Initial Environmental Examination

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Samoa: Renewable Energy Development and Power Sector Rehabilitation project

Fuluasou Small Hydropower Project

Prepared by Electric Power Corporation of Samoa

TABLE OF CONTENTS

ABBREVIATIONS iii
EXECUTIVE SUMMARY iv
1. INTRODUCTION 1
1.1. Background 1
1.2. Report Purpose and Scope 1
1.3. Methodology 2
2. PROJECT DESCRIPTION 5
3. INSTITUTIONAL, POLICY AND LEGAL FRAMEWORK 9
3.1. Institutional Framework 9
3.2. Legal and Policy Framework 10
3.2.1. Environment Law and Regulations 10
3.2.2. Permits Required 11
3.2.3. Samoa Codes of Environmental Practice 12
3.2.4. Policy Framework 12
3.3. ADB Safeguard Policy Statement 13
4. DESCRIPTION OF THE ENVIRONMENT 14
4.1. Overview of Physical Environment 14
4.2. Overview of Biological Environment 15
4.3. Overview of Socio-Economic Environment 17
4.4. Fuluasou SHP Site 20
4.4.1. Protected Areas 20
4.4.2. Catchment and Hydrology 21
4.4.3. Fish and Aquatic Macroinvertebrates 22
4.4.4. Vegetation 22
4.4.5. Avifauna 27
4.4.6. Other Fauna 27
4.4.7. Presence of Critical Habitat 29
5. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES 31
5.1. Design Phase and Pre-Construction Impacts 31
5.1.1. Climate Change Adaptation 31
5.1.2. Hydrology 33
5.1.3. Biodiversity 36

5.2. Construction Phase Impacts on the Physical Environment 36
5.2.1. Air Quality 36
5.2.2. Erosion 37
5.2.3. Water Quality 38
5.2.4. Stockpile Management 39
5.2.5. Waste Management 39
5.2.6. Hazardous Materials 40
5.3. Construction Phase Impacts on Biological Environment 40
5.3.1. Vegetation 40
5.3.2. Avifauna and other terrestrial fauna 42
5.3.3. Aquatic ecology 42
5.4. Construction Phase Impacts on Socio-Economic Environment 46
5.4.1 Noise and Vibration 46
5.4.2 Establishment of Site Office and Works Yard 46
5.4.3 Traffic 47
5.4.4 Worker Health and Safety 48
5.4.5 Community Health and Safety 49
5.4.6 Physical Cultural Resources 49
5.5 Operational Impacts on Physical Environment 50
5.6 Operational Impacts on Biological Environment 50
5.7 Operational Impacts on Socio-Economic Environment 51
6. CONSULTATION, PUBLIC INFORMATION AND DISCLOSURE 52
6.1. Consultation and Public Information 52
6.2. Disclosure 53
7. ENVIRONMENTAL MANAGEMENT PLAN 54
7.1 Introduction 54
7.2 Implementation of the EMP 55
7.3 Monitoring 58
8 CONCLUSIONS AND RECOMMENDATIONS 66
8.1 Project Benefits 66
8.2 Conclusions 66
REFERENCES 67
APPENDIX A: NESP: Key Environment Sector Objectives Relevant to the Project 70

ABBREVIATIONS

ADB	Asian Development Bank
CEAR	Comprehensive Environmental Assessment Report
CEMP	Construction Environmental Management Plan
COEP	Code of Environmental Practice
CPP	Consultation and Participation Plan
DEC	Division of Environment and Conservation (of MNRE)
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ENSO	El Niño Southern Oscillation
EO	Environment Officer
EPC	Electric Power Corporation
EHSG	Environmental Health and Safety Guidelines (World Bank)
GOS	Government of Samoa
GRM	Grievance Redress Mechanism
HSP	Health and Safety Plan
IEE	Initial Environmental Examination
IES	International Environmental Specialist
IUCN	International Union for the Conservation of Nature
KBA	Key biodiversity area
MAF	Mean Annual Flow
MAF	Ministry of Agriculture and Fisheries
MALF	Mean Annual Low Flow
MFAT	Ministry of Foreign Affairs and Trade (of New Zealand)
MSMP	Materials and Spoil Management Plan
MNRE	Ministry of Natural Resources and Environment
MWTI	Ministry of Works, Transport and Infrastructure
NESP	National Environment and Development Sector Plan 2013-2016
NWAP	National Water Allocation Policy
PEAR	Preliminary Environmental Assessment Report
PMC	Project Management Consultant
PMU	Project Management Unit
PPE	Personnel Protective Equipment
PRO	Public Relatins Officer (of EPC)
PUMA	Planning and Urban Management Agency
SHP	Small Hydropower Plant
SPREP	Secretariat of the Pacific Regional Environment Programme
SWA	Samoa Water Authority
TOR	Terms of Reference
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
VMS	Village Managed Schemes
WRD	Water Resources Division (of MNRE)
WMP	Waste Management Plan

EXECUTIVE SUMMARY

1. **Introduction.** Samoa is heavily reliant on imported fossil fuels for power generation. The objective of the Renewable Energy Development and Power Sector Rehabilitation project is to assist the efforts of Government of Samoa (GOS) to reduce the country's heavy reliance on fossil fuels by providing a secure, sustainable and environmentally-sound source of electricity for consumers. The development initiative includes the construction of four new small hydro plants (SHPs) and the refurbishment of four existing SHPs. As part of additional financing available to the project, this report provides an environmental assessment of another proposed SHP at Fuluasou (the project).

2. **Categorization.** The Fuluasou scheme is categorized as Category B for environment in accordance with the Asian Development Bank (ADB) Safeguard Policy Statement 2009 (SPS) as the potential adverse environmental impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed readily.

