegetation type that comprises Solomon Islands Rainforest is Lowland Forest which comprises common species including several *Calophylum* representatives (One Earth 2023). However, conservation significant flora species are also associated with this ecoregion (Table 3-2), including *Actinodaphne solomonensis*, *Cryptocarya medicinalis,* and *Pterocarpus indicus* (Rosewood).

There are also several invasive flora species known from within the Project Area including Merremia (*Merremia peltata*), Paper mulberry (*Broussonetia papyrifera*), and Mila-a-Minute (*Mikania micrantha*). These invasives compete with native species for space and edaphic resources (Inogen 2021).

3.4 Terrestrial Fauna

3.4.1 Avifauna

Based on the review of available information and species records, a total of 77 bird species were identified or are considered likely to occur within the Project Area and immediate surrounds, of which five species were listed (IUCN 2022) as Vulnerable and seven species as Near Threatened (Annex 3). There were 15 bird species identified as conservation significant, which were confirmed or are likely to occur within the Project Area and terrestrial EAAA, based on relevant criteria and thresholds (Table 3-2). One introduced bird species has also been found; Common Myna (*Acridotheres tristis*), which is native to Asia.

3.4.2 Mammals

Based on the review of available information and species records, 33 terrestrial mammal species, including 23 bat species have been recorded from the Project Area and immediate surrounds. This includes five introduced species and another three naturalised species (Annex 4). Three species were also listed (IUCN 2022) as Critically Endangered, one as Endangered, two as Vulnerable, and another two as Near Threatened (Annex 3). Within the EAAA and Project Area, based on relevant criteria and thresholds, seven mammal species were identified as confirmed or are likely to occur (Table 3-2). Invasive mammal species known from the Project Area also include feral cats, pigs, and rats, which are detrimental to native mammals and their habitat (Inogen 2021).

3.4.3 Reptiles and Amphibians

A total of 22 reptile species have been recorded from the Project Area and immediate surrounds, including one species listed as Vulnerable and two species listed as Near Threatened (Annex 5; IUCN 2022). Of these, 15 amphibian species listed by IUCN as of Least Concern (IUCN 2022), and one introduced species (cane toad; *Rhinella marina*), were confirmed or are considered likely to occur within the Project Area (Annex 5). In addition, 15 reptile and amphibian species associated with the Project Area and EAAA were considered conservation significant, according relevant criteria and thresholds (Table 3-2).

3.4.4 Insects

Numerous species of insects have been observed, particularly in association with the riverine habitat of Tina River. This includes terrestrial spiders along the river margin, such as orb-weavers belonging to the genus *Gasteracantha* and *Argiope*. However, no targeted surveys for terrestrial insects have been conducted to date. There are also numerous flying insects such as damselflies that utilize the riverine habitat and surrounds, which have an aquatic larvae life cycle phase. Conservation significant aquatic insects are discussed in Section 4.3.4.

Table 3-2: Conservation significant vegetation communities, flora and fauna species identified from the ecology review, were screened for the CHA, in relation to the EAAA and Project Area.

Scientific Name	Common Name	IUCN Status[3]	Habitat Type[4]	Known Distribution [5]	Restricted Range[6],[7]	Records from within the EAAA and Project Area
Vegetation Communities						
Solomon Islands Rainforest		N/A	UF, R	SI	N/A	This ecoregion includes Montane Forest and Lowland Forest, corresponding to Undisturbed Primary Forest habitat above and below 600 m asl (including Riparian Forest habitat). In the Project Area, due to lower elevation, this corresponds to Primary Undisturbed Forest Habitat (Lowland Forest).
Flora						
Calophyllum vitiense	Calophyllum	LC	UF, DF	-	Yes, EOO ~ 23,980 km²	Recorded during pre-clearance surveys for Access Road Lot 2-2 and Lot 2-3.
Actinodaphne solomonensis+	Actinodaphne+	CR	UF, DF	-	Yes, EOO ~ 4 km²	Recorded during the ESIA 2017 biodiversity surveys at the Power Plant 2 site and recorded during Myknee Ecological Consulting's Terrestrial Biodiversity and Critical Habitat Revision Survey in 2020.
Cryptocarya medicinalis+	Cryptocarya+	CR	UF, DF	SI	Yes, EOO ~ 4 km²	Recorded during the ESIA 2017 biodiversity surveys at the Power Plant 2 site and recorded during Myknee Ecological Consulting's Terrestrial Biodiversity and Critical Habitat Revision Survey in 2020.
Pterocarpus indicus+	Rosewood+	EN	UF	-	DD	Recorded during the ESIA 2017 biodiversity surveys at the Access Road 2, Access Road 3, Cliff 2, Upper Stream 1, Upper Stream 3 and recorded during Myknee Ecological Consulting's Terrestrial Biodiversity and Critical Habitat Revision Survey in 2020 and HEC 2021 survey. Recorded during pre-clearance surveys.
Mammals						
Uromys porculus	Guadalcanal Rat	CR	UF	G	Species is endemic to Guadalcanal therefore extent of occurrence is assumed to be 5,302 km²	No, unlikely to occur. Not recorded since 1888 (Oceania Ecology Group 2016),
Pteralopex atrata	Guadalcanal Monkey-faced Bat	EN	UF, GH	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Likely to occur. Elevational limit <400 m and it has been recorded approx. 20 km from site 2016–2019) (Oceania Ecology Group 2016).
Uromys rex	King Rat	EN	UF	G	Yes, EOO is estimated to be ~5000 km².	Likely to occur. Signs recorded 6 km from site in 2015 (Oceania Ecology Group 2016). FCP (C3) – Likely. Captured in 1987 and 1989 in Poha Valley, Poha River Catchment and Gold Ridge (Matepono River catchment). Matepono River catchment is immediately east of Tina River Catchment.
Dobsonia inermis	Solomons Bare-backed Fruit-bat	LC	UF, DF, GH	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Likely to occur. Recorded approx. 20 km from site 2016–2019) (Oceania Ecology Group 2016).
Pteropus woodfordi	Dwarf Flying-fox	LC	UF, DF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Likely to occur. Recorded approx. 20 km from site 2016–2019) (Oceania Ecology Group 2016).
Hipposideros dinops	Fierce Leaf-nosed Bat	VU	UF	Indonesia, Papua New Guinea Solomon Islands	DD; The Fierce Leaf-nosed Bat is not endemic to Solomon Islands as IUCN (2023) notes that this species is present on the islands of Bougainville (Papua New Guinea), Choiseul, New Georgia, Nggatokae Island, Santa Isabel, San Jorge, and Malaita (all in the Solomon Islands). This species 1) is neither CR or EN, 2) its extent of occurrence is unknown, and 3) it is found in a wider area outside SI, therefore this taxon has not been evaluated for CH assessment.	Likely (recorded approx. 20 km from site 2016–2019).
Melonycteris fardoulisi	Fardoulis' Blossom Bat	NT	UF, DF, GH	SI		

[3] Conservation status is a per IUCN 2022. The IUCN Red List of Threatened Species. Version 2022-1. <https://www.iucnredlist.org>
[4] As defined in Section 4.2.1 and based on habitat mapping prepared by Myknee 2020. UF= Undisturbed Primary Forest, DF = Disturbed Secondary Forest, R = Riparian, RF= Remnant Forest, FH = Fallow Habitat, GH = Garden Habitat, C = Cliff Habitat
[5] SI = Solomon Islands, G = Guadalcanal
[6] Restricted range definition is equivalent to 'endemicity' for terrestrial vertebrates and plants and is defined as those species having an Extent of Occurrence (EOO) of less than 50,000 km² (World Bank Group 2019). Solomon Islands total area is 28,896 km².
[7] EOO data from IUCN 2022.
+ Indicates species associated with Solomon Islands Rainforest ecoregion.

Scientific Name	Common Name	IUCN Status[3]	Habitat Type[4]	Known Distribution [5]	Restricted Range[6,7]	Records from within the EAAA and Project Area
					Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Likely to occur. Recorded approx. 20 km from site 2016–2019) (Oceania Ecology Group 2016).
Avifauna						
Ceyx nigromaxilla	Guadalcanal Dwarf Kingfisher	LC	UF, DF	G	Yes, species is endemic to Guadalcanal therefore extent of occurrence is assumed to be 5,302 km².	Recorded during ESIA Scoping Study at Res 3, Dam 4.
						Observed during FCP:C3.
Coracina papuensis elegans	White-bellied Cuckooshrike	LC	UF, DF, R, GH, FH	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Recorded at TL4 and Kambi Tabu site during biodiversity survey. Call and flyover in vicinity of Lot 1 area during and recorded in Lot 2-2 and Lot 2-3 during pre-clearance surveys.
Eurystomus orientalis solomonensis	Oriental Dollarbird	LC	DD	SI	Sub-species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Not recorded during surveys.
Cacomantis variolosus addendus	Brush Cuckoo	LC	DD	SI	Sub-species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Not recorded during surveys.
Centropus milo	Buff-headed Coucal	LC	UF, DF, R, GH	SI	Yes, EOO is estimated to be 46,900 km².	Recorded during ESIA Scoping Study at TL3, TL4, TL5, Acc.1, PP1, Dam2 and at the power house site during Myknee Ecological Consulting's survey and recorded during pre-clearance surveys at the Magazine area, disposal area 2 and 3, Lot 2-2, Lot 2-3.
Corbus woodfordi	White-billed Crow	LC	UF, DF	SI	No, estimated to be 50,500 km².	Recorded during ESIA Scoping Study at Acc 3, PP1, Tun, Upp 2. Recorded during Myknee Ecological Consulting's survey at Powder Magazine Area, Recorded during pre-clearance surveys at Lot 2-1, Lot 2-2, Lot 2-3.
Guadalcanaria inexpectata	Guadalcanal Honeyeater	LC	UF (montane)	G	Yes, EOO is estimated to be 1,400 km²	Recorded during pre-clearance surveys at Powder Magazine Area, DA-2 and 3, Lot 2-1 and Lot 2-3. Biodiversity element triggering KBA criteria.
Myzomela melanocephala	Black-headed Myzomela	LC	UF, GH	SI	Yes, EOO is estimated to be 10,200 km².	Recorded during ESIA scoping study at Dam2, Dam4, Upp.2. Observed during FCP:C3.
Pachycephala implicata	Guadalcanal Hooded-Whistler	LC	UF	G	Yes, EOO is estimated to be 930 km²	Recorded during Myknee Ecological Consulting's survey at Reference Site. Observed during pre-clearance survey carried out by Hyundai in 2021.
Pachycephala pectoralis cinnamomea	Golden Whistler	LC		SI	Sub-species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Recorded during ESIA scoping study at PP2, Res.2, Res.4,
						Dam2.
Hypotaenidia philippensis christophori	Buff-banded Rail	LC	DD	SI	Sub-species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Recorded during the scoping survey at TL3.
Hypotaenidia woodfordi	Guadalcanal Rail	LC	UF, GH	G	Yes, EOO is estimated to be 6500 km².	Observed during Entura 2011 biodiversity survey (TL1 and TL3) and ESIA scoping study (TL1 and TL3). Observed during preclearance surveys in Lot 2-1 and Lot 2-2.
Ninox jacquinoti granti	Guadalcanal Boobook	NT	UF, DF	Papua New Guinea (Bougainville) Solomon Islands	Yes, EOO is estimated to be 6600 km².	Recorded during Myknee Ecological Consulting's survey at the Reference Site. Presence recorded during preclearance surveys at Powder Magazine Area , DA-2, DA-3, Lot 2-1 and Lot 2-3.
Ducula brenchleyi	Chestnut-bellied Imperial Pigeon	NT	UF, DF, R	SI	Yes, EOO is estimated to be 38,500 km².	No recorded occurrences within Project Area but is considered 'likely' to occur.
Zosterops rendovae	Grey-throated White-eye	LC	UF	Papua New Guinea (Bougainville) Solomon Islands	Yes, EOO is estimated to be 11,300 km2.	No recorded occurrences in the Project Area but considered likely to occur.
Reptiles and Amphibians						
Acutotyphlops infralabialis	Red Blind Snake	DD	UF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km².	Not recorded during surveys.
Ramphotyphlops becki	Beck's Blind Snake	DD	UF	G	Species is endemic to Guadalcanal therefore extent of occurrence is assumed to be 5,302 km²	Not recorded during surveys.

Scientific Name	Common Name	IUCN Status[3]	Habitat Type[4]	Known Distribution [5]	Restricted Range[6,7]	Records from within the EAAA and Project Area
Cornufer bufoniformis	Warty Webbed Frog	LC	UF, DF, R, W, GH	Papua New Guinea (Bougainville) Solomon Islands	Yes, EOO is estimated to be 28,226 km^2.	Recorded during Myknee Ecological Consulting's survey at Vurapokilo Stream. Call heard during pre-clearance surveys.
Cornufer malukuna	Malukuna Webbed Frog	LC	UF, DF, R, W	G	Yes, EOO is estimated to be 27,175 km2.	Recorded during biodiversity surveys at Upp.2, Camp #1, Vurapokilo Stream.
Cyrtodactylus biordinis	Guadalcanal Bow-fingered Gecko	LC	UF	G	Yes, EOO is estimated to be 5,336 km^2.	Not recorded during surveys.
Emoia flavigularis	Yellow-throated Skink	LC	UF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km^2.	Observed during pre-clearance surveys at Lot 2-2, Lot 2-3.
Sphenomorphus bignelli	-	LC	UF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km^2.	Not recorded during surveys.
Sphenomorphus concinnatus	Elegant Forest Skink	LC	UF, DF, GH	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km^2.	Not recorded during surveys.
Sphenomorphus cranei	Crane's Skink	LC	UF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km^2.	Not recorded during surveys.
Tribolonotus schmidti	Schmidt's Crocodile Skink	LC	UF	G	Species is endemic to Guadalcanal therefore extent of occurrence is assumed to be 5,302 km^2	Recorded in the Powerhouse and tunnel area during pre-clearance surveys.
Salomonelaps par	Solomons Coral Snake (Solomons Red Krait)	LC	UF, GH	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km^2.	Recorded in Lot 2-2, and Lot 2-3 during pre-clearance surveys.
Cyrtodactylus salomonensis	Solomons Bent-toed Gecko	NT	UF	SI	Yes, EOO is estimated to be 9,999 km^2.	Recorded at Vurapokilo Stream (upper area) during biodiversity surveys and recorded in Lot 2-2 and Lot 2-3 during pre-clearance surveys.
Corucia zebrata	Prehensile-tailed Skink (Solomon Island Prehensile-tailed Skink)	NT	UF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km^2.	Not recorded during surveys.
Loveridgelaps elapoides	Solomon's Small-eyed Snake	VU	UF	SI	Species is endemic to Solomon Islands therefore the extent of occurrence assumed to be 28,400 km^2.	Not recorded during surveys but considered likely as per the FCP.
Cornufer myersi	Myers Wrinkled Ground Frog	LC	UF	SI	Yes, EOO is estimated to be 4,300 km^2.	Not recorded during surveys.

4. AQUATIC ECOLOGY REVIEW

4.1 Regional Biodiversity Context

Freshwater river systems in Solomon Islands include a limited number of rivers over 30 km in length, including on Guadalcanal, with upper catchments characterised by rocky streams and tributaries (Polhemus *et al.* 2008). These river systems also tend to be short and steep and generally lack low gradient alluvial floodplain reaches, although where present, the floodplain is usually heavily developed. River flow depends on various factors, such as climate, soil, vegetation, and catchment basin morphology, with some streams ephemeral or having subsurface flows during the drier months.

The orientation of rivers and catchment areas in the Solomon Islands is usually perpendicular to the coast, and the catchment areas are small. Runoff varies considerably, depending on the site's orographic characteristics, the seasons, and vegetative cover. It is also changes dependent on episodic weather events such as, cyclonic floods or droughts. However, based on slope, flow and substrate size, rivers have been divided into three zones (higher, middle, and lower course) that provide specific habitats for fish and crustacean communities (Keith *et al*. 2010).

Higher course rivers are characterised by a steep slope (generally more than 10%) and rapid flows, with large boulders and cobbles directly from the parent rock. The delimitation with the middle course often corresponds to a topographical discontinuity such as a cascade. Middle course rivers have an average slope of generally less than 10%. The riverbed is covered in pebbles and rocks. Sometimes, sandy bottoms can be found in slow current reaches. Lower course rivers have part of the watercourse located in the floodplain or coastal plain. For coastal streams, two areas can be distinguished in this zone comprising the estuary, immediately under marine influence, and the upstream part, where salinity remains very low.

4.1.1 Fish

Freshwater fishes inhabiting the river systems of the Solomon Islands may be classified according to their salinity tolerance. This provides an indication of their biogeographical distribution and ecological preferences, as well as context to evaluate the effects on these species from changes to river flow. The following simplified classification has been applied (Keith *et al*. 2021):

- Primary fish: those that are strictly intolerant to saltwater and therefore cannot cross any salty zone.
- Secondary fish: those that are mainly found in freshwater but can cross narrow salty barriers occasionally.
- Diadromous fish: those that are migratory and alternate between freshwater and saltwater according to their life cycle. These fish could be further classified in to three subcategories:
    - Anadromous fish: spend most of their life in salt water and migrate to freshwater to reproduce.
    - Catadromous fish: spend most of their life in freshwater and migrate to saltwater to reproduce.
    - Amphidromous fish: females spawn in freshwater, where the eggs are then fertilised by the males. After hatching the larvae are carried by the current out to sea where they spend a variable amount of time. The young fry then return to freshwater to resume their growth.

Similar to most other Pacific islands, the Solomon Islands does not have any indigenous primary and secondary fish. Therefore, all freshwater fish fauna of Solomon Islands is categorised as diadromous, needing movement between fresh and salt water to complete their life cycle. Eels are catadromous fish with adults migrating to the ocean to spawn, and juveniles migrating back into freshwater systems to grow to maturity. During their upstream migrations, juvenile eels can climb to the upper reaches of river systems.

Species, such as Gobioids, Mesopristes and prawns, are amphidromous. Spawning occurs in the rivers, and larvae drift passively to the ocean before migrating back as juveniles to the freshwater system where they grow into adults. The factors triggering upstream migration of juveniles are not completely understood, and may vary between species, although may be related to the hydrological regime and high turbidity, or lunar cycles.

In the latest comprehensive guide to freshwater fishes of Solomon Islands, Keith et al. (2021) lists a total of 80 fish species that are known to occur in the rivers of the Solomon Islands, along with one unidentified Gobioid and a noodle fish species. Of these, 14 were listed as local or regional endemics. The goby *Stiphodon surrufus* was listed as Vulnerable by Keith et al. (2021). However, *Stiphodon surrufus* and the taxon *S. birdsong* which was synonymised with *S. surrufus* based on morphological (Keith *et al*. 2015) and genetic (Lor 2016) characters, are both now listed as Least Concern by the IUCN (IUCN 2023).

4.2 Hydrology

4.2.1 Climate and Flows

Average daily temperatures in Guadalcanal range from 22°C to 31°C throughout the year, with a yearly average of 26.6°C in Honiara. The island has a tropical moist climate with regular rainfall. Rainfall increases with altitude and is higher on the windward coast (South shore). Annual rainfall at both Honiara, and Honiara International Airport is 1972 mm, with summer months being the driest. It was estimated that annual rainfall at the dam site exceeds 2500 mm per annum, and in excess of 3500 mm of total annual rainfall in the headwater reaches of the Tina River.

Guadalcanal is periodically subjected to tropical cyclones that are most likely to occur between November and April and are associated with extreme rainfall events. The Tina River experiences flash floods almost immediately after heavy rainfall events occur in the upper catchment. Flow and water level can change rapidly during such events. While the Tina River is characterised by fast to very fast flows, moderate to deep water and moderate discharge in upstream areas. In comparison the Toni and Ngalimbiu Rivers have moderate to fast flows and willow to moderate depths, with high discharge. The Sutakama River, approximately 20 km to the east, is most similar to the Tina River, being a more substantial system subject to higher flows surrounded by largely pristine forest with limited anthropogenic disturbance in the upper and mid catchment.

4.2.2 River Geomorphology

The Project Area intersects the Tina River, the catchment area of which is approximately 150 km^2. At its headwaters, the river flows through a narrow, steep-sided and incised limestone gorge that is largely pristine and unaffected by human development. In its mid reaches, the slopes gradually become less steep, with isolated human settlements occurring. The Tina River joins the Toni River, a much smaller system with a catchment area of approximately 45 km^2, and at the confluence forms the Ngalimbiu River, which flows downstream through a coastal plain, before discharging into Iron Bottom Sound on Guadalcanal's North coast. The coastal plain is more highly developed than upstream areas of the catchment.

The Tina River is a single channel meandering river. It has torrential behaviour with regular flash floods. The texture of its bed includes gravel, cobbles and boulders, and fine and coarse-grained sand. In the higher elevation headwaters of the Tina River, very large boulders are intertwined with logs. The upper Tina River is characterised by sequences of pools and rapids and sharp meanders. Major boulders, some greater than 3 m diameter, have accumulated along the channel bars. These large boulders indicate that intense floods occasionally occur within this reach.

In its middle reach, the river enters steep limestone gorges where its course is more confined and less meandering. At this location most of the river's course is made of rapids. In many areas, riverbanks are dominated by rocky outcrops. The dam and reservoir infrastructure of the Project will be located in this area. The river reaches downstream of the dam flows through areas with willower shoreline slopes, lower gradient, and many meanders, including where the powerhouse infrastructure will be situated. The density of human settlement also gradually increases with distance downstream to the confluence with the Toni River, where the river becomes the Ngalimbiu River. The Ngalimbiu River flows across a flat coastal plain characterised increased anthropogenic habitations and activities, including palm oil plantations and gravel extraction for development.

4.3 Aquatic Ecology

4.3.1 EAAA, Riverine Habitat and Reaches

The EAAA for aquatic biodiversity values that was derived for the Project consists of four sub-catchments that extend from the upper catchment of the Tina and Toni Rivers, to the coast of the Ngalimbiu River, comprising a total area of 538.06 ha (Figure 4-1). The Tina River has a larger upper catchment and is a more substantial system than the Toni River, the confluence of which becomes the Ngalimbiu River, before flowing out to meet the ocean (Figure 4-1).

The river systems have been separated into reaches (Figure 4-1) according to elevation within the catchment and disturbance (Table 4-1). The Upper and Mid Riverine Reaches of the Tina and Toni Rivers are relatively pristine, and are characterised by a diverse range of habitats, substrates, and flows, and are typically surrounded by Undisturbed Primary Forest. There are faster flowing riffles in the upper catchment, with the prevalence of larger boulders and with limited submerged vegetation (FRC environmental 2021; 2022).

Downstream in the Ngalimbiu River flows are more moderate, with the riverbed comprising finer material, characterised by emergent vegetation and invasive species, and limited habitat diversity. This is associated with a higher level of anthropogenic disturbance from habitations and agriculture, including intensive fishing practices closer to the coast (FRC environmental 2021; 2022).

The aquatic EAAA and associated river systems supports potentially conservation significant communities and species, defined under the IFC GN6 (World Bank Group 2019) criteria and thresholds. This includes listed species (Endangered) and species that may be considered range restricted. These are summarised in the subsequent sections for aquatic ecosystems.

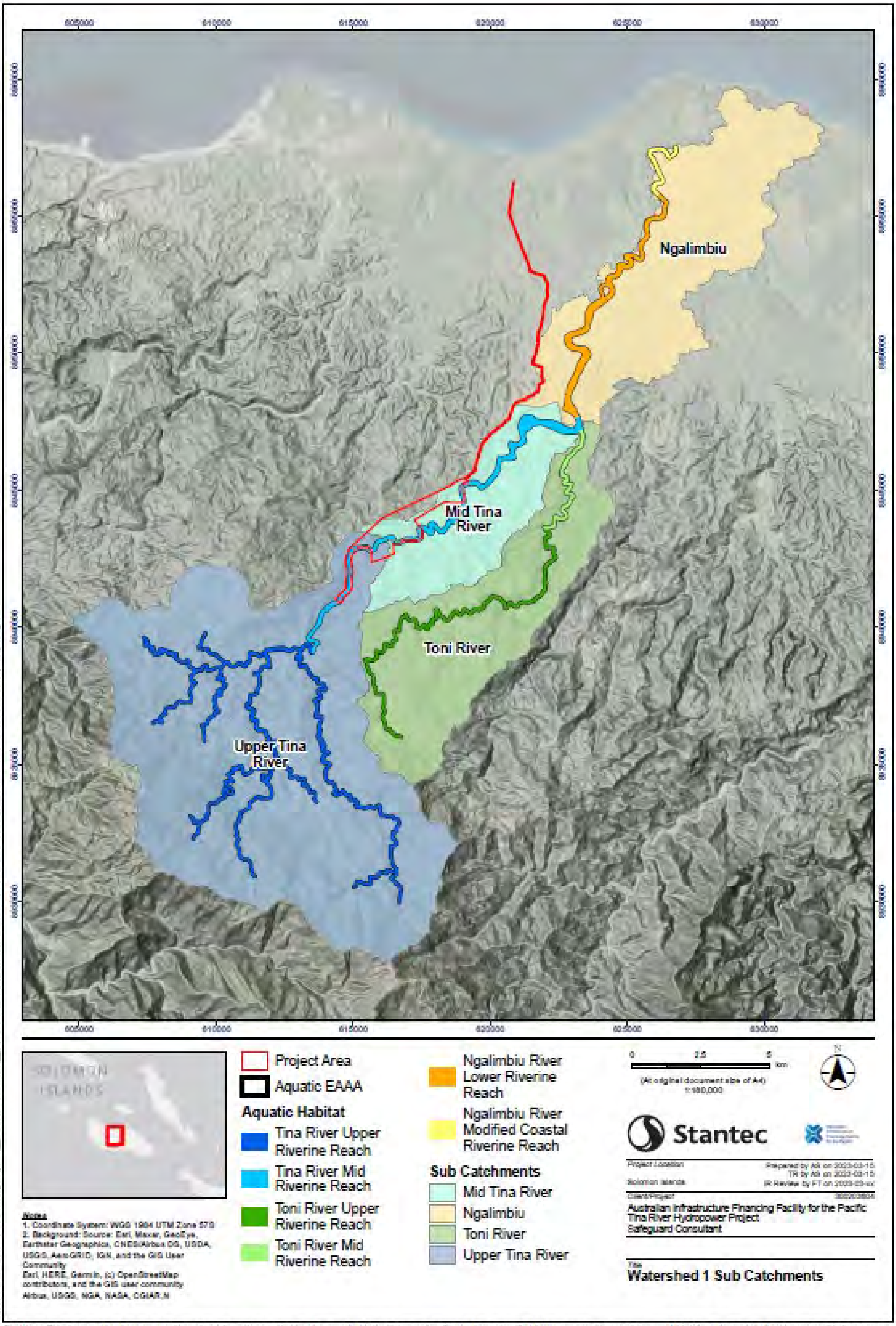

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Figure 4-1: Riverine reaches of the aquatic EAAA showing sub catchments of the Tina, Toni, and Ngalimbiu Rivers, in relation to the Project Area.

Table 4-1: Summary of aquatic (A) riverine reaches within the EAAA for the Tina, Ngalimbiu, and Toni Rivers.

River System	Riverine Reach	Description (Source: FRC 2022)
Tina River	**Upper Riverine Reach** 	The Upper Riverine Reach of the Tina River comprises numerous smaller, narrow tributaries (approximately 10 m wide), which converge into a well-defined channel (up to 35 m wide), has stable banks and steep-sided slopes. The river and its tributaries are a perennially flowing waterway, which varies over the wet and dry seasons. High quality habitat in the upper catchment is attributed to diverse substrate (large boulders, cobbles, small pebbles, sand, and gravel), flow, depth, and surrounding native vegetation (native forest). The area is pristine, which corresponds to high ecological values that support rich macroinvertebrate and fish communities.
	Mid Riverine Reach 	The Mid Riverine Reach of the Tina River comprises a well-defined channel (up to 50 m wide)), which is mildly braided, with irregular meanders and low, stable banks with low to steep-sided slopes. The river is a perennially flowing waterway, which varies over the wet and dry seasons. High quality habitat is attributed to diverse substrate (large boulders, cobbles, small pebbles, sand, and gravel), flow, depth, and surrounding native vegetation (native forest). The mid catchment area is relatively pristine, upstream, becoming more disturbed downstream, which corresponds to moderate to high ecological values that can support rich macroinvertebrate and fish communities.
Ngalimbiu River	**Lower Riverine Reach** 	The Lower Riverine Reach of the Ngalimbiu River comprises a well-defined channel (up to 80 m wide), which has highly stable low banks. The river is a perennially flowing waterway, which varies over the wet and dry seasons. Habitat comprises mostly cobbles, pebbles sand and gravel, with native forest surrounds interspersed with invasive shrub and grass species. Anthropogenic disturbance in the lower catchment is higher with habitations and cropping or plantations becoming more prevalent. This corresponds to moderate to lower ecological values and less diverse macroinvertebrate and fish communities.
	Coastal Riverine Reach 	The Coastal Riverine Reach of the Ngalimbiu River comprises a well-defined channel (up to 70 m wide), which has highly stable low banks. The river is a perennially flowing waterway, which varies over the wet and dry seasons. Habitat transitions to from smaller pebbles and sand to silt and sand closer to the coast. There is a higher level of anthropogenic disturbance of the surrounding land, while this part of the river is subject to intense fishing practices, with the pest species mosquitofish also known this area. This corresponds to lower ecological values and less diverse macroinvertebrate and fish communities.
Toni River	**Upper Riverine Reach** 	The Upper Riverine Reach of the Toni River likely comprises similar characteristics to the upper catchment of the Tina River and is in largely pristine condition, with surrounding native vegetation (including forest and riparian species). Substrate composition, flow and depth vary, with channel width less than the Tina River (<30 m wide). As the upper catchment area is largely undisturbed, this corresponds to high ecological values that are likely to support rich macroinvertebrate and fish communities.
	Mid Riverine Reach 	The Mid Riverine Reach of the Toni River likely comprises similar characteristics to the mid catchment of the Tina River. This part of the river is also has low to moderate disturbance from logging and habitations, with surrounding native vegetation (including forest and riparian species), with a low density of weeds. Substrate composition, flow and depth vary, although typically there are less large boulders downstream, and the maximum channel with is approximately 30 m. Ecological values likely range from moderate to high and can also support rich macroinvertebrate and fish communities.

4.3.2 Water Quality

The Tina and Ngalimbiu River system and nearby Toni River, as well as the Sutakama River to the east, are characterised as largely pristine, and freshwater (<400 µS/cm) in their upper and mid reaches. The coastal reach of the Ngalimbiu River is tidally influenced, with salinity increasing to >3000 µS/cm at the mouth of the ocean. The pH of surface waters in these rivers is generally circumneutral to alkaline in the upper reaches (pH 7-8), becoming more alkaline downstream (>pH 8) (FRC environmental 2021; 2022).

The majority of metals and trace elements in surface water generally complies with ANZG (2018) guidelines (FRC environmental 2021, 2022). Exceptions have included the concentrations of total aluminium, copper, cadmium, cobalt, zinc, and dissolved concentrations of copper and zinc. However, this is likely attributed to natural mineralisation in the catchment, with exceedances recorded in the Tina and Sutakama Rivers in the most recent 2022 survey. Herbicide concentrations, while known for use on palm oil plantations, were below reporting limits, including along the lower reaches of the Ngalimbiu River (FRC environmental 2021).

4.3.3 Algae and Macrophytes

Phytoplankton in the Tina, Ngalimbiu, Toni and Sutakama Rivers typically occur in low abundance and diversity, representing four phyla; Bacillariophyta (diatoms), Chlorophyta (green algae), Cyanophyta (blue-green algae) and Euglenozoa (Protists). The 2022 survey reported 65 taxa with 39, 11, 14 and one taxa in each of the four phyla, respectively (Annex 6). Of these, diatoms were the most diverse phyla and were locally abundant at some sites. While phytoplankton have not been identified to species level, they are typically considered to have a cosmopolitan distribution globally, and therefore are not listed by the IUCN.

Periphyton (algae growing on substrates) has been found in varying abundance throughout these rivers systems. Diversity has generally been higher in the Tina and Toni Rivers, except where sandier river beds are more prevalent. During the 2020 survey (FRC environment 2021) taxa numbers comprised 58 morphospecies of diatoms, 27 green algae and 30 cyanobacteria (Annex 7), along with three red algae (seaweeds) and four protists identified.

Macrophytes (Annex 8) have been found in low densities along the banks and dry beds of the rivers and include *Typha* sp. stands (FRC environmental 2021, 2022). The most widespread aquatic plants recorded comprise sedges including *Cyperus* spp. and *Fimbristylis* spp. and willow primrose (*Ludwigia octovalvis*). While uncommon, aquatic weeds including kang kong (*Ipomoea aquatica*) are also known from the Tina River, while para grass (*Brachiaria mutica*) occurs at moderate densities along the edges of the lower Tina, Toni and Ngalimbiu Rivers. The invasive devil's fig / eggplant (*Solanum* sp.) also occurs along the banks of the Tina and Ngalimbiu River (FRC environmental 2021). Low densities of water morning glory (*Ipomoea aquatica)* are also present in the lower reaches of the Ngalimbiu River in proximity to the coast (FRC environmental 2022).

4.3.4 Macroinvertebrates and Crustaceans

The macroinvertebrate composition of the Tina, Ngalimbiu, Toni and Sutakama Rivers predominantly comprise aquatic insect larvae from a range of orders including Hemiptera (families Notonectidae, Gerridae, Mesoveliidae, Ochteridae, Saldidae and Veliidae), Odonata (families Chlorocyphidae, Coenagrionidae, Protoneuridae and Libellulidae), Coleoptera (family Dystiscidae) and Diptera (family Dolichopodidae) (THL 2019). During the 2021 survey (FRC environmental), a total of 81 macroinvertebrate morphospecies were identified from the Tina, Toni and Ngalimbiu Rivers, 58 of which were found in the Tina River (Annex 9).

During the most recent 2022 survey (FRC environmental 2022), a total of 124 macroinvertebrate morphospecies were identified across the Tina, Toni, Ngalimbiu and Sutakama Rivers (Annex 9). Of these, 98 taxa were recorded from the Tina River, while 44 species were recorded from the Sutakama River. The majority of taxa comprised aquatic insect larvae, including three families of beetles (Coleoptera), 10 families of flies (Diptera), four families of mayflies (Ephemeroptera), five families of true bugs (Hemiptera), four families of dragonflies (Odonata), eight families of caddisflies (Trichoptera), and one family of moths/butterflies (Lepidoptera). Segmented worms (Oligochaeta), polychaete worms (Polychaeta), proboscis worms (Nemertea), arachnids (Arachnida) and snails (Mollusca) were also recorded. While abundance and diversity were variable, these were typically higher in the upper reaches of the Tina and Toni Rivers, compared to the lower Ngalimbiu River. There were also no Plecoptera, Ephemeroptera, and Trichoptera (PET) taxa recorded from the lower Ngalimbiu River.

All crustaceans collected during these surveys have been native species, comprising a total of 24 morphospecies (FRC environmental 2021; 2022). The crustacean communities in the Tina, Ngalimbiu, Toni and Sutakama Rivers were predominantly freshwater prawns (Palaemonidae; 13 morphospecies) and freshwater shrimp (Atyidae; eight morphospecies). The most widespread and diverse Palaemonid prawns were mostly represented by *Macrobrachium* and *Palaemon* species (Annex 9). This included the Koua river prawn (*Macrobrachium australe*), and the Hawaiian river shrimp (*Macrobrachium grandimanus*). One morphospecies each of hermit crab (Paguridae), marine prawn (Penaeidae), freshwater crab (Varunidae) and amphipod (Corophiidae) were also reported in 2022 (FRC environmental 2022).

A consolidation of aquatic invertebrate results from recent surveys (FRC environmental 2021; 2022) indicates there are more than 140 macroinvertebrate and microcrustacean taxa that have been identified from the Tina and Ngalimbiu River system (Annex 9). The conservation significance of these groups is not often considered for evaluation by the IUCN and there is also limited survey effort and scientific literature available to understand taxonomy, distribution, endemicity and population size. However, based on a limited number of studies from Guadalcanal, there are numerous macroinvertebrates that are considered endemic (Polhemus *et al.* 2008; BRLi 2013; HEC 2020), predominantly comprising insects with an aquatic larval stage. The damselfly *Lieftinckia lairdi* is listed as Endangered by the IUCN (IUCN 2022) and has been identified from Charebuma River on Guadalcanal (Polhemus *et al.* 2008), although has not been recorded in any of the recent baseline surveys of the Tina, Ngalimbiu, Toni and Sutakama Rivers (FRC environmental 2021; 2022).

Of the aquatic invertebrate taxa recorded from the Tina and Ngalimbiu Rivers, four macroinvertebrate and one freshwater prawn species were identified as of potential conservation significance (Table 4-2). These were taxa with potentially restricted distributions and/or represent new records for the Solomon Islands (Table 4-2).

4.3.5 Fish

The most recent field survey (FRC environmental, 2022) identified a total of 41 fish morphospecies, were native and mostly comprised gobies (Gobiidae) and gudgeons (Eleotridae) as follows:

- 14 species caught in the upper reaches of the Tina River, including eleven goby and three gudgeon species;
- 17 species caught in the mid reaches of the Tina River, including ten goby and five gudgeon species;
- 11 species caught in the Toni River, including six goby and three gudgeon species;
- 23 species caught in the Ngalimbiu River sites (upstream of the river mouth), including 11 goby and seven gudgeon species;
- 12 largely marine vagrant species caught in the Ngalimbiu River mouth, including one goby species; and
- 15 species caught in the mid and upper reaches of the Sutakama River, including 10 goby and one gudgeon species.

Table 4-2: Conservation significant aquatic biota species identified from the ecology review, which were considered for the CHA, indicating records from the Project Area.

Scientific Name	Common Name	IUCN Status	Habitat Type (migration pattern)	Known Distribution	Restricted Range / New Records*	Local Records and Habitat (FRC 2021; 2022; Golder Associates 2009; Albert *et al.* 2016)
Macroinvertebrates						
Orphninotrichia sp. 1	Trichoptera; caddisflies	Not evaluated	Freshwater	Australia	Yes	Upper and mid reaches of the Tina River (relatively pristine), supporting diverse habitats
Prosopistoma sedlaceki	Ephemeroptera; mayflies	Not evaluated	Freshwater	New Guinea and Solomons (Guadalcanal)	Yes	Upper and mid reaches of the Tina River and Sutakama Rivers (relatively pristine), supporting diverse habitats
Rhagovelia brownie	Hemiptera; true bugs	Not evaluated	Freshwater	Endemic to Guadalcanal	Yes	Upper reach of the Tina River (relatively pristine), supporting diverse habitats. Other records from rivers in mid to lower catchments on Guadalcanal (within 60 km)
Xylochironomus sp. 1	Chironomidae; nonbiting midges	Not evaluated	Freshwater	Australia	Yes	Upper reach of the (relatively pristine), supporting diverse habitats
Crustaceans						
Caridina intermedia	Freshwater prawn	Not evaluated	Marine; freshwater; brackish	Solomon Islands (Choiseul, Guadalcanal, Isabel, Kolombangara, Vella Lavella); PNG (New Britain)	No	Mid to lower reaches of the Tina/Ngalimbiu River system and more broadly across Guadalcanal and along the coast
Fish						
Hypseleotris cf *guentheri*	Gudgeon	Not evaluated	Marine; freshwater; brackish (amphidromous)	Solomon Islands and PNG	No	Mid to lower reaches of the Tina/Ngalimbiu River system, mid reach of the Sutakama River and Matepono River on Guadalcanal
Rhyacichthys guilberti	Loach goby	DD	Marine; freshwater; brackish (amphidromous)	New Guinea, Solomon Islands and Vanuatu	No	Upper to lower reaches of the Tina/Ngalimbiu River system and Matepono River on Guadalcanal
Schismatogobius essi	Goby	Not evaluated	Freshwater+	Solomon Islands and West New Britain (PNG)	No	Mid to lower reaches of the Tina River and upper reach of Sutakama River
Schismatogobius hoesei	Scaleless goby	LC	Freshwater+	NW Australia, Papua New Guinea and Solomon Islands	No	Mid reach of Tina River and upper reach of Sutakama River
Schismatogobius vanuatuensis	Vanuatu *Schismatogobius*	DD	Freshwater+	New Guinea, Solomon Islands and Vanuatu	No	Upper and mid reaches of the Tina River system

Note * indicates based on available data and literature and following precautionary approach. + distribution extends beyond the Solomon Islands and limited information suggests these are known migratory (diadromous) species.

Based on the consolidated fish records from the Tina and Ngalimbiu Rivers, which comprises previous survey data, scientific papers, and recent environment DNA (eDNA) work, at least 125 taxa have been recorded the freshwater reaches of this system (Annex 10). Of these, 28 taxa have not been identified to species level, due to limited taxonomic resolution and a lack of taxonomic guides. In addition, according to the recent eDNA results, at least nine marine fish species recorded as part of this dataset (Wilderlab 2023) are likely from DNA residues in residential sewage, with these species common in the food industry as both fresh and canned fish (Annex 11)

None of the fish recorded from Tina River to date are endemic to the system, Guadalcanal, or the Solomon Islands, and all are migratory (catadromous and amphidromous) species (THL 2019). In general, the freshwater fish species of the Tina and Ngalimbiu Rivers are small in body size with very few species exceeding 20 cm in total length (Keith et al, 2021). While some groups (e.g. Syngnathidae) are largely restricted to the lower reaches of the river, most species migrate further upstream.

Previous studies (Pilgrim 2017) of *Stiphodon*, *Sicyopterus* and *Lentipes* have indicated that representatives of these genera are potentially restricted to freshwater environments on the Solomon Islands. Based on the literature review, five taxa of *Sicyopterus* (*S. cynocephalus, S. lagocephalus, S. longifilis, S. microcephalus, S. stiphodonoides*) and four taxa of *Schismatogobius* (*S.* cf *bruynisi, S. essi, S. hoesei, S. vanuatuensis*) have been recorded from Tina River (Annex 9). However, none of these taxa are restricted to the Tina River, Guadalcanal or the Solomon Islands. In addition, no *Lentipes* species have been recorded from this system.

Recent eDNA work (Wilderlab 2022) identified two additional species of *Sicyopterus* from the Tina River (*S. parvei* and *S. lividus)* (Annex 11). The former species is an Indonesian local endemic (Lord et al. 2019), known only from Manggarai, Flores (Tjakrawidjaja 2002); Sukamade River, East Java (Rukmana et al. 2014); and Java and Bali (Dahruddin et al. 2016), with no records from the Pacific Islands. Similarly, *S. lividus* is known from Ponape in the Eastern Caroline Islands, Micronesia (Parenti and Maciolek, 1993), with no records from the Solomon Islands. Therefore, the records of both species are considered erroneous (Keith and Lord pers. comm. 2023).

Therefore, based on the available information and species records, there are no endemic taxa known to Guadalcanal or the Solomon Islands, and no Threatened or Endangered species listed by the IUCN (IUCN 2022). However, according to the consolidated fish records from the Tina and (Annex 9), five species are potentially conservation significant (Table 4-2), and have local or regional importance within a global context (Keith *et al.* 2021).

There are also at least two exotic species; Mozambique tilapia (*Oreochromis mossambicus*) and Mosquitofish (*Gambusia holbrooki*), which are locally established in the lower reaches of the Tina and Ngalimbiu River system (Annex 10). The goldfish record (*Carassius auratus*) from the eDNA results can be attributed to household waste from aquaria species (Annex 10).

4.4 Summary of Significant Communities and Species

The detailed ecology review of terrestrial and aquatic biodiversity values was based on publicly available regional literature and data, and survey work specifically commissioned for the Project, as well as consultation with relevant experts. A total of 278 terrestrial flora species and 147 fauna species have been recorded or are considered likely to occur in the Project Area. In comparison, from the Tina and Ngalimbiu River systems, a total of 134 algae, 14 macrophytes, 143 macroinvertebrates (including 26 macrocrustaceans), and at least 125 fish species have been identified.

Conservation significant communities and taxa identified during the ecology review are summarised in Table 3-2 (terrestrial ecosystems) and Table 4-2 (aquatic ecosystems), and include IUCN listed species and those defined as trigger species (World Bank Group 2019). Key communities comprised the Solomon Islands Rainforest which supports Lowland and Montane Forest, and several conservation significant flora species (Table 3-2).

A total of one vegetation community (Solomon Islands Rainforest flora), four plants, seven mammals, 15 birds, and 16 reptile and amphibian species were identified as potential terrestrial Critical Habitat trigger species (Table 3-2), while four macroinvertebrates, one macrocrustacean, and five fish taxa (including eDNA results) (Table 4-2) were identified as potential aquatic Critical Habitat trigger species. These conservation significant communities and taxa were subsequently screened against the relevant Critical Habitat criteria and thresholds, in accordance with IFC GN6 (World Bank Group 2019), resulting in a reduced subset of trigger species, described in more detail in Section 5.2.

5. CRITICAL HABITAT ASSESSMENT

5.1 Review of Previous Critical Habitat Assessments

A review of previous terrestrial and aquatic Critical Habitat Assessments (CHAs) completed for the Project are provided in the sections below. During these assessments, spatial and environmental data gaps were identified, with higher resolution spatial data now available to define habitat units more accurately. Updated information is also available on conservation significant communities and species, their habitats and distribution, which was used to revise the CHA presented in Section 5.2.

5.1.1 Pilgrim CHA (2017)

The terrestrial CHA completed by Pilgrim (2017), was based on the ESIA (TRHDP 2017) and on previous guidelines and thresholds (World Bank Group 2012a; 2012b). This CHA classified substantial Natural Habitat within the Discrete Mapping Unit (DMU; now known as the EAAA), consisting of both Undisturbed Forest and Disturbed Secondary and Remnant Forests (Pilgrim, 2017). A summary of the classification of Critical Habitat and direct impacts from the Project within Core Land is provided in Table 5-1. The following justification was provided for this classification Critical Habitat as follows:

- Solomon Islands Rainforest, comprising relatively intact Undisturbed Forest, Montane Forest and Riparian Forest and listed as a World Heritage Site, and potentially occurring within the Core Land, triggering Critical Habitat.
- Guadalcanal Boobook (*Ninox granti*), the DMU was estimated to represent more than 1% of the species' global range or population. In the absence of further information on the species' distribution and ecology, high quality forest within the Core Land was preliminarily assessed as Critical Habitat (Pilgrim 2017).
- Black-headed Myzomela (*Myzomela melanocephala*), the DMU was estimated to represent approximately 1.7% of the species' known range. In the absence of further information on the species' ecology and distribution, high quality forest within the Core Land was preliminarily assessed as Critical Habitat.
- Guadalcanal Bow-fingered Gecko (*Cyrtodactylus biordinis*), the DMU was estimated to represent more than 1% of the species' global distribution and population. In the absence of further information on the species' ecology and distribution, high quality forest between 300 m to 500 m elevation within the Core Land was preliminarily assessed as Critical Habitat.
- King Rat (*Uromys rex*), while there was no evidence of the presence of the species, the species may remain undetected within the Tina watershed and within forest considered Natural Habitat in the Core Land. Therefore, this may trigger Critical Habitat and appropriate mitigation and offset measures should be in place.
- White-eyed Starling (*Aplornis bruneicapillus*), there was no evidence of the presence of this species, and the Core Land does not trigger Critical Habitat, although adaptive management and low-level monitoring was recommended.

The key findings of the aquatic CHA (Pilgrim 2017) indicated the following:

- Tina River, freshwater ecosystem retaining the majority of its ecological function, despite some degradation from gravel mining and fishing, as well as general household use from villages, particularly in low-lying areas of the catchment. The river and associated tributaries were classified as Natural Habitat.

- Fish, identifications were uncertain, with a high likelihood that some would be restricted range species or species new to science. This may qualify the Tina River and its tributaries as Critical Habitat.

Table 5-1: Summary of quantitative estimation of direct impacts from the Project on terrestrial Critical, Natural, and Modified Habitat (Pilgrim 2017).

Classification	Habitat Unit	Direct Impact Area (ha)
Critical Habitat	Undisturbed Forest	9.54
	Montane Forest	0
	Riparian	21.62
Sub-total (Critical Habitat)		***31.16***
Natural Habitat	Disturbed Forest	29.65
	Remnant Forest	21.87 (incl. 10 ha of temporary disturbance)
	Cliffs	16.12
Sub-total (Natural Habitat, including Critical Habitat)		***98.80***
Modified Habitat	Grasslands	6.09
	Garden	0
	Fallow Brush Land	6.40
Sub-total (Modified Habitat)		***12.49***
TOTAL		**111.29**

5.1.2 TRHDP ESIA (2019)

The updated ESIA (THL 2019) divided Core Land into three sub-regions based on elevation; higher elevation of Undisturbed Montane Forest, mid-elevation Lowland Forest and lower elevation Grasslands. The location of the Project and impact areas occur within the mid-elevation river gorge and downstream catchment, representing a very small portion of the catchment (<3% of land area) (THL 2019). Within these habitats the following was noted in relation to the terrestrial CHA:

- There have been no conservation significant terrestrial species recorded and these areas do not support globally significant numbers of migratory species or key evolutionary processes.

- Restricted range and endemic species were found to occur, although the habitats within impacted areas represented only a small portion of broader habitats available for the species.

- Construction and operation of the Project will mostly occur outside of areas classified as terrestrial Critical Habitat. However, the following ecosystem was also noted as potentially triggering Critical Habitat.

- Undisturbed Montane Forest, above 400 masl in the upper catchment to the south, west and east of the dam site and reservoir potentially represents an ecosystem with limited global distribution and supports a unique assemblage of species, which may trigger Critical Habitat.

The aquatic assessment of the Tina River within the Core Land (THL 2019) did not qualify as Critical Habitat for the following reasons:

- Riverine Habitat, while having an important role in maintaining the life cycle of numerous fish species does not support restricted taxa or specific behaviours unique to the Tina River.
- Upper Tina River, based on available information did not satisfy the definition for endemic or range restricted macroinvertebrate insect and all taxa have been identified in other catchments throughout Guadalcanal.

5.1.3 Myknee Ecological Consulting Review (2020)

A terrestrial biodiversity and Critical Habitat review was undertaken by Myknee Ecological Consulting (2020) to clarify habitats and species records within the Core Land of the Project. This included a field survey to verify flora and fauna data and habitat mapping, with cross-reference to Critical Habitat identified in previous versions of the ESIA (TRHDP 2017; THL 2019). The Critical Habitat review is brief and largely consists of mapping. The key findings of the CHA were as follows:

- The two proposed quarry Sites, the temporary storage sites, the steep cliff site above the dam, the powerhouse area and the proposed crusher plant sites were all regarded as Critical Habitat. No further explanation is provided to justify this classification.

5.1.4 P-2 BMP for Lot 1 (2020)

The BMP for Lot 1 of the Project comprised a terrestrial CHA (HEC 2020), which relied mostly on Pilgrim (2017), along with habitat mapping from Myknee Ecological Consulting (2020), with the following key findings:

- Primary Lowland Forest, Riparian and Cliff areas were considered Critical Habitat.
- Secondary lowland forest and remnant lowland forest were considered Natural Habitat.
- Biodiversity values (conservation significant species) that qualified the Lowland Forest and Montane Forest as Critical Habitat included:
  - Guadalcanal Boobook (*Ninox granti*);
  - Black-headed Myzomela (*Myzomela melanocephala*);
  - White-eyed Starling (*Aplonis brunneicapillus*);
  - King Rat (*Uromys rex*);
  - Guadalcanal Bow-fingered Gecko (*Cyrtodactylus biordinis*);
  - Guadalcanal Monkey-faced Bat (*Pteralopex atrata*); and
  - Solomon Sea-Eagle (*Haliaeetus sanfordi*).

The aquatic CHA identified the following in relation to potential conservation significant species:

- Fish species, knowledge gaps exist within the catchment, with the Natural Habitat of the Tina River also considered Critical Habitat.
- *Lieftinckia lairdi* (dragonfly), potential to occur within the riverine habitat and/or riparian margins (lacking data). This species is listed as endangered by the IUCN (IUCN 2020) and is also considered a restricted range species, triggering Critical Habitat (using the precautionary approach).

5.1.5 P-2 BMP for Lots 2 and 3 (2021)

The BMP prepared by Inogen Alliance (2021) for Lot 2 & 3 of the Project included a revised terrestrial CHA, considering Pilgrim (2017), with comparison of conservation significant species listed by the IUCN, along with mapping of flora and fauna survey results from Myknee Ecological Consulting (2020). This review utilised the area calculations for habitat types impacted within the Core Land. The key findings of the terrestrial CHA were as follows:

- 31 species of important biodiversity value were considered potentially Critical Habitat-qualifying species. However only 20 of these species were observed during field surveys, with remaining species either reported to have been seen by locals or recorded in previous studies of the area.
- The review concluded that direct impacts on Critical Habitat appear to be non-significant, given the remaining extent of high-quality forest on Guadalcanal.

5.1.6 Panel of Experts Review (2022)

A specialist review of the biodiversity values of the Tina River that may impacted by the Project was recently completed by Pusey & Cambell (2022), providing CHA guidance in relation to aquatic biota (macroinvertebrates and fish) as follows:

- Fish, the Tina River was not considered Critical Habitat for, with considerable new information available for the Solomon Islands on species within the Tina/Ngalimbiu River. Most species are known from wider West Pacific or Solomon Islands region, and there are no endemics recorded from the Tina/Ngalimbiu River or listed as conservation significant. In addition, the river within the Core Land is not known to support globally significant concentrations or numbers of individuals of congregatory species.
- Aquatic invertebrates, the Tina River should be regarded as Critical Habitat on a precautionary basis, in the absence of further information. There are likely to be many species present in the river that are endemic and restricted to Guadalcanal and possibly to the Tina River.

However, several knowledge gaps were also identified (Pusey & Cambell 2022) as follows:

- Limited understanding of the e-flow requirements to support aquatic biota, downstream of the powerhouse; and
- Lack of understanding on modification of the river’s flow regime in relation to the potential impacts on the mobilisation of sediments, the aquatic ecosystem food web and the reproduction and recruitment of fish species.

5.2 Revised Critical Habitat Assessment

5.2.1 Terrestrial Critical Habitat Assessment

The conservation significant vegetation communities, flora and fauna species identified in Section 3.4 were assessed against the IFC GN6 (World Bank Group 2019) Critical Habitat criteria and thresholds (Annex 1 & 12). These potential trigger communities and species are discussed in the sections below and summarised in Table 5-2. Further investigation determined that of these, one vegetation community, three flora species, two mammal species, and two bird species triggered Critical Habitat (Table 5-2).

5.2.1.1 Terrestrial Vegetation Communities and Flora

Solomon Island Rainforest triggers **Critical Habitat** (Annex 1), due to its extent within the terrestrial EAAA, while also supporting several potential flora trigger species as follows:

- Actinodaphne (*Actinodaphne solomonensis*), a tree species native to the Solomon Islands that grows primarily in tropical rainforest, at approximately 150 masl (MNHN & Chagnoux 2022). This habitat is considered consistent with the area of Undisturbed Primary Forest and Disturbed Secondary Forest. The EAAA is estimated to represent more than 0.5% of the species' global range or population which qualifies these habitat units as **Critical Habitat** (Table 5-2, Annex 1).
- Cryptocarya (*Cryptocarya medicinalis*), a tree species endemic to Solomon Islands and occurs at approximately 200 masl (IUCN 2022) and previously recorded from approximately 180 masl in habitat described as Foothill Rainforest, Primary Forest and along ridge tops and hillsides in well drained, Secondary Forest (Bijmoer *et al.* 2022). This is consistent with Undisturbed Primary Forest, Disturbed Secondary Forest, and Cliff Habitat. The EAAA is estimated to represent more than 0.5% of the species' global range or population, triggering **Critical Habitat** (Table 5-2, Annex 1).
- Rosewood (*Pterocarpus indicus*), is lacking data on global range and EOO, although is listed as Endangered by the IUCN (IUCN 2022) and is known to occur from 600 masl to 1300 masl in both Primary Undisturbed Forest and less commonly in Secondary Undisturbed Forest. It can grow in all soil types and is most frequent along tidal creeks, rocky shores and some coastal sites (IUCN 2022). The species has been recorded within the Project Area (Myknee Ecological Consulting 2020; HEC 2021), however also has a wider distribution across Asia Pacific (GBIF 2022). Applying the precautionary approach, this species does trigger **Critical Habitat** (Table 5-2, Annex 1).

5.2.1.2 Terrestrial Fauna

Rats

A large survey of Guadalcanal's three species of *Uromys* rats was undertaken to understand potential occurrence and distribution (Oceania Ecology Group 2016). Based on the results, the following was determined:

- Guadalcanal Rat (*Uromys porculus*), ground-dwelling and unlikely to occur within the Project Area or surrounds due to high densities of feral cats found on Guadalcanal and therefore **does not** trigger Critical Habitat (Annex 1).
- Emperor Rat (*Uromys imperator*), unlikely to occur in the Project Area or surrounds due to high densities of feral cats found on Guadalcanal and therefore **does not** trigger Critical Habitat (Annex 1).

- King Rat (*Uromys rex*), arboreal and survey of Intact Lowland Forest between Tina River and Valevahalo recorded evidence (chewed ngali nuts, *Canarium* sp.) of this species on Guadalcanal, with potential for occurrence within the Project Area (Oceania Ecology Group 2016). The EAAA represents greater than 0.5% of the global population size and therefore triggers **Critical Habitat** (Table 5-2, Annex 1).

Bats

Several species of bats have the potential to trigger Critical Habitat according to their habitat preferences as follows:

- Montane monkey-faced Bat (*Pteralopex pulchra*), known only from a single specimen collected on the southern slopes of Mt Makarakomburu, occurring in upland areas of Montane Cloud Forest (Oceania Ecology Group 2016). Extensive surveys above 1,000 masl on the northern side of Mt Popomanasau failed to record the species. It has not been recorded during several surveys of the Project Area and is therefore considered unlikely to occur and **does not** trigger Critical Habitat (Annex 1).
- Guadalcanal Monkey-faced Bat (*Pteralopex atrata*), more common and known from the Lowland Forests of Guadalcanal to approximately 400 masl, roosting in hollow trees. The species may also visit disturbed areas, including village gardens and the edges of Primary Forest and Secondary Forest. This is consistent with comparable Garden Habitat, Undisturbed Primary Forest and Disturbed Secondary Forest in the Project Area and it is considered likely to occur (Oceania Ecology Group 2016). The EAAA represents greater than 0.5% of the global population size and therefore triggers **Critical Habitat** (Table 5-2, Annex 1).

Birds

Several bird species were identified as potential trigger species as follows:

- Guadalcanal Honeyeater (*Guadalcanaria inexpectata*), occupies Montane Forest, preferably Primary Montane Forest above 950 m asl. This species known range is within the threshold for restricted-range and the terrestrial EAAA contains greater than 10% of the global population size. While this species is mainly found in Primary Montane Forest above 950 m asl, it has also been observed within the Project Area and therefore, as a precautionary measure, triggers **Critical Habitat** (Annex 1).
- Guadalcanal Hooded Whistler (*Pachycephala implicata*), occupies Montane Forest above 1,100 m asl. This species known range is within the threshold for restricted-range and the terrestrial EAAA contains greater than 10% of the global population size. While this species is mainly found in Primary Forest above 1,100 m asl, this species has been observed within the Project Area and therefore, as a precautionary measure, triggers **Critical Habitat**. (Annex 1).

Reptiles and Amphibians

There were no reptiles or amphibians that triggered Critical Habitat (Annex 1), based on the screening of species records and distribution against relevant criteria and thresholds. However, for amphibians, according to the available EOO data, eight species were within the restricted range threshold, although the terrestrial EAAA does not contain greater than 10% of the global population. Therefore, reptiles and amphibians **do not** trigger Critical Habitat (Annex 1).

5.2.1.3 Critical, Natural and Modified Habitat Classification

Based on the outcomes of the CHA (Annex 1), one vegetation community (Solomon Islands Rainforest), three flora (*Actinodaphne solomonensis, Cryptocarya medicinalis and Pterocarpus indicus*), two avifauna (*Guadalcanaria inexpectata* and *Pachycephala implicata*), and one bat (*Pteralopex atrata*) species triggered Critical Habitat (Table *5-2*, Figure 5-1Figure 5-1). The following classifications were applied in accordance with the IFC GN6 definitions for CHA (World Bank Group 2019) to the EAAA and Project Area:

- **Critical/**Natural Habitat, comprising areas that are largely pristine (including the Solomon Islands Rainforest ecoregion) or have only been slightly disturbed due to logging, although still support primary ecological function and terrestrial species composition. This includes Undisturbed Primary Forest, Remnant Forest, and Cliff Habitat, supporting trigger species including Actinodaphne (*Actinodaphne solomonensis*), Cryptocarya (*Cryptocarya medicinalis),* Rosewood (*Pterocarpus indicus*), King Rat (*Uromys rex*), Guadalcanal Honeyeater (*Guadalcanaria inexpectata*) and Guadalcanal Hooded-Whistler (*Pachycephala implicata*) (Table *5*-2).
- **Critical/**Modified Habitat, comprising Disturbed Secondary Habitat in the Project Area, which while subject to logging activities, still supports trigger species including Actinodaphne (*Actinodaphne solomonensis*), Cryptocarya (*Cryptocarya medicinalis),* and Rosewood (*Pterocarpus indicus*) and Guadalcanal Monkey-faced Bat (*Pteralopex atrata*) (Table *5*-2).
- Modified Habitat, comprising areas that have been subject to anthropogenic disturbance including logging or agriculture activities, and development, resulting in substantial modification of primary ecological function and terrestrial species composition. This includes Fallow, Garden, Modified Lowland Forest, Agricultural and Cropping, Development and Habitations, Grassland and Saline Swamp Forest Habitats, which does not support trigger species (Table *5*-2).

The CHA and trigger species were subsequently used to inform management and mitigation of terrestrial biodiversity values that may be impacted by the Project (P-2 BMP).

Table 5-2: Summary of the Terrestrial (T) CHA for the Project, according to habitat unit and conservation significant communities and species.

Habitat Assessment	Habitat Unit	Justification for Assessment	Communities or Species Triggering Critical Habitat	Total TEAAA (ha)	Total Project Area (ha)	Total Area Core Land (ha)
Critical/Natural	Undisturbed Primary Forest	• Supports undisturbed forest with intact canopy in pristine condition that provides habitat for a range of trigger species	Vegetation • Solomon Islands Rainforest Flora • Actinodaphne (*Actinodaphne solomonensis)* • Cryptocarya (*Cryptocarya medicinalis*) • Rosewood (*Pterocarpus indicus*) Fauna • King Rat (*Uromys rex*) • Guadalcanal Honeyeater (*Guadalcanaria inexpectata*) • Guadalcanal Hooded-Whistler (*Pachycephala implicata*)	22,421.60	184.21	184.21
Critical/Modified	Disturbed Secondary Forest	• Supports mid-succession secondary forest with intact canopy that provides habitat for a range of trigger species, however, has been subject to logging activities	Flora • Actinodaphne (*Actinodaphne solomonensis)* • Cryptocarya (*Cryptocarya medicinalis*) • Rosewood (*Pterocarpus indicus*) Fauna • Guadalcanal Monkey-faced Bat (*Pteralopex atrata*)	127.11	123.47	119.67
Critical/Natural	Remnant Forest	• Supports mature Ngali nut trees that provide habitat for trigger species	Fauna • King Rat (*Uromys rex*)	44.92	44.92	44.92
Critical/Natural	Cliff Habitat	• Supports unique ecosystems niche habitats and refugia for potential trigger species	Flora • Cryptocarya (*Cryptocarya medicinalis*)	21.79	21.79	21.79
Modified	Fallow Habitat	• Comprises minor areas of modified habitat that is unlikely to support trigger species	• N/A	8.07	8.07	8.07
Modified	Garden Habitat	• Comprises minor areas of modified habitat that is unlikely to support trigger species	• N/A	2.27	2.27	2.05
Modified	Modified Lowland Forest Habitat	• Comprises modified habitat of regrowth or secondary species and weeds that is unlikely to support trigger species	• N/A	5,355.18	13.22	0.00
Modified	Agricultural Cropping Habitat	• Comprises homogenous cultivations that are unlikely to support trigger species	• N/A	3,570.56	10.50	0.00
Modified	Development and Habitations	• Comprises heavily modified areas for habitation, with invasives and domesticated animals, unlikely to support trigger species	• N/A	548.66	8.75	0.00
Modified	Grassland Habitat	• Comprises grasses typically near roads or habitations with invasives, unlikely to support trigger species	• N/A	842.35	32.16	0.00
Modified	Saline Swamp Forest	• Subject to tidal influence and marine connectivity, with anthropogenic disturbance, unlikely to support trigger species	• N/A	135.68	0.00	0.00
TOTAL				**33,078.18**	**449.37**	**380.72**
TOTAL CRITICAL HABITAT				**22,615.42**	**374.40**	**370.60**

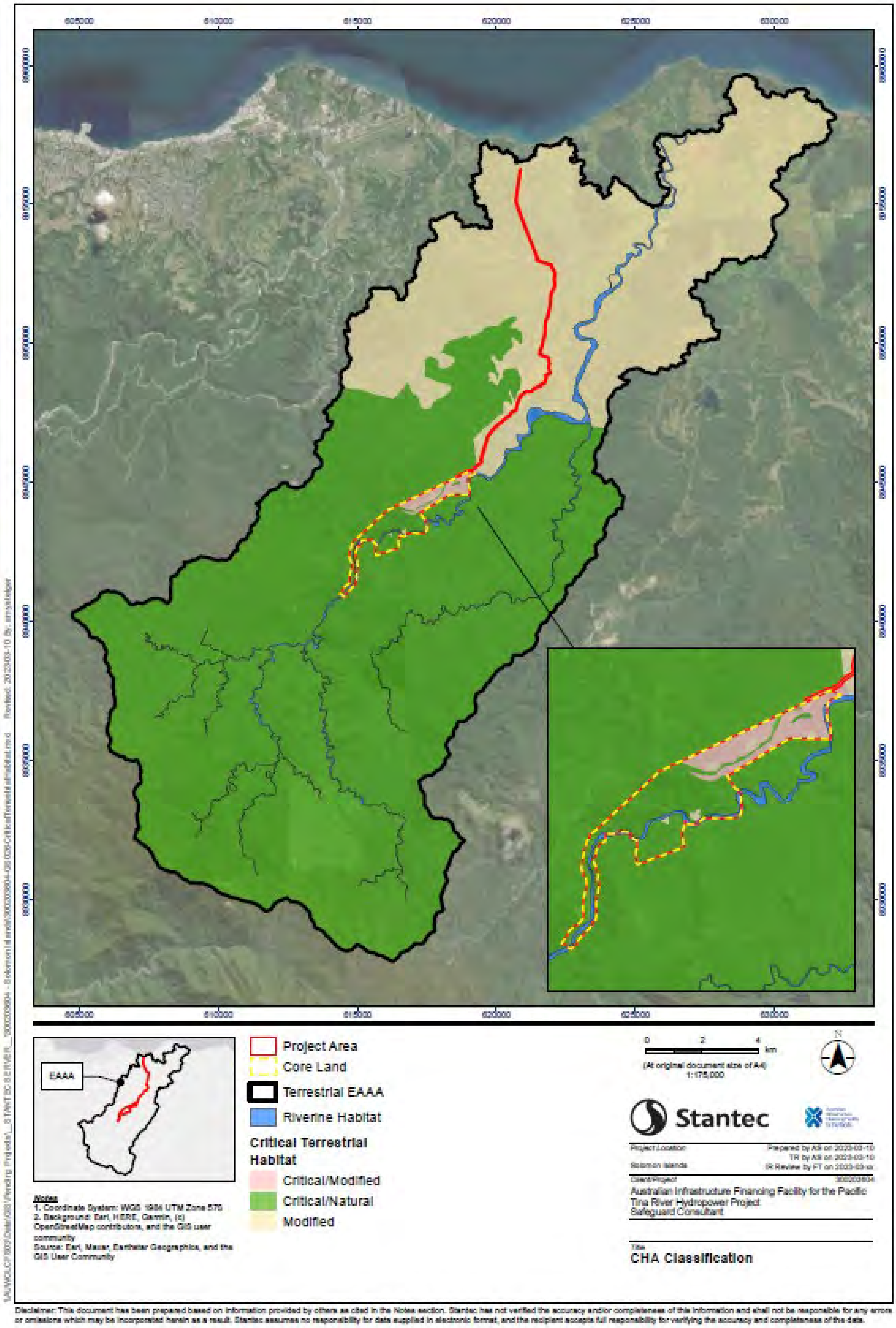

Figure 5-1: Terrestrial Critical, Natural and Modified Habitat within the terrestrial EAAA.

5.2.2 Aquatic Critical Habitat Assessment

The conservation significant aquatic biota species identified in Section 4.3 were assessed against the IFC GN6 (World Bank Group 2019) Critical Habitat criteria and thresholds. These potential trigger species are discussed in the sections below and summarised in Table 5-3. Further investigation determined that of these, four macroinvertebrate species (Figure 5-2) triggered Critical Habitat (Table 5-3).

5.2.2.1 Macroinvertebrates and Crustaceans

The recent baseline surveys of the Tina, Ngalimbiu, Toni and Sutakama Rivers (FRC environmental 2021; 2022), is constrained by limited taxonomic resolution, with most specimens only identified to genus. At genus level, these taxa are known to be widespread throughout the Indo-Pacific or Pacific Islands or occur more broadly across the globe. However, there were four confirmed insect taxa that appear to have a restricted distribution (based on the precautionary principle), and/or are considered new records, and potential trigger species as follows:

- *Orphninotrichia* sp. 1 (Trichoptera; caddisflies), found only during the August 2022 from the upper Tina River (one specimen only) and is the only known record of this genus outside Australia. The restricted distribution of this species within the freshwater upper catchment of the Tina River and representative new record of this species in Guadalcanal triggers **Critical Habitat** (Table 5-3, Figure 5-2).
- *Prosopistoma sedlaceki* (Ephemeroptera; mayflies), recorded from the Tina (November 2021 and August 2022) and Sutakama River (August 2022), although is only known from New Guinea and Guadalcanal in the Solomon Islands. The restricted distribution of this species within the freshwater mid and upper sections of these river systems triggers **Critical Habitat** (Table 5-3, Figure 5-2).
- *Rhagovelia brownie* (Hemiptera; true bugs), found only during the August 2022 from the upper Tina River and is endemic to Guadalcanal (known from across an approximate 60 km stretch of rivers on the island). The restricted distribution of this species within the freshwater upper catchment of the Tina River triggers **Critical Habitat** (Table 5-3, Figure 5-2).
- *Xylochironomus* sp. 1 (Chironomidae; nonbiting midges), found only during the August 2022 from the upper Tina River (one specimen only) and is the only known record of this genus outside Australia. The restricted distribution of this species within the freshwater upper catchment of the Tina River and representative new record of this species in Guadalcanal qualifies as **Critical Habitat** (Table 5-3, Figure 5-2).
- Due to the limited taxonomic resolution of most macroinvertebrates, there is potential that additional taxa may be considered restricted and/or new records, triggering Critical Habitat.

An additional macrocrustacean species was also identified during screening as follows:

- *Caridina intermedia* (Atyidae; freshwater prawns), recorded in Ngalimbiu River in November 2021 and August 2022 and Toni River in November 2021, and is only known from the Solomon Islands (Choiseul, Guadalcanal, Isabel, Kolombangara, Vella Lavella) and PNG (New Britain). However, this species was not found in the Project Area, and was only recorded from the broader EAAA in the lower catchment of the Ngalimbiu River in proximity to the coast and therefore **does not** trigger Critical Habitat.

5.2.2.2 Fish

There is some uncertainty regarding the fish species of Guadalcanal, due to lack of taxonomic resolution and an absence of distribution data. The records of the species recorded to date are considered Data Deficient or of Least Concern under the IUCN (IUCN 2022), with no listed Threatened or Endangered species, based on recent surveys (FRC environmental 2022). Of the 14 species known from the Solomon Islands of local or regional significance within a global context (Keith *et al.* 2021), five species have been recorded from the Tina, Ngalimbiu and Sutakama River systems (FRC environmental 2021; 2022), and may be considered potential trigger species, summarised below:

- *Hypseleotris* cf *guentheri* (Gudgeon), known from numerous Pacific Islands including the Solomon Islands. Recorded outside of the Project Area, from the mid and lower sections of the Tina/Ngalimbiu River, including near the coast. Considered a widespread species across its range, although no population estimates exist. Not restricted and migrates between freshwater and marine environments, and therefore **does not** trigger Critical Habitat.
- *Rhyacichthys guilberti* (Loach Goby), occurs throughout New Guinea, Vanuatu, and the Solomon Islands. Recorded outside of the Project Area from the upper reach of the Tina River and lower reach of the Ngalimbiu River, including near the coast, as well as the mid-reach of the Sutakama River. No population estimates exist. Not restricted and migrates between freshwater and marine environments, and therefore **does not** trigger Critical Habitat.
- *Schismatogobius essi* (Goby), occurs throughout West New Britain (PNG) and the Solomon Islands, and has been recorded from Tina and Ngalimbiu River System from the mid (Project Area) and lower sections near the coast, as well as the upper catchment of the Sutakama River. No population estimates exist. Not restricted and migrates between freshwater and marine environments, and therefore **does not** trigger Critical Habitat.
- *Schismatogobius hoesei* (Scaleless Goby), known from northwest Australia, Papua New Guinea, and the Solomon Islands, and has been recorded from outside the Project Area in the Toni River and upper catchment of the Sutakama River. No population estimates exist. Not restricted and migrates between freshwater and marine environments, and therefore **does not** trigger Critical Habitat.
- *Schismatogobius vanuatuensis* (Vanuatu *Schismatogobius*), occurs throughout New Guinea, Vanuatu and the Solomon Islands, and has been recorded from the upper and mid Tina River sections, including within the Project Area. No population estimates exist. Not restricted and migrates between freshwater and marine environments, and therefore **does not** trigger Critical Habitat.

More broadly, the Project does not trigger Critical Habitat based on fish species due to the following:

- None of the species recorded are listed as Threatened under the IUCN and are not considered of conservation significance and do not trigger Critical Habitat.
- There are no verified records of any Critically Endangered or endangered species, as well as any endemic or restricted-range species from the Tina/Ngalmbiu River systems.
- There are no records of any globally significant concentrations or numbers of individuals of congregatory species from these systems, nor unique assemblages of species.
- None of the species recorded are endemic to Guadalcanal or the Solomon Islands, and therefore are not considered to have a restricted range.
- All native fish species known from the systems are migratory (anadromous, catadromous, or amphidromous), and require connectivity between freshwater, estuarine and or marine environments to sustain populations.

Table 5-3: Summary of the Aquatic (A) CHA for the Project, according to riverine reaches and conservation significant species.

River System	Habitat Classification	Riverine Reach	Justification for Assessment	Species Triggering Critical Habitat	Total AEAAA (ha)	Total Project Area (ha)c	Total Core Land (ha)
Tina River	**Critical/** Natural	Upper Riverine Reach	• Supports three trigger species of range restricted macroinvertebrates in high quality habitat (pristine), with diverse substrate (boulders, pebbles, and sand), flow, depth, and surrounding native forest vegetation	• *Rhagovelia browni* (true bug) • *Orphninotrichia* sp. 1 (caddisfly) • *Xylochironomus* sp. 1 (nonbiting midge)	152.98	0.00	0.00
	Critical/ Natural	Mid Riverine Reach	• Supports one trigger species of range restricted macroinvertebrate high quality habitat (pristine), with diverse substrate (boulders, pebbles, and sand), flow, depth, and surrounding native forest vegetation	• *Prosopistoma sedlaceki* (mayfly)	165.13	28.24	28.24
Ngalimbiu River	Natural	Lower Riverine Reach	• Largely unmodified river habitat, with moderate to lower quality habitat (habitation and disturbance in surrounds), with more homogeneous substrate (sand and gravel), and some invasive vegetation	• NA	135.23	0.00	0.00
	Modified	Modified Coastal Riverine Reach	• Unlikely to support trigger species due to comparatively lower quality habitat (habitation and disturbance), more homogeneous substrate (sand and gravel), and invasive vegetation	• NA	18.94	0.00	0.00
Toni River	**Critical/** Natural	Upper Riverine Reach	• Likely to support trigger species of range restricted macroinvertebrates in similar habitat to upper and mid reaches of Tina River	• Likely supports above trigger species	43.23	0.00	0.00
	Critical/ Natural	Mid Riverine Reach	• Likely to support trigger species of range restricted macroinvertebrates in similar habitat to mid reaches of Tina River (more disturbance from habitation and/or logging)	• Likely supports above trigger species	22.43	0.00	0.00
TOTAL					**537.94**	**28.24**	**28.24**
TOTAL CRITICAL HABITAT					**318.11**	**28.24**	**28.24**

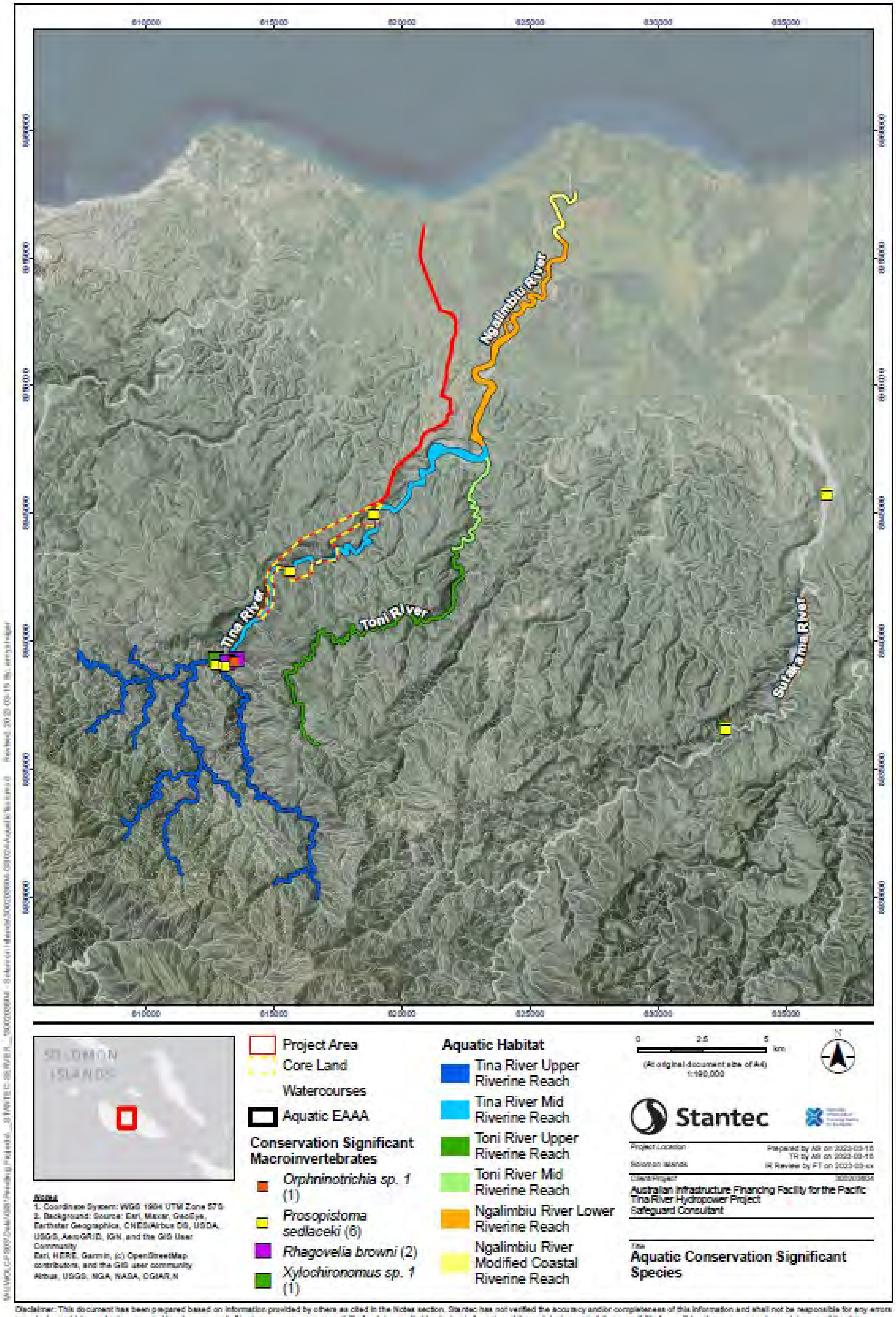

Figure 5-2: Aquatic macroinvertebrate CHA trigger species.

5.2.2.3 Critical, Natural and Modified Habitat

Based on the outcomes of the CHA, a total of four macroinvertebrate taxa (*Rhagovelia brownie, Orphninotrichia* sp. 1, *Xylochironomus* sp. 1 and *Prosopistoma sedlaceki*) in the Tina River system triggered Critical Habitat (Table 5-4, Figure 5-3). Fish did not trigger Critical Habitat as based on the available information to date there were species that were listed as conservation significant (IUCN 2022) or considered range restricted. The following classifications were applied in accordance with the IFC GN6 definitions for CHA (World Bank Group 2019):

- **Critical**/Natural Habitat, comprising the Upper Reach and Mid Riverine Reaches of the Tina River and Toni River (outside of the Project Area), which are in largely pristine condition, and support diverse habitats surrounded by mostly intact forest. These reaches support primary aquatic functions and assemblages, and several restricted range (based on available data) macroinvertebrate trigger species including the caddisfly *Orphninotrichia* sp. 1, the true bug *Rhagovelia browni* and the non-biting midge *Xylochironomus* sp. 1 (nonbiting midges), mayfly *Prosopistoma sedlaceki* (Table 5-4).
- Natural Habitat, comprising the Lower Riverine Reach (outside of the Project Area), of the Ngalimbiu River. This section of the river is largely unmodified (although there is development in the surrounds) and mostly retains aquatic functions and composition, however, does not support trigger species (Table 5-4).
- Modified Habitat, comprising the Modified Coastal Riverine Reach of the Ngalimbiu River, which is heavily modified due to habitations and intensive fishing practices, with invasive weeds and mosquito fish (Table 5-4), and does not support trigger species.