3. **Initial Environmental Examination.** As a requirement of the SPS, an initial environmental examination (IEE) has been undertaken as part of project preparation and feasibility study of the proposed works. The feasibility study includes environmental assessment as per requirements of GOS and following the ADB SPS.

4. **Policy, Legal and Administrative Framework.** The project shall comply with requirements of a number of pieces of legislation including: Lands, Survey and Environment Act 1989; Planning and Urban Management Act 2004 and the Environmental Impact Assessment (EIA) Regulations 2007; Forestry Management Act 2011; and, Water Resources Management Act 2008. For development of hydropower projects, development consent must be obtained from the Planning and Urban Management Agency (PUMA) within the Ministry of Natural Resources and Environment (MNRE). The development consent application must include an environmental assessment which complies with the above Acts and Regulations. The project will also comply with the requirements of the ADB SPS. GOS environmental clearance and development consent (and other permits) must be obtained before any works commence.

5. The IEE is intended to meet the requirements of the ADB for Category B projects as described in the SPS as well as comply with the the EIA Regulations as required by the country safeguard system of GOS.

6. MNRE contains a number of divisions that help to implement the statutory and non-statutory framework for environmental management and biodiversity protection. Division of Environment and Conservation (DEC) is responsible for national parks, conservation and waste management. The Terrestrial Conservation Section within DEC is responsible for implementing the Protection of Wildlife Regulation 2004. The Water Resources Division is responsible for developing and implementing watershed management plans for ensuring the protection and conservation of watershed areas. The Forestry Division is responsible for the sustainable development and management of forest resources, including effective implementation of forest management plans, ecological restoration of national parks, and developing programs for the establishment of community conservation areas.

7. There are also a number of policy documents and draft management plans that provide direction for the environment sector and non-statutory mechanisms under existing laws for conservation and biodiversity protection; these have also been taken into account in the design of the mitigation measures proposed.

8. **Critical Habitat.** The SHP site was assessed for the presence of critical habitat, as defined by the SPS. The Fuluasou SHP is not considered to contain critical habitat due to the highly modified nature of the site and habitat generally unsuitable for threatened species, the presence of existing infrastructure, and absence of threatened species.

9. **Environmental Impacts.** The Fuluasou SHP is an existing derelict SHP which is to be rebuilt. The habitat is highly modified, and there is an existing dam, reservoir, penstock and powerhouse present. Potential impacts generated from the works are described in the IEE and include, *inter alia*, loss of vegetation and habitat, soil erosion, water pollution, noise and traffic congestion.

10. **Environmental Flows.** Minimum flows have been developed for the SHP site. The environmental flow is proposed based on the 95th percentile of the flow duration curve and is consistent with MNRE recommendations. This equates to 0.36 m^3/sec at the Fuluasou SHP intake.

11. **Mitigation Measures.** Measures set out in the environmental management plan (EMP) will ensure that environmental impacts are minimised and managed appropriately at the site.

12. **Environmental Benefits.** The operation of the SHP will have beneficial effects through more efficient provision of clean electrical power from renewable resources and improved environmental management within EPC. The Fuluasou project will achieve a net reduction of greenhouse gas emissions of around 1,729 tons of CO_2 per year. This corresponds to fuel savings of 645 litres of fossil fuel per year.

13. **Environmental Management Plan.** Mitigation measures, environmental monitoring, and capacity development are set out in the EMP to minimize the environmental impacts in the pre-construction, construction and operational phases. Following consultations with MNRE, this IEE will be reformatted (and updated as required) as a comprehensive environmental impact assessment and submitted for review and approval by PUMA. The EMP will be updated if necessary at the detailed design stage by EPC. Based on the updated EMP, the PMC and contractor will be tasked with finalizing the detailed design and compilation of a construction EMP (CEMP) and the contractor will be responsible for implementing the approved CEMP as well as complying with the Samoa Codes of Enviornmental Practice.

14. **Implementation Arrangements.** The executing agency for the project is the Ministry of Finance and the implementing agency is Electricity Power Company (EPC). The project Management Unit (PMU) established under the Power Sector Expansion Sector project will be retained and strengthened to lead design and implementation of the project. The PMU will be supported by a project management consultant (PMC) to assist with design and supervision.

15. Implementation of international good environmental practice forms the basis of the EMP which covers issues such as erosion and sedimentation control, materials sourcing and spoil management, waste management, minimization of habitat disturbance, and worker and community health and safety. The updated EMP will form part of the construction contract documents and the contractor will be required to prepare a site-specific CEMP. The contractor will submit the CEMP to EPC and PUMA for approval prior to commencement of works.

16. **Information Disclosure, Consultation and Participation.** The stakeholder consultation process disseminated information to the general public, affected communities and key environmental stakeholders. Information was provided on the scale and scope of the project, the expected benefits and the potential environmental impacts and proposed mitigation measures through consultation and meetings with government departments, local authorities and the general public. The process also gathered information on relevant concerns of the local community for the project so as to address these in the project design and implementation stages. This IEE is submitted to ADB by the borrower and the final IEE report will be disclosed to the public by EPC and uploaded to the ADB website.

17. **Grievance Redress Mechanism.** A grievance redress mechanism (GRM) will be established to receive, evaluate and facilitate the resolution of affected people's concerns, complaints and grievances about the environmental and social performance of the project. The GRM is based on accepted practices in Samoa including previous experience on similar ADB projects and provides an accessible, time-bound and transparent mechanism for the affected persons to voice and resolve social and environmental concerns linked to the project.

18. **Conclusions.** The proposed Fuluasou SHP is a highly modified environment. No significant adverse environmental impacts that are irreversible, diverse, or unprecedented have been identified. The IEE concludes that the potential negative impacts arising from the construction of the Fuluasou SHP on the site of an existing (damaged) SHP will be relatively minor, site specific and localized and acceptable, providing that the set of mitigation measures described in the IEE and tabulated in the EMP are incorporated in the design and implemented properly.

1. INTRODUCTION

1.1. Background

1. The Asian Development Bank (ADB) is supporting the efforts of the Government of Samoa (GOS) to reduce the country's reliance on fossil fuels for power generation by providing a secure, sustainable and environmentally sound source of electricity. The ADB Renewable Energy Development and Power Sector Rehabilitation Project (the project), is financing the repair and construction of several small hydropower plants (SHPs) in Samoa.[1]

2. The project will have four outputs as follows:

   (i) *Rehabilitation of damaged hydropower plants in Upolu*. The project will rehabilitate and reconnect to the grid three SHPs damaged by Cyclone Evan with a total installed capacity of 4.69 MW;

   (ii) *Construct new hydropower plants in Upolu and Savai'i*. The project will build and connect to the existing grid three new SHPs with a total preliminary capacity of 0.81 MW;

   (iii) *Operation and Maintenance (O&M) Knowledge Transfer Program*. The project will provide capacity development to EPC through an O&M knowledge transfer programme; and

   (iv) *Efficient project Implementation*. EPC will be assisted by the project Owner's Engineers (POE).

3. In August 2014, additional cofinancing for the project was sourced from the European Union (EU) and the New Zealand Ministry of Foreign Affairs and Trade (MFAT). The proposed co-financing will allow the additional grid-connected SHPs to be built with a total additional capacity of 1.16 MW, and the 0.68 MW Fuluasou SHP (located on the island of Upolu).

4. The Fuluasou SHP has been identified as a priority site for development based on having (i) the largest capacity addition to the Samoa Electric Power Corporation (EPC), (ii) the best match with the available co-financing amount, (iii) technical and financial feasibility, (iv) simplicity of land and environment issues, and (v) the readiness for ADB project processing (ADB, 2014).

1.2. Report Purpose and Scope

5. In accordance with ADB safeguard policies, when additional financing is required to fund an expansion in scale or changes in scope for a project, due diligence will involve technical, economic, financial, safeguard, capacity, social and poverty aspects for the added and/or changed components.

6. Environmental and social safeguards due diligence was undertaken by MWH during September 2014. The purpose was to review and update the work completed under the existing loans, and to undertake new assessments required to identify actual or potential adverse effects of the sub-project in order to comply with ADB Safeguard Policy Statement 2009 (SPS). This information has contributed to the preparation of the initial environmental examination (IEE) as reported in this document.

[1] ADB, 2013. Renewable Energy Development and Power Sector Rehabilitation Project (approved by the ADB Board on 15 November 2013 as Grants 0370/0371/0373-SAM).

7. The purpose of this IEE report is to present the environmental impacts and risks associated with the sub-project. Specifically, the objectives of the IEE are to:

(i) Characterise the baseline environmental and socio-economic characteristics of the area surrounding the Fuluasou SHP.

(ii) Assess the potential environmental and social impacts of the construction and operation of the SHP;

(iii) Identify the presence of any critical habitat[2] within the project area;

(iv) Determine requirements for environmental flows commensurate with impacts;

(v) Provide avoidance, mitigation and management measures for the identified impacts; and

(vi) Document public and other stakeholder consultation regarding proposed works.

8. This IEE adheres to the requirements of the ADB SPS and GOS country safeguard systems (described further in section 3), and generally follows the form and content of the IEEs approved for new SHPs on Upolu and Savai'I that were prepared for the original project (ADB, 2013).

1.3. Methodology

9. The IEE involved a combination of literature reviews, meetings and informal interviews with key staff and stakeholders, as well as site visits and ecological investigations of the Fuluasou SHP site, as described below. Refer to Chapter 2 for a description of the project including the location and site plans for the SHP.

10. **Literature review.** A review was completed of existing reports and information for the two sites. This included reports and documents covering engineering design, stakeholder consultation, land ownership, ecology, threatened species, protected areas, and other relevant information. Documents were sourced from the Government of Samoa, ADB and MWH, as well as online sources.

11. **Consultation.** Meetings and interviews were held with key staff within the EPC, Ministry of Natural Resources and Environment (MNRE), ADB, MWH, Secretariat of the Pacific Regional Environment Programme (SPREP), Samoa Conservation Society, and Atherton & Associates. The purpose of these meetings was to assist with the information gathering in preparation of the IEE, specifically to determine the existing environment, biodiversity values, and the likely effects of the construction and operation of the SHP. A list of participants and meetings held in August and September 2014 is provided in Table 1.1.

12. Based on available information, it is understood that the components of the SHP predominantly fall within government land. The exception is a short section of the penstock that is protected by an easement. A total of four households will be affected by the SHP reinstatement at Fuluasou. Three houses are located on government land and one is on private land owned by Mr Craig (the Riverside Complex). The latter property has an easement for the Fuluasou penstock over the property.

13. Stakeholders have been consulted. Meetings were held with the stakeholders in July 2013, with follow-up meetings undertaken during September and October 2014.

14. EPC will be conducting follow-up consultation when further details on the design are available.

[2] As per the definition in the ADB Safeguard Policy Statement 2009 (Appendix 1 para. 28-30).

15. **Ecological surveys.** Site visits to the Fuluasou SHP site were undertaken by the project team between 11 and 18 September 2014 which included members from MWH, ADB, EPC and MNRE (Table 1.2). The team was led by ecologist and Senior Environmental Consultant, Kristy Hall of MWH, and included Fialelei Enoka and Rebecca Stirnemann, who have extensive experience surveying for avifauna in Samoa.

16. During the site visits a qualitative assessment of vegetation and habitat was undertaken, with an emphasis on the quality of habitat for threatened avifauna, specifically mao (*Gymnomyza samoensis*) and manumea (*Didunculus strigirostris*). Surveys for avifauna were conducted by way of five minute point counts (Dawson & Bull, 1975; FAO, 2007), in addition to roving surveys which recorded additional species that were not detected during point counts. A total of three fixed point counts were undertaken within the project footprint s; at Fuluasou.