The CHA and trigger species were subsequently used to inform management and mitigation of terrestrial biodiversity values that may be impacted by the Project (P-2 BMP).

Table 5-4: Summary of the Aquatic (A) CHA for the Project, according to riverine reaches and conservation significant species.

River System	Habitat Classification	Riverine Reach	Justification for Assessment	Species Triggering Critical Habitat	Total AEAAA (ha)	Total Project Area (ha)c	Total Core Land (ha)
Tina River	**Critical/**Natural	Upper Riverine Reach	• Supports three trigger species of range restricted macroinvertebrates in high quality habitat (pristine), with diverse substrate (boulders, pebbles, and sand), flow, depth, and surrounding native forest vegetation	• *Rhagovelia brownie* (true bug) • *Orphninotrichia* sp. 1 (caddisfly) • *Xylochironomus* sp. 1 (nonbiting midge)	152.98	0.00	0.00
	Critical/Natural	Mid Riverine Reach	• Supports one trigger species of range restricted macroinvertebrate high quality habitat (pristine), with diverse substrate (boulders, pebbles, and sand), flow, depth, and surrounding native forest vegetation	• *Prosopistoma sedlaceki* (mayfly)	165.13	28.24	28.24
Ngalimbiu River	Natural	Lower Riverine Reach	• Largely unmodified river habitat, with moderate to lower quality habitat (habitation and disturbance in surrounds), with more homogeneous substrate (sand and gravel), and some invasive vegetation	• NA	135.23	0.00	0.00
	Modified	Modified Coastal Riverine Reach	• Unlikely to support trigger species due to comparatively lower quality habitat (habitation and disturbance), more homogeneous substrate (sand and gravel), and invasive vegetation	• NA	18.94	0.00	0.00
Toni River	**Critical/**Natural	Upper Riverine Reach	• Likely to support trigger species of range restricted macroinvertebrates in similar habitat to upper and mid reaches of Tina River	• Likely supports above trigger species	43.23	0.00	0.00
	Critical/Natural	Mid Riverine Reach	• Likely to support trigger species of range restricted macroinvertebrates in similar habitat to mid reaches of Tina River (more disturbance from habitation and/or logging)	• Likely supports above trigger species	22.43	0.00	0.00
TOTAL					**537.94**	**28.24**	**28.24**
TOTAL CRITICAL HABITAT					**318.11**	**28.24**	**28.24**

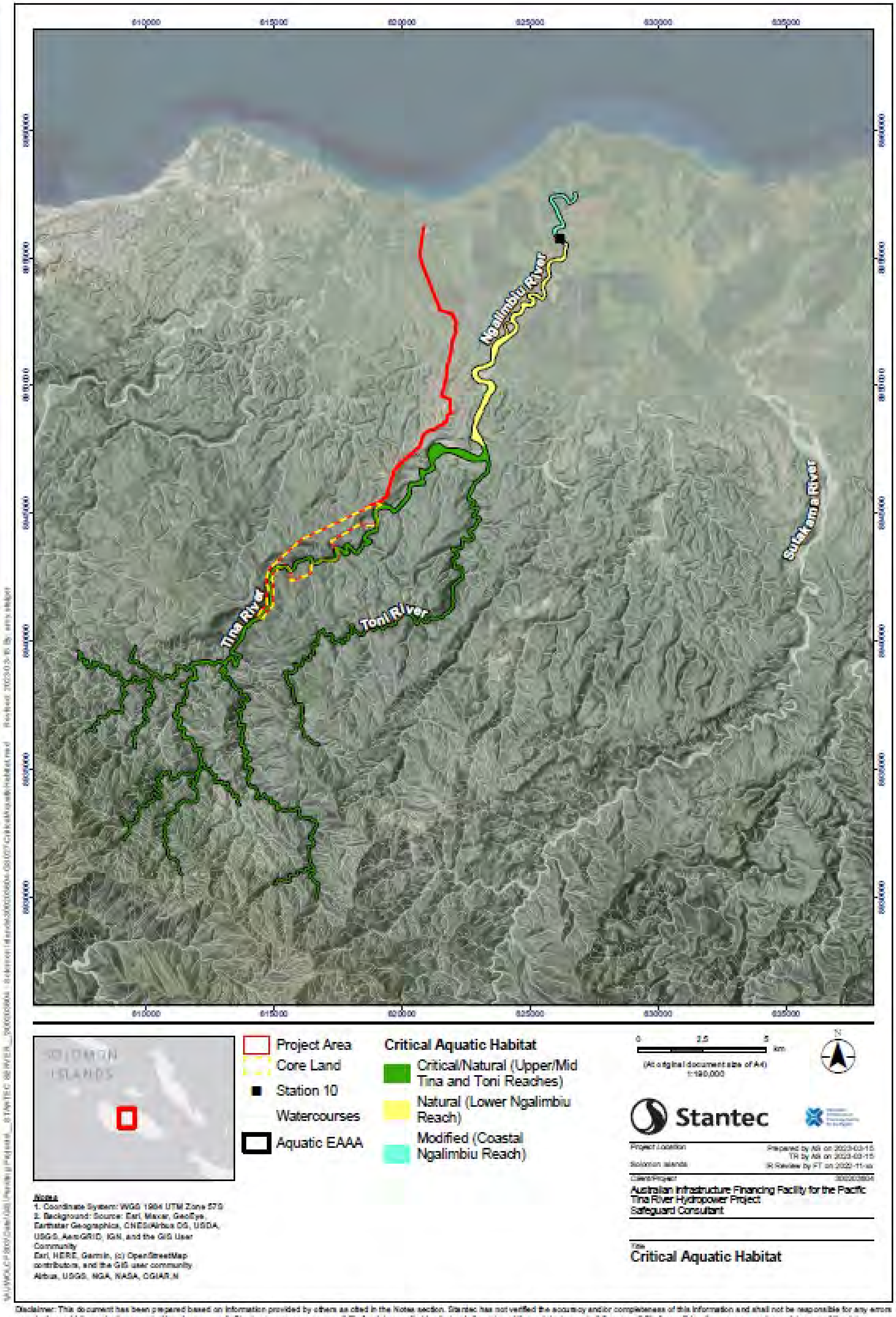

Figure 5-3: Aquatic Critical, Natural and Modified Habitat within the aquatic EAAA.

6. SUMMARY

The detailed ecology review of terrestrial and aquatic biodiversity values was based on publicly available regional literature and data, and survey work specifically commissioned for the Project, as well as consultation with relevant experts. Conservation significant communities or species were assessed against the Critical Habitat criteria and thresholds for the Project, in accordance with IFC GN6. Previous assessments were also reviewed as part of the revised CHA.

Key conservation significant communities that triggered Critical Habitat for terrestrial biodiversity values included the Solomon Islands Rainforest, three flora (*Actinodaphne solomonensis, Cryptocarya medicinalis and Pterocarpus indicus*), two avifauna (*Guadalcanaria inexpectata* and *Pachycephala implicata*), and one bat (*Pteralopex atrata*) species triggered Critical Habitat. For aquatic biodiversity values, a total of four macroinvertebrate taxa (*Rhagovelia brownie, Orphninotrichia* sp. 1, *Xylochironomus* sp. 1 and *Prosopistoma sedlaceki*) in the Tina River system triggered Critical Habitat. Fish did not trigger Critical Habitat as there were no conservation significant listed species identified and the distribution of taxa was not restricted based on available data.

Critical/Natural Habitat comprises largely pristine or slightly disturbed areas that support primary ecological function and species composition. For terrestrial ecosystems this includes Undisturbed Primary Forest, Remnant Forest, and Cliff Habitat and for aquatic ecosystems is the Upper and Mid Riverine Reaches of the Tina and Toni River. Critical/Modified Habitat comprises Disturbed Secondary Habitat for terrestrial ecosystems, while Natural Habitat, comprises the Lower Riverine Reach of the Ngalimbiu River for aquatic ecosystems.

Modified Habitat comprises areas that have been subject to anthropogenic disturbance including logging or agriculture activities and development, and includes terrestrial Fallow, Garden, Modified Lowland Forest, Agricultural and Cropping, Development and Habitations, Grassland and Saline Swamp Forest Habitats. For aquatic habitats this includes the Modified Coastal Riverine Reach of the Ngalimbiu River. Modified Habitat does not support trigger species. The CHA and trigger species identified from the CHA were subsequently used to inform management and mitigation of terrestrial biodiversity values that may be impacted by the Project presented in the BMP.

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8. ANNEXES

Annex 1: Conservation Significant Communities and Species Screened for the Critical Habitat Assessment. Communities and species that trigger Critical Habitat are shown in bold.

Scientific Name	Common Name	IUCN Status[8]	IFC PF6 Criteria (World Bank 2019)					% Global Population (i.e., EOO in EAAA)	Critical Habitat Determination
			1. CR and EN Species	2. Endemic / Restricted-range Species	3. Migratory or Congregatory Species	4. Highly Threatened / or Unique Ecosystems	5. Key Evolutionary Processes		
Communities									
NA	**Solomon Islands Rainforest**					**Other areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning.**			**Triggers Critical Habitat. Most of the Project Area was likely part of the Solomon Islands Rainforest ecoregion, supporting a unique assemblage of species. Corresponds to Undisturbed Primary Forest in the Project Area and Montane Forest and Lowland Forest throughout the EAAA and therefore triggers Critical Habitat.**
Flora									
Calophyllum vitiense	Calophyllum	LC	-	Range (23,980km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.3%	Does not exceed global population threshold (Criterion 2).
Actinodaphne solomonensis	**Actinodaphne**	**CR**	**EAAA contains ≥ 0.5% of the global population of the global population size.**					**100%**	**Exceeds global population threshold (Criterion 1). Qualifies undisturbed primary forest and disturbed secondary forest as Critical Habitat.**
Cryptocarya medicinalis	**Cryptocarya**	**CR**	**EAAA contains ≥ 0.5% of the global population of the global population size.**					**100%**	**Exceeds global population threshold (Criterion 1). Qualifies undisturbed primary forest, disturbed secondary forest, and cliff habitat as Critical Habitat.**
Pterocarpus indicus	**Rosewood**	**EN**	**DD**						**Triggers Critical Habitat. Occurrences of the species have been recorded during previous flora and fauna surveys within the Project Area. As a precautionary approach and in the absence of global range and EOO data, this species is considered to trigger Critical Habitat.**
Terrestrial Mammals									
Pteralopex pulchra	Montane monkey- faced bat	CR	EAAA contains ≥ 0.5% of the global population of the global population size.					6.2%	Elevational limit >1,250 masl (Oceania Ecology Group 2016). This species has been screened out as works will not occur at that elevation.
Pteralopex atrata	**Guadalcanal Monkey-faced Bat**	**EN**	**EAAA contains ≥ 0.5% of the global population of the global population size.**					**1.2%**	**Elevational limit <400 m, known to roost within hollow trees but may also visit disturbed areas, including village gardens and edges of secondary/primary forest. It is considered likely that this species may occur within the Project Area (Oceania Ecology Group 2016).**
Uromys rex	**King Rat**	**EN**	**EAAA contains ≥ 0.5% of the global population of the global population size.**					**6.6%**	**King Rat is arboreal and searches of intact lowland forests between Tina River and Valevahalo in 2015 did uncover signs believed to be evidence (chewed ngali nuts, *Canarium* sp.) of King Rat presence on Guadalcanal and it was concluded that the potential for occurrence within the Project Area is likely (Oceania Ecology Group 2016).**

[8] Conservation status is a per IUCN 2022. The IUCN Red List of Threatened Species. Version 2022-1. <https://www.iucnredlist.org>

Scientific Name	Common Name	IUCN Status[8]	IFC PF6 Criteria (World Bank 2019)					% Global Population (i.e., EOO in EAAA)	Critical Habitat Determination
			1. CR and EN Species	2. Endemic / Restricted-range Species	3. Migratory or Congregatory Species	4. Highly Threatened / or Unique Ecosystems	5. Key Evolutionary Processes		
Dobsonia inermis	Solomons Bare-backed fruit-bat	LC		Range (28,400km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Pteropus woodfordi	Dwarf flying-fox	LC		Range (28,400km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Hipposideros dinops	Fierce Leaf-nosed Bat	VU							Reviewed based upon area of occupancy of 200-400km² (IUCN 2020), however this is not its extent of occurence. No EOO is available from IUCN (2022). Species distribution includes Indonesia, Papua New Guinea, Solomon Islands. As such species is not considered to be 'restricted range' and does not trigger any of the criteria.
Melonycteris fardoulisi	Fardoulis' Blossom Bat	NT		Range (28,400km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Birds									
Ceyx nigromaxilla	Guadalcanal Dwarf Kingfisher	LC		Range (5,302km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				6.2%	Does not exceed global population threshold (Criterion 2).
Coracina papuensis elegans	White-bellied Cuckooshrike	LC		Range (28,400km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Eurystomus orientalis solomonensis	Dollar Bird	LC		Range (28,400km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Corvus woodfordi	White-billed Crow	LC		Range (28,400km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				0.7%	Does not exceed global population threshold (Criterion 2).
Cacomantis variolosus addendus	Brush Cuckoo	LC		Range (28,400km²) is within the threshold range for 'restricted range'.				1.2%	Does not exceed global population threshold (Criterion 2).

Scientific Name	Common Name	IUCN Status[8]	IFC PF6 Criteria (World Bank 2019)					% Global Population (i.e., EOO in EAAA)	Critical Habitat Determination
			1. CR and EN Species	2. Endemic / Restricted-range Species	3. Migratory or Congregatory Species	4. Highly Threatened / or Unique Ecosystems	5. Key Evolutionary Processes		
				EAAA contains <10% of the global population size.					
Centropus milo	Buff-headed Coucal	LC		Range (28,400km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				0.7%	Does not exceed global population threshold (Criterion 2).
Guadalcanaria inexpectata	**Guadalcanal Honeyeater**	**LC**		**Range (1,400km2) is within the threshold range for 'restricted range'. EAAA contains ≥10% of the global population size.**				**23.6%**	**Exceeds global population threshold (Criterion 2). Prefers primary montane forest above 950 m (eBird) which is not included within the Project Area. Species has been screened out as works do not occur at that elevation.**
Myzomela melanocephala	Black-headed Myzomela	LC		Range (10,200km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				3.2%	Does not exceed global population threshold (Criterion 2).
Pachycephala implicata	**Guadalcanal Hooded-Whistler**	**LC**		**Range (930km2) is within the threshold range for 'restricted range'. EAAA contains ≥10% of the global population size.**				**35.6%**	**Exceeds global population threshold (Criterion 2). Whilst this species is mainly found in primary forest above 1100 meters of elevation, this species has been observed within the project area and therefore is considered to qualify undisturbed forest as Critical Habitat.**
Pachycephala pectoralis cinnamomea	Golden Whistler	LC		Range (28,400km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Hypotaenidia philippensis christophori	Buff-banded Rail	LC		Range (28,400km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Hypotaenidia woodfordi	Guadalcanal Rail	LC		Range (6,500km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				5.1%	Does not exceed global population threshold (Criterion 2).
Ninox jacquinoti granti	Guadalcanal Boobook	NT		Range (6,500km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				5.0%	Does not exceed global population threshold (Criterion 2).
Ducula brenchleyi	Chestnut-bellied Imperial Pigeon	NT		Range (38,500km^2) is within the				0.9%	Does not exceed global population threshold (Criterion 2).

Scientific Name	Common Name	IUCN Status[8]	IFC PF6 Criteria (World Bank 2019)					% Global Population (i.e., EOO in EAAA)	Critical Habitat Determination
			1. CR and EN Species	2. Endemic / Restricted-range Species	3. Migratory or Congregatory Species	4. Highly Threatened / or Unique Ecosystems	5. Key Evolutionary Processes		
				threshold range for 'restricted range'. EAAA contains <10% of the global population size.					
Zosterops rendovae	Grey-throated White-eye	LC		Range (11,300km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				2.9%	
Reptiles and Amphibians									
Acutotyphlops infralabialis	Red Blind Snake	DD		Range (28,400km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Ramphotyphlops becki	Beck's Blind Snake	DD		Range (5,302km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				6.2%	Does not exceed global population threshold (Criterion 2).
Cornufer bufoniformis	Warty webbed frog	LC		Range (5,302km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Cornufer malukuna	Malukuna Webbed Frog	LC		Range (27,175km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Cyrtodactylus biordinis	Guadalcanal Bow-fingered Gecko	LC		Range (5,336km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				6.2%	Does not exceed global population threshold (Criterion 2).
Emoia flavigularis	Yellow-throated skink	LC		Range (28,400km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Sphenomorphus bignelli	-	LC		Range (28,400km^2) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).

Scientific Name	Common Name	IUCN Status[8]	IFC PF6 Criteria (World Bank 2019)					% Global Population (i.e., EOO in EAAA)	Critical Habitat Determination
			1. CR and EN Species	2. Endemic / Restricted-range Species	3. Migratory or Congregatory Species	4. Highly Threatened / or Unique Ecosystems	5. Key Evolutionary Processes		
Sphenomorphus concinnatus	Elegant Forest Skink	LC		Range (28,400km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Sphenomorphus cranei	Crane's Skink	LC		Range (28,400km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Tribolonotus schmidti	Schmidt's Crocodile Skink	LC		Range (5,302km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				6.2%	Does not exceed global population threshold (Criterion 2).
Salomonelaps par	Solomons Coral Snake (Solomons Red Krait)	LC		Range (28,400km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Cyrtodactylus salomonensis	Solomons Bent-toed Gecko	NT		Range (9,999km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				3.3%	Does not exceed global population threshold (Criterion 2).
Corucia zebrata	Prehensile- tailed Skink (Solomon Island Prehensile-tailed Skink)	NT		Range (28,400km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Loveridgelaps elapoides	Solomon's small-eyed snake	VU		Range (28,400km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				1.2%	Does not exceed global population threshold (Criterion 2).
Cornufer myersi	Myers Wrinkled Ground Frog	LC		Range (4,301km²) is within the threshold range for 'restricted range'. EAAA contains <10% of the global population size.				7.7%	Does not exceed global population threshold (Criterion 2).

Annex 2: Flora Species Recorded from the Project Area and immediate surrounds (Entura & Pacific Horizons Consultancy Group 2011; THL 2019; Pilgrim 2017; Myknee Ecological Consulting 2020; HEC 2020; Taluva Bioresource Management and Consultancy 2020; Taluva Bioresource Management and Consultancy / Myknee Ecological Consulting 2021; Myknee Ecological Consulting/HEC 2021)

Scientific Name	Common Name	IUCN Status
Acacia auriculiformis	Ear-leaf Acacia	LC
Acalypha grandis	Acalypha	LC
Actinodaphne solomonensis	Actinodaphne	CR
Actinodaphne sp.	-	NE
Aglaia cucullata	Amoora	NE
Aglaia silvestris	Aglaia	NT
Albizia procera	White siris	LC
Albizia sp.	Albizzia, Paraserianthes	NE
Alocasia macrorrhiza	Wild Giant Taro	NE
Alpinia novae-pommeraniae	Wild Ginger	NE
Alpinia oceanica	Alpinia	NE
Alpinia purpurata	Red Ginger	NE
Alpinia purpurata	Ginger	NE
Alpinia spp.	Ginger Plant	NE
Alpinia stapfiana	Ginger	NE
Alstonia scholaris	Alstonia, Milky Pine	LC
Alstonia spectabilis	Alstonia	LC
Areca macrocalyx	Wild Betel Nut	LC
Areca catechu	Betle nut	NE
Artocarpus altilis	Bread Fruit	NE
Artocarpus vrieseanus	Wild Bread Fruit	NE
Astronidium novae-georgiae	Astronidium	NE
Astronidium solomonensis	Astronidium	NE
Bambusa balcooa	Yellow Bamboo	NE
Bambusa blumeana	Spiny Bamboo	NE
Bambusa sp.	Fi'l Kao	NE
Barringtonia edulis	Cut nut	NE
Barringtonia procera	Cut nut	NE
Barringtonia sp.	Wild Cut nut	NE
Begonia solomonensis	Begonia	NE
Bombax ceiba	Cotton Tree	LC
Brachiaria mutica	Para Grass	LC
Broussonetia papyrifera	Paper Mulberry	LC
Brownlowia argentata	Brownlowia	NE
Burckella obovata	Burckella	LC
Burckella sp.	Burckella	NE
Calamus aruensis	Lawyer Cane, Rattan	NE
Calamus vestitus	Lawyer Cane, Rattan	NE

Scientific Name	Common Name	IUCN Status
Calamus vitiensis	Lawyer Cane, Rattan	NE
Calanthe longifolia	Terrestrial orchid	NE
Calophyllum neoebudicum	Calophyllum	LC
Calophyllum peekelli	Calophyllum	LC
Calophyllum soulattri	Calophyllum	LC
Calophyllum vitiense	Damanu	LC
Cananga odorata	Ylang, Cananga	LC
Canarium asperum	Wild Ngali nut, Canarium	LC
Canarium indicum	Ngali Nut	LC
Canarium salomonense	Small Ngali nut, Canarium	NE
Carica papaya	Pawpaw, Papaya	NE
Caryota rumphiana	Caryota Palm	LC
Causonis trifolia	Cayratia	NE
Cedrela odorata	Spanish Cedar	VU
Celtis latifolia	Celtis	NE
Celtis philippensis	Celtis	LC
Cerbera manghas	Cerbera	LC
Cheilocostus speciosus	Crepe Ginger	LC
Cinnamomum solomonense	Cinammon	LC
Citrus limon	Bush lime	NE
Clerodendrum buchananii	Clerodendrum	NE
Cocos nucifera	Coconut	NE
Colocasia esculenta	Taro	LC
Cominsia gigantea	Cominsia	NE
Commelina diffusa	Climbing Dayflower	LC
Commersonia bartramia	Commersonia	LC
Cordyline fruticosa	Cordyline, Ti	LC
Crinum asiaticum	Crinum, lily	NE
Cryptocarya medicinalis	Cryptocarya	CR
Cryptocarya sp.	Cryptocarya	NE
Cucurbita sp.	Curcubita	NE
Cyathocalyx petiolaris	Cyathocalyx	NE
Cycas revoluta	Sago palm tree, ban shou	LC
Cycas seemannii	Cycad, logologo	VU
Cyrtosperma chamissonis	Swamp Taro	NE
Cyrtosperma johnstonii	Wild Taro	NE
Cyrtosperma johnstonii	Wild Taro	NE
Dendrocnide inerme	Poison or Stinging Tree	NE
Dennstaedtia erecta	Fern	NE
Dennstaedtia sp.	Dennstaedtia Fern	NE
Dicranopteris linearis	Gleichenia linearis fern	LC
Dillenia ingens	Giant-leaved Dillenia	NE

Scientific Name	Common Name	IUCN Status
Dioscorea alata	Purple Yam	NE
Dioscorea sp.	Yam	NE
Diplazium esculentum	Edible fern	LC
Donax canniformis	Donax	NE
Dracontomelon sp.		NE
*Drymophloeus salomonense**	Drymophloeus	Exotic
*Drymophloeus salomonensis**	Drymo Palm	Exotic
Dysoxylum excelsum	Dysox, Dysoxylum	NE
Dysoxylum parasiticum	Dysoxylum	NE
Dysoxylum sp.	Dysoxylum	NE
Elaeis guineensis	Oil Palm	LC
Elaeocarpus angustifolius	Elaeocarpus	LC
Elaeocarpus sp.	Elaeocarpus	NE
Elatostema salomonense	Elatostemon	NE
Endospermum formicarum	Bass Wood	NE
Endospermum medullosum	Whitewood	VU
Erythrina sp.	Erythrina	DD
Euphorbia hirta	Milky Weed, Asthma-plant	NE
Euphorbia sp.	-	NE
Falcataria falcata	Moluccan albizia	LC
Ficus benjamina	Ficus, Strangler Fig	LC
Ficus bracteata	Ficus, Fig tree	NE
Ficus chrysochaete	Ficus	NE
Ficus copiosa	Ficus	LC
Ficus longibracteata	Ficus, Fig	NE
Ficus longifolia	Ficus	NE
Ficus septica	Ficus	LC
Ficus sp.	Ficus	NE
Ficus variegata	Ficus	LC
Ficus virgata	Ficus, Fig	DD
Ficus wassa	Ficus	NE
Finschia chloroxantha	Finschia	LC
Flagellaria gigantea	Flagellaria	NE
Flueggea flexuosa	Poumuli	LC
Freycinetia solomonensis	Climbing pandanus	NE
Garcinia sessilis	Heilala	LC
Garcinia solomonensis	Garcinia	NE
Gironniera sp.	Gironniera	NE
Glochidion zeylanicum	Glochidion	LC
Gmelina moluccana	Canoe wood, Gmelina	LC
Grammatophyllum speciosum	Giant Orchid	NE
Gymnostoma papuana	Casuarina	NE

Scientific Name	Common Name	IUCN Status
Haplolobus floribundus	Haplolobus	LC
Haplolobus sp.	Haplolobus	NE
Heliconia lanata	Heliconia	NE
Heliconia salomonensis	Heliconia	NE
Heritiera solomonensis	Bush Heritiera	NE
Hernandia nymphaeifolia	Hernandia	LC
Heterospathe minor	Heterospathe palm	NE
Heterospathe salomonense	Heterospathe	NE
Heterospathe salomonensis	Heterospathe palm	NE
Hibiscus tiliaceus	Yellow Hibiscus	LC
Homalanthus sp.	Homalanthus	NE
Homalanthus tatambense	Homalanthus	NE
Homalomena pendula	Homalomena	NE
Hornstedtia lycostoma	Hornstedtia, Sweet Ginger	NE
Hornstedtia scottiana	Sweet Ginger	NE
Hoya guppyi	Hoya	NE
Hydriastele macrospadix	Tall Palm	NE
Intsia bijuga	Kwila, Iron Wood, Merbau	NT
Ipomoea batatas	Sweet Potato	NE
Ipomoea illustris	Ipomoea	NE
Kleinhovia hospita	Kleinhovia	LC
Leea indica	Leea	LC
Leucosyke salomonensis	Leucosyke	LC
Licuala lauterbachii	Licuala palm	NE
Litsea purglabra	Litsea	NE
Ludwigia octovalvis	Primrose Willow	LC
Lygodium palmatum	Lygodium Fern	NE
Macaranga dioica	Macaranga	LC
Macaranga polyadenia	Macaranga	LC
Macaranga similis	Macaranga	LC
Macaranga tanarius	Macaranga	LC
Mangifera indica	Planchonella, Wild Mango	NE
Manihot esculenta	Cassava, Tapioka	NE
Medinilla cauliflora	Medinilla	NE
Melastoma affine	Melastoma (Blue Tongue)	NE
Melicope elleryana	Euodia	LC
Melicope solomonensis	Euodia	NT
Melicope sp.	Melicope	NE
Merremia pacifica	Merremia	NE
Merremia peltata	Merremia	NE
Metroxylon salomonense	Sago palm, Sagu	NE
Mikania micrantha	Mile-a-minute	NE

Scientific Name	Common Name	IUCN Status
Mimosa invisa	Sensitive Grass	NE
Mimosa pudica	Sensitive Grass	LC
Morinda citrifolia	Wild Noni tree	NE
Mucuna bennettii	Mucuna (New Guinea Creeper)	LC
Mucana sp.	Legume	NE
Musa acuminata	Red Dacca (Wild Banana)	LC
Musa sapientum	Banana	NE
Musa spp.	Banana tree	NE
Mussaenda cylindrocarpa	Mussaenda	NE
Myristica fatua	Myristica	LC
Myrmecodia tuberoa	Ant Plant	NE
Nastus obtusus	Bamboo, Green Bamboo	NE
Nastus racembambose	Climbing Bamboo	NE
Neonauclea orientalis	Nauclea	NE
Nephrolepis sp.	Nephrolepis	LC
Nephrolepsis biserrata	Fish tail Fern	NE
Nephrolepsis hirsutula	Fish tail Fern	NE
Nothofagus sp.		LC
Osmoxylon novoguineense	Boerlagiodendron	LC
Osmoxylon sp.		NE
Palaquium firmum	Pometia, Taun, Pencil Cedar	LC
Pandanus compressus	Pandanus	NE
Pandanus sp.	Pandanus	NE
Paraserianthis falcata	Albizia	NE
Parinari glaberrima	Tita Tree	NE
Parinari noda	Parinari	NE
Paspalum conjugatum	T-grass	LC
Pennisetum polystachyon	Mission Grass	NE
Pennisetum purpureus	Napier Grass	LC
Pennisetum sp.	Pennisetum	NE
Pholidota sp.	Orchid	NE
Phragmites karka	Fi'l Rade	LC
Phreatia sp.	Orchid	NE
Phyllanthus reticulatus	Phyllanthus	LC
Physokentia insolita	Physokentia	NE
Pimeleodendron amboinicum	Pimeleodendron	NE
Piper betle	Piper	NE
Piper wichmanii	Piper	NE
Pipturus argenteus	Pipturus	LC
Planchonella firma	Planchonella	LC
Planchonella thyrsoidea	Planchonella	NT
Pleomele angustifolia	Pleomele	NE

Scientific Name	Common Name	IUCN Status
Plerandra solomonensis	Plerandra	NE
Polyscias guilfoylei	Polyscias	NE
Polysicias sp.	Polyscias	NE
Pometia pinnata	Pometia, Taun (Dawan)	LC
Premna corymbosa	Premna	NE
Psidium guajava	Guava Tree	LC
Pterocarpus indicus	Rose wood	EN
Ptychosperma salomonense	Ptychosperma palm	NE
Pueraria lobata	Legume Cover crop	NE
Pueraria sp.	Pueraria	NE
Pullea sp.	Pullea	NE
Rhopaloblaste elegans	Rhopaloblaste palm	NE
Rhus taitensis	Rhus	NE
Rubus moluccanus	Wild Raspberry	NE
Samanea saman	Rain Tree	LC
Saurauia purgans	Saurauia	NE
Schizaea sp.	-	NE
Schizomeria serrata	Schizomeria	LC
Schizostachyum serrata	Schizomeria	NE
Schizostachyum tessellatum	Bamboo	NE
Schleinitzia novo-guineensis	Schleinitzia	LC
Schleinitzia sp.	Schleinitzia	NE
Scindapsus salomoneinsis	Scindapsus	NE
Selaginella rechingeri	Selaginella	NE
Semecarpus forstenii	Semecarpus	LC
Senna alata	Cassia	LC
Sida rhombifolia	Sida	NE
Sloanea insularis	Sloanea	NT
Solanum sp.	Potatoe, Kumara	NE
Solanum torvum	Egg Plant, Devil's Fig	NE
Spathodea campanulata	African Tulip (African Tulip Tree)	LC
Spathoglottis plicata	Ground Orchid	NE
Spathoglottis sp.	Ground Orchid	NE
Sphaeropteris brackenridgei	Cyathea, Tree Fern	LC
Sphaeropteris spp.	Cyathea	NE
Sphaeropteris vittata	Tree Fern	LC
Starchytapheta jamaicensis	Blue Rat's tail	NE
Starchytapheta spp.	Blue Rat's tail	NE
Stenochlaena palustris	Climbing Fern	NE
Sterculia conwentzii	Sterculia	LC
Sterculia parkinsonii	Sterculia	LC
Sterculia sp.	Sterculia	NE

Scientific Name	Common Name	IUCN Status
Strobilanthes reptans	Hemigraphis	NE
Sysygium nemorale	Syzygium	NE
Syzygium buerttneriana	Syzygium	NE
Syzygium myriadena	Syzygium	NE
Syzygium onesima	Syzygium, Wild Local Apple	NE
Syzygium onesimum	Syzygium	LC
Syzygium sp.	Syzygium	NE
Syzygium tierneyana	Syzygium	NE
Tapeinochilus solomonense Tapeinochilus	Ginger	NE
Terminalia brassii	Brown Terminalia, Swamp Oak	NT
Terminalia calamansanai	Yellow Terminalia	LC
Terminalia complanata	Terminalia	LC
Terminalia sepicana	Terminalia	LC
Terminalia sp.	Terminalia	NE
Themeda triandra	Kangaroo Grass	NE
Theobroma cacao	Cocoa	NE
Timonius timon	Timonius	LC
Trema orientale	Trema (Andrarezina)	LC
Trichospermum psilocladum	Trichospermum	LC
Uncaria appendiculata	Water Rope	NE
Utania racemosa	Fagraea	NE
Trema orientalis	Ear-leaf Acacia	LC
Trichospermum psilocladum	Acalypha	LC
Uncaria lanosa appendiculata	Actinodaphne	CR
Utania racemosa		NE
Viola odorata	Amoora	NE
Vitex cofassus	Aglaia	LC
Vitex negundo	White siris	LC
Wollastonia biflora	Albizzia, Paraserianthes	NE
Zygogynum haplopus	Wild Giant Taro	NE

*Introduced species. IUCN: VU – Vulnerable, NT – Near Threatened, LC – Least Concern, NE – Not Evaluated.

Annex 3: Avifauna Species Recorded from the Project Area and immediate surround (Entura & Pacific Horizons Consultancy Group 2011; THL 2019; Pilgrim 2017; Myknee Ecological Consulting 2020; HEC 2020; Taluva Bioresource Management and Consultancy 2020; Taluva Bioresource Management and Consultancy / Myknee Ecological Consulting 2021; Myknee Ecological Consulting/HEC 2021)

Scientific Name	Common Name	IUCN Status*
Accipiter albogularis	Pied Goshawk	LC
Accipiter hiogaster	Variable Goshawk	LC
Accipiter meyerianus	Meyer's Goshawk	LC
Accipiter novaehollandiae pulchellus	Variable Goshawk (grey or rufous breasted)	LC
Acridotheres tristis	Common Myna	LC
Actitis hypoleucos	Common Sandpiper	LC
Aerodramus vanikorensis lugubris	Uniform Swiftlet	LC
Alcedo atthis salomomensis	Common (River) Kingfisher	LC
Amaurornis moluccana	Pale-vented Bush-hen	LC
Anas superciliosa	Pacific Black Duck	LC
Aplonis brunneicapillus	White-eyed Starling	VU
Aplonis cantoroides	Singing Starling	LC
Aplonis grandis	Brown-winged Starling	LC
Aplonis metallica nitida	Metallic Starling	LC
Aviceda subcristata proxima	Pacific Baza	LC
Cacatua ducorpsii	Solomons Corella	LC
Centropus milo	Buff-headed Coucal	LC
Ceyx nigromaxilla	Guadalcanal Dwarf Kingfisher	LC
Chalcophaps stephani mortoni	Stephan's Emerald Dove	LC
Chalcopsitta cardinalis	Cardinal Lory	LC
Charmosyna margarethae	Duchess Lorikeet	NT
Cinnyris jugularis flavigaster	Olive-backed Sunbird	LC
Collocalia esculenta becki	Glossy Swiftlet	LC
Columba pallidiceps	Yellow-legged Pigeon	VU
Coracina lineata pusilla/ C. l. sublineata	Barred-Cuckooshrike	LC
Coracina papuensis elegans	White-bellied Cuckooshrike	LC
Coracina welchmani	North-melanesian Cuckoo-Shrike	LC
Corvus woodfordi	White-billed Crow	LC
Dicaeum aeneum	Midget Flowerpecker	LC
Dicrurus bracteatus	Spangled Drongo	LC
Ducula pacifica	Pacific Imperial Pigeon	LC
Ducula pistrinaria	Island Imperial Pigeon	LC
Ducula rubricera rufigila	Red-knobbed Imperial Pigeon	LC
Eclectus roratus solomonensis	Eclectus Parrot (Moluccan Eclectus)	NT
Edolisoma holopolium	Solomon Cicadabird	NT
Edolisoma tenuirostre	Common Cicadabird	LC
Egretta sacra	Pacific Reef Heron	LC
Eudynamys orientalis	Pacific Koel	LC

Scientific Name	Common Name	IUCN Status*
Eurostopodus nigripennis	Solomons Nightjar	VU
Geoffroyus heteroclitus	Song Parrot	LC
Guadalcanaria inexpectata	Guadalcanal Honeyeater	LC
Gymnophaps solomonensis	Pale Mountain-pigeon	VU
Haliaeetus sanfordi	Solomon Sea-Eagle (Sandford's Sea-Eagle)	VU
Haliastur indus flavirostris	Brahminy Kite	LC
Hemiprocne mystacea woodfordiana	Moustached Treeswift	LC
Hirundo tahitica subfusca	Pacific Swallow	LC
Hypotaenidia philippensis christophori	Buff-banded Rail	LC
Hypotaenidia woodfordi	Guadalcanal Rail	LC
Lorius chlorocercus	Yellow-bibbed Lory	LC
Macropygia mackinlayi arossi	Mackinlay's Cuckoo-Dove	LC
Megapodius eremita	Melanesian Scrubfowl	LC
Microcarbo melanoleucos	Little Pied Cormorant	LC
Micropsitta finschii	Green Pygmy-parrot	LC
Mino kreffti sanfordi	Long-tailed Myna	NT
Monarcha b. barbatus	Solomons Pied Monarch	LC
Monarcha castaneiventris	Chestnut-bellied Monarch	LC
Myiagra ferrocyanea	Steel-blue Flycatcher	LC
Myzomela melanocephala	Black-headed Myzomela	NT
Ninox jacquinoti granti	Guadalcanal Boobook	NT
Nycticorax caledonicus mandibularis	Nankeen Night-heron	LC
Pachycephala implicata	Guadalcanal Hooded Whistler	LC
Pachycephala orioloides	Oriole Whistler	LC
Pachycephala pectoralis cinnamomea	Golden Whistler	LC
Petroica pusilla	Pacific Robin	LC
Porphyrio porphyrio	Purple Swamphen	LC
Ptilinopus lewisii	Claret-breasted Fruit-dove	LC
Ptilinopus solomonensis ocularis	Yellow-banded Fruit-dove	LC
Ptilinopus superbus	Superb Fruit-dove	NT
Reinwardtoena crassirostris	Crested Cuckoo-dove	LC
Rhipidura cockerelli	White-winged Fantail	LC
Rhipidura leucophrys melaleuca	Willie Wagtail	LC
Rhipidura rufifrons rufofronta	Rufous Fantail	LC
Rhyticeros plicatus mendanae	Blyth's Hornbill (Papuan Hornbill)	LC
Todirhamphus chloris alberti	Collared Kingfisher	LC
Todirhamphus leucopygius	Ultramarine Kingfisher	LC
Trichoglossus haematodus massena	Coconut Lorikeet	LC
Turnix maculosa salamonis	Red-backed Button-quail	LC

*Introduced species. IUCN: VU – Vulnerable, NT – Near Threatened, LC – Least Concern, NE –Not Evaluated.

Annex 4: Mammal Species Recorded from the Project Area and immediate surrounds (Entura & Pacific Horizons Consultancy Group 2011; THL 2019; Oceania Ecology Group 2016; Pilgrim 2017; Myknee Ecological Consulting 2020; HEC 2020; Taluva Bioresource Management and Consultancy 2020; Taluva Bioresource Management and Consultancy / Myknee Ecological Consulting 2021; Myknee Ecological Consulting/HEC 2021)

Scientific Name	Common Name	IUCN Status
Anthops ornatus	Flower-faced Bat (Solomons Leaf-nosed Bat)	VU
Aselliscus tricuspidatus	Trident Leaf-nosed Bat	LC
Canis lupus familiaris	Feral Dog	Introduced
Dobsonia inermis	Solomons Bare-backed Fruit-bat	LC
Emballonura dianae	Large-eared Sheath-tailed Bat	LC
Emballonura raffrayana	Raffray's Sheath-tailed Bat	LC
Felis catus	Feral Cat	Introduced
Hipposideros calcaratus	Spurred Leaf-nosed Bat	LC
Hipposideros cervinus	Fawn Leaf-nosed Bat	LC
Hipposideros diadema	Diadem Leaf-nosed Bat	LC
Hipposideros dinops	*Fierce Leaf-nosed Bat*	VU
Macroglossus minimus	Northern Common Blossom Bat (Dagger-toothed Long-nosed Fruit Bat)	LC
Melonycteris fardoulisi	Fardoulis' Blossom Bat	NT
Melonycteris woodfordi	Woodford's Blossom Bat	LC
Miniopterus australis	Little Long-fingered Bat (Little Bent-winged Bat)	LC
Mosia nigrescens	Lesser Sheath-tailed Bat	LC
Nyctimene major	Island Tube-nosed Bat	LC
Nyctimene vizcaccia	Umboi Tube-nosed Bat	LC
Phalanger orientalis	Northern Common Cuscus	Prehistorically introduced
Pipistrellus angulatus	New Guinea Pipistrelle	LC
Pteralopex atrata	Guadalcanal Monkey-faced Bat	EN
Pteralopex pulchra	Montane Monkey-faced Bat	CR
Pteropus rayneri	Solomons Flying Fox	NT
Pteropus woodfordi	Dwarf Flying-fox	LC
Rattus exulans	Pacific Rat	Prehistorically introduced
Rattus norvegicus	Norwegian Rat	LC, Prehistorically introduced
Rattus praetor	Large New Guinea Spiny Rat	Introduced
Rattus rattus	Black Rat	Introduced
Rousettus amplexicaudatus	Geoffroy's Rousette	LC
Saccolaimus saccolaimus	Bare-rumped Sheath-tailed Bat	LC
Sus scrofa	Wild Pig	Introduced
Uromys imperator	Emperor Rat	CR
Uromys porculus	Guadalcanal Rat	CR

*Introduced species. ^Prehistorically introduced species. IUCN: CR – Critically Endangered, EN – Endangered, VU – Vulnerable, NT – Near Threatened, LC – Least Concern, NE – Not Evaluated.

Annex 5: Reptile and Amphibian Species Recorded from the Project Area and immediate surrounds (Entura & Pacific Horizons Consultancy Group 2011; THL 2019; Pilgrim 2017; Myknee Ecological Consulting 2020; HEC 2020; Taluva Bioresource Management and Consultancy 2020; Taluva Bioresource Management and Consultancy / Myknee Ecological Consulting 2021; Myknee Ecological Consulting/HEC 2021)

Scientific Name	Common Name	IUCN Status
Boiga irregularis	Brown Tree Snake	LC
Candoia paulsoni	Solomons Ground Boa	LC
Cornufer bufoniformis	Warty Webbed Frog	LC
Cornufer elegans	Elegant Sticky-toed Frog	LC
Cornufer guentheri	Solomon Island Eyelash Frog	LC
Cornufer guppyi	Giant Webbed Frog	LC
Cornufer hedigeri	Solomon Islands Giant Treefrog	LC
Cornufer malukuna	Malukuna Webbed Frog	LC
Cornufer myersi	Myers Wrinkled Ground Frog	LC
Cornufer solomonis	Solomon Wrinkled Ground Frog	LC
Cornufer trossulus	Torakino Sticky-toed Frog	LC
Cornufer vertebralis	Fauro Sticky-toed Frog	LC
Cornufer weberi	Weber's Wrinkled Ground Frog	LC
Corucia zebrata	Prehensile-tailed Skink (Solomon Island Prehensile-tailed Skink)	NT
Cyrtodactylus biordinis	Guadalcanal Bow-fingered Gecko	LC
Cyrtodactylus salomonensis	Solomons Bent-toed Gecko	NT
Dendrelaphis calligaster	Solomons Tree Snake (Green Tree Snake)	LC
Emoia caeruleocauda	Pacific Bluetail Skink	LC
Emoia cyanogaster	Green-Bellied Tree Skink (Teal Emo Skink)	LC
Emoia cyanura	Brown-tailed Copper-striped Skink (White-bellied Copper-striped Skink)	LC
Emoia flavigularis	Yellow-throated Skink	LC
Emoia nigra	Pacific Black Skink (Black Emo Skink)	LC
Emoia pseudocyanura	Solomons Blue-tailed Skink	LC
Eugongylus albofasciolatus	White-banded Giant Skink (Barred Shark Skink)	LC
Gehyra oceanica	Oceanic Gecko	LC
Gekko vittatus	Sago Gecko	LC
Lamprolepsis smaragdina	Emerald Tree Skink (Emerald Skink)	LC
Litoria lutea	Solomon Island's Treefrog (Faro Island Treefrog)	LC
Litoria sp.	-	-
Litoria thesaurensis	Treasury Island Treefrog	LC
Loveridgelaps elapoides	Solomon's Small-eyed Snake	VU
Nactus multicarinatus	Solomons Slender-toed Gecko	LC
Ornithuroscincus noctua	Moth Skink	LC
Papurana kreffti	San Cristobal Treefrog	LC
Prasinohaema virens	Green-blooded Skink	LC
Ramphotyphlops depressus	Melanesia Blind Snake	LC
Rhinella marina	Cane Toad	LC, Introduced
Salomonelaps par	Solomons Coral Snake (Solomons Red Krait)	LC
Sphenomorphus bignelli	-	LC
Sphenomorphus concinnatus	Elegant Forest Skink	LC
Sphenomorphus solomonis	-	LC
Tribolonotus schmidti	Schmidt's Crocodile Skink	LC
Varanus indicus	Mangrove Monitor	LC

Annex 6: Phytoplankton Groups/ Morphospecies Recorded from the Tina, Toni, Ngalimbiu and Sutakama Rivers, listed to genus level (FRC environmental 2021; 2022).

Phyla
Bacillariophyta (Diatoms)
Achnanthales sp.
Bacillariaceae sp.
Bacillariophyceae sp.
Cyclotella sp.
Cymbella sp.
Cymbellales sp.
Epithemia sp.
Fragilaria sp.
Gomphonema sp.
Gomphonemataceae sp.
Halamphora sp.
Naviculales sp.
Rhopalodia sp.
Surirella sp.
Chlorophyta (Green Algae)
Ankistrodesmus sp.
Chlorophyta sp.
Cosmarium sp.
Chlamydomonadaceae sp.
Microspora sp.
Mougeotia sp.
Monoraphidium sp.
Phacotus sp.
Selenastrum sp.
Spirogyra sp.
Stauridium tetras
Tetraedron/Polyedriopsis sp.
Trebouxiophyceae sp.
Zygnemaceae sp. 1-2
Cyanophyta (Blue-Green Algae)
Chroococcus sp.
Chroococcales sp.
Chamaesiphonaceae sp.
Cyanophyta sp.
Leptolyngbya sp.
Lyngbya sp.
Oscillatoria sp.
Oscillatoriales sp.
Phormidium sp.
Pseudanabaena sp.
Rivulariaceae sp.
Chamaesiphonaceae sp.
Protists
Euglena sp.
Trachelomonas sp.

Annex 7: Periphyton Groups Recorded from the Tina, Toni, Ngalimbiu and Sutakama Rivers (FRC environmental 2021; 2022).

Phyla	Taxa
Diatoms	
Ochrophyta	*Achnanthales*
Ochrophyta	*Achnanthes sp.*
Ochrophyta	*Achnanthidium sp.*
Ochrophyta	*Amphora sp.*
Ochrophyta	*Bacillariaceae*
Ochrophyta	*Bacillariophyceae*
Ochrophyta	*Bacillariophyceae sp*
Ochrophyta	*Campylodiscus sp*
Ochrophyta	*Cocconeis sp*
Ochrophyta	*Cyclotella sp.*
Ochrophyta	*Cymbella sp.*
Ochrophyta	*Cymbellales sp.*
Ochrophyta	*Entomoneis sp.*
Ochrophyta	*Epithemia sp.*
Ochrophyta	*Fragilaria sp.*
Ochrophyta	*Gomphonema sp.*
Ochrophyta	*Gomphonemataceae sp.*
Ochrophyta	*Halamphora*
Ochrophyta	*Kybotion sp*
Ochrophyta	*Melosira cf. nummuloides*
Ochrophyta	*Naviculales*
Ochrophyta	*Peronia sp.*
Ochrophyta	*Rhopalodia sp*
Ochrophyta	*Surirella sp.*
Ochrophyta	*Ulnaria sp.*
Green Algae	
Chlorophyta	*Chaetophorales sp.*
Chlorophyta	*Chlamydomonadales sp.*
Chlorophyta	*Chlorophyta sp.*
Chlorophyta	*Cosmarium sp.*
Chlorophyta	*Debarya/Mougeotia*
Chlorophyta	*Gongrosira sp.*
Chlorophyta	*Monoraphidium sp.*
Chlorophyta	*Oocystis sp.*
Chlorophyta	*Polytoma sp.*
Chlorophyta	*Pteromonas sp.*
Chlorophyta	*Selenastrum sp.*
Chlorophyta	*Stauridium tetras*

Phyla	Taxa
Chlorophyta	*Sirogonium sp.*
Chlorophyta	*Spirogyra sp.*
Chlorophyta	*Rhizoclonium sp.*
Chlorophyta	*Zygnemataceae sp.*
Chlorophyta	*Zygnematales sp.*
Blue-green Algae	
Cyanobacteria	*Anabaena sp.*
Cyanobacteria	*Calothrix sp.*
Cyanobacteria	*Chamaesiphonaceae sp.*
Cyanobacteria	*Chroococcales sp.*
Cyanobacteria	*Cyanophyta sp.*
Cyanobacteria	*Homoeothrix sp.*
Cyanobacteria	*Leptolyngbya sp.*
Cyanobacteria	*Lyngby sp.*
Cyanobacteria	*Oscillatoria sp.*
Cyanobacteria	*Oscillatoriales sp.*
Cyanobacteria	*Phormidium sp.*
Cyanobacteria	*Planktothix sp.*
Cyanobacteria	*Pseudanabaena ap.*
Cyanobacteria	*Rivulariaceae sp.*
Red Algae	
Rhodophyta	*Rhodophyta sp.*
Protists	
Euglenozoa	Euglenoidea *sp.*
Euglenozoa	*Trachelomonas* sp.

Annex 8: Macrophytes Recorded from the Tina, Toni, Ngalimbiu and Sutakama Rivers (FRC environmental 2021; 2022).

Species Name	Common Name	Exotic
Cyperus difformis	Variable flat sedge	
Cyperus eragrostis	Tall flat sedge	
Cyperus iria	Ricefield flat sedge	
Cyperus javanicus	Javanese flat sedge	
Cyperus rotundus	Nut grass	
Eclipta prostrata	White eclipta	
Fimbristylis sp.	Fimbry sedge	
Ludwigia octovalvis	Willow primrose	
Persicaria hydropiper	Water pepper	
Persicaria sp.	Smartweed	
Phragmites karka	Common reed	
Typha sp.	Bull rush	
Brachiaria mutica	Para grass	✓
Ipomoea aquatica	Water morning glory	✓
Solanum sp.	Devil's fig	✓

Annex 9: Macroinvertebrates and Crustaceans Recorded from the Tina, Toni, Ngalimbiu and Sutakama Rivers (FRC environmental 2021; 2022).

Family	Taxon	Common Name	IUCN Status	Tina/Ngalimbiu River System (FRC 2021)	Tina/Ngalimbiu River System (FRC 2022)	Sutakama River (FRC 2022)
Aeshnidae	sp. indet. imm.				X	
Araneidae	*Tetragnatha* sp.			X		
Atyidae	*Atyopsis spinipes*	Bamboo shrimp	LC	X		
Atyidae	*Caridina barakoma*	Freshwater shrimp	Not evaluated	X	X	
Atyidae	*Caridina cf. serratirostris*		LC	X		
Atyidae	*Caridina gracilirostre*		Not evaluated		X	
Atyidae	*Caridina intermedia*		Not evaluated	X	X	
Atyidae	*Caridina papuana*		LC	X		
Atyidae	*Caridina* spp.			X	X	
Atyidae	*Caridina typus*		LC	X		
Baetidae	Offadens sp.			X	X	X
Baetidae	Platybaetis sp.			X	X	X
Baetidae	sp. indet.			X	X	X
Brachyura	sp. indet.			X		
Caenidae	sp. 1			X	X	
Caenidae	sp. 2			X	X	X
Caenidae	sp. 3			X	X	
Caenidae	sp. 4			X	X	
Caenidae	sp. 5				X	
Caenidae	sp. indet.			X	X	X
Calamoceratidae	Anisocentropus sp.			X	X	
Ceratopogonidae	Ceratopogon sp.			X		
Ceratopogonidae	*Dasyhelea* sp.			X		
Ceratopogonidae (Ceratopogoninae)	*Bezzia* sp. 1				X	
Ceratopogonidae (Ceratopogoninae)	*Culicoides* sp. 1				X	
Ceratopogonidae (Ceratopogoninae)	*Nilobezzia* sp. 1				X	
Ceratopogonidae (Ceratopogoninae)	*Stilobezzia* sp. 1				X	
Ceratopogonidae (Forcipomyiinae)	sp. 1				X	
Chironomidae (Aphroteniinae)	cf. Paraphrotenia sp. 1				X	
Chironomidae (Chironominae)	Anuncotendipes sp. 1			X	X	
Chironomidae (Chironominae)	Chironomus sp. 1				X	
Chironomidae (Chironominae)	Cladopelma sp. 1				X	X
Chironomidae (Chironominae)	Cryptochironomus sp. 1			X	X	X
Chironomidae (Chironominae)	Demicryptochironomus sp. 1				X	
Chironomidae (Chironominae)	Dicrotendipes sp. 1			X	X	
Chironomidae (Chironominae)	Fissimentum sp. 1				X	
Chironomidae (Chironominae)	Microchironomus sp. 1			X	X	X
Chironomidae (Chironominae)	Microtendipes sp. 1			X	X	

Family	Taxon	Common Name	IUCN Status	Tina/Ngalimbiu River System (FRC 2021)	Tina/Ngalimbiu River System (FRC 2022)	Sutakama River (FRC 2022)
Chironomidae (Chironominae)	Nilothauma sp. 1			X		
Chironomidae (Chironominae)	Parachironomus sp. 1				X	
Chironomidae (Chironominae)	Paracladopelma sp. 1			X	X	
Chironomidae (Chironominae)	Paratendipes sp. 1			X		
Chironomidae (Chironominae)	Polypedilum sp. 1			X	X	X
Chironomidae (Chironominae)	Robackia sp. 1			X	X	
Chironomidae (Chironominae)	sp. indet.			X	X	X
Chironomidae (Chironominae)	Tanytarsini sp. 1			X	X	X
Chironomidae (Chironominae)	Tanytarsini sp. 2			X	X	X
Chironomidae (Chironominae)	Xylochironomus sp. 1				X	
Chironomidae (Orthocladiinae)	Botryocladius sp. 1			X	X	X
Chironomidae (Orthocladiinae)	Cardiocladius sp. 1				X	
Chironomidae (Orthocladiinae)	Corynoneura sp. 1			X	X	X
Chironomidae (Orthocladiinae)	Cricotopus sp. 1				X	
Chironomidae (Orthocladiinae)	Limnophyes sp. 1			X	X	X
Chironomidae (Orthocladiinae)	Limnophyes sp. 2			X	X	X
Chironomidae (Orthocladiinae)	Nanocladius sp. 1			X		
Chironomidae (Orthocladiinae)	Paratrichocladius sp. 1			X		
Chironomidae (Orthocladiinae)	sp. 1			X	X	X
Chironomidae (Orthocladiinae)	sp. 2				X	
Chironomidae (Orthocladiinae)	sp. indet.			X	X	
Chironomidae (Orthocladiinae)	Thienemanniella sp. 1			X	X	
Chironomidae (Tanypodinae)	Ablabesmyia sp. 1			X	X	X
Chironomidae (Tanypodinae)	Ablabesmyia sp. 2			X	X	
Chironomidae (Tanypodinae)	Larsia sp. 1			X	X	X
Chironomidae (Tanypodinae)	Monopelopia sp. 1				X	
Chironomidae (Tanypodinae)	Nilotanypus sp. 1			X		
Chironomidae (Tanypodinae)	Paramerina sp. 1			X	X	
Chironomidae (Tanypodinae)	sp. indet.			X	X	
Chironomidae (Tanypodinae)	Thienemannimyia sp. 1			X	X	X
Coenagrionidae	Teinobasis sp.			X	X	X
Conoesucidae	sp. 1				X	X
Corduliidae	sp. unk. 1				X	
Corophiidae	sp. indet.			X	X	
Crambidae	Hygraulus sp.			X	X	X
Dolichopodidae	sp. indet.			X	X	X
Dytiscidae	sp. indet. imm.				X	
Empididae	sp. indet.			X	X	X
Gerridae	Limnogonus sp.				X	

Family	Taxon	Common Name	IUCN Status	Tina/Ngalimbiu River System (FRC 2021)	Tina/Ngalimbiu River System (FRC 2022)	Sutakama River (FRC 2022)
Glossosomatidae	sp.			X	X	
Hydrophilidae	cf. *Laccobius*			X	X	
Hydropsychidae	sp.			X	X	X
Hydroptilidae	*Hydroptila* sp. 1				X	
Hydroptilidae	*Orphninotrichia* sp. 1				X	
Hydroptilidae	*Orthotrichia* sp. 1				X	X
Hydryphantidae	cf. *Tartarothyas* sp. 1			X	X	
Hygrobatidae	sp. 1				X	
Leptoceridae	Oecetis sp.			X		
Leptoceridae	sp. indet. imm.				X	X
Leptoceridae	Triplectides sp.			X	X	X
Leptophlebiidae	*Atalophlebia* sp.			X		
Leptophlebiidae	*Atalophlebia* sp. 1			X	X	X
Leptophlebiidae	*Atalophlebia* sp. 2			X	X	X
Leptophlebiidae	*Atalophlebia* sp. 3			X	X	X
Leptophlebiidae	*Atalophlebia* sp. 4				X	
Leptophlebiidae	*Atalophlebia* sp. indet.				X	X
Leptophlebiidae	sp.			X		
Leptophlebiidae	*sp. 1 nr Koornonga*				X	
Leptophlebiidae	sp. indet.			X	X	X
Libellulidae	sp. indet.			X	X	
Lumbriculidae	Lumbriculus variegatus		Not evaluated	X	X	X
Mesoveliidae	Mesovelia subvittata		Not evaluated		X	
Micronectidae	*Micronecta* sp. 1				X	
Muscidae	sp. indet.			X	X	X
Naididae	*Pristina proboscidea*		Not evaluated		X	
Naididae	sp. 1				X	X
Naididae	sp. indet.				X	
Nereididae	sp. 1				X	X
Neritidae	Clithon cf. donovani		Not evaluated	X	X	
Oribatidae	sp. 1				X	
Paguridae	sp. 1				X	
Palaemonidae	*Macrobrachium* cf *aemulum*		LC	X		
Palaemonidae	*Macrobrachium* cf *australe*	koua river prawn	LC	X	X	
Palaemonidae	*Macrobrachium* cf *bariense*		LC	X	X	
Palaemonidae	*Macrobrachium* cf *gracilirostre*	cf	LC	X		
Palaemonidae	*Macrobrachium* cf *grandimanus*	Hawaiian river prawn	LC	X		
Palaemonidae	*Macrobrachium* cf *handschini*		LC		X	
Palaemonidae	*Macrobrachium jaroense*	Jaro river prawn	LC	X	X	

Family	Taxon	Common Name	IUCN Status	Tina/Ngalimbiu River System (FRC 2021)	Tina/Ngalimbiu River System (FRC 2022)	Sutakama River (FRC 2022)
Palaemonidae	*Macrobrachium lar*	giant jungle prawn	LC	X		
Palaemonidae	*Macrobrachium latidactylus*	scissor river prawn	LC	X	X	
Palaemonidae	*Macrobrachium placidulum*	Taiwanese longclaw	LC	X	X	X
Palaemonidae	Macrobrachium sp.			X		
Palaemonidae	*Palaemon consinnus*		Not evaluated	X		
Palaemonidae	*Palaemon* sp.			X	X	X
Peneidae	Peneidae sp			X		
Philopotamidae	Chimarra sp.			X	X	X
Polycentropodidae	*Plectrocnemia* sp. 1				X	X
Prosopistomatidae	*Prosopistoma sedlaceki*		Not evaluated	X	X	X
Prostomatidae	*Prostoma graecense*				X	
Scatopsidae	sp. 1				X	
Simuliidae	sp.			X	X	X
Staphylinidae	sp. indet.				X	
Stratiomyidae	*Odontomyia* sp. 1				X	
Thiaridae	*Melanoides tuberculata*		LC		X	
Thiaridae	Mieniplotia scabra		DD	X	X	
Thiaridae	*Sermyla riquetii*		LC	X	X	
Thiaridae	*Stenomelania aspirans*		Not evaluated		X	
Thiaridae	*Stenomelania* sp.			X	X	
Tipulidae	Molophilus sp.			X	X	X
Tipulidae	sp. unk. 1				X	
Tipulidae	sp. unk. 2				X	
Tubificidae	Branchiura sowerbyi		Not evaluated	X		
Varunidae	*Varuna* sp.	river swimming crab		X		
Veliidae	*Rhagovelia brownie*		Not evaluated		X	
Aeshnidae	sp. indet. imm.				X	

Annex 10: Fish Recorded from the Tina, Toni, Ngalimbiu and Sutakama Rivers (FRC environmental 2021; 2022; Albert et al. 2016; Jowett 2016; BRLi 2013; 2014; Entura 2011; Golder Associates 2009).

Scientific Name	Common Name	IUCN Status	Field Survey Results (Refer to Above References)			eDNA Results (Wilderlab 2022)		Notes for eDNA Results
			Tina/Ngalimbiu River System	Sutakama River System	Metapona River System	Tina/Ngalimbiu River System	Sutakama River System	
Allomogurnda sp.		NE	X					
Ambassis buruensis	Buru glass perchlet	DD	X		X			
Ambassis interruptus	Long-spined glass perchlet	LC	X		X			
Ambassis miops	Flag-tailed glass perchlet	LC	X		X	X		
Anguilla marmorata	Marbled eel	LC	X		X	X	X	
Anguilla megastoma	Polynesian longfinned eel	DD	X		X			
Apogon sp.		NE	X					
Awaous sp.		NE	X					
Awaous grammepomus	Scribbled goby	LC	X		X	X	X	
Awaous guamensis		LC	X		X	X	X	
Awaous ocellaris	Spotfin river goby	LC	X		X	X	X	
Belobranchus sp		NE	X		X			
Belobranchus belobranchus	Throat-spine gudgeon	LC	X	X	X	X	X	
Belobranchus segura		LC	X		X	X	X	
Benthosema pterotum	Skinnycheek lanternfish	LC				X		
Bunaka gyrinoides	Greenback gauvina	LC	X		X	X	X	
Butis amboinensis	Olive flathead-gudgeon	LC	X		X			
Butis butis	Crimson-tipped Gudgeon	LC	X					
Carangoides malabaricus	Malabar trevally	LC	X					
Caranx ignobilis	Giant trevally	LC				X		Marine species. Common in the human food industry as well as fish bait industry.
Caranx papuensis	Brassy trevally	LC	X			X		
Caranx sexfasciatus	Bigeye trevally	NE	X			X		
Carassius auratus	Goldfish	LC				X		From aquarium industry
Cestraeus goldiei	Goldie River mullet	DD				X		
Crenimugil cf heterocheilos	Half fringelip mullet	LC	X	X	X	X	X	
Crenimugil buchanani	Bluetail mullet	NE	X		X	X		
Eleotris fusca	Brown spine-cheek gudgeon	LC	X		X	X		
Eleotris acanthopoma	Spinecheek gudgeon	LC				X		
Ellochelon vaigiensis	Diamondscale mullet	LC	X					
Encrasicholina heteroloba	Shorthead anchovy	LC				X		Marine species. Common in the human food industry as well as fish bait industry.
Encrasicholina punctifer	Buccaneer anchovy	LC				X		Marine species. Common in the human food industry as well as fish bait industry.
Epigonus sp.						X		
Gambusia holbrooki	Eastern gambusia	NE	X		X	X		
Gazza achlamys	Smalltoothed ponyfish	LC				X		Marine species. Larger specimens marketed fresh or dried-salted but most of the catch made into fishmeal or discarded.
Gerres filamentosus/ Gerres sp.	Silver-biddie	NE	X			X		
Giuris margaritacea	Snakehead gudgeon	LC	X		X	X		
Giuris viator	Travelling gudgeon	NE	X					
Glossogobius clitellus	Saddled goby	LC	X	X	X			
Glossogobius illimis		LC	X		X			
Glossogobius sp.		NE	X					
Gymnothorax polyuranodon	Freshwater moray eel	LC	X		X			
Hippichthys heptagonus		LC	X			X	X	
Hypseleotris cyprinoides	Tropical carp gudgeon	DD				X		

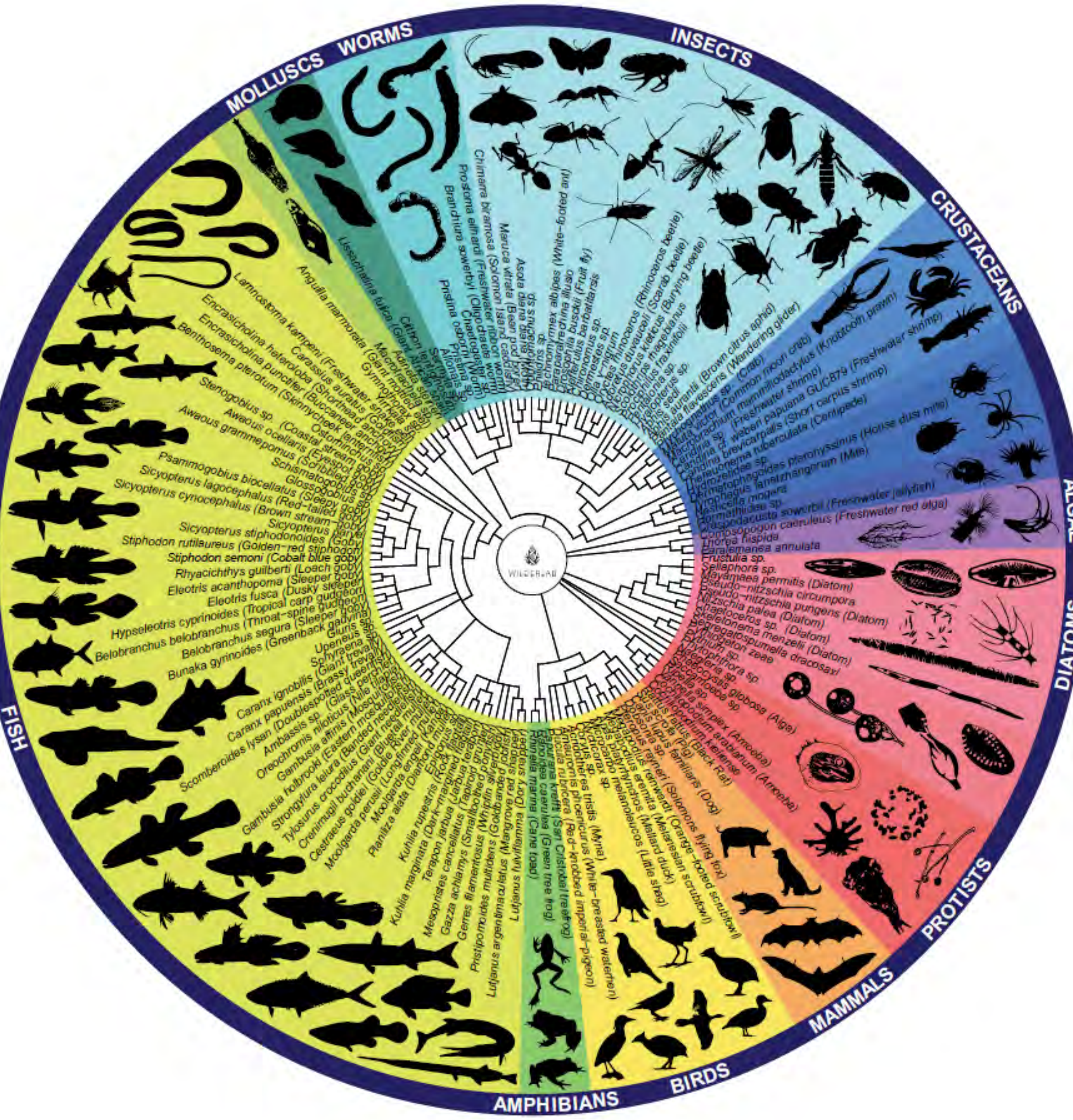
Scientific Name	Common Name	IUCN Status	Field Survey Results (Refer to Above References)			eDNA Results (Wilderlab 2022)		Notes for eDNA Results
			Tina/Ngalimbiu River System	Sutakama River System	Metapona River System	Tina/Ngalimbiu River System	Sutakama River System	
Hypseleotris cf *guentheri*		NE	X		X			
Katsuwonus pelamis	Skipjack tuna	LC				X		Marine species. Common in food industry.
Kuhlia marginata	Spotted flagtail	LC	X	X	X	X	X	
Kuhlia rupestris	Rock flagtail	LC	X		X	X	X	
Lamnostoma kampeni	Freshwater snake-eel	NE	X	X	X	X		
Leiognathidae	Ponyfish	NE	X					
Lentipes sp. (Solomonensis)		NE	X					
Lutjanus argentimaculatus	Mangrove red snapper	LC	X		X	X		
Lutjanus fuscescens	Freshwater snapper	NE	X			X		
Lutjanus sp.	Snapper (juvenile)	NE	X					
Lutjanus vitta	Brownstripe snapper	LC	X					
Mesopristes argenteus	Silver grunter	LC	X	X				
Mesopristes cancellatus	Tapiroid grunter	LC	X		X	X	X	
Microphis argulus	Flat-nosed pipefish	LC	X					
Microphis brachyurus	Short-tail pipefish	LC	X					
Microphis brevidorsalis	Stream pipefish	LC	X					
Microphis leiaspis	Barhead pipefish	LC	X		X			
Microphis manadensis	Manado pipefish	LC	X		X			
Microphis mento	Red pipefish	LC	X					
Microphis retzii	Ragged-tailed pipefish	LC	X		X			
Microphis sp.		NE	X					
Microphis spinachoides	Spinach pipefish	NE	X		X			
Moolgarda engeli	Kanda	LC				X		
Moolgarda perusii	Longfinned mullet	LC				X		
Mugil cf cephalus	Flathead grey mullet	LC	X					
Mulloidichthys sp.	Goatfish (juvenile)	NE	X					
Oostethus brachyurus		DD	X					
Ophiocara porocephala	Spangled gudgeon, Northern mud gudgeon	LC	X					
Oreochromis mossambicus	Mozambique tilapia	NE	X		X	X	X	
Ostorhinchus lateralis	Pinstripe cardinalfish	LC	X					
Periophthalmus argentilineatus	Barred mudskipper	LC	X					
Planiliza alata	Diamond mullet	LC				X		
Planiliza macrolepis	Largescale mullet	LC	X					
Planiliza planiceps	Tade gray mullet	LC	X		X			
Pleuronectidae	Right-eye flounder (juvenile)	NE	X					
Polydactylus sp.	Threadfin salmon (juvenile)	NE	X					
Pristipomoides multidens	Goldbanded jobfish	LC				X		Marine species. Common in food industry.
Psammogobius biocellatus	Sleepy goby	LC				X		
Redigobius bikolanus	Speckled goby	LC	X					
Redigobius sp.		NE	X					
Redigobius tambujon	Dualspot goby	LC	X					
Rhyacichthys guilberti / R. aspro	Loach goby	DD	X		X	X	X	
Schismatogobius cf bruynisi		LC	X			X	X	
Schismatogobius essi		NE	X	X				
Schismatogobius hoesei	Scaleless goby	LC	X					

Scientific Name	Common Name	IUCN Status	Field Survey Results (Refer to Above References)			eDNA Results (Wilderlab 2022)		Notes for eDNA Results
			Tina/Ngalimbiu River System	Sutakama River System	Metapona River System	Tina/Ngalimbiu River System	Sutakama River System	
Schismatogobius vanuatuensis	Vanuatu schismatogobius	DD	X	X				
Scolecenchelys macroptera	Narrow worm eel	NE	X					
Scomber sp.		NE				X		Marine species. Common in food industry.
Scomberoides lysan / Scomberoides sp.	Queenfish	NE	X			X		
Scorpaenidae	Scorpionfish (juvenile)	NE	X					
Sicyopterus cynocephalus	Brown stream-goby	LC	X	X	X	X	X	
Sicyopterus lagocephalus	Blue stream-goby	LC	X	X	X	X	X	
Sicyopterus lividus	Rockclimbing goby	LC				X		Local endemic to Eastern Caroline Islands. Record in error.
Sicyopterus longifilis	Threadfin goby	LC	X	X				
Sicyopterus microcephalus	Hagen's goby	LC	X		X			
Sicyopterus parvei		DD				X		Local endemic to Indonesia. Record in error.
Sicyopterus sp.		NE	X		X			
Sicyopterus stiphodonoides		LC	X	X		X	X	
Sicyopus zosterophorus	Red-belted goby	LC	X					
Sillago sp.	Whiting (juvenile)	NE	X					
Sphyraena sp.	Barracuda (juvenile)	NE	X		X			
Stenogobius genivittatus	Chinstripe goby	NE	X		X			
Stenogobius hoesei		LC	X					
Stenogobius beauforti	Beaufort's goby	LC	X		X			
Stiphodon pelewensis	Daintree cling goby	LC	X	X	X			
Stiphodon rutilaureus	Orange cling goby	LC	X		X	X		
Stiphodon semoni	Opal cling goby	LC	X	X	X	X	X	
Stiphodon sp cf atropurpureus	Blue neon goby	LC	X					
Stiphodon sp cf multisquamus		DD	X					
Stiphodon sp cf ornatus	Rainbow cling goby	DD	X					
Stiphodon sp.		NE	X	X				
Stiphodon surrufus	Emerald cling goby	LC	X					
Strongylura leiura	Banded needlefish	LC				X		
Terapon jarbua	Crescent grunter	LC	X			X		
Tetractenos sp.	Pufferfish	NE	X					
Thryssa baelama	Baelama anchovy	LC	X					
Tylosurus crocodilus	Giant needlefish	LC				X		Marine species. Common in food industry.
Upeneus sp.						X		
Yarica hyalosoma	Mangrove cardinalfish	LC	X					
Yirrkala sp						X		
Zenarchopterus sp.		Not evaluated	X					
Zenarchopterus dispar	Feathered river-garfish	LC	X					

Annex 11: Fish Recorded from the Tina, Toni, Ngalimbiu and Sutakama Rivers from the eDNA Results (Wilderlab 2022).

Family	Scientific.Name	16S Sequence Available	12S Sequence Available	Detectable
Ambassidae	*Ambassis interrupta*	TRUE	FALSE	TRUE
Ambassidae	*Ambassis miops*	FALSE	FALSE	FALSE
Anguillidae	*Anguilla marmorata*	TRUE	TRUE	TRUE
Apogonidae	*Apogon hyalosoma*	FALSE	FALSE	FALSE
Apogonidae	*Fibramia lateralis*	TRUE	FALSE	TRUE
Apogonidae	*Ostorhinchus cyanosoma*	FALSE	FALSE	FALSE
Carangidae	*Carangoides malabaricus*	TRUE	TRUE	TRUE
Carangidae	*Carangx sexcifastius*	TRUE	TRUE	TRUE
Carangidae	*Caranx papuensis*	TRUE	TRUE	TRUE
Carangidae	*Scomberoides tala*	FALSE	FALSE	FALSE
Cichlidae	*Oreochromis mossambicus*	TRUE	TRUE	TRUE
Eleotridae	*Allomogurnda sp.*	FALSE	FALSE	FALSE
Eleotridae	*Belobranchus sp*	FALSE	FALSE	FALSE
Eleotridae	*Belobranchus belobranchus*	FALSE	FALSE	FALSE
Eleotridae	*Belobranchus segura*	FALSE	FALSE	FALSE
Eleotridae	*Bunaka gyrinoides*	TRUE	FALSE	TRUE
Eleotridae	*Butis amboinensis*	FALSE	FALSE	FALSE
Eleotridae	*Eleotris fusca*	TRUE	TRUE	TRUE
Eleotridae	*Giuris margaritacea*	FALSE	TRUE	TRUE
Eleotridae	*Ophiocara porocephala*	TRUE	TRUE	TRUE
Gerreidae	*Gerres oyena*	TRUE	FALSE	TRUE
Gobiidae	*Awaous sp.*	FALSE	FALSE	FALSE
Gobiidae	*Awaous grammepomus*	TRUE	FALSE	TRUE
Gobiidae	*Awaous guamensis*	TRUE	FALSE	TRUE
Gobiidae	*Awaous melanocephalus*	FALSE	FALSE	FALSE
Gobiidae	*Awaous ocellaris*	FALSE	TRUE	TRUE
Gobiidae	*Glossogobius celebius*	FALSE	TRUE	TRUE
Gobiidae	*Glossogobius illimis*	FALSE	TRUE	TRUE
Gobiidae	*Glossogobius sp.*	FALSE	FALSE	FALSE
Gobiidae	*Lentipes sp. (Solomonensis)*	FALSE	FALSE	FALSE
Gobiidae	*Redigobius bikolanus*	TRUE	TRUE	TRUE
Gobiidae	*Redigobius sp.*	FALSE	FALSE	FALSE
Gobiidae	*Redigobius tambujon*	FALSE	FALSE	FALSE
Gobiidae	*Schismatogobius cf bruynsii*	FALSE	FALSE	FALSE
Gobiidae	*Schismatogobius essi*	FALSE	FALSE	FALSE
Gobiidae	*Schismatogobius hoesei*	FALSE	FALSE	FALSE
Gobiidae	*Schismatogobius vanuatensis*	FALSE	FALSE	FALSE
Gobiidae	*Sicyopterous sp.*	FALSE	FALSE	FALSE
Gobiidae	*Sicyopterus cynocephalus*	TRUE	TRUE	TRUE
Gobiidae	*Sicyopterus lagocephalus*	TRUE	TRUE	TRUE
Gobiidae	*Sicyopterus longifilis*	TRUE	TRUE	TRUE
Gobiidae	*Sicyopterus stiphodonoides*	TRUE	TRUE	TRUE
Gobiidae	*Sicyopus zosterophorus*	TRUE	FALSE	TRUE
Gobiidae	*Stenogobius hoesei*	FALSE	FALSE	FALSE
Gobiidae	*Stenogobius sp.*	FALSE	FALSE	FALSE

Family	Scientific.Name	16S Sequence Available	12S Sequence Available	Detectable
Gobiidae	*Stiphodon atratus*	TRUE	FALSE	TRUE
Gobiidae	*Stiphodon atropurpureus*	FALSE	FALSE	FALSE
Gobiidae	*Stiphodon birdsong*	FALSE	FALSE	FALSE
Gobiidae	*Stiphodon multisquamus*	FALSE	FALSE	FALSE
Gobiidae	*Stiphodon ornatus*	FALSE	FALSE	FALSE
Gobiidae	*Stiphodon pelewensis*	TRUE	TRUE	TRUE
Gobiidae	*Stiphodon rutilaureus*	TRUE	FALSE	TRUE
Gobiidae	*Stiphodon semoni*	FALSE	FALSE	FALSE
Gobiidae	*Stiphodon sp.*	FALSE	FALSE	FALSE
Kuhliidae	*Kuhlia marginata*	TRUE	FALSE	TRUE
Kuhliidae	*Kuhlia rupestris*	TRUE	TRUE	TRUE
Leiognathidae	*Leiognathus equula*	FALSE	FALSE	FALSE
Lutjanidae	*Lutjanus argentimaculatus*	TRUE	TRUE	TRUE
Lutjanidae	*Lutjanus fuscescens*	FALSE	FALSE	FALSE
Lutjanidae	*Lutjanus sp.*	FALSE	FALSE	FALSE
Lutjanidae	*Lutjanus vitta*	TRUE	TRUE	TRUE
Mugiliidae	*Crenimugil cf heterocheilos*	FALSE	FALSE	FALSE
Mugiliidae	*Ellochelon vaigiensis*	TRUE	TRUE	TRUE
Mugiliidae	*Muigil cephalus*	TRUE	TRUE	TRUE
Mugiliidae	*Planiliza macrolepis*	TRUE	TRUE	TRUE
Mugiliidae	*Planiliza planiceps*	FALSE	FALSE	FALSE
Mullidae	*Mulloidichthys sp.*	FALSE	FALSE	FALSE
Muraenidae	*Gymnothorax polyuranodon*	TRUE	FALSE	TRUE
Ophichthidae	*Lamnostoma kampeni*	TRUE	FALSE	TRUE
Pleuronectidae	*NA*	FALSE	FALSE	FALSE
Poeciliidae	*Gambusia holbrooki*	TRUE	TRUE	TRUE
Polynemidae	*Polydactylus sp.*	FALSE	FALSE	FALSE
Rhyacichthyidae	*Rhyacichthys guilberti*	TRUE	FALSE	TRUE
Scorpaenidae	*NA*	FALSE	FALSE	FALSE
Sillaginidae	*Sillago sp.*	FALSE	FALSE	FALSE
Sphyraenidae	*Sphyraena sp.*	FALSE	FALSE	FALSE
Syngnathidae	*Coelonotus leiaspis*	TRUE	FALSE	TRUE
Syngnathidae	*Hippichthys heptagonus*	TRUE	FALSE	TRUE
Syngnathidae	*Microphis argulus*	FALSE	FALSE	FALSE
Syngnathidae	*Microphis brevidorsalis*	FALSE	FALSE	FALSE
Syngnathidae	*Microphis retzii*	FALSE	FALSE	FALSE
Syngnathidae	*Microphis sp.*	FALSE	FALSE	FALSE
Syngnathidae	*Oostethus brachyurus*	TRUE	TRUE	TRUE
Syngnathidae	*Oostethus brachyurus*	TRUE	TRUE	TRUE
Syngnathidae	*Oostethus manadensis*	TRUE	TRUE	TRUE
Terapontidae	*Mesopristes argenteus*	FALSE	FALSE	FALSE
Terapontidae	*Mesopristes cancellatus*	FALSE	TRUE	TRUE
Terapontidae	*Terapon jarbua*	TRUE	TRUE	TRUE
Tetraodontidae	*Tetractenos sp.*	FALSE	FALSE	FALSE
Zenarchopteridae	*Zenarchopterus sp.*	FALSE	FALSE	FALSE
Zenarchopteridae	*Zenarchopterus dispar*	TRUE	TRUE	TRUE



Source: WilderLab 2022

Annex 12: Data Deficient Flora Species Not Carried Forward into the CHA.