17. Aquatic ecology surveys of fish and macroinvertebrate communities were undertaken previously in 2013 (Atherton et al., 2013a; Atherton et al., 2013b).

18. **Analysis and reporting.** The IEE report was prepared by assessing baseline conditions, identifying risks during site visit and desktop evaluation, evaluating potential project impacts and benefits, and assessing mitigation and management mechanisms relative to ADB safeguards, and national and international statutory requirements.

Table 1.1: Participants at Meetings and Informal Interviews August-September 2014

Date	Name	Organisation	Position
22/08/14	Robin Spittle	MWH	Principal Consultant Asia-Pacific Hydropower
25/08/14	Caroline van Halderen	MWH	Senior Planner
15/09/14	Woo Yul Lee	ADB	Energy Specialist
	Taniela Faletau	ADB	Environment / Social Safeguards
09/09/14	Fonoti Perelini	Electric Power Corporation	Manager, EPC Project Management Unit
	Iosefa Aiolupotea	Electric Power Corporation	Environmentalist
	Niuluga Evaimalo	MNRE Division of Environment and Conservation (DEC)	Principal Biodiversity Officer
	Joe Teo	MNRE - DEC	Terrestrial Biodiversity Officer
	Faafou Wynette Leaupepe	MNRE - DEC	Terrestrial Biodiversity Officer
	Yvette Kerslake	MNRE - Forestry Division	Project Coordinator / Manager
	Malaki Iakopo	MNRE - Water Resources Division (WRD)	Assistant Chief Executive Officer
	Emelyn Maiava-Papalii	MNRE – WRD	Senior Policy & Regulatory Officer
10/09/14	James Atherton	Atherton & Associates	Environmental Consultant
	Asi Tuuau	Electric Power Corporation	Social Resettlement Officer
16/09/14	Malaki Iakopo	MNRE – WRD	Assistant Chief Executive Officer
	Rebecca Stirnemann	Self Employed	Ecologist
	Paul Anderson	Secretariat of the Pacific Regional Environment Programme (SPREP)	Environmental Monitoring & Reporting Officer
	Vainuupo Jungblut	SPREP	RAMSAR Officer Oceania

Source: Project AF studies (MWH 2014)

Table 1.2: Details of Site Visits September 2014

Date	Name	Position	Location
11/09/14	Kristy Hall	Senior Environmental Consultant, MWH	Fuluasou powerhouse, penstock route, dam, reservoir. Vegetation description and avifauna point counts.
	Iosefa Aiolupotea	Environmentalist, EPC	
	Fialelei Enoka	MNRE - DEC	
	Joe Te'o	Terrestrial Biodiversity Officer, MNRE	
	Fini Male	MNRE - DEC	
13/09/14	Kristy Hall	Senior Environmental Consultant, MWH	Half day overview site visit to Fuluasou powerhouse, penstock, dam, reservoir
	Caroline van Halderen	Senior Planner, MWH	

Source: Project AF studies (MWH 2014)

2. PROJECT DESCRIPTION

2.1. Location of the Project

19. The Fuluasou SHP is located on the island of Upolu, Tuamasaga District, Samoa (Figure 2-1). The proposed Fuluasou SHP is five kilometres south-west of the capital city, Apia, close to the outskirts of the town and in the vicinity of Tuaefu and Ululoloa villages (Figure 2-2). The SHP will rehabilitate an existing derilect facility located on the Fuluasou River. The existing dam and reservoir is located in the lower foothills of Fuluasou catchment at the confluence of the eastern and western branches. The existing damaged penstock is located on public and private land, and runs through the Faleata Golf Course. The existing derelict powerhouse is located on the main stem of the Fuluasou River on Talimatau Road.

20. The proposed Fuluasou SHP will rehabilitate an existing, derelict SHP facility located on the Fuluasou River (Figure 2-3). The output of the scheme following rehabilitation is a nominal 0.68 MW (MWH, 2014).

21. The original Fuluasou plant was commissioned in 1951 and upgraded in 1985. The plant has been out of service since May 1988 when the penstock was damaged in a cyclone. Further damage was caused in 1990 when part of the penstock was washed away during another cyclone. The plant currently comprises of an existing dam and reservoir, damaged penstock and derelict powerhouse. Parts of the remaining penstock have been crushed by trees.

22. The engineering site inspection found that the Fuluasou reservoir has silted up and requires dredging to reactivate available storage. The intake structure and scour gates require rehabilitation, and the penstock and powerhouse needs to be rebuilt.

23. The proposed Fuluasou SHP development will involve the following components:

(i) Rehabilitation of the existing dam to abstract 1.8 m^3/sec. This will involve dredging of material from the dam and physical strengthening.

(ii) Installation of a new underground 2.5 km penstock along the existing alignment, subject to deviations around two private dwellings.

(iii) Construction of a new powerhouse with a single Turgo turbine at the site of the existing powerhouse next to the Fuluasou River.

(iv) Connection to an existing substation located approximately 200 m from the powerhouse site, using a transmission cable.

24. Water for the Fuluasou SHP will be abstracted from the Fuluasou River at the site of the existing dam and be returned to the river at the powerhouse, located approximately 2.5 km downstream.

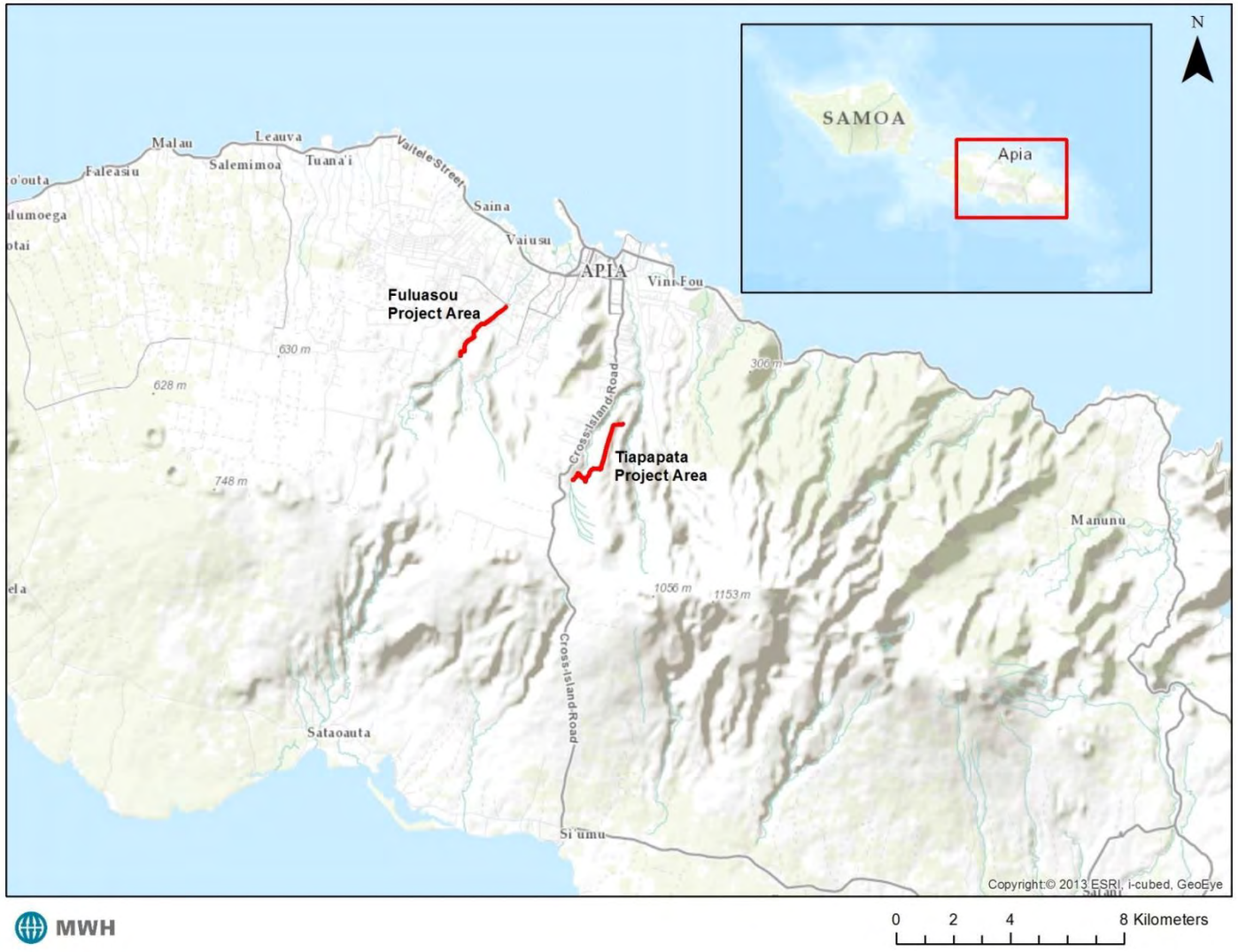


Figure 2-1: Location of the proposed Fuluasou SHP, Upolu, Samoa

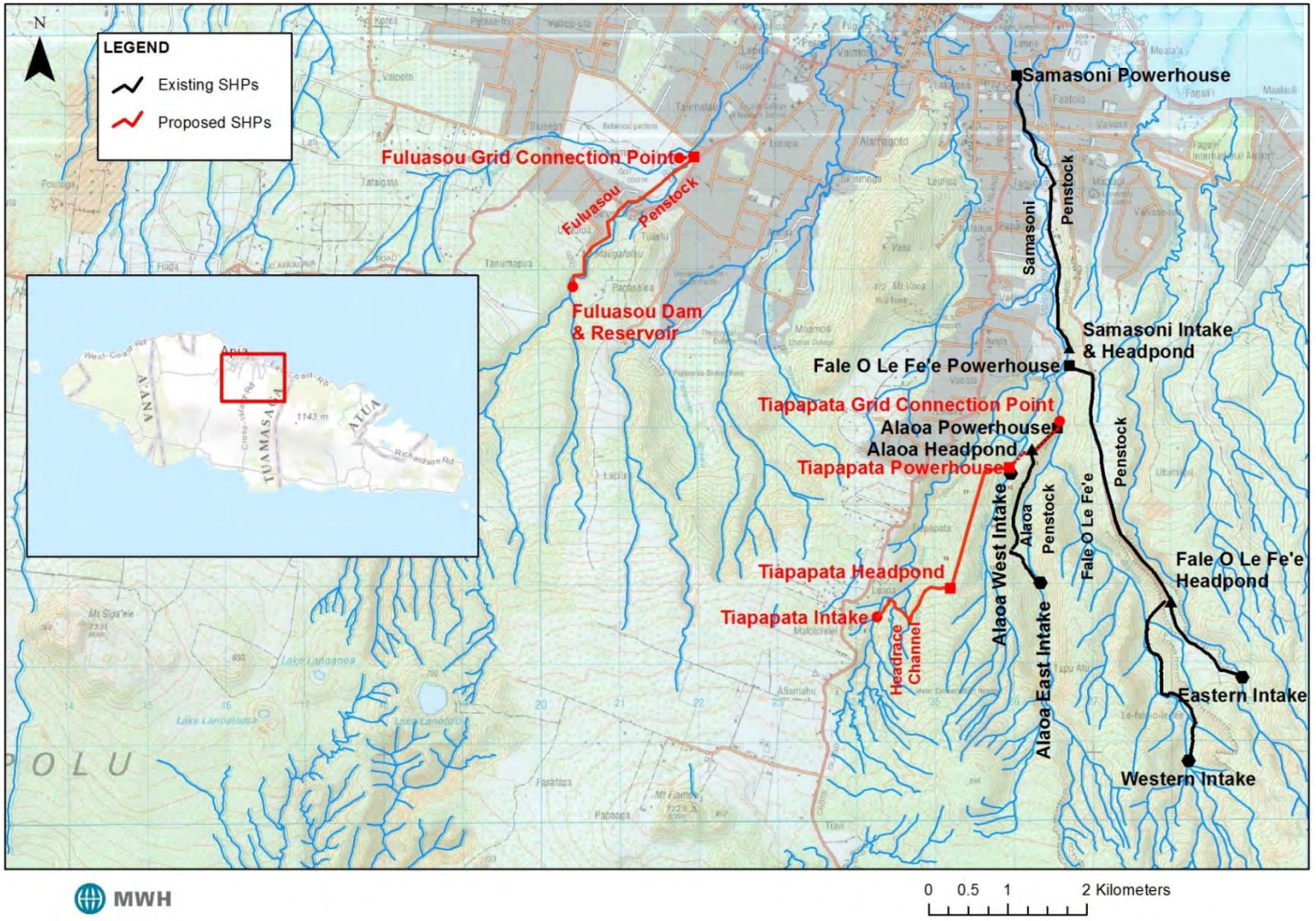


Figure 2-2: Location of the proposed Fuluasou in relation to existing SHPs near Apia

Figure 2-3: The proposed Fuluasou SHP (replacing a derelict facility)

3. INSTITUTIONAL, POLICY AND LEGAL FRAMEWORK

3.1. Institutional Framework

25. **Executing and implementing agency**. The project will be executed by the Ministry of Finance (MOF) and the implementing agency is the EPC. As the sole provider of electricity in Samoa, the EPC's mandate includes generation, transmission, distribution and sale of electricity.

26. **Environmental agency**. The MNRE is the environmental agency in Samoa. MNRE is comprised of a number of divisions including: Disaster Management; Environment and Conservation; Forestry; Land Management; Meteorology; Planning and Urban Management Agency (PUMA); Renewable Energy; and Water Resources Division (WRD).

27. **Division of Environment and Conservation.** The MNRE Division of Environment and Conservation (DEC) is responsible for national parks, conservation and waste management. The Terrestrial Conservation Section within DEC is responsible for implementing the Protection of Wildlife Regulation 2004.

28. **Planning and Urban Management Agency.** Its stated mission is to plan and manage developments that provide better development outcomes for green growth**.** The main roles and responsibilities of PUMA include: preparing strategic urban planning tools such as planning provisions, plans, and development standards; development consent and compliance of development activity; environmental impact control and compliance; establishing the Planning Tribunal; and enforcement of provisions. PUMA is the lead agency for implementation of the Planning and Urban Management Act 2004 and issuance of consent for project development.

29. **Water Resources Division**. The objective of the WRD is to ensure community access to water of suitable quality and appropriate quantities to meet all reasonable health, environmental and economic development needs. The WRD manages, protects and controls the allocation and use of water resources under the Water Resources Management Act 2008. The WRD comprises three sections: Policy; Watershed; and Hydrology. The Policy Section is responsible for the development, implementation and monitoring of national water resources legislation and policies that address water issues and sets out a framework of implementation, ensuring an integrated and coordinated approach between all the agencies. The Watershed Section is responsible for developing and implementing watershed management plans, thus ensuring the protection and conservation of watershed areas, nationwide. The Section also assists in reviewing and providing recommendations on EIAs and environmental monitoring, for all developments which may be detrimental to water resources.