Scientific Name	Common Name
Actinodaphne sp.	
Aglaia cucullata	Amoora
Albizia sp.	Albizzia, Paraserianthes
Alocasia macrorrhiza	Wild Giant Taro
Alpinia novae-pommeraniae	Wild Ginger
Alpinia oceanica	Alpinia
Alpinia purpurata	Red Ginger
Alpinia purpurata	Ginger
Alpinia spp.	Ginger Plant
Alpinia stapfiana	Ginger
Artocarpus altilis	Bread Fruit
Artocarpus vrieseanus	Wild Bread Fruit
Astronidium novae-georgiae	Astronidium
Astronidium solomonensis	Astronidium
Bambusa balcooa	Yellow Bamboo
Bambusa blumeana	Spiny Bamboo
Bambusa sp.	Fi'l Kao
Barringtonia procera	Cut nut
Barringtonia sp.	Wild Cut nut
Begonia solomonensis	Begonia
Burckella sp.	Burckella
Calamus aruensis	Lawyer Cane, Rattan
Calamus vestitus	Lawyer Cane, Rattan
Calamus vitiensis	Lawyer Cane, Rattan
Calanthe longifolia	Terrestrial orchid
Calophyllum peekelli	Calophyllum
Canarium salomonense	Small Ngali nut, Canarium
Causonis trifolia	Cayratia
Celtis latifolia	Celtis
Citrus limon	Bush lime
Clerodendrum buchananii	Clerodendrum
Cocos nucifera	Coconut
Cominsia gigantea	Cominsia
Crinum asiaticum	Crinum, lily
Cryptocarya sp.	Cryptocarya
Cucurbita sp.	Curcubita
Cyathocalyx petiolaris	Cyathocalyx
Cyrtosperma chamissonis	Swamp Taro
Cyrtosperma johnstonii	Wild Taro
Cyrtosperma johnstonii	Wild Taro
Dendrocnide inerme	Poison or Stinging Tree

Scientific Name	Common Name
Dennstaedtia erecta	Fern
Dennstaedtia sp.	Dennstaedtia Fern
Dillenia ingens	Giant-leaved Dillenia
Dioscorea alata	Purple Yam
Dioscorea sp.	Yam
Donax canniformis	Donax
Dracontomelon sp.	
*Drymophloeus salomonense**	Drymophloeus
*Drymophloeus salomonensis**	Drymo Palm
Dysoxylum excelsum	Dysox, Dysoxylum
Dysoxylum parasiticum	Dysoxylum
Dysoxylum sp.	Dysoxylum
Elaeocarpus sp.	Elaeocarpus
Elatostema salomonense	Elatostemon
Endospermum formicarum	Bass Wood
Erythrina sp.	Erythrina
Euphorbia hirta	Milky Weed, Asthma-plant
Euphorbia sp.	
Ficus bracteata	Ficus, Fig tree
Ficus chrysochaete	Ficus
Ficus longibracteata	Ficus, Fig
Ficus longifolia	Ficus
Ficus sp.	Ficus
Ficus virgata	Ficus, Fig
Ficus wassa	Ficus
Flagellaria gigantea	Flagellaria
Freycinetia solomonensis	Climbing pandanus
Garcinia solomonensis	Garcinia
Gironniera sp.	Gironniera
Grammatophyllum speciosum	Giant Orchid
Gymnostoma papuana	Casuarina
Haplolobus sp.	Haplolobus
Heliconia lanata	Heliconia
Heliconia salomonensis	Heliconia
Heritiera solomonensis	Bush Heritiera
Heterospathe minor	Heterospathe palm
Heterospathe salomonense	Heterospathe
Heterospathe salomonensis	Heterospathe palm
Hibiscus tiliaceus	Yellow Hibiscus
Homalanthus sp.	Homalanthus
Homalanthus tatambense	Homalanthus
Homalomena pendula	Homalomena

Scientific Name	Common Name
Hornstedtia lycostoma	Hornstedtia, Sweet Ginger
Hornstedtia scottiana	Sweet Ginger
Hoya guppyi	Hoya
Hydriastele macrospadix	Tall Palm
Ipomoea illustris	Ipomoea
Licuala lauterbachii	Licuala palm
Litsea purglabra	Litsea
Lygodium palmatum	Lygodium Fern
Melastoma affine	Melastoma (Blue Tongue)
Melicope sp.	Melicope
Merremia pacifica	Merremia
Merremia peltata	Merremia
Metroxylon salomonense	Sago palm, Sagu
Mikania micrantha	Mile-a-minute
Mimosa invisa	Sensitive Grass
Morinda citrifolia	Wild Noni tree
Mucana sp.	Legume
Musa sapientum	Banana
Musa spp.	Banana tree
Mussaenda cylindrocarpa	Mussaenda
Myrmecodia tuberoa	Ant Plant
Nastus obtusus	Bamboo, Green Bamboo
Nastus racembambose	Climbing Bamboo
Neonauclea orientalis	Nauclea
Nephrolepsis biserrata	Fish tail Fern
Nephrolepsis hirsutula	Fish tail Fern
Osmoxylon sp.	
Pandanus compressus	Pandanus
Pandanus sp.	Pandanus
Paraserianthis falcata	Albizia
Parinari glaberrima	Tita Tree
Parinari noda	Parinari
Pennisetum polystachyon	Mission Grass
Pennisetum sp.	Pennisetum
Pholidota sp.	Orchid
Phreatia sp.	Orchid
Physokentia insolita	Physokentia
Pimeleodendron amboinicum	Pimeleodendron
Piper betle	Piper
Piper wichmanii	Piper
Pleomele angustifolia	Pleomele
Plerandra solomonensis	Plerandra

Scientific Name	Common Name
Polyscias guilfoylei	Polyscias
Polysicias sp.	Polyscias
Premna corymbosa	Premna
Ptychosperma salomonense	Ptychosperma palm
Pueraria lobata	Legume Cover crop
Pueraria sp.	Pueraria
Pullea sp.	Pullea
Rhus taitensis	Rhus
Rubus moluccanus	Wild Raspberry
Schizaea sp.	
Schizostachyum serrata	Schizomeria
Schizostachyum tessellatum	Bamboo
Schleinitzia sp.	Schleinitzia
Scindapsus salomoneinsis	Scindapsus
Selaginella rechingeri	Selaginella
Sida rhombifolia	Sida
Solanum sp.	Potatoe, Kumara
Solanum torvum	Egg Plant, Devil's Fig
Spathodea companulata	African Tulip
Spathoglottis plicata	Ground Orchid
Spathoglottis sp.	Ground Orchid
Sphaeropteris spp.	Cyathea
Starchytapheta jamaicensis	Blue Rat's tail
Starchytapheta spp.	Blue Rat's tail
Stenochlaena palustris	Climbing Fern
Sterculia sp.	Sterculia
Strobilanthes reptans	Hemigraphis
Sysygium nemorale	Syzygium
Syzygium buerttneriana	Syzygium
Syzygium myriadena	Syzygium
Syzygium onesima	Syzygium, Wild Local Apple
Syzygium sp.	Syzygium
Syzygium tierneyana	Syzygium
Tapeinochilus solomonense Tapeinochilus	Ginger
Terminalia sp.	Terminalia
Themeda triandra	Kangaroo Grass
Theobroma cacao	Cocoa
Uncaria appendiculata	Water Rope
Utania racemosa	Fagraea
Wollastonia biflora	Wedelia
Zygogynum haplopus	Belliolum

Annex P-2-3: Terrestrial Offset Management Strategy.

Tina River Hydropower Development Project

Terrestrial Offset Management Strategy

PREPARED FOR

TINA HYDRO DEVELOPMENT PROJECT | JUNE 2023

Stantec

Tina River Hydropower Development Project

TERRESTRIAL OFFSET MANAGEMENT STRATEGY

June 2023

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1. INTRODUCTION

1.1 Background

The Tina River Hydropower Development Project (the Project) includes a 15-megawatt (MW) hydropower facility, transmission line, access roads and related permanent and temporary infrastructure. The Terrestrial Offset Management Strategy (TOMS) has been developed for the Project as a sub-plan of the P-2 Biodiversity Management Plan (BMP), which is one of a suite of environmental and social management plans applicable to the Project.

The Project is to demonstrate how it will achieve no net loss[1] in terrestrial Natural Habitat, and net gain[2] in terrestrial Critical Habitat of the Tina River. The TOMS demonstrates the mechanism for how this will be achieved.

1.2 Aim and Scope

The aim of the TOMS is to set out the management actions required to achieve no net loss of Natural Habitat and net gain in Critical Habitat from the construction and operation of the Project. The specific objectives of the TOMS are to:

- Identify a viable offset option(s) for the residual impacts associated with the Project.
- Outline monitoring and management requirements to ensure effective implementation of the offset.
- Set out the responsibilities and an indicative budget to ensure effective implementation of the offset.

The TOMS relates to impacts and offset requirements largely within Core Land. As such, responsibility for implementation will be Tina Hydropower Limited (THL). Actions outside of Core Land will be addressed under the Aquatic Offset Management Strategy (AOMS) to be implemented by the Solomon Islands Government (SIG).

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[1] Defined as the point at which project-related impacts on biodiversity are balanced by measures taken to avoid and minimize the project's impacts, to undertake on-site restoration and finally to offset significant residual impacts, if any, on an appropriate geographic scale (e.g. local, landscape-level, national, regional) (World Bank Group 2019).

[2] An additional conservation outcome that can be achieved for the biodiversity values for which the critical habitat was designated. Net gain may be achieved through the development of a biodiversity offset to protect and conserve biodiversity (World Bank Group 2019).

2. METHODOLOGY

The development of the TOMS follows the safeguard policies of the Concessional Finance Partners and the requirements of the Environmental and Social Impact Assessment for the Project (ESIA) prepared in 2017 and updated in 2019 (TRHDP, 2017; THL, 2019). It also references the draft Biodiversity Management Plans for the Project prepared in 2020 and 2021, as well as the final P-2 BMP for Main Works approved in 2023. The TOMS has been drafted in close cooperation with stakeholders including the SIG Project Office (PO), THL, HEC and CFPs.

2.1 Offset Principles

Under IFC Performance Standard 6, which applies to the Project, no activities are permitted within areas of Natural or Critical Habitat, unless a range of criteria are met (World Bank Group, 2012). The Project applies the mitigation hierarchy to avoid, minimise and mitigate adverse impacts on terrestrial habitat. This includes measures such as minimising the project footprint and area of clearance, undertaking pre-construction biodiversity surveys, flora and fauna salvage, and revegetation of temporary sites at the completion of construction. However, it is not possible to avoid or restore all impacts to terrestrial ecosystems, and some impacts will remain. Therefore, a terrestrial offset is required to ensure that no net loss of Natural Habitat and net gain in Critical Habitat is achieved.

Biodiversity offsets can only be considered after appropriate avoidance, minimization, and restoration measures have been applied. A biodiversity offset should be designed and implemented to achieve measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity. This is based on three core principles that apply to all offset designs (World Bank Group, 2016):

- **Equivalence:** Offsets should conserve the same biodiversity values (species, habitats, ecosystems, or ecological functions) as those lost to the original project, following the principle known as “like-for-like”. Alternatively, offsets can result in the conservation of higher-priority habitat, known as the principal of “trading up”.
- **Additionality:** Offsets must deliver conservation gains beyond those that would be achieved by ongoing or planned activities that are not part of the offset.
- **Permanence:** Offsets should persist for at least as long as the adverse biodiversity impacts from the project, and ideally should last in perpetuity.

2.2 Calculation of Residual Biodiversity Impacts

The estimated residual impact of the Project has been quantified using the ‘habitat hectares’ method, whereby the areal extent and condition of ecosystems to be impacted are used to account for variable quality of the areas to be impacted and the severity of the impacts (Parkes, et al., 2003; World Bank Group, 2016; Pilgrim, 2017).

In the habitat hectares method, ecosystem quality is assessed within a theoretical range from zero (such as areas destroyed by a project) to 100% habitat quality (a pristine or ‘benchmark’ ecosystem). Critical Habitat types and ecosystem condition scores within and surrounding the Tina River Project area were applied from the ESIA and previous versions of the BMP, moderated with more recent field surveys and site experience. Cliff habitats were assessed to be in undisturbed, pristine condition (100% habitat quality), given the inaccessibility of near-vertical riparian cliffs characteristic of most of this habitat type. Undisturbed primary forest was assessed as 90% habitat quality, as site investigations and consultation confirmed the presence of some human modification with temporary camps and small-scale tree harvesting. Disturbed secondary forest and remnant forest were given scores of 60% and 30% respectively, in keeping with the 2017 and 2019 ESIA. Disturbed secondary forest are areas that have been previously affected by logging but have rich plant diversity and rapid vegetation regeneration (Pilgrim, 2017). They support mid-succession secondary forest with an intact canopy that provides habitat for a range of trigger species. Remnant forest areas have undergone extensive disturbance, with few large remaining trees (Pilgrim, 2017), but they do retain some mature trees including Ngali nut (*Canarium sp.*) with a modified plant community in lower tiers due to increased light levels. The following factors were considered in the calculation of impacts on terrestrial ecosystems, and resultant change in habitat quality:

- Vegetation clearance required during construction for temporary and permanent infrastructure, accounting for the physical footprint required plus a buffer for manoeuvring of machinery.
- Permanent disturbance or 'edge effects' along roads and around permanent infrastructure.

A description of all habitat types impacted by the Project, including pre- and post-project habitat quality scores are provided in section 3.0.

2.3 Selection of Offset Activities and Sites

A range of offset options were considered and reviewed for the Project. A multicriteria analysis was applied to each offset option, according to the following criteria:

- Additionality. The offset area should be subject to potential impact, were it not protected (i.e. not an existing protected area).
- Equivalence (Like for Like). The offset should protect or restore biodiversity and habitat values that are equivalent to those impacted.
- Permanence. Potential risks to the longevity and successful management of the area should be minimised, with adequate offset mapping, management plans, equipment and training of staff.
- Land Tenure. The Project must be able to secure the land for offset purposes.
- Stakeholders. The offset option should be suitable to key decision makers, the local community and other stakeholders.
- Financial. Costs should be known and reasonable, with appropriate ongoing funding, including up-front and recurrent costs.

Options included both protection and restoration offsets as described below, although alternative methods including the funding of land management, enforcement of existing laws, and research were also considered:

- **Protection Offsets (Averted Loss or Preservation Offsets):** Offsets that protect biodiversity in an area demonstrated to be under threat of imminent or projected loss (due to factors unrelated to the current project). This offsetting assumes that the designated offset area (or species of concern) would eventually be diminished, degraded or lost if it were not explicitly protected through the conservation support provided by the biodiversity offset (Ledec, et al., 2016).
- **Restoration Offsets (Enhancement Offsets):** Defined as offsets to remediate past damage to biodiversity (due to factors unrelated to the current project) via rehabilitation or enhancement of biodiversity components, or re-creation of ecosystems and their associated biodiversity values, at suitable offset sites (World Bank Group, 2019).

The preferred options for the offset were selected based upon adherence to the above principals and likelihood of success.

2.4 Management Actions

Once the offset option(s) were confirmed, a number of actions were developed:

- Biodiversity management and monitoring requirements
- Stakeholder engagement
- Institutional responsibilities
- Timeline for implementation
- Indicative budget and funding sources.

3. CALCULATION OF RESIDUAL IMPACTS

The Project will result in direct and indirect impacts to terrestrial biodiversity. To calculate the full area of vegetation clearance, the project footprint was provided by the contractor, including all permanent and temporary facilities. The construction footprint was calculated as the full footprint plus a buffer to account for access for people, machinery and other vehicles. The types of facility and the associated buffer sizes are outlined below:

- Permanent and temporary infrastructure – 20 m buffer
- Dam structure, entry & exit to the tunnel – 200 m buffer
- Powerhouse – 100 m buffer
- Electricity Transmission Lines – 20-metre-wide corridor either side (40 metres total).

The Project will result in the clearance of **114.55 ha** of terrestrial vegetation for permanent and temporary infrastructure (Table 3-1 and Appendix A). This comprises **106.51 ha** of Critical Habitat and **8.04 ha** of Modified Habitat. Impacts to Modified Habitat do not trigger offset requirements under CFP safeguard policies.

The Project will also reduce the quality of surrounding habitat due to edge effects. These are permanent changes in site conditions caused by increased human disturbance, noise, vibration, light, wind, weed and pest invasion, and other factors. It has been determined that edge effects will reduce the habitat quality for a distance of approximately 150 metres from all permanent infrastructure including the dam and powerhouse. Edge effects will also extend 150 metres either side of Project roads, for a total width of 300 metres. This distance also includes the transmission line corridor. These edge effects equate to impacts over an additional **82.38 ha** of Critical Habitat, resulting in a decline in habitat quality, albeit not total loss (Table 3-3, Appendix A).

The estimated residual impact of the proposed vegetation clearance and edge effects has been quantified using the quality hectares method. Ecosystem quality classifications were applied, informed by the ESIA (Appendix F), Pilgrim (2017) and known habitat conditions. Current (pre-development) terrestrial habitat quality scores ranged from 5% for highly modified garden habitat through to 100% for inaccessible cliff habitat:

- Cliff Habitats – 100% quality (natural/undisturbed/pristine condition)
- Undisturbed Primary Forest – 90% quality (near-pristine condition, with some invasive species present including feral pigs (personal observation and eDNA results 2022)
- Disturbed Secondary Forest – 60% quality (disturbed forest of moderate ecological value)
- Remnant Forest – 30% (quality areas affected by previous logging but that still show rich plant diversity and rapid vegetation regeneration)
- Fallow Habitat – 30% quality (areas that were formerly used for agriculture but have since been left undisturbed)
- Garden Habitat – 5% quality (highly modified garden habitat)

Scores declined to 0% of original condition for cleared areas, through to 80% of original condition for areas subject to edge effects (Table 3-2 and Table 3-3).

In total, the Project results in direct and indirect impacts to **188.89 ha** of terrestrial Critical Habitat. This habitat hectare calculations equate to the loss of:

- **70.82 QHa** lost due to vegetation clearance.
- **11.21 QHa** due to permanent edge effects.

In total the Project results in the loss of **82.03 quality hectares** (QHa) of terrestrial Critical Habitat. The Project is therefore required to achieve get gain for impacts to **82.03 QHa**.

Table 3-1: Habitat types and areas of vegetation clearance within the Project area

Habitat Type		Class[3]	Total within EAAA (ha)[4]	Total in Core Land (ha)[5]	Total in Lot 1 (ha)	Total Vege Clearance (ha)
Undisturbed Primary Forest		CH	22421.6	187.87	0	40.70
Disturbed Secondary Forest		CH	127.11	123.47	3.8	37.20
Remnant Forest		CH	44.92	44.92	0	23.92
Cliff Habitat		CH	21.79	21.79	0	4.69
Fallow Habitat		MH	8.07	8.07	0	3.37
Garden		MH	2.27	2.27	0.22	0.99
River[6]		Various	538.06	31.07	0	N/A
Agriculture and Cropping		MH	5355.18	0	13.22	0
Development and Habitations		MH	3570.56	0	10.5	0
Grassland		MH	548.66	0	8.75	3.68
Modified Lowland Forest		MH	842.35	0	32.16	0
Saline Swamp Forest		NH	135.68	0	0	0
TOTAL:			**33616.24**	**419.46**	**68.65**	**114.55**

[3] CH = Critical Habitat MH = Modified Habitat

[4] EAAA = Ecologically Appropriate Area of Analysis. The EAAA for terrestrial biodiversity values was delineated by watersheds using a digital elevation model.

[5] Core Land + 175m reservoir extent

[6] Addressed in Aquatic Offset Management Plan (AOMS). Not included in Terrestrial calculations.

Table 3-2: Quality hectares lost due to vegetation clearance affecting Critical Habitat[7]

Habitat Type		Class	CH Vegetation Clearance (ha)	Habitat Quality Current (%)	Habitat Quality Post-Project (%)	Loss in Habitat Quality (∆%)	Total Loss in QHa (ha x ∆%)
Undisturbed Primary Forest		CH	40.70	90	0	90	36.63
Disturbed Secondary Forest		CH	37.20	60	0	60	22.32
Remnant Forest		CH	23.92	30	0	30	7.18
Cliff Habitat		CH	4.69	100	0	100	4.69
TOTAL:			**106.51 ha**				**70.82 QHa**

Table 3-3: Quality hectares lost due to edge effects affecting Critical Habitat[7]

Habitat Type		Class	Area of edge effects excl. cleared land (ha)	Habitat Quality Current (%)	Habitat Quality Post-Project (%)[8]	Loss in Habitat Quality (∆%)	Total Loss in QHa (ha x ∆%)
Undisturbed Primary Forest		CH	31.61	90	72	18	5.69
Disturbed Secondary Forest		CH	37.66	60	48	12	4.52
Remnant Forest		CH	11.59	30	24	6	0.70
Cliff Habitat		CH	1.53	100	80	20	0.31
TOTAL:			**82.38 ha**				**11.21 QH**

[7] Modified habitat does not require to be offset.

[8] Assumes 80% of original habitat quality post-project.

4. SELECTION OF OFFSET ACTIVITIES

4.1 Options Analysis

As part of the development of the TOMS, a series of options for offsetting the impacts of the Project were considered, along with other activities that can directly or indirectly benefit biodiversity, known as additional conservation actions. These options and activities were developed based on current knowledge of the Project and Solomon Island context, including Project impacts, offset requirements and likely acceptability to SIG, customary landowners, and local communities.

The following offset options were considered:

- Offsetting within Core Land
- Protection of the Tina River lower catchment
- Protection of the Tina River upper catchment
- Protection of the Guadalcanal Key Biodiversity Area
- Protection of an adjacent river catchment e.g. Toni River, Sutakama River
- Protection of Barana Community Park
- Protection of Nini Trust Land.

The following additional conservation actions were considered:

- Enforcement of existing laws
- Purchase and revegetation of an area of degraded habitat
- Funding for research.

The long list was assessed against the core principles of biodiversity offsets: equivalence, additionality and permanence, with additional criteria added related to land ownership, stakeholder support and consideration of relative costs, as per the World Bank guidance (World Bank Group, 2016). A summary of this assessment is presented in Annex II.

The result was the selection of a combination of two offset options for the Project. These are:

- Establishment of a Core Land Conservation Area
- Protection of the upper Tina River catchment

The combination of these two options is consistent with the intentions of the ESIA 2017 and 2019.

4.2 Core Land Conservation Area

The proposed offset will protect remaining habitat and establish a conservation area within Core Land (Figure 4-1). This option has significant benefits:

- The land has been purchased by SIG and is secure for the duration of the PPA, whereby it will be leased to THL.
- The location is within and adjacent to the Project, achieving equivalence and allowing for ease of management.
- The area retains and protects all habitat types impacted by the Project.
- The area has a mix of habitat types, allowing for a combination of approaches to be used to achieve habitat quality improvements.
- Almost all of the site is below 400 m asl and is easily accessible by road. In the absence of conservation management the area would likely be logged in the near future.

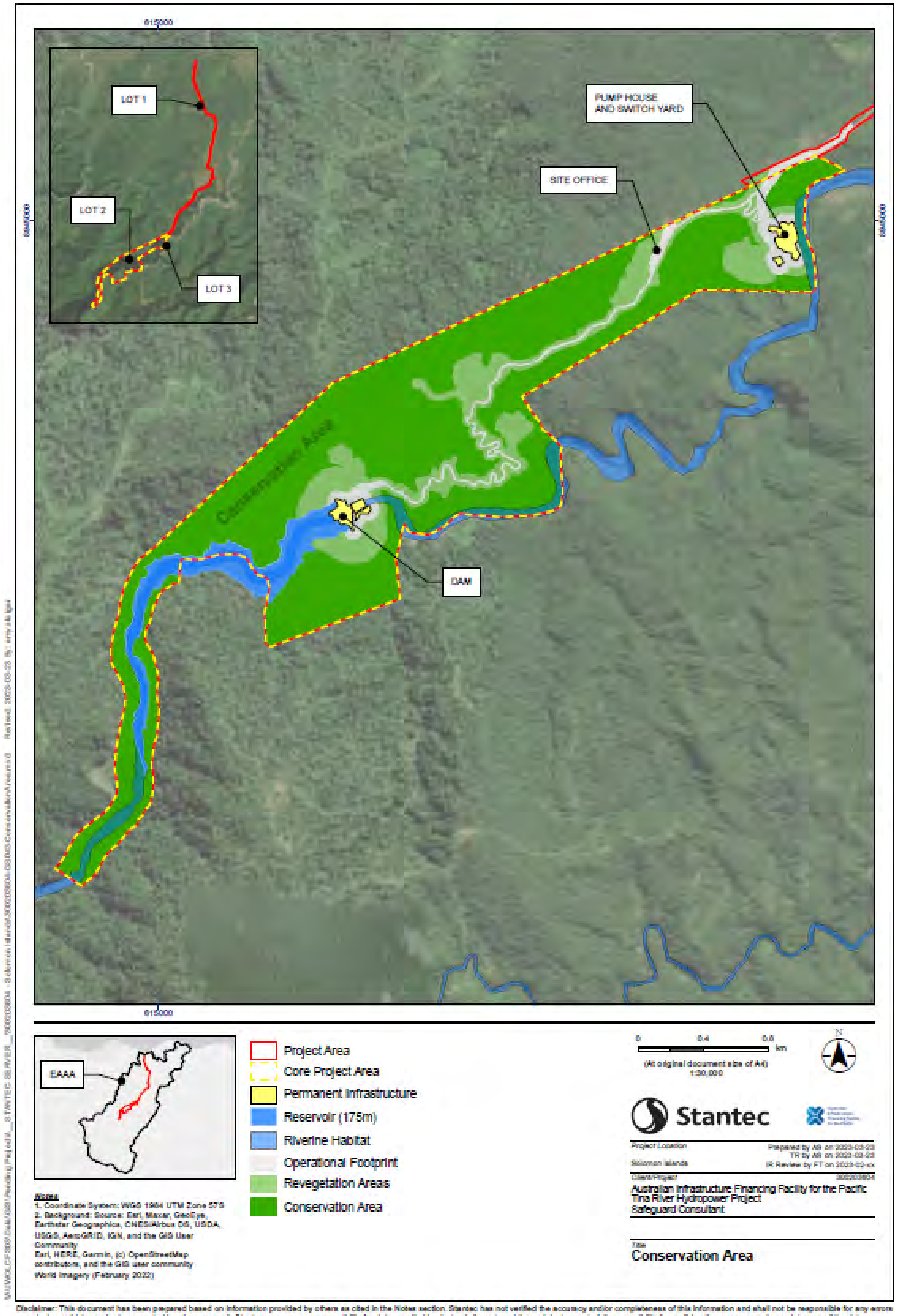

Figure 4-1: Proposed Core Land Conservation Area showing management zones

Ecosystem benefits and net gain can be achieved via a combination of averted loss offsets: through protection from logging, revegetation and restoration of cleared areas; and ecosystem restoration of remaining habitats.

4.2.1 Averted Loss Through Protection from Logging

Averted loss offsets account for the expected offset gains (in QHa) achieved by protecting habitats from forestry activities. This method applies the known deforestation rate in a location to determine the offset gain per year and applies this for the duration of a project.

For averted loss offsets, Pilgrim (2017) recommends the following equation is used to determine the offset gain per year: Deforestation rate averted x ecosystem condition quality x offset area. This equation was adapted using the following inputs:

<u>Quality hectares available</u>

The area of unimpacted land within each habitat type (i.e. land that will not be impacted by either permanent or temporary infrastructure, or is within the zone of edge effects) x ecological value of that habitat type

<u>Deforestation rate</u>

A deforestation rate of 0.45% annual loss of tree cover was applied, based on a loss of 9% of tree cover in Guadalcanal over 20 years (Global Forest Watch, 2022).

<u>Annual offset gain</u>

Quality hectares available x deforestation rate

<u>Total offset gain over the life of the Project</u>

Annual offset gain x 30 years (the length of the PPA)

The only habitats that this calculation was applied to were vegetation types with remaining tall trees: undisturbed primary forest, disturbed secondary forest, and remnant forest. Cliff habitat was assumed to have little to no trees and be inaccessible for forestry. Modified fallow and garden habitats within Core Land similarly do not contain tall trees that could potentially be harvested.

Averted loss achieves **20.27 QHa** over the duration of the 30-year PPA (Table 4-2). This requires effective access control to prevent logging and other habitat clearance throughout this time.

4.2.2 Revegetation of Cleared Areas

Areas within Core Land that will be cleared of vegetation for the construction of temporary infrastructure will be actively revegetated in accordance with the Post-construction Rehabilitation and Revegetation Plan (CESMP C-4). Sites shall be recontoured, spread with topsoil, and then planted with cover crops such as pueraria (*Neustanthus phaseoloides*), velvet bean (*Mucuna pruriens*), and vetiver grass (*Chrysopogon zizanioides*). Once stabilised, sites will be inter-planted with native shrub and tree species.

A total of **66.29 ha** of Core Land will be revegetated following the removal of temporary infrastructure. This figure assumes that all temporary sites will be rehabilitated, although maintains a realistic setback of 50 metres around the dam and powerhouse, 20 metres either side of the transmission lines, and allows for a site office. This calculation also maintains a 15-

metre-wide corridor along roads and excludes replanting at spoil disposal site #0 (which is surrounded by grassland are unlikely to become mature forest).

Assuming that the ecological value of this habitat after 30 years will amount to 70%, the total offset gain achieved is **46.40 QHa** (Table 4-1).

Table 4-1: Quality hectares gained through revegetation of cleared areas

Area to be revegetated (ha)	Habitat Quality after 30 yrs (%)	Gain in QHa
66.29	70	**46.40 QHa**

4.2.3 Natural Regeneration

Protection of habitats within Core Land will not only prevent their potential loss through forestry activities but will also allow remaining habitats to naturally regenerate and improve in habitat quality over time. Over the 30-year period of the PPA, the structure and species composition of all terrestrial habitats are expected to mature and improve over time as a result of the permanent protection afforded by the Project.

The largest gain in ecological value can be expected to occur in Modified habitats such as fallow and garden habitat that are currently the most degraded. It is assumed that these areas of Modified habitat will achieve 80% habitat quality over the 30-year PPA, slightly higher than areas to be revegetated, acknowledging that these sites already have a dense cover of vegetation with native seed sources nearby. Undisturbed primary forest will achieve a small improvement in habitat quality from 90% to 95%, primarily through maturation and reduction in disturbance by humans. No change will occur within cliff habitat which is already at 100% habitat quality.

Natural regeneration achieves **21.82 QHa** over the duration of the 30-year PPA (Table 4-3).

4.2.4 Total Net Gain/Loss

Table 4-4 presents the overall summary in quality hectares achieved through the establishment of the Core Land Conservation Area. The Project results in an overall loss in **70.82 QHa** of Critical Habitat terrestrial habitats due to habitat clearance and edge effects. Through a combination of averted loss oversets, active revegetation of cleared areas, and natural regeneration of remaining habitats, a total of **88.49 QHa** can be achieved. This is **125%** of the minimum offset required and represents a small net gain in biodiversity as a result of the project.

All impacted habitat types are represented within the Core Land Conservation Area, however not all habitat types achieve a net gain. Disturbed secondary forest which gets a significant boost in area as a result of the revegetation to occur as a result of the project. Cliff habitat achieves no gains as habitat quality is already at 100% (given that the cliff habitats next to the river are very steep and inaccessible to humans). All other habitat types achieve some gains but not sufficient to offset the loss from the Project.

It is acknowledged that implementing biodiversity offsets can be challenging and require a significant commitment of time and resources. In the presence of such uncertainty, achieving more than the minimum offset required and/or taking an alternative approach can be beneficial.

Table 4-2: Calculation of offset gains through protection of Core Land habitats from forestry (averted loss) – habitats with trees

Habitat Type		Class	Unimpacted habitat within Core Land (ha)[9]	Habitat Quality Current (%)	Deforestation rate[10]	Annual offset gain (ha x deforestation)	Total offset gain (annual gain x 30 yr PPA) (ha)	Gain in QHa
Undisturbed Primary Forest		CH	131.39	90	0.45%	0.59	17.73	15.96
Disturbed Secondary Forest		CH	48.40	60	0.45%	0.21	6.53	3.92
Remnant Forest		CH	9.41	30	0.45%	0.04	1.27	0.38
Cliff Habitat		CH	15.57	100	N/A	N/A	N/A	N/A
TOTAL:			**204.77 ha**			**0.85 ha**	**25.54 ha**	**20.27 QHa**

Table 4-3: Calculation of offset gains through natural regeneration – all habitat types

Habitat Type		Class	Unimpacted habitat within Core Land (ha)	Habitat Quality Current (%)	Quality after natural regeneration (%)	Δ Habitat Quality (%)	Gain in QHa
Undisturbed Primary Forest		CH	131.39	90	95	5	6.57
Disturbed Secondary Forest		CH	48.40	60	80	20	9.68
Remnant Forest		CH	9.41	30	80	50	4.71
Cliff Habitat		CH	15.57	100	100	0	0.00
Fallow Habitat		MH	0.70	30	80	50	0.35
Garden		MH	0.69	5	80	75	0.52
TOTAL:			**206.16 ha**				**21.82 QHa**

[9] Habitat outside areas affected by permanent or temporary infrastructure, or the zone affected by edge effects.

[10] Deforestation rate = 0.45% annual loss of tree cover, based on a loss of 9% of tree cover in Guadalcanal over 20 years (Global Forest Watch, 2022). Cliff habitat excluded as unsuitable for forestry.

Table 4-4: Overall summary of offset gains through establishment of the Core Land Conservation Area

Habitat Type	Class	CH loss due to clearance & edge effects (QHa)	Gain through averted loss (QHa)	Gain through revegetation (QHa)	Gain through natural regen. (QHa)	Total Gain (QHa)	Offset Achieved within Core Land?
Undisturbed Primary Forest	CH	**42.32**	15.96	-	6.57	**22.53**	**No**
Disturbed Secondary Forest	CH	**26.84**	3.92	46.40	9.68	**60.00**	**YES**
Remnant Forest	CH	**7.88**	0.38	-	4.71	**5.09**	**No**
Cliff Habitat	CH	**5.00**	-	-	-	**-**	**No**
Fallow Habitat	MH	**-**	-	-	0.35	**0.35**	N/A
Garden	MH	**-**	-	-	0.52	**0.52**	N/A
TOTAL:		**70.82 QHa**	**20.27 QHa**		**21.82 QHa**	**88.49 QHa**	**YES**

4.3 Tina River Upper Catchment

Parts of the Tina River upper catchment are proposed for protection to address impacts to aquatic biodiversity (refer to detail provided in the AOMS). The area proposed for protection under the AOMS totals up to **12,175 ha**, including **618.44 ha** below 400 metres elevation and **11,451.90 ha** above 400 metres elevation. MMERE will be the lead agency responsible for oversight of the area, as they have a national role in biodiversity conservation and development planning.

The detail in the AOMS will not be repeated here, however there is more than sufficient quality hectares available in the upper catchment to address Project needs. The upper catchment represents over 10 times the minimum area required to offset the impacts under the AMOS, and over 6.7 times the quality hectares available to address both terrestrial and aquatic habitat combined (Table 4-5). If the Core Land and upper catchment below 400 m asl is combined, this equates to twice (200%) the quality hectares required in the TOMS. The catchment above 400 m asl alone still equates to 9.7 times the quality hectares required under the AOMS.

While Core Land provides sufficient quality hectares to offset terrestrial impacts overall, not all habitat types can be entirely offset within this area (refer Table 4-4). The Tina River upper catchment provides the opportunity to protect additional areas of Undisturbed Primary Forest and riparian Cliff Habitat which fall outside of Core Land.

Table 4-5: Quality hectares required and available within Core Land and Upper Catchment

	TOMS	AOMS	TOTAL
Offset Required (QHa)	82.03	159.49	241.52
Offset Available (QHa)			
- Core Land	88.49	-	88.49
- Upper Catchment <400 m asl	-	75.10	75.10
- Upper Catchment >400 m asl	-	1,546.01	1,546.01
TOTAL OFFSET AVAILABLE	**88.49 available**	**1,621.11 available**	**1,709.60 available**
TOTAL GAIN/LOSS:	**6.46 QHa surplus**	**1,461.62 QHa surplus**	**1,468.08 QHa surplus**

5. OFFSET IMPLEMENTATION & MANAGEMENT

5.1 Creation of Core Land Conservation Area

The creation of the Core Land Conservation Area will protect a total of **360.58 ha** (Figure 4-1), comprising the following components:

- **66.29 ha** of revegetation area where active management is required.
- **277.11 ha** of conservation area where remaining habitat will be protected.
- **17.19 ha** of riverine habitat will remain, albeit impacted by the Project.

There will also be **30.88 ha** of reservoir and **23.66 ha** of roads and hydropower infrastructure that will sit outside of the Conservation Area.

The key actions associated with the Core Land Conservation Area are as follows:

1. **Stakeholder Consultation:** The PO have developed a Consultation and Engagement Strategy to guide and coordinate consultation activities required under the BMP, AOMS and TOMS.
   Consultation has been undertaken over a number of years and activities to seek feedback on the latest draft BMP, AOMS and TOMS was completed by PO, THL and HEC in April 2023. Ongoing engagement with workers and the community will be undertaken during construction and operation to ensure effective implementation.
2. **Site Access and Security:** THL and HEC will ensure strict access controls into Core Land during construction and operation. This will help to prevent unauthorized access into Core Land and prevent illegal hunting and vegetation clearance.
   Restrictions on any use or access of Core Land shall be clearly defined for customary landowners to avoid any potential conflicts. Any restrictions in access will be included in the Management Plan (refer below) and communicated via the ongoing consultation and engagement processes.
3. **Monitoring:** THL and HEC will implement monitoring requirements within Core Land as detailed in the P-2 Biodiversity Management Plan, related Construction and Environmental Management Plans, plus any additional requirements developed as part of the Management Plan (refer below).
4. **Management Plan:** A Core Land Conservation Area Management Plan will be prepared by THL/HEC or a nominated sub-consultant.
   This shall detail the aims and objectives for the Core Land Conservation Area for the duration of the PPA, and establish in more detail a 5 year plan and first annual budget.
   It will also detail the resourcing needs, monitoring requirements and Key Performance Indicators required to achieve the offset requirements within Core Land.
   This document will be developed by THL/HEC (or sub-consultant) and approved by PO, OE and CFPs by December 2023.
5. **Resourcing:** THL and HEC will ensure adequate funding and resourcing for implementation of the terrestrial offset.

5.2 Protection of the Tina River Upper Catchment

Details of management actions for the upper catchment are detailed in the AOMS.

5.3 Stakeholder Engagement

There has been formal and informal engagement undertaken throughout the development of the BMP (including earlier versions), AMOS and TOMS (refer the BMP for more details). The number of interested parties poses complications for engagement activities.

As part of the development and implementation of the BMP and associated offset strategies, the Project Office has prepared a BMP Consultation and Engagement Strategy. The purpose of this document was to scope and commence the consultation needed to facilitate the development and implementation of the BMP, AMOS and TOMS, acknowledging that this will be an ongoing process during construction and operation of the Project. A copy of the Strategy, including the outcome of consultation undertaken in April 2023, is provided in Annex P-2-5 appended to the main BMP.

The BMP Consultation and Engagement Strategy complements the Project-wide Stakeholder Engagement and Communications Plan (P-3) Grievance Redress Mechanism (P-6) and related environmental and social management plans.

5.4 Roles and Responsibilities

The TOMS responds to impacts caused by the Project contained within Core Land. As most offset requirements fall within Core Land, responsibility for the TOMS is led by the Project Company (THL).

The key roles and responsibilities for implementation of the TOMS are illustrated in Figure 5-1. The contractor (HEC) will lead implementation during the construction phase, including the completion of all revegetation. THL will assume direct responsibility during the operation phase. During both construction and operation, site security will have a key role to play in restricting unauthorised access to Core Land and the upper catchment.

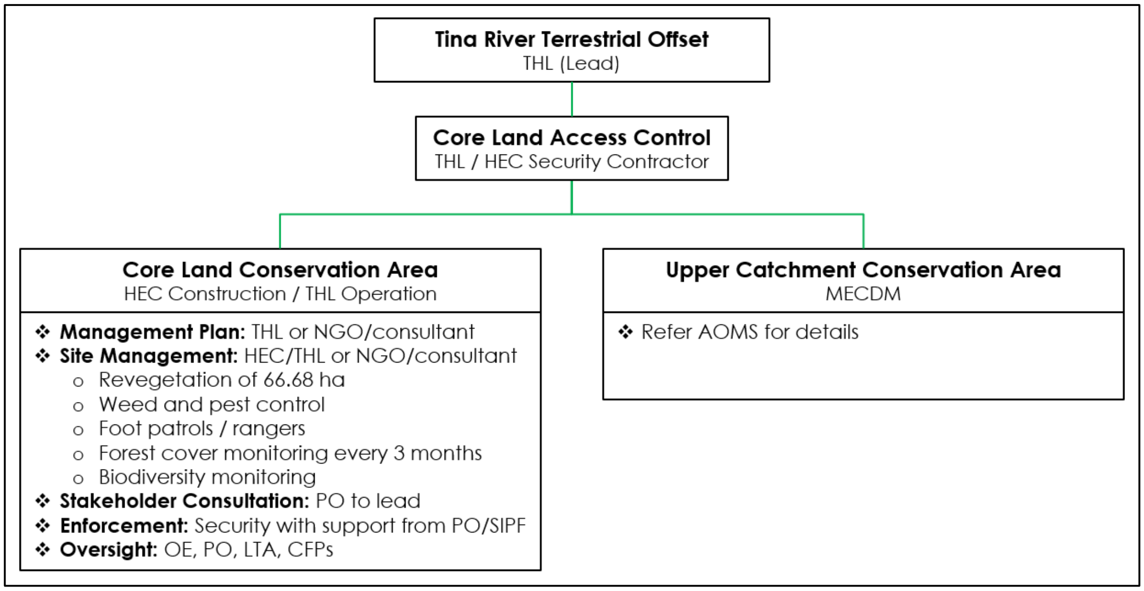

Figure 5-1: TOMS roles and responsibilities

5.5 Indicative Budget

Table 5-1 presents an indicative budget for implementation of the TOMS.

Funding will need to be committed to ensure the long-term management of the Core Land Conservation Area. It is anticipated that the funding for TOMS implementation during the construction phase will come from project finance. Funding for TOMS implementation during the operational phase will come from the tariff.

The following activities are to be financed by Technical Assistance grants or other related sources at little to no cost to THL:

- TOMS development and finalisation (funded by the Australian Infrastructure Financing Facility for the Pacific (AIFFP))
- AOMS development and finalisation (funded by AIFFP)
- BMP Communications and Engagement Strategy (funded by Asian Development Bank (ADB) Technical Assistance)
- Upper Catchment Conservation Area (likely funded via Technical Assistance and administered by SIG)

5.6 Timeline

The TOMS is required to be in place and approved prior to the commencement of main works.

An indicative timeline of activities is included in Figure 5-2.

Table 5-1: Indicative budget and timeframe for implementation

Item	Task	Budget Estimate (USD)	Timing	Notes
TOMS	CFP clearance	N/A	June 2023	Final TOMS expected to be cleared June 2023
Core Land Conservation Area	BMP Consultation and Engagement Strategy	$100,000 one off*	May 2023	Preparation of BMP Consultation and Engagement Strategy completed May 2023.
	Ongoing engagement activities	$20,000 per year	Ongoing	Estimated cost of BMP/AMOS/TOMS training and other consultation for workers and community.
	Management Plan:			Plan establishing governance arrangements; monitoring and management activities; resource requirements; updated budget.
	Draft plan with 1st annual budget	$80,000 one off	Q3 2023 (draft)	
	Final approved plan	As above	Q4 2023	Annual reports with budgets to be prepared.
	Annual report with task plan and budget for following year	$20,000 per year	Q4 annually ongoing	Management Plan to be reviewed every 5 years
	Staff:			
	Conservation Manager (new)	$75,000 per year	Main works	Core Land Conservation Area implementation.
	1 x Governance lead (existing)	$20,000 per year		1 x existing position (salary) as GRM Lead
	2 x CLOs (existing)	$40,000 per year		2 x existing positions (salary) for consultation and engagement and grievance investigation
	2 x Biodiversity officers (existing)	$40,000 per year		2 x existing positions (salary) for biodiversity monitoring, site maintenance and patrols
	6 x locals for maintenance, weed and pest control, patrols	$50,000 per year		6 x new part-time roles potentially funded via CBSP tariff to form 2 x 4 person teams with BOs.
	Biodiversity consultant	$75,000 per year		NGO or consultant for external oversight/advice
	Equipment:			
	1 x site office (existing)	$100,000 per year estimated	Main works	Equipment for implementation of Core Land Conservation Area monitoring and maintenance activities.
	1 x vehicle			
	Personal protective equipment			
	Biodiversity monitoring equipment			
	Weed and pest control tools, chemicals etc.			
	Revegetation:			
	Propagation of 700,000 plants	$50,000 per year 5 yrs	Construction phase	10,000 cover crop plants per hectare plus 500 native trees and shrubs per hectare (refer C-4).
	66.29 ha of replanting	$50,000 per year 5 yrs	Construction phase	
	Aftercare and maintenance	$40,000 per year	Ongoing	Ministry of Forestry budgets SID$5,000 per hectare for replanting on accessible fertile sites.
Upper Catchment Conservation Area	-	-	-	Refer detail in AOMS

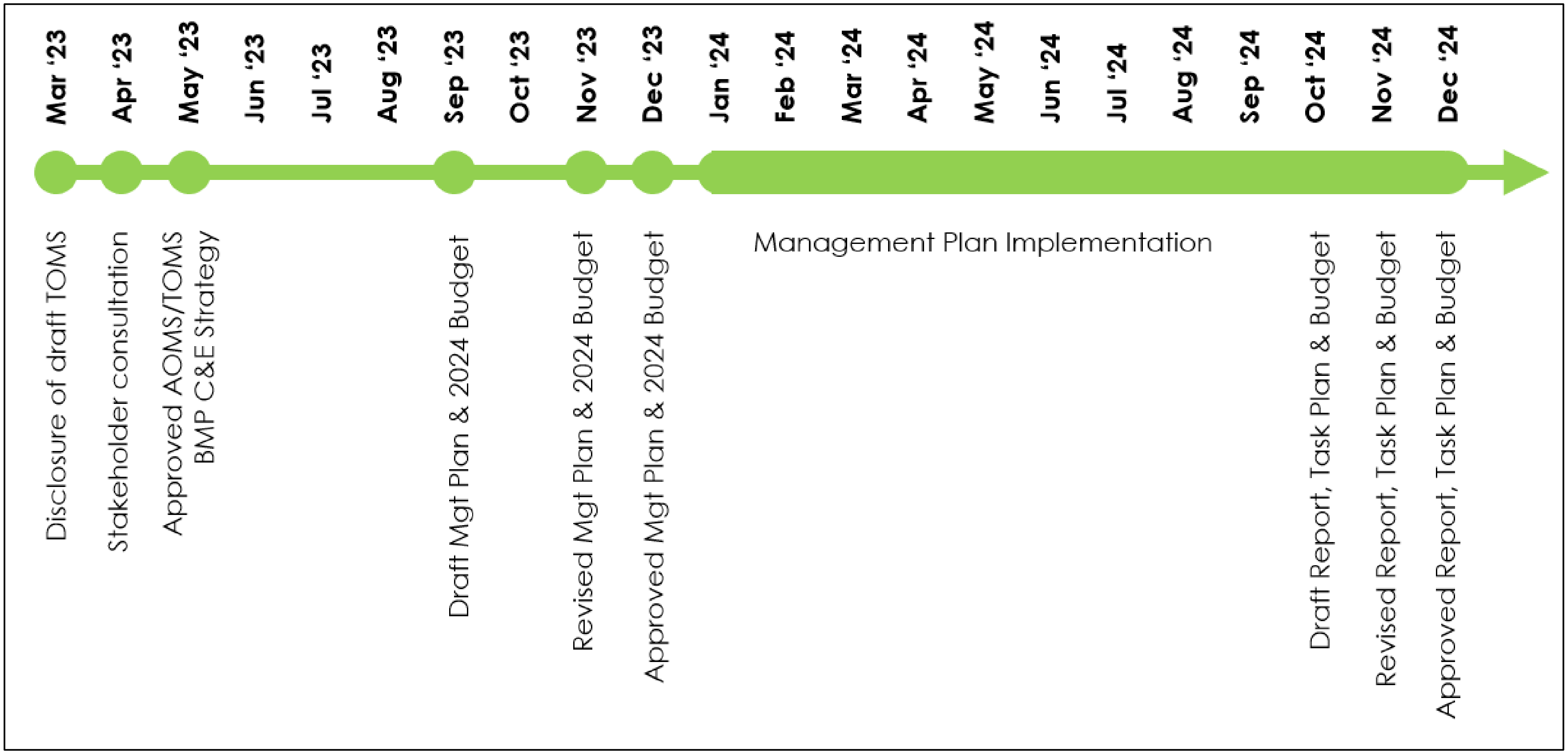

Figure 5-2: Indicative timeline

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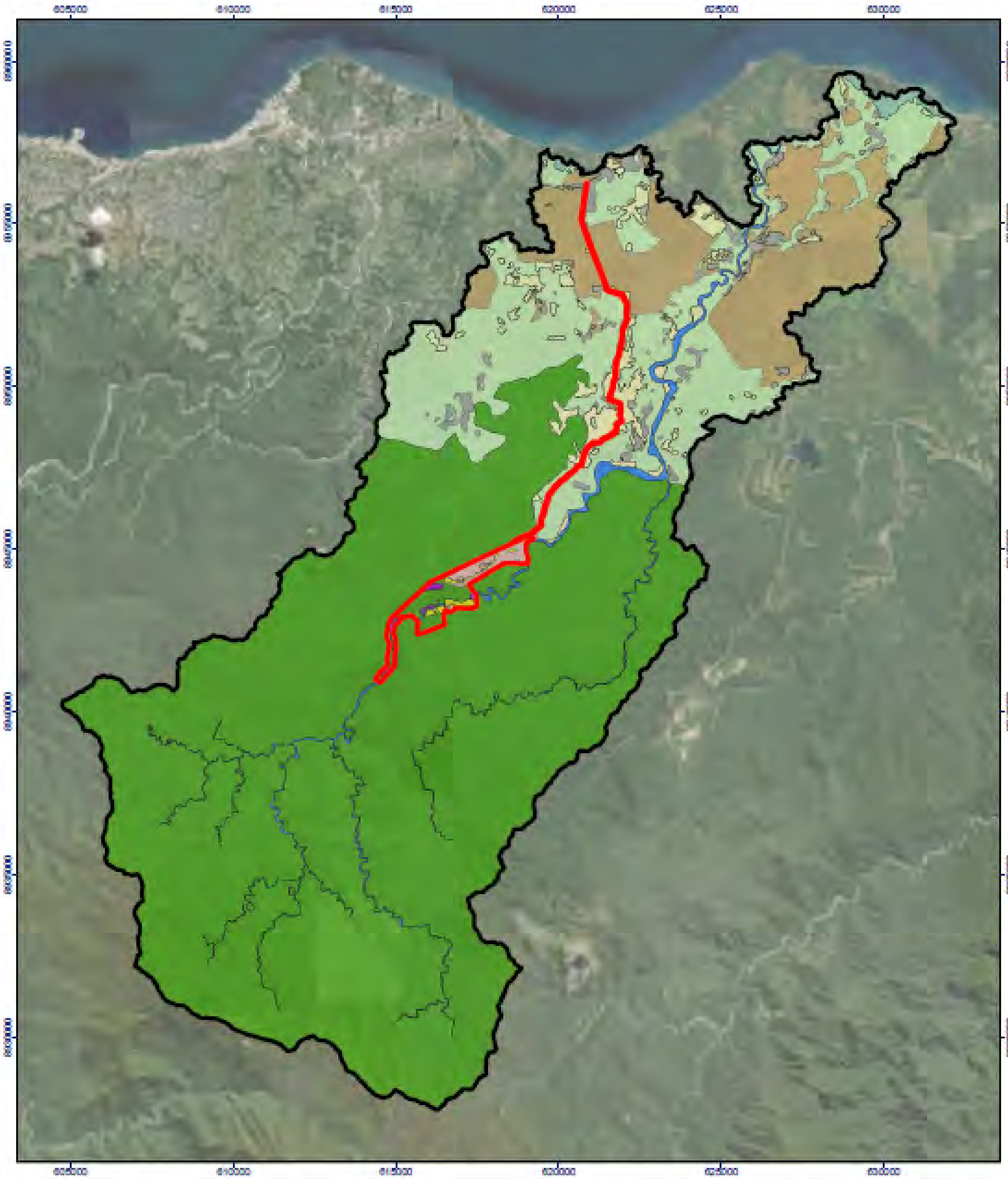
ANNEX I: MAPS



Project Area
Terrestrial EAAA

Terrestrial Habitat Units

- Undisturbed Primary Forest Habitat
- Disturbed Secondary Forest Habitat
- Remnant Forest
- Riverine Habitat
- Cliff Habitat
- Fallow Habitat
- Garden Habitat
- Modified Lowland Forest Habitat
- Agricultural Cropping Habitat
- Grassland Habitat
- Development and Habitations
- Saline Swamp Forest Habitat

0 2 4 km
(At original document size of A4)
1:175,000

Notes
1. Coordinate System: WGS 1984 UTM Zone 57S
2. Background: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

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Project Location: Solomon Islands
Prepared by AS on 2023-03-10
TR by AS on 2023-03-10
IR Review by FT on 2023-11-xx

Client/Project: 300203604
Australian Infrastructure Financing Facility for the Pacific
Tina River Hydropower Project
Safeguard Consultant

Title
Terrestrial Habitat Units

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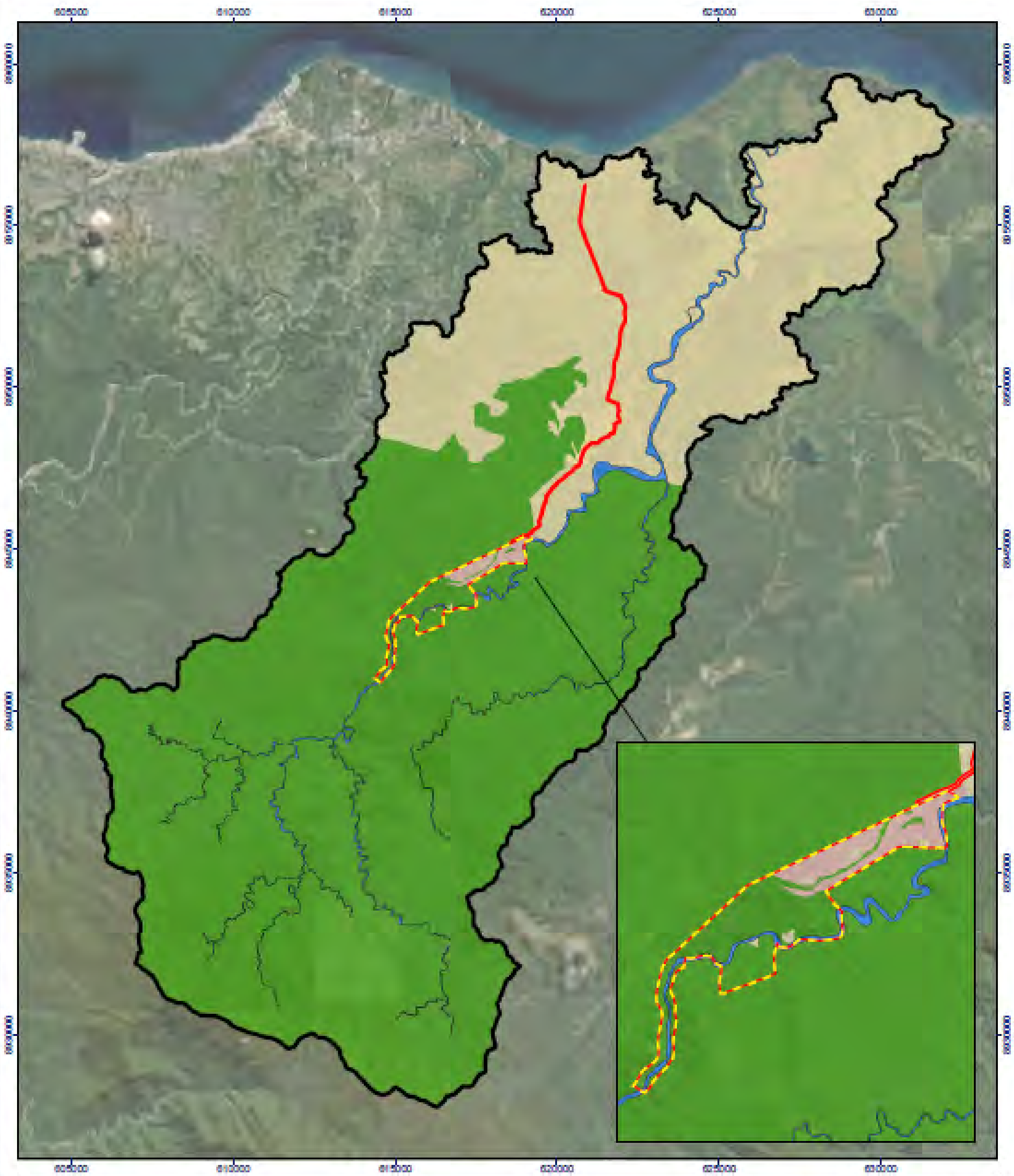

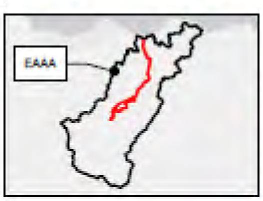

Project Area
Core Land
Terrestrial EAAA
Riverine Habitat

Critical Terrestrial Habitat

Critical/Modified
Critical/Natural
Modified

Notes
1. Coordinate System: WGS 1984 UTM Zone 57S
2. Background: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

0 2 4 km
(At original document size of A4)
1:175,000

N

Stantec

Project Location
Solomon Islands

Client/Project
Australian Infrastructure Financing Facility for the Pacific
Tina River Hydropower Project
Safeguard Consultant

Title
CHA Classification

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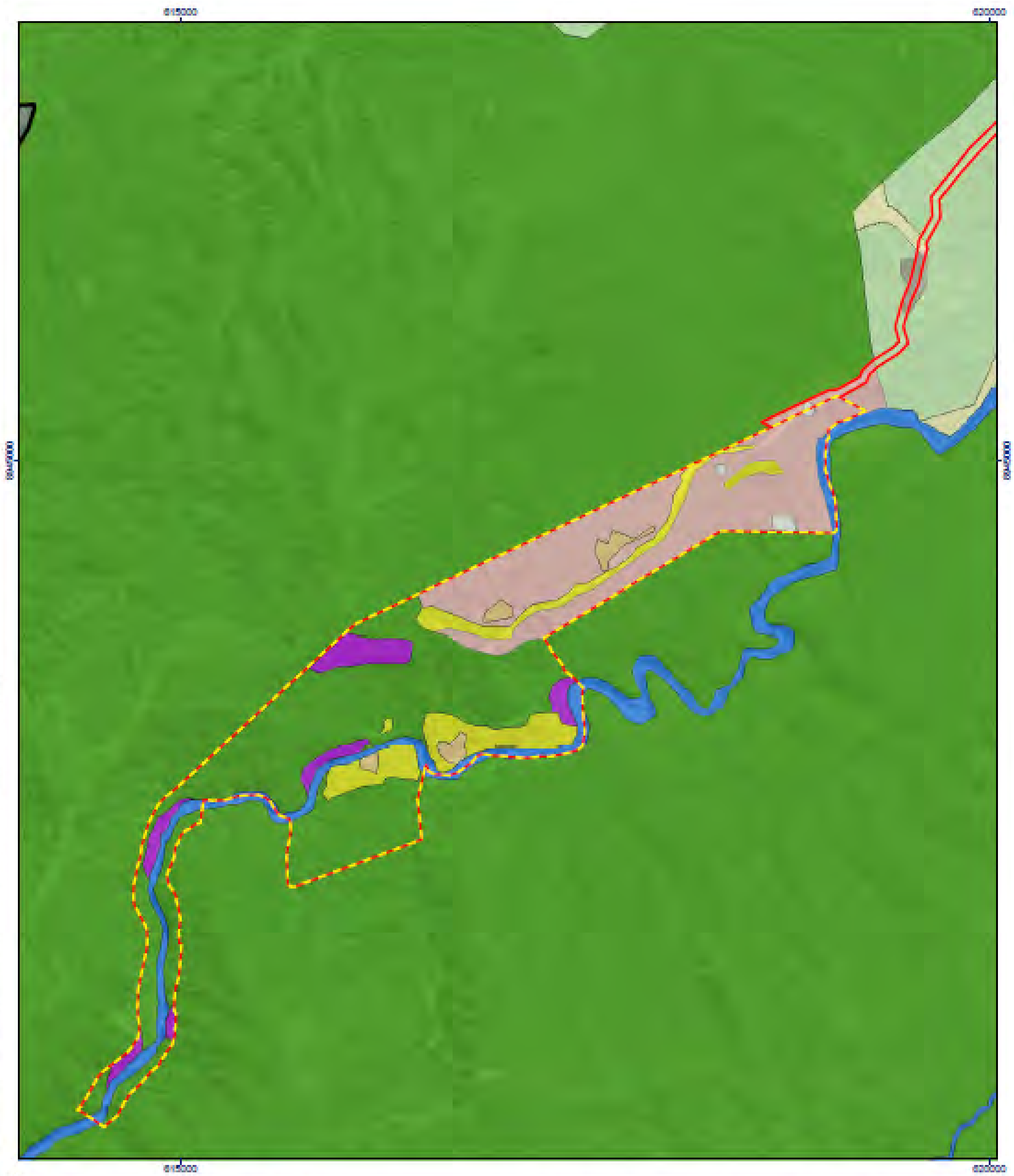

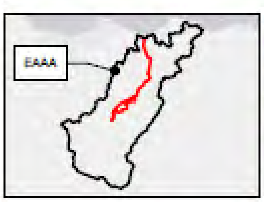

Project Area
Core Land
Terrestrial EAAA

Terrestrial Habitat Units

Undisturbed Primary Forest Habitat
Disturbed Secondary Forest Habitat
Remnant Forest
Riverine Habitat
Cliff Habitat
Fallow Habitat
Garden Habitat
Modified Lowland Forest Habitat
Grassland Habitat
Development and Habitations

0 0.45 0.9 km
(At original document size of A4)
1:35,000

N

Notes
1. Coordinate System: WGS 1984 UTM Zone 57S
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Project Location: Solomon Islands
Prepared by AS on 2023-03-10
TR by AS on 2023-03-10
IR Review by FT on 2023-11-xx

Client/Project: 300203604
Australian Infrastructure Financing Facility for the Pacific
Tina River Hydropower Project
Safeguard Consultant

Title
Terrestrial Habitat Units

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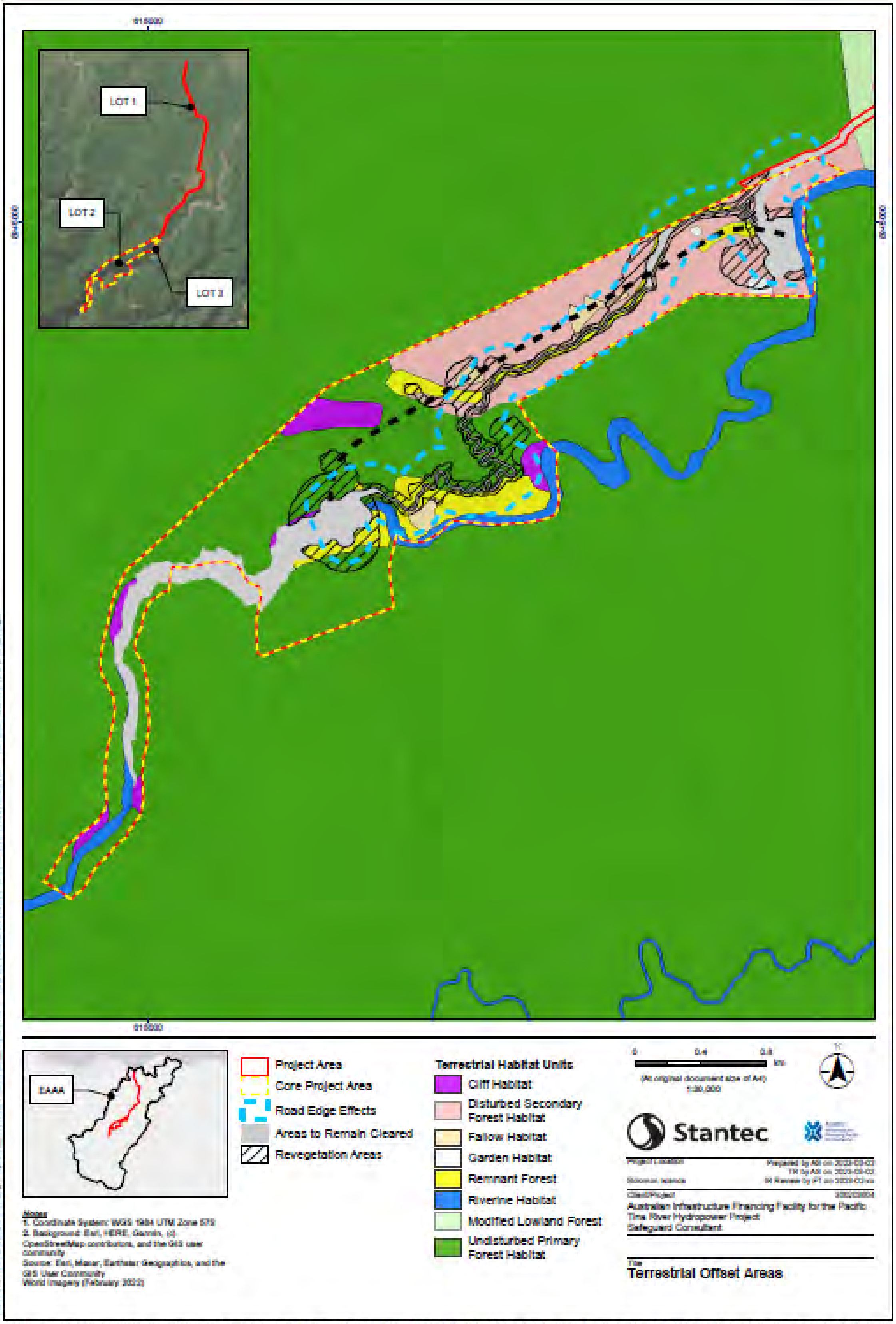

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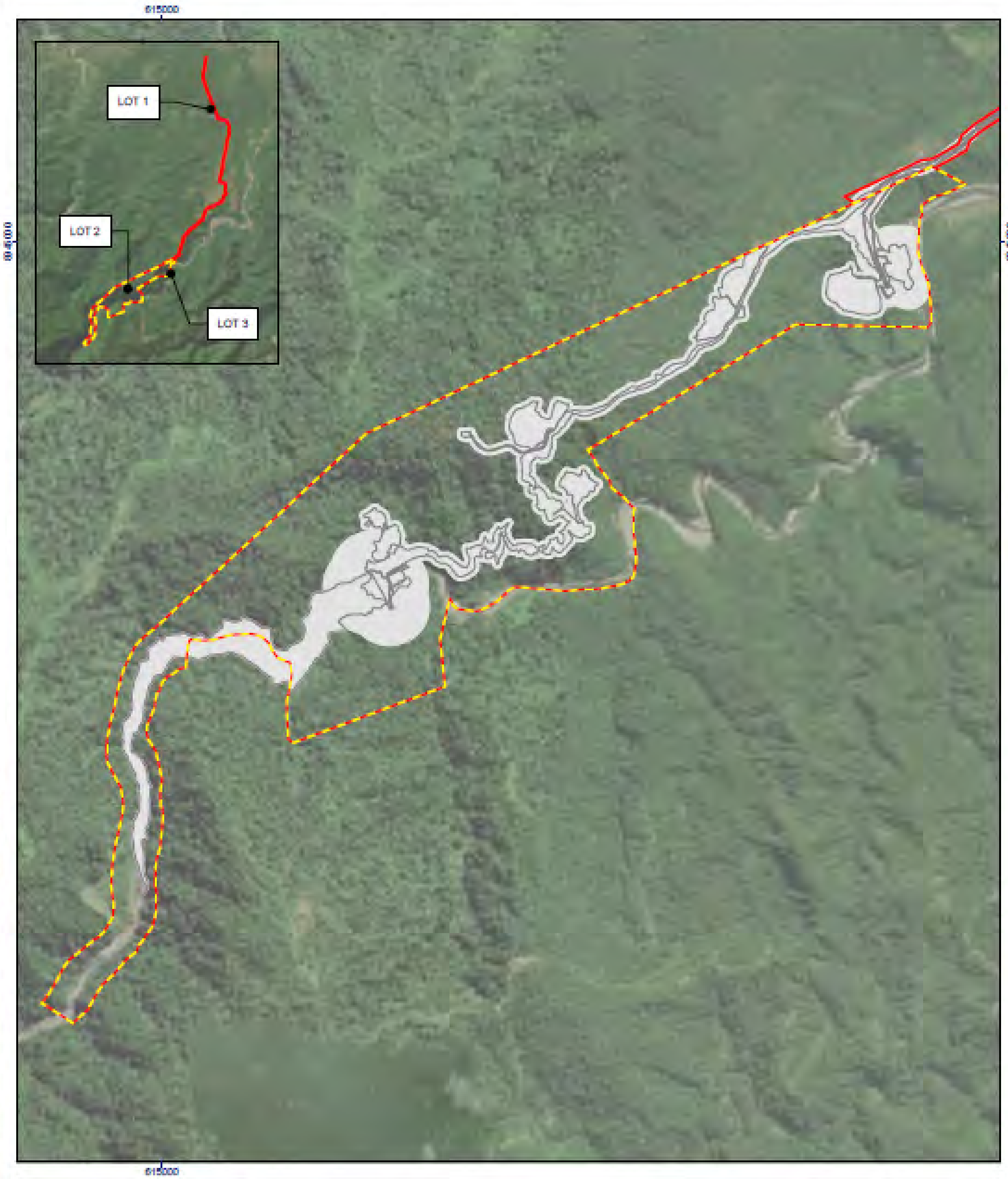

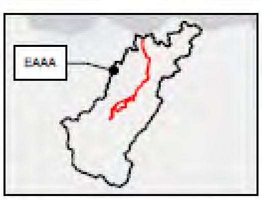

- Project Area
- Core Project Area
- Site Features
- Areas to be Cleared

0 0.4 0.8 km

(At original document size of A4)
1:30,000

N

Notes
1. Coordinate System: WGS 1984 UTM Zone 57S
2. Background: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
World Imagery (February 2022)

Stantec

Project Location Solomon Islands	Prepared by AS on 2023-02-28 TR by AS on 2023-02-28 IR Review by FT on 2023-02-xx
Client/Project	300203604

Australian Infrastructure Financing Facility for the Pacific
Tina River Hydropower Project
Safeguard Consultant

Title
Clearance Areas

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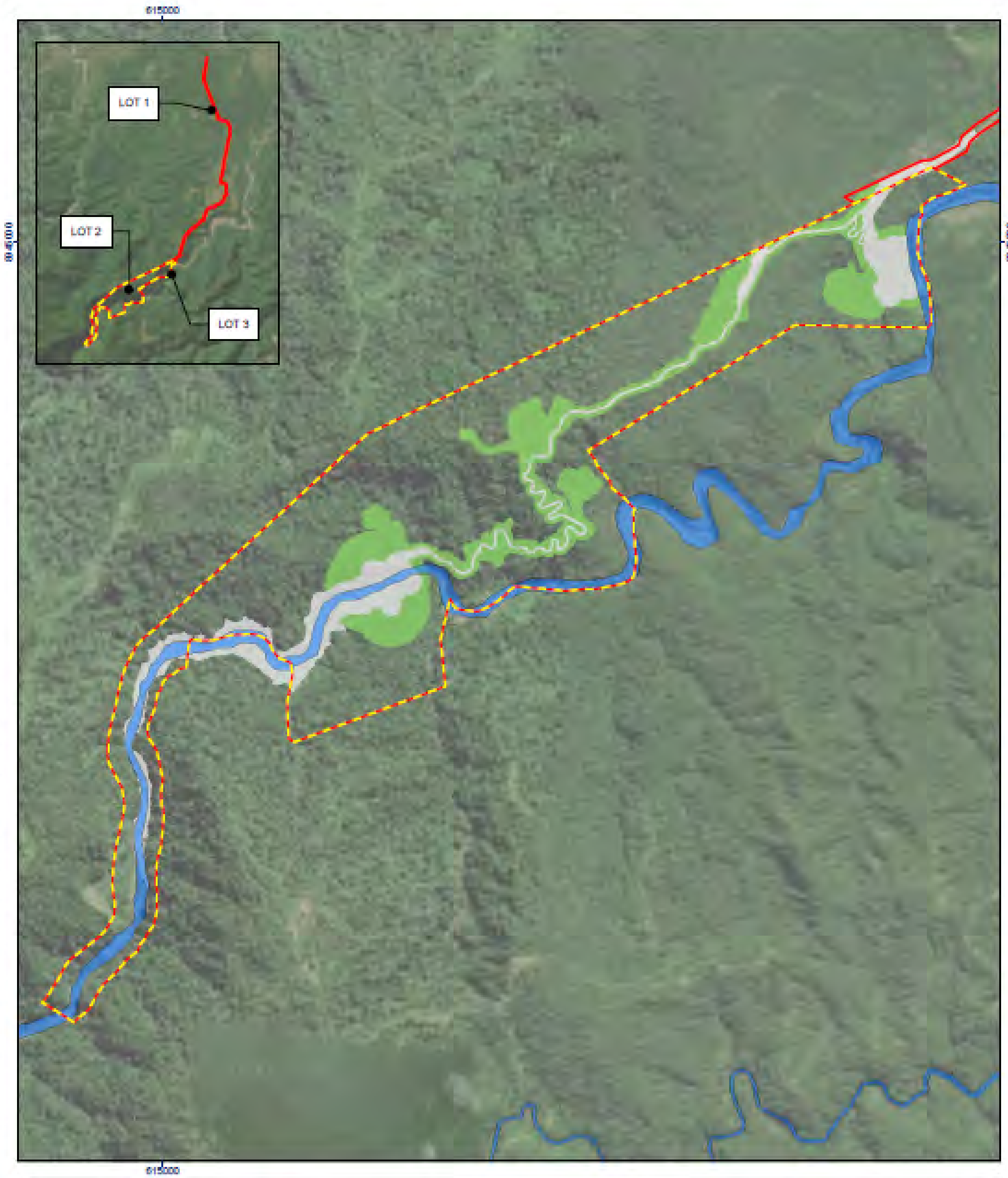

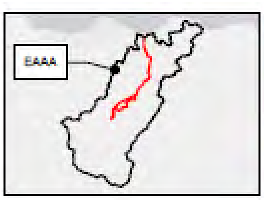

- Project Area
- Core Land
- Areas to Remain Cleared
- Revegetation Areas
- Riverine Habitat

0 0.4 0.8 km
(At original document size of A4)
1:30,000

Stantec

Project Location: Solomon Islands

Prepared by AB on 2023-03-14
TR by AB on 2023-03-14
IR Review by FT on 2023-03-xx

Client/Project: 300203604
Australian Infrastructure Financing Facility for the Pacific
Tina River Hydropower Project
Safeguard Consultant

Title
Revegetation Areas

Notes
1. Coordinate System: WGS 1984 UTM Zone 57S
2. Background: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
World Imagery (February 2022)

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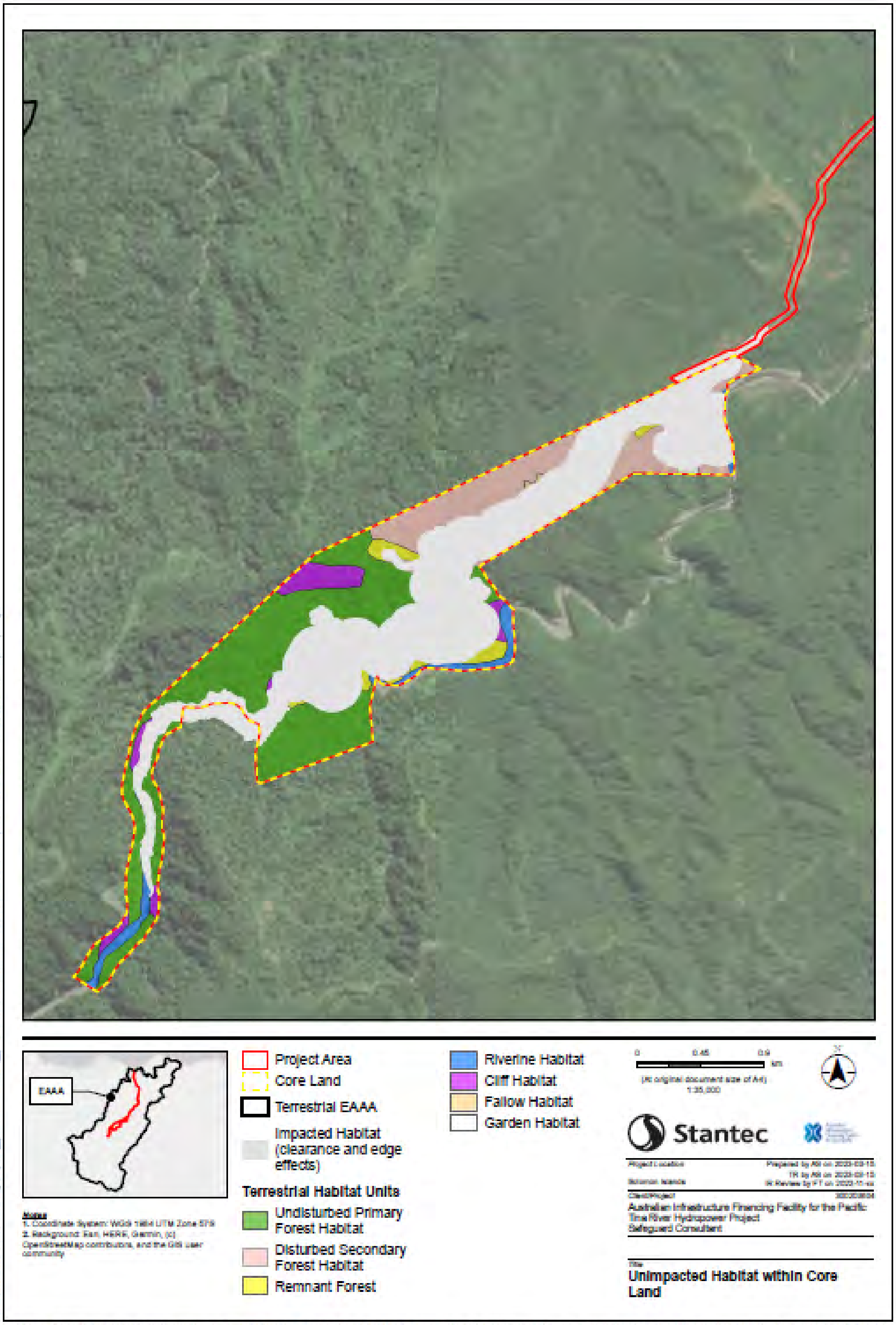

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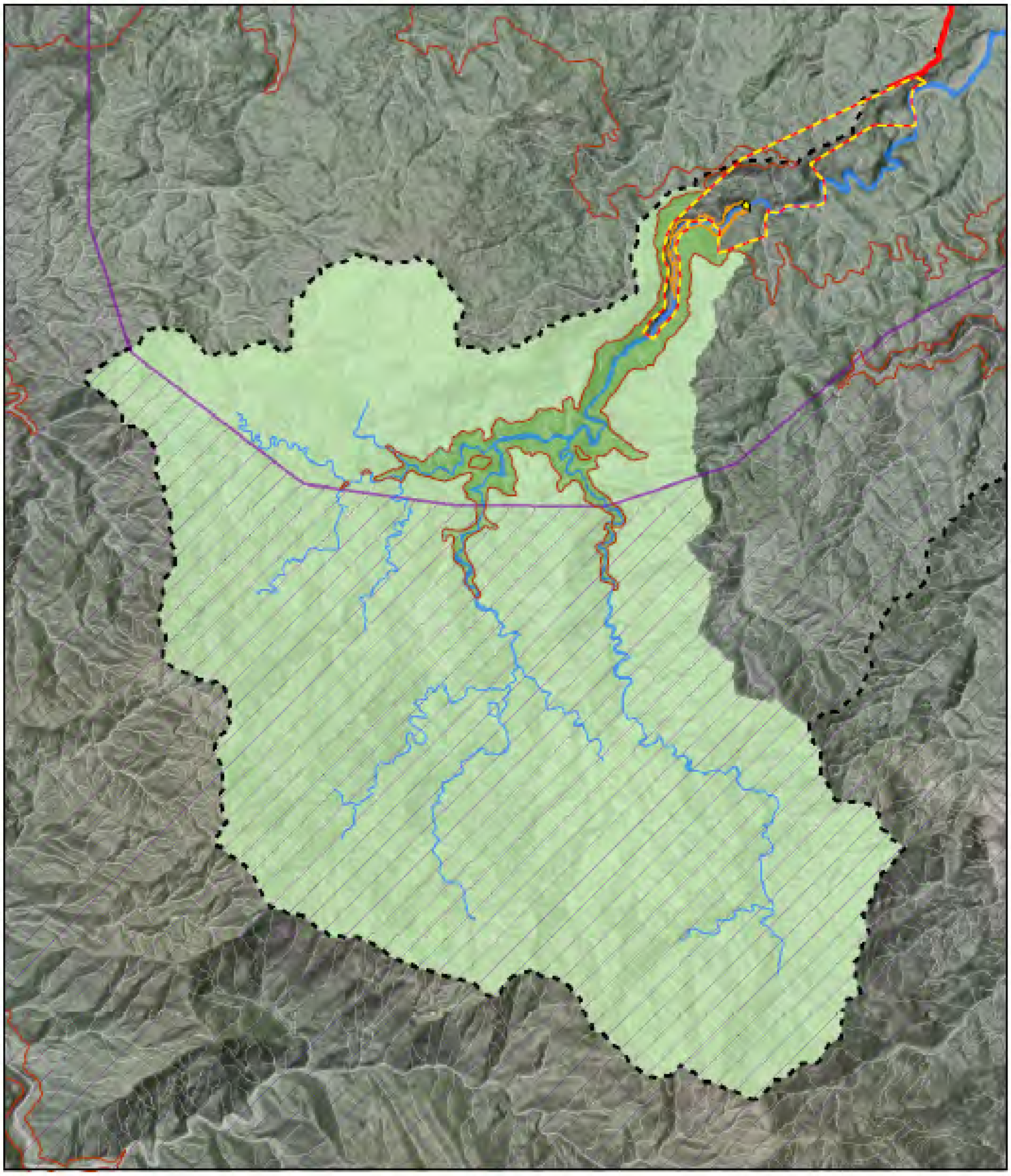

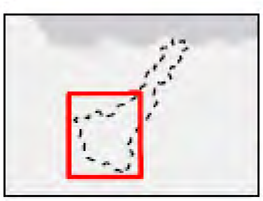

Project Area
Core Land
Watercourses
400m Contours (SRTM)
RCC Dam
Watershed 1
Reservoir (175m)
Key Biodiversity Areas

Aquatic Habitat

Upper Reach Catchment
above 400m
below 400m

0 1 2 km
(At original document size of A4)
1:100,000

N

Notes
1. Coordinate System: WGS 1984 UTM Zone 57S
2. Background: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Airbus, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen and the GIS User Community

Project Location
Solomon Islands

Prepared by AB on 2023-03-23
TR by AB on 2023-03-23
IR Review by FT on 2023-11-xx

Client/Project
Australian Infrastructure Financing Facility for the Pacific
Tina River Hydropower Project
Safeguard Consultant

Title
Aquatic OMS and KBA

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ANNEX II: MULTICRITERIA ANALYSIS OF OFFSET OPTIONS

Option 1: Protection (Averted Loss) Offset within Core Land

The ESIA (Tina Hyrdopower Limited, 2019) states that the Project Company will implement an offset within the Core Land that will include measures to protect the remaining natural habitat in the Core Land, and to rehabilitate an area of modified habitat within the Core Land. A total of seven habitat units have been delineated within the Core Land according to Myknee's Ecological Consultancy (Sirikolo, et al., 2020). The majority of the Core Land comprises Undisturbed Primary and Disturbed Secondary Forest. The upper Core Land in the north is characterised by Remnant Lowland Forest and Undisturbed Primary Lowland Forest habitat, with Riparian and Cliff habitats extending along the periphery of the Tina River. In contrast, low-lying areas to the south consist mostly of Disturbed Secondary Lowland Forest habitat, with small sections of Remnant Forest and Riparian habitat along the margins of the river.

An Offset Management Area Survey Report was prepared by Taluva Bioresource Management and Consultancy (Sese, 2020) and provides a description and assessed suitability of providing the offset within the upper reaches of the TRHDP Core Land boundary, upstream of the dam, where the habitat consists of primary forests, riparian zones and cliff habitats.

Sese (2020) notes that there is evidence to suggest that environmental values occur within the proposed offset area, including critically endangered native rats, vulnerable flora including Rosewood (Dalbergia spp.) and important food and nesting plants including nut trees (*Canarium indicum* and *C. salomonense*) and *Ficus* spp. It is also noted that culturally significant sites (Tambu sites) exist within the project boundary, and that these sites must remain undisturbed as local landowners are culturally forbidden to enter or take anything from these sites except for religious (heathenism) purposes (Sese, 2020).

The Offset Management Area Survey Report does however note that there are some environmental issues within this area that will need to be managed as part of the offset management strategy, including landslides, siltation, high turbidity and mineral content of water, paucity of endemic species, invasive and non-native flora and fauna, and timber milling (Sese, 2020).

The benefits of offsetting within the Core Land include THL being able to manage the offset without the need to purchase additional land. The offset would be able to demonstrate additionality by establishing new protected areas.

Option 2: Protection of the Lower Tina River Catchment

Option 2 involves protecting an area of habitat within the lower watershed of the Tina River. The majority of habitat in this lower watershed is modified, although some remnant habitat remains. To implement this option, identification of suitable habitat would first be required. To meet the equivalency criteria, it may be necessary to secure a significantly larger area than the residual impact area as the quality of the habitat is likely to be significantly lower than impacted habitat in the Core Land.

Fragmented land uses and ownership are likely to impede the ability to secure contiguous land of sufficient quality to make this option feasible.

Option 3: Protection of the Tina River Upper Catchment (outside Core Land)

The ESIA (Tina Hyrdopower Limited, 2019) Appendix K notes the opportunity to protect an area of critical habitat in the upper watershed of the Tina River. This would be an 'averted loss' offset, where in the absence of offsetting, the area of forest would be expected to be lost due to actions such as logging. As such, protection of the area would allow offset gains to be achieved. It is noted that this opportunity would require considerable engagement with stakeholders including customary landholders to determine if this is a viable offsetting option.

There is 7.11km^2 of Undisturbed Primary Forest below 400masl that is not currently protected, excluding areas that will be impacted by the reservoir.

Option 4: Protecting the Guadalcanal Key Biodiversity Area (KBA)

Option 4 would involve expanding protection beyond the Tina River watershed to include all or part of the Guadalcanal Watersheds KBA. The Guadalcanal KBA has been identified as an area of high biodiversity value that is worthy of protection. While the length of the river and area of protection to achieve a net gain for the current project is still to be determined, this opportunity would likely well exceed the minimum offset requirements of the current project. This option would create significant biodiversity gains and the potential to be supported by additional funding and grants from international donors and NGOs.

Option 5: Protection of an Adjacent River Catchment

This option would involve providing an offset in the form of protecting an area along an adjacent river catchment. However, given the ownership structure and intensity of land use in most river catchments of a similar size and scale, protection of an adjacent catchment is unlikely to be viable. There is also potential to create physical and/or economic displacement of local people if this option is pursued. It is currently assumed that this displacement would be greater than the level of displacement that may result from protecting an area along the Tina River catchment.

Option 6: Barana Community Park (existing protected area on Guadalcanal)

The Barana Community Nature Park is located to the north-west of the Tina River catchment, south of Honiara. The park spans approximately 50 km^2 of forest in the upper catchment of the Mataniko River. It is the only existing protected area on Gaudalcanal, and was established in 2017 with the support of SPREP. The park supports both conservation and agricultural activities, along with tourism.

The potential to provide offsets in the form of funding to support and strengthen existing environmental management of the park should be investigated. However, the viability of this option needs further investigation. While the ecological equivalence and viability of this area as an offset is currently unknown, the opportunity to restore this area has been achieved and as such, it would be likely to demonstrate additionality of the current offset.

Option 7: Nini Trust Land

The Nini Land area is located on west Guadalcanal, where the Nini Trust group has undertaken tribal mapping and the group has started the protection of an area of approximately 0.3 km^2. The option to provide offsets for the current project through funding to support and strengthen environmental management of this area of land should be investigated. While the viability of this option needs to be pursued further, it is understood that the Nini Trust group has already commenced discussion with carbon trading group, and the FPIC is clearly demonstrated with this group.

Option 8: Greater Enforcement of Existing Laws

Option 8 would involve providing an offset in the form of greater enforcement or formal protection of forests above 400masl within the Tina River catchment. Forests above 400masl contain some of the highest biodiversity in the Solomon Islands and are protected from logging under the Forest Act 1999. However, these areas are still vulnerable to illegal timber extraction due to a lack of legal enforcement.

A study by the NGO Global Witness (2018) calculated that 1 in every 20 km of logging road in the Solomon Islands is above 400 m in altitude. It is estimated that the annual deforestation rate for the Solomon Islands is 0.02%. Data from Global Forest Watch (2022) indicates a 7.5% decline in forest cover between 2001 and 2021 for the Solomon Islands as a whole, and 9.0% for the island of Guadalcanal (equating to 43,944 ha). More detailed data from Butler (no year) indicates forest loss on Guadalcanal of 8.5% between 2001-2020.

This offset option would involve active patrolling and management of areas above 400 masl, including management of access to the upper catchment via core land roads. Consideration needs to be given to how or if SIG can restrict access to existing forestry roads in the Tina River catchment. At present there are existing roads on either side of the catchment that are being used for logging. These are outside Core Land and therefore unable to be controlled by THL.

It is acknowledged that foot patrols are unlikely to be achievable due to the absence of roads in the upper catchment (above existing forestry roads), and that management would include the use of satellite monitoring of land use. Consideration also needs to be given if monitoring biodiversity (over and above vegetation cover) would be required to determine progress towards net gain. This monitoring could include camera trapping, tracking tunnels, and/or physical surveys of terrestrial species.

Greater formal protection would also likely be a requirement of this offsetting option, and this could be in the form of a MoU. This MoU, along with greater patrols could be viewed as a way of achieving Protection (Averted Loss) offsets, by likely reducing the risk of illegal logging in these areas.

Option 9: Purchase an Area for Improvement (i.e. Plantation to Revegetate)

As opposed to Option 2, which requires the identification of existing high-quality habitat within the Lower Tina River Catchment, this option can facilitate the gain of habitat quality through restoration of currently degraded habitat, such as modified plantation habitat in the lower catchment. This is more feasible from a land tenure and land availability perspective, but it may not be feasible to use this option to achieve equivalent biodiversity values. This remains a potential option, but requires additional investigation to understand viability and stakeholder willingness to consider restoration as an option.

Option 10: Funding for Research

The World Bank Group (2016) identifies research funding as a potentially viable element of compensation-based offset, in particular where land tenure is uncertain. Research that leads to the implementation of improved land management practices has the potential to offset the impacts of a project, and to have wide-reaching benefit beyond the geographic area. However, these wide-reaching outcomes have low likelihood of being achieved and the additionality, equivalence and long-term outcomes of research are difficult to predict, monitor and quantify.

Summary table of options

Offset Option	Description	Criteria						Overall Assessment
		Additionality	**Equivalence**	**Permanence**	**Land Tenure**	**Stakeholders**	**Finance / Resourcing**	
Terrestrial offset within Core Land	Protect (avert loss) of existing habitat within Core Land that lies outside DIAs. The suitability and extent of habitat within Core Land has been thoroughly assessed.	Core Land below 400 masl is not currently protected. Core Land above 400masl has existing protection, but there is the opportunity to strengthen this.	Equivalent habitat exists for all impacted habitat types. Higher elevation habitat that may be more pristine than impacted habitat is available.	Area secured for the Project	Existing arrangements are in place with Customary Land Owners, allowing the Project to use Core Land.	Likely to be acceptable politically. Acceptable to Customary Landowners.	Costs for management of Core Land anticipated within existing Project budgets	Can be achieved. Easiest to offset given location within Core Land Impacts upon customary landowners and broader social impacts are minimised.
Protection of the lower Tina River Catchment	Protection of modified or remnant habitat amongst existing plantations in the lower Tina River Catchment.	Formal protection of unprotected areas in the lower catchment.	Not like-for-like (modified habitat with lower biodiversity, lower elevation, different land use pressures).	Unlikely to be viable given the intensity of existing development including villages, roads, agriculture, and fisheries.	Needs to be investigated to determine if it is a feasible option. Very likely to be landowner issues.	Multiple landowners and river users. Very likely to be issues related to conflicting land uses. May not be politically acceptable.	Cost to acquire land unknown.	Unlikely to be viable.
Protection of the upper Tina River Catchment (outside Core Land)	Opportunity to protect an area of Critical Habitat in the upper watershed of the Tina River	An 'averted loss' offset, where in the absence of offsetting, the area would be expected to be lost due to actions such as logging. Protection of the area would allow offset gains to be achieved. Predicted loss can be estimated, but an absence of data is noted.	Identified area of high biodiversity. Not equivalent but likely more pristine than Core Land, and in close proximity to impacted habitat.	The SIG is proposing a MOU be established between MOFR, MECDM, and MMERE to protect and conserve the upper catchment. There is also the potential to create a legally Protected Area.	The majority of the area is outside of Core Land. Project Office indicates that there are 27 known tribal landowners. No known villages.	previously supportive of creating a Protected Area in the upper catchment, however the delay in progress means that there is little current interest. SIG is generally supportive, subject to costs of implementation	No physical displacement required. Purchase of land not considered necessary to secure the offset area, so long as landowner support is achieved. Potential financial income stream from carbon offsets or similar.	Likely to be acceptable. Feasibility requires further investigation and consultation. High quality habitat. Additionality can be predicted but is uncertain.
Protection the Guadalcanal Watersheds Key Biodiversity Area (KBA)	Expanding protection beyond the Tina River watershed to include all or part of the Guadalcanal Watersheds KBA. The Guadalcanal KBA has been identified as an area of high biodiversity value that is worthy of protection.	This would expand protection beyond the Tina River watershed to encompass all or part of the Guadalcanal Watersheds KBA.	Identified area of high biodiversity. This would likely be well beyond the minimum offset requirements of the project, but it would create significant biodiversity gains. Equivalence of habitat (e.g. for species that trigger Project Critical Habitat) not determined.	The extent of this area would be beyond the scope of the project, but may be able to be funded by alternative methods, including from international donors and NGOs	Potential landowner issues. Investigation required to determine whether this would involve the Project securing land, or funding and collaboration via MOU with other management entity.	Likely to be acceptable politically, dependent upon the protection mechanism (MOU, regulation, act). May support the local economy by creating ecotourism opportunities. Opportunity for cooperation with other management entities.	May be able to be funded by alternative methods, including from international donors and NGOs. Cost unknown.	Likely to be acceptable. Likely to offset significantly more high quality habitat than required. Additional research required to determine whether protected biodiversity values are equivalent. Likely to be supported for positive social and economic outcomes. Costs unknown.
Protection of an adjacent river catchment e.g. Toni River, Sutakama River	Protect an area within an adjacent river catchment.	Where habitat of sufficient quality within other river catchments remains, this is likely to require protection.	Intensity of land use in most river catchments of a similar size and scale is generally greater, resulting in a greater proportion of modified habitat and overall lower habitat quality.	Needs to be investigated to determine if it is a feasible option.	Potential landowner issues.	Given the ownership structure and intensity of land use in most river catchments of a similar size and scale, protection of an adjacent catchment is unlikely to be viable.	It would potentially create physical and/or economic displacement of local people. Costs unknown.	The Toni River and Sutakama River have existing mining and logging rights. Not viable.

Offset Option	Description	Criteria						Overall Assessment
		Additionality	Equivalence	Permanence	Land Tenure	Stakeholders	Finance / Resourcing	
Funding for SIG to improve enforcement of existing forestry laws	Greater enforcement or formal protection of forests above 400masl within the Tina River catchment.	It is acknowledged that regulations already exist to restrict mining and logging in this area – however active patrolling and management of areas above 400masl would improve the enforcement of these regulations.	Forests above 400masl contain some of the highest biodiversity in the Solomon Islands.	Foot patrols are unlikely to be viable with few roads in the upper catchment. Would include satellite monitoring. Biodiversity may need to be monitored (over and above vegetation cover) to determine progress towards net gain.	Project Office indicates that there are 27 known tribal landowners.	On its own this is unlikely to be acceptable by CFPs as little additionality can be demonstrated.	Costs for short-term and long-term management could be calculated, and included in annual SIG budgets. Source of funding would need to be determined.	Unlikely to be viable as a stand-alone action but may be one of a suite of actions alongside formal protection).
Greater protection of Barana Community Park (existing protected area within Guadalcanal)	Funding to support and strengthen existing environmental management of the Barana Community Nature Park, south of Honiara.	Existing protected area. Existing management regime likely to be in place.	Approximately 5,000ha of forest in the upper catchment of the Mataniko River. Not equivalent but likely to include similar habitat types.	Potential to offset via payment to fund existing management, if there is currently inadequate on-the-ground management. However, the adequacy of existing management has not been determined.	Existing protected area. Funding and collaboration rather than ownership. MOU or similar will be required.	Opportunity for cooperation with existing management.	Risk of cost-shifting (risk of government reducing its budgetary allocation in response to the increased revenue from biodiversity offset payments made by the project).	Unlikely to be viable. Biodiversity offset needs to demonstrate additionality – if this is an existing protected area with low level threats and adequate funding, it would be hard to demonstrate additionality for the current offset. Needs to be investigated to determine if it is a feasible option.
Protection of Nini Trust Land	Funding to support and strengthen management of Nini Land area in west Guadalcanal, where the Nini Trust group has undertaken tribal mapping and protection of 300 ha.	There is the intent to protect the Nini Land area, but this may require strengthening and formalisation.	Habitat equivalence requires further investigation.	Further investigation required to understand feasibility of long-term management.	Needs to be investigated to determine the means of partnership or collaboration with the Nini Trust group.	Insufficient data to determine stakeholder willingness.	Costs unknown.	Unlikely to be viable without significant further investigation and engagement. Nini Trust group has commenced discussion regarding offsets with a carbon trading group.
Purchase an area for improvement (i.e. plantation to revegetate)	Revegetate and improve habitat values within a modified land area.	Restoration qualifies for additionality.	Would involve restoration resulting in a gain of habitat quality, rather than averted loss of equivalent habitat. Can be calculated to provide a quantitative estimate of equivalence, but not truly like-for-like.	Further investigation required to understand feasibility of long-term management.	Potential landowner issues.	Potential landowner issues.	Cost to acquire land unknown.	Unlikely to be viable without investigation to determine if it is a feasible option.
Funding for research to improve the knowledge of SI terrestrial biodiversity e.g. biodiversity of Guadalcanal Key Biodiversity Area (KBA)	Funding of research to inform conservation and management of biodiversity values in Guadalcanal.	Difficult to quantify without long-term research.	Research is not equivalent to direct impacts to biodiversity, but may enhance biodiversity values far beyond residual impacts. Difficult to quantify without long-term research. High risk that equivalence is not achieved.	Research can be short-term and have long-term impact. Long-term impact and implementation of research findings difficult to monitor and quantify.	N/A	On its own this is unlikely to be acceptable by CFPs as little additionality can be demonstrated.	Costs unknown.	Unlikely to be viable without significant demonstration of the predicted success of the research program/s.

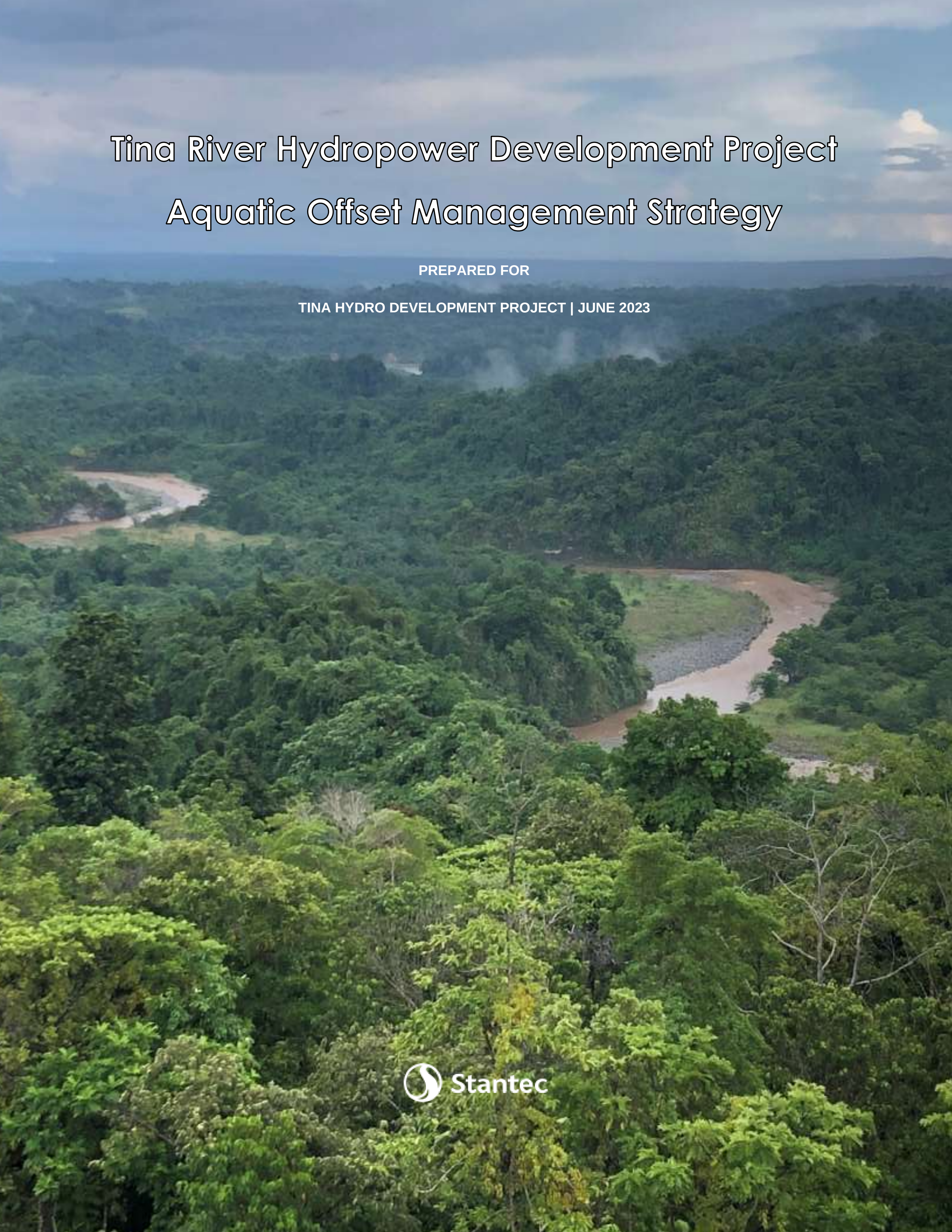
Annex P-2-4: Aquatic Offset Management Strategy.

Tina River Hydropower Development Project

Aquatic Offset Management Strategy

PREPARED FOR

TINA HYDRO DEVELOPMENT PROJECT | JUNE 2023



Stantec

Tina River Hydropower Development Project

AQUATIC OFFSET MANAGEMENT STRATEGY

June 2023

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1. INTRODUCTION

1.1 Background

The Tina River Hydropower Development Project (the Project) includes a 15-megawatt (MW) hydropower facility, transmission line, access roads and related permanent and temporary infrastructure. The Aquatic Offset Management Strategy (AOMS) has been developed for the Project as a sub-plan of the P-2 Biodiversity Management Plan (BMP), which is one of a suite of environmental and social management plans applicable to the Project.

The Project is to demonstrate how it will achieve no net loss[1] in Natural Habitat, and net gain[2] in Critical Habitat of the Tina River. The AOMS demonstrates the mechanism for how this will be achieved.

1.2 Aim and Scope

The aim of the AOMS is to set out the management actions required to achieve no net loss of Natural Habitat and net gain in Critical Habitat from the construction and operation of the Project. The specific objectives of the AOMS are to:

- Identify a viable offset option(s) for the residual impacts associated with the Project.
- Outline monitoring and management requirements to ensure effective implementation of the offset.
- Set out the responsibilities and an indicative budget to ensure effective implementation of the offset.

The AOMS relates to impacts caused both within and outside of Core Land, however, as most offset actions cannot be addressed within Core Land, responsibility for implementation will be led by the Solomon Islands Government (SIG).

While Core land provides sufficient quality hectares to offset terrestrial impacts overall, not all habitat types can be entirely offset within this area. The Tina River upper catchment provides the opportunity to protect addition areas of Undisturbed Primary Forest and riparian Cliff Habitat which falls outside of the Core Land, this is covered further in the TOMS. Details of these terrestrial offsets within the upper catchment will be included in the Upper Catchment Offset Management Plan.

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[1] Defined as the point at which project-related impacts on biodiversity are balanced by measures taken to avoid and minimize the project's impacts, to undertake on-site restoration and finally to offset significant residual impacts, if any, on an appropriate geographic scale (e.g., local, landscape-level, national, regional) (World Bank Group 2019).

[2] An additional conservation outcome that can be achieved for the biodiversity values for which the critical habitat was designated. Net gain may be achieved through the development of a biodiversity offset to protect and conserve biodiversity (World Bank Group 2019).

2. METHODOLOGY

The development of the AOMS follows the safeguard policies of the Concessional Finance Partners and the requirements of the Environmental and Social Impact Assessment for the Project (ESIA) prepared in 2017 and updated in 2019 (TRHDP, 2017; THL, 2019). It also references the draft Biodiversity Management Plans for the Project prepared in 2020 and 2021, as well as the final P-2 BMP for Main Works approved in 2023. The AOMS has been drafted in close cooperation with stakeholders including the SIG Project Office (PO), THL, HEC and CFPs.

2.1 Offset Principles

Under IFC Performance Standard 6, which applies to the Project, no activities are permitted within areas of Natural or Critical Habitat, unless a range of criteria are met (World Bank Group, 2012). The Project applies the mitigation hierarchy to avoid, minimise and mitigate adverse impacts on aquatic habitat. This includes measures such as maintenance of e-flows downstream of the dam, bypass screens for fish to prevent entrainment, and a fish trap and haul system to allow fish to move to the upper catchment. However, it is not possible to completely avoid impacts on the Tina River and limited mitigation and restoration options are available. Therefore, an aquatic offset is required to ensure that no net loss is achieved for impacts to natural habitat (e.g. fish) and net gains are achieved for critical habitat (e.g. aquatic macroinvertebrates).

Biodiversity offsets can only be considered after appropriate avoidance, minimization, and restoration measures have been applied. A biodiversity offset should be designed and implemented to achieve measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity, in the case of critical habitat. This is based on three core principles that apply to all offset designs (World Bank Group, 2016):

- **Equivalence:** Offsets should conserve the same biodiversity values (species, habitats, ecosystems, or ecological functions) as those lost to the original project, following the principle known as “like-for-like”. Alternatively, offsets can result in the conservation of higher-priority habitat, known as the principal of “trading up”.
- **Additionality:** Offsets must deliver conservation gains beyond those that would be achieved by ongoing or planned activities that are not part of the offset.
- **Permanence:** Offsets should persist for at least as long as the adverse biodiversity impacts from the project, and ideally should last in perpetuity.

As per IFC Performance Standard 6 (PS6): in certain situations, areas to be impacted by a project may be neither a national nor a local priority for biodiversity conservation. There may be other areas of biodiversity with like values that are a higher priority for conservation and sustainable use and under imminent threat or in need of protection or effective management. In these situations, it may be appropriate to consider offsets that involve “trading up” (i.e., where the offset targets biodiversity of higher priority than that affected by the project). Under Asian Development Bank (ADB) policies, trading up is only appropriate when the offset areas are ecologically comparable.[3]

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[3] For ADB Safeguards Policy Statement, for project located in Natural Habitat, “the Mitigation measures will be designed to achieve at least no net loss of biodiversity. They may include a combination of actions, such as post project restoration of habitats, offset of losses through the creation or effective conservation of ecologically comparable areas that are managed for biodiversity while respecting the ongoing use of such biodiversity by Indigenous Peoples or traditional communities, and compensation to direct users of biodiversity.” (Appendix 1, Para 27)

2.2 Calculation of Residual Biodiversity Impacts

The estimated residual impact of the Project has been quantified using the 'habitat hectares' method, whereby the areal extent and condition of ecosystems to be impacted are used to account for variable quality of the areas to be impacted and the severity of the impacts (Parkes, Newell, & Cheal, 2003; World Bank Group, 2016; Pilgrim, 2017).

In the habitat hectares method, ecosystem quality is assessed within a theoretical range from zero (such as areas destroyed by a project) to 100% habitat quality (a pristine or 'benchmark' ecosystem). Habitat types and ecosystem condition scores within and surrounding the Tina River Project area were determined on the basis of the 2021 and 2022 aquatic ecology field surveys, complemented by aerial photographs, topographic maps, and results from hydrological modelling. The upper tributaries[4] of the Tina River are largely inaccessible and unmodified by humans, so were assumed to be 100% habitat quality. The main Tina River in and around the Project was allocated 90% habitat quality due to small scale vegetation clearance, hunting and fishing within or adjacent to the river. In the vicinity of Tina village, the river was allocated 80% habitat quality, dropping slightly to 75% downstream of the confluence with the Toni River. In this area there is increasing habitation and use of the river, including for gravel extraction. The downstream reach near the coast was allocated 50% habitat quality due to the prevalence of invasive aquatic flora and fauna species.

The following factors were considered in the calculation of impacts on aquatic ecosystems of the Tina River from the Project, and resultant change in habitat quality:

- Physical occupation of the river and riparian zone by the dam, powerhouse, access roads and temporary infrastructure.
- Altered flow regime downstream of the dam, including extent and modification of available of aquatic habitat.
- Restriction to the movement of migratory species through the presence of the dam, reducing the diversity and abundance of species in the upper catchment.

A description of all habitat types impacted by the Project, including pre- and post-project habitat quality scores are provided in section 3.0.

2.3 Selection of Offset Activities and Sites

A range of offset options were considered for the Project. A multicriteria analysis was applied to each offset option, according to the following criteria:

- Additionality. The offset area should be subject to potential impact, were it not protected (i.e., not an existing protected area).
- Equivalence (Like for Like). The offset should protect or restore biodiversity and habitat values that are equivalent to those impacted.
- Permanence. Potential risks to the longevity and successful management of the area should be minimised, with adequate offset mapping, management plans, equipment and training of staff.
- Land Tenure. The Project must be able to secure the land for offset purposes.

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[4] The extent of upper catchment tributaries were mapped in GIS based on topography. This may under- or over-estimate the true extent of smaller watercourses in the catchment.

- Stakeholders. The offset option should be suitable to key decision makers, the local community and other stakeholders.
- Financial. Costs should be known and reasonable, with appropriate ongoing funding, including up-front and recurrent costs.

The preferred options for the offset were selected based upon adherence to the above principles and likelihood of success, as evaluated in the current project context, and in consultation with relevant SIG ministries and stakeholders.

2.4 Management Actions

Once the offset option(s) were confirmed, a number of actions were developed:

- Biodiversity management and monitoring requirements
- Stakeholder engagement
- Institutional responsibilities
- Timeline for implementation
- Indicative budget and funding sources.

3. CALCULATION OF RESIDUAL IMPACTS

In total, the Project will affect 94.93 linear kilometres (km) of the Tina River catchment (Table 3-1; Annex I). This comprises of 14.82 km of Critical Habitat between the top of the reservoir and the confluence of the Toni River, 12.73 km of Natural Habitat downstream of the Toni River confluence, and 3.42 km of Modified Habitat in downstream reaches. The Project will also restrict fish passage to approximately 63.96 km of river and tributaries in the upper catchment, also classified as Critical Habitat. Part of the upper catchment falls within the Guadalcanal Watersheds Key Biodiversity Area (KBA).

Critical habitat has been triggered due to the presence of four range-restricted aquatic macroinvertebrates. Three of the four taxa have only been recorded in the Tina River upstream of the Project. One species has been recorded upstream and downstream of the Project, as well as in the Sutakama River (Annex I). Downstream of the Toni River confluence, the river is classified as Natural Habitat, as it retains natural flow regime, channel morphology and meander, and a predominantly native aquatic ecosystem. Downstream of Ngalimbiu Bridge, the habitat is Modified due to the prevalence of invasive vegetation and mosquito fish.

The BMP has determined that the Project will affect the Tina River aquatic ecosystem from the headwaters to the sea. These impacts vary in intensity depending upon the location in the catchment, including the degree of modification of flows, the area and quality of aquatic habitat available, and accessibility for migratory fish passage. Current (pre-development) aquatic ecosystem quality was assessed to range from 100% in the upper tributaries, where there is little or no human use or modification, through to 50% in the downstream reach. Following development of the Project, these ecosystem quality scores were found to decrease by between 6% and 75%, based on fish access and modelled changes in flows:

- Tina River upper tributaries: 100% quality to 25% due to restrictions in fish passage.
- Main stem of the Tina River upstream of reservoir: 90% quality to 25% due to restrictions in fish passage.
- Dam and reservoir: 90% quality to 25% due to restrictions in fish passage and change in habitat conditions (river to lake, with increase in aquatic habitat area).
- Dewatered section between the dam and powerhouse: 90% to 60% due to 30% maximum reduction in inundated area and associated effects on in-stream habitat, but with maintained access for fish communities.
- Powerhouse to Toni River confluence: 80% quality to 70% due to 5% decrease in inundated area and 5% loss of habitat values, with access for fish communities.
- Toni River to Ngalimbiu River bridge: 75% quality to 69% due to 3% decrease in inundated area + 3% loss of habitat values, with access for fish communities.
- Downstream of Ngalimbiu River bridge: 75% quality to 69% due to 3% decrease in inundated area and 3% loss of habitat values, with access for fish communities.

Habitat hectare calculations have been developed accounting for the change in habitat values as a result of the Project (Table 3-2 and Table 3-3). In total the Project results in a loss in **159.49 quality hectares** (QHa) across the catchment. The Project is required to achieve:

- Net gain for impacts to **151.38 QHa** of aquatic Critical Habitat.
- No net loss for impacts to **8.11 QHa** of aquatic Natural Habitat.

Table 3-1: Summary of aquatic habitats and impacts to the Tina River catchment.

River System	Reach		Class*	Total River Area (ha)	Total River Length (km)	Project Impact River Area (ha)	Project Impact River Length (km)
Tina River	Upper tributaries		CH	152.98	60.52	152.98	60.52
	Main stem U/S of reservoir		CH	18.67	3.44	18.67	3.44
	Reservoir and dam		CH	13.52	2.76	13.52	2.76
	Dam to powerhouse		CH	12.10	1.90	12.10	1.90
	Powerhouse to Toni River		CH	120.84	10.16	120.84	10.16
Ngalimbiu River	Toni River to modified river		NH	135.23	12.73	135.23	12.73
	Modified downstream reach		MH	18.94	3.42	18.94	3.42
SUB-TOTAL:				**472.28 ha**	**94.93 km**	**472.28 ha**	**94.93 km**
Toni River	Upper tributaries		CH	43.23	17.82	0	0
	Mid riverine reach		CH	22.43	5.66	0	0
SUB-TOTAL:				**65.66**	**23.48**	**0**	**0**
TOTAL:				**537.94 ha**	**118.41 km**	**472.28 ha**	**94.93 km**

*CH = Critical Habitat; NG = Natural Habitat; MH = Modified Habitat

Table 3-2: Quality hectares impacted (area of river)

Reach		Class	River Area (ha)	Habitat Quality Current (%)	Habitat Quality Post-Project (%)	Loss in Habitat Quality (∆%)	Total Loss in QHa (ha x ∆%)
Tina River upper tributaries		CH	152.98	100	25	75	114.74
Main stem U/S of reservoir		CH	18.67	90	25	65	12.14
Reservoir and dam		CH	13.52	90	25	65	8.79
Dam to powerhouse		CH	12.10	90	60	30	3.63
Powerhouse to Toni River		CH	120.84	80	70	10	12.08
Toni River to modified river		NH	135.23	75	69	6	8.11
Modified downstream reach		MH	18.94	50	44	-	-
TOTAL:			**472.28 ha**				**159.49 QHa**

*Modified habitat does not require to be offset

Table 3-3: Quality kilometres Impacted (length of river)

Reach		Class	River Length (km)	Habitat Quality Current (%)	Habitat Quality Post-Project (%)	Loss in Habitat Quality (∆%)	Total Loss in QKm (km x ∆%)*
Tina River upper tributaries		CH	60.52	100	25	75	45.39
Main stem U/S of reservoir		CH	3.44	90	25	65	2.24
Reservoir and dam		CH	2.76	90	25	65	1.79
Dam to powerhouse		CH	1.90	90	60	30	0.57
Powerhouse to Toni River		CH	10.16	80	70	10	1.02
Toni River to modified river		NH	12.73	75	69	6	0.76
Modified downstream reach		MH	3.42	50	44	-	-
TOTAL:			**94.93 km**				**51.77 QKm**

*Modified habitat does not require to be offset

4. SELECTION OF OFFSET ACTIVITIES

4.1 Options Analysis

As part of the development of the AOMS, a series of options for offsetting the impacts of the Project were considered, along with other activities that can directly or indirectly benefit biodiversity, known as additional conservation actions. These options were developed based on current knowledge of the Project and Solomon Island context, including Project impacts, offset requirements and likely acceptability to SIG, customary landowners, and local communities.

The following offset options were considered:

- Offsetting within Core Land
- Protection of the Tina River lower catchment
- Protection of the Tina River upper catchment
- Protection of the Guadalcanal Key Biodiversity Area
- Protection of the Toni River catchment
- Protection of an adjacent river catchment e.g. Sutakama River
- Removal of barriers to fish passage e.g. dam, bridge or culvert replacements.

The following additional conservation actions were considered:

- Enforcement of existing laws
- Preparation of new law/policy
- Funding for research.

The long list was assessed against the core principles of biodiversity offsets: equivalence, additionality and permanence, with additional criteria added related to land ownership, stakeholder support and consideration of relative costs, as per the World Bank guidance (World Bank Group, 2016). A summary of this assessment is presented in Annex II.

The protection of the upper catchment is considered to be a viable aquatic offset for natural riverine habitat, and protects habitat for all four macroinvertebrate taxa that trigger critical habitat (*Orphninotrichia* sp. 1, *Prosopistoma sedlaceki*, *Rhagovelia brownie* and *Xylochironomus* sp. 1). Therefore, all aquatic species of conservation importance that were identified in the BMP will be offset under this current approach. However, the upper catchment is impacted by the Project, due to the reduction in fish passage caused by the dam, and likely flow-on effects to aquatic ecosystems upstream.

Under CFP policies, it was not considered that protection of the upper catchment was sufficient to offset all aquatic biodiversity impacts of the project. As a result, in addition to protecting the upper catchment, other offset options will be investigated. This is to be progressed under a separate Technical Assistance package provided by the ADB to SIG.

In summary, two options are proposed to protect species and habitats of conservation importance in the Project's area of influence and beyond. These are:

- Protection of the upper Tina River catchment, including both aquatic and terrestrial species and habitats.
- Preparation and implementation of Technical Assistance (TA) to identify additional conservation measures for aquatic biodiversity.

These actions are further described below, with implementation and management detailed in section 4.3.0.

4.2 Tina River Upper Catchment

Protection of the Tina River upper catchment as an offset was first proposed in the Project ESIA (2017) and carried through to the updated ESIA (THL, 2019):

> *The Project will take a series of steps to protect the upper Tina River catchment. Immediate protection measures will include actions of the TCLC and Project Company to restrict access to vehicles (including commercial logging machinery) to the upper catchment through the Core Area, to monitor changes in forest coverage in the upper catchment, to monitor logging truck activity on existing logging roads, and to support SIG to enforce seldom used statutory restrictions on logging at elevations above 400 masl (which if enforced would represent the vast majority of the upper catchment). This protection work will be furthered by Project Office funding for an NGO to facilitate consultations with customary landowners to seek support for the creation of a protected area in the upper catchment…*

The area proposed for protection is the Tina River upper catchment, outside of Core Land from the dam crest to the top of the catchment (Figure 4-1). The area proposed for protection totals up to **12,175 ha**, including **618.44 ha** below 400 metres elevation and **11,556.77 ha** above 400 metres elevation. Protecting this habitat would primarily be focused on terrestrial species and habitats of high conservation value (given the ecological uniqueness of this area). This approach is also intended to protect both water quality in the headwaters of this catchment and aquatic habitat that is suitable for aquatic insects, including all four taxa which trigger Critical Habitat.

Protecting the Tina River upper catchment presents the following benefits:

- It will protect up to **12,175 ha** of habitat in total including **618.44 ha** below 400 metres elevation and **11,556.77 ha** above 400 metres elevation.
- It will protect **12,008 ha** of Solomon Islands rainforest (terrestrial habitat).
- It will protect part of the Guadalcanal Watersheds Key Biodiversity Area.
- It will be contiguous with the proposed Tina River Core Land Conservation Area.
- It has the potential to accommodate additional terrestrial offsets for the Project.
- It is supported by SIG, including MECDM, MMERE, MOFR.
- Customary landowners have previously expressed interest in protecting the area.
- There is the potential to establish a formal Protected Area, subject to further investigations and consultation with landowners.

The protection will also have the following indirect benefits to the aquatic habitat:

- It will encompass up to **167 ha** of riverine habitat (aquatic habitat) impacted by the Project, encompassing the main stem of the Tina River and tributaries above Core Land. Some indirect benefits will be achieved through this protection, related to erosion prevention and maintenance of riverine vegetation.
- By preventing deforestation, it will protect the physical habitat of river and streams and extend the life of the hydropower plant by reducing sedimentation.

According to habitat hectare calculations (Table 4-1), the Project impacts **159.49 QHa** of aquatic habitat, encompassing both Critical Habitat and Natural Habitat. Protecting the upper catchment will achieve protection of **1,621 QHa** of terrestrial habitat, as well as (indirectly) aquatic habitat over the 30-year PPA, through averted loss to undisturbed primary forest (Critical Habitat). This is an order of magnitude higher than the minimum required.

It is noted that the quality hectare gains above are calculated using the average deforestation rates across Guadalcanal (Global Forest Watch, 2022). Deforestation rates above 400 m asl may be lower, due to steep topography and existing legal protection, while areas below 400 m asl may be higher. Even if a significantly lower and theoretical deforestation rate of 0.05% is applied to areas above 400 m asl, and the rate below 400 m asl is kept constant, this still equates to a total gain in 246.88 QHa over 30 years.

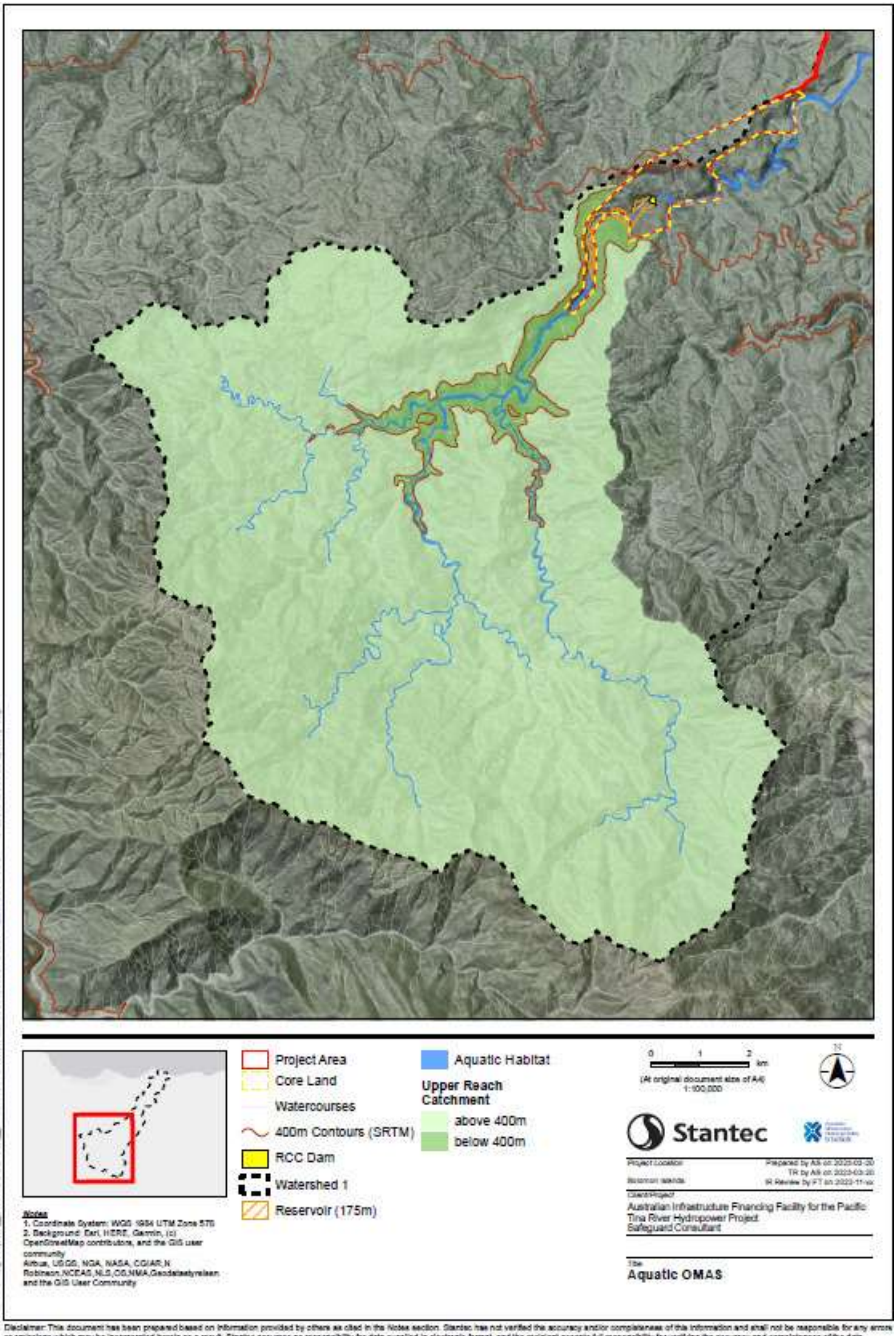

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Figure 4-1: Tina River upper catchment

Table 4-1: Quality hectares calculations (averted loss of terrestrial habitat)

Habitat Type		Class	Available Habitat (ha)	Habitat Quality (Q)	Deforestation Rate (%)	Annual offset gain (ha x deforestation)	Gain over 30 years (ha x deforest x 30)	QHa gain (gain X Q)
Above 400 m asl			11,556.77					
- Undisturbed Primary Forest		CH	11,451.90	100%	0.45	51.53	1,546.01	1,546.01*
- Riverine Habitat		CH	104.87	N/A	N/A	N/A	N/A	N/A
Below 400 m asl			618.44					
- Undisturbed Primary Forest		CH	556.27	100%	0.45	2.50	75.10	75.10
- Riverine Habitat		CH	62.17	N/A	N/A	N/A	N/A	N/A
TOTAL:			**12,175.21 ha**	**-**	**-**	**-**	**1,621.11 Qha**	**1,621.11 Qha**

Aquatic habitat impacted by the Project therefore no habitat quality gain calculated for riverine habitat.

*If a significantly lower rate of e.g. 0.05% is applied >400 masl this equates to a gain in 171.78 Qha over 30 years.

4.3 Technical Assistance

Additional resources will be mobilized to support analytical work that could lead to the identification of supplemental offset options and additional conservation actions aimed to achieve no net loss (NNL) and net gain. This is proposed to be carried out under a specific Technical Assistance to SIG, under ADB funding. This initiative will be carried out in parallel to project construction and implementation.

Considerations under the proposed TA could include:

- Align the existing River Waters Act with international best practices;
- Prepare new guidelines and associated regulations to govern environmental flows (eFlows);
- Perform a Strategic Environmental and Social Assessment of existing and planned river projects in the Province of Guadalcanal, to identify opportunities to mitigate future impacts and possibly contribute to biodiversity conservation gains; and
- Capacity building of Government Agencies, civil society organisations (CSOs), and water users.

While biodiversity gains from these activities are difficult to quantify at the present time, they could potentially lead to benefits to rivers and streams throughout the Solomon Islands.

5. OFFSET IMPLEMENTATION & MANAGEMENT

5.1 Protection of the Tina River Upper Catchment

The protection of the Tina River upper catchment will achieve the mutual benefits of maintaining water quality and storage capacity in the hydropower reservoir, protection of upstream aquatic habitat for Critical Habitat qualifying macroinvertebrates and conserving areas of Solomon Islands rainforest, with associated flora and fauna. In the absence of this protection, logging, mining and other development interests are likely to degrade the forest and headwaters over the duration of the 30-year PPA, particularly below 400 metres elevation.

The area proposed for protection totals up to **12,175 ha**, including **618.44 ha** below 400 metres elevation and **11,556.77 ha** above 400 metres elevation. MMERE will be the lead agency responsible for oversight of the area, as they have a national role in biodiversity conservation and development planning.

The key actions associated with the protection of the Tina River upper catchment are as follows:

1. **Letter of Intent:** A letter of intent to improve conservation of the Tina River upper catchment was agreed by SIG on 09 December 2022.
   The letter was jointly signed between the Permanent Secretaries for the Ministry of Mines, Energy and Rural Electrification (MMERE), Ministry of Forestry and Research (MOFR), and the Ministry of Environment, Climate Change, Disaster Management (MECDM).
   The letter of Intent sets out the intention to establish a Memorandum of Understanding (MOU) to conserve and protect the Tina River Upper Catchment.
2. **Stakeholder Consultation:** The PO is leading stakeholder consultation under the AOMS, given that implementation requirements fall to SIG.
   The PO are developing a Consultation and Engagement Strategy to guide and coordinate consultation activities required under the BMP, AOMS and TOMS.
3. **Memorandum of Understanding:** A MOU is proposed to be developed between MECDM, MMERE and MOFR.
   The MOU will set out the principles under which the AOMS will be implemented and how SIG Ministries will collaborate to enforce and monitor existing legal protections against commercial logging, mining operations and any other industrial and commercial extractive activities that may impact the upper catchment.
4. **Permanent Protection:** PO on behalf of SIG is to develop a credible indicative process to work towards the permanent protection of the upper Tina River catchment. The objective is to create a conservation area within the upper catchment.
   The mechanism for this is not yet determined, but could include the establishment of a legally Protected Area, a carbon offset site (if applicable), and/or a protected area in accordance with traditional *kastom* processes.
   A mechanism that provides for long-term protection whilst also permitting sustainable management and sources of income for the area is required.
   Any conservation area would respect the customary landowners and traditional uses of the upper catchment, and would be ideally be driven by the tribes themselves.
5. **Forest Cover Monitoring:** Monitoring of the upper catchment is essential to prove that SIG is delivering on the Implementation Agreement and achieving a successful offset. Monitoring of the upper catchment will be completed by MECDM or outsourced to a conservation NGO or consultancy. Every 3 months the integrity and condition of the vegetation cover within Core Land and the upper catchment will be mapped in GIS (or similar) with the aid of purchased high resolution satellite imagery. Should logging,

development or other incursions be identified, an incident response team shall be deployed.

6. **Incidence Response:** The investigation of forest clearance or other breaches of the upper catchment will be led by MECDM with the support of MOFR (responsible for enforcement of the Forestry Act), the Solomon Islands Police Force (SIPF). Should MECDM identify any illegal activities within the upper catchment through forest cover monitoring or other methods, a team shall be deployed via helicopter (or on foot) to investigate. Where necessary, enforcement action will be undertaken, followed by a review of monitoring, security and site management procedures.

Once a viable pathway to protection of the upper catchment is ascertained and long-term funding is secured, additional activities can be undertaken. This may include but not be limited to co-governance arrangements between customary landowners and SIG, preparation of a management plan for the upper catchment; enhanced security and enforcement via aerial and/or foot patrols; biodiversity research, monitoring and management activities; and eco-tourism.

5.2 Technical Assistance

5.2.1 Strategic Environmental and Social Assessment

An ADB TA (under preparation) will aim to explore in more detail supplementary offset options and measures that would achieve the Project's NNL/NG objectives by offsetting the aquatic biodiversity loss in other riverine ecosystems. Subject to endorsement of SIG, this will involve a Strategic Environmental and Social Assessment (SESA) focusing on:

- Establishing a baseline of ecological conditions of riverine ecosystems in Guadalcanal;
- Evaluating existing and planned river projects in the Guadalcanal Province (or beyond, if no comparable aquatic habitats are identified); and
- Identify and propose additional measures to support the achievement of NNL objectives.

The process – led by MMERE, with inputs from MECDM – will start with an extensive biodiversity baseline data collection exercise, which will aim to identify river systems ecologically comparable to the Tina River. Concurrently, an assessment will be undertaken on the status of conservation and development in the river systems. This will identify the potential impacts of planned projects (and their cumulative impact with the existing ones) on these systems, as well as the stakeholders who may be affected. The assessment will then be used to identify, discuss and propose additional technically and financially feasible measures that can help to offset the ecological losses due to the Project.

The final output of the SESA will include a set of recommendations and options for SIG on actions and measures which could ensure the long-term protection and management of aquatic biodiversity. Such measures or actions could include, for example, a combination of policy and planning measures, physical investments, support to community management activities, capacity and monitoring support to achieve measurable biodiversity outcomes. Details of the study, including Terms of Reference, will be agreed between SIG and CFPs. It is expected that the final document (including the scoping and baseline phases, impact assessment analysis, reporting and decision-making) will be ready in approximately two years from inception.

5.2.2 Policy Support

Under the policy support activities of the proposed Technical Assistance, a comprehensive appraisal of the country's primary and secondary legislation (including but not limited to the River Waters Act), other legal documents which covers river resources management, use and protection, and relevant policies, regulations, and guidelines will be undertaken. The review will identify gaps and limitations in the existing legislation and recommend areas for improvement. Consultations will be conducted with government agencies, CSOs, water users, and other stakeholders to gather feedback on the current state of the country's river systems and legislation. Following consideration, and if endorsed by SIG, a set of draft amendments to the Act and other relevant policies, regulations and guidelines may be proposed to address the gaps and limitations identified.

In addition, the proposed Environmental Flow (E-flow) guidelines will help to ensure that the water resources in the Solomon Islands will be managed in a sustainable and equitable manner. Subject to the endorsement of SIG and other stakeholders, the guidelines will provide a framework for determining the minimum flow of water required to maintain healthy ecosystems, including consideration of seasonal flows, sediment, lateral and longitudinal connectivity (flow of biota), whilst sustaining the water needs of people and supporting economic activities.

These activities are to be led by the Water Resources Management Division of MMERE. This Division is responsible for the assessment, administration, management and planning of water resources in Solomon Islands. This includes both groundwater and surface water use for domestic, agriculture, industrial use, and energy development. The Division also helps draft water policy and legislation that ensure the protection, restoration and enhancement of Solomon Islands' water resources.

5.3 Stakeholder Engagement

There has been formal and informal engagement undertaken throughout the development of the BMP (including earlier versions), AOMS and TOMS (refer the BMP for more details). The number of interested parties poses complications for engagement activities.

As part of the development and implementation of the BMP and associated offset strategies, the Project Office has prepared a BMP Consultation and Engagement Strategy. The purpose of this document was to scope and commence the consultation needed to facilitate the development and implementation of the BMP, AMOS and TOMS, acknowledging that this will be an ongoing process during construction and operation of the Project. A copy of the Strategy, including the outcome of consultation undertaken in April 2023, is provided in Annex P-2-5 appended to the main BMP.

Feedback received during the initial consultation includes:

- The upper Tina River catchment is culturally and nationally significant.
- There are multiple tribes that have connection to the area.
- There is a strong willingness from those tribes who have been consulted to protect the area from logging and mining interests, and to improve social and cultural connections with the land and ancestry:
    - The Buhu Garo tribe wishes to develop a protected area and carbon offset site whereby ecosystem services can provide sustainable incomes to their people. This process appears to be well advanced, including identification of an area for protection, preparation of a management plan, and employment of rangers. They are working alongside a local carbon trading company Wildlife Works.
    - The Uluna-Sutahuri tribe wish to protect the area to promote cultural connection to land through the *Vaolusia* model.[5]
    - The Charana and Chavuchavu tribes recognise the long-term benefits from protecting the catchment and want livelihood benefits for their communities.

[5] The Vaolusia Model is an indigenous land connection concept of the Bahomea and Malango people whereby reconnecting to land reveals commonalities of ancestry and pathways to solving problems, including land disputes.

- There is a desire for alternative income streams from the management of natural resources, and for engagement and "ownership" of the process by youth.

The BMP Consultation and Engagement Strategy complements the Project-wide Stakeholder Engagement and Communications Plan (P-3) Grievance Redress Mechanism (P-6) and related environmental and social management plans.

5.4 Roles and Responsibilities

The AOMS responds to impacts caused by the Project within and outside of Core Land. However, as offset requirements fall outside of Core Land, responsibility for the AOMS is to be coordinated by MMERE on behalf of SIG.

The key roles and responsibilities for implementation of the AOMS are illustrated in Figure 5-1. MECDM will lead the protection of the upper catchment, while MMERE will lead the Technical Assistance to identify complementary measures to conserve aquatic biodiversity. THL and HEC also play a role in the success of the upper catchment by providing security services within Core Land and therefore restricting unauthorised access to parts of the catchment. SIG will also need to manage and prevent unauthorised access to other parts of the catchment.

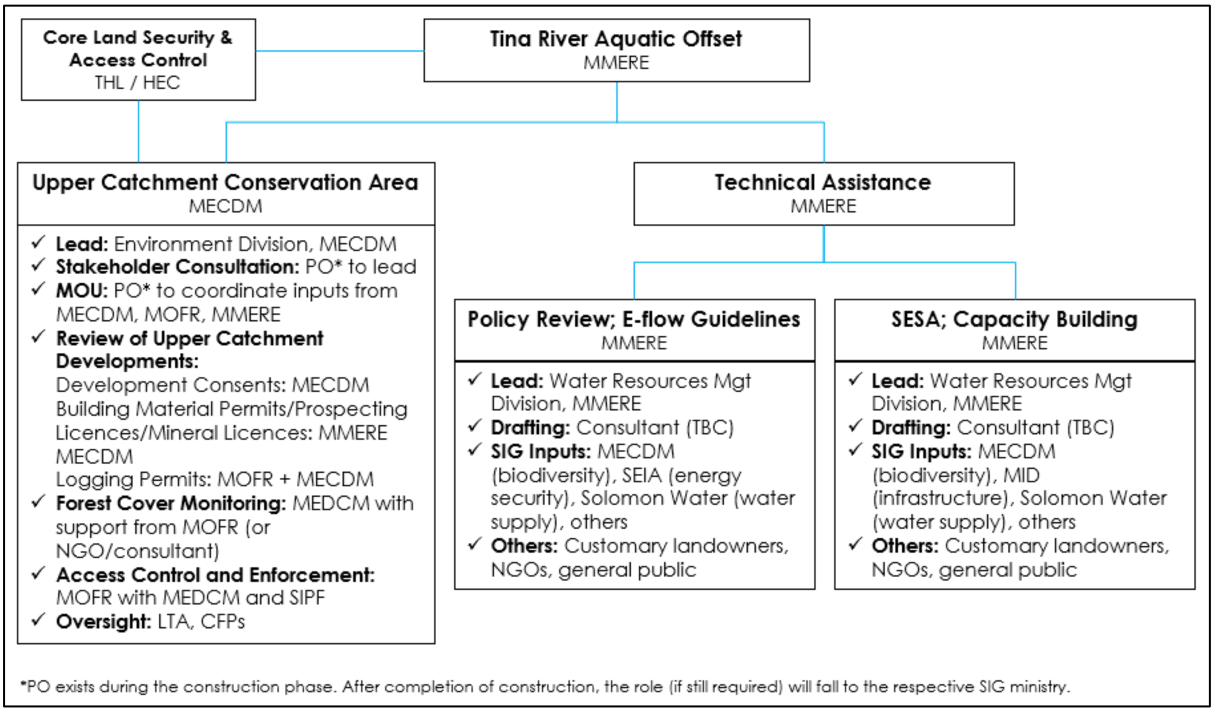

Figure 5-1: AOMS roles and responsibilities

5.5 Indicative Budget

Table 5-1 presents an indicative budget for implementation of the AOMS.

A number of activities are to be financed by Technical Assistance grants or other related sources at no cost to SIG:

- AOMS development and finalisation (funded by the Australian Infrastructure Financing Facility for the Pacific (AIFFP))

- BMP Communications and Engagement Strategy (TA funded by ADB)
- Technical Assistance, including Policy Reforms, Eflow Guidelines, SESA and Capacity Building (TA funded by ADB)

Funding sources will need to be secured to ensure the long-term protection of the upper catchment. With limited sources of funds, it is worth considering the range of alternative financing that could be used. These options are briefly summarised Table 5-2 below. In reality, a range of funding sources can be used to ensure the long-term viability of the upper catchment protected area.

5.6 Timeline

The AOMS is required to be in place and approved prior to the commencement of main works.

An indicative timeline of activities is included in Figure 5-2.

Table 5-1: Indicative budget and timeframe for implementation.

Item	Task	Budget Estimate (USD)	Timing	Notes
AOMS	CFP clearance	N/A*	May 2023	Final AOMS expected to be cleared May 2023
Upper Catchment Conservation Area	Letter of intent between MMERE, MOFR, MECDM	N/A	Dec 2022	Completed
	BMP Consultation and Engagement Strategy with process for permanent protection	$100,000 one off*	May 2023	Preparation of BMP Consultation and Engagement Strategy and initial consultation expected to be completed May 2023.
	Ongoing consultation	$15,000 per year (TBC)	Ongoing	Annual budget for MMERE to continue engagement activities. Assumes 1 FTE. Budget to be refined after completion of C&E Strategy.
	MOU between MMERE, MOFR, MECDM	N/A (largely drafted)	Final draft June 2023 In force by Dec 2023	In development The MOU will confirm governance arrangements; access controls; monitoring and management responsibilities; resource requirements.
	Monitoring and enforcement	$90,000 per year	Ongoing	Aerial mapping every 3 months, access control and incident response
	Management Plan	$80,000	TBC	To be developed once the pathway and mechanism for protection is confirmed. To cover the 30-year PPA period, with detail for the first 5 years, including annual budget. To be updated when needed, as a living document with formal reviews every 5 years.
Technical Assistance	Review and amendment of the River Waters Act; review and develop e-flow guidelines/policy; SESA to identify technically, financially and feasible aquatic offset options; capacity building	$3,000,000*	Q4 2023-2028	Assumed 5-year programme of development, funded via Technical Assistance grant. Initial work to be completed by December 2024.

*TA grant funding

Table 5-2: Alternative funding sources

Source	Notes
Tax Revenue	Funded solely by SIG. Protection of the upper catchment is unlikely to be seen as a priority and would be at risk of inadequate funding going forward.
Project Finance	A range of financing options may be available for protection of the Upper Catchment. This will require endorsement by CFPs, SIG and repayment of funds over time.
Technical Assistance	Technical Assistance is a viable option and highly attractive to SIG. It is particularly appropriate for the initial scoping and establishment of a protected area in the upper catchment. However, it is unlikely that TA grant funding will be available in perpetuity. Therefore, there is a need
Other donor funding	The creation of an upper catchment conservation area is likely to attract support from international NGOs, Universities and related institutions. Funding from these sources may or may not be short-term, and/or focus on specific areas or species. Funding for comprehensive and long-term management of the entire area may be more difficult to secure. Research support can also be provided, such as university students studying and monitoring biodiversity, and the production of papers that share knowledge.
Tariff	A portion of the tariff is allocated to the Community Benefit Sharing Programme. These funds could be used to employ Community Rangers to monitor and patrol Core Land and/or the Upper Tina River catchment.
Green Bonds	Green bonds (sometimes called Blue Bonds) are nominal fixed income bonds which provide finance for specific sovereign projects with climate change mitigation and environmental outcomes. Green Bonds help to ensure high quality projects with robust environmental outcomes are financed, delivered, monitored and reported on.
Carbon Trading	There is the potential to protect the upper catchment as a carbon offset site. Carbon projects provide long-term sustained income in the term of annual payments in return for not cutting down forests. These schemes are often accompanied by community livelihood restoration programmes to develop alternative sources of income and improve standards of living. Carbon projects must meet stringent criteria, including: • Additionality: emissions cuts would not have occurred without the carbon project investment. • Permanence: emissions reductions or removals represented by a carbon credit endure for the long term. • Leakage: deforestation is not simply displaced from one area to another. • Benefit-sharing: landowner communities are equitably compensated. It is not clear if carbon credits can be allocated to a proposed biodiversity offset site. This appears to vary between schemes.
Ecotourism	Promotion of the Tina River upper catchment as a conservation area could encourage ecotourism to the Solomon Islands. Revenue could be gained from providing tours to the hydropower scheme and reservoir; hikes in Core Land and the upper catchment; bird watching; accommodation etc.

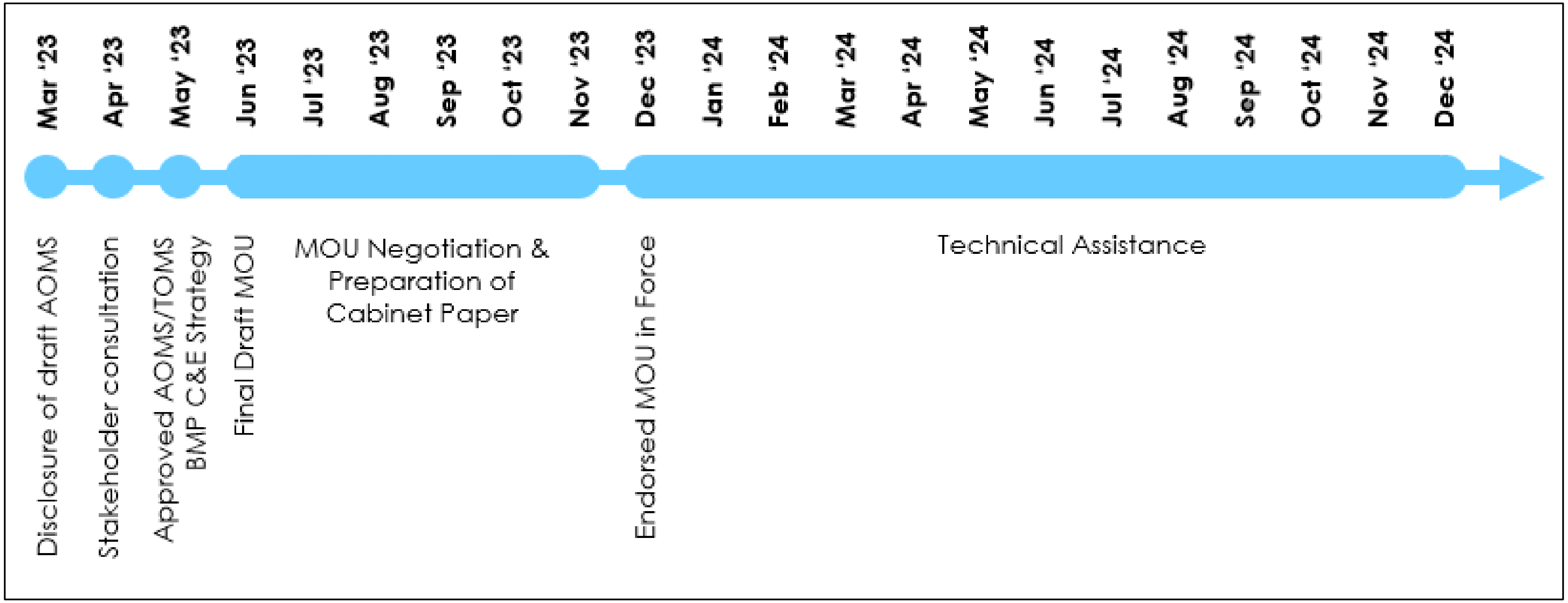

Figure 5-2: Indicative timeline

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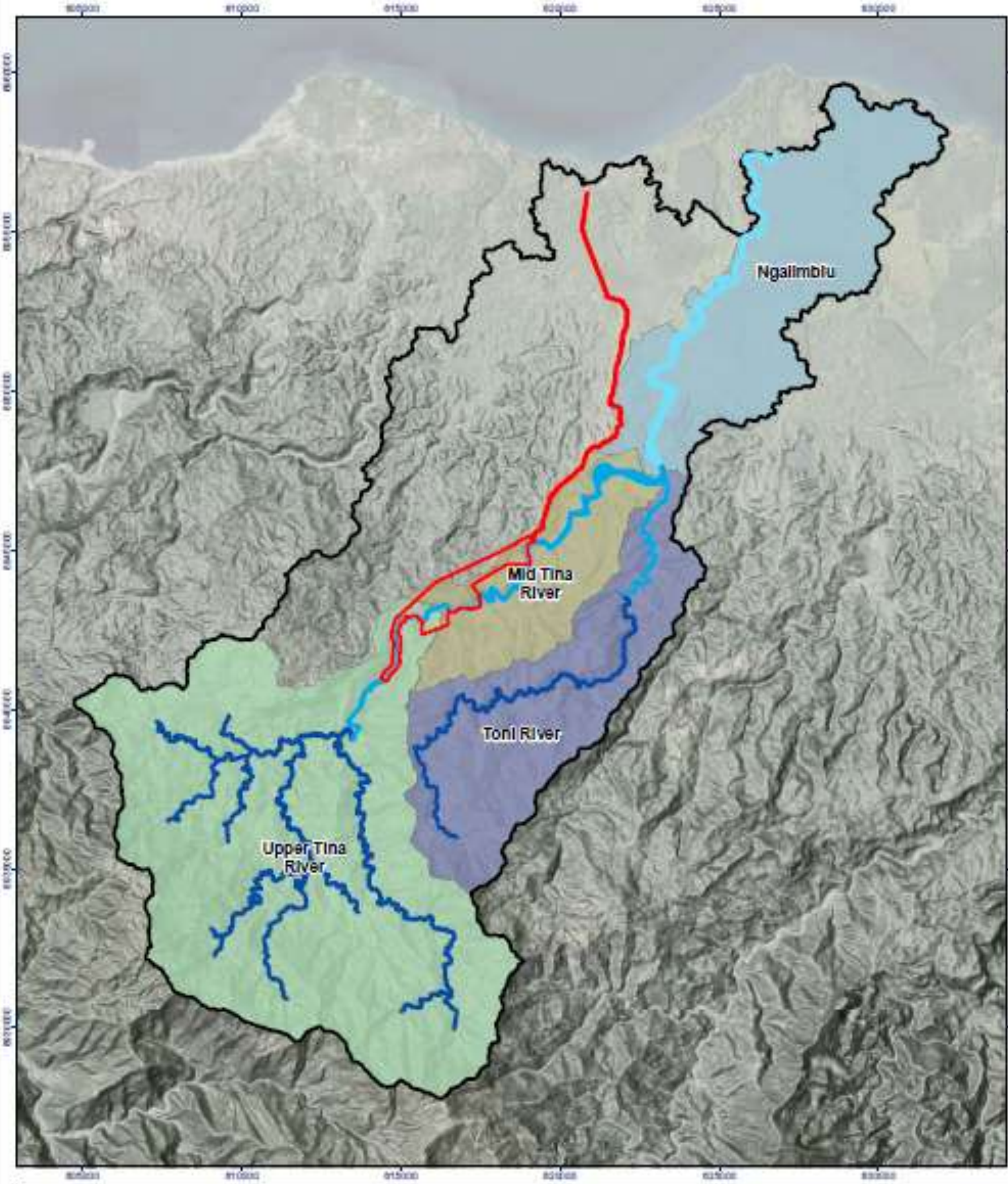
ANNEX I: MAPS



Project Area

Aquatic Habitat

- Lower Riverine Reach
- Mid Riverine Reach
- Upper Riverine Reach

Sub Catchments

- Mid Tina River
- Ngalimbiu
- Toni River
- Upper Tina River

0 2.5 5 km

(At original document size of A4)
1:100,000

Notes
1. Coordinate System: WGS 1984 UTM Zone 57S
2. Background: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Airbus, USGS, NGA, NASA, CGIAR, N

Stantec

Project Location	Prepared by AB on 2023-12-08
	TR by AB on 2023-12-08
Solomon Islands	IR Review by FT on 2023-11-xx
Client/Project	30020806

Australian Infrastructure Financing Facility for the Pacific
Tina River Hydropower Project
Safeguard Consultant

Title
Watershed 1 Sub Catchments

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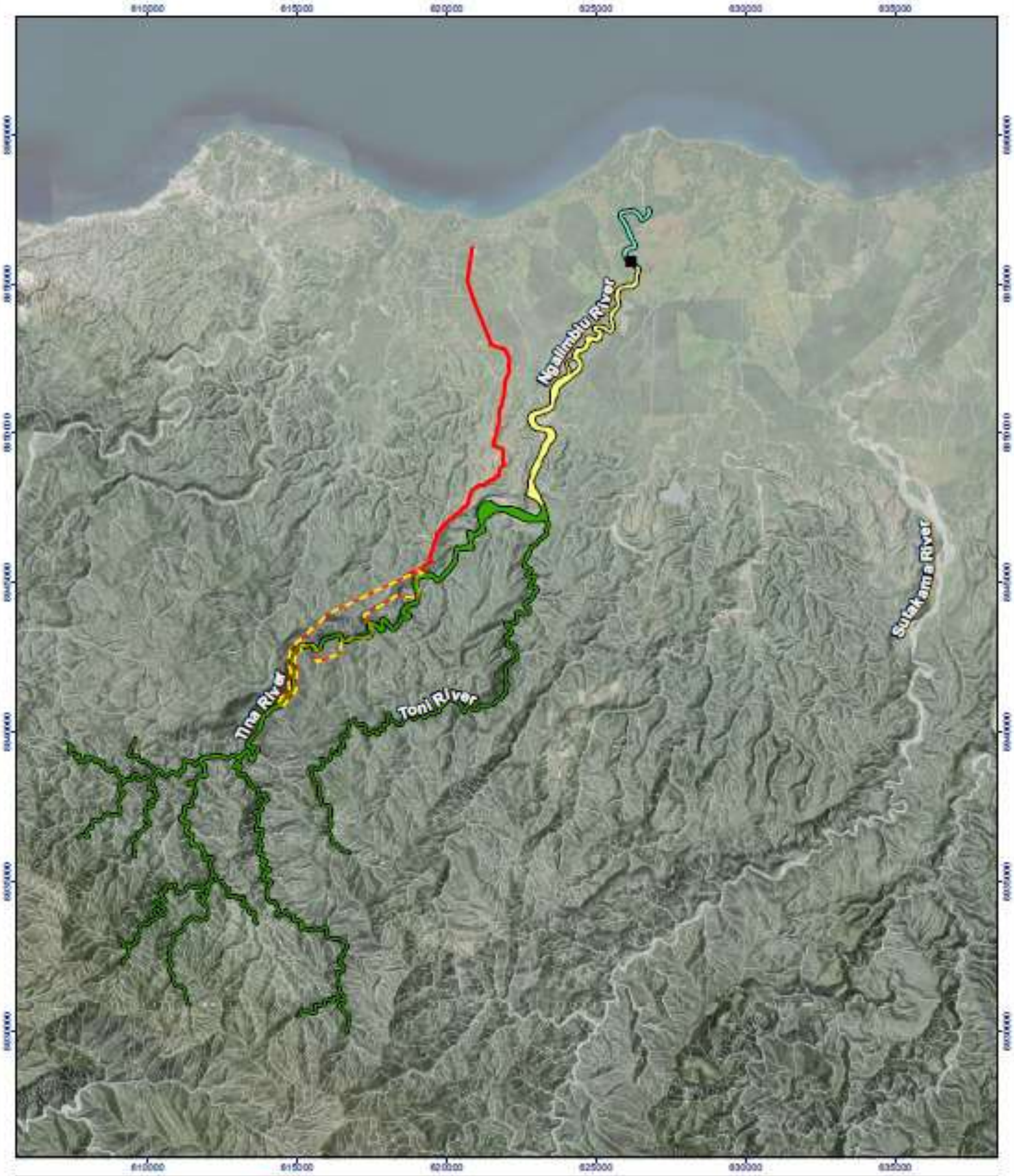

Project Area
Core Land
Station 10
Watercourses
Aquatic EAAA

Critical Aquatic Habitat

Critical/Natural (Upper and Mid Reaches)
Natural (Upper Ngalimbiu River)
Modified (Lower Ngalimbiu River from Station 10)

0 2.5 5 km
(At original document size of A4)
1:190,000

Stantec

Project Location
Solomon Islands

Prepared by AB on 2023-03-15
TR by AB on 2023-03-15
IR Review by FT on 2022-11-xx

Client/Project

Australian Infrastructure Financing Facility for the Pacific
Tina River Hydropower Project
Safeguard Consultant

Title
Critical Aquatic Habitat

Notes
1. Coordinate System: WGS 1984 UTM Zone 57S
2. Background: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Airbus, USGS, NGA, NASA, CGIAR, N

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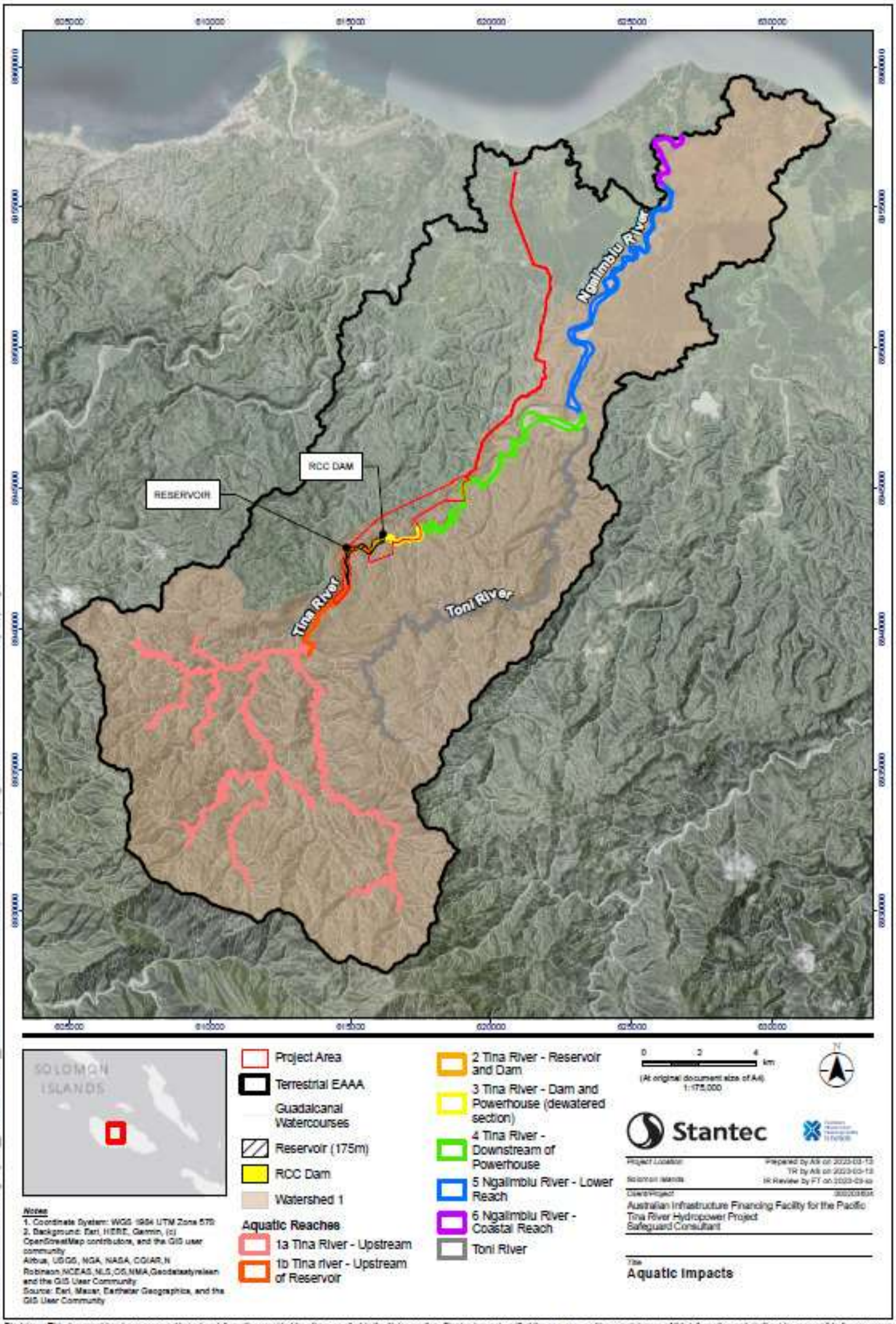

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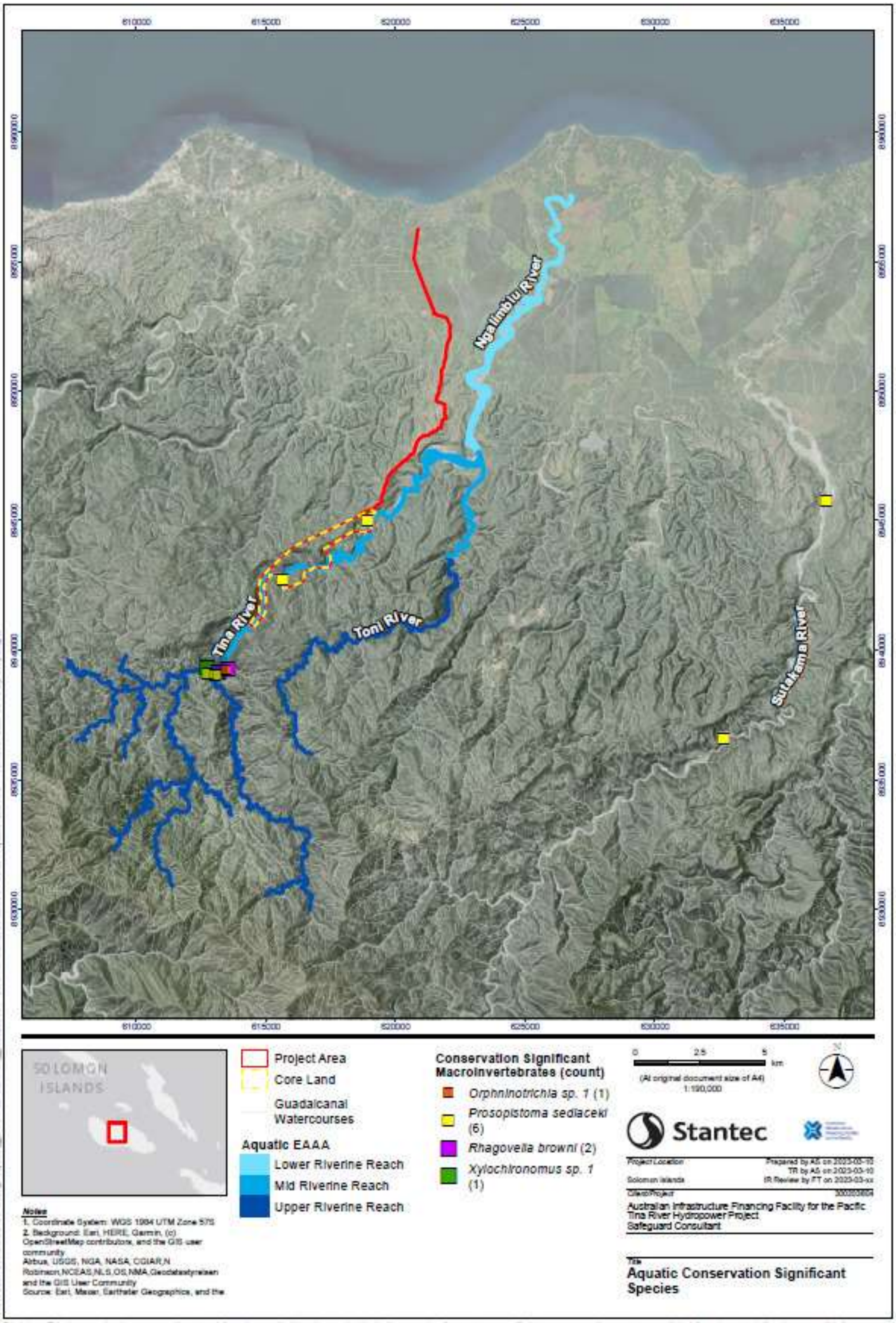

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ANNEX II: MULTICRITERIA ANALYSIS OF OPTIONS

Option	Description	Criteria						Overall Assessment
		Additionality	Equivalence	Permanence	Land Tenure	Stakeholders	Finance / Resourcing	
Aquatic offset within Core Land	Protect and restore the Tina River and riparian habitats within Core Land	None. River impacted throughout Core Land. Very little conservation gain.	Yes. Within Project area.	Yes. Core Land allows for long-term management.	Secure. Within Core Land.	Most stakeholders already supportive of the Project.	Small area and vicinity to the Project allows for effective management.	Not appropriate. There is only a very short section of river within Core Land and it is impacted by the Project. It is not possible to complete the offset within Core Land.
Protection of the lower Tina River Catchment	Protect and restore the Tina River and riparian habitats downstream of the Project, outside of Core Land	Yes. Would allow protection and restoration of natural and modified river and riparian habitats.	Yes. Same river system, albeit at lower elevation than the Project.	Problematic. The number and complexity of landowners is likely to prove difficult for long-term management.	Large number of different landowners, villages, agricultural and commercial land use.	Large number of different landowners, agricultural and commercial land use. Likely to be difficult to get broad community support.	Likely to be cost prohibitive, requiring significant physical and/or economic displacement.	The Project impacts the Tina River throughout its length, including downstream. Complexity of land use means that this option is not viable.
Protection of the upper Tina River catchment	Protect and restore the Tina River and riparian habitats upstream of the Project and reservoir, located outside of Core Land	Yes. Includes the protection of forest and riparian areas above and below 400 m elevation. Includes habitat for all 4 range-restricted macroinvertebrate taxa that were found in the catchment, triggering Critical Habitat. Part of the Guadalcanal Watershed KBA.	Yes. Same river system, albeit at higher elevation than the Project.	SIG is generally supportive of the protection of the upper catchment. PO is investigating the pathway to permanent protection, including the viability to create a legally Protected Area.	Outside of Core Land. Project Office indicates that there are 27 known tribal landowners. No known villages.	Landowners were previously supportive of creating a Protected Area in the upper catchment. SIG is generally supportive, subject to costs of implementation.	No physical displacement required. Purchase of land not considered necessary to secure the offset area, so long as landowner support is achieved. A range of financing options are available.	The Project impacts the Tina River throughout its length, including upstream. The area proposed will protect the habitat for all 4 macroinvertebrate taxa that triggered Critical Habitat for the Project. There is evidence of support for this option from some stakeholders.
Protection of the Guadalcanal Watersheds KBA	Extending the proposed offset area outside of the Tina River catchment to include the entirety of the Guadalcanal Watersheds KBA (378,538 ha)	Yes. Protection of forest and riparian areas identified as of importance for biodiversity.	Yes. Protects the upper catchment of the Tina River, Toni River and most other river systems on Guadalcanal.	The number and complexity of landowners may prove difficult for long-term management.	Tribal land outside of Core Land. Unknown if villages are present within the KBA.	Very large number of landowners and stakeholders.	Costs of securing and implementing the offset likely to be significant when compared to other options.	Very large area crossing several districts on Guadalcanal. Limited political will to pursue this option.
Protection of the Toni River catchment	Protecting the Toni River to offset impacts on the Tina River.	Protection of forest and riparian areas above (and potentially below) 400 m elevation.	Unaffected river located within the same catchment. Smaller river system.	Will require agreement of government and landowners to allow for management.	Tribal land outside of Core Land. No known villages except at very mouth of the river.	Several tribal landowners. May include communities that are already engaged in the Project. Existing logging and mining interests that are likely to oppose any protection.	No physical displacement required. Potential economic displacement due to existing logging and mining interests.	Not viable due to existing mining and logging interests in the Toni River catchment.