30. **Forestry Division**. The Forestry Division is dedicated to ensure sustainable development and management of forest resources across related sectors in Samoa. In addition to research and monitoring the Division is currently working towards the implementation and monitoring of the following main activities; effective development (including management plans), management and ecological restoration of four National Parks; programs for the establishment of community conservation areas (CCAs); development of the National Forest Plan of Samoa; development of regulations under the Forestry Management Act 2011.

31. **Other agencies**. The Ministry of Works, Transport and Infrastructure (MWTI) is responsible for drainage and storm water management, especially in relation to the development of road infrastructure and power lines. The MWTI also regulates the construction of buildings and issue building permits, to construct, maintain and manage the public assets, which in the case of the project, includes the construction of access roads.

32. Any land acquisition needed under this project will have social implications and transformations and each case will have to refer to the MWTI.

33. The Ministry of Women, Culture and Social Development through its Internal Affairs Division, is facilitating the provision and improvement of water supply and sanitation services in Village Managed Schemes, and assisting MNRE in water resources management at community level.

34. The Samoa Water Authority (SWA) is the national service provider of water supply and more recently for sanitation, sewerage and wastewater treatment. The SWA also monitors their own water supplies and has a water quality laboratory to support these activities. Because drinking water is collected from both the Fuluasou River, near where the SHP will be installed, this requires coordination between EPC and SWA.

35. The Ministry of Agriculture and Fisheries (MAF) is responsible for the promotion, sustainable development and management of irrigation services, and assists MNRE in the prevention and monitoring of uncontrolled clearance of forests for agriculture in watershed areas. The relevance to the project is in conservation of the watershed through the control of cropping development.

3.2. Legal and Policy Framework

36. The implementation of the project will be governed by the environmental laws and regulations of Samoa and the safeguard policies of the ADB, and be in compliance with national policy documents as described below.

3.2.1. Environment Law and Regulations

37. **Lands, Surveys and Environment Act 1989.** This Act establishes the principal functions of the MNRE which include advising the Minister on all aspects of environmental management and conservation including: (i) the potential environmental impact of a public or private development proposal; and (ii) to act as the advocate of environmental conservation for Government, its agencies, and other public authorities with advice on procedures for the assessment and monitoring of environmental impacts.