Option	Description	Criteria						Overall Assessment
		Additionality	Equivalence	Permanence	Land Tenure	Stakeholders	Finance / Resourcing	
Protection of an adjacent river catchment e.g. Sutakama River	Protecting the Sutakama River to offset impacts on the Tina River.	Protection of forest and riparian areas above (and potentially below) 400 m elevation.	Located in a nearby river system with similar size and aspect. Includes aquatic ecology control sites. The river supports one of the 4 macroinvertebrate species that triggered Critical Habitat for the Project.	Will require agreement of government and landowners to allow for management. May be difficult to achieve given the location away from the Tina River.	Tribal land outside of Core Land. At least one village present (Nanala).	Large number of landowners not previously engaged in the Project.	Costs of securing and implementing the offset likely to be high when compared to other options.	Located in a different catchment physically removed from the Tina catchment. Likely to be sufficient length and area of river to meet offset requirements. Migratory and non-migratory fish habitat protected. However, permanent protection will likely to be difficult to achieve due to expected lack of government and landowner support.
Removal of barriers to fish passage e.g. dam removal; bridge/culvert replacement	Removal of barrier(s) to fish passage in other catchments yet to be determined.	Yes. Can easily quantify the area of habitat restored based on the area of habitat upstream of any structure to be removed.	Would return fish passage to other river system(s) currently impacted. Unknown where or if such structures are located.	Yes. Limited long-term management required once barriers are removed.	Unknown. Likely to be tribal land. Most structures likely to be associated with roads.	Unknown. Dependent upon the location of structure(s) to be removed.	Short term investment required up front to mitigate structures. Less ongoing cost.	The location and nature of any fish passage barriers are not known. Given that fish were not the taxa that triggered Critical Habitat for the Project, this option has not been pursued further.
Funding for SIG to improve enforcement of existing forestry laws	Greater enforcement or formal protection of forests (and consequently riparian habitat and rivers) above 400 masl within Guadalcanal, with a focus on the upper Tina River catchment.	Regulations already exist to restrict mining and logging above 400masl. Improved management, patrolling and enforcement would lead to greater protection of terrestrial and aquatic biodiversity.	Will protect generally small stream and rivers above 400 masl.	Will require ongoing funding and commitment from SIG.	Tribal land outside of Core Land.	Various, depending upon how wide the implementation is (e.g. Tina River only or broader throughout Guadalcanal or SI)	Costs for short-term and long-term management could be included in annual SIG budgets. Source of funding would need to be determined.	SIG are meant to be protecting these areas already. Net gain may be difficult to monitor and quantify, but could be via satellite imagery.
Funding for SIG to develop new law/policy to protect rivers throughout the Solomon Islands	Drafting of new guidelines related to environmental flows and associated changes to existing laws	Yes. If implemented, the new policy would lead to improved management of SI rivers.	Would potentially benefit streams and rivers throughout the Solomon Islands.	Yes. New guidelines and legal amendments would remain in place permanently unless repealed.	None.	Predominantly government stakeholders.	Costs would be discrete, with defined outputs. Grant funding available.	The development of new eFlow guidelines and regulations will result in long-term benefits for aquatic biodiversity and improved certainty for water resource developments.
Funding for research to improve the knowledge of SI aquatic biodiversity e.g. development of a fish or macro-invertebrate key(s)	Funding of research to inform conservation and management of aquatic biodiversity in Guadalcanal.	Likely to lead to improved, more informed, management and conservation of aquatic ecosystems. Difficult to quantify gains.	Research is not equivalent to direct impacts to biodiversity, but may enhance biodiversity values far beyond residual impacts by improving the effectiveness of management and conservation actions going forward.	No long-term management required. Long-term impact and implementation of research findings difficult to monitor and quantify.	None.	Stakeholders likely to include research institutes, NGOs who are likely to be supportive.	Costs would be discrete and reasonable, with defined outputs. External funding likely to be available.	May be difficult to quantify and demonstrate net gain (although agreed KPIs could be developed).

Annex P-2-5: BMP Consultation and Engagement Strategy.

BMP Consultation & Engagement Strategy and Preliminary Feedback Report

Prepared by the TRHDP Project Office

TABLE OF CONTENTS

1. Part 1. BMP Consultation and Engagement Strategy

1.1 Purpose

The purpose of the BMP Consultation and Engagement Strategy (BMP-CES) is to scope and commence the consultation needed to facilitate the acceptance, development and implementation of the BMP, AOMS and TOMS, acknowledging that this will be an ongoing process during construction and operation of the Project. The document will also help to develop a plausible indicative engagement process to work towards the protection of the upper Tina River catchment (UTC). The strategy provides the methodology and tools required to identify stakeholders and ensure genuine stakeholder participation in this process, helping to foresee and manage potential risks associated with the implementation of the BMP, with particular emphasis on the protection of the UTC.

The document is divided into two sections, the first outlining the overall approach to consultation and engagement for the implementation of the BMP AOMS and TOMS and the second section reports on the preliminary feedback received and lists recommendations on how to proceed with stage 2 consultation and engagement with UTC landowners to protect the UTC in line with the BMP. The objective of the stage 2 consultation and engagement is to establish a Plan of Management (PoM) that will be utilised by UTC landowners to benefit from protecting the catchment.

This strategy is designed to complement the P3- Stakeholder Engagement and Communications Plan that guides project related information flows between relevant stakeholders during project construction.

1.2 Stakeholder identification and analysis

1.2.1 Stakeholder identification

Stakeholder identification for the Project was undertaken in accordance with the Stakeholder Engagement Plan 2012 and further defined through the ESIA processes since then. The current list of stakeholders can be viewed in the P3 – Stakeholder and Communications Plan. This list includes customary landowners of the UTC as defined by the indigenous land identification process that used customary knowledge to trigger the project land acquisition. The PO is not aware of any information to suggest that this list is not a current and accurate list of landowners for the entire Tina River catchment. The list, however, does not definitively identify landowners who retain rights to logging, fishing, hunting and cultural access to the UTC and therefore further work is required to scope and identify landowners with proven ongoing connection to the UTC.

PO staff including CLOs have identified through local knowledge and networks, key informants from the current list of Directly Affected Population who self-identify as having cultural connection to the lands within the UTC. The key informants have established focus groups of interested landowners and are currently being consulted by the PO as part of the BMP-CES. A further community vetting process of these focus groups is being undertaken through which community members are afforded the opportunity to challenge both the intent and membership of these groups. This has been initiated by landowners themselves through public notices of intent in the impacted communities. It anticipated that some UTC landowners will also be members of the Directly Affected Population and beneficiaries of CBS.

There exist several general stakeholders with relevant interests in the protection of the UTC including NGOs, the private sector and relevant ministries of the SIG. These are included in table 1 and have been identified through an ongoing process of consultation and engagement undertaken by the PO during the planning phase of the project and the development of the draft BMP.

1.2.2 Relevant Stakeholders

Table 1. Stakeholders to be consulted as part of the BMP-CES.

Stakeholder	Stakeholder Name	Priority issues for BMP implementation	Engagement methods
Offset affected stakeholders	Bahu Garo landowners Uluna Sutahuri landowners Other UTC landowners as they emerge (Chavuchave, Charana, Sarahi, Salasivo)	• Community Support for BMP implementation • Community Participation in protection of UTC • Community benefit from protection of UTC	• Key informant interviews • Focus Group Discussions • Stakeholder Planning Forums • Participatory planning activities
Directly Affected Population	Community Benefit Share communities & Tina Project Area Company (TCLC)	• Understanding of Core Land access constraints • General understanding of the importance of UTC protection	• Community Forums • Internet dissemination of information • Information access at site offices
	Community Benefit Share Women's Groups	• Impact of BMP implementation on women and families	• Focus group discussion facilitated by PO Gender expert • Community Forums • Internet dissemination of information • Information access at site offices
General stakeholders	Islands Knowledge Institute	• Shared interest in cultural and natural preservation of UTC	• Face to face meetings • Stakeholder planning forums
	Live and Learn	• Shared interest in poverty reduction and environmental education	• Face to face meetings • Stakeholder planning forums
	FAO	• Relevant experience and interest through GEF	• Face to face meetings
	MECDM	• Ministry responsible for leading the implementation of UTC conservation MOU	• Face to face meetings • Stakeholder planning forums
	MMERE	• Ministry responsible for PO oversight and partner to UTC conservation MOU	• Face to face meetings • Stakeholder planning forums
	MOFR	• Partner to UTC conservation MOU and key relevant ministry for development of carbon schemes	• Face to face meetings • Stakeholder planning forums
	Solomon Power	• Signatory to PPA and relevant to potential funding negotiations	• Face to face meetings • Stakeholder planning forums
	Carbon Traders eg Nakau, Ecological Solutions Foundation	• Shared interest in catchment protection	• Face to face meetings • Online/telephone engagement • Stakeholder planning forums
	Solomon Islands National University (SINU)	• Research programs in cultural and environmental education	• Face to face meetings • Online/telephone engagement • Stakeholder planning forums
	THL/HEC	• Core Land area BMP management	• Ongoing coordination

1.2.3 Summary of previous stakeholder engagement activities relating to BMP

A summary of BMP consultations can be viewed in table 7-1 of the BMP. Ongoing consultations as part of the socialisation and implementation of the BMP will be recorded in the Stakeholder Engagement Management Database managed by the PO. Preliminary consultations will be outlined in the Preliminary Feedback Report.

1.3 BMP Communication and Consultation with Stakeholders

1.3.1 Biodiversity Offset Key Messages

Unfamiliarity with the concept and term 'biodiversity offset' within the proposed offset affected communities presents challenges to effectively communicating the purpose of the AOMS and TOMS. The PO has compiled a list of simplified key messages and FAQs to communicate both the technical details of the proposed offset, as well as the wider implications of the importance of protecting the catchment to the upper catchment landowners and wider Solomon Islands population. These messages and FAQs are used as standalone materials during consultation activities.

Definitions

Biodiversity is the variety of life on earth including different ecosystems, species and genes.

Natural Habitat refers to land and water areas with mostly native plant and animal species and have not been drastically altered by people.

Critical Habitat refers to land and water areas that are significantly important to critically endangered species.

Terrestrial Habitat are areas of land such as rainforests and grasslands.

Aquatic Habitat are river areas such as the Tina River.

Biodiversity Offset is an area that is being protected and improved to compensate for another area that has been impacted by an activity.

No net loss of biodiversity refers to there being no overall loss in biodiversity because of a project due to measures and actions put in place by a developer and other stakeholders.

Message 1. Lender requirements for the project are that the TRHDP does not result in a net loss in natural habitat and ideally reaches a net gain in critical habitat. This means that the project must seek to avoid or minimise any destruction to natural habitat and then restore it when it does or enhance another area through an offset when that is not possible.

Message 2. The proposal is to protect and preserve biodiversity in the upper catchment, both aquatic and terrestrial.

Message 3. The protection will be implemented with the support of landowners, government and outside parties who have indicated in consultation that they also want to see the area protected.

Different stakeholders will have different roles as follows:

SIG Roles	• MOU between MOFR, MECDM and MMERE for the duration of the PPA. SIG will enforce and monitor existing laws to protect the biodiversity of the catchment above 400masl. • SIG will subject any development applications under 400masl to requirements to protect the catchment under the MOU and reject them if they do not comply. For example, commercial logging and mining. • SIG will engage customary landowners to develop a Plan of Management that: 1) Clearly maps the boundaries of the catchment to be protected. 2) Lists prohibited and permitted activities within the catchment. 3) Promotes activities that lead to catchment protection.

	4) Links landowners to catchment protection programs and activities that benefit them including livelihood opportunities.
Landowners	• Landowners will be permitted to continue customary access to the catchment and undertake activities agreed in a Plan of Management. These will include non-commercial hunting, fishing, foraging and other activities. • Landowners will voluntarily participate in the protection of the catchment and will potentially benefit from doing so through income and other benefits yet to be defined. • Landowners will be invited to engage in a longer-term process with the SIG to develop a Plan of Management that also defines the benefits that landowners will receive.
Outside parties	• Support landowners to manage the catchment through funding, technical support and advise. This may be though: 1) cultural education programs 2) ranger programs 3) Eco-tourism 4) Livelihood development 5) Biodiversity awareness and protection programs 6) Others such as ecosystem services

Message 4. The land will not be acquired by the SIG. It will remain under customary ownership but will eventually have a Plan of Management overlay.

Message 5. Protecting the upper catchment ensures sustainability of the hydro facility and income generated by the scheme as well as reducing power costs and decreasing greenhouse gas emissions.

Message 6. SIG is committed to the welfare and rights of its people; therefore, it wants to hear from UTC landowners who have any questions, concerns, ideas or suggestions about the proposal to protect the upper catchment, to document these concerns and to communicate these to project implementors and the CFPs.

1.3.2 Frequently Asked Questions

What is a Biodiversity Management Plan (BMP)?
A BMP is a way of ensuring that the biodiversity impacts of a project are avoided, minimised, mitigated or offset. It seeks to ensure that there is permanently no net loss to biodiversity because of the project, and preferably a net gain.

What is a Biodiversity Offset?
A Biodiversity offset is an area that is being protected and improved to compensate for another area that has been impacted by an activity.

How can I have a say in the implementation of this BMP?
Ongoing feedback to the project can be delivered through the current GRM process. Upper catchment landowners can become involved in the ongoing implementation of the BMP in the upper catchment through the upper catchment protection consultation process that is being facilitated by the PO.

How will the BMP impact me?
Under the proposal, the upper catchment area will be protected from commercial logging and mining activities. This means landowners will not be able to sell timber from the area or benefit from mining activities.

I am a customary landowner from the upper catchment, how can I be involved in this process?
The TRHDP PO is consulting with upper catchment landowners to establish a Plan of Management for the upper catchment. The Plan of Management will be designed, developed and implemented by customary landowners. Customary landowners of the upper catchment are free to join this process.

How have upper catchment landowners been identified for consultation?
The PO has been guided by the Bahomea Land Identification Committee to identify landowners of the upper catchment. Any landowners not currently included in consultations who believe they should, can contact the Project Office.

What will be the consultation process to implement the BMP?
The PO will link customary landowners with other stakeholders that have an interest in the protection of the upper catchment to map the landowner priorities and aspirations for protecting the catchment. Through this process a management committee and Plan of Management for the catchment will be developed.

What kind of benefits will customary landowners receive from protecting the upper catchment?
The precise benefits are not yet known, however, there is potential that landowners may benefit from projects where other stakeholders have a shared interest in the protection of the catchment. For example, through ranger programs, cultural and environmental programs and research. Other livelihood programs or options will be explored as the project progresses.

How will these benefits be identified?
Potential benefits will be identified through the consultation process with landowners where landowners prioritise how they would like to utilise the catchment for protection. Landowners will be at the centre of this process.

When will we receive benefits from protecting the upper catchment?
It is hard to say exactly when benefits may be received. The benefits from protecting the upper catchment may occur after management plans are in place, after the consultation process has been completed and agreements are made.

Will the upper catchment be acquired by the government?
No. Unlike the Core Land area, the upper catchment will not be acquired by the government. It will remain as customary land but will have catchment protection overlay on it.

How would a protected area be managed?
The area would be managed by a landowner management committee. All activities within the area would need to comply with the management plan that is designed by landowners. The government, through its MOU, will enforce current protection legislation for areas above 400masl and consider all applications for development under 400masl in accordance with the intent of the MoU, which is to protect the catchment.

What activities would be permitted in the upper catchment if it is protected?
It will be up to the landowners to determine what activities can and can't be done in the upper catchment. Commercial logging and mining will be excluded, but it is likely that other activities such as non-commercial hunting, fishing and foraging for personal use will be allowed.

1.4 Key Principles of Engagement

The PO led consultation and engagement will build and maintain constructive relationships between stakeholders during the commencement of the project to test and ensure the viability of implementing the proposed BMP. This entails the provision and sharing of relevant and understandable information for project stakeholders and providing a platform for stakeholders to express their views and concerns relating to the BMP implementation for consideration by CFPs, SIG and project implementors.

A variety of techniques will be employed over the course of the consultation and engagement including face to face meetings, key informant interviews, focus group discussions, community forums, social media posts and stakeholder workshops. Face to face meetings with key informants and focus groups will utilise a *Tok Stori*[1]

[1] *Tok Stori,* the Melanesian term for 'telling stories', is an approach that has been used successfully by development actors in the Solomon Islands to build connection and elicit clear flows of information, less liable to bias that can result from more structured interview processes.

approach whereby the key messages are communicated, and a conducive space is opened for stakeholders to convey their views. The voices of vulnerable groups, including women, will be given special consideration by ensuring women's participation in meetings, the involvement of female staff from the PO, as well as ensuring that the timing and placement of meetings takes into consideration women's multiple roles as well as the accessibility of the elderly and otherwise vulnerable groups to attend.

1.5 Methodology

The BMP and associated documents will be disclosed in accordance with the TRHDP Media Protocols, ensuring timely and transparent delivery of information and adequate time for stakeholders to review and comment on the relevant documents. Disclosure of the BMP and associated plans is currently scheduled for March 29th 2023. Comments and concerns will be received by the PO and THL during a follow up community forum that will be led by THL in early April. Community members are also able to and encouraged to access the TRHDP GRM to provide feedback on the BMP. THL will lead this component of the consultation in line with their own established BMP Disclosure and Community Consultation Plan.

The PO will begin testing the viability of the BMP, in particular the AOMS, with the UTC landowners through focus groups established during the stakeholder identification phase that runs contiguously with the disclosure process above. Key messages will be delivered and the *Tok Stori* approach utilised to garner an understanding of landowner enthusiasm and concerns pertaining to the implementation of the BMP. The PO has developed culturally appropriate key message materials to be distributed to key informants and at focus groups. Further details of the consultation process are outlined in table 2.

General stakeholders with a shared interest in the implementation of the BMP will also be consulted at this stage. The PO will lead face to face meetings where possible as well as undertake phone interviews. Key messages will be conveyed, testing assumptions, foreseeing potential obstacles to the BMP implementation, while also looking for possible opportunities for future collaboration in the implementation of the BMP.

A key outcome of the initial engagement is the development of a Preliminary Feedback Report which will provide a summary of consultation activities undertaken, including the methodology, timing, location, stakeholders present, and feedback received. The report will:

- Record landowner support for the proposal, including a summary of plans and aspirations for protecting the upper catchment in line with the offset strategy.
- Catalogue the extent, if any, of dissatisfaction with the BMP plan and highlight identified risks to its implementation.
- Catalogue potential partners for the implementation of the BMP, including NGOs and private sector.
- Identify lessons learned from other similar projects that have been implemented or attempted in the Solomon Islands.
- Provide recommendations on further consultation activities required to ameliorate these risks and mitigate future risks that may arise during project design development.
- Include the results of THL led consultation and engagement activities pertaining to the BMP disclosure.
- Will be compiled on or before the 17th of April 2023 to support the finalisation of the BMP, AOMS and TOMS.

Contingent on the preliminary feedback report revealing no overwhelming objections to the viability of the BMP and documented support from UTC landowners to participate in the protection of the UTC, the PO will commence ongoing consultation with stakeholders (phase 2 consultations). These consultations will focus on the role of UTC landowners to participate in the implementation of the BMP and to develop a PoM for a biodiversity offset in the UTC that includes a suite of mitigation measures from which landowners benefit, improving the likelihood of sustainability for the protection of the UTC.

1.5.1 A plausible indicative process to work towards the protection of the upper catchment.

Phase 2 consultations will commence as a participatory planning process with UTC landowners after the acceptance of the BMP, TOMS and AOMS from May 2023 onwards. The PO will utilise in house expertise and external consultants to undertake the participatory planning process bringing to the planning potential partners and collaborators including SIG MOU signatories, NGOs, private sector and biodiversity experts with a shared interest in the protection of the UTC. This process will assist UTC landowners consolidate their own ambitions for catchment protection. The PO will engage with the Biodiversity Advisory Group (BAG) to assist in the planning and implementation of the consultation process ensuring consistency and alignment with the BMP.

The **participatory planning process** will help the UTC landowners identify and prioritise the offset options that best suit their needs, are practical to implement, align with the BMP, and bring tangible benefits to the landowners. An expert facilitator will probe the landowners to design a benefits program that meets the above requirements. Where external stakeholders are involved, for example carbon traders, these organisations will be facilitated to present their models for consideration, however, these external actors will not lead the consultation process.

The desired outcome from the phase 2 consultations is a PoM for the UTC protection that includes priority areas of action; partners and potential partners; funding requirements; risk management; performance measures and a realistic timeframe for implementation. This Plan of Management would become the framework for the official declaration of a Protected Area in the UTC and the main channel for ongoing monitoring and feedback on the progress and status of the BMP implementation in the UTC.

1.5.2 Steps required to create a Protected Area in accordance with the SIG Protected Areas Act 2010[2].

1. Initial consultation with landowners to gauge support for and develop PA proposal. This will be completed under phase 1 consultation to develop a preliminary feedback report on the feasibility of the BMP implementation.
2. Prepare for PA landowner consultation meetings. This step is legally required by the SIG and notice should be publicly announced both 4 and 1 week prior to the meeting. Individuals that cannot be at the meeting should be consulted individually and other channels for communication such as letter writing should be established.
3. Undertake the PA landowner consultation meetings. A consensus and resolution to protect the area should be reached at this stage. The meeting must follow the disclosure process above, have accurate record keeping and resolutions signed off by at least two participants.
4. Establishment of a Management Committee. This committee will become the focus for writing the management plan and fulfilling the next steps towards the designation of a Protected Area.
5. Preparation of Map of PA. This is a legal requirement for the preparation of a PA and must show accurate boundaries.
6. Write to and meet with the Ministries and Provincial Government. In this case, close collaboration between landowners and Ministry parties to the MOU for the Upper Tina Catchment, will be important for landowners to communicate their wishes to SIG.
7. Meet with neighbouring tribes to confirm customary land boundaries and get support for the proposal. This is a legal requirement for a PA and a written agreement must be signed between neighbouring tribes and the landowning tribes. The map of the area must be agreed to.
8. Prepare the management plan. It is a legal requirement for the declaration of a Protected Area that a Plan of Management is submitted to SIG. Program partners will facilitate landowners through a participatory process to develop a Plan of Management that identifies:
    a. Reasons for declaration of the PA.
    b. Sites of biological importance.
    c. Sites of cultural importance.
    d. Sites of misuse.
    e. Other reasons for the declaration.
    f. Other conservation programs in the area that are supporting biodiversity protection in the area.

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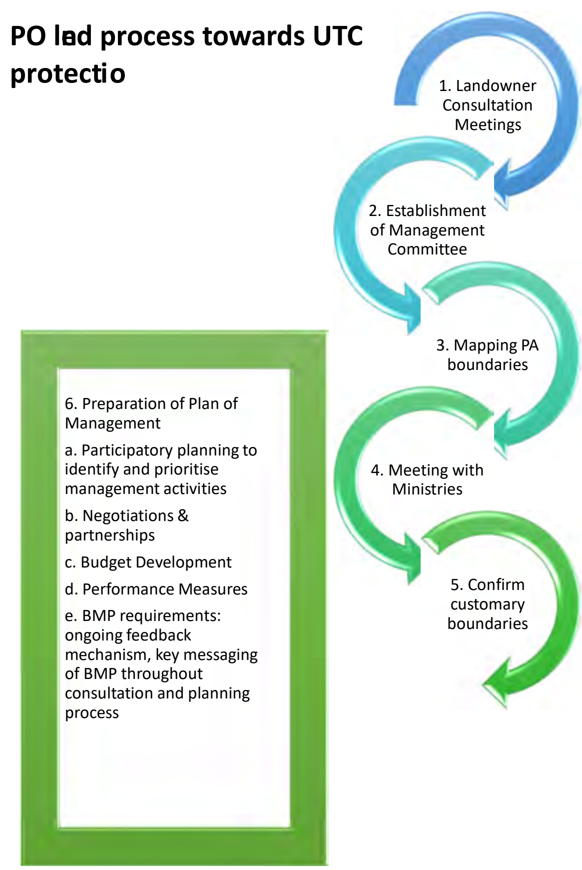
[2] Adapted from 'Protected Areas Toolkit' written by Landowners Advocacy and Legal Support Unit of the Solomon Islands Public Solicitor's Office.

9. Prepare the budget for the PA. The budget will include all aspects of the required management plan such as staffing (eg Rangers) and infrastructure (PA signage, ranger huts, paths, trails).
10. Complete and submit the SIG Protected Area application form to the Director of Environment.
11. Work with the MECDN to follow progress of application and address any unfulfilled requirements.

1.5.3 In the eventuality that a Protected Area and Plan of Management cannot be developed.

If a Protected Area cannot be officially declared due to a breakdown in the processes described above, the PO will still strive to ensure that UTC landowners are engaged in protecting the UTC in line with the proposal outlined in the BMP. That is, with local implementing partners, the PO will facilitate participatory planning processes to assist UTC landowners to identify and prioritise management activities for the UTC and define how landowners will benefit from these actions through agreements with other stakeholders. In the absence of an official Plan of Management, an alternative mechanism to ensure ongoing monitoring and feedback on the ongoing viability of BMP implementation will be sought.



1.6 Consultation framework

Table 2. Consultation framework for Stage 1 and 2 consultations from March 2023 to August 2025

Objective	**Communication & Consultation Actions and Outcomes**	**Targeted Stakeholder**	**Responsible parties**	**Timing**
1. Disclosure of BMP documents.	Draft BMP published on Tina Hydro Website.	All project Stakeholders.	PO	March 29th 2023
	Draft BMP socialised through social media.	All project Stakeholders.	PO	March 29th 2023
	Socialisation of BMP at community forum[3]. Key messages: • HEC & THL present Management, Monitoring and Mitigation measures listed in BMP and OMAS. • Interact face to face with participants to solicit feedback.	Communities: a. Antioch/Valesala b. Tina/Horohotu/Valebebe/ Haimane/Vuramali/Katihana c. Namopila/Habusi/Valekocha/ Vatenudi/ Komureo d. Marava/Ngongoti/Valele Project Stakeholders: THL, HEC, Stantec, PO, TCLC, MSS External stakeholders: MECDM, MoFR, MMERE	THL	4th of April 2023
	Preparation of hard copy BMP documents to be made available at PO and HEC/THL site offices.	All project Stakeholders.	PO & THL/HEC	March 28th 2023
	Reporting and Documentation: THL Consultation and Engagement Report, reporting engagements through Stakeholder Engagement Management Database, Photo documentation and minuting of community forums including sex disaggregated data of attendance, Preliminary Feedback Report to be included in next BMP document review and release. Review and update of Stakeholder Engagement Management Database. NB All engagement is undertaken in accordance with Tina River Hydropower Development Project Media protocols (Annex P-3-III).			
2. Implementation of T-OMS within Core Land area	Stakeholder engagement to implement preferred option of T-OMS **Refer P-3** - THL and PO to coordinate stakeholder engagement. - THL to lead on issues pertaining to use and access of core land area.	Communities with relevant interests in access and use of core land area.	THL & PO	April 2023 onwards

[3] As outlined in THL BMP disclosure and Community Consultation Plan March 2023.

	Reporting and Documentation: PO update of Stakeholder Engagement Management Database, THL reporting in accordance with P3 Stakeholder Engagement and Communications Plan			
3. Development and implementation of A-OMS and T-OMS in upper catchment	UTC stakeholder identification process: - Review of Bahomea land identification committee UTC landowner list. - Establishment of Key Informants. - Scoping of intertribal connections and sister clans with Key Informants. - Establishment of UTC landowner focus groups led by Key Informants.	UTC Tribal landowners.	PO	March to April 2023
	Peer review and community vetting of UTC landowner focus group: - Announcement of BMP implications for upper catchment at public BMP disclosure forum. - Sharing of stakeholder list among focus groups. - Facilitate internal vetting of focus group members.	UTC Tribal Owners.	PO with UTC TOs	March to April 2023
	Testing the viability of the BMP plan with UTC landowners. - Develop and distribute culturally appropriate key message materials - *Tok Stori* sessions with focus groups - Facilitate the gathering of relevant information from key informants. - Document feedback into preliminary feedback report	UTC landowner focus groups (landowners, CBS communities & women's groups).	PO	April 3rd until April 12th 2023
	General Stakeholder consultations, testing assumptions, observing obstacles, looking for collaboration. - Face to face meetings - Phone interviews	General stakeholders	PO	April 3rd until April 14th 2023

	Phase 2 consultations: Implementation of 6 step plan for the development of a UTC Protected Area that aligns with the TOMS and AOMS. Key actions: 1. Landowner consultation meetings with female and male UTC landowners. 2. Establishment of management committee representative of women and men and tribal areas. 3. Mapping of tribal areas and PA boundaries. 4. Meetings with Ministries. 5. Confirm customary boundaries of neighbouring tribes. 6. Preparation of Plan of Management (PoM) - Participatory planning workshops to assist landowners to identify and prioritise management activities to protect catchment and determine how landowners will benefit. - Negotiations and partnerships - Agreed Budgets. - Agreed performance measures. - Agreed timeframes - Ongoing dispersal of key messaging materials - Use of GIS, Flora and Fauna survey data etc - Site visits - Ongoing engagement to hear feedback and any issues that impact on the viability of the BMP implementation (this will be a mechanism built into the Plan of	UTC customary landowners, external Stakeholders	PO, SIG, NGOs, Private sector	May 2023 to August 2025

	Management in collaboration with the BAG).			
	Reporting and Documentation: Completion of Preliminary Feedback Report, Documentation of all engagements in accordance with Project wide protocols, Development of UTC Protection Plan of Management. Development of Key Message IEC materials			

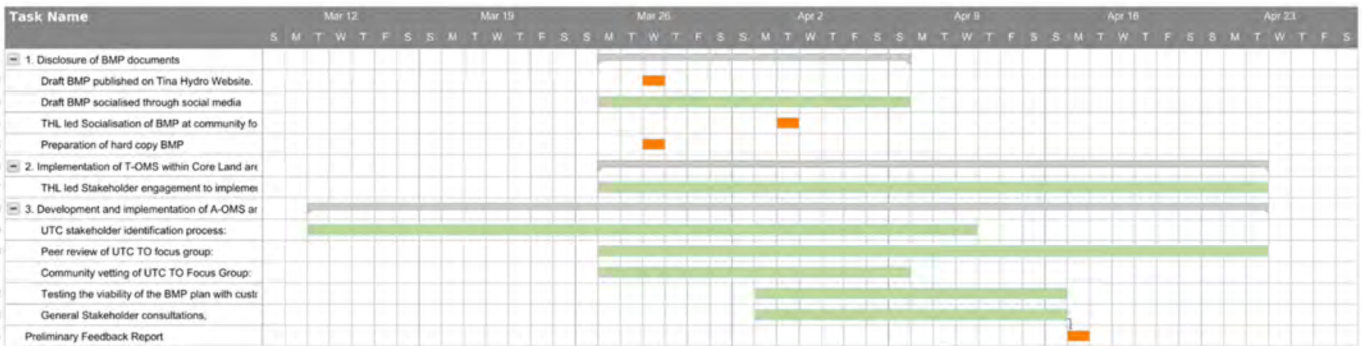
1.7 Risk Management

The PO has conducted a risk analysis for the BMP CES covering initial disclosure and communication of the BMP as well as risks associated with the phase 2 participatory planning process and development of a UTC Plan of Management. A Risk Management Framework has been compiled and can be accessed in Appendix I. Part 2 of this document, Preliminary Feedback Report, discusses risks specific to the stage 2 consultation and development of a PoM.

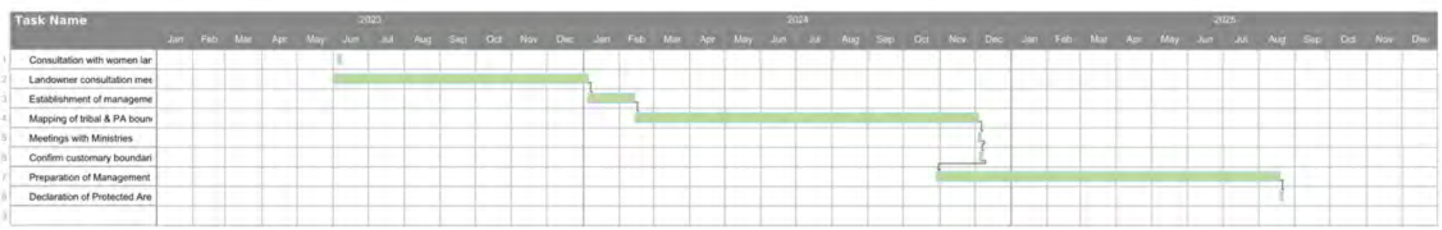
Key general risks with moderate consequence for the success of the consultation strategy include process related aspects such as participation of vulnerable groups in feedback and decision making, ensuring key messages are delivered clearly and effectively and the avoidance of elite capture during consultation and engagement activities. These are all acceptable risks and manageable with the best practice approaches outlined in the RMF.

1.8 Schedule of engagements

BMP Stage 1 Consultation



BMP Stage 2 Consultation



2. Part 2. Draft BMP Consultation and Engagement Preliminary Feedback Report

2.1 Introduction

The PO BMP-CES was developed with the goal to effectively engage communities impacted by the implementation of the BMP over the short and long term, to ensure that they are informed of how and why the BMP was developed and are aware of how it will impact them, and how they can participate in its implementation.

The strategy recognises that local communities possess the knowledge and expertise required to implement the proposed BMP, especially in the upper catchment, therefore it is essential to engage with the impacted community to ensure that these community competencies are recognised and considered by the parties responsible for the BMP implementation.

Over February to April 2023, the PO led consultation activities in conjunction with community leaders as well as THL/HEC to articulate the draft BMP to stakeholders and hear feedback on the feasibility of implementing the BMP as it is described in the draft BMP.

2.2 Background to the consultation

The PO was guided by the Bahomea Land Identification Committee process to identify two key informants from Buhugaro and Uluna Sutahuri tribes who have current intentions to undertake conservation and biodiversity protection measures within the upper catchment. These informants have previously been involved in the initial stages of the FAO GEF Tina Popomanesiu protected area project. Both informants were heavily involved in the landowner identification process for the upper catchment and are knowledgeable of tribal blocks within the UTC as well as neighbouring locations. The PO has used these informants as an entry point into UTC landowner consultations. Further UTC landowner tribes were identified and consulted through information provided by the key informants and from the public disclosure of the proposed UTC protection measures as part of the BMP disclosure.

General stakeholders were identified through a document review, local knowledge acquired through the PO team as well as suggestions from UTC landowners. Criteria for selection was based on a shared interest in protecting the UTC.

2.3 Documents reviewed

The PO drew on an extensive list of project related documents such as ESMPS as well as information relating to other similar and relevant activities regionally. A complete list of documents reviewed for the purposes of building the consultation strategy and developing the preliminary feedback report can be accessed in Appendix 2.

2.4 Methodology

BMP documents were disclosed by the PO in accordance with project media protocols on the 29th of March. This was followed by a community forum whereby the BMP was presented to representatives of all the impacted areas and participants were invited to provide feedback on the BMP plans. Prior to formal disclosure, the PO consulted with UTC landowners, discussing the options presented in the BMP and eliciting feedback on these options. After BMP disclosure, the PO continued consultations with an expanded number of UTC landowners that emerged from the stakeholder identification process as well as the initial BMP public forum. During these face to face consultations with UTC landowners, the PO conveyed the key messages of the BMP relevant to the protection of the upper catchment. Key messages were distributed and a *Tok Stori* approach used to gain feedback from community members. The THL prepared consultation feedback report is attached as Appendix 3.

General stakeholders were also interviewed at this time. These included NGOs, government representatives and the private sector.

The BMP TOMS/AOMS was disclosed on the project website on Friday the 31st March 2023.

2.5 List of BMP consultation and engagement activities undertaken

No.	Stakeholder	Location	Date
1	Buhugaro Tribe	Honiara	3/2/23
2	Uluna Sutahuri Tribe	Honiara	6/2/23
3	Buhugaro Tribe	Honiara	6/2/23
4	ESSI/Wildlife Works	Honiara	8/2/23
5	Buhugaro Tribe	Honiara	16/3/23
6	MMERE Permanent Secretary	Honiara	16/3/23
7	THL E&S Team	Honiara	17/3/23
8	Uluna Sutahuri	Honiara	17/3/23
9	Community Consultation for BMP disclosure	Ngongoti	4/4/23
10	Charana Tribe	Honiara	5/4/23
11	Honiara Local Court	Honiara	6/4/23
12	Sarahi and Salaviso Tribes	Honiara	6/4/23
13	Chavuchave Tribe	Honiara	6/4/23
14	Uluna Sutahuri Tribe	Honiara	6/4/23
15	Island Knowledge Institute	Honiara	6/4/23
16	Solomon Islands Ranger Association	Honiara	13/4/23
17	Live and Learn	Honiara	13/4/23
18	Solomon Islands National University	Honiara	14/4/23

All Minutes of Consultation and Engagement Activities are attached in Appendix 4 while the THL prepared Consultation and Engagement Report from the Ngongoti community consultation is attached as Appendix 3.

2.6 Community and stakeholder feedback received.

Key feedback received from landowners and general stakeholders regarding the viability of implementing the BMP are summarised in the following bullet points.

- **UTC landowners desire that the development of a Protected Area should be a standalone project, decoupled from the TRHDP. That is, it should not be seen as a consequence of TRHDP.[4]**

During consultation with Buhugaro and Uluna Sutahuri tribes, both expressed that they have their own motives for protecting the catchment. In the case of Buhugaro it is largely with the intention of developing a Protected Area whereby ecosystem services can provide sustainable incomes to their people. Uluna Sutahuri have not progressed as far in formalising plans for the eastern side of the UTC but have clear intentions to protect the area to promote cultural connection to land through the *Vaolusia Model*. The *Vaolusia Model* is an indigenous land connection concept of the Bahomea and Malango people whereby reconnecting to land reveals commonalities of ancestry and pathways to solving problems, including land disputes. Both stated that while having a similar goal in mind to the TRHDP BMP, they see this process as being independent from the TRHDP and driven by their own wants and needs.

- **There is an indication from both Buhugaro and Uluna Sutahuri key informants that they are willing to work collectively to protect the catchment.[5]**

Buhugaro and Uluna Sutahuri are focussed on different areas of the catchment and are consulting with tribes that they are aware of as having a claim to specific blocks within the catchment. Through the consultations with the PO they are aware of each other's intentions and have indicated to the PO that they are willing to come together to work collectively towards protecting the catchment.

- **Any activity in the upper catchment should involve all the UTC identified landowner tribes.[6]**

[4] Buhugaro consultations on 16/3/23 & Uluna Sutahuri on 17/3/23
[5] Ibid.
[6] Community consulation for BMP disclosure in Ngongoti 4/4/23

The actual number of tribes that claim to be UTC landowners is not definitively known. During the BMP disclosure forum in Ngongoti, one community member stated 23 tribes should be involved, a number that has been derived from the Bahomea land Identification Committee processes. Uluna Sutahuri and Buhugaro key informants state that there are multiple tribes that have connection to the area but the exact number is not known. Nevertheless, they both stated that further identification of UTC landowners needs to be undertaken as part of the development of the Protected Area and that this should follow local processes such as the *Vaolusia Model*.

- **Protecting the catchment from commercial logging and mining will bring cultural and livelihood benefits for future generations because the area is culturally and naturally significant.**[7]

Key informants as well as representatives from Charana and Chavuchave tribes stated that there are long term benefits to be gained from protecting the catchment. For example, these may be through the trading of ecosystem services. No specific mention was made of compensation or benefits packages by the UTC landowners, however, there is a tacit understanding that external support will be required to ensure the protection of the UTC.

- **Protecting the catchment provides a way for solving social problems through reconnecting to land as part of the 'Vaolusia Model'.**[8]

All UTC landowners consulted stated that a high priority for them was to reconnect with land and to transfer their culture to the next generation. Through the *Vaolusia Model*, tribes can renew their connection to land and in doing so renew connection to each other by understanding common ancestry.

- **SIG commitment to protect the UTC through the MoU is valued by UTC landowners because it provides landowners with an authoritative tool to communicate protection to other tribal members.**[9]

Chavuchave tribal representatives stated that local communities respected the role and position of the SIG in the development of the MoU to protect the catchment. It aligns with the intentions of the UTC landowners to protect the UTC.

- **The process to protect the catchment should be led by local processes where local tribes are consulted in communities and not through a house of chiefs.**[10]

ESSI and Buhugaro tribes previous experience with the GEF – FAO Protected Area project has provided them with lessons learned on the most appropriate methods for engaging communities in the development of a Protected Area Plan of Management. They suggest going directly to the tribes and individuals that would be involved in the protection of the catchment and avoid going through the House of Chiefs. The reason for this is to ensure targeted planning, local ownership of the process and to avoid elite capture.

- **There is a strong willingness from all UTC landowners consulted to work to protect the UTC.**

Throughout the consultations with impacted communities, NGOs and UTC landowners, the PO has not heard any complaints, opposition, or reservations concerning the protection of the area as proposed in the BMP. Communities consulted during the Ngongoti open forum stated that they are supportive of the overall project and would like to see major works commence soon. Implicit in this message, conveyed after a thorough discussion of the BMP implications, is that communities are satisfied with the BMP process outlined for the core area and don't object to the concept of UTC protection as outlined by the PO during the consultation event. Furthermore, several UTC landowners present at the forum agreed that they would like to pursue

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[7] Buhugaro consultations 3/2/23 & 16/3/23, Charana & Chavuchave consultations 6/4/23
[8] IKI meeting 6/4/23 & Uluna Sutahuri consultations 6/4/23.
[9] Charana consultations 6/4/23
[10] Buhugaro consultations 3/2/23 & 16/3/23, ESSI/Wildlife Works meeting 8/2/23

further discussion of the process to protect the upper catchment in follow up consultations focussed only on UTC landowners. Charana, Sarahi and Salasivo tribal representatives subsequently approached the PO in support of the BMP concept and were provided more details through the key messages on how the BMP is likely to be implemented.

- **Youth must be engaged in any consultation process to develop a Protected Area as they will be the ones to inherit it and manage it[11].**

Island Knowledge Institute, a Solomon Islands based organisation with extensive experience engaging with the youth of the UTC landowner tribes including participatory research activities within the UTC, stated that many youth are from logging families and the lure of quick money from logging is ever present. Therefore, youth should be engaged in a process to be able to identify alternative income streams from the management of natural resources and to build ownership of the process.

2.7 Limitations

This preliminary consultation was undertaken within a very tight timeframe to test the viability of the BMP with stakeholders before the submission of the final BMP to CFPs in May 2023. The consultations were undertaken over a short period that included the Easter holidays and at a time when the attention of many project impacted communities was diverted to issues relating to water supply and delays in local procurement of human resources. Furthermore, the PO team were occupied with competing tasks such as the clearance of other ESMPs and other issues as they arose on the ground and could not dedicate significant resources to the consultation process.

Consequently, there was not sufficient time to adequately identify a greater number of UTC landowners who may have differing opinions on the proposed BMP. Furthermore, very few women were consulted, particularly as part of the UTC landowner consultation. Given that land descent is matrilineal in the UTC locations, the absence of women's voices may present a gap in information and evidence to support the viability of the proposed BMP.

Thus, it cannot be said with confidence that obstacles or objections to the proposed BMP will not arise in the future. The following recommendations will monitor such occurrences and mitigate for any impacts they may have on the implementation of the BMP.

2.8 Recommendations and options

2.8.1 Limitations of current consultations be addressed through targeted women's consultation and ongoing stakeholder engagement.

Women's involvement: Using the TRHDP Gender Action Plan (GAP) as a guide, the PO will organise consultation sessions specifically with women UTC landowners to hear their feedback on the proposed BMP. As noted in the GAP, land descent is matrilineal in the upper catchment and women in the project area strongly wish to contribute their views and participate in decision making regarding land use arrangements. Women in the project area have indicated that they would prefer women only consultation sessions to provide a conducive space for open discussion. Consistent with previous consultation activities, the PO, led by the gender focal point, should convey key messages and FAQs and facilitate a *Tok Stori* session to elicit feedback on the BMP. The session would provide a framework for future consultation on the development of a Plan of Management for the UTC, in which women must actively participate, and allow the PO to adapt the planned consultation methodology accordingly.

UTC stakeholder identification: The current list of UTC stakeholders engaged during this period is representative but unlikely to be complete. Therefore, the next step will be to initiate the steps outlined in the attached strategy to begin developing a Plan of Management. Intrinsic in this strategy are mechanisms for further stakeholder identification; ongoing feedback and consultation concerning risks to the viability of the BMP; opportunities for benefits and collaboration as they present themselves; broadening of the UTC landowner list; and adaptation of the strategy as new issues emerge.

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[11] IKI meeting 6/4/23

2.8.2 Development of Plan of Management

Local ownership of the process and outcomes of consultation to develop a PoM is integral to the success of the BMP being implemented in the upper catchment. The consultation strategy must be implemented carefully to avoid the perception that project implementors are in any way controlling or directing UTC landowners on how they should manage the UTC. Landowners have stated that they desire to protect the catchment, motivated by their own needs, and not as a consequence of the TRHDP. This desire must be respected as the consequence of not doing so could result in UTC landowners losing trust in the consultation process. Currently there is a shared desire between landowners and the TRHDP to protect the UTC, the development of the PoM must be sensitive to this risk to ensure the viability of the BMP OMAS.

The phase 2 consultation described in the PO BMP CES will work alongside UTC landowners to consolidate stakeholder identification, map boundaries, establish governance arrangements and identify land management priorities and funding sources. The participatory consultation and design process should adhere to the following best practice principles:

- Use local systems, knowledge and processes to identify UTC landowners.
- Place UTC landowners at the centre of prioritising and identifying management activities within the PoM and ensure that women's voices are heard and acted on.
- Build relationships between UTC landowners by establishing commonalities and shared goals.
- Endeavour to undertake consultation and planning activities on location within communities and on UTC land when feasible.

2.8.3 Potential ecosystem service arrangements

UTC landowners and general stakeholders have presented several potential ecosystem services that could bring income and benefits to the UTC landowners. There is precedent in the Solomon Islands for a number of these activities, and the potential of them within the UTC should be explored further as part of the phase 2 consultation process.

Ecotourism, that is, "responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education"[12] is being promoted by Solomon Islands Tourism to attract high end tourists to come and appreciate the wealth of natural assets within the Solomon Islands. In response, several operators have emerged across the nation offering tourists experiences ranging from complete cultural immersion in local ceremonies to secluded mountain top hideaways.

The significant undisturbed critical and natural habitat of the UTC combined with the presence of the Tina River Dam will present a potential drawcard for ecotourists. However, this does represent a niche industry, vulnerable to external threats such as tourism downturns, and at this stage should be considered accordingly in the development of the PoM.

Ranger programs, as implemented by the Solomon Islands Ranger Association (SIRA), may present a key tool in managing biodiversity in the UTC in line with the BMP. SIRA have recently revised and finalised a new 3 year strategic plan supported by the Critical Ecosystems Partnership Fund and are undertaking training activities to build capacity of Rangers across the Solomon Islands.

UTC landowners have communicated their desire to establish Rangers within the proposed protected area and therefore it will be critical to further explore the potential for collaboration with SIRA on ranger activities specific to the UTC.

Community forestry may also be considered as a component of the management plan to protect the catchment. The investment in a model whereby UTC landowners engage in forestry ranging from assisting natural regeneration to a more intensive agroforestry approach could offset the perceived potential loss of income from logging in the UTC as well as provide sustainable incomes into the future. The current Livelihoods in Forest Ecosystem (LIFER) program being implemented by the Australian Centre for International Agricultural Research in the Solomon Islands is a relevant and current project with potential for collaboration or cross learnings.

[12] 2015 definition from The International Ecotourism Society.

Carbon Credit Projects are being pursued by some UTC landowners as a potential source of income attained from protecting the catchment. Landowners are looking to emulate the Babatana Rainforest Conservation Project in Choiseul. This project, which is a partnership between Solomon Islands NGO Natural Resources Development Foundation and Australian based social enterprise, the Nakau Programme, trades carbon credits from the protection of forest that would otherwise be logged on the international carbon market.

Given the specific nature of the UTC, the fact that the majority of the land is above 400masl and thus already protected by regulation from logging as well as the SIG MoU committing to protecting the areas below 400masl, there are still unanswered questions around the eligibility of the area for a carbon credit project that will need to be explored to determine whether this option is viable.

2.9 Phase 2 Consultation Risks

A complete analysis of risks associated with the ongoing consultation process is presented in Appendix 1. The key risk with highest consequence moving into phase 2 consultations is that UTC landowners abandon the consultation process in part or altogether. This could be a result of poor messaging and communications or a consultation approach that is not consistent with the needs of the UTC landowners. Therefore, careful consideration should be given to messaging and adequate time and resources allocated to the consultation to ensure that it meets the needs of local communities. Other programmatical risks outlined in the RMF such as elite capture, insufficient stakeholder identification and the emergence of consultation fatigue are acceptable risks with moderate consequence that can be mitigated by following best practice as outlined in the Risk Management Framework (RMF) Appendix 1.

2.10 Resourcing

There are a number of potential collaborating partners in the Solomon Islands that can play a significant role in the implementation of the phase 2 consultation and design and development of a PoM. NGOs and associations such as SIRA have indicated a willingness to play a role in this process and their existing capacity and knowledge would be a major asset for the PO to leverage and utilise. The PO will require additional personnel and external support to facilitate this process effectively and in a timely manner otherwise competing priorities, especially as main works commence, could jeopardise the implementation of the phase 2 consultation. As per the outlined schedule, it is estimated that the process towards the declaration of a Protected Area, or another arrangement that is consistent with meeting the needs of the BMP OMAS, will require two years of consultation, design and development. PO work plans will need incorporate this work and ensure that CLOs and other relevant functions such as the GFP are resourced and workload allocated appropriately. It is recommended that an expert consultant/consultancy, experienced in community management of natural resources, participatory planning and relevant in country experience should be engaged by the PO to facilitate stage 2 consultations.

2.11 Conclusion

The proposed BMP OMAS to implement an ‘out of kind’ offset for terrestrial habitat in the UTC is a viable option to pursue provided that further consultation and stakeholder identification is undertaken as part of a culturally appropriate consultation and planning process. Further specific consultation with women is likely to strengthen this case. To effectively engage with UTC landowners and ensure local ownership of the process and outcome from the consultation, planning and design of a Plan of Management, the strategy must be implemented carefully, sensitive to the needs of UTC landowners. It must follow local processes for landowner identification and build relationships between landowners and other stakeholders where landowners are driving the discussion and are at the centre of the design process. Failure to do so could risk an abandonment of the consultation and planning process and jeopardise the viability of the BMP OMAS in the UTC.

3. Appendices

3.1 Appendix 1. RISK MANAGEMENT FRAMEWORK

Consequence →	Insignificant	Minor	Moderate	Major	Severe
Development Outcomes	Temporary delay Resource (Intensive)	Short period of impact Isolated impact	Forces reconsideration of Project strategies. Impact across a number of components/elements	Suspension of Project (or elements) Loss of industry credibility	Termination of Project Complete loss of credibility
Reputation	Internal non-management Review only	Internal management review or audit to prevent escalation.	Special audit required by external group or Client etc. Ability called into question by Client and /or Partners	Intense public, political or media scrutiny. E.g.: front page headlines. Poor performance noted on AusAID Contractor's Register	Listed on World Bank or 'Relevant List', Legal action taken by Client.
Project Process & Systems	Minor errors in systems or processes requiring corrective action. Minor delay without impact on overall schedule.	Policy procedural rule occasionally not met or services do not fully meet needs.	Damaged relationship with Partners One or more key accountability requirements not met. Inconvenient but not client welfare threatening.	Impact with Associates Strategies not consistent with Client's requirements. Trends show service is degraded.	Critical system failure, bad policy advice or ongoing non-compliance. Business severely affected.
Financial	1% of Budget	2.5% of Budget	> 5% of Budget	> 10% of Budget	>25% of Budget
	Insignificant	**Minor**	**Moderate**	**Major**	**Severe**

Likelihood ↑ — Expectation:			**1**	**2**	**3**	**4**	**5**
Is expected to occur in most circumstances	**5**	**Almost Certain**	**M**	**H**	**H**	**E**	**E**
Will probably occur at some stage	**4**	**Likely**	**M**	**M**	**H**	**H**	**E**
Might occur at some time in the future	**3**	**Possible**	**L**	**M**	**M**	**H**	**E**
Could occur but doubtful	**2**	**Unlikely**	**L**	**M**	**M**	**H**	**H**
May occur but only in exceptional circumstances	**1**	**Rare**	**L**	**L**	**M**	**M**	**M**

Reference	The Risk (What Can Happen)	Source (How Can This Happen)	Impact (From Event Happening)	Control Strategies	Current Risk Level			Acceptability (A / U)	Responsibility
					Likelihood	Consequence	Current Risk Level		
1	Disclosure of BMP documents								
1.1	Low uptake of documents due to limited access to website & social media & unfamiliarity with technical documents.	Inadequate preparation and planning for disclosure activities	Community understanding & acceptance of the BMP is low, affecting implementation and sustainability.	• Provide alternative means of communication including verbal and hard copies, community noticeboards and appropriate materials/technical specialists to convey key messages.	**3**	**2**	**M**	**A**	PO/ THL
1.2	Limited opportunity for vulnerable group participation.	Inadequate gender and social inclusion awareness among staff.	Women and other vulnerable groups miss out on influencing development of BMP and its implementation	• PO staff ensure conducive space is provided to vulnerable groups to participate. • Follow the TRHDP GAP • Ensure timing/method of consultation is appropriate	**3**	**3**	**M**	**A**	PO/ THL
1.3	Budget disclosure leads to community agitation	Miscommunication leads to release of proprietary information.	BMP implementation is delayed or abandoned due to community conflict.	• Only redacted documents disclosed. • Messaging emphasizes scale and duration of project.	**1**	**4**	**M**	**A**	PO/ THL
2	Implementation of TOMS within Core Land area								
2.1	Emergence of community confusion around separate requirements for TOMAS and AOMAS	Inadequate and unclear communication to communities on the separate needs of AOMAS an TOMAS	BMP implementation jeopardised by access breaches in core land and lack of ownership over BMP in UTC.	• Close coordination between PO and THL to ensure consistent messaging.	**1**	**2**	**L**	**A**	**PO/ THL**
3	Development and implementation of A-OMS and T-OMS in upper catchment								
3.1	Emergence of speculative claims to areas within the UTC &	Unrealistic information circulates in community due to unclear and inadequate	BMP implementation delayed or abandoned.	• Stakeholder identification and vetting process that utilises existing local processes.	**2**	**3**	**M**	**A**	**PO**

Reference	The Risk (What Can Happen)	Source (How Can This Happen)	Impact (From Event Happening)	Control Strategies	Current Risk Level: Likelihood	Current Risk Level: Consequence	Current Risk Level: Current Risk Level	Acceptability (A / U)	Responsibility
	disagreement over rights to upper catchment lands	communications from the project		• Transparent communications through key messaging is publicly available and promoted • GRM established and promoted					
3.2	Landowners with genuine claims are inadvertently excluded from consultation process	Insufficient consultation undertaken to identify landowners	BMP implementation is delayed or abandoned due to emergence of disagreements between UTC tribes	• Phase 2 consultations follow Protected Area Act 2010 requirements for public disclosure. PO with key informants publicise the process to all known stakeholders.	**2**	**3**	**M**	**A**	**PO**
3.3	Landowners challenge the concept of an offset on the grounds that Core Land has already been acquired.	Inadequate explanation and communication of BMP and OMAS concept in understandable form	Unwillingness to support an offset strategy in the UTC	• Utilise key messaging to convey the objective of the offset. • Use culturally appropriate staff and materials to communicate concept.	**2**	**3**	**M**	**A**	**PO**
3.4	Key messages around AOMAS become diluted as they enter community.	Inconsistent and infrequent communication of key messages to community members from PO staff.	Community understanding & acceptance of the BMP is low, affecting implementation and sustainability	• Provide ongoing messaging to communities in a variety of media with a variety of materials.	**3**	**3**	**M**	**A**	**PO**
3.5	Proposed protection activities and community benefits are not feasible	Unrealistic expectations of potential benefits from landowners	BMP implementation delayed or abandoned.	• Participatory planning process promotes ownership of the development of the PoM in line with expectations and feasibility. • Exploration of all known and new options as part of the development process	**3**	**2**	**M**	**A**	**PO**
3.6	Development and design process is dominated by elites	BMP implementation does not have community-based support	Likely incursions and failure to meet PoM requirements	• Broad stakeholder engagement in consultation and planning phases using participatory methods.	**3**	**3**	**M**	**A**	**PO**
3.7	Delays in meeting deadlines during	Competing priorities combined with unrealistic time allocation and	BMP implementation delayed or abandoned.	• Coherent strategy with realistic time frame and adequate resourcing of participatory planning facilitators	**2**	**3**	**M**	**A**	**PO**

Reference	The Risk (What Can Happen)	Source (How Can This Happen)	Impact (From Event Happening)	Control Strategies	Current Risk Level: Likelihood	Current Risk Level: Consequence	Current Risk Level: Current Risk Level	Acceptability (A / U)	Responsibility
	consultation of PoM development process.	inadequate resourcing of facilitators							
3.8	Externalities such as political tension or distractions due to competing priorities such as the Pacific Games.	Factors beyond the control of the project.	Consultation and PoM development is delayed.	• Feedback to monitor situation and enact contingency planning.	**3**	**3**	**M**	**A**	**PO**
3.9	Multiple parties commit to catchment protection but unwilling to work together under one plan of management.	Underlying tension and cultural differences between tribal landowners in the UTC	Implementation of UTC protection in line with BMP becomes incoherent and the catchment protection becomes vulnerable to breaches	• Participatory planning process will seek to build relationships between landowners with a common interest to design a PoM that is fit for purpose. • Consideration of challenges/issues included in design development (eg cadastral surveying methodology)	**3**	**3**	**M**	**A**	**PO**
3.10	Emergence of consultation fatigue.	Untargeted engagements that disempower community members.	Communities become disinterested in the BMP, affecting its viability and sustainability	• Avoid unnecessary engagements, focus on targeted participatory approaches that are driven by landowners needs.	**3**	**2**	**M**	**A**	**PO**
3.11	UTC landowners abandon the PoM consultation process	UTC landowners dissatisfied with consultation process	The UTC becomes significantly more vulnerable to incursions that impact on viability of BMP	• Consultation process must be bottom up, participatory and place impacted communities at the centre of designing the PoM	**3**	**4**	**H**	**A**	**PO**
3.12	Risk that landowners not interested in participation in TRHDP BMP?	UTC landowners unwilling to accommodate project needs for catchment protection.	Project cannot claim or prove that the UTC is being protected as a BMP offset	• Clear and timely communication of project needs to impacted communities. • Ensure that key messages are reiterated throughout the consultation process and that the imperative for BMP implementation is a foundation for the development of PoM	**2**	**4**	**H**	**A**	**PO**

3.2 Appendix 2. DOCUMENTS REVIEWED.

Project ESMPs
Draft BMP OMAS March 2023
Draft MoU between MMERE, MECDM, MOFR. February 2023
Integrated Forest Management in the Solomon Islands: GEF Document 2015
Report on the Bahomea House of Chief & Malango House of Chiefs Joint meeting/ 2nd October 2020 at the Holiday resort, Henderson Honiara. FAO GEF Document
Report on the Bahomea Task force Work plan/ 29th January 2020- Marava Village, Central Guadalcanal. FAO GEF Document
Report on the Bahomea House of Chiefs Consultation 18-19 June, 2019. FAO GEF Document
Solomon Islands: Workshop on biodiversity aspects for the Solomon Islands Tina River Hydropower Development Project Sydney, January 23 to 25, 2023
Livelihoods in Forest Ecosystem Recovery (LIFER) project information. https://www.aciar.gov.au/fst-2020-135
ESIA 2019
CBSP Mid Term Review Initial Findings 2022
Tina River Gender Action Plan
Land Acquisition and Livelihoods Restoration Plan
Community Development Plan 2017
Community Benefits Sharing Plan 2017
Ecotourism – a suitable tourism development strategy for the Solomon Islands. Marlise Haider 2017.

3.3 Appendix 3 THL CONSULTATION AND ENGAGEMENT REPORT

ESMP (BMP and OMAS)

Disclosure for Main works

(DAM, POWERHOUSE, TUNNEL)

Community Consultation Report

04.04.2023

Revision History

Revision	Date	Details	Remarks
0	06.04.2022	Draft version submitted to THL	

1. Participation

The participation of communities and stakeholders remains essential for the disclosure of BMP and OMAS for the project in order to capture valuable feedback, suggestions and support for the development of ESMPs. A good representation of members from various communities was seen in this event with a high percentage of female participation. A summary of the attendance is provided below.

#	Stakeholder	Male	Female	Total
1	Project Stakeholders (TRHDP-PO, THL, HEC, MSS, World Bank)	22	8	30
2	Vuramali	2	3	5
3	Tina	5	3	8
4	Taurasha	1	0	1
5	Valele	3	1	4
6	Horohotu 1 & 2	9	3	12
7	Valebariki	2	0	2
8	Vatunadi	1	0	1
9	Antioch	2	1	3
10	Valesala	2	0	2
11	Marava	4	2	6
12	Ngongoti	2	2	4
13	Managikiki	3	2	5
14	Haimane	3	1	4
15	Katihana	1	1	2
16	Namopila	1	0	1
Total		**63**	**27**	**90**

2. Introduction

A package of Environmental and Social Management Plans (ESMPs) for the Hydropower Facilities (dam, tunnel, and powerhouse) had been developed and then submitted to SIG, the World Bank (WB), and Asian Development Bank (ADB). HEC and THL disclosed 28 ESMPs on the project website and held a Community Consultation at Managikiki village on 23 November 2022.

Subsequently, Biodiversity Management Plan (BMP) and Offset Management Area Strategy (OMAS) which are the sub-plans required under the ESMP were updated. Therefore, further consultation was also required for disclosure of the BMP and OMAS prior to the start of the Hydropower Facilities construction. The consultation is to be undertaken in accordance with the Lenders and the Safeguard Documents. It was based on a targeted and structured approach and also built upon consultation and disclosure that were already undertaken by THL and HEC. The steps undertaken were:

- Consistent with the approach of the previous consultation, with the disclosure of the BMP and OMAS on the TRHDP website in the week commencing 27 March 2023 for 7 days.
- The BMP and OMAS posted to the TRHDP website were watermarked appropriately to note that they are not final and subject to Lender's review and feedback from stakeholders. To facilitate this, a disclaimer was prepared to
  (a) invite comments on the ESMP's, and

(b) state that clearance is currently being sought for the Hydropower Facilities (dam, tunnel and powerhouse).

- A brief summary report of the consultation and disclosure process conducted, which will summarise the feedback received and how the concerns raised have been addressed in the relevant documents, will be provided with the submission of the BMP to SIG, WB and ADB for clearance.

3. Requirements

All the ESMPs are 'living documents' thus they are subjected to reviews, changes, and updates. The Construction Environmental and Social Management Plan (CESMP) describes the process for the management of updates to ESMPs which is presented in Section 7 of the P1 CESMP.

Thus, in order to accommodate the concerns of the communities, all the ESMPs were disclosed in November 2022, except BMP which is disclosed currently to fulfill the requirement before they can be cleared by the CFPs. The information disclosure was conducted in line with P3 Stakeholder Engagement Plan.

Apart from the above, the Project shall keep the communities regularly informed and updated about the progress of construction, the schedule of construction, and major activities being conducted.

4. Purpose of the consultation

The main purpose of the consultation was:

1. To disclose the updated BMP and OMAS for the construction of the Hydropower Facilities to Project Affected Communities.
2. To present BMP implementation, management, mitigation, and proposed offset measures for the Project, including for activities outside of Core Land, which will affect stakeholders.
3. To provide an opportunity for community members to present their views and feedback regarding the updated BMP and OMAS
4. For HEC and THL to receive community feedback through face-to-face consultation which will contribute to the review, improvement, finalization, and approval of the BMP and OMAS
5. To update community members on the planned timelines.

5. Strategy for Information Disclosure

a. Development of an ESMP (BMP and OMAS) Disclosure and Consultation Plan by HEC and THL and submitting it to the Project Office for feedback on the plan.
b. Distribution of notices to target communities 7 days before the ESMP Disclosure and Community Consultation stating the purpose, date, time and venue. The Project Office also posted it on their Facebook page to make people in the communities aware of the disclosure event.
c. Development of a standard PowerPoint Presentation which is to be used by all presenters and shall contain a summary of the Biodiversity Management Plan and Offset Management Area Strategy to inform the communities.

d. Printing of 30 copies of the PowerPoint presentations (Booklets) and the consultation program sequence for the communities.
e. Sharing of disclosure information with PO and THL beforehand, including notices, and presentation material.
f. Briefing meeting within the HEC team on the program and the PowerPoint Slides prior to the consultation on Tuesday 4th April 2023.
g. Face-to-face presentation with breaks for community comments and feedback
h. Recording community feedback, concerns, and suggestions and incorporating them in the Disclosure Report.

6. Formal remarks during the consultation

Formal remarks were presented by the Deputy Project Manager of the Project Office, the CEO of THL, and the Project Manager for HEC.

Remarks by the Project Office.

The PO thanked everyone for their time and effort to ensure the planned disclosure happened. Words of thanks are also extended to HEC and THL for organizing the consultation and to all officers from project partners who are present and community chiefs and elders, men, women, youths, and children for their attendance in this important consultation. The Project Office also informed the communities that there are further consultations planned around this subject in the coming days.

Remarks by THL

The CEO of THL expressed gratitude to the community for participating in a meeting and discussed the roles and responsibilities of each project partner, including PO through CBSP/THL and HEC, in ensuring that community benefits plans are fulfilled. THL will operate the dam for 30 years until its handover to SIG, and water supply will be implemented under the CBSP components. The construction activities of the main works, including the dam, powerhouse, and tunnel, will begin after the completion of BMP, and similar consultations with the community will take place before the main works start. HEC during the construction will engage a number of unskilled and skilled workers for the community. The CEO emphasized the importance of listening to the community's opinions and incorporating them into the project.

Remark by HEC

HEC thanked all community members for their participation. HEC as the EPC Contractor continues to implement the ESMP Mitigations and Management actions to safeguard our Environments and all social aspects of Communities.

For the new construction of the Main works (Dam, Powerhouse & Tunnel) there will be several job openings, wherein community members can be engaged. Building relationships with communities is important for the completion of the project.

7. Presentation on BMP and OMAS

The presentation of the Biodiversity Management Plan Disclosure was developed based on the information within the current version of the BMP. The presentation material was printed in form of a booklet that had images and information easy to visualize and understand.

Since the BMP is a comprehensive plan that has detailed assessments of potential impacts on biodiversity, as well as a set of measures to avoid, minimize, mitigate, restore, and offset those impacts, the presentation mainly focussed on understanding the implementation, roles, and responsibilities, activities undertaken by various stakeholders, etc. Refer to Annexure 1 for the BMP Disclosure Presentation material.

The Presenters and presentation topics during the disclosure event are outlined below.

#	Contents	Presenter
1	Introduction to the BMP Disclosure and Community Consultation	Titus Siapu, HEC
2	Opening Prayer	Vuramali Pastor(SSEC)
3	Welcome Remarks	Fred Conning, Deputy Project Manager, PO Yonghoon Chang, CEO, THL Moon Eui Man, Project Manager, HEC
4	Aims and Objectives of the Disclosure	Samuela, THL
5	Introduction to Project Facilities • Temporary Facilities and Permanent Facilities, their purpose.	Manas, HEC
6	Introduction to Biodiversity and Types of Habitats • Introduction to Biodiversity • Modify and Natural Habitats • Critical Habitats • Requirements for Habitats • Mitigation Hierarchy	Edmond, HEC
7	P2- Biodiversity Management Plan • Project Impacts • Contents of BMP	Ivory, Ryline, Eagarhn, HEC
8	Aims and Objectives of P2- BMP • Mitigation measures • Terrestrial Habitat types • Trigger species for Critical Habitat • Aquatic Habitat • Monitoring Measures	Edmond, HEC
9	Roles and Responsibility under BMP and TOMAS • During Construction and operations • Within the core boundary and outside of the core boundary	Manas, Samuela and Fred
10	Terrestrial Offset Management Strategy • Core Land Conservation Area • Key actions and measures • Timelines	Edmond, HEC
11	Questions, Suggestions, Feedback	
12	Closing Statement	Titus, HEC

8. Community Perception and Feedback

During the consultation process, community members were allowed to provide their comments, and questions, and share suggestions and feedback related to the presentation. The feedbacks received were not entirely on the subject of BMP, but was also associated with other components of the project. All the valuable inputs from the communities were carefully recorded and collated in a table. The project stakeholders proactively provided clear and concise responses and provided additional information to address concerns, where necessary. The project stakeholders ensured that the engagement is transparent and the priorities of the communities are taken care.

Community	Type	Questions/Comments
Namopila	Question	When will the Water Quality Monitoring and survey take place at Senge Stream as proposed previously on GRM 056?
	Question/ Suggestion	The 23 tribes were not included in the Core area, but they are included in the upper catchment area. Why were they not included in the first place? Why now? Any activity or interest in the upper catchments should involve the 23 tribes.
	Question/ Suggestion	The project should only focus on the species that are present only in the core area. How to implement it?
Pamphylia	Concern	Concern about the project's likely impacts on the Agricultural livelihoods of People in his community.
Horohotu 2	Question	When will their water supply suppose to be completed?
Valele	Suggestion	The CBSP Projects should be met at the right time as proposed.
Pavu	Suggestion	The Community Benefits should focus only on Bahomea, not Malango
	Suggestion	The project has a high level of safeguard requirements, unlike other logging companies that dominate this region. HEC and THL are doing their best to deliver project information to the communities. He requested the communities to support this initiative.
Marava	Question/ Suggestion/ Concern	Why has the project been delayed? The project should focus only on the Acquired area rather than focusing outside the Customary area. Impacts affected outside the acquired land should also be implemented or is there any mechanism to implement those affected outside the boundary?

	Question	Is BMP the only requirement for the start of main works?
	Concern	Whether BMP is done well or not, the communities will still have some impacts related to the construction of the Dam He was referring to the flow of the river from the dam, 1. How much water volume can flow by the dam so that people living along the Tina River can still be used? 2. What would happen to the freshwater species if the project diverted all the water into the turbine?
	Concern	Concerned about the Water turbidity of the Marava stream water sources.
	Suggestions	How will the communities work closely with TRHDP to mitigate the impact of the Dam and other facilities that have some impact on our rivers, streams, and food gardens? Communities and Project Partners should have some resolution outcome or M.o.U sign.
	Concern	The GRM process seems not effective. We feel that our issues are not answered. Is GRM the only process in place to address our concerns? The grievances are always thrown away in the trash. These are not effective.
	Suggestion	Surveys and monitoring of BMP aspects of the project should involve local community members
Horohotu 1	Concern	Concerning Community Benefits like water supply. When will HEC provide the water tank as proposed during a household survey conducted in March 2022? He also highlighted the water turbidity of the downstream community.
Haimane	Suggestion	The project should be considered Human Habitat first before looking at Biodiversity/Wildlife.
Horohotu 2	Question/ Suggestion	What was the importance of preserving those species? He was suggesting creating a Zoo to conserve all these species for rehabilitation measures after the completion of the project.
Managikiki	Question/ Concern	Managikiki community had a lot of Community issues submitted to the Project Partners during the past Community Consultations. It seems that the Consultations are the same and repeated all the time does not bring any benefit to the community.
	Suggestions	TRHDP should be concentrated on impacted communities (Directed Impacted) for the implementation of Community Benefits such as water supply, and electricity.
	Questions	1. Most of these communities are raising their concerns about Community Benefits such as Water supply/water Tanks and Electricity. 2. When will the Commencement of the water Tanks and water supply roll outs?

In responding to community questions the stakeholder made the following responses to the communities:

Stakeholder	Responses
Project Office	• Regarding the Upper Catchment Protection and other issues outside of the core boundary, there is a separate consultation planned to discuss this matter. This consultation is only for the protection of the core land under the responsibility of THL and HEC. • For water supply and community Benefits, CBSP Phase 1 is now completed, and Phase 2 is in the planning phase and procurement of funds is in process.
THL	• In response to the functioning of GRM, all the grievances raised by communities have always been recorded and not a single complaint has been thrown away. The GRM team engages with the complainant from the raising of the Grievance to its closure and subsequent follow-ups. • In response to Upper Catchment Protection, within the BMP there are many project stakeholders and each one has a set of roles and responsibilities allocated to them. THL and HEC shall be responsible for the management of the Core land conservation area during construction and only THL shall be responsible for the operation phase of the project.
HEC	• HEC attended to some of the questions that were related to the turbidity of streams by providing them with the results of monitoring undertaken in the past. • HEC with respect to e-flow and fish passage provided the information that during operation, the entire river will not be diverted, there is an e-flow requirement stated in the BMP that needs to be strictly followed. And for the fish passage, there is a trap and haul type fish passage designed, it will be used together with other measures to promote adaptive management. • Further information about how the Core Land Conservation Area will be protected was explained to the communities. The MINIMISE, MITIGATE, RESTORE, and OFFSET principle was further explained more thoroughly for communities to understand how things work along with construction. • With communities' suggestions for their involvement in BMP matters, there exists a BAG, where the community members can be included to present their views and be a part of the process. • HEC also informed that there remains a better scope of community engagement in terms of BMP during the rehabilitation and revegetation works.
World Bank	• In response to one of the questions related to why community consultation is necessary, the WB Safeguards consultant explained, how the consultation process delivers information associated with the project. This further adds value by incorporating the community's perceptions, suggestions, concerns, and feedback.

9. Conclusion

Disclosure of the ESMPs- BMP & OMAS to communities for the construction of the Hydropower Facilities (Main works Dam, Power House & Tunnel) has been successfully facilitated by HEC and THL on 4th April 2023. The consultations have resulted in feedback that can sufficiently inform the review and improvement of ESMPs – BMP & OMAS to capture community context as is relevant.

The BMP Disclosure and Consultation has allowed the communities to understand the contents of the Biodiversity Management Plan and OMAS, and to provide their feedback. It also informed the communities about further consultations planned by the Project Office about the Upper Catchment Protection.

While HEC and THL largely tried to deliver BMP and OMAS, however community benefits, water, electricity and other aspects that provide direct benefits were the aspirations of the community.