38. **Planning and Urban Management Act 2004**. This Act sets out the framework for the planning, use, development, management and protection of land in Samoa. Under Section 34, all development needs consent, unless a sustainable management plan or regulations provide otherwise.

39. Development consent must be applied for prior to undertaking certain activities. Section 42 describes the triggers and process to be followed when an environmental assessment will be required. Under Section 42 of the Act, PUMA may require an applicant under Section 37 to provide an environmental impact assessment (EIA) in relation to the proposed development to which the development application relates; and (ii) where PUMA decides that an environmental impact assessment shall be prepared, the format, structure, subject matter of any such assessment and any other related matters shall be specified in writing by PUMA to the applicant and the applicant shall comply with the Agency's requirements under this section. The Act also outlines the process of notification of applications and also the submissions and hearings on development applications.

40. **Environmental Impact Assessment Regulations 2007.** The Regulations made under the Act are also administered by PUMA. The Regulations establish what level of EIA is required, the aspects that need to be included and the process for review and approval. Section 4 of the regulations prescribes two forms of EIA: (i) preliminary environmental assessment report (PEAR); and (ii) comprehensive environmental impact assessment (CEIA).

41. A PEAR is required when PUMA considers an activity requiring consent is not likely to have a significant adverse impact on the environment. A CEIA is required when a development is likely to have a significant adverse impact on the environment.

42. The Regulations also outline: (i) baseline and compliance monitoring (Section 8); (ii) reviews of the EIA (Section 9 and 10); and (iii) public consultation (Section 11). Schedules attached to the Regulations detail the content of the PEAR and CEIR.

43. **Forestry Management Act 2011.** This Act provides for the effective and sustainable management of Samoa's forestry resources, and for related purposes and gives MNRE, through the Forestry Division, principal responsibility for the management of the forestry resources in Samoa, and sole power to issue rights to exploit the forestry resources, formulate policies and implement programs and activities to support the development of forest plantations and farm agro-forestry in Samoa. This Act also provides for National Forestry Planning and Sustainable Development by establishing that the Ministry shall prepare a National Forest Plan to provide for the sustainable management of forestry resources in Samoa. The National Forest Plan shall: be consistent with the national forest policy and other relevant government policies; be based on a certified National Forest Inventory which shall include particulars of: (i) remaining native forestry resources; (ii) areas and species of planted trees on plantations and farm forests; (iii) areas determined to be protected forests and production forests; (iv) areas of national parks and reserves; (v) forestry resources in water catchment areas; (vi) other particulars required by the Minister or prescribed by regulations made under this Act.

44. **Water Resources Management Act 2008**. This Act makes provision for the management, conservation and use of water resources in Samoa including coastal waters where freshwater accumulates or discharges and is mixed with seawater. The Act sets out the principles of sustainable management of water resources, defines rights to control and manage water resources, regulates the taking and use of water, establishes the Samoa Water Resources Board, provides for the protection of watersheds, provides for community involvement in water resources management, provides for enforcement and defines offences.

45. In water resources management, the Act requires the precautionary principle to be observed. Control of water resources is vested in the GOS. The granting of rights to take or use water may only be done in accordance with the provisions of this Act. In exercising its powers, the GOS shall take into account rights of use of the water resource recognized in the Samoa Water Resource Management Plan and the local management of water sources in accordance with By-laws made under this Act. Moreover, nothing in this Act shall affect existing rights to land and resources held in accordance with the customs and traditions of Samoa. The MNRE implements the Act and is required to manage the water resource in accordance with principles set out in this Act. The Act sets out rules relative to the application for and granting of licenses and permits to drill for water or to otherwise take or abstract water. The Samoa Water Resources Board shall have various advisory, coordinating and monitoring functions, shall take over the functions of the Watershed Management Committee and have other powers in relation to watershed management.

3.2.2. Permits Required

46. The project will need a number of environmental permits:

(i) An application for a water permit under the Water Resources Management Act should be lodged with the WRD of MNRE;

(ii) An application for development consent (with the environmental assessment report) is required to be submitted to PUMA;

(iii) If required, an application is to be made to Forest Division of MNRE for a tree-harvesting permit.

47. When a project belongs to the competency of several agencies and could have potentially significant environmental effects, Section 44 of the Act requires that PUMA will consult the appropriate agencies by sending a referral to them requesting comments. The responses should be received by PUMA within 10 days, unless more information is requested. The timeframe to obtain a permit for a project depends on its complexity and the number of agencies involved.

3.2.3. Samoa Codes of Environmental Practice

48. The Codes of Environmental Practice (COEP) (Beca, 2006) were prepared to define methods and/or procedures to be applied in order to avoid or mitigate adverse environmental effects that may arise out of infrastructure development or maintenance work. The COEPs are to be implemented by all development works where development consent is required under the Planning and Urban Management Act (2004).

49. There are a total of 14 COEP which have been prepared covering public consultation, land acquisition, slope and soil protection, campsites, archaeological discovery, drainage, earthworks, erosion and sedimentation measures, and other activities applicable to development works.

50. There are three implementation mechanisms for the COEPs (Beca, 2006):

(i) use of the COEP is specified in the Terms of Reference (TOR) for the design of works. The relevant design directives stated in the COEP should also be incorporated in the Terms of Reference;

(ii) use of the COEP is required in the specifications for the construction of physical works. The relevant suggested specifications within the COEP should be incorporated in the proposed works specifications; and

(iii) environmental approvals are granted with the condition that works proceed under the provisions of the COEP.

51. Monitoring the implementation of the COEPs is the responsibility of PUMA, through granting of development consents, as well as MWTI through contract administration for routine maintenance and minor works.