Annex 1: BMP and OMAS Disclosure Presentation Booklet

Annex 2: Photographic Report

Annex 3: Attendance Records

Annex 4: Notice to the communities

BIODIVERSITY MANAGEMENT PLAN

ESMP Disclosure & Community Consultation

Aims and Objectives of the Disclosure

- Identify Project stakeholders to be engaged as part of BMP development and implementation;
- Complete of a risk analysis with appropriate mitigation strategies, that identify potential issues, ensure consistent messaging and facilitate ease of BMP implementation;
- Identity methods and channels of engagement, ensuring these are consistent with kastom and are gender inclusive;
- Review and update of the Stakeholder Engagement Management Database;
- Provide feedback from stakeholders for finalisation and implementation of the BMP and associated plans, including preparation a summary report; and
- Provide a schedule of engagement tasks to be completed during Project construction and operations, that aligns with Project needs and milestones.

Introduction to the Project

Introduction (Project Facilities)

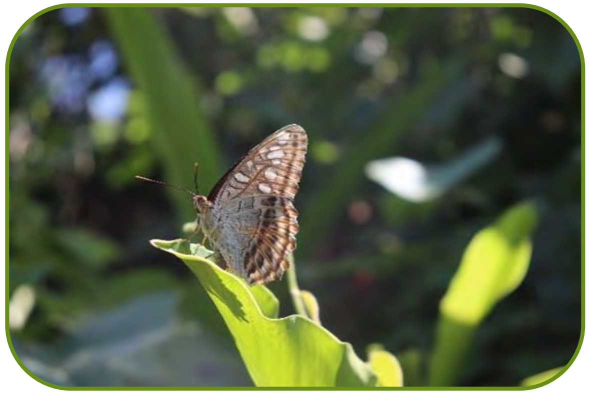
Major Facilities in the Tina River Hydropower Project

RCC Dam	Reservoir	Intake
Disposal Areas	Magazine	Headrace Tunnel
Office, Crusher and Concrete Batcher Plant	Surge Tank	Powerhouse
Switchyard	Access Roads	Workers Accommodation Camp

Introduction to Biodiversity and Types of Habitats

Introduction (Biodiversity)

- Biodiversity is the variety of life on Earth, including different ecosystems, species, and genes.
- The Other Global Environmental Crisis: Biodiversity Loss (rapid, irreversible)
- Biodiversity loss mainly due to:
  - Habitat loss and degradation
  - Invasive non-native species
  - Overharvest; direct and incidental take
  - Climate change



Modified and Natural Habitats

- Modified Habitats: Land and water areas with mostly non-native plant or animal species, or where human activity has substantially altered ecological functions.
  - Examples: Cultivated lands; tree crops; forestry plantations; drained or filled-in wetlands; reservoir impoundments; built-up areas.
- Natural Habitats: Land and water areas with mostly native plant and animal species, or where human activity has not substantially altered ecological functions.
  - Include areas lightly modified by human activities but retaining their ecological functions and most native species, such as natural forests with logging, native grasslands with livestock, and coral reefs with fishing.

Critical Habitats

- Critical Habitats: Land and water areas with high biodiversity importance or value, including:

  (a) Significant importance to Critically Endangered or Endangered species (IUCN Red List).

  (b) Significant importance to endemic or restricted-range species.

  (c) Supporting globally or nationally significant concentrations of migratory or congregatory species.

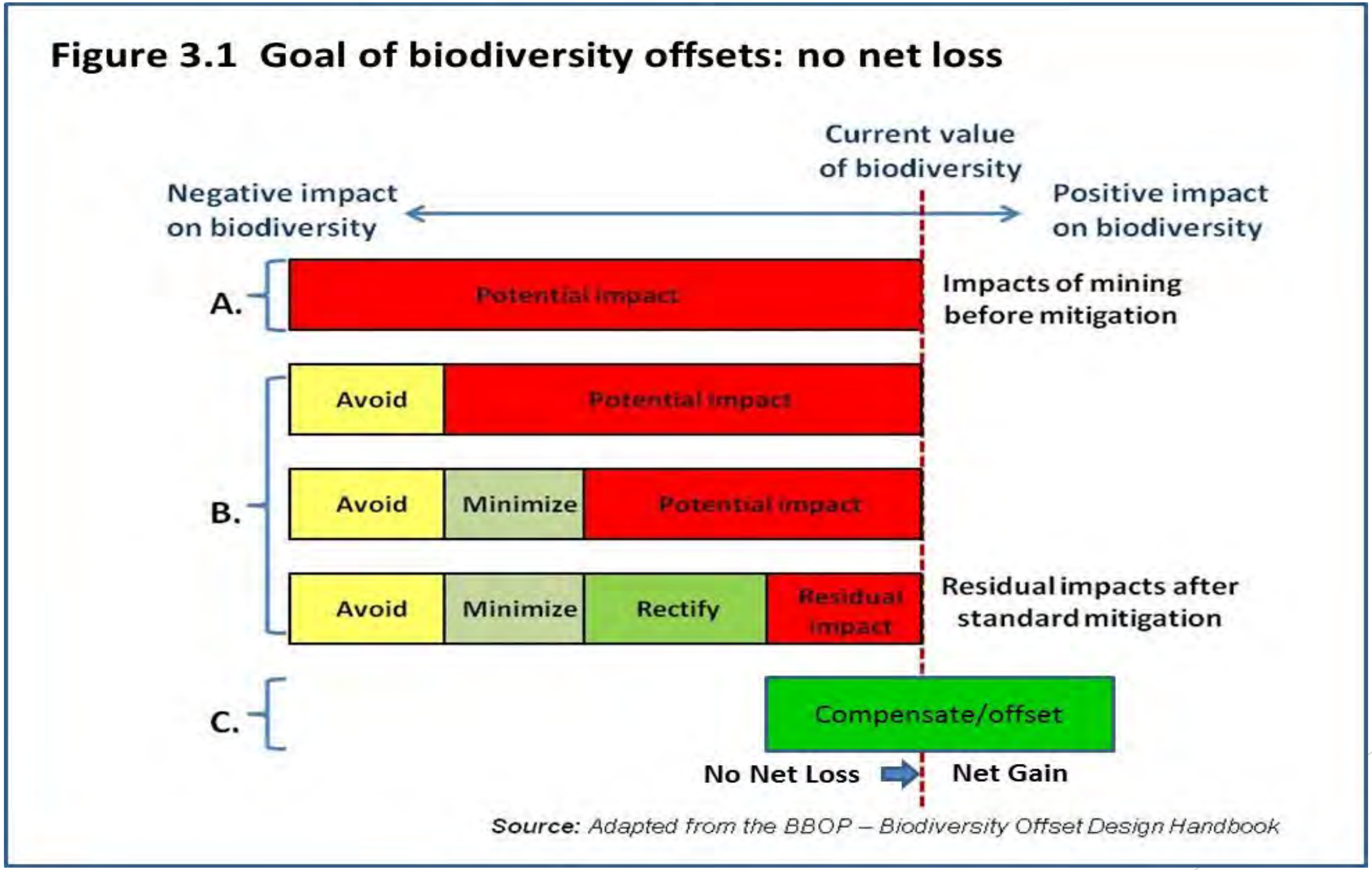
  (d) Highly threatened or unique ecosystems.

- Critical Habitats are also Natural or (sometimes) Modified Habitats.

Requirements for Habitats

For Modified Habitats,	• Avoid or minimize impacts and use mitigation measures.
For Natural Habitats:	• Apply mitigation hierarchy to achieve No Net Loss (pref. Net Gain) of biodiversity.
For Critical Habitats:	• No net population reduction in any Critically Endangered or Endangered species. • Mitigation strategy to achieve Net Gain in those biodiversity values for which the Critical Habitat was designated. • Long-term biodiversity monitoring of the Critical Habitat.

Mitigation Hierarchy



P2 Biodiversity Management Plan

Project Impacts -Direct and Indirect

- Vegetation clearing
  1. Loss of fauna and flora habitat or individuals
  2. Loss of topsoil and erosion
  3. Release of Sediments
- Vehicle strike or hunting and poaching
  - Injury or mortality of fauna individuals
- Light, noise, fugitive dust, and vibrations
  1. causing degradation of habitat
  2. disrupting fauna behavior
- Pollution of soils and habitats with waste or contaminants
- Illegal logging or induced clearing of Critical Habitat within Core Land
- Spread of invasive species (weeds, animal pests and aquatic invasive species)
- Incomplete vegetation rehabilitation
- Changes in e-flows downstream of the reservoir and dam
- Fish entrapment or mortality
- Creation of a physical barrier from the reservoir and dam

Devising the Biodiversity Management Plan

- Covers both Terrestrial and aquatic ecosystems.
- Management and Mitigation measures have considered various phases of the projects.
- Direct and Indirect Impacts considered.
- Practicality for implementation.
- Appropriate monitoring plans developed to target conservation significant communities and species.
- For residual impacts, OFFSETS were applied with the following targets:
  - No Net Loss for Natural Habitats
  - Net Gain for Critical Habitats
- Offset Accounting considered temporary and permanent impacts.
- Offset documents presented in the Terrestrial OMS (TOMS) and Aquatic OMS(AOMS).

AIM AND OBJECTIVE OF P2-BMP

- The P2 Biodiversity Management Plan outlines the mitigation measures that will be applied to manage impacts
  - Minimising clearance of habitat through careful design and best practice construction methods
  - Identifying and protecting flora and fauna through wildlife shepherding and salvage during clearance, and propagation of native plants for revegetation
  - Revegetation of cleared habitat associated with temporary infrastructure
  - Implementing conservation actions to protect and restore species and habitats within Core Land
  - Implementing construction environmental management (including erosion and sediment control, traffic management, hazardous chemical, and waste management)
  - Maintenance of e-flows in the dewatered section of the river
  - Maintenance of upstream and downstream fish passage(trap and haul system)
- Following the mitigation hierarchy of avoid, minimise, and restore biodiversity values, with any residual impacts to be offset.

Mitigation Measures

Construction Phase

- Minimising clearance of habitat through careful design and best practice construction methods;
- Identifying and protecting flora and fauna through wildlife shepherding and salvage during clearance, and propagation of native plants for revegetation;
- Revegetation of cleared habitat associated with temporary infrastructure;
- Implementing conservation actions to protect and restore species and habitats within Core Land; and
- Implementing good industry practice in the form of construction environmental management (including erosion and sediment control, traffic management, hazardous chemical, and waste management), as detailed in the ESMPs.

Operation Phase

- Implementing conservation actions to protect and restore habitats and species within Core Land;
- Implementing good industry practice in the form of environmental management (including speed limits, hazardous chemical, and waste management);
- Maintenance of e-flows in the dewatered section of the river; and
- Maintenance of upstream and downstream fish passage via a trap and haul system.

Terrestrial Habitat Types

Undisturbed Primary Forest	Remnant Forests	Cliff	Garden
			
Agricultural Cropping	Grassland	Distributed Secondary Forest	Riverine Habitat
			
Fallow Habitat	Modified lowland Forest	Development and Habitations	Saline Swamp Forest
			

Trigger Species

Terrestrial Critical Habitats

One Vegetation Community:

- Solomon Islands Rainforest

Three Flora species:

- *Actinodaphne solomonensis,*
- *Cryptocarya medicinalis*
- *Pterocarpus indicus*

Two avifauna species:

- *Guadalcanaria inexpectata*
- *Pachycephala implicata*

One Bat:

- *Pteralopex atrata*

One Mammal:

- *Uromys rex*







Aquatic Habitat Types

Tina River	Ngalimbiu River	Toni River
Upper Riverine Reach	Lower Riverine Reach	Upper Riverine Reach
		
Mid Riverine Reach	Coastal Riverine Reach	Mid Riverine Reach
		

Trigger Species

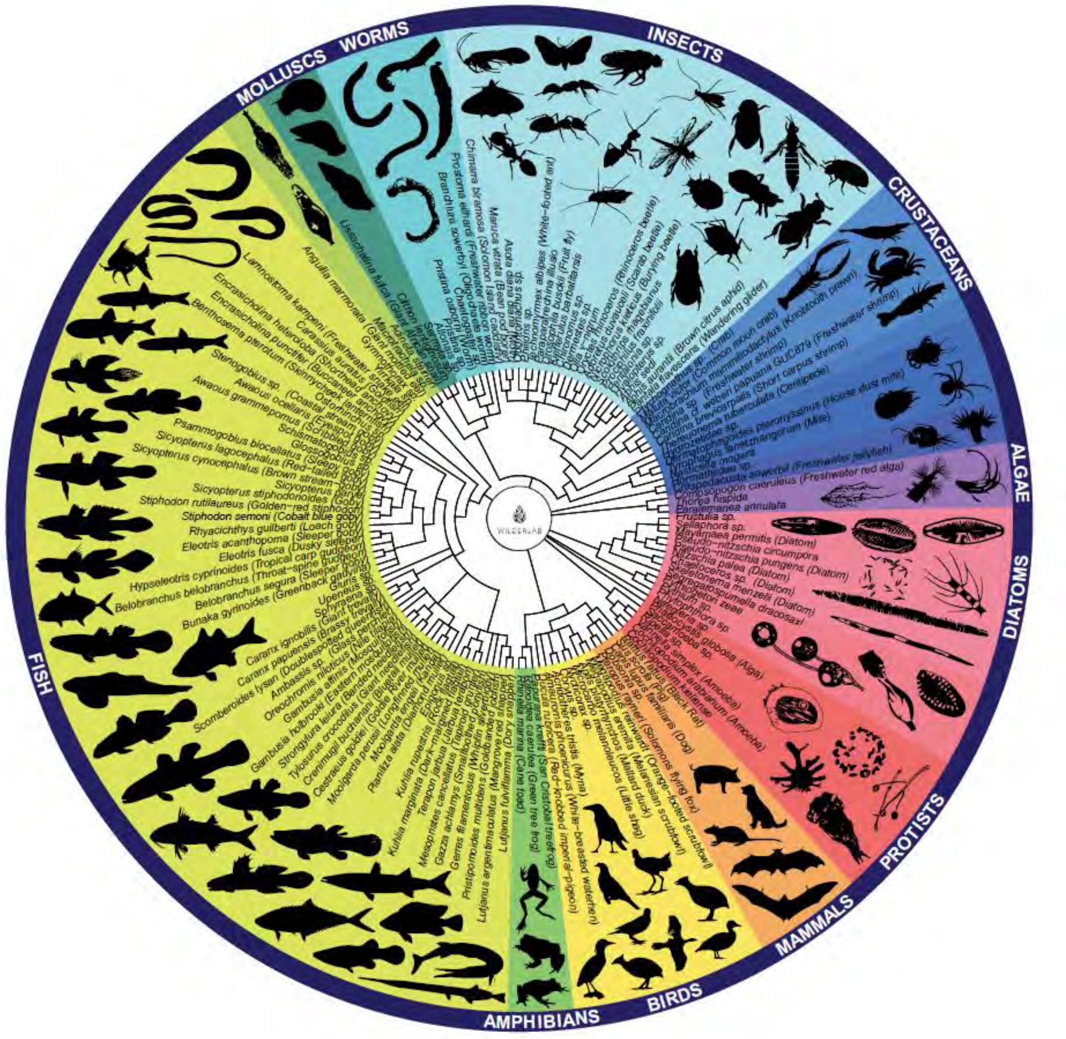
Aquatic

- four macroinvertebrate taxa
  - *Rhagovelia browni,*
  - *Orphninotrichia* sp. 1,
  - *Xylochironomus* sp. 1
  - *Prosopistoma sedlaceki*)

- Fish did not trigger Critical Habitat as there were no conservation significant listed species identified and the distribution of taxa was not restricted

Monitoring Measures

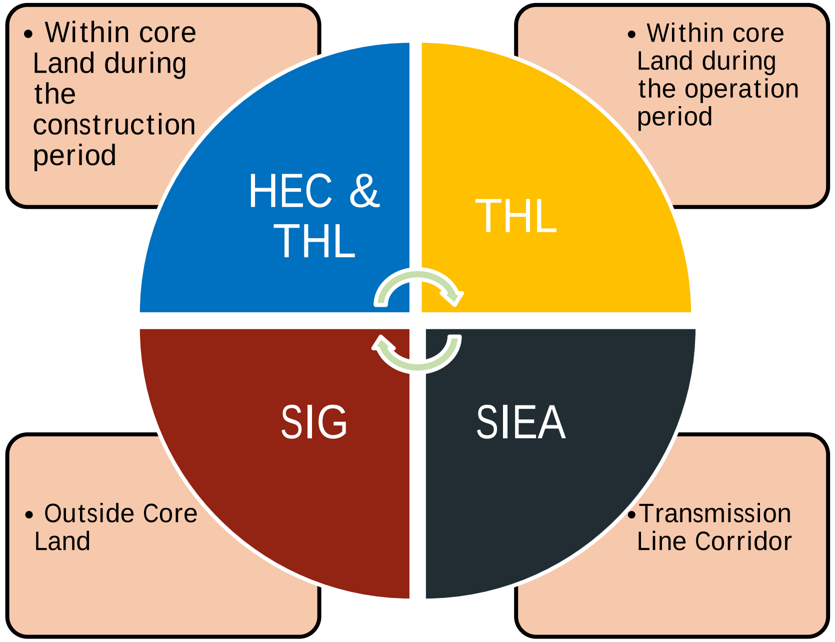
Terrestrial Flora Monitoring	• Critical Habitat Flora Species • Invasive Flora Species Survey
Vegetation Rehabilitation Monitoring	• Rehabilitation Monitoring Survey.
Terrestrial Fauna Monitoring	• Critical Habitat Mammal Species • Critical Habitat Avifauna Species • Invasive Fauna Species Survey
Water Quality and Sediment Quality	• Water Quality Monitoring • Suspended Sediment Monitoring
Aquatic Fauna Monitoring	• Critical Habitat Macroinvertebrate Species • Locally Important Fish Species • Aquatic Biodiversity using eDNA

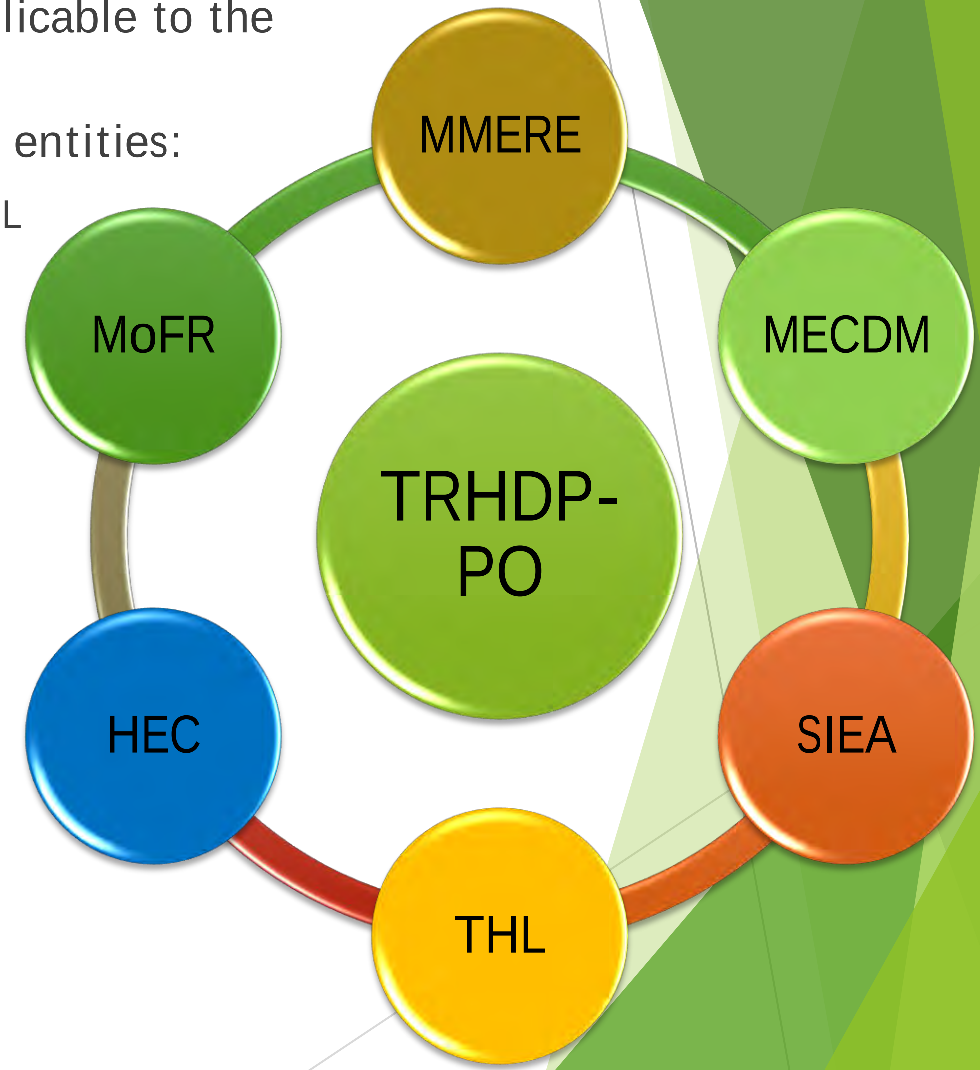





Roles and Responsibility under BMP

- Biodiversity Management Plan for the project shall be applicable to the construction and Operation phase of the project.
- Implementation of BMP shall be managed by the following entities:
  - Within core Land during the construction period: HEC and THL
  - Within core Land during the operation period: THL
  - Outside of core Land: SIG through Project Office
  - Transmission Line Corridor: Solomon Power





Roles and Responsibilities: During Construction

Hyundai Engineering Company: EPC Contractor

- HEC will have specific responsibilities under the BMP during the construction phase including:
  - Providing adequate resources to prevent, minimize and mitigate biodiversity impacts of construction activities;
  - Monitoring and reporting regularly;
  - Coordinating community consultation and stakeholder engagement; and
  - Restoring disturbed forest through provisions within C4 Post-construction Rehabilitation and Revegetation Plan.
- HEC will employ ecologists, fauna spotter/catchers, and wildlife carers as subcontractors to undertake the terrestrial and aquatic field surveys, monitoring, and wildlife care as required by this BMP
- Submission of Monthly Reports and Quarterly Safeguards Report.

Stantec, New Zealand: Owner's Engineer

- Review BMP and any subsequent updates, for compliance with the E&S Standards and good industry practice;
- Monitor and audit Project delivery and HEC activities in accordance with the detailed Project design, method statements, BMP, related ESMPs, and detailed site plans;
- OE Site Engineer to undertake regular site supervision, and report any E&S non-compliances to the HEC HSE Manager, THL E&S Manager and OE Environmental & Social Safeguards (ESS) Lead; and
- Audit HEC performance with respect to the requirements of the EPC Contract, and HSE obligations, including a site visit conducted every six months, for the duration of the construction phase, by the OE ESS Lead at minimum.

Roles and Responsibilities: During Operation

Tina Hydropower Limited

- Engage and manage specialist biodiversity consultancy firm to provide advice and services relating to the BMP;
- Review BMP compliance with the E&S Standards and GIIP;
- Management of a Biodiversity Advisory Group (BAG);
- Prepare monthly E&S performance reports
- Audit compliance with the BMP; and
- Implement agreed biodiversity offsets actions as identified in the TOMAS and AOMAS.

Solomon Islands Government(SIG)

- Implementation and Management of Upper Tina Catchment.

Solomon Power

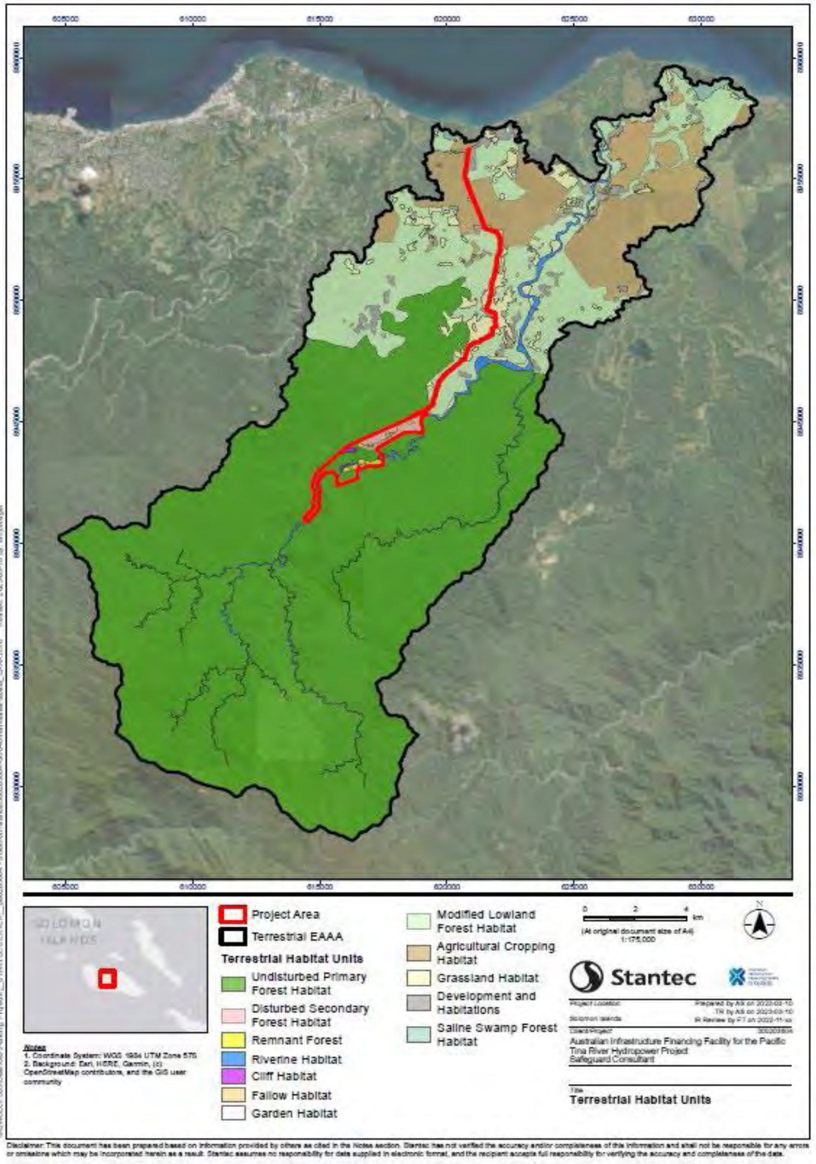
- Biodiversity management in the transmission line corridor and the implementation of any biodiversity actions required outside of the Core Land

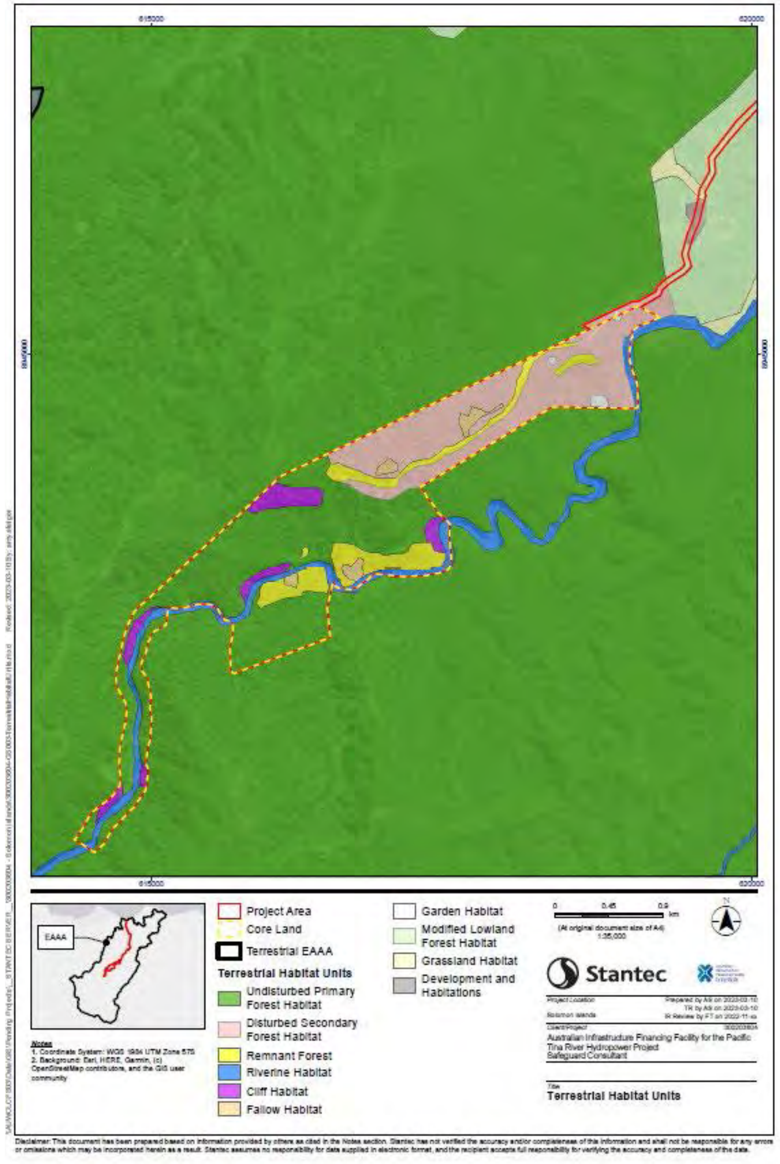
TRHDP - Project Office

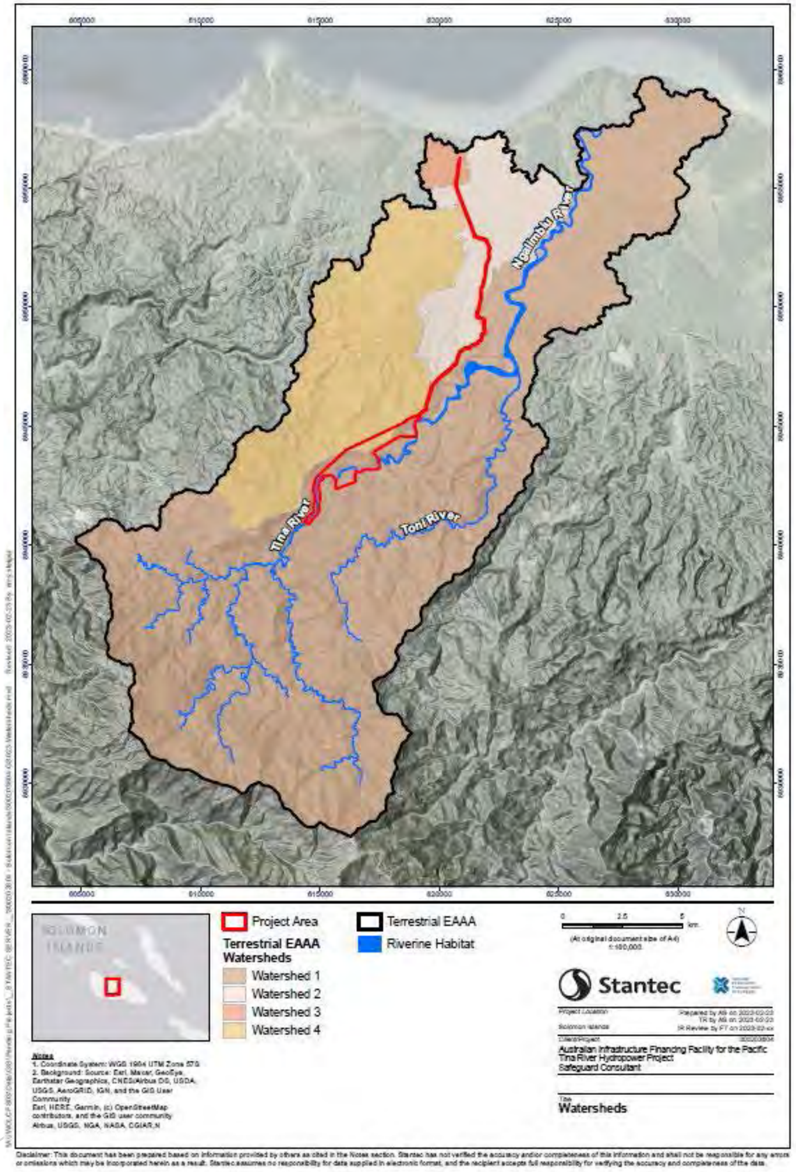
- Directly responsible for the management of biodiversity impacts during the clearing of the reservoir.

Terrestrial Offset Management Strategy

Terrestrial Habitat Units and Watersheds







Terrestrial Offset Management Strategy

Option Analysis

- Offsetting within Core Land
- Protection of the Tina River lower catchment
- Protection of the Tina River upper catchment
- Protection of the Guadalcanal Key Biodiversity Area
- Protection of an adjacent river catchment e.g. Toni River, Sutakama River
- Protection of Barana Community Park
- Protection of Nini Trust Land
- Enforcement of existing laws
- Purchase and revegetation of an area of degraded habitat
- Funding for research.

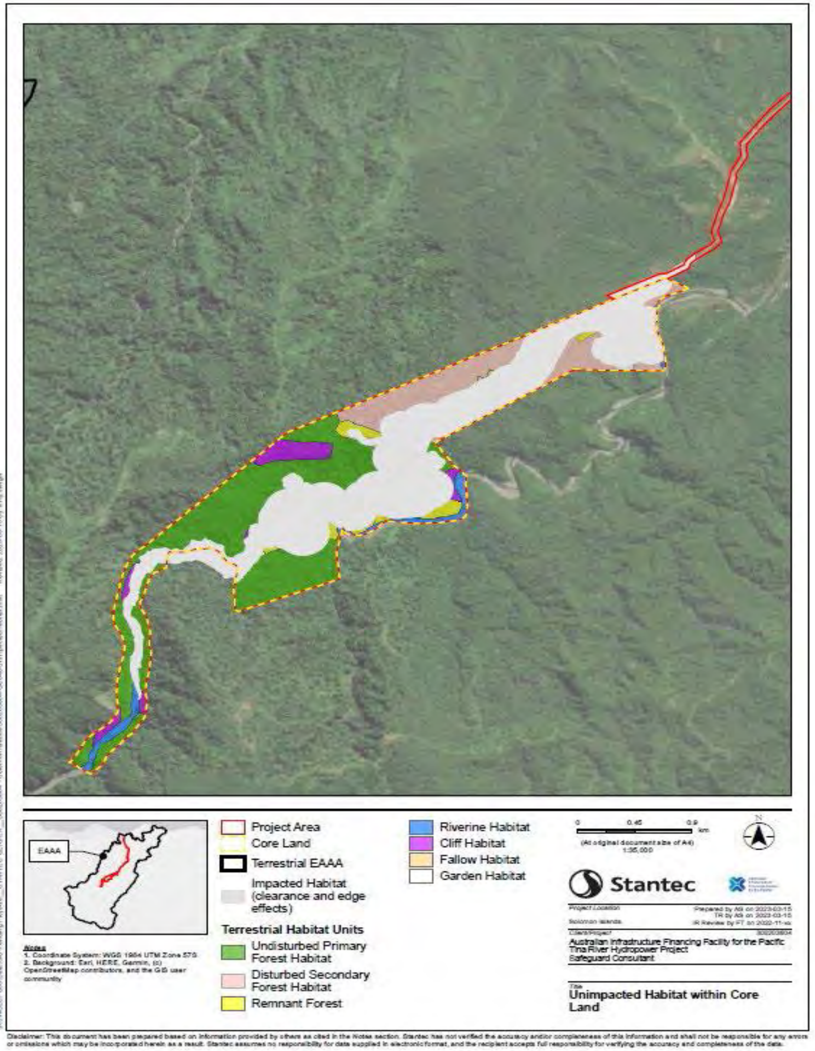
Selected Option

- Establishment of a Core Land Conservation Area
- Protection of the Upper Tina River Catchment

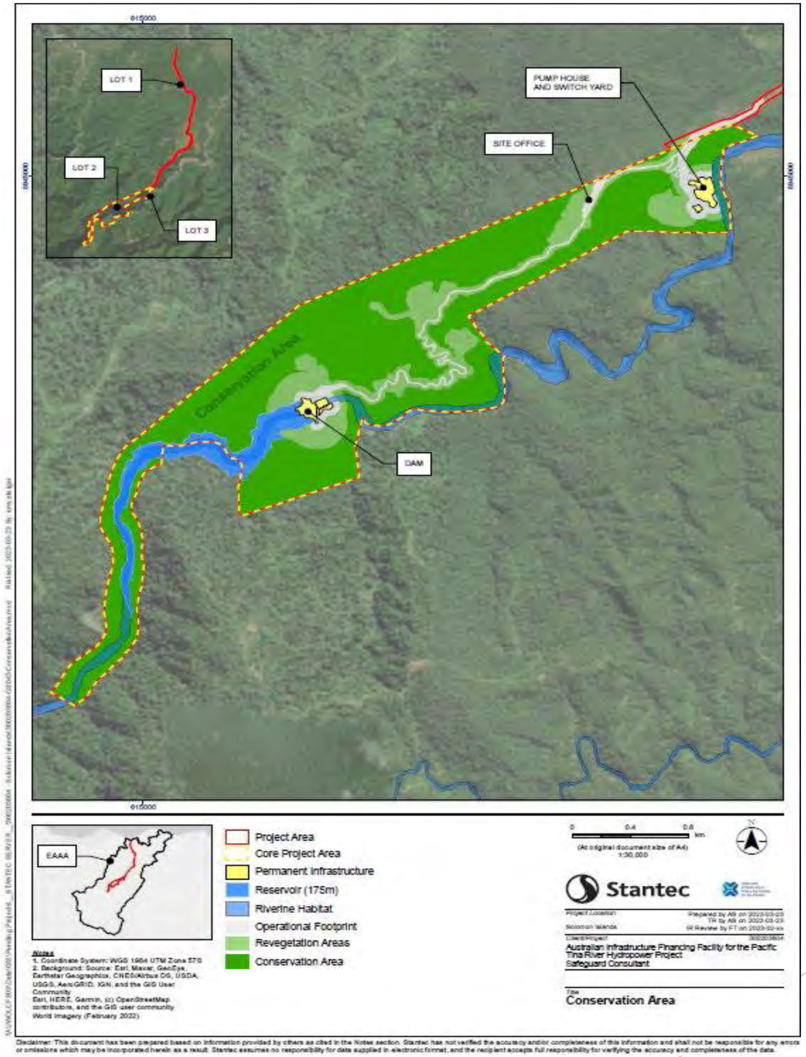
Core Land Conservation Area

- Purpose: Protect remaining habitat and establish a conservation area within Core Land
- Significant Benefits
  - The land is owned by TCLC, jointly owned by SIG and Landowners and is secure for the duration of the PPA, whereby it has been leased to THL.
  - The location is within and adjacent to the Project, achieving equivalence and allowing for ease of management.
  - The area retains and protects all habitat types impacted by the Project.
  - The area has a mix of habitat types, allowing for a combination of approaches to be used to achieve habitat quality improvements.
  - Almost all of the site is below 400 m asl and is easily accessible by road. In the absence of conservation management, the area would likely be logged in the near future.
- Ecosystem benefits and net gain can be achieved via a combination of: averted loss offsets achieved through protection from logging, revegetation and restoration of cleared areas, and ecosystem restoration of remaining habitats.

Proposed Conservation Area within Core Land for Project Terrestrial Offsets



Unimpacted Area within Core Land



Conservation Area within Core Land

Key Actions: Core Land Conservation Area

- Stakeholder Consultation: THL and HEC is required to be involved in consultation required under the BMP and TOMS. The PO are developing a Consultation and Engagement Strategy to guide and coordinate consultation activities required under the BMP, AOMS and TOMS.
- Site Access and Security: THL and HEC are required to ensure strict access controls into Core Land during construction and operation. This will help to Restrictions on any use or access of Core Land shall be clearly defined for customary landowners to avoid any potential conflicts.
- Monitoring: THL and HEC will implement monitoring requirements within Core Land as detailed in the P-2 Biodiversity Management Plan, related Construction and Environmental Management Plans, plus any additional requirements developed as part of the Management Plan.
- Management Plan (December 2023 expected): A Core Land Conservation Area MP shall be prepared by THL/HEC or a nominated sub-consultant. This shall detail the aims and objectives for the Core Land Conservation Area for the duration of the PPA, and establish in more detail a 5 year plan and first annual budget. It will also detail the resourcing needs, monitoring requirements and Key Performance Indicators required to achieve the offset requirements within Core Land.
- Resourcing: THL and HEC shall ensure adequate funding and resourcing for the implementation of the terrestrial offset.

Measures for Core Land Conservation

- Averted Loss through Protection from Logging.
  - Achievement of 20.27 Qha during 30-year PPA through effective access control to prevent logging and other habitat clearance.
- Revegetation of Cleared Areas
  - Areas cleared for Temporary facilities (approx. 66.29 ha) will be actively revegetated.
  - Sites shall be recontoured, spread with topsoil, and then planted with cover crops such as pueraria (*Neustanthus phaseoloides*), velvet bean (*Mucuna pruriens*), and vetiver grass (*Chrysopogon zizanioides*). Once stabilized, sites will be inter-planted with native shrubs and tree species.
  - Assuming that the ecological value of this habitat after 30 years will amount to 70%, the total offset gain achieved is 46.40 Qha.
- Natural Regeneration:
  - Protection of habitats within Core Land will not only prevent their potential loss through forestry activities but will also allow remaining habitats to naturally regenerate and improve in habitat quality over time.
  - Natural regeneration achieves 21.82 QHa over the duration of the 30-year PPA

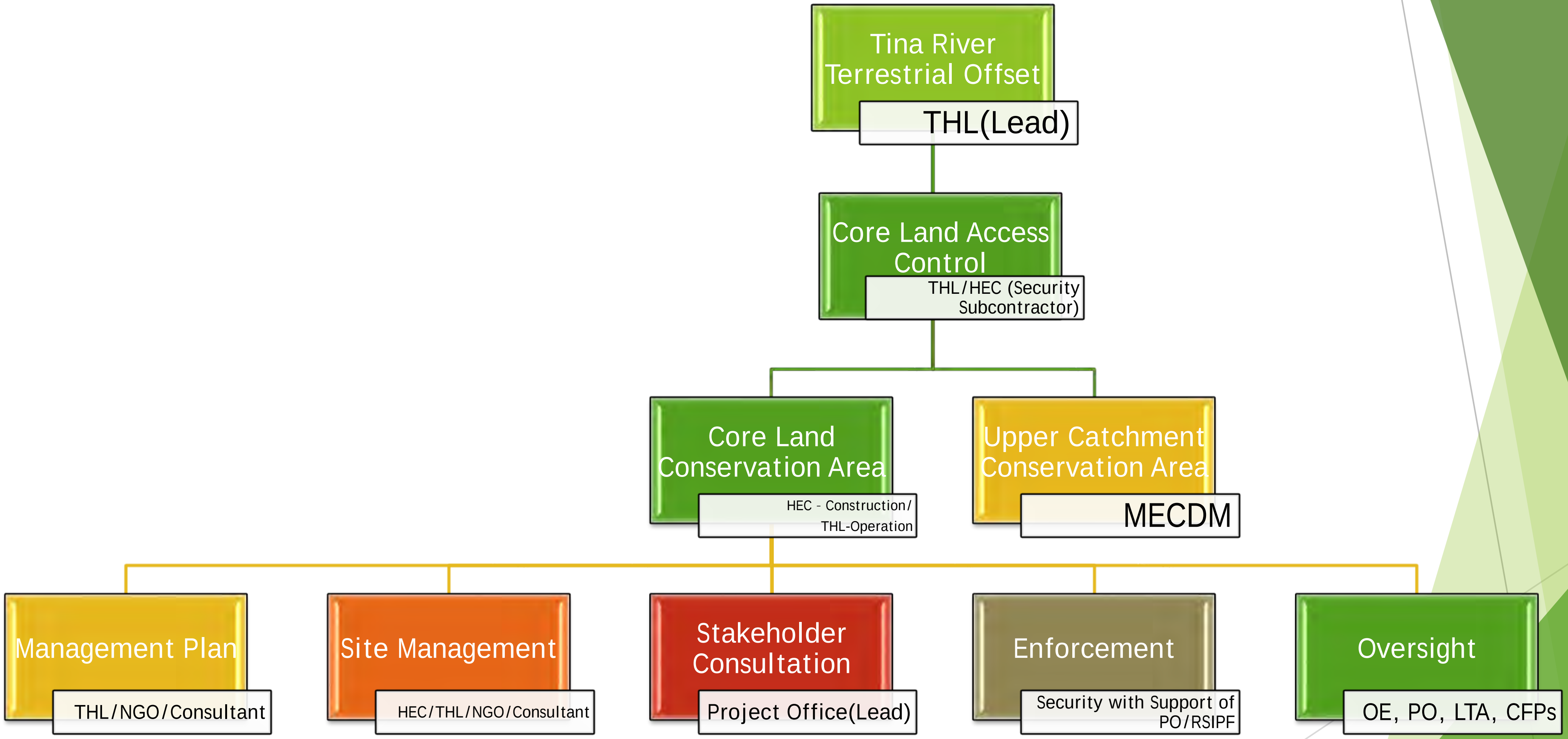
<u>Total Net Gain/Loss</u>

The Project results in an overall loss in 70.82 QHa of Critical Habitat terrestrial habitats due to habitat clearance and edge effects.

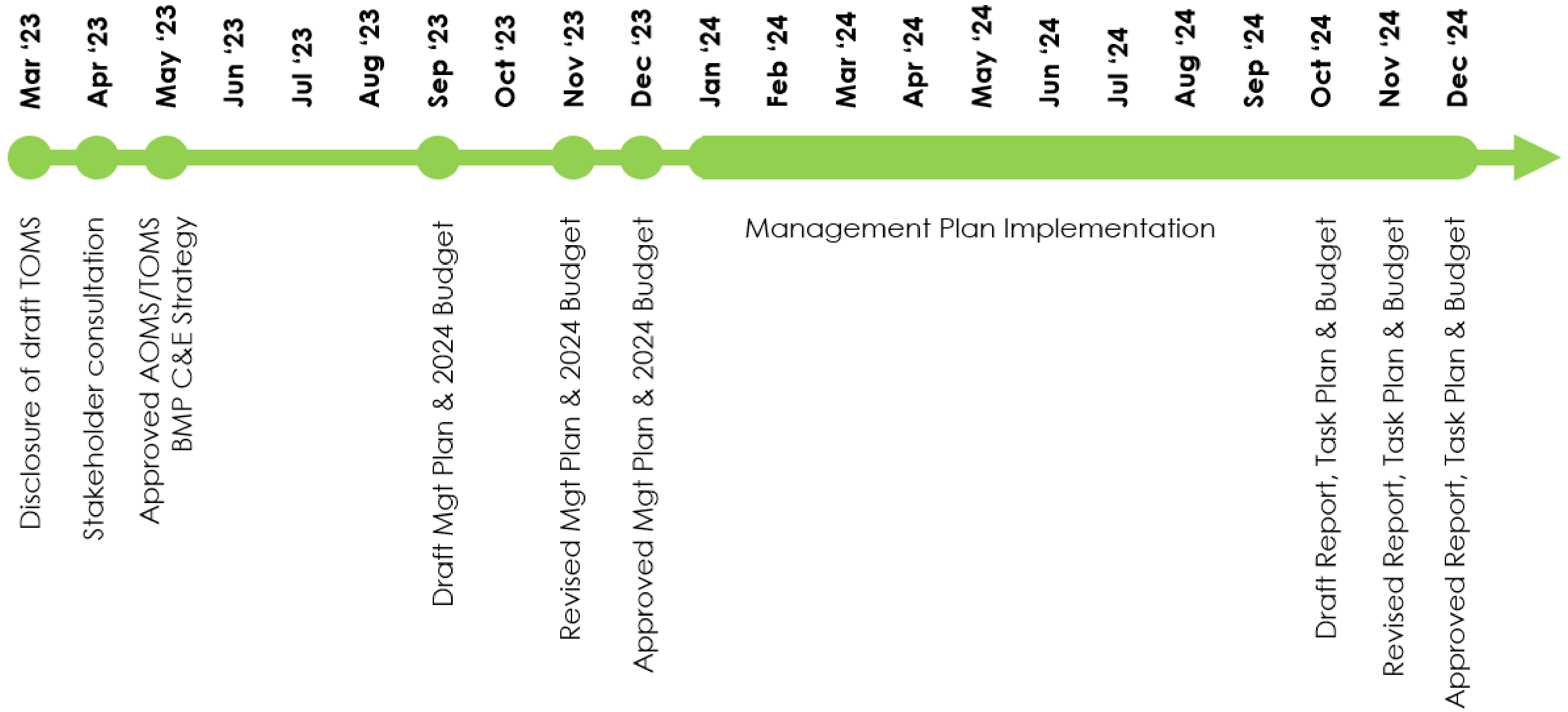
Through a combination of averted loss oversets, active revegetation of cleared areas, and natural regeneration of remaining habitats, a total of 88.49 QHa can be achieved.

This is 125% of the minimum offset required and represents a small net gain in biodiversity as a result of the project.

TOMS: Roles and Responsibility



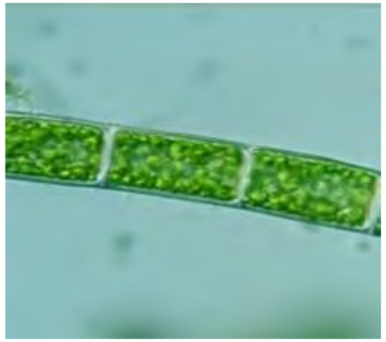
Indicative Timeline



QUESTIONS?
SUGGESTIONS?
FEEDBACK?

THANK YOU

Flora (or plants) are an essential part of the natural world. They convert carbon dioxide to oxygen, provide habitat for animals, regulate the water cycle and provide many products that people use every day.



Algae are a diverse group of organisms that are not necessarily closely related. Most are aquatic (live in water) and have chlorophyll.

Bryophytes include mosses and liverworts, they are non-flowering, do not have a vascular system (tubes that transport water and nutrients within plants), do not have true stems and leaves and do not reproduce by seed.

Ferns are a group of non-flowering plants that have a vascular system and stems and leaves. Ferns reproduce by spores that can be found on the backs of their leaves.

Gymnosperms are an ancient group of plants that includes conifers, cycads and gnetales. They are non-flowering plants that produce seeds, have a vascular system and true stems and leaves.

Flowering plants are the most diverse group of plants that includes many of the plants that people rely on for food. Angiosperms produce flowers that are specialised structures for reproduction.

Fungi are different from plants, animals, protists, and bacteria. They become more noticeable as mushrooms and moulds when fruiting and are important for recycling nutrients that are important to other organisms.

Source: Solomon Islands Forest Life by Tyrone Lavery, Patrick Pikacha, Diana Fisher

The term **fauna** is used to describe all animal life. Fauna include invertebrates that are animals without a back-bone (e.g. insects and arachnids) and vertebrates that do have a backbone (e.g. reptiles and birds).

Insects
This group include beetles, dragonflies, bees and wasps, ants, bugs and butterflies.

Arachnids
Spiders, scorpions, ticks and mites are all examples of arachnids.

Centipedes & millipedes
Centipedes and millipedes have segmented bodies and one pair of antennae.

Crustaceans
Crustaceans are primarily marine, but there are freshwater and terrestrial species.

Reptiles
Reptiles are vertebrates and include skinks, geckoes, monitor lizards, dragon lizards, snakes and crocodiles.

Birds
Birds are vertebrates with feathers and beaks. They can often fly and produce distinctive songs that can be used to identify different species.

Annelid worms
Annelid worms include earthworms and leeches. Earthworms are important for nutrient recycling.

Molluscs
The greatest diversities of molluscs live in the sea, snails and slugs are examples of molluscs that live on land.

Freshwater fish
The freshwater fish of Solomon Islands are important indicators of water quality

Amphibians
Frogs are the only type of amphibian that occur in Solomon Islands.

Mammals
The main mammal groups that occur in Solomon Islands are bats and rats. However, pigs, possums, dogs and cats are also examples of mammals.

THL CEO, welcoming all the communities and stakeholders to the consultation programme.

TRHDP PO Deputy Project Manager delivering Welcome remarks at the start of the consultation.

HEC Project Manager presenting the opening remarks and request communities' cooperation during construction.

The BMP Disclosure/Community consultation attended by project stakeholders and communities

The BMP Disclosure/Community consultation attended by project stakeholders and communities

THL Governance Lead answering a question raised by Community on the functioning of P6 Grievance Redress Mechanism(GRM).

THL E and S Manager Presenting the Aim and Objective of this BMP disclosure and Consultation. He requested members from their community to share their concerns.

One of the Community Leaders sharing his concerns to the project stakeholders.

Regarding an enquiry about the need for consultation, Lenders point of view. WB Safeguards consultant explains the process and importance of Disclosure and consultation.

A young community leader sharing his views and concerns to the project stakeholders.

HEC E and S Team members presenting information related to BMP and TOMS.

Some participants from the community sitting outside of the hall.

HEC E and S Supervisor answering on a query regarding monitoring and mitigation measures listed in the Biodiversity Management Plan.

HEC Electrical Manager answers a community members concern about e-flow.

HYUNDAI ENGINEERING CO., LTD.	TINA RIVER HYDRO POWER DEVELOPMENT PROJECT ; ESMP DISCLOSURE ATTENDANCE RECORDS

Date of Consultation : 04/04/2023 **Venue:** Ngongoti **Time:** 10:00 AM

1. To disclose the updated BMP and OMAS for the construction of the Hydropower Facilities to Project Affected Communities.
2. To present BMP implementation, management, mitigation, and proposed offset measures for the Project, including for activities outside of Core Land, which will affect stakeholder
3. To provide an opportunity for community members to present their views and feedback regarding the updated BMP and OMAS
4. For HEC and THL to receive community feedback through face-to-face consultation which will contribute to the review, improvement, finalization, and approval of the BMP and OMAS
5. To update community members on the construction schedule to date.

Name of Community: PROJECT STAKEHOLDERS.

NO	Name	Gender	Village/Organizations	Title
1.	Rolland B	M	MSS	Security Supervisor.
2.	George Bua	M	MSS	Driver.
3.	Irene	F.	MSS	Managing Director.
4.	Edward Koto	M	MSS	Director.
5.	Yonghoon Chang	M	THL	CEO
6.	Hanyong Cho	M	THL	CTO
7.	Samuela Tawakedrau	M	THL	E&S Manager.
8.	Fiona	F.	THL	Governance Lead
9.	Karen M	F.	THL	Mechanical Assistant.
10.	Derwin Ouita	M	THL	Admin Manager.
11.	Jaydol	M	THL	H&S Assistant.
12	Tino T Mabnua	M	THL	E&S Assistant.
13.	Fred Conning	M	TRHDP-PO	Dy. Project Manager.
14.	Glen Ainsworth	M	TRHDP-PO	E&S Manager.
15.	Baltazare Rongo	M	TRHDP-PO	CLO

Number of Attendee : 15	Male: 12 Female: 3	Signatures of Facilitator	HSaia	[signature]

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Name of Community: PROJECT STAKEHOLDERS.

NO	Name	Gender	Village/Organizations	Title
16	Mandus Boselalu	M	TRHDP PO	E&S Officer.
17.	Joel Zole	M	TRHDP-PO	CLO - Social Monitoring.
18	Eui Man Moon	M	HEC	Project Manager.
19.	I J Shin	M	HEC	E&S Manager.
20.	Manas R Samal	M	HEC	Electrical Manager.
21.	Yogesh Muthulingam	M	HEC	QS.
22.	Edmond Jr. Bate	M	HEC	E and S Supervisor.
23.	Ivory Solomate	F	HEC	E&S Officer.
24.	Helen La	F	HEC	CLO and Gender focal Point.
25.	Ryline Dollan	F	HEC	Biodiversity Officer.
26.	Eagarhn N. Mana	M	HEC	Biodiversity officer.
27.	Titus Siapu	M	HEC	CLO.
28.	Paul	M	TRHDP-PO	Stakeholder Consultant.
29.	Alison	F	World Bank	Operation Analyst
30.	Joyce	F	World Bank	Safeguards consultant.

Number of Attendee : 30 cumulative	Male: 22 Female: 8.	Signatures of Facilitator	Hlaa	[signature]

HYUNDAI ENGINEERING CO. LTD.	TINA RIVER HYDRO POWER DEVELOPMENT PROJECT ; ESMP DISCLOSURE ATTENDANCE RECORDS

Date of Consultation : 04/04/2023	Venue: Ngongoti	Time: 10 am
	1. To disclose the updated BMP and OMAS for the construction of the Hydropower Facilities to Project Affected Communities. 2. To present BMP implementation, management, mitigation, and proposed offset measures for the Project, including for activities outside of Core Land, which will affect stakeholder 3. To provide an opportunity for community members to present their views and feedback regarding the updated BMP and OMAS 4. For HEC and THL to receive community feedback through face-to-face consultation which will contribute to the review, improvement, finalization, and approval of the BMP and OMAS 5. To update community members on the construction schedule to date.	

Name of Community:

NO	Name	Gender	Village/Organizations	Title
1	Daisy	F	Vuramali	
2	Avellyn Ivy	F	Tina Community	[signature]
3.	Lilian Para.	F	Valele "	Women Rep.
4	Whitlam Kiko (M)		Managahuli	[signature] (Chief).
5	Samatha. kylie	(F)	Horohotu (2)	[signature]
6	Elvina-Dollan	(F)	Horohotu (2)	[signature]
7	M. Litany	(M)	Vatunadi	[signature]
8.	Charles Sedo	(M)	Horohotu	Charles Sedo
9	OSCAR	M	Antioch	[signature]
10	Alfred. L.	M	Valesala	[signature]
11	Dollan Gisi	M	Horohotu	[signature]
12	Kendrick	(F)	Vuramali	[signature]
13	Jasper	(M)	Tina	[signature]
14	Zimri Launi	(M)	Marara	[signature]
15	Peter Gesi	(M)	Hamai VGe	[signature]

Number of Attendee : 15	Male: 9 Female: 6	Signatures of Facilitator	Hdaa	[signature]

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Name of Community:

NO	Name	Gender	Village/Organizations	Title
16	DICKSON. CHULUVERANA	M	HOROHOTU(1) Village	[signature]
16	Hudson. Mesae	M	HoroHotu(1) Village.	[signature]
17	SAMSON. HILA.	M	HoroHoTu(1) Village.	[signature]
18	DOUGLAS OMI	M	Haimane Village	[signature]
19	AUSTIN KANO	M	Pamphylia Village	[signature]
20	Erley Sade	M	Managi Vge	[signature]
21	Ezekiel Presley	M	Vuravuli Vge.	[signature]
22	Michael Lose	M.	Managikiki Vg.	[signature]
23	Catherine Miva	F	Marava	[signature]
24	Smith Ian	M	Horohotu	[signature]
25	Seli	M	Marava	[signature]
26	Benkoke	M	Haimane.	
27	Jack S.	M	Marava	[signature]
26	Oberth	M	Katihana	
29	Para	M	Antioch	[signature]

Number of Attendee : 15	Male: 14 Female: 1	Signatures of Facilitator	HLaia	[signature]

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Name of Community:

NO	Name	Gender	Village/Organizations	Title
30	Ronnie	M	Vuramali	
31	IAN. H	M	HOROHOTU	
33	Jack H.	M	HOROHOTU	
34	Reychoal	F	Katihoua	
35	Kinda	F	HOROHOTU	
36	Millka	F	Vuramali	
37	~~Quara~~ Atali Irene	F	Grashill	
38	Edykoto	M	Grashill	
39	Vuza olo	M	Managi	
40	Liisa K.	M	Marava	
41	Mei	M	HOROHOTU	
42	PRIMO CHAPA	M	GRASS Hill	
43	JOHN MATESOIA	M	GRSS Hill	
44	George Boaz (Jr)	M	GRASS HILL	
45	Maxly Chumba	M	Namopila	

Number of Attendee : 15	Male: 12 Female: 3	Signatures of Facilitator	Hdaia	

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Name of Community:

NO	Name	Gender	Village/Organizations	Title
46	Sarina	F	Managikaki	
47	Jacinta	F	Horimanan	[signature]
48	Sharing	F	Mangoi	
49	Beverlyn	F	~~NEDE~~ Antioak	[signature]
50	Cheresi	M	Valebankiki	Soloni
51	Nico	M	Tina	
52	Ben	M	Taurasha	
53	Rolando	M	Tina	[signature]
54	David Hila	M	Ngongoti	
55	Misack	M	Tina	
56	GEORGE	M	NGONGOTI	[signature]
57	Simon	M	Antioch	
58	Ryndon Philemon	M	Valebanki	
59	Sharon Para	F	Ngongoti	
60	Alia	F	Ngongoti	

Number of Attendee : 15	Male: 9 Female: 6	Signatures of Facilitator	Hilaic	[signature]

HYUNDAI ENGINEERING CO., LTD.

SAMPLE

NOTICE

FROM: **Hyundai Engineering Co., Ltd**

TO: **Tina 2 COMMUNITY**

SUBJECT: Community Consultation for disclosure of Biodiversity Management Plans and associated documents for the construction of Main Works

Hyundai Engineering Co., Ltd (HEC) together with Tina Hydro Limited (THL) kindly wish to request your attendance at a community consultation regarding the above.

DATE: Tuesday 4th April 2023

TIME: 10 am

VENUE: Ngongoti Community Hall

Brief background

A package of Environmental and Social Management Plans (ESMPs) for the Hydropower Facilities (dam, tunnel, and powerhouse) had been developed and then disclosed on the project website following which a community consultation was held on 23rd November 2022. Subsequently, Biodiversity Management Plan (BMP) and Offset Management Area Strategy (OMAS) which are the sub-plans required under the ESMP were updated.

Clearance is currently being sought for the Hydropower Facilities and as part of the clearance process, the BMP and OMAS will be posted to the TRHDP website (https://www.tina-hydro.com/project-documents/) on 27th March 2023 and community consultation will be held on 4th April 2023. The Project welcomes any comments, observations, or recommendations for improvement to these plans during the disclosure process. Comments also can be submitted to the THL in writing or via email and the comments shall be analyzed and appropriate mitigation measures will be incorporated into the final BMP and OMAS.

Therefore, it is important that community members actively participate during this consultation and disclosure meeting so that your views are heard, recorded, and considered in the ongoing preparation of the BMP and OMAS.

HEC and THL look forward to community leaders, men, women, and youths from the communities attending this important consultation.

Please note that this consultation is an extension of the community awareness pertaining to Disclosure for main works [23rd November 2022].

Purpose of the consultation

The main purpose of the consultation is

1. To disclose the updated BMP and OMAS for the construction of the Hydropower Facilities to Project Affected Communities.
2. To present BMP implementation, management, mitigation and proposed offset measures for the Project, including for activities outside of Core Land, which will affect stakeholder
3. To provide an opportunity for community members to present their views and feedback regarding the updated BMP and OMAS
4. For HEC and THL to receive community feedback through face-to-face consultation which will contribute to the review, improvement, finalization, and approval of the BMP and OMAS
5. To update community members on the construction schedule to date.

We look forward to your participation and your constructive discussion in this program.

Tagio Solohana

HEC Management

*Enclosure: Presentation on Draft BMP and OMAS

3.4 Appendix 4. MINUTES OF CONSULTATION AND ENGAGEMENT ACTIVITIES

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Buhugaro Tribe on 03rd February 2023

Parties: SIG (PO), Buhugaro Tribe

Venue: PO, Conference Room

Attendees: Fred Conning (Deputy Project Manager), Sam Kamilo (Tribal Chief of Buhugaro)

Discussion

Item	Description
1	**Buhugaro and Carbon Trade Prep work**- the Buhugaro tribe has already GPS their land boundary in the Tina catchment and they have a map that also includes the Tina River. The PO requested the tribe to provide the map to the PO so we can confirm the area that they are intending to protect.
2	**Consultation:** The tribe has already done their own consultation with other tribes and made everyone aware through public notices pasted in the communities about their work towards the carbon project.
3	**Tribe Position:** All agreed to deny logging and mining in the area they are earmarking for the carbon project as these activities will deny them participation in the carbon trading scheme.
4	**Tina Catchment Protection-**The tribe is also aware that the upper Tina River catchment is required to be protected for the hydro project and has taken this initiative.
5	**Meeting with PO** -The PO agree to have the next meeting with representatives of the tribe on the 7th of February so we can get more detailed information on their maps and any other information that will be useful for the PO to achieve the requirements of the BMP/OMAS.
	Next meeting is scheduled for 6th February 2023

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Uluna-Sutahuri Tribe on 06th February 2023

Parties: SIG (PO), Uluna-Sutahuri Tribe

Venue: PO, Conference Room

Attendees: Fred Conning (Deputy Project Manager), Michael Litani (Uluna-Sutahuri)

Agenda: To discuss the Tina Core-land Company (TCLC) and eventually the upper catchment protection.

Discussion

Item	Description
1	Uluna- Sutahuri is one of the tribes that have an interest in the Popomanatseu area which is part of the Tina Upper catchment.
2	The Uluna – Sutahuri tribe have been involved with some scientific expedition to the Tina Catchment in recent times and catchment protection has already been a subject of the tribe's discussion.
3	Mr Litani is also aware of the need to protect the Tina Catchment from logging and Mining and this idea is also well known to the people in the project communities. The traditional landowners of the catchment are looking forward to participating in the activities related to the catchment Protection. The Landowners are very well aware that the Hydro project is a government asset and the facility will need to be maintained to ensure that the scheme remains intact.
4	Litani is one of the members of a group of elders who have been leading the Tina Land identification process and he is already well-versed with the land boundaries of the upper catchment and the groups who have an interest in those different land blocks.
5	Litani will bring a list of tribes who have an interest in the catchment, and it is important to get the buy-in from them.
6	A next meeting is proposed for Friday 10th February 2023 so that both parties can map out the path to ensuring that FPIC is obtained to do the protection in the Upper Catchment.
7	Fred also confirmed in this meeting that Litani will be looking only at the true right bank of the river only as the true left bank is where the Buhugaro Tribe have already undertaken the protection work.

	Next meeting is scheduled for 10th February 2023

Photograph of meeting:

1. Fred Conning, left, discussing with Mr Michael Litani of the Uluna-Sutahuri Tribe in the PO Conference Room on 6th February 2023.

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Buhugaro Tribe on 06th February 2023

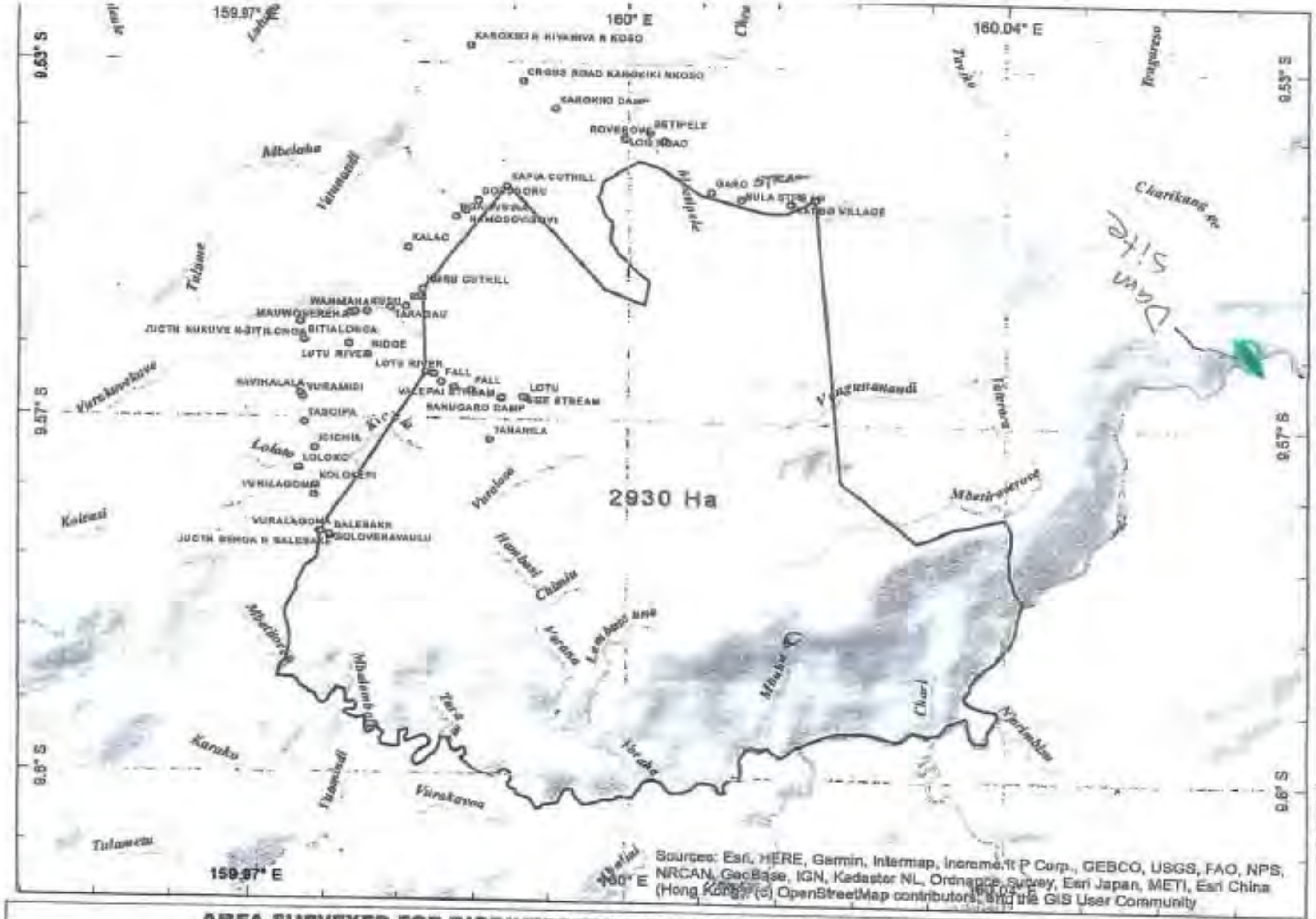
Parties: SIG (PO), Buhugaro Tribe

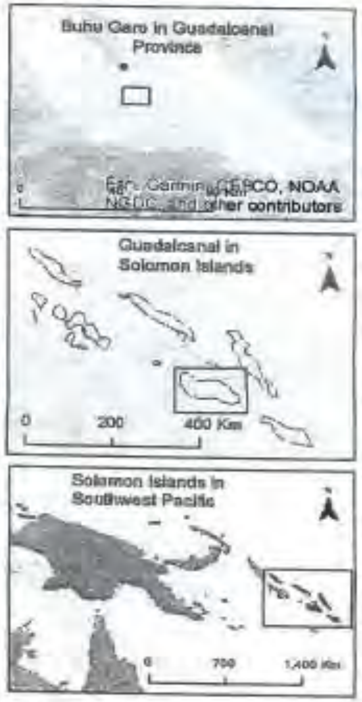
Venue: PO, Conference Room

Attendees: Fred Conning (Deputy Project Manager), Sam Kamilo (Tribal Chief of Buhugaro)

Discussion

Item	Description
1	The meeting was only a follow-up on the map of the area and the steps that the tribe has taken regarding the activities undertaken so far on the catchment protection.
2	Below is the map and the set of meetings that was undertaken with regard to the catchment protection. Note the location of the dam on the map. When we meet David Boseto on Wednesday 8th February 2023, we can again listen to his plans for the area. It would also visualized that most of the activities that David and his group are doing require achieving FPIC which is in line with the CFPs thinking.





Project

Biodiversity survey and protected area establishment in Guadalcanal Province, Solomon Islands.

Map Description

This map shows Buhu Garo conservation ar boundary in Guadalcanal Province. The map also indicates important features including rivers and streams within the proposed conservation area.

ecological Solutions Foundation

AREA SURVEYED FOR BIODIVERSITY AND PROTECTED AREA ESTABLISHMENT IN BUHU GARO

Coordinate System	World Geodetic System 1984
Datum	WGS 1984 Geodetic Datum
Unit	Degree
Measurements	Metric units

Important Features — Conservation Area — Rivers and Streams

0 — 1.5 — 3 Km   **Total Surveyed Area = 2930 Ha**

Surveyed By	ESF
Date Surveyed	November - December 2022
Map Prepared By	Geo-Intelligence Services
Date Prepared	December 8, 2022

SECOND MANAGEMENT COMMITTEE MEETING

BUHU GARO TRIBE, GUADALCANAL PROVINCE

12^{TH} & 13^{th} JANUARY, 16^{th} & 17^{th} JANUARY, 2023

DATE	TIME	ACTIVITY/ SESSION	RESPONSIBILITY
THURSDAY 12^{TH} JANUARY 2023	10am	Opening Prayer	Committee Rep
	10.10am-10.30am	Welcome Remarks & Introduction	Hensllyn Boseto
	10.30am-10.45am	Recap Work done	ESF
	10.45am- 12pm	Confirm PA Name & Category	Rebeun Tako
		Review PA Management Plan-Draft	Hensllyn & Rebeun
	12.pm- 1 pm	LUNCH	
	1pm-2.00 pm	Revise PA Budget	Hensllyn
	2.00pm- 2.30pm	Signing of PA Application Form & Constitution	Rebeun Tako
	2.30pm-3.00pm	Revise PA Map/ Identify Land use Plan on PA Map	Hensllyn
	3.00pm- 3.30pm	Questions & Answers	Rebeun Tako
	3.30pm- 4pm	Tomorrow's activities	
	4.0pm	Closing Prayer	Committee Rep

Day 2: Friday 13^{th} January

DATE	TIME	ACTIVITY/ SESSION	RESPONSIBILITY
FRIDAY 13^{TH} JANUARY 2023	10am	Opening Prayer	Committee Rep
	10.10am-10.30am	Get contacts of all Management Committee Members	Rebeun Tako
	10.30am-10.45am	Signing of Rangers Appointment Letters	Hensllyn
	10.45am- 11.00am	Handing out of Rangers Appointment Letters	Rebeun Tako
	11.00am- 12.00-pm	Profiling of Rangers & Inspectors	Hensllyn & Rebeun
	12.pm- 1 pm	LUNCH	
	1.00pm- 2.00pm		
	2.00pm- 3.00pm	Social survey	Hensllyn & Rebeun
	3.30pm	Closing Prayer	Committee Rep

Day 3: Monday 16th January 2022

DATE	TIME	ACTIVITY/ SESSION	RESPONSIBILITY
MONDAY 16TH JANUARY 2023	10am	Opening Prayer	Committee Rep
	10.10am-12pm	Go through Management Plan and Endorse MP	Rebeun Tako
	12pm-1pm	LUNCH	
	1PM- 2PM	MEL ACTIVITIES	Hensllyn Boseto & Rebeun Tako
	2.00pm- 3.00pm	Questions & Answers	Hensllyn
	3.00pm- 3.30pm	Final wrap up	Committee Rep
	3.30pm	Closing Prayer	

Day 4. Tuesday 17th January 2023

To complete any incomplete activities and to submit Buhu Garo Letters to Stakeholders

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Wildlife Works on 8th February 2023

Parties: SIG (PO), Wildlife Works

Venue: PO, Conference Room

Attendees: Fred Conning (DPM), Glen Ainsworth (E&S Manager), Helen Dolaiano (GFP), Mandus Boselalu (ESSO), and David Boseto (ESSI/Wildlife Works)

Agenda:

- To discuss approachable ways to engage with landowners/communities for the protection of the Tina River Upper Catchment.
- To learn some of the experiences and lessons learnt by ESSI in working with Buhu Garo tribe towards Protected Areas PA 2010.
- To learn more about the work of the Wildlife Works and carbon trade initiatives.

Welcome Remarks:

The meeting was opened with a word of welcome by Fred (DPM) to Mr. David Boseto who is the founder of ESSI and the Director of Wildlife Works. In a brief remark the DPM also thank David for taking his time out from his busy schedule and accept the project office's request to meet. The DPM also explain the main purpose of the meeting as outlined in the above agenda.

Discussion

Item	Description
1	Fred Conning; • Introduce the need for the upper catchment protection of Tina River for the shake of the hydro facilities (dam, tunnel and powerhouse) itself and Biodiversity offset management. • A Letter of Intent to protect the upper catchment has been signed by the Permanent Secretaries (PS) for MMERE, MECDM and MOFR to protect the upper catchment of the Tina River from commercial logging and mining development. • Project office to lead the upper catchment protection of Tina River as it is outside of the core land (acquired Land).
2	David Boseto; • Introduced himself and the work of ESSI to the PO team • In 2015, He participated in a major expedition to the interior of Guadalcanal (Upper Tina River to Mt Popomanaseu) to document the unique and diverse flora and fauna of this biodiversity hotspot led by USP in partnership with the American Museum of Natural History (AMNH) and the Solomon Islands Community Conservation Partnership (SICCP). • ESSI has been working in Western, Choiseul, Makira, Malaita and Guadalcanal under the FAO

	Integrated Forest Management Project (IFMP) funded by GEF 5 as an implementation partner to carry out biodiversity surveys. • Stated that FAO/IFMP project was not implemented in the central Guadalcanal biodiversity hotspot in the upper Tina River Catchment due to higher expectations by one of the chiefs. During the first community consultation by FAO with the Tina community, a chief demanded that FAO give them money before a consultation can be convened and from that, there was no implementation of the project and as a result ESSI withdraw from the FAO-led project. • ESSI has now worked with Buhu Garo tribe in conservation and working towards protecting the land under PA Act 2010 and carbon trade initiatives. • ESSI undertook a lot of community consultations in leading to the PA and the majority of the tribal people support the idea. • Biodiversity survey was already carried out and the report was almost completed including the map of the area to be protected. ESSI has also supported the management committee to draft the management plan for the PA. • Final community consultation before submission of the PA application to the Director ECD (MECDM) was carried out from 6th – 10th February. • Lessons learnt: o Consultations to be done with the tribe to consult with the right people and avoid the house of chiefs (Not to repeat the FAO issue), o Consultations/meetings to be done in the communities. o Avoid raising high expectations when talking about the protection of the upper catchment at the start of community consultations. o FPIC • ESSI has all the data for flora and fauna for the upper Tina River catchment and is willing to share it with the PO. • ESSI is willing to support the PO in the protection of the Tina River Upper catchment in any possible way.
3	Glen Ainsworth; • Briefly stated that the upper catchment protection is a requirement under the BMP (OMAS & TOMAS). • States that according to the initial studies, it stated that there is enough land inside the core land for offsets but then Stantec (OE) came up with another finding saying that there is not enough land inside the core land for offsets. Thus, need to do offsets outside of the core boundary and the PO will take the lead. • Asked David if they can share the Biodiversity Reports for Buhu Garo and the upper Tina catchment areas that ESSI has carried surveys with the PO.
4	Mandus Boselalu; • Request David if ESSI can share the GIS shape file for the map of Buhu Garo conservation area for POs reference purposes as we awaiting the revised map from Kristy for the upper catchment.
5	David Boseto; In response to Glen & Mandus: • It is a public document and can be shared with anyone. Once the draft is finalized, we can share copies with the Project Office. • The GIS shape file can be shared with the PO.

6	Fred Conning; • Asked David to brief the PO on the roles and objectives of Wildlife Works.
7	David Boseto; • Wildlife Works was founded in 1997 with a mission to create a market-based solution for wildlife conservation that provided real, sustainable development to local communities. • It is a carbon trading company that assists the community to conserve their land and in return it buys the carbon credit stored by the forest that was conserved. • Wildlife Works now has an office in the Solomons based in Honiara and David is the Director. • Wildlife Works will work in partnership with ESSI to assist communities in carbon trading. • Wildlife Works will focus on Guadalcanal as a pilot site and then expand to other provinces later. • In Guadalcanal, they are working with Buhu Garo tribe and others in the weather coast and West Guadalcanal supporting them in the PA process and then assisting them in the carbon trading. • Wildlife Works will pay carbon credits for 10 years and does not entertain middleman. Wildlife Works Will also assist the Government MoFR to work on the carbon trade Policy for REDD+.
8	Glen Ainsworth; • What are the requirements for carbon trade under Wildlife Works? • Some of the areas in the upper Tina River Catchment are well above 400 masl, are they qualified for carbon trading projects seeing that above 400 masl the carbon storage decreases?
9	David Boseto; • The requirement is if there is a threat to biodiversity such as logging and mining. For Example, there is a PL (PL194) for Goldridge mining adjacent to Buhu Garo thus we see that as a threat. Likewise, once there is a threat even above 400 masl Wildlife Works will still buy carbon credits.

Photograph of meeting:

1. From L-R: David B (ESSI/Wildlife Works), Fred C (DPM), Glen A (E&S Manager), Helen D (GFP), Mandus B (ESSO)

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Buhugaro Tribe Representatives on 16th March 2023

Parties: SIG (PO), Buhugaro Tribe

Venue: PO, Conference Room

Attendees: Sam Kamilo- Tribal Chief of Buhugaro Tribe, William - Buhugaro Tribe, Jeanette - Buhugaro Tribe, Emanuel Labu – Buhugaro Tribe, Fred Conning – Deputy Project Manager, Glen Ainsworth – ESS Manager, Helen Dolaiano, Joel Zole, Baltazare Rongo – PO CLO team, Michael Schultz – ADB Community Consultation & Engagement Specialist/Advisor

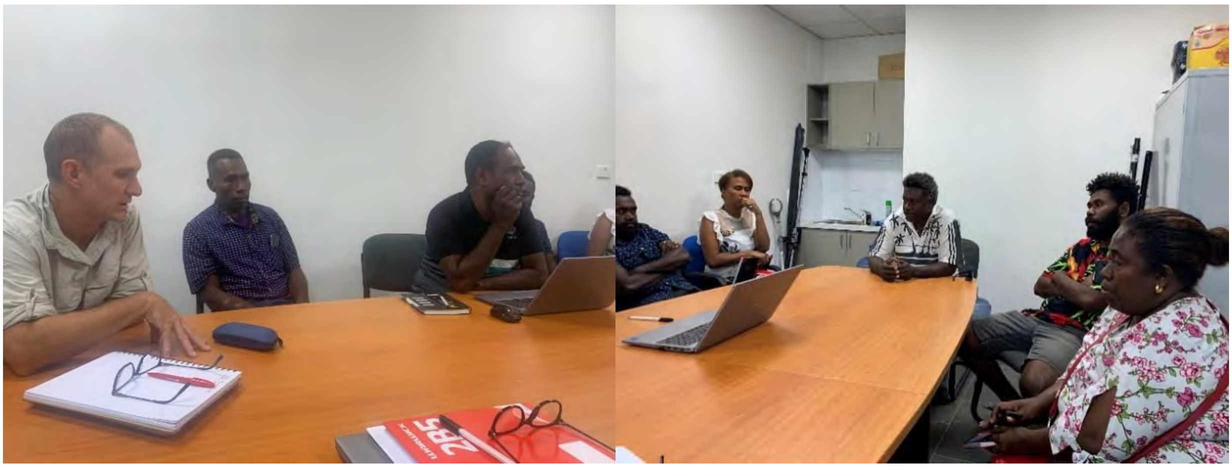
Agenda:

- To update PO on the plans of Buhugaro Tribe to conserve and protect their land in the Upper Tina Catchment

Discussion

Item	Description
1	• Introducing Michael Shultz to Buhugaro Tribal Representatives
2	• Sam Kamillo provided background: - The Buhugaro tribe has mapped their land boundary in the Upper Tina Catchment that they intend to protect - 2030 hectares. - The tribe have completed their own consultation with other neighboring tribes and posted public notices for community awareness regarding their work towards a carbon project. After three months they have not received any objections. - The Tribe Position is to deny all commercial logging and mining in the area they are earmarking for the carbon project as these activities will deny them participation in the carbon trading scheme. - The tribe is also aware that the upper Tina River catchment is required to be protected for the Tina hydro project. - Currently working on a budget to cover the construction of a hut to house future rangers. - The group is also working with Sky Islands- a local Charitable trust group that is interested in reconnecting indigenous people to their traditional roots - Recently Queen Elizabeth Park was decommissioned in Honiara. Their plan is to transfer the idea of a National Park to the area that they are interested in protecting. t. Want to be recognized as working independently for the Tina Hydro Project and not as a consequence. - The tribe also want to preserve the area to educate and transfer their culture and customs to the next generations.

Photograph of meeting:



(L-R) Michael Schultz, Baltazare, Fred, Joel, Helen, Sam Kamilo, William, Jeanette

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Stantec on 16th March 2023

Parties: SIG (PO), Stantec

Venue: PO, Conference Room and Online (virtual meeting)

Attendees: Stantec – Kristy Harrison, AIFFP- Nik. Y, Fred Conning – Deputy Project Manager, Glen Ainsworth – ESS Manager, Michael Schultz – ADB Community Consultation & Engagement Specialist/Advisor

Agenda:

- To discuss the Communication and Engagement Strategy for the core land and Upper Tina Catchment

Discussion

Item	**Description**
1	• Introduced Michael Shultz (MS)
2	• Kristy and Nik explained their understanding of the TOR for the communication and engagement strategy. Strategy for core land and UTC. • Glen Ainsworth - Does not align with last 6 weeks of discussions with the CFPs at weekly meetings. Which is to gain no overwhelming objection to protecting the UTC only. To be a subsection in the BMP. - Kristy waiting for CFP clearance of 1:1 T-OMAS in core land. -Discussed the name of the PO Stakeholder Engagement and Communication Strategy agreed to with NY on previous discussions – now BMP Consultation and Engagement Strategy - Discussed MS TOR
3	• MS spoke to Michelle as well as the PO team and reached the following shared understanding of the content of the strategy: - The strategy will encompass communication and consultation relating to the implementation of the entire BMP. This includes those activities being undertaken within the Core Area and any other relevant activities contained in the BMP that will impact communities and stakeholders. - The strategy will include a plan to engage communities to develop a credible and plausible process to protect the UTC area.

Photograph of meeting:

(L-R) Michael, Fred, Glen (photographer) – online Stantec

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Permanent Secretary (PS), Ministry of Mines, Energy and Rural Electrification (MMERE) on 16th March 2023

Parties: SIG (PO), PS MMERE

Venue: PO, Conference Room

Attendees: Dr Chris Vehe (MMERE PS), Fred Conning – Deputy Project Manager, Glen Ainsworth – ESS Manager, Michael Schultz – ADB Community Consultation & Engagement Specialist/Advisor

Agenda:

- To update PS MMERE on the Communication and Engagement Strategy for the core land and Upper Tina Catchment

Discussion

Item	Description
1	• Introducing Michael Shultz
2	• Glen Ainsworth – The strategy is to undertake a situation analysis of the relevant tribal group's current interest in protecting the UTC. • AIM: to assess whether there is any overwhelming objection to the protection of the UTC. Develop strategy accordingly. • Further consultation is to occur following disclosure and CFP clearance of the BMP. Referencing Offsets is not understood – use UTC protection for wildlife and forest.
3	• PS points of clarity around UTC protection and strategy for stakeholder engagement and communications. - Keep discussions and communications with targeted focus tribal groups relevant to the UTC customary landowners. - Communicating with the wider community will attract unnecessary alternative interests.

Photograph of meeting:

(L-R) Fred, Michael, Glen, and Dr Chris Vehe (PS MMERE)

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Tina Hydro Limited (THL) on 17th March 2023

Parties: SIG (PO), THL

Venue: PO, Conference Room

Attendees: Samuela Tawakedrau (THL), Fiona Rodie (THL), Tino Tingia- E&S Assistant (THL), Jaydol Jacob- H&S Assistant (THL), Fred Conning – Deputy Project Manager, Glen Ainsworth – ESS Manager, and Michael Schultz – ADB Community Consultation & Engagement Specialist/Advisor

Agenda:

- To update THL on the Communication and Engagement Strategy for the core land and Upper Tina Catchment

Discussion

Item	**Description**
1	• Introducing Michael Shultz to THL E&S team
2	• Discuss PO strategy to communicate with targeted focus groups to assess interest and opportunities in protecting the upper Tina catchment.
3	• THL community engagement will be focusing on the Core land groups which includes the same groups PO will be engaging with for the UTC.

Photograph of meeting:

(L-R) Michael, Fred, Fiona, Jaydol Jacob- H&S Assistant, Tino Tingia- E&S Assistant, and Samuela,

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Guadalcanal's Gaenialu Movement on 17th March 2023

Parties: SIG (PO), Gaenialu Movement

Venue: PO, Conference Room

Attendees: Fred Conning – Deputy Project Manager, Glen Ainsworth – ESS Manager, and Michael Litani (Gaenialu Movement)

Agenda:

- To update PO on Gaenialu Movement and objectives on protecting natural resources and discuss ways UCP activities can align with the group's ideologies

Discussion

Item	Description
1	• Michael is a member of the Gaenialu movement (a cultural group on Guadalcanal) with the objective of preserving the traditional culture of Guadalcanal. One of the aspects of this group is the inclusiveness of its activities and equal sharing of benefits of their activities. • Conservation and protection of natural resources for the next generation is part of the Gaenialu group's principal and upper Tina catchment protection activities can align with the group's ideologies.
2	• There may be a need to disconnect the Tina Hydro project from the upper catchment activities as it will be good to see the upper catchment activities as an activity more about conservation and reconnecting indigenous people to their land.
3	• Fred informed Michael that there is already a group – Island Knowledge Institute, (IKI) who have an interest in conducting activities that will be closely aligned to the Gaenialu ideologies, so there will be a need for him to meet with them and PO will organize this. - Michael will be assisting the PO with the true right upper catchment identification of the tribes and those with an interest in that area. IKI with its interest will be advised of Michael's intention. - The PO is of the view that Michael and IKI should be allowed to lead the right bank upper catchment protection activities.

Photograph of meeting:

(L-R) Fred, Michael, Glen (Photographer)

MINUTES OF MEETING

THL/PO BMP Community Consultation & Engagement

Minutes of Community Consultation & Engagement meeting by Tina Hydro Limited (THL), Hyundai Engineering Company (HEC), and Solomon Islands Government (PO) on 5th April 2023

Parties: THL, HEC, SIG (PO)

Venue: Ngongoti Village, Central Guadalcanal

Attendees: THL, HEC, and SIG (PO) delegations and reps from Tina Catchment Communities

Agenda:

- THL/PO BMP Community Consultation & Engagement
- Introduction of the UTC protection Proposal

Discussion

Item	Description
1	• The BMP was well received by the HEC team.
2	• Questions and speculation raised as to why there are a lot of delays in project construction- there has been no clear information shared with the community. I also understand that this is commercially sensitive information and the best group to advise on this delay is THL.
3	• There was also a question raised as to why there is a need for the BMP consultation- there were already too many of these consultations conducted and the community are feeling fatigued on consultation. The WB responded to this.
4	• The session was used mainly by two individuals to grandstand and establish their positions within the community – this is also taking the attention the focus from the BMP discussion. The two individuals do not necessarily against the BMP consultation but only want to "show off" that they know a lot more than any other community members- [These two individuals are always present in these community meetings]
5	• The session was also used by the Community to raise issues regarding the CBSP – some responses provided by the PO
6	• The Upper catchment protection offset was introduced, including announcing the MOU that SIG is working on – there was some reservation to discuss this as the community tends to focus more on the activities within the acquired land. Reading between the lines, there was some sensitivity to discussing the upper catchment but there is an opening for SIG (or other interested organizations)

	to have a discussion with the upper catchment traditional owners- There will need to be a strategy devised to ensure that this discussion happen and we can confirm from the consultation that this will have to be led by traditional owners. The UC protection is feasible with a well-mapped-out strategy.
7	• There was support for the consultation- one person specifically informed the event that it is great that the Project team are presenting on the BMP, and this is important to allow transparency and communities to be aware of the impacts of major project works.
8	• There was one tribe that did not submit their claim for ownership during the land acquisition process and most of the people talking in the session are from this tribe and trying to find avenues for discussing land-related matters.

Photograph of Community Consultation:

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Island Knowledge Institute (IKI) on

Parties: SIG (PO), Island Knowledge Institute (IKI)

Venue: PO, Conference Room

Attendees: Fred Conning – Deputy Project Manager, Michael Schultz – ADB Community Consultation & Engagement Specialist/Advisor, and Lysa Wini (IKI)

Agenda:

- To discuss the work of IKI with indigenous land and resource owners and how it can assist in the UCP

Discussion

Item	Description
1	• IKI is more about reconnecting indigenous people to their traditional land and getting to appreciate the relationships that exist in these traditional spaces. • IKI's vision is that the sense of the originality of people and their space is important to understand how relationships can be enhanced to achieve a certain outcome.
2	• On the upper catchment- IKI can work with the traditional owners to enhance the above thinking and from that they can move towards an idea of upper catchment protection. • IKI can provide the resources to support its activities and they have been doing this around different places in Guadalcanal, Malaita and Western Province.
3	• They (IKI) work through the youth on programs to reconnect to the land. Have been working for two years and built-up relationships and connections to the land. • IKI believes that the catchment is vulnerable to logging and mining because already there are incursions from outside. Youth are generally from households that have previously profited from logging, so can easily revert to old ways if there is no alternative provided.

Photograph of meeting:

Photo taken by : Fred Conning

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Solomon Islands Rangers Association (SIRA) on 13th April 2023

Parties: SIG (PO), SIRA

Venue: PO, Conference Room

Attendees: Fred Conning – TRHD Project Office Deputy Project Manager, Glen Ainsworth – TRHD Project Office E&S Manager, Albert Kwatelae – SIRA Technical & Coordinating Officer, Mandus Boselalu – TRHD Project Office ESSO, and Baltazare Rongo – TRHD Project Office CLO

Agenda:

- To learn some of the experiences and lessons learned by SIRA in working with Rangers from Protected Areas.

Welcome Remarks:

The meeting was opened with a word of welcome by Glen (E&S Manager) to Mr. Albert Kwatelae who is the Technical Officer and Coordinator for SIRA. In a brief remark the E&S Manager also thanked Albert for taking his time out from his busy schedule and accept the project office's request to meet despite of the short notice. Furthermore, Glen also explains the main purpose of the meeting as outlined in the above agenda.

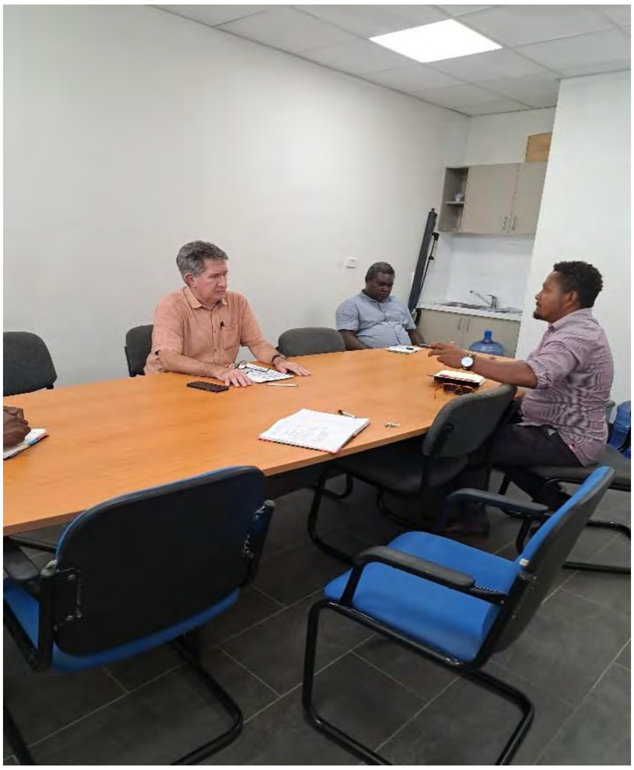
Discussion

Item	Description
1	**Fred Conning:** • Presented the brief background overview of the TTRHD project in terms of donor partners who financially supports the project which are World Bank, ADB, SIG, etc including technical aspects and compliance to based on the World Banks world's best practices. • Also gave brief accounts of the ESMPs and the need to protect the upper catchment of the TRHD project.
2	**Albert Kwatelae:** • Introduced himself to the project team and his role with SIRA. He was the first SIRA President to be elected, the position he held until September 2022 which he resigned and take up the coordinating role. • SIRA was well established in 2015 with the help of Solomon Islands Community Conservation Partnership (SICCP) through funding and technical support. • The formation of the association has been triggered from increasing number of community conservation areas throughout the country and the need for to protect the areas from illegal poachers. • SIRA is a member-based association and membership is an annual thing ranges from $10 for a single ranger to $100 for a CBO registered ranger. • The main roles of SIRA are to provide trainings for local community rangers in terms of environmental monitoring, biodiversity surveys and etc. including capacity building for rangers. • SIRA has been supported locally by SICCP and also from donor partners such as THIN GREEN LINE, University of Queensland, Macarthur Foundations, IUCN/CEPF and United States Forest Services (USFS). • The association has been working with other rangers association from Australia, Papua New Guinea, Fiji, Vanuatu, Samoa and the Cook Islands which are all members of the Oceania Rangers Association (QRA) and so there is an international connection.

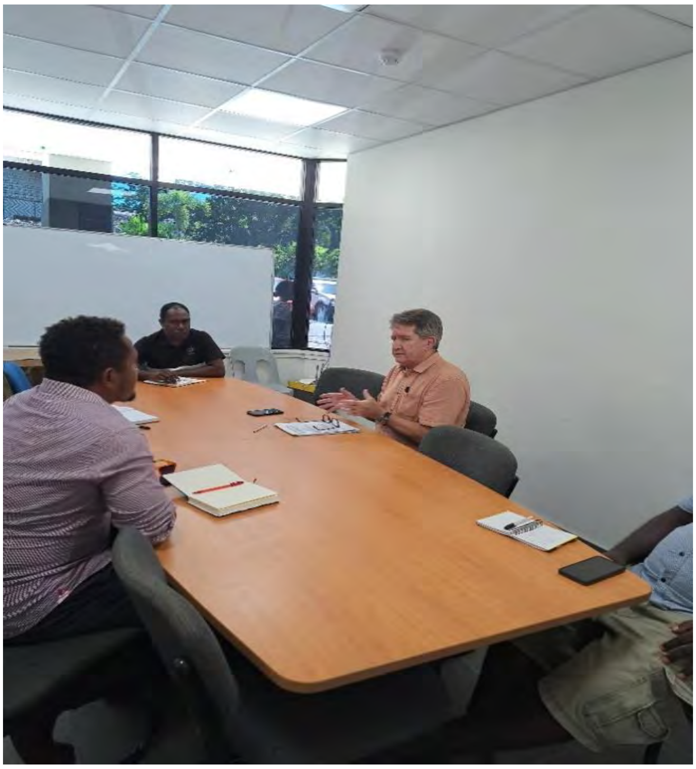
	• The Association is also working in partnership with ECD division from the MECDM to train rangers across the country. • Concentrating on the protection of both the Terrestrial, Aquatic and marine `biodiversity. • At the moment SIRA working on a USFS funded project to be piloted in Guadalcanal Province in close partnership with ESSI and the MOFR.
3	**Glen Ainsworth:** • Glen briefly explained that for the TRHDP main works to happen, there are a number of ESMPs that are need to be approved by the Lenders. • Also provided a copy of the list of ESMPs to Mr. Albert for his reference. • One of the ESMP is the Biodiversity Management Plan (BMP) which was prepare by THL and HEC and this leads to the offset management strategy that we are here to talk about. • Briefly discussed that the upper catchment protection is a requirement under the BMP (OMAS & TOMAS). • Stated that lates studies found out that there is not enough land inside the core land for offsets. Thus, need to do offsets outside of the core boundary and that the upper catchment of the Hydro dam will be a good area for offset as it will need to be protected in respect to the hydro dam. • LOI was already signed by three-line ministries namely; MECDM, MMERE and MOFR to prohibit any extractive industries to occur in that area such as logging and mining. • MOU will be developed and signed by MECDM, MMERE and MOFR and this is still underway. • Also stated that a lot of the area are beyond 400masl and are already protected under the Law. • Seeing that the process for a protected area under the PA Act 2020 is a long way from now which PO will be working on, a special protection of the upper catchment will provide social and environmental protection and preservation of culture and history of the landowning tribes.
4	**Glen Ainsworth:** • Asked Albert if he could share some of the challenges SIRA faced in implementing the ranger's activity on the ground
5	**Albert Kwatelae:** • The main challenges that encountered by SIRA is disputes over Land Rights or Ownership within a tribe over an area to be protected due to logging pressures. • Rangers in SI is a voluntary job and a lot of rangers leave their assignment in protecting conserved areas and switch to logging to get income.
6	**Baltazare Rongo:** • Asked Albert on what are some of the lessons learned that SIRA
7	**Albert Kwatelae:** • Continuous presence of rangers on the ground will always provide security for a protected area and also stops illegal poaching to occur. • Working together by landowning tribes and rangers will certainly makes a good protected area for conservation.
8	**Albert Kwatelae:** • Suggested that once everything is in place, there is a need to send rangers from these areas in the UTC to other places that are similar for a look and learn trip. • Confirmed that SIRA is really supportive of the initiative that the PO working on and happy to support TRHDP upper catchment protection works either directly or indirectly. • Also thanks the Project Officer for the invitation and looking forward for future collaboration.
9	**Glen Ainsworth:**

	• On-behalf of the Project Office and the Deputy Project Manager thanked Mr. Albert Kwatelae for his time and appreciated the inputs SIRA has been doing in the country. • While this is part of the community and stakeholders engagement strategies under the BMP, PO is looking forward work with SIRA once it is approved by the Lender.

Photograph of meeting:



(L-R) Glen, Mandus, and Albert (SIRA)



(L-R) Albert (SIRA), Fred, Glen, and Mandus

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Live and Learn Solomon Islands (LLSI) on 13th April 2023

Parties: SIG (PO), LLSI

Venue: PO, Conference Room

Attendees: Fred Conning – TRHDP Project Office Deputy Project Manager, Glen Ainsworth – TRHDP Project Office E&S Manager, Bill Apusae – LLSI Carbon Financed Community Forest Conservation Project Manager, Gwen – LLSI Carbon Financed Community Forest Conservation Project Officer, Baltazare Rongo – TRHDP Project Office CLO, Mandus Boselalu – TRHDP Project Office ESSO

Agenda:

- To learn some of the experiences and lessons learned by LLSI in working with Forest Protected Areas.
- To learn more about the work of the LLSI in the Carbon Financed Community Forest Conservation Project and the NAKAU carbon trade initiatives.

Welcome Remarks:

The meeting was opened with a word of welcome by Glen (E&S Manager) to the LLSI officers; Bill Apusae who is the Project Manager and Gwen. Project Officer. In a brief remark the Mr. Glen also thanked both for taking their time out from their busy schedule and accept the project office's request to meet. Furthermore, Glen also explains the main purpose of the meeting as outlined in the above agenda.

Discussion

Item	**Description**
1	**Fred Conning:** • Presented the brief background overview of the TTRHD project in terms of donor partners who financially supports the project which are World Bank, ADB, SIG, etc including technical aspects and compliance to base on the World Banks world's best practices. • Also gave brief accounts of the ESMPs and the need to protect the upper catchment of the TRHD project.
2	**Bill Apusae:** • Introduced himself and the other lady officer to the PO. • Live and Learn through the Carbon Financed Community Forest Conservation Project have been involved with Three (3) sites the Solomon Islands namely Lake Tegano in Renell, Zaira in Marovo and Choiseul undertaking activities which are ecosystem conservation in nature. • Live & learn are working with the NAKAU Program for carbon trading activities in Choiseul, Padezaka, Sirebe and Siporae Tribal Lands which is called the Babatana Carbon Project Site. Live & learn is the Project Coordinator that dealt with on ground stakeholder engagement on this carbon project in Solomon Islands whilst NAKAU is the one selling carbon credits on behalf of the CBOs. • LLSI is also subcontracted by SIWA to carry out Social Surveys for the Kongulai water source catchment

	protection. • Bill also stated that there is a need to continued engagement with traditional communities.
3	**Glen Ainsworth:** • Glen briefly explained that for the TRHDP main works to happen, there are a number of ESMPs that are need to be approved by the Lenders. • Also provided a copy of the list of ESMPs to Mr. Bill and his counterpart for their reference. • One of the ESMP is the Biodiversity Management Plan (BMP) which was prepare by THL and HEC and this leads to the offset management strategy that we are here to talk about. • Briefly discussed that the upper catchment protection is a requirement under the BMP (OMAS & TOMAS). • Stated that lates studies found out that there is not enough land inside the core land for offsets. Thus, need to do offsets outside of the core boundary and that the upper catchment of the Hydro dam will be a good area for offset as it will need to be protected in respect to the hydro dam. • LOI was already signed by three-line ministries namely; MECDM, MMERE and MOFR to prohibit any extractive industries to occur in that area such as logging and mining. • MOU will be developed and signed by MECDM, MMERE and MOFR and this is still underway. • Also stated that a lot of the area are beyond 400masl and are already protected under the Law. • Seeing that the process for a protected area under the PA Act 2020 is a long way from now which PO will be working on, a special protection of the upper catchment will provide social and environmental protection and preservation of culture and history of the landowning tribes.
4	**Glen Ainsworth:** • What are some of the challenges that LLSI has faced in working on forest conservation projects in the Solomon Islands especially the sites that LLSI have been working on.
5	**Bill Apusae:** The main challenges with conservation projects: • There is continue challenges from logging interest- a lot of cash is available with loggers and this can switch interest away from forest and catchment protection interests • On going challenges with landownership related matters, • Raising expectations for cash benefits. Outputs from these projects can be slow and this may turn community interest away.
6	**Fred Conning:** • What are some of the lessons learned for LLSI in conservation Projects?
7	**Bill Apusae:** Lessons learned: • Continued engagement with the community is the key to achieve a protected area, • Avoid raising expectations in the community.
8	**Bill Apusae:** • LLSI is really supportive of the initiative that the PO working on and happy to support TRHDP upper catchment protection works in the near future if everything goes as planned.
9	**Glen Ainsworth:** • On-behalf of the Project Office and the Deputy Project Manager thanked LLSI reps for their time and

	acknowledges the works LLSI has been doing in the country through community forest conservation and the NAKAU carbon trade activities. • While this is part of the community and stakeholders' engagement strategies under the BMP, PO will get back to LLSI once the Biodiversity Management Plan (BMP) is approved by Lenders.
10	**Fred Conning:** • Encourages that LLSI to check the ESMPs that were posted in the TRHDP website and lates updates, • Suggested that Live & Learn can learn from TRHDP in terms of community and stakeholder engagement strategies and so forth to use in the Kongulai project as they both the same type of project.

Photograph of meeting:

(L-R) Mandus, Gwen, Bill, Fred, Glen, Baltazare (photographer)

MINUTES OF MEETING

Upper Catchment Protection, Non-Government Organisations (NGOs), Stakeholders meeting

Minutes of Meeting by SIG (PO) and Solomon Islands National University (SINU) on 14th April 2023

Parties: SIG (PO), SINU

Venue: Fusion Café, SINU School of Tourism and Hospitality

Attendees: Dr. John Fasi (SINU), Fred Conning (DPM), Baltazare Rongo (CLO), Mandus Boselalu (ESSO), Joel Zole (CLO), Dr. Lincy P (SINU) & Helen Dolaiano (GFPO)

Agenda:

- To discuss the protection of the Tina River Upper Catchment and what are some of the possible ways that SINU can engage or benefit from the proposed protected area.

Welcome Remarks:

The meeting was opened with a word of welcome by Dr. John Fasi (SINU) on behalf of the University to the Project Office Staffs. In a brief response, DPM also thank Dr. Fasi and Dr. Lincy for taking their time out from the busy schedule of the University and accept the project office's request to meet. The DPM also explain the main purpose of the meeting as outlined in the above agenda. This followed by a brief introduction from each of the PO officers as well as SINU reps.

Discussion

Item	Description

1	**Fred Conning:**
	• Briefly introduce the aim of the meeting and also gave a brief overview of the project in terms:
	  - Project financed by the Lenders; World Bank, ADB, SIG, KEXIM and etc,
	  - Technical aspects of the project
	  - Compliance based on the World Bank world's best practice.
	  - Brief accounts of the ESMPs
	• Introduce the need for the upper catchment protection of Tina River for the shake of the hydro facilities (dam, tunnel and powerhouse) itself and Biodiversity offset management.
	• A Letter of Intent to protect the upper catchment has been signed by the Permanent Secretaries (PS) for MMERE, MECDM and MOFR protect the upper catchment of the Tina River from commercial logging and mining development.
	• Project office to lead the upper catchment protection of Tina River as it is outside of the core land (acquired Land).

2	**Glen Ainsworth:** • There is a total of 35 ESMPs that will need to be approved by the Lenders before we can start the construction of the main works (Dam, Tunnel, Power House, and so forth). • The PO has taken the last two (2) and half years with back-and-forth submission and reviews of the ESMPs with the Lenders trying to get the ESMPs to their standards. • We finally have 29 ESMPs cleared by the Lenders which is the majority of the total ESMPS and the

	last 2 for THL, the BMP which required more work as it requires the Terrestrial Offset Management Strategy (TOMAS) and the Aquatic Offsets Management Strategy (AOMAS) • One of the components of the BMP is the community and stakeholder communication and engagement of the BMP. • Part of the project land, the access road leading to the dam was acquired by SIG and the 50-meter buffer from Blackpost to the core land where power house, underground tunnel is acquired land which is the core land and THL is responsible to manage any biodiversity impacts that might occur during construction of main works. • Stated that lates studies found out that there is not enough land inside the core land for offsets. Thus, need to do offsets outside of the core boundary and there are several options but we see it fits to do it in the Tina River upper catchment. And since it is outside of the core land boundary, it will be the responsibility of the project office/SIG. • A Letter of Intent (LOI) was already signed by the three-line ministries namely; MECDM, MMERE and MOFR to prohibit any extractive industries to occur in the upper catchment of the hydro dam such as logging and mining. • A MOU will be developed and signed by MECDM, MMERE and MOFR to prohibit logging and mining in the upper catchment and this is still underway. • The Lenders requirement is for the protection of the upper catchment in a way that will not deprive the rights of the indigenous people who owns the customary lands. • The area to be protected is about 12,500 Ha and is customary Lands.
3	**Fred Conning:** • Explained that the access road leading from Blackpost to the core land is all acquired land now registered under title. • All development that THL will carry out especially building of Dam, power house, tunnel and etc. will only happen within the acquired land • Some of the offsets will happen inside the core land but it is not enough thus will need to happen somewhere else as Glen mentioned.
4	**Dr John Fasi:** • Asked Fred whether the offsets can be done in other places or provinces.
5	**Fred Conning & Glen Ainsworth:** • Yes, that can be done as well. But seeing that the upper catchment will be protected anyway for the safety of the dam, it will also be good to do the biodiversity offsets there as well.
6	**Dr John Fasi:** • Stated that creating a Tina Upper Catchment management plan to protect the catchment from extractive industries will be in line with the activities that SINU is doing in terms of undertaking practical experiences for students on activities such as research, biodiversity surveys and monitoring. • The University should be working along with major projects such as the Tina Hydro Development Project so that any future projects that will be developed can adapt a similar approach in the development of the project. • Is also particularly interested in the application of the ESMP requirements for the project and think that such an avenue to show the application of the ESMP will be very useful for the project. • Is the current Chair of the Protected Areas Advisory Committee (PAAC) within the Ministry of Environment, Climate Change, Disaster and Meteorology (MECDM) who looks after the PA Act 2010 and this will also make it easier for the Tina Upper Catchment management to be highlighted and supported by other partners that work with MECDM. • Suggested that a SINU committee will need to discuss with the PO office as soon as possible to look into ways that PO and SINU can work together on the initiative. • Also suggested that it’s best idea that SINU and PO can have an MOU so that SINU students can

	access the upper catchment areas for research and practical activities.
7	**Fred Conning:** • On-behalf of the Project Office thanked Dr. Fasi and Dr. Lincy for their time and acknowledges their support in the Tina UC protection. • While this is part of the community and stakeholders' engagement strategies under the BMP, PO will consult SINU once the Biodiversity Management Plan (BMP) is approved by Lenders
8	**Dr John Fasi:** • On behalf of SINU thanked the Project Office for such an important and interesting consultation and look he looks forward for SINU to work closely with the Project Office.

Photograph of meeting:

(L-R) Dr. John Fasi (SINU), Fred C (DPM), Baltazare R (CLO), Mandus B (ESSO), Joel Z (CLO), Dr. Lincy P (SINU) & Helen D (GFPO), Glen (Photographer)

Upper Catchment Feedback Summary

Date	**Parties Met**	**Main discussion points**
05/04/23	Zimri Launi-Charana Tribe	Met with Fred to discuss the UC protection idea. Inform him that he can come to the office next week to discuss and get more information on the UC plan. There is an interest to participate in the UC activities. Must be some livelihood benefits for the protection of the catchment
05/04 /23	Peter Rocky – Sarahi Tribe Dollan Gisi- Salasivo Tribe	Inform the PO that they are interested in discussing further with the upper catchment and they will be getting in touch with the Ministry of Environment regarding conservation. The PO only noted their interest. They see the SIG MoU commitment as important for ensuring overall protection.
06/04/23	Titus Siapu- Chavuchavu Tribe	Titus is a members of the Tina Community and also an employee of HEC. After the Consultation he had spent time with members of the community having lunch and discussing the BMP consultation. Members of the community have expressed support for SIG's MOU and also the idea of preserving the upper catchment for the future generation. There is still no clear indication of what benefits the community can get from the UC protection but generally there is a feeling that there is a need to protect the UC.
06/04/23	Michael Litani- Uluna Sutahuri Tribe	Michael Litani is a traditional elder who has been leading the Bahomea Land ID process earlier in the project. According to Michel, the discussion regarding the upper catchment should not be spelled out in a community meeting but it will be good to focus on groups that have an interest in the UC. The BMP consultation has also been used by people with no interest in the UC to raise issues with the CBSP water supply project. There is interest from community elders on the UC project but this needs to be progressed with the interested parties in the area identified.

Annex P-2-6: Hydrologic and Hydraulic Assessment.

Tina River Hydropower Development Project

Hydrologic and Hydraulic Assessment

PREPARED FOR

TINA RIVER HYDROPOWER LIMITED | MARCH 2023

Tina River Hydropower Development Project

Hydrologic and Hydraulic Assessment

March 2023

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ACRONYMS

Acronym	Definition
AEP	Annual Exceedance Probability
ARI	Average Recurrence Interval
BMP	Biodiversity Management Plan
DESCP	Drainage, Erosion and Sediment Control Plan
DIA	Direct Impact Area
DEM	Digital Elevation Model
EFMP	Environmental Flows Management Plan
EIS	Environmental Impact Statement
FFA	Flood Frequency Analysis
FDA	Flow Duration Analysis
FPP	Fish Passage Plan
GPS	Global Positioning System
HEC	Hyundai Engineering Corporation Limited
masl	Metres above sea level
MECDM	Ministry of Environment, Climate Change, Disaster Management and Meteorology
MMERE	Ministry of Mines, Energy and Rural Electrification
MW	Mega Watt
PMF	Probable Maximum Flood
PMP	Probably Maximum Precipitation
SIG	Solomon Islands Government
SRTM	Shuttle Reconnaissance Topographic Mission
STMP	Spoil and Top Soil Management Plan
TBA	To be appointed
TCLC	Tina Project Area Company
THL	Tina Hydropower Limited
PROJECT	Tina River Hydro Development Project (the Project)
WMPSPP	Waste Management and Point Source Pollution Plan

GLOSSARY

Term	Definition
Annual Exceedance Probability	A flow event with the stated percentage chance of being exceeded in any given year
Average Recurrence Interval	A flow event with an average interval between exceedance events measured in years
Fluvial geomorphology	The study of the interactions between the physical shape of rivers and their hydrological and sediment transport processes and the resulting landforms
Hydropeaking	The practice of releasing pulses of water to provide hydroelectric power to meet varying demand
Probable Maximum Flood	A hypothetical flood event occurring under the most severe combination of meteorological conditions that are reasonably possible in a region under the Probable Maximum Precipitation
Probable Maximum Precipitation	A hypothetical rainfall event occurring under the most severe combination of meteorological conditions that are reasonably possible in a region
Run of river	Hydroelectric generation project in which little or no water storage is provided
Shear stress	Hydraulic characteristic utilised to predict erosive potential

1. INTRODUCTION

1.1 Background

The Tina River Hydropower Development Project (TRHDP; the Project) is the first large utility-scale renewable energy project to be developed in the Solomon Islands. The Project is located on central Guadalcanal and will support the development of renewable energy to supply electricity for Honiara. The Project consists of a hydropower facility, access roads, transmission lines, and technical assistance to the Solomon Island Government to implement the scheme.

The main works comprise a dam and reservoir on the Tina River, intake and tunnel delivering the water to the powerhouse, electrical switchyard and transmission line. Temporary facilities required for construction include a camp to accommodate workers, site office, batch and crusher plants, explosives magazine and stockpile/spoil disposal areas. A detailed Project description is available in P1 Construction Environmental and Social Management Plan (CESMP).

The Project is managed by a dedicated government Project Office sitting within the national Ministry of Mines, Energy and Rural Electrification (MMERE). The Project is financed by the Solomon Island Government (SIG), plus six different financiers known as the concessional finance partners (CFPs).

This hydrologic and hydraulic assessment supports the P-2 Biodiversity Management Plan (BMP), one of the sub-plans required under the Environment and Social Management Plan (ESMP) which applies to both the construction and operational phases of the Project. The BMP sits alongside the overarching P-1 CESMP and related sub-plans.

1.2 Aim and Scope

As outlined in the 7 July 2022 Scope of Work (Stantec Ref 300208000), a hydrologic and hydraulic assessment was required to support for the BMP. The aim of the assessment was to summarise existing hydrology information through modelled and collected data to gain a better perspective on seasonal flows in the Tina River. An assessment of the river morphology from the upstream extent of the reservoir to the confluence with the Toni River was also required to allow better determination of the habitat types present during baseline conditions and assess changes in habitat and sediment transport over time,

The aims of the BMP for the Project were as follows (adapted from THL, 2019):

1. To apply the mitigation hierarchy of avoid, minimise, mitigate, restore, and where residual impacts remain offset, adverse impacts of the Project on terrestrial and aquatic ecology;
2. To protect and, where possible, enhance remaining significant habitats within Project Area;
3. To protect and, where possible, improve the survival of IUCN-listed species within Project Area, through management and the control of invasive species;
4. To achieve no net loss in Natural Habitat and Net Gain in Critical Habitat and summarise Biodiversity Impacts.

The BMP quantifies these potential impacts through the assessment of habitat and conservation significant species, with the identification of measures to avoid, minimise, or mitigate impacts and restore biodiversity, where required. The hydrologic and hydraulic assessment quantifies the effect of hydropeaking, which is the flow rate fluctuation that is introduced with dam operations. Hydropeaking affects inundation extents, flow depths, and velocities relative to the baseline condition.

Hydropeaking also affects sediment transport capacity, which can be represented in terms of shear stress (tractive forces along the channel bed and banks) and other hydraulic characteristics. The presence of the dam and powerhouse can affect river morphology upstream and downstream of the proposed Project Area. This report is based on the 2019 update to the Tina River Hydropower Development Project (TRHDP) Environmental and Social Impact Assessment (ESIA) by Tina Hydropower Limited (2019). Key elements of the hydrology information in this report were extracted to inform the BMP.

1.3 Approach

Baseline hydrologic and hydraulic models were developed for dry and wet periods, mapping a range of variables including inundation extent, depth, velocity, and shear stress. Hydraulic results for non-operational (night-time) flows and operational (daytime) flows were compared between baseline and Project conditions to establish changes in the variables related to hydropeaking.

Changes in velocity were considered indicative of potential changes in sediment dynamics along the river. The results of the modelling were used to understand the potential geomorphic effects of changes in flow rates along the river reaches, including the significance of changes in e-flows downstream of the dam wall. The hydrological assessment will be provided to THL and the Project CFPs, as part of the supporting documentation for the BMP.

1.4 Data and Literature Review

The following documents were reviewed to inform this hydrological and hydraulic assessment:

- Tina River Hydropower Development Project Hydrology Analysis Report, by Hyundai Engineering Company, 2022.
- Tina River Hydropower Development Project Investigation of Sediment and Discharge Load, by Hyundai Engineering Company, 2021.
- Environmental Impact Statement (EIS) for the Tina River Hydropower Project, Solomon Islands: biodiversity value, proposed mitigation and offsets, and future monitoring, 2019.
- Review and Comment on Environmental Impact Statement for the Tina River Hydropower Project by B.J. Pusey and I.C. Campbell, Commissioned by World Bank, 2022.

The reviewed documents provide available precipitation and flow gauge records, meteorological data, flow duration analyses, flood frequency analyses, hydrological analyses, baseline geomorphology, and sediment characterisation for the Tina River and adjacent catchments.

2. PROJECT AREA CONTEXT

2.1 Project Location

The Project Area is located on the island of Guadalcanal. **Figure 2-1** shows the Project and catchment area locations relative to the island of Guadalcanal. **Figure 2-2** shows the dam, tunnel, powerhouse, and other Project-related feature locations. **Figure 3-1** shows the river alignments and Project features within the catchment boundary.

2.2 Climate and Meteorology

Guadalcanal has a tropical, moist climate with regular rainfall. Rainfall increases with altitude and is higher on the Southern coast. Annual rainfall at both Honiara, and Honiara International Airport is 1972 mm, with summer months being the driest. It was estimated that annual rainfall at the dam site exceeds 2500 mm per annum, with more than 3500 mm of total annual rainfall in the headwater reaches of the Tina River.

Guadalcanal is periodically subjected to extreme rainfall events associated with tropical cyclones that are most likely to occur between November and April. The Tina River experiences flash floods almost immediately after heavy rainfall events occur in the upper catchment. Flow and water level can change rapidly during such events. The Tina River is characterised by a relatively steep channel with high-velocity flows.

Additional background details on the climate and meteorology of the Project Area, including temperatures, precipitation, and runoff characteristics are available in the Hydrology Analysis Report (HEC, 2022).

2.1 Geomorphology

At its headwaters, the Tina River flows through a narrow, steep-sided and incised, limestone gorge that is largely pristine and unaffected by human development. The Tina River is a single channel meandering river. It has torrential behaviour with regular flash floods. The bed substrate includes gravel, cobbles and boulders, and fine and coarse-grained sand. In the higher elevation headwaters of the Tina River, very large boulders are intertwined with logs. The upper Tina River is characterized by sequences of pools and rapids and sharp meanders. Large boulders, some greater than 3 m diameter, have accumulated along the channel bars. These large boulders indicate that intense floods occasionally occur within this reach.

In its mid-reaches, the Tina River's side slopes gradually become less steep, with isolated human settlements occurring. In this middle reach, the river enters steep limestone gorges where its course is more confined and less meandering. At this location most of the river's course is made of rapids. In many areas, the riverbanks are dominated by rock outcrops.

The dam and reservoir infrastructure of the Project are located in the middle reach. Downstream of the dam site the river flows through an area having willower shoreline slopes, lower gradient, and many meanders, and includes the powerhouse infrastructure. The density of human settlements also gradually increases with distance downstream to the confluence with the Toni River, where the river becomes the Ngalimbiu River. The Ngalimbiu River flows across a flat coastal plain, before discharging into Iron Bottom Sound on Guadalcanal's North coast. Relative to the upstream areas of the catchment, the coastal plain is characterized by denser human settlement along with palm oil plantations, gravel extraction, and other development.

Figure 2-1: Project location on the island of Guadalcanal.

Figure 2-2: Dam and powerhouse location relative to Tina River.

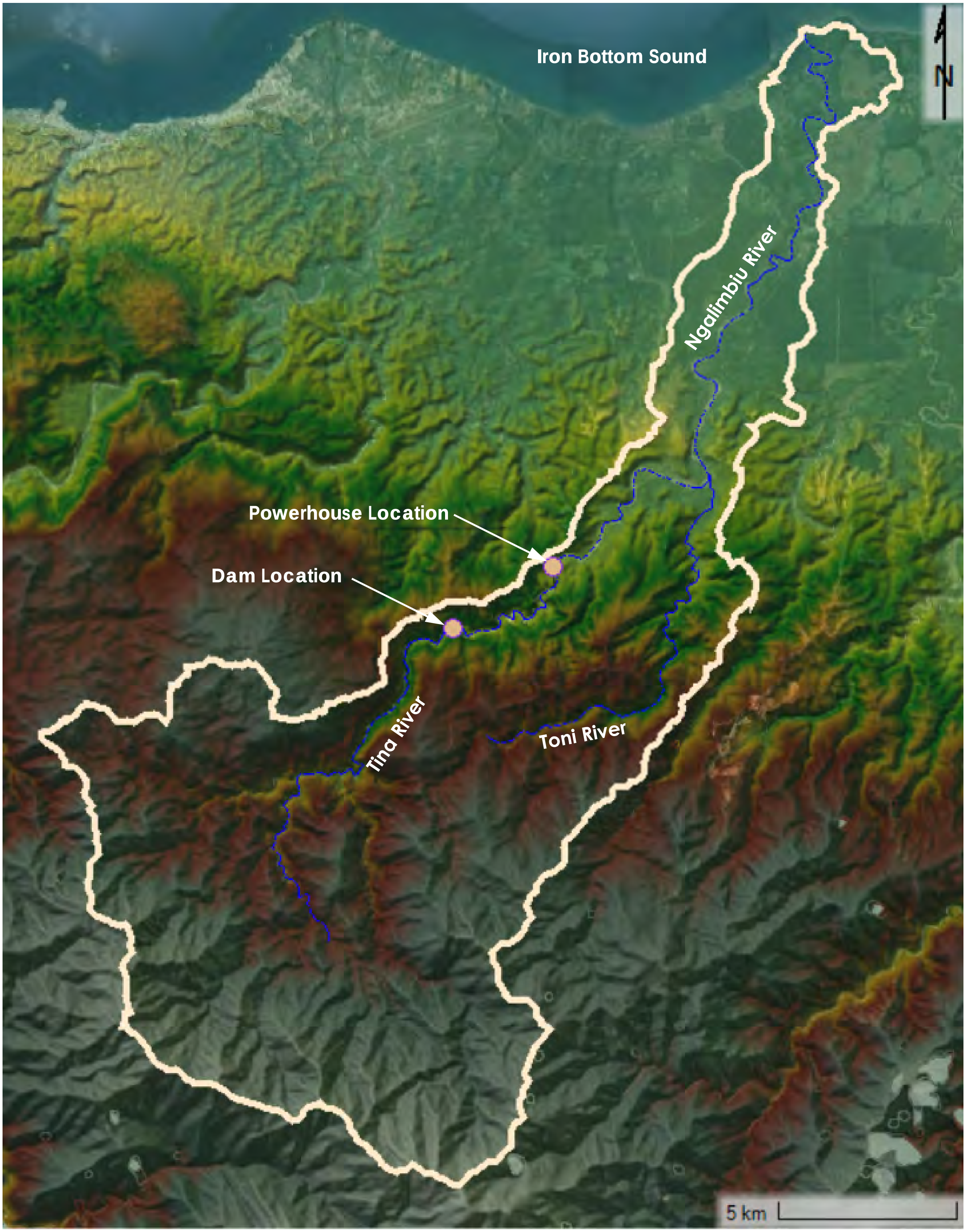

Figure 2-3: Dam and powerhouse location relative to Ngalimbiu River catchment area.

3. HYDROLOGY

3.1 Catchment Area

Catchment areas and flow paths were delineated using HEC-HMS software V4.10 (USACE 2022a). The underlying terrain for the delineations was based on a digital elevation model (DEM) combined from available satellite-based (SRTM) data, local topographic survey data, and available bathymetric survey data. In areas where only SRTM data are available, substantial vertical discrepancies are apparent in the data. The discrepancies may result in erroneous catchment delineations, particularly in the flatter downstream reaches, where actual catchment delineations may differ from those shown.

The Project Area is located within the Ngalimbiu River catchment. The Ngalimbiu River is formed by the confluence of the Tina River and the Toni River. The Tina River has a catchment area of approximately 150 km^2, and the Toni River has a catchment area of approximately 45 km^2. The Tina River comprises approximately 65% of the total Ngalimbiu River catchment area. Above the proposed dam location, the Tina River has a catchment area of approximately 123 km^2, comprising approximately 53% of the total Ngalimbiu River catchment. **Table 3-1** summarises the subcatchment areas. **Figure 3-1** shows the Project Area subcatchments graphically.

Table 3-1: Catchment area summary for Tina, Toni, and Ngalimbiu Rivers.

Catchment	Catchment Area
Tina River upstream of dam	122.9 km^2
Tina River between dam and powerhouse	10.1 km^2
Tina River upstream of powerhouse	133.0 km^2
Tina River between powerhouse and Toni River confluence	15.8 km^2
Total Tina River above Toni River confluence	148.8 km^2
Toni River catchment	44.8 km^2
Total Tina River and Toni River catchment	193.6 km^2
Ngalimbiu River downstream of Tina and Toni River confluence	35.8 km^2
Total Ngalimbiu River catchment	229.4 km^2
Tina River catchment relative to Toni River catchment	332%
Tina River catchment relative to total Tina/Toni River above confluence	77%
Tina River above dam relative to Ngalimbiu River catchment	53%
Tina River above powerhouse relative to Ngalimbiu River catchment	58%
Tina River catchment relative to total Ngalimbiu River catchment	65%
Toni River catchment relative to Tina River catchment	30%
Toni River catchment relative to total Tina/Toni River above confluence	23%
Toni River catchment relative to total Ngalimbiu River catchment	20%

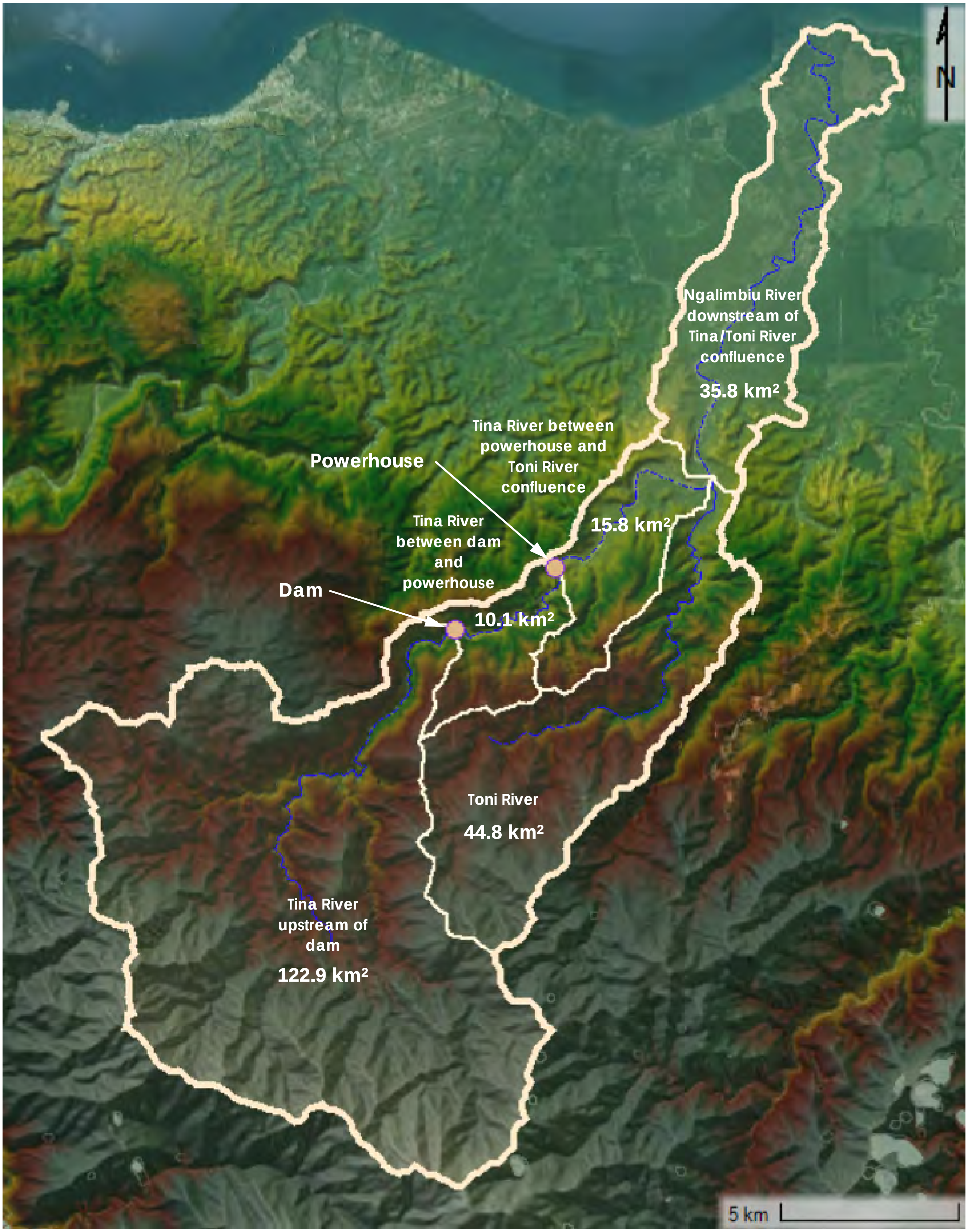

Figure 3-1: Tina, Toni, and Ngalimbiu River subcatchment areas.

3.2 Flow duration analysis

Figure 3-2 shows the available discharge data for the Tina River as presented in HEC 2022. A flow duration analysis was undertaken based on the available data for a range of locations along the Tina River and in adjacent catchments. **Figure 3-3** shows the results of the flow duration analysis for the Tina River at the proposed dam site, with a median discharge of approximately 18 m^3/s.

3.3 Flood frequency analysis

Figure 3-4 shows the annual maximum discharge rates for the Tina River at the dam site based on measured flow rates in the Ngalimbiu River catchment and adjacent catchment areas. The time series chart is extracted from the Tina River Hydrology Analysis Report (HEC, 2022).

Figure 3-5 shows the results of a flood frequency analysis (HEC-2022). Based on the limited available data, events with a low probability of occurrence, such as the 1% Annual Exceedance Probability (AEP) event, have a high degree of uncertainty.

3.4 Operational hydrology

The operational hydrology is described in the Tina River Hydrology Analysis Report (HEC 2022) and in the Environmental Impact Assessment (THL, 2019). The reservoir generally fills during night-time hours, with drawdown occurring during daytime hours with higher power demand. Relative to baseline (pre-Project) conditions, hydropeaking results in lower nighttime and higher daytime flows in the reaches downstream of the powerhouse. A minimum flow of 1 m^3/s (environmental flow) is specified for the bypassed reach adjacent to the headrace tunnel, with a minimum flow of 3.4 m^3/s specified in the reach downstream of the powerhouse.

3.5 Selected flow events

Based on the operational scenarios, a range of events was selected for modelling purposes covering wet and dry periods during baseline, daytime operational, and night-time operational conditions. A 30 m^3/s flow was selected to represent wet periods. This flow rate is exceeded approximately 5% of the time based on the results of the flow duration analysis (**Figure 3-3**).

Due to the limited storage in the dam, the Project essentially acts as a run-of-the-river dam during flow rates exceeding 30 m^3/s with little difference between baseline and post-Project flow rates during both daytime and night-time operations.

A 5 m^3/s flow was selected to represent dry periods, corresponding to a flow duration exceedance of approximately 99%.

The range of assessed flows is shown against the flow duration and flow frequency analysis results in **Figure 3-2** through **Figure 3-5** with the upper limit for wet period assessment shown as a dashed blue line and the lower limit for dry period assessment shown as a dashed red line.

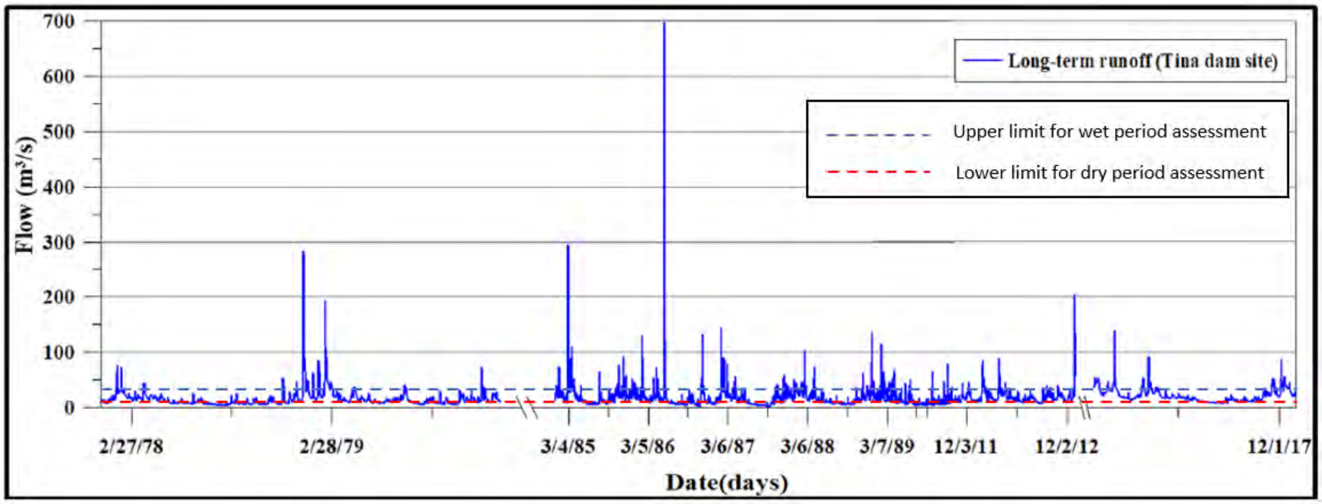

Figure 3-2: Continuous runoff record for Tina dam site (from HEC, 2022).

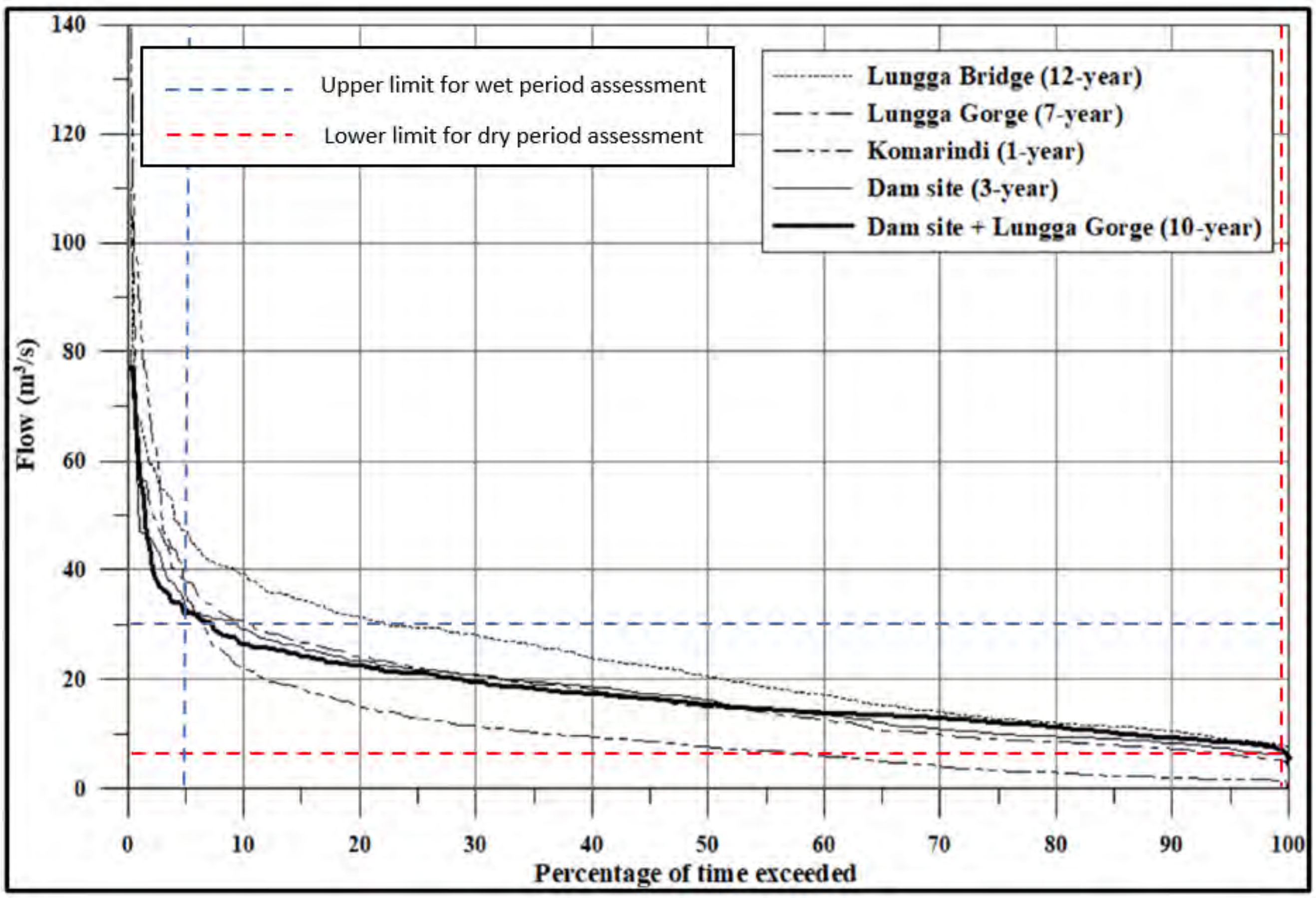

Figure 3-3: Flow Duration Analysis (from HEC, 2022).

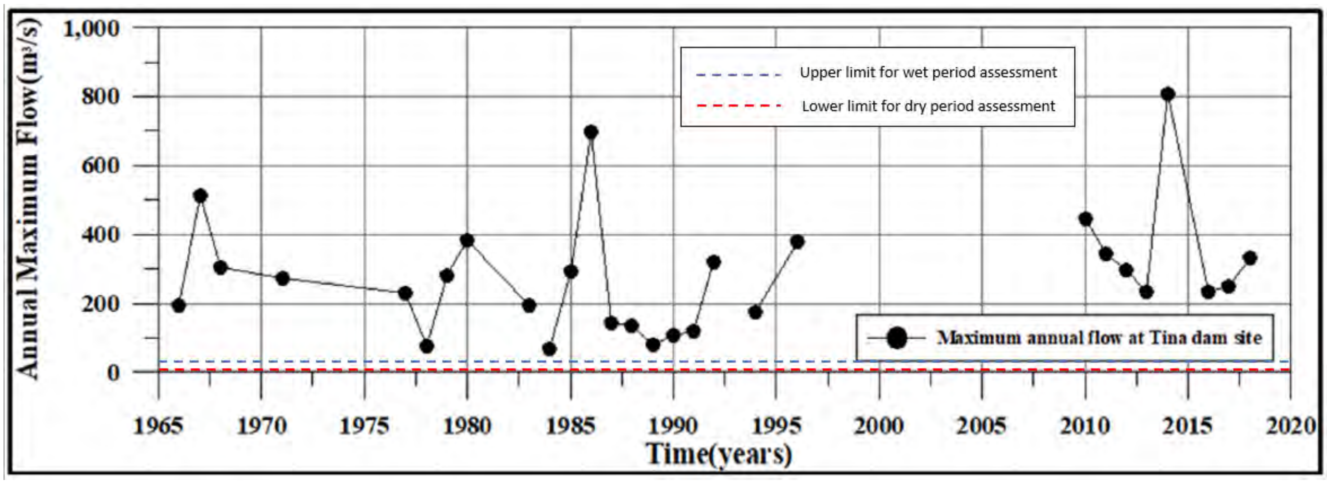

Figure 3-4: Maximum annual flow at Tina dam site (from HEC, 2022).

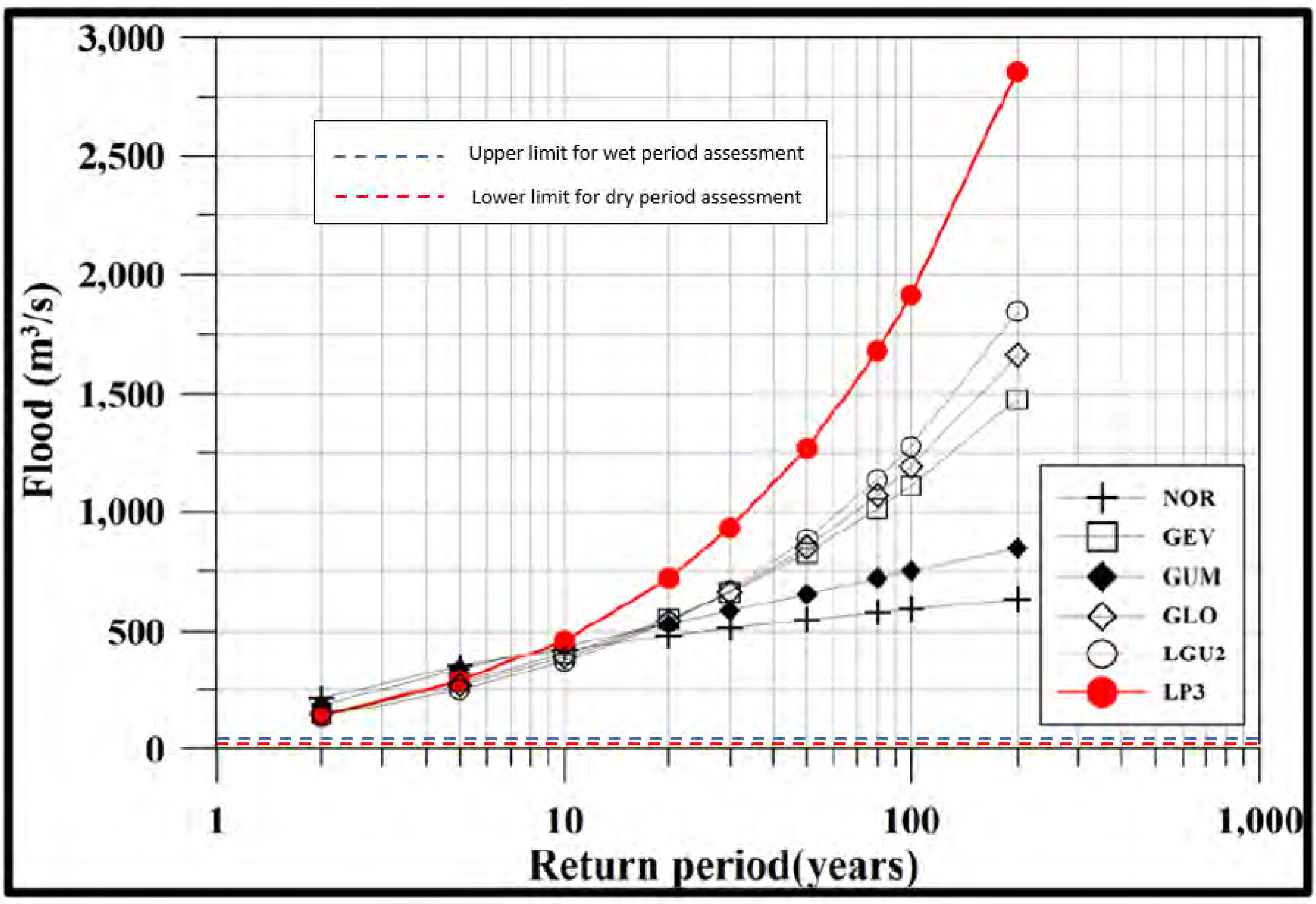

Figure 3-5: Flood Frequency Analysis results (from HEC, 2022).

The primary differences between baseline and post-Project flow rates downstream of the powerhouse are related to the storage capacity in the reservoir. When the reservoir is full during wet periods, the total river flow downstream of the powerhouse is effectively equal to the inflow into the reservoir. With the exception of the inundated area within the reservoir (Aquatic Reach #2), dam operations during flood events with total river flow rates exceeding 30 m^3/s are unlikely to affect downstream widths, depths, velocities, and other hydraulic characteristics.

Although the flood events that exceed the top of the graph in **Figure 3-3** represent less than 1% of the time in terms of flow duration, it is these flows that will have the greatest effect on bed and bank morphology and other channel dynamics. The assessed flow limits cover most operating conditions and account for most of the downstream discharge on a volumetric basis. There may be some time over the life of project where extremely dry periods result in conditions that prevent any power generation while minimum e-flows are provided.

Although major bed and bank morphology is not expected to occur as a result of hydropeaking, the dam is likely to trap the entire bed load of the river along with some of the suspended sediment load. The potential impacts of the reduced sediment load is likely to affect channel morphology more than the hydropeaking; evaluation of potential benefits associated with the implementation of a sediment management program is outside the scope of this study but should be addressed in the future.

Figure 3-6 shows the adopted flow rates for wet and dry periods for the following regions:

- Reservoir inflow upstream of dam (Aquatic Reach #2);
- Dewatered bypass reach and headrace tunnel between the dam and powerhouse (Aquatic Reach #3); and
- Downstream reach between powerhouse and Toni River confluence (Aquatic Reach #4).

The extents of aquatic reaches are outlined in the BMP (Stantec 2023). Discharge rates for Aquatic Reach #4 (downstream) include additional inflow from the 10 km^2 catchment area between the dam and powerhouse.

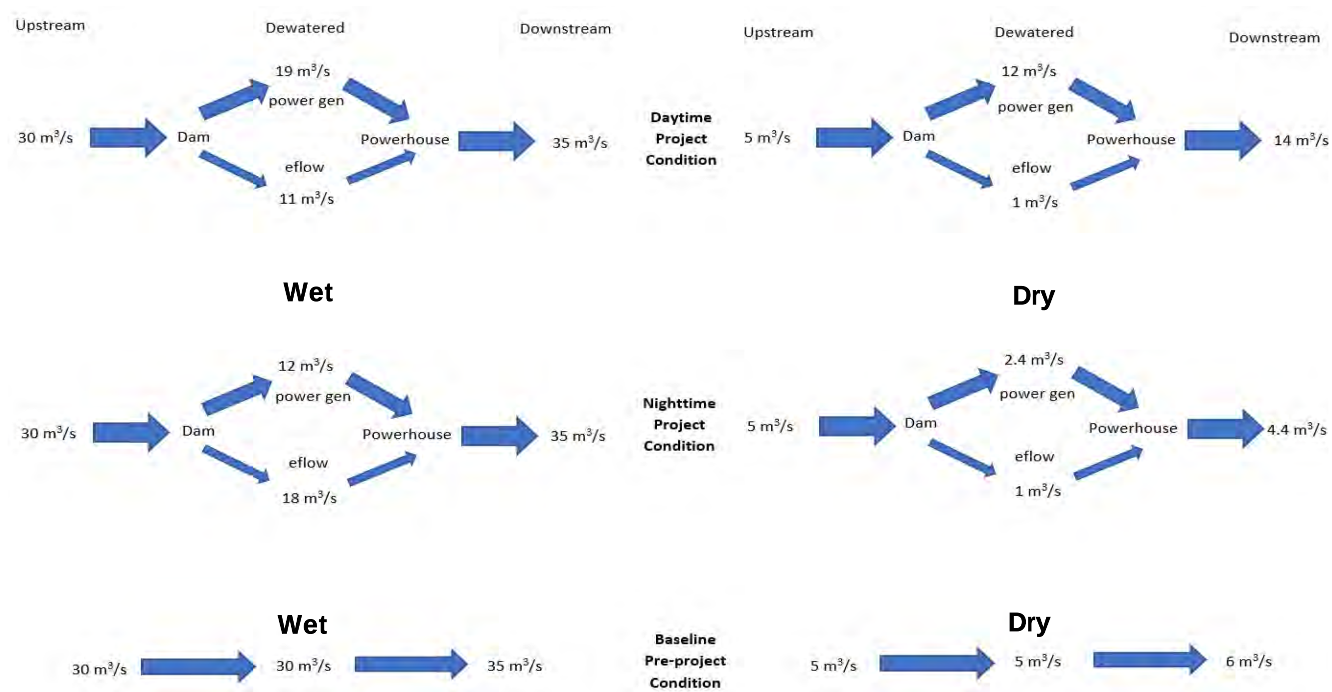

Figure 3-6: Selected baseline and operational scenarios.

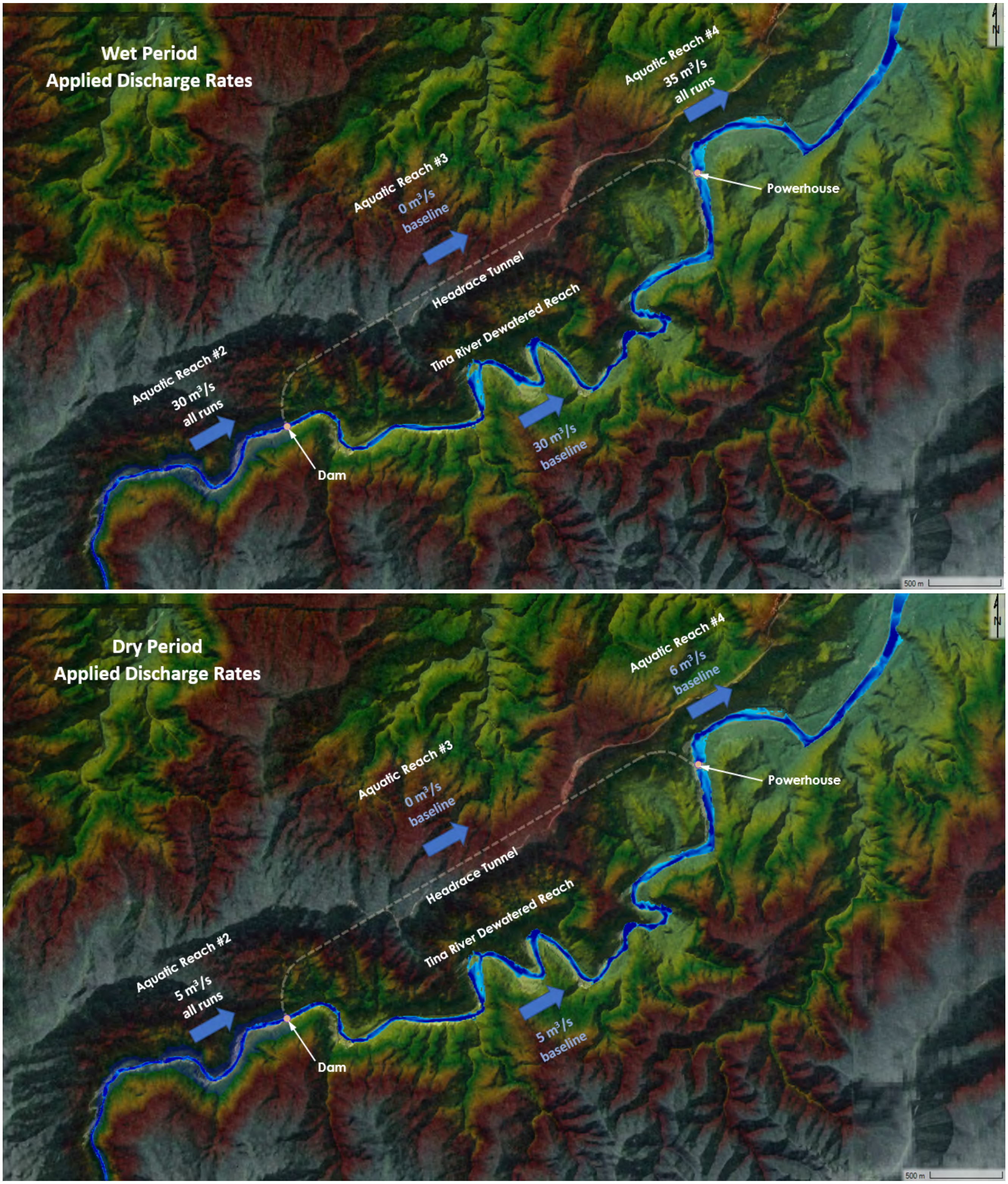

Figure 3-7: Selected baseline scenarios.

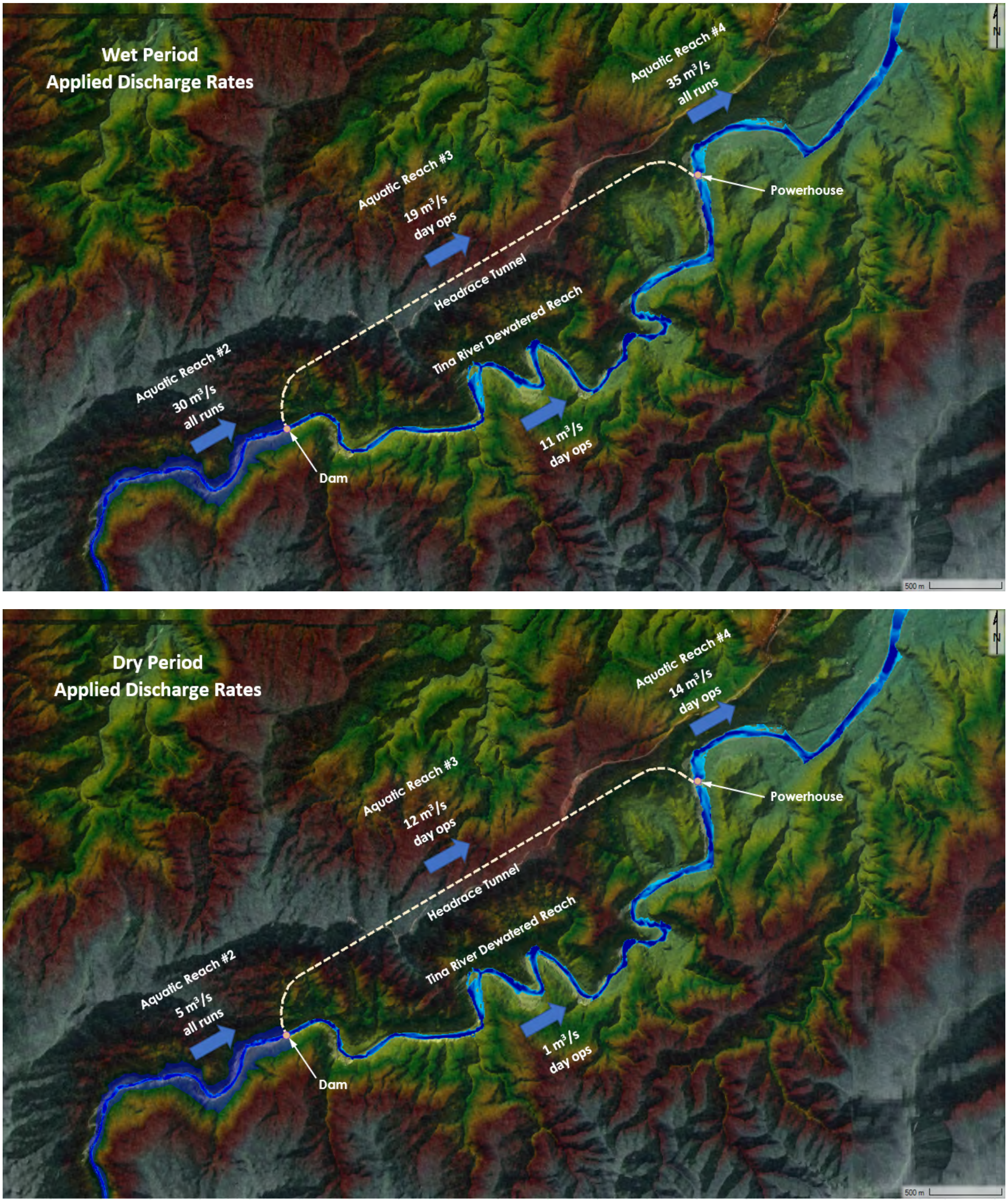

Figure 3-8: Selected daytime operational scenarios.

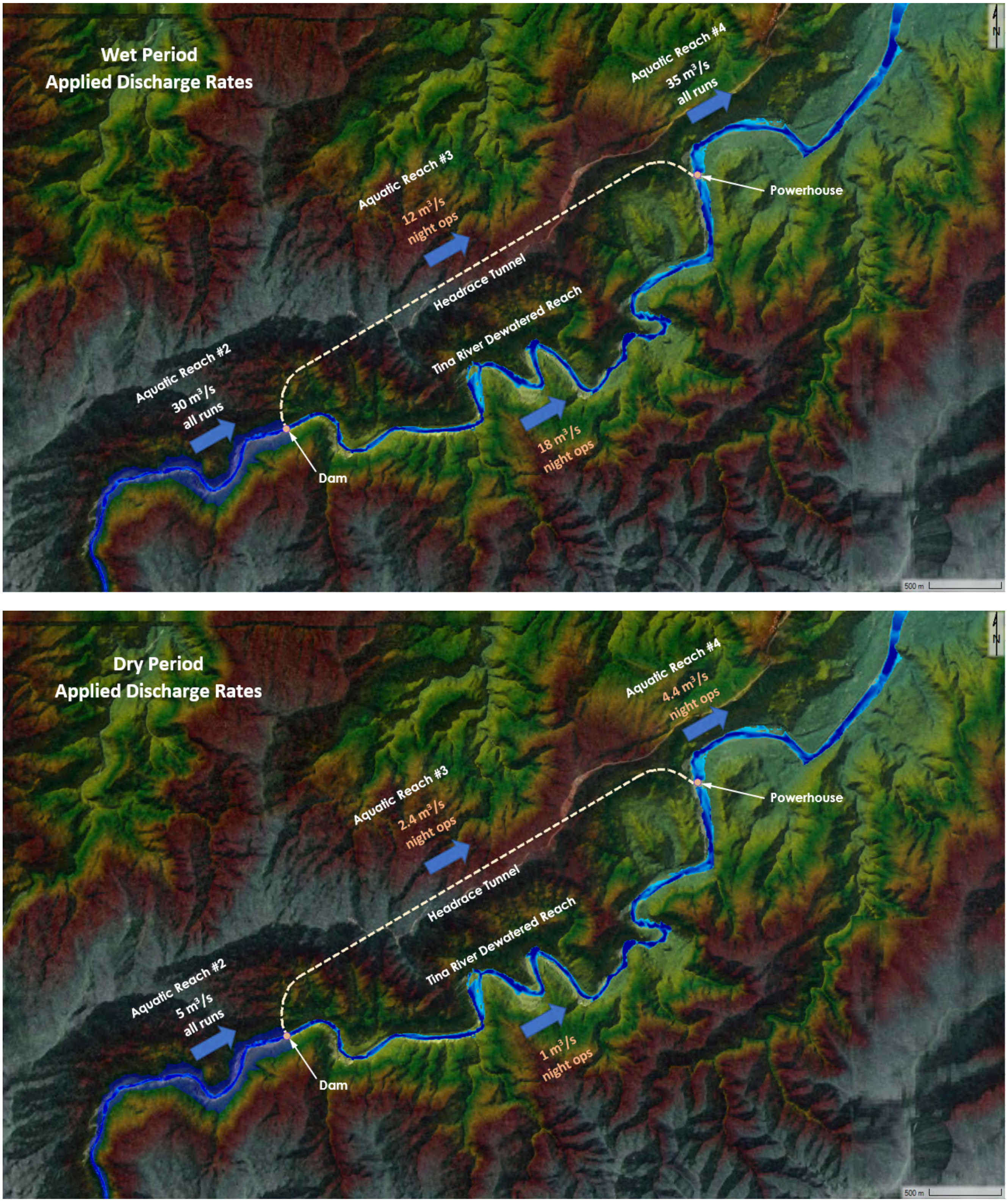

Figure 3-9: Selected night-time operational scenarios.