3.2.4. Policy Framework

52. **Strategy for the Development of Samoa.** The environment component of the Strategy for the Development of Samoa 2012-16 (SDS) comes under Priority Area 4: Environment Sector which comprises the two key outcome areas of environment sustainability and climate and disaster resilience, supported with a range of strategic areas. The SDS for the environment sector is further consolidated and refined in the National Environment and Development Sector Plan 2013 – 2016 (NESP).

53. **State of the Environment Report.** The State of the Environment Report 2013 (SOE) is the result of a comprehensive review and assessment of the changes and trends occurring in Samoa's natural and human environments in response to the impacts of the economic, social and environmental forces.

54. The SOE notes in respect of Planning and Urban Management Act 2004 and EIA Regulations provide an environmental planning framework that in theory safeguards against poorly designed and environmentally unfriendly development initiatives. Effectively implemented and enforced, it serves an important function of ensuring the built environment's sustainability. There is increasing compliance and public acceptance of PUMA's development consent process with the number of development consent applications received steadily increasing since 2007.

55. Available information is limited but shows that 99% of development proposals screened between 2007 and 2011 were approved and issued with development consent. The majority not approved (1%) is due to the lack of information. The SOE concludes that the PUMA planning framework demonstrates that development is regulated and screened with an environmental filter. Major development proposals that previously would have received the green light based on technical and economic feasibility criteria are now required to satisfy the environmental sustainability criterion. Monitoring and enforcement and monitoring are areas for improvement.

56. **National Environment and Development Sector Plan.** The NESP articulates the overall vision and goal for the environment sector—improved environmental sustainability and disaster resilience through green growth--and the higher level outcomes that it seeks to achieve. It reflects the overall vision and goal of the SDS and in doing so, clarifies how the national goal and vision will be achieved in the qualities of the natural environment that the NESP represents and is responsible for. Of the NESP's ten high level development outcomes—identified to provide broad strategic directions to improve environmental conditions and to achieve more sustainable environments in the future—five are relevant to the mitigation and management measures being proposed as part of the project:

2. Restoration of degraded habitats and threatened species of economic and conservation importance to healthy states and viable populations;
3. Environmental resources such as forests land, water and fisheries are managed sustainably to protect them from natural threats and contamination;
5. Knowledge of Samoa's biodiversity and natural resource is enhanced and kept up to date through science based assessments and ongoing monitoring;
9. Strengthened institutional framework with improved governance and capacity at all levels to promote integrated decision making, improve monitoring and enforcement, and strategic environmental assessment; and
10. Promote and mainstream an integrated habitat-based approach towards environmental assessments to support climate change adaptation and mitigation.

57. The NESP sets out strategies and measures for addressing the key environmental issues facing Samoa, and based on the analysis provided in the SOE, establishes 11 key environmental sector objectives. The mitigation and management measures being proposed for the project are underpinned by a number of these. A summary is provided below and the full list is provided in Appendix A. The logframe included in the NESP ties each of these strategies to specific actions and performance targets to be met annually over the period to 2016.

3.3. ADB Safeguard Policy Statement

58. The ADB SPS promotes the sustainability of project outcomes by protecting the environment and people from potential adverse impacts.

59. The SPS has the following objectives: (i) avoid adverse impacts of projects on the environment and affected people; (ii) where possible; minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and (iii) help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

60. The environmental safeguards requirements of the SPS set out eleven principles to ensure that the environmental soundness and sustainability of projects are achieved and to support the integration of environmental considerations into the project decision-making process.

61. The SPS categorizes potential projects or activities into categories of impact (A, B or C) to determine the level of environmental assessment required to address the potential impacts.

62. The project is categorized as environment Category B because potential adverse environmental impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed readily (refer section 5). Accordingly this IEE has been prepared as the requisite level of assessment to address the potential impacts in line with the SPS.

63. The SPS states that no project activity will be implemented in areas of critical habitat unless three specific requirements are met. The IEE has confirmed there is no critical habitat within the Fuluasou SHP site.

4. DESCRIPTION OF THE ENVIRONMENT

64. This section provides the baseline conditions of the physical, biological and socio-economic environment for the project as they relate to the proposed Fuluasou SHP. The general description of Samoa-wide characteristics is sourced from the IEEs prepared for the original project (ADB, 2013). The descriptions of the SHP site are based on site visits and surveys in September 2014, and compilation of existing data.

4.1. Overview of Physical Environment

65. **Climate**. Samoa has a wet tropical climate with temperatures ranging between 17°C and 34°C and an average temperature of 26.5°C. Average humidity for the capital Apia is 83%. The average annual rainfall is about 2,000 mm with about three-quarters of the precipitation occurring during November- March.

66. Due to the predominance of moisture-bearing southeasterly trade winds, the northwest parts of the main islands, as well as the southeast side of Savai'i, are rain shadow areas, receiving about half the rainfall of the highland areas.

67. Samoa is affected by tropical cyclones which occur seasonally between November to March. Cyclone Evan struck Upolu in December 2012. A weather monitoring mast at Mt. Fiamoe measured wind at a peak speed of 46m/s at 28m above ground, in a ten-minute average, with a maximum three-second gust of 59m/s being recorded in the same 10-minute interval. Cyclone Evan was thought to be the worst to hit Samoa in over two decades.

68. **Geography**. The topography of Samoa is rugged and mountainous. About 40% of Upolu and half of Savai'i is characterized by steep slopes descending from volcanic ridges. The interior of both main islands is still covered with mountain forests and, in the case of the highest peaks on Savai'i, covered in cloud forest.

69. The interior areas also contain volcanic peaks with the Upolu crestal ridge rising to 1,100m. Savai'i has more and younger volcanic cones with the highest peak reaching 1,848m at Mt. Silisili. Western Savaii and northwest Upolu are almost devoid