4. HYDRAULIC MODEL SETUP

Baseline and operational scenario hydraulic models were set up using HEC-RAS Version 6.3.1 (USACE 2022b) with the following input parameters.

4.1 Terrain

The underlying terrain for the HEC-RAS model is based on a composite Digital Elevation Model that utilises the following data sets in descending priority order:

- Bathymetric survey data (point cloud)
- 10-m DEM from local LiDAR/photogrammetry
- 1 arc-second (~30m) DEM from satellite-based SRTM data

Figure 4-1 shows the relative spatial coverage area of the three terrain data sources. The final DEM was resampled at a resolution of 10-m by 10-m, projected to the WGS84 Zone 57S projection.

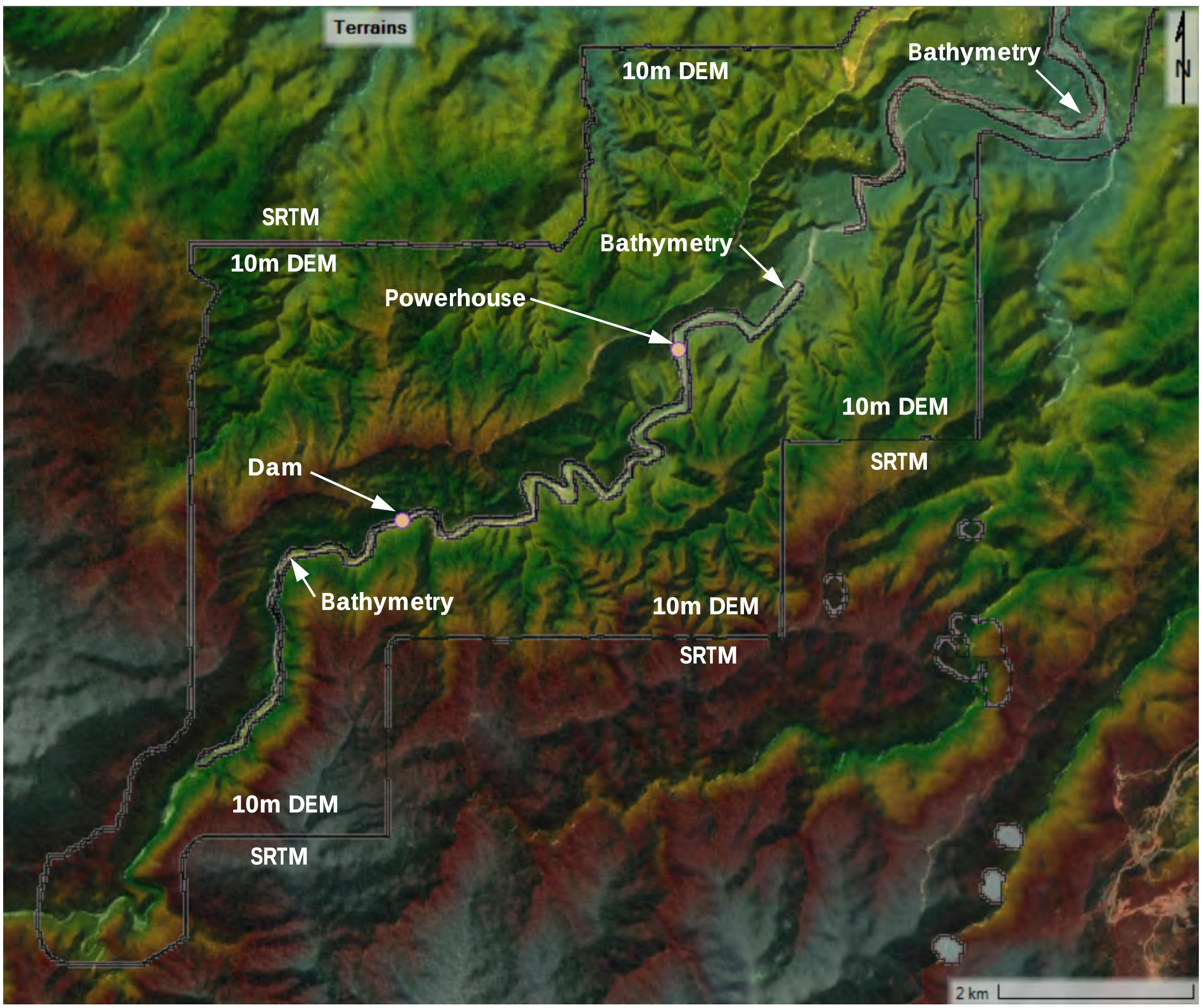

Figure 4-1: Terrain coverage areas.

4.2 Computational Mesh

A 20-m by 20-m computational grid was applied to the 230-km^2 Ngalimbiu River catchment area. Along the main watercourses, a spacing of 10-m by 10-m was applied as a repeating breakline to match the underlying terrain resolution and align cell faces with flow directions. HEC-RAS recognises sub-grid terrain resolution, and the computation of flow transfer between individual grid cells accounts for the geometry of the underlying surface at the terrain resolution of 10-metre by 10-metre across the entire two-dimensional (2D) grid area.

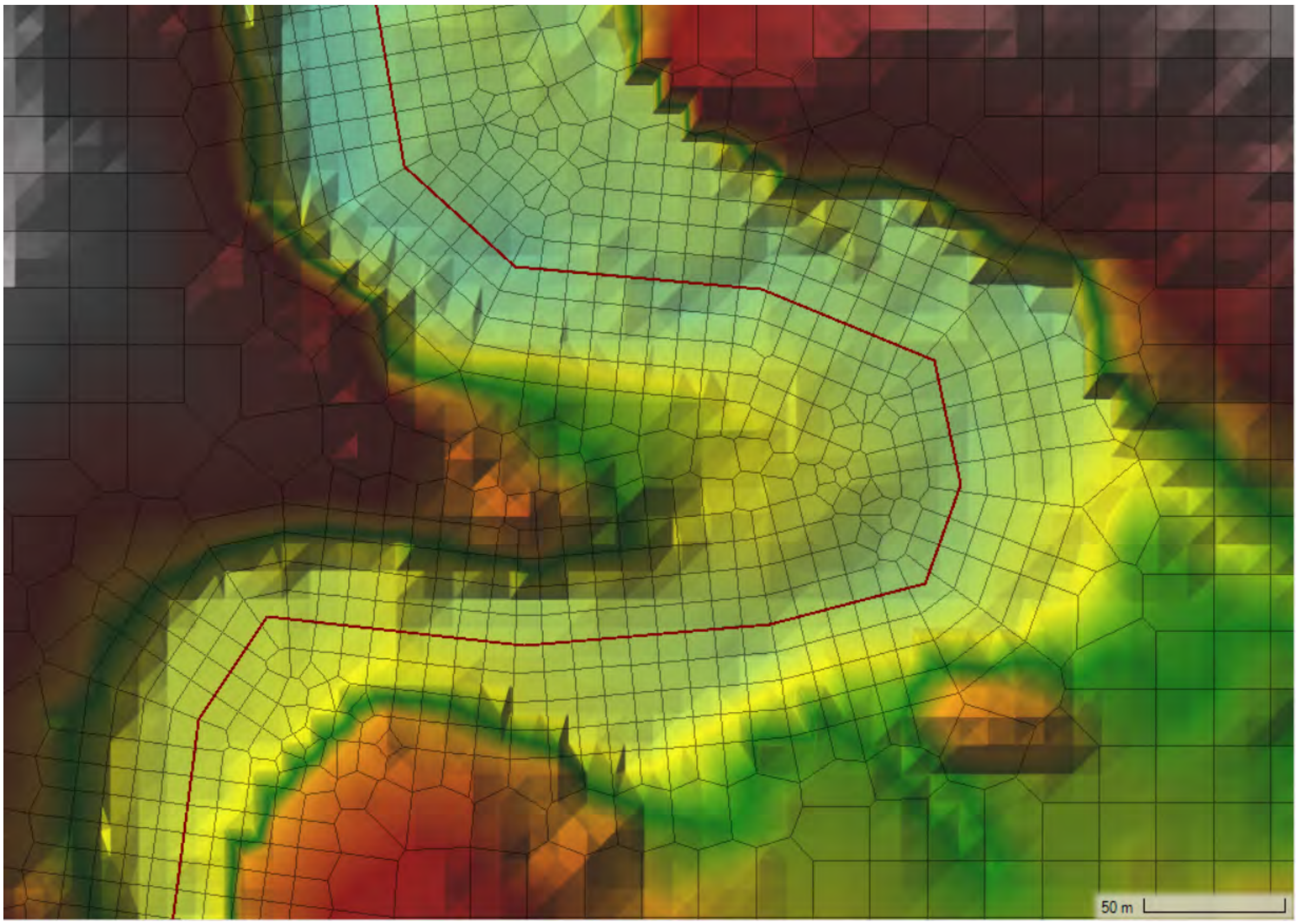

Figure 4-2: Computational mesh coverage.

4.3 Roughness

Spatially varying Mannings roughness coefficients were assigned to the modelled areas. Applied roughness coefficients range from 0.045 for channels to 0.08 for floodplains. The relatively high floodplain roughness coefficients account for shallow flow characteristics in the sheet flow areas of the direct precipitation or rain-on-grid model extents. A range of uniform roughness coefficients was applied to the model as a sensitivity analysis to account for potential differences arising from variable flow depths, vegetation coverage and other uncertainties. Roughness coefficient sensitivity analysis results are presented in Annex A.

4.4 Precipitation

Hypothetical precipitation events were applied to the 2D flow area to generate peak flow rates matching the wet and dry period discharge rates presented above. All infiltration, evapotranspiration, and other losses are assumed to have been removed from the applied precipitation depths. An excess precipitation depth of 24 mm was applied to the model to represent dry periods, with a depth of 52 mm applied for the wet period.

4.5 Boundary conditions

Inflow boundary conditions were applied as a constant flow rate matching the upstream inflow rates shown in **Figure 3-6**. Flow rates are adjusted at the dam, powerhouse, and confluence locations. The downstream boundary condition was assigned a constant stage hydrograph for a sea level of 1.0 m for both wet and dry periods.

4.6 Simulation window

A 24-hour simulation window was applied to the model to allow complete propagation of the runoff throughout the model. Results were checked to confirm that the simulation time adequately captured the rise and recession of peak flows throughout the modelled areas.

4.7 Computational time step

A variable time step was assigned based on a maximum Courant Number of 2.0. Using this option, HEC-RAS selects an adaptive time step based on the assigned computational mesh size and computed velocities. The adopted time step generally ranged between 1 and 5 seconds. Mass balance errors and water surface elevation convergence errors were checked to ensure model stability and that imbalances remained below reasonable thresholds, confirming compliance with Courant Number criteria.

4.8 Structures

No bridges, culverts, or other hydraulic structures were included in the model. This approach assumes that any low-flow culverts along existing features are blocked or ineffective at the modelled flood stages. The dam, headrace tunnel, powerhouse, and other infrastructure are represented as flow changes in the model and were not included in the model geometry.

4.9 Calculation options and tolerances

The full momentum shallow water equation set was applied in order to account for inertial terms that become significant with the changes in flow direction and other characteristics of the flow along the Tina River. Except where otherwise noted, program defaults have been applied to all remaining coefficients, options, tolerances, and model settings.

4.10 Summary

Table 4-1 summarises the model parameters used for the baseline and operational conditions model runs.

Table 4-1: Summary of hydraulic model parameters.

Model Parameter	Value
Terrain Digital Elevation Model	10m DEM – 30m SRTM
Precipitation inflow	52 mm rainfall excess (wet period) 24 mm rainfall excess (dry period)
Inflow	30 m^3/s (wet period) 5 m^3/s (dry period)
Outflow	Normal depth energy gradient 0.7%
Simulation Window	24 hours
Computational time step	1-5 seconds
Computational mesh grid	10-20 metres
Roughness	.045-.080
Equation Set	Full momentum shallow water equation

5. HYDRAULIC MODEL RESULTS

Hydraulic model results are extracted in the affected river reaches. The results figures utilise the chainage reference shown in **Figure 5-1**. The zero chainage references the Ngalimbiu River mouth at Iron Bottom Sound.

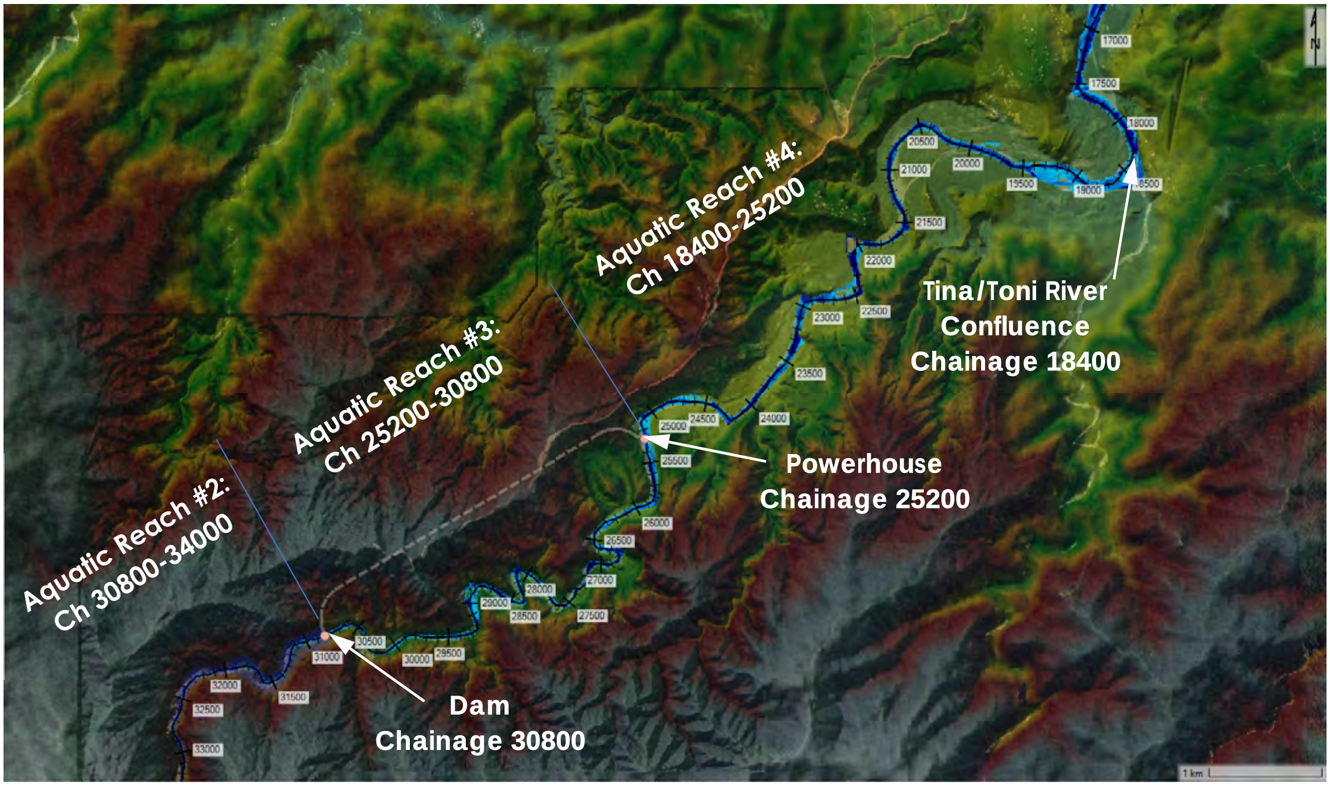

Figure 5-1: Chainage reference for profile figures.

5.1 Direct Precipitation

Flow hydrographs were extracted from the rain-on-grid model results at the dam location, the powerhouse location, and downstream of the Tina River and Toni River confluence. **Figure 5-2** shows the hydrographs for wet periods, and **Figure 5-3** shows the hydrographs for dry periods.

The rain-on-grid results are used to predict the additional contributing inflow from downstream catchment areas based on the available terrain data.

Relative to the peak discharge rates at the dam, the results show that wet period peak discharge rates at the powerhouse increase by 18%, and dry period peak discharge rates increase by 26%. Downstream of the Tina River and Toni River confluence area, wet period peak discharge rates increase by 48%, and dry period peak flows increase by 66%.

The effect on flow volumes, represented by the area under the hydrograph curves, is more pronounced. The wet and dry period total flow volumes increase by 60% and 56%, respectively, at the powerhouse. Downstream of the confluence area, the corresponding volumetric increases are 185% and 140% for the wet and dry periods, respectively.

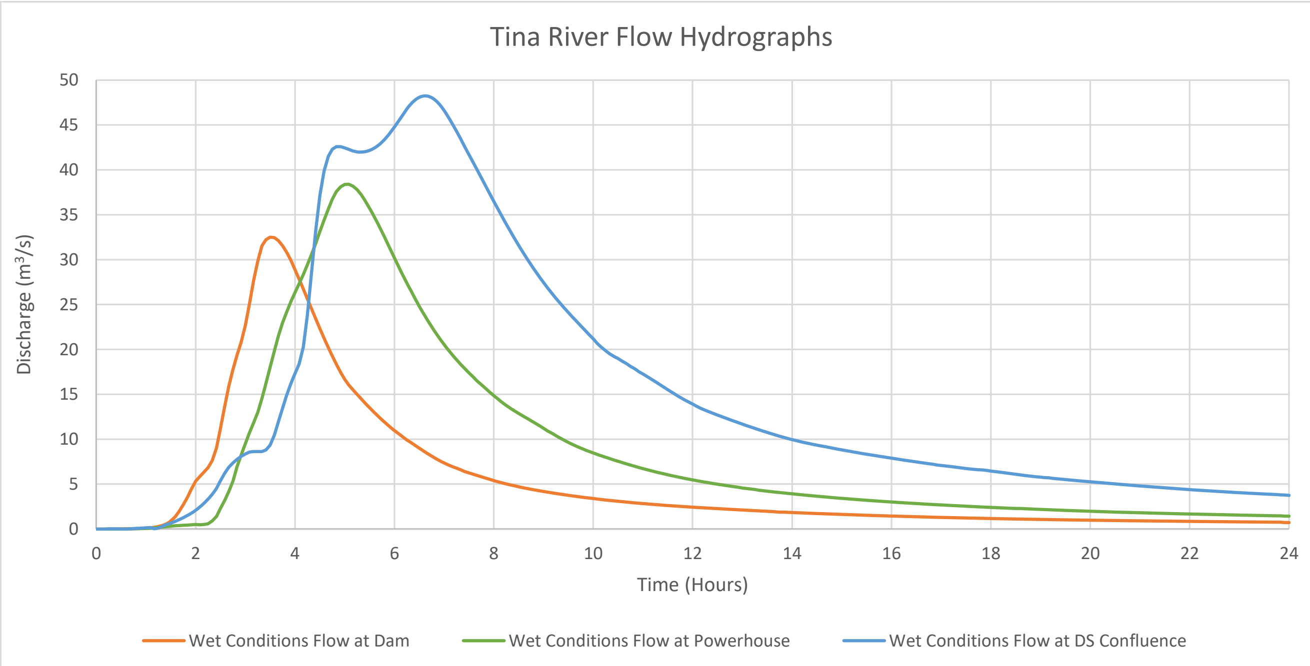

Figure 5-2: Flow hydrographs for wet periods.

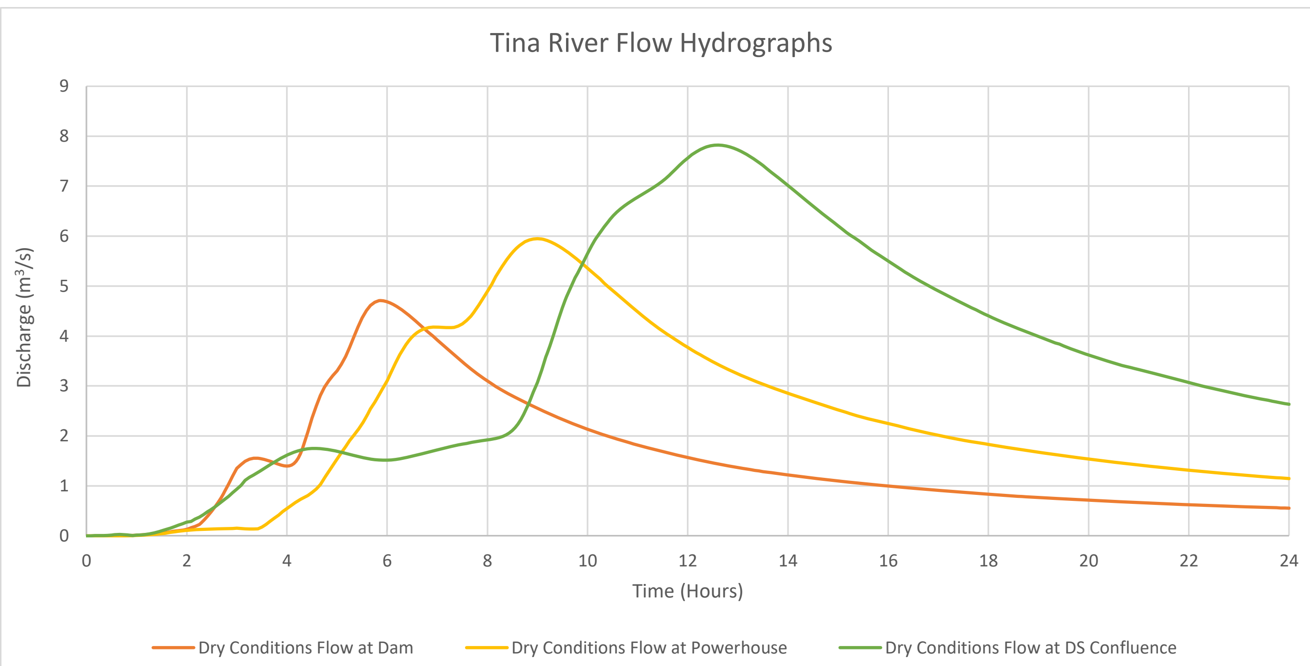

Figure 5-3: Flow hydrographs for dry periods.

These results show that the effect of changes to the instantaneous flow rates at the dam location are diminished due to additional inflow volumes from downstream contributing catchments. These findings reflect surface water runoff related to precipitation only and do not account for groundwater contributions or interflow.

5.2 Inundation Extents

The maximum inundation extents under baseline, daytime, and night-time flow scenarios during wet periods are shown in **Figure 5-4**. **Figure 5-5** shows the extents associated with the same scenarios during dry periods. During wet period, the only differences occur between the dam and powerhouse. All scenarios are the same downstream of the powerhouse; although there are some differences between scenarios between the dam and powerhouse, some of the differences are indiscernible at the presented scale.

Table 5-1 summarises the inundated areas for the Tina River from the dam to the Toni River confluence location.

Table 5-1: Summary of total inundated areas between dam and Toni River confluence.

Scenario	Inundated Area (ha)
Wet period baseline conditions	109
Wet period daytime operations	105
Wet period night-time operations	107
Dry period baseline conditions	78
Dry period daytime operations	83
Dry period night-time operations	71

Table 5-2 summarises the inundated areas by reach for the Tina River from the dam to the Toni River confluence location. The differences between baseline and operational scenarios are most pronounced between the dam and powerhouse locations. Downstream of the Toni River confluence, the differences are diminished due to additional contributing catchment area.

As reflected in the tabulated results, following construction of the Project, the following changes are likely to occur:

- The dewatered reach (Aquatic Reach #3) will have less water relative to the baseline condition, during both wet and dry periods, and during both daytime and night-time operations.
- During wet periods, the inundated area in the dewatered reach (#3) reduces by approximately 20% during the day and 10% at night. During dry periods, the reduction is approximately 30% regardless of the time of day.
- Between the powerhouse and Toni River (Aquatic Reach #4) the only reduction occurs at night during dry periods, when the inundated area is reduced by about 5%.
- The effect downstream of the Toni River is dampened, to a reduction of around 3% relative to the baseline condition.
- No hydrologic effects are anticipated for the Toni River itself.

Table 5-2: Summary of changes to inundated area by reach.

Scenario	Aquatic Reach #1 and #2	Aquatic Reach #3		Aquatic Reach #4		Aquatic Reach #5
	Upstream of Dam	Dewatered Reach (between dam and powerhouse)		Between powerhouse and Toni River		Downstream of Toni River
	Percent Reduction to Baseline	Inundated Area (ha)	Percent Reduction to Baseline	Inundated Area (ha)	Percent Reduction to Baseline	Percent Reduction to Baseline
Wet Baseline		22.2	NA	50.2	NA	
Wet Daytime		18.0	**18.9%**	50.2	0.0%	
Wet Night-time	No decrease	20.2	**9.0%**	50.2	0.0%	No decrease
Dry Baseline		15.3	NA	37.2	NA	
Dry Daytime		11.0	**28.1%**	42.9	-15.3%	
Dry Nighttime		11.0	**28.1%**	35.2	**5.4%**	**3.1%**

The tabulation of changes to inundated areas shows that the relative changes to inundated areas is not linearly proportional to the change in discharge rate. This effect is related to the river sections and bed profile as adopted from the available bathymetric and topographic data. The effect is shown graphically in the river sections and profiles below. **Figure 5-17**, for example, shows that a substantial change in depth related to the change in discharge; however, due to the steepness of the banks relative to the channel bed, the impact on top width (and therefore the inundated area measured in plan view) is limited. Likewise, oscillations in the bed profile tend to pond water during low flow conditions, expanding the inundated area relative to a smooth bed profile. The collection of more detailed bathymetric data may affect the relative relationship between changes in discharge and changes in inundated area.

5.3 Water surface elevation profiles

Figure 5-6 shows a longitudinal water surface elevation profile for the Tina River for wet periods. Although baseline, daytime, and night-time scenarios are included, the differences are not discernible at the scale of the figure. **Figure 5-9** shows a zoomed-in view of the profiles for a representative section of the river between the dam and powerhouse. In this reach, night-time depths and water surface elevations are lower than the baseline, and daytime depths and water surface elevations are lower than night-time scenarios. For wet periods, the water surface elevation profiles are identical upstream of the dam and downstream of the powerhouse.

Figure 5-11 shows the longitudinal profile for dry periods, with a zoomed-in view of a portion of the reach between the dam and powerhouse shown in **Figure 5-14**.

5.4 Velocities

Maximum velocities along the Tina River centreline alignment are shown in profile view in **Figure 5-7** for wet periods. The wet period profiles are identical upstream of the dam and downstream of the powerhouse. Differences are apparent in the reach between the dam and powerhouse, with the lowest velocities associated with the lowest flows reflected by the daytime operations. Night-time velocities are generally between the daytime and baseline velocities.

The dry period maximum velocity profiles are shown in **Figure 5-12**. The profiles are identical upstream of the dam. Differences are most pronounced between the dam and powerhouse. Downstream of the powerhouse the flows exhibit higher daytime velocities and lower night-time velocities relative to the baseline scenarios.

5.1 Shear Stress

Shear stresses reflect the erosive potential of the flow. Maximum shear stresses along the Tina River centreline alignment are shown in profile view in **Figure 5-8** for wet periods. The wet period shear stress profiles are identical upstream of the dam and downstream of the powerhouse. Differences are apparent in the reach between the dam and powerhouse, with the lowest shear stress associated with the lowest flows reflected by the daytime operations. Night-time shear stresses are generally between the daytime and baseline velocities.

The dry period maximum shear stress profiles are shown in **Figure 5-13**. The profiles are identical upstream of the dam. Differences are most pronounced between the dam and powerhouse. Downstream of the powerhouse the flows exhibit higher daytime shear stresses and lower night-time shear stresses relative to the baseline scenarios.

5.2 Cross Sections

Figure 5-10 shows maximum water surface elevations along a cross section located within the reach between the dam and powerhouse for wet periods. The results show how the inundation extents are less sensitive to the differences in flow than the depths due to the incised channel shape.

Figure 5-15 shows the maximum water surface elevations along a cross section located within the reach between the dam and powerhouse for dry periods. **Figure 5-16** shows a representative cross section location between the powerhouse and the Toni River confluence. **Figure 5-17** shows a representative cross section located downstream of the confluence.

The results show how the inundation extents can vary more significantly with depth, particularly where channel sections have a composite shape with an incised section and a milder overbank slope.

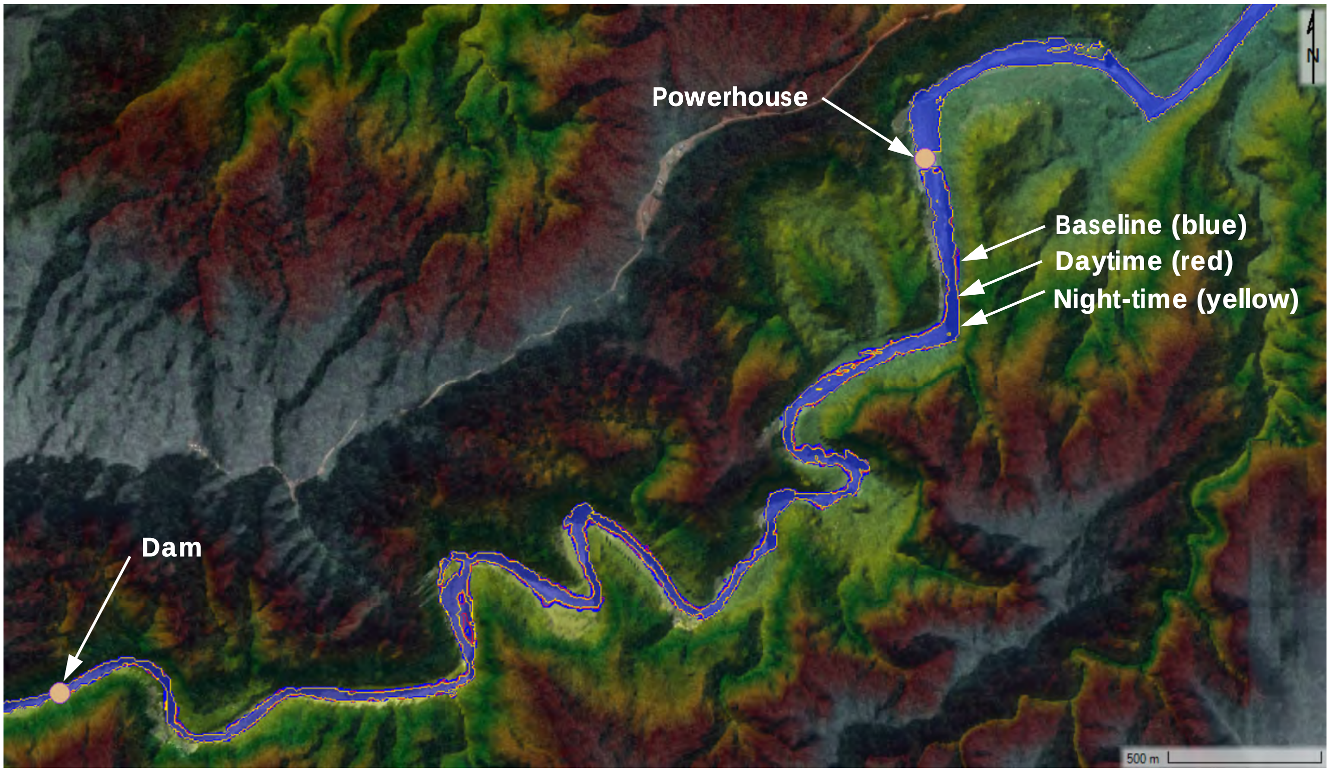

Figure 5-4: Comparison of inundation areas for wet periods.

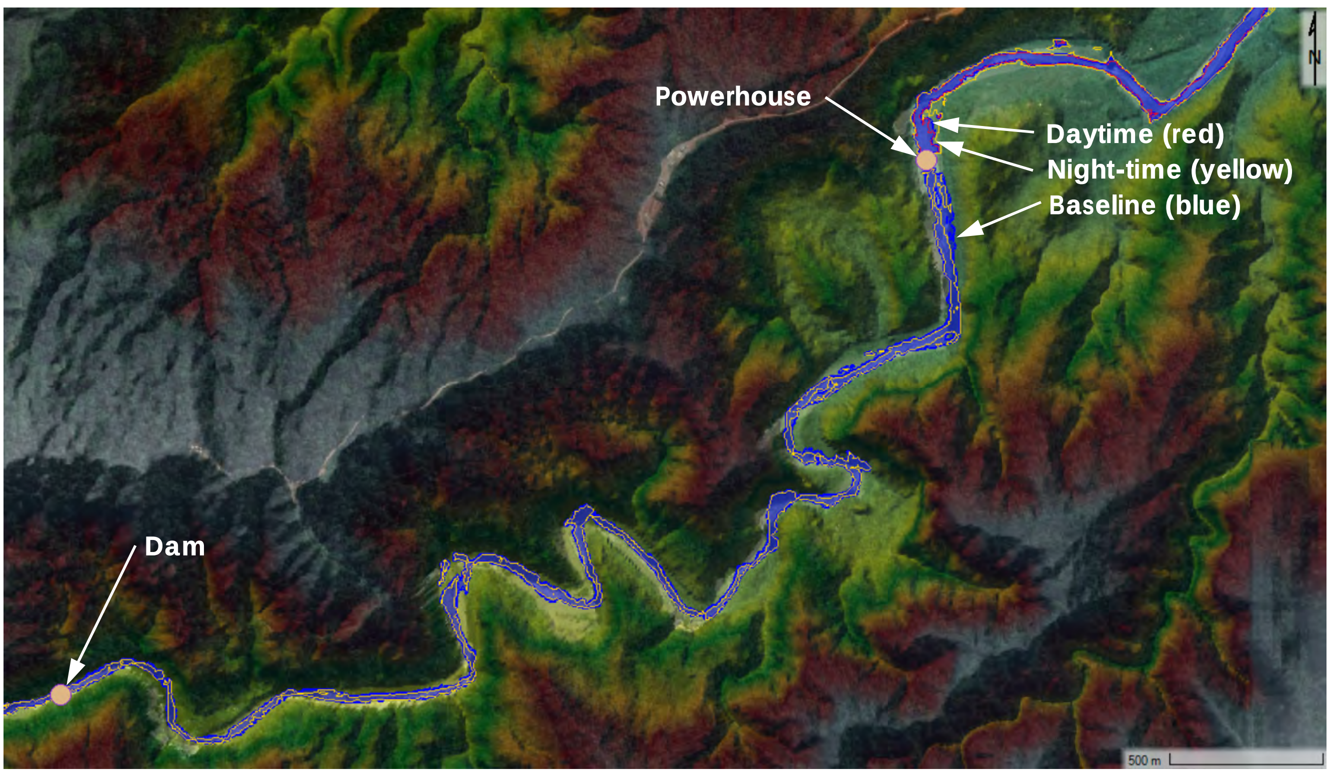

Figure 5-5: Comparison of inundation areas for dry periods.

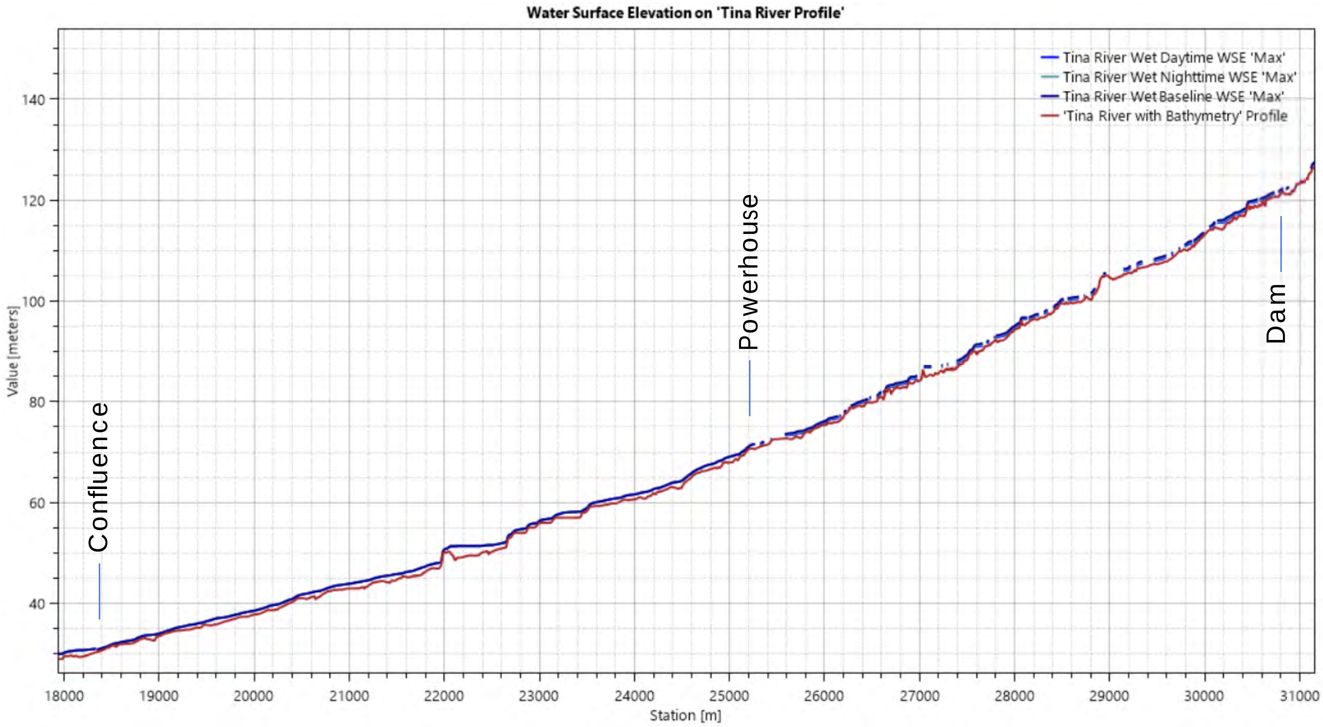

Figure 5-6: Water surface elevation profile comparison for wet periods.

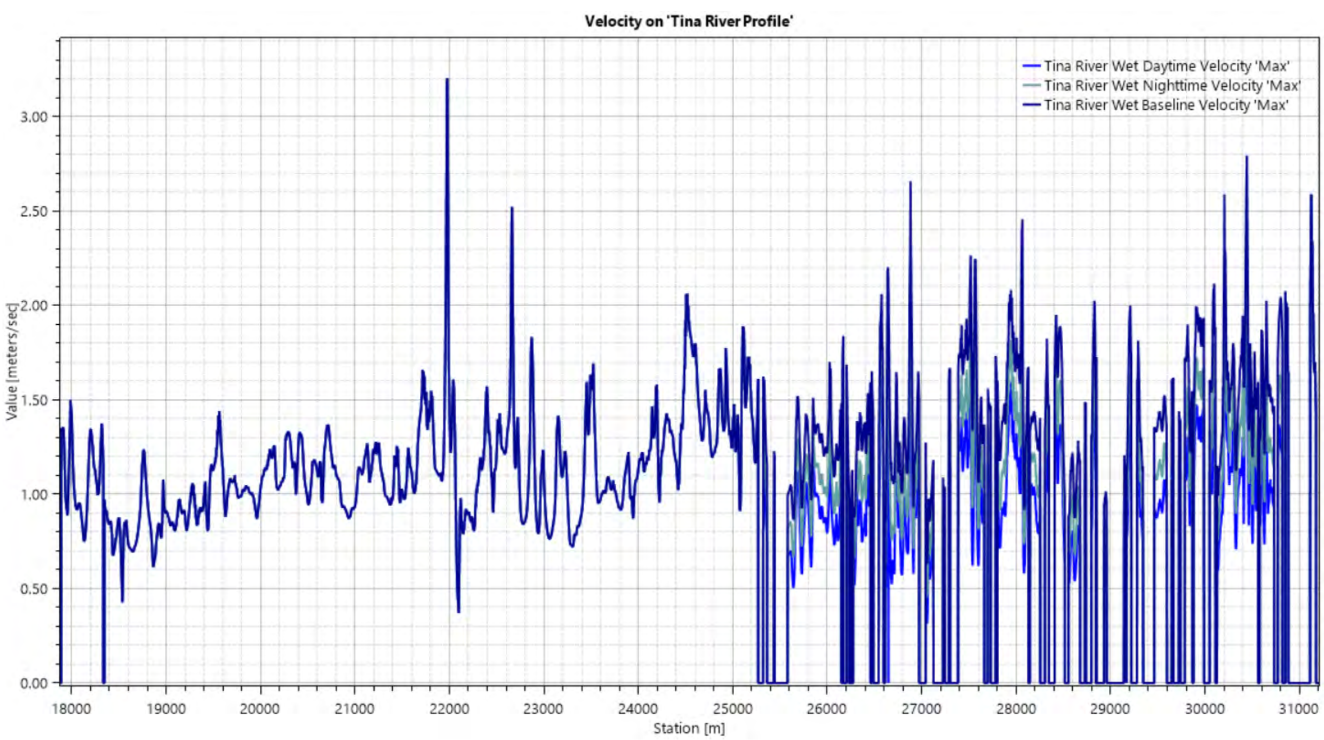

Figure 5-7: Velocity profile comparison for wet periods.

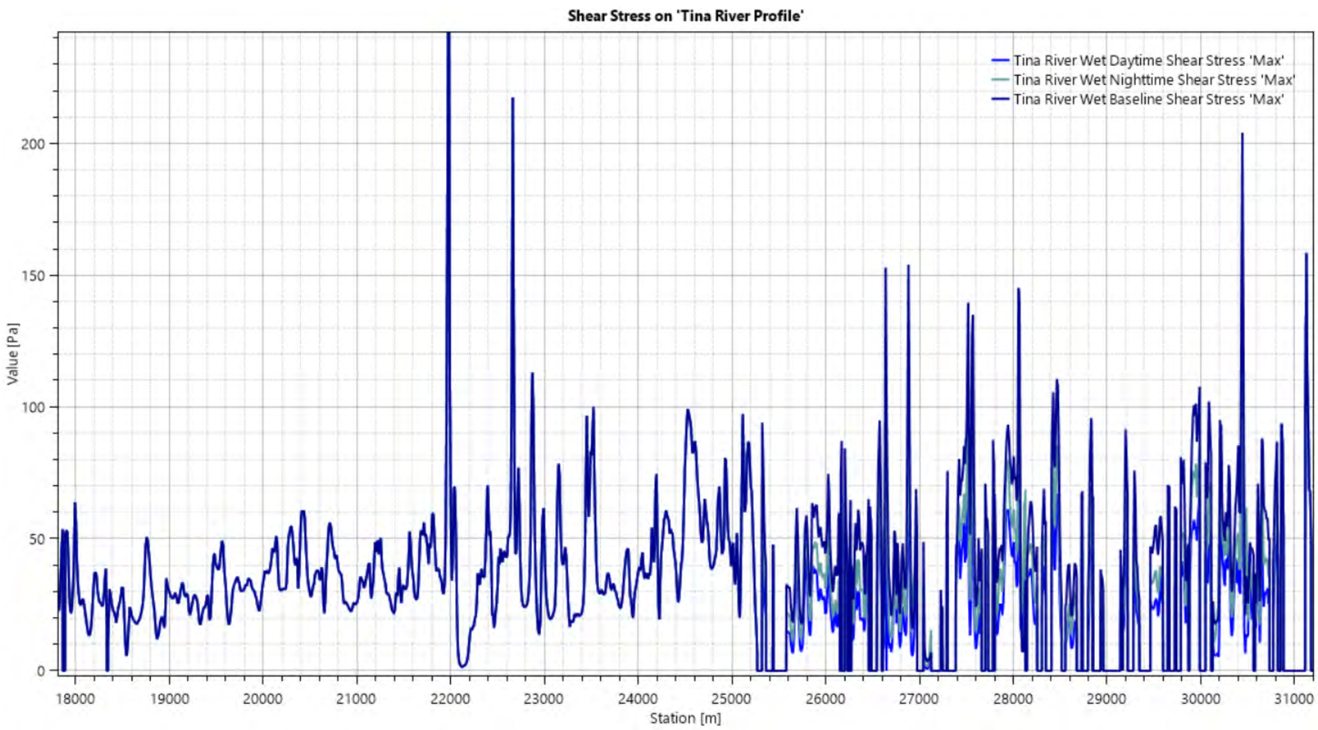

Figure 5-8: Shear stress profile comparison for wet periods.

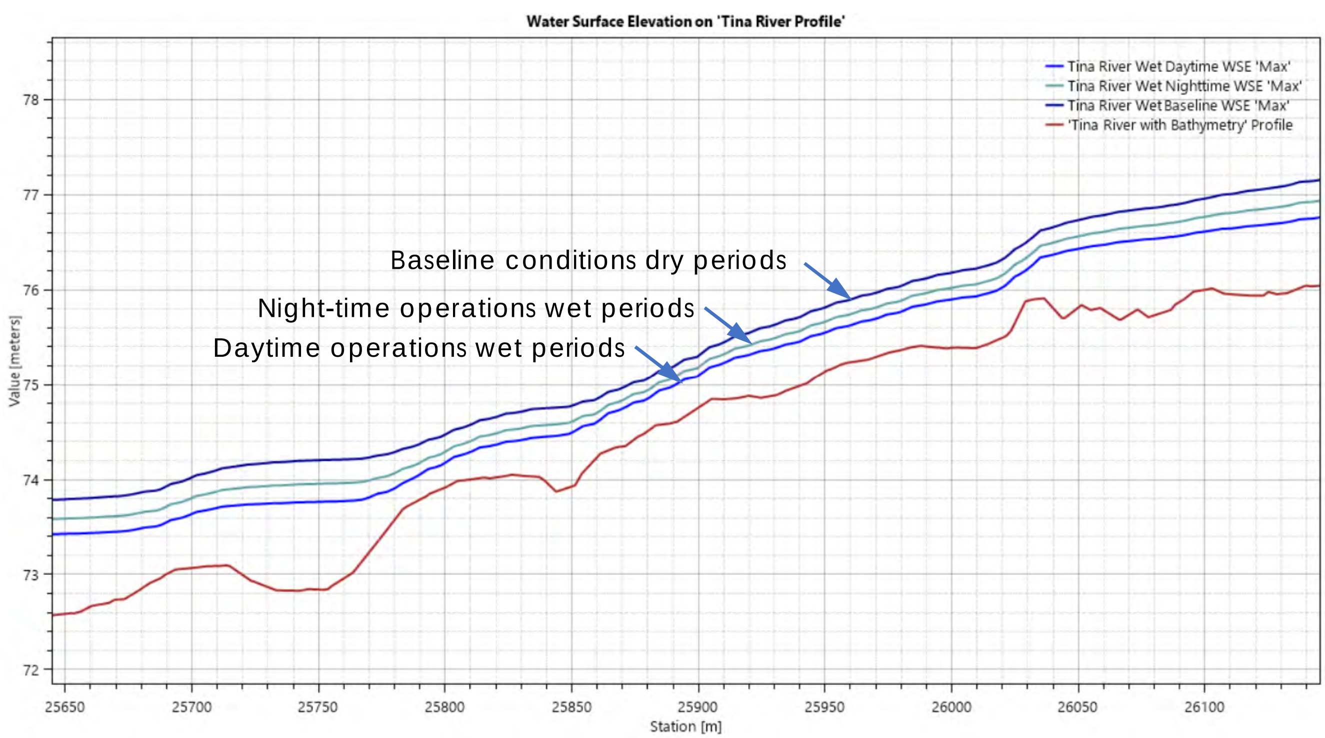

Figure 5-9: Water surface elevation profile comparison for wet periods.

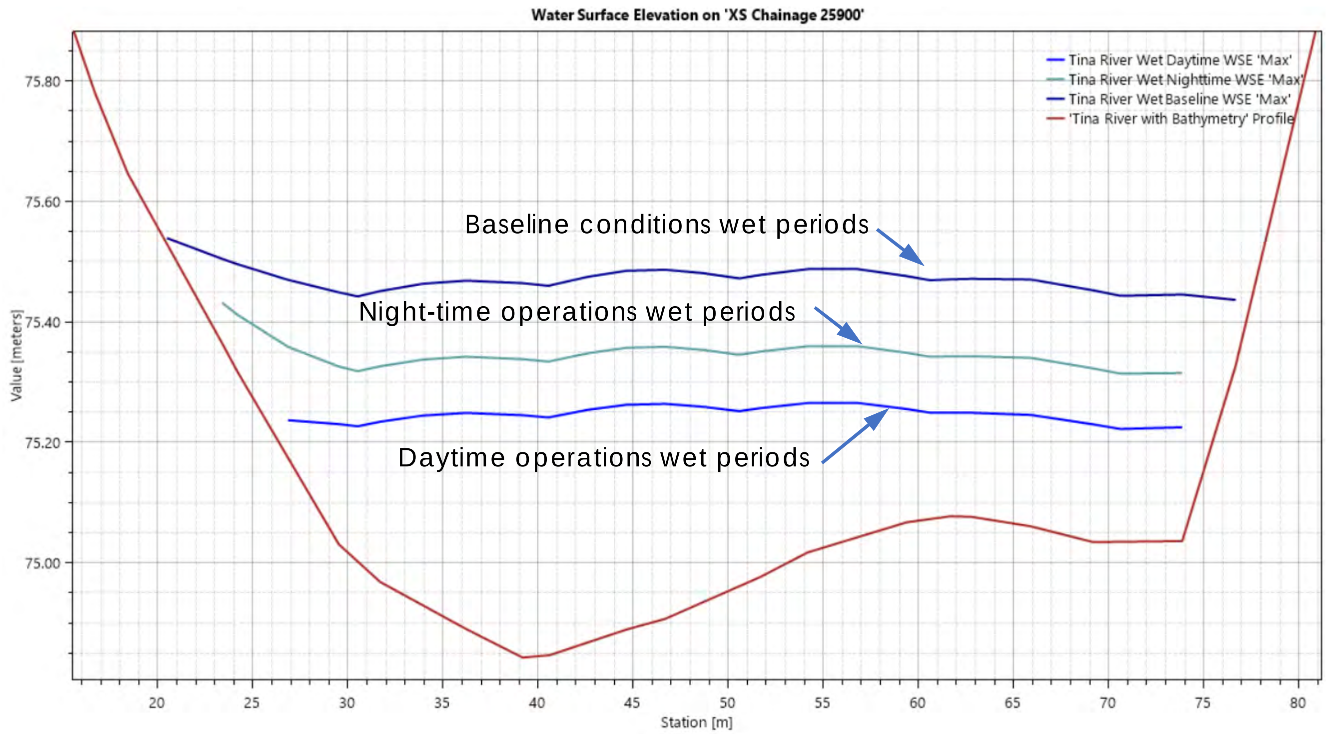

Figure 5-10: Representative cross section comparison for wet periods from dam to powerhouse.

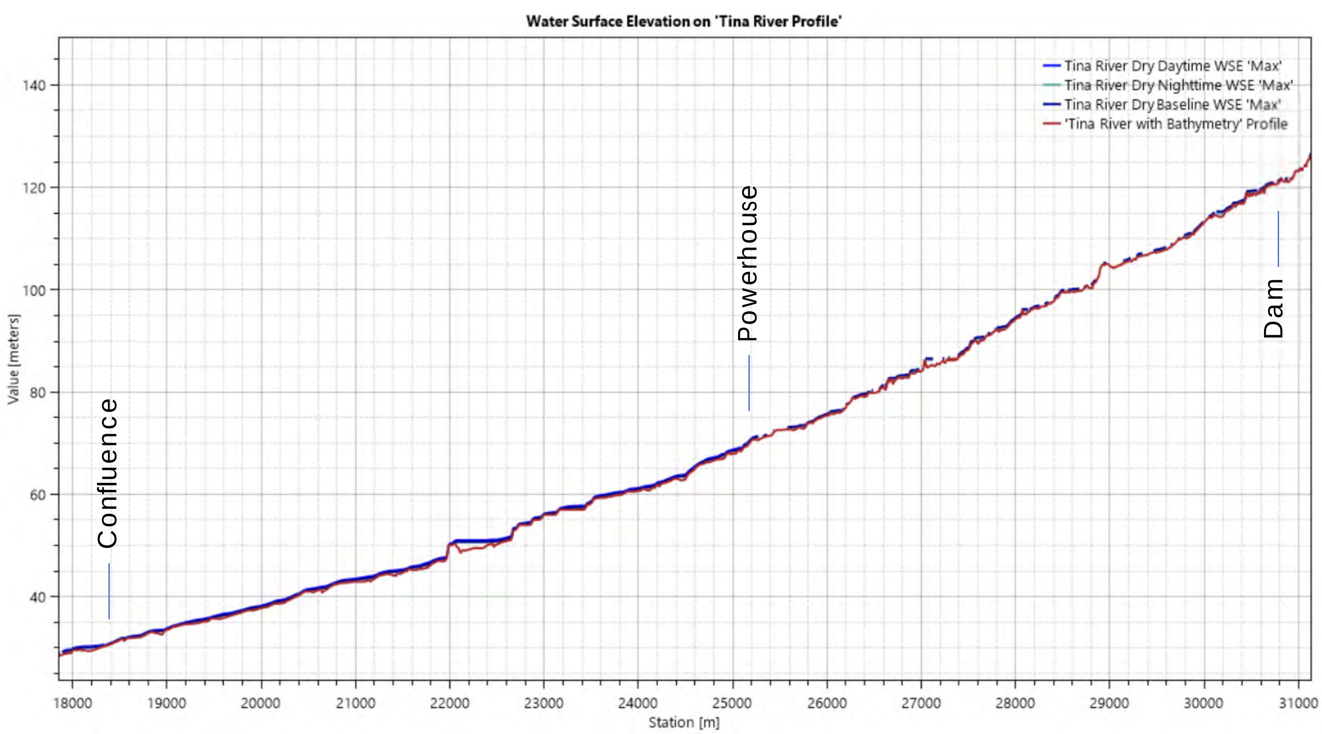

Figure 5-11: Water surface elevation profile comparison for dry periods.

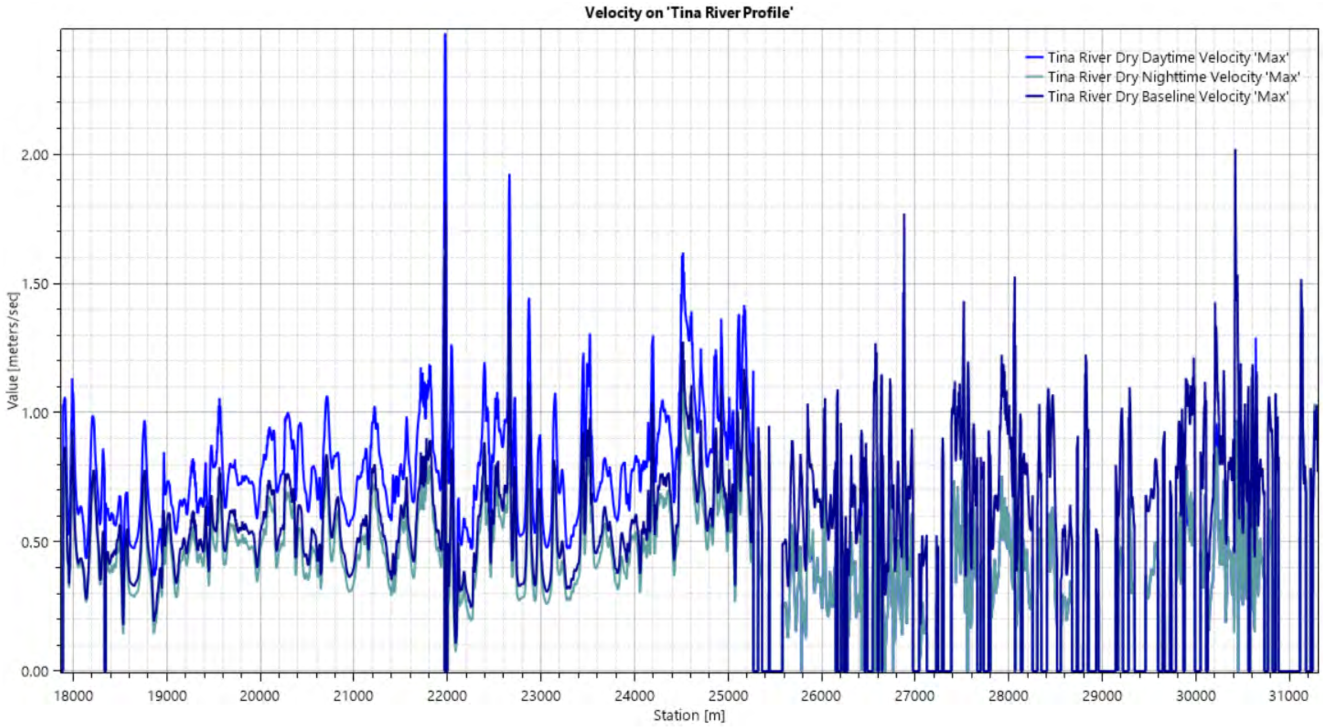

Figure 5-12: Maximum velocity profile comparison for dry periods.

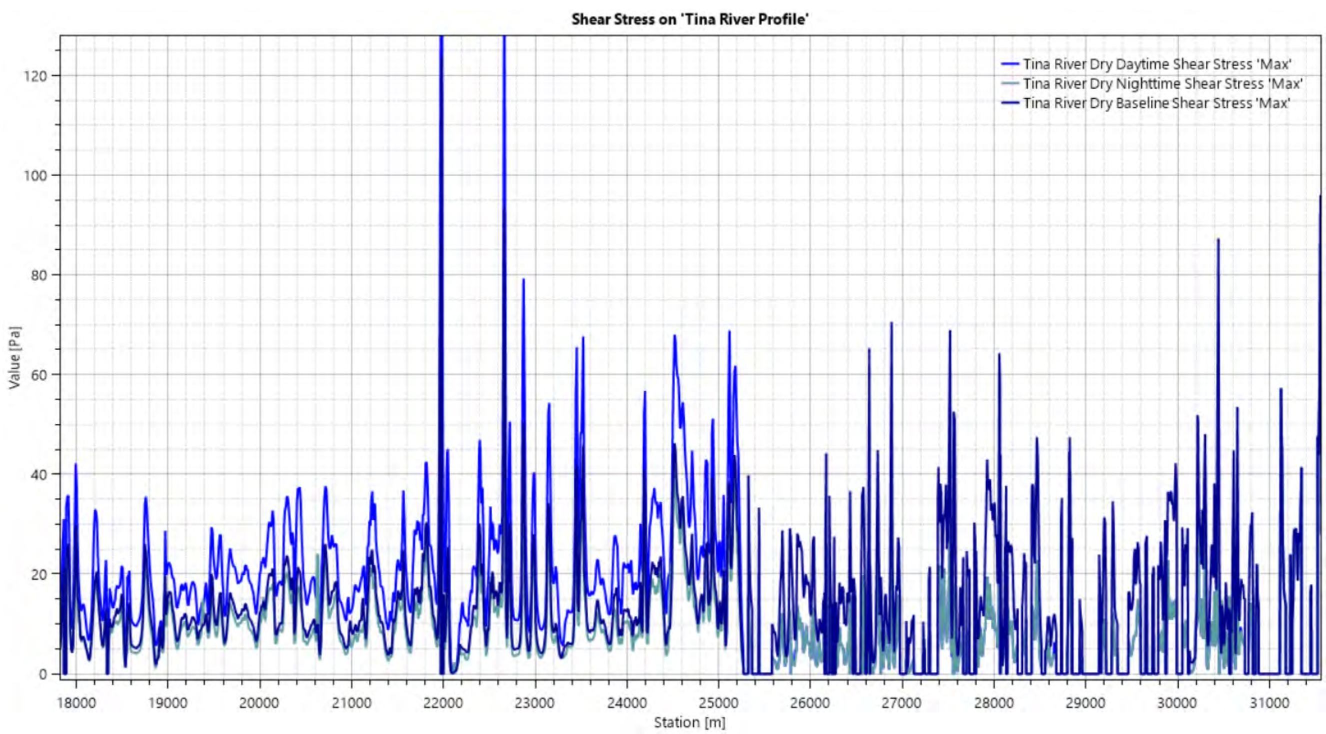

Figure 5-13: Maximum shear stress profile comparison for dry periods.

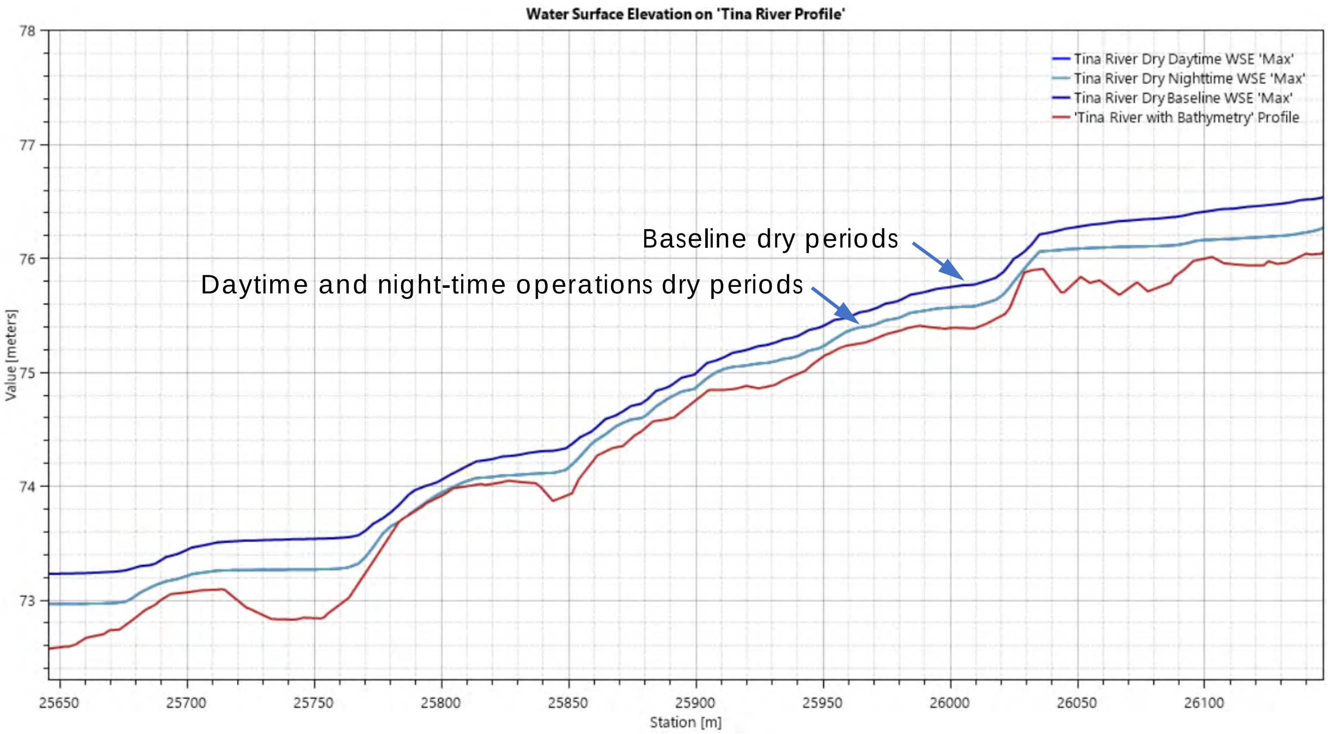

Figure 5-14: Maximum water surface elevation profile comparison for dry periods.

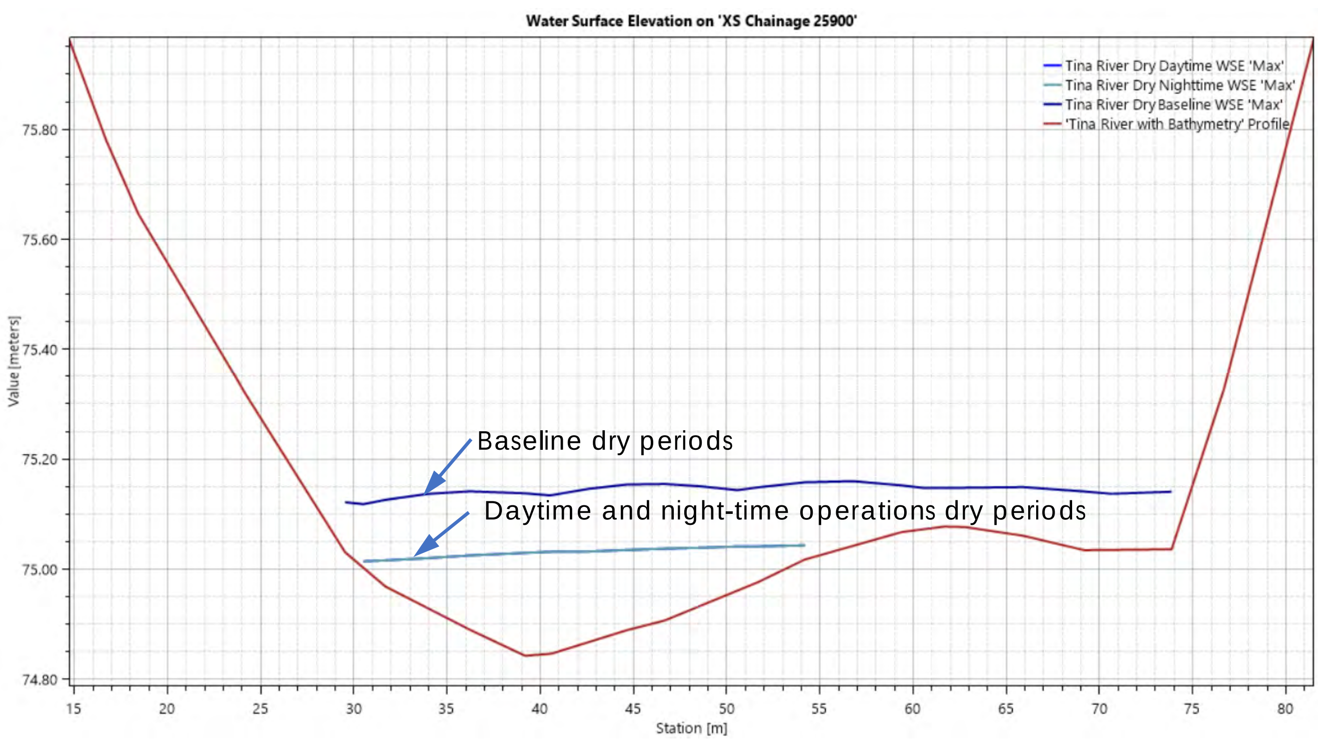

Figure 5-15: Representative cross section comparison for dry periods from dam to powerhouse.

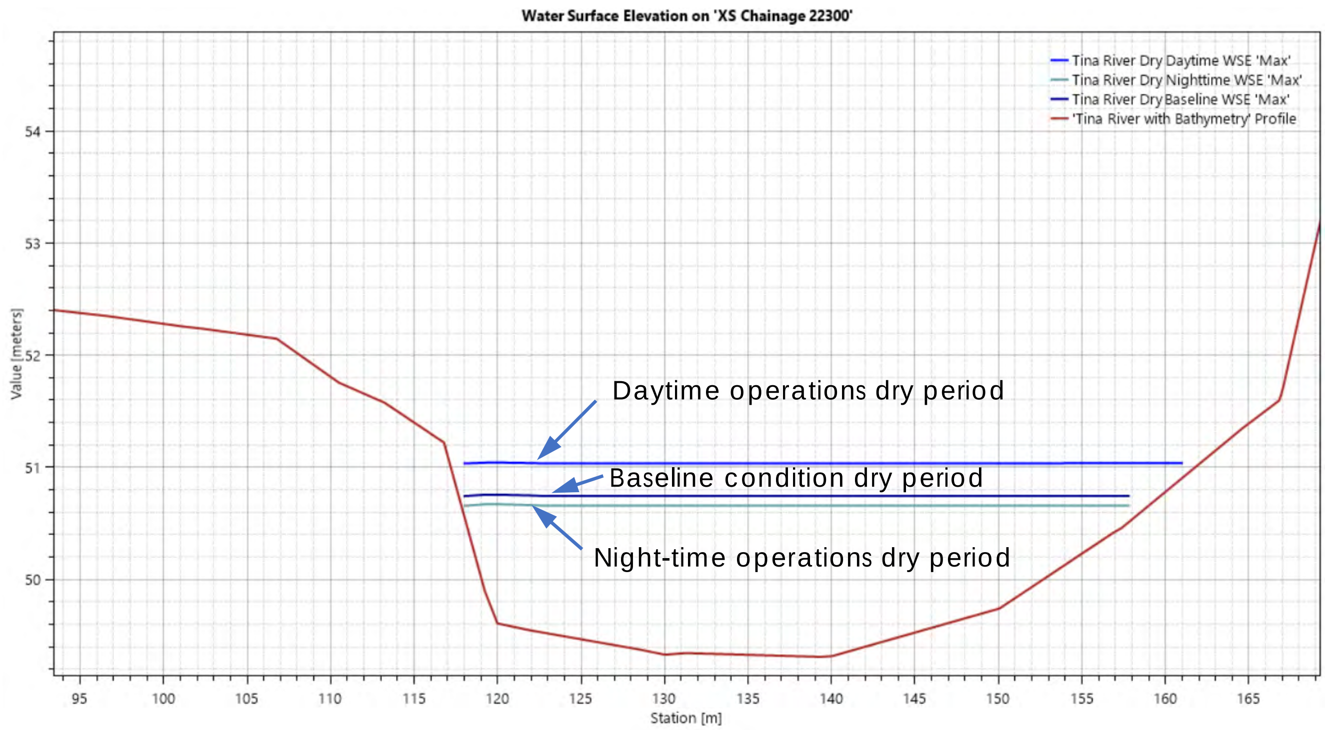

Figure 5-16: Representative cross section comparison for dry periods from powerhouse to confluence.

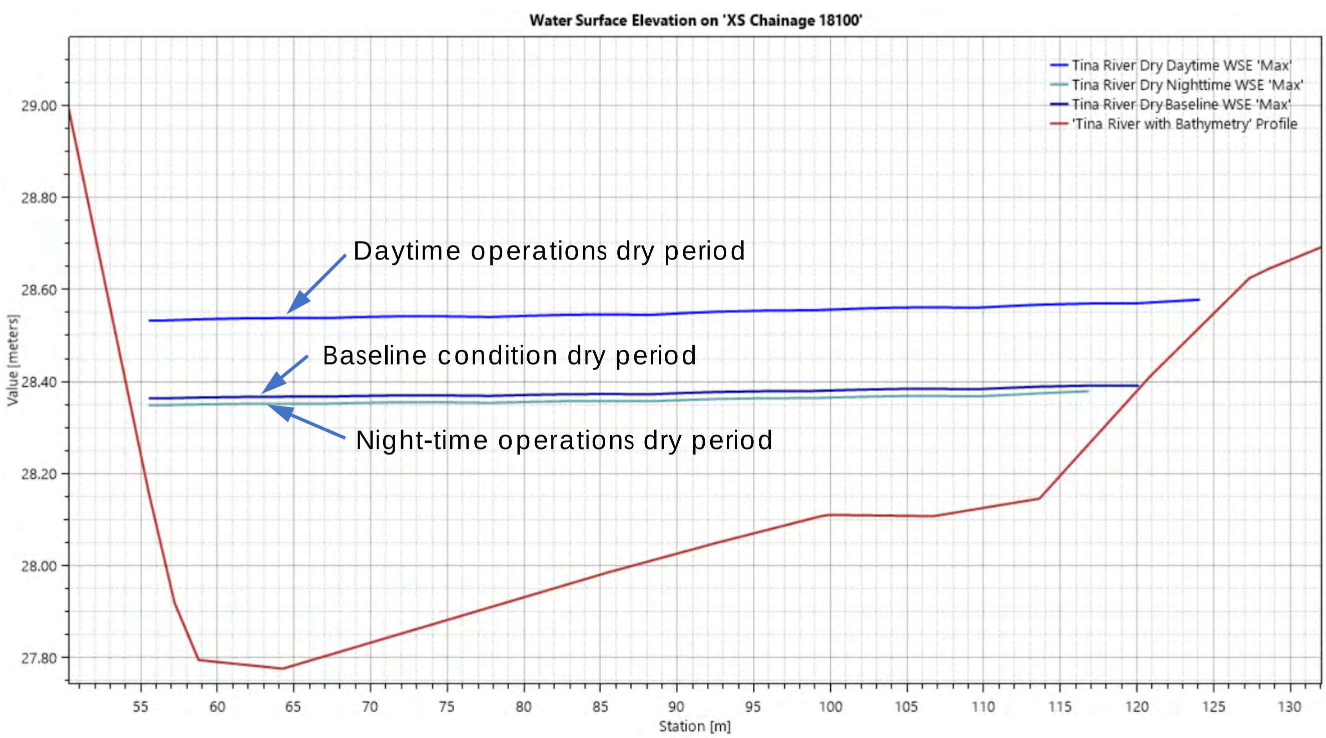

Figure 5-17: Representative cross section comparison for dry periods downstream of confluence.

5.3 E-flows and River Geomorphology

In the upper and mid reaches of the Tina River, aquatic habitat is predominantly associated with areas characterised by fast flowing riffles, while in the lower Tina River, Toni River and upper Ngalimbiu River it is characterized by riffles with moderate flow and runs. The lower reaches of the Ngalimbiu River includes runs with moderate flow. In-stream habitat consists of a range of rock faces and boulders with limited cover of large woody debris. Submerged vegetation was mostly limited although emergent vegetation and introduced grasses are present in low to moderate abundance along the rivers.

The Tina River and upper Ngalimbiu River comprise a range of substrates, with the prevalence of larger boulders and cobbles interspersed with pebbles, gravel and sand. The Toni and lower Ngalimbiu riverbeds consist of mostly finer material (gravel and sand), with the downstream Ngalimbiu River almost entirely dominated by sands close to the river mouth (FRC environmental 2020). The gravel and sand reaches are most susceptible to changes related to hydropeaking. \

The hydrologic and hydraulic modelling results show some changes in water levels and inundation extents relative to the baseline conditions during Project operation as follows:

- Comparison of depths, inundation extents, velocities, and shear stresses between baseline and operational Project conditions show the most significant changes in the bypassed, dewatered river reach between the dam and powerhouse (Aquatic Reach #3).
- Downstream of the powerhouse (Aquatic Reach #4), changes in water levels and top width related to hydropeaking do not significantly affect the total volume of flow when averaged across multiple days.
- Due to the limited storage capacity of the reservoir, the overarching water balance tends to equalise between baseline and Project conditions over periods of 48 to 72 hours.
- Based on the predicted hydrological modelling, the most significant changes to e-flows within the mid reaches of the Tina River, will occur from the dam wall to the confluence of the Toni River (Aquatic Reaches #3 and #4).
- Downstream of the Toni River confluence, additional inflows and attenuation tend to diminish the impacts of hydropeaking.

As shown by the flow records, the Tina River is subject to flash floods that far exceed the capacity of the reservoir. During these events, which result in substantial sediment dynamics in the river channel, flow rates for power generation are not significant. For example, the ESIA (TRHDP 2019) reports flows of up to 445 m^3/s, exceeding the effects of bypassing for power generation by more than an order of magnitude. The HEC hydrology assessment (2022) reports peak discharge rates of 700 m^3/s. Bank-full discharge rates that generally result in channel-forming conditions in analogous systems tend to be associated with flow rates with an annual exceedance probability (AEP) of approximately 50%. The maximum flows under which hydropeaking results in significant differences are far below the 1 in 2-year, or 50% AEP discharge rates predicted by the flood frequency assessment.

5.4 Impacts of Hydropeaking on Aquatic Ecology and Habitat

The results of the hydraulic modelling have been applied to findings related to aquatic ecology and habitat availability.

Upper Tina River Reach (from approximately 300 to 400 masl)

This reach is demarcated by the confluence of a number of minor tributaries upstream of the Project Area, with undisturbed forest surrounds. Although there are no hydraulic effects of the Project condition upstream of the reservoir, some loss of habitat related to blockage of upstream fish passage may affect the upper reach. Effects of hydropeaking downstream of the dam may affect fish migration that has an ultimate effect on habitat in the upper Tina River reach. Impacts may be offset with appropriate mitigation measures.

Mid Tina River Reach (between approximately 100 to 300 masl)

In this reach, the river flows through lowland forest, with minor logging of forest surrounds. This reach includes the Project Area, with the tailrace tunnel and bypass channel where effects of hydropeaking are most pronounced. This reach is divided into five subreaches:

- Upstream of the reservoir (Aquatic Reach #1). The project has no effect on habitat areas, with the exception of effects on upstream fish migration.
- Reservoir and dam (Aquatic Reach #2). In this reach, inundation extents are affected by the presence of the dam and the reservoir formed behind the dam. In some scenarios, there is an increase in inundated areas; relative to the baseline condition, no reduction in inundated area is anticipated under operational scenarios. Some dam and spillway modifications may be required to address downstream movement of small fish and eggs.
- Dewatered section between dam and powerhouse (Aquatic Reach #3). This reach is subject to discharge reductions of up to 80% during dry periods. Hydraulic modelling shows associated decreases in inundated area of up to 30%.
- Downstream of powerhouse to Toni River (Aquatic Reach #4). This reach is subject to discharge reductions of up to 10% during dry periods. Hydraulic modelling shows associated decreases in inundated area of up to 5%. During wet periods, changes relative
- Downstream of Toni River confluence (Aquatic Reach #5). This reach is subject to discharge reductions of up to 8% during dry periods. Hydraulic modelling shows associated decreases in inundated area of up to 3%.

Lower Tina River Reach (below approximately 50 to 100 masl)

This reach is demarcated by the confluence of the Tina and Toni River, and the beginning of the Ngalimbiu, and where development becomes evident on the river margins and surrounds. In wet periods, there are no effects related to hydropeaking. During dry periods, the effects gradually diminish in a downstream direction.

Relative to the pristine habitats that occur in the upper catchment of the Tina and Toni Rivers, the downstream Ngalimbiu River supports a limited diversity of habitat and increased development (FRC environmental 2020). The effects of hydropeaking are diminished in the downstream reaches due to the contribution of additional catchment areas through tributary channels.

6. CONCLUSIONS

6.1 Summary

As shown in the hydraulic modelling results, during dry periods, hydropeaking tends to result in higher instantaneous downstream flow rates while the reservoir is being drawn down during daytime hours when power generating demands are highest. These periods of increased flow have the potential for increased sediment mobility. However, the overall sediment dynamics during natural flash floods far exceed the dynamics related to hydropeaking, and significant long-term erosion downstream of the Toni River confluence is unlikely to occur as a result of the sub-daily flow fluctuations associated with Project operations. The dam will trap the river's bed load, which may increase erosivity downstream of the dam; the adoption of a sediment management strategy may be warranted to offset the impacts.

The Toni River and other downstream tributaries reduce the effect of the hydropeaking oscillations. The Toni River has roughly one third of the catchment area of the Tina River; given the limited catchment size, the Toni River does not have sufficient catchment area relative to the Tina River to completely eliminate the sub-daily changes in flow rates that will proceed further downstream of the confluence. However, the sub-daily fluctuations do not have a significant effect on the volumetric delivery of water downstream of the Toni River confluence when averaged out over periods of greater than one day.

Wet period and dry period flows were modelled and compared to baseline conditions. Based on the modelling results, the following changes are likely to occur following construction of the Project:

- The dewatered reach (Aquatic Reach #3) will have less water relative to the baseline condition, during both wet and dry periods, and during both daytime and night-time operations.
- During wet periods, the inundated area in the dewatered reach (#3) reduces by approximately 20% during the day and 10% at night. During dry periods, the reduction is approximately 30% regardless of the time of day.
- Between the powerhouse and Toni River (Aquatic Reach #4) the only reduction occurs at night during dry periods, when the inundated area is reduced by about 5%.
- The effect downstream of the Toni River is dampened, to a reduction of around 3% relative to the baseline condition.
- No hydrologic effects are estimated for the Toni River itself.

The quantitative change in inundated areas is not linearly proportional to the change in discharge rate. This effect is related to the shape of the channel cross section and oscillations in the bed profile that are apparent in the adopted bathymetric data as described in this report.

The effect of the estimated change in the sub-daily flow regime on ecology and habitat availability is described further in the BMP (Stantec, 2023).

6.1 Recommendations

Impacts related to the presence and operations of the TRHDP may be mitigated through the following actions:

- Maintenance of environmental flows in the dewatered section of the river.
- Maintenance of upstream and downstream fish passage via a trap and haul system.
- Implementing conservation actions to protect and restore species and habitats within Core Land.
- Implementing good industry practice in the form of environmental management (including speed limits, hazardous chemical, and waste management etc.).
- Implementation of a sediment management program to periodically release stored sediment.
- Adherence to recommended operation and maintenance activities.

6.2 Limitations

This report provides a summary of Tina River hydrologic conditions and 2D hydraulic model setup and results under a range of flow conditions. Baseline and Project conditions are compared; the findings are based on model results that rely on the highest resolution available terrain data. In some areas, the available terrain data are too coarse for accurate delineation of contributing catchment areas and determination of flow characteristics. Should more detailed or more extensive topographic data become available in the future, the results of this study should be revisited.

Due to the sparse availability of local precipitation data and flow records, flood frequency estimates presented in this report have a high degree of uncertainty. Ongoing data collection and gauging may help reduce the level of uncertainty.

7. REFERENCES

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8. ANNEXES

Annex 1: Sensitivity analysis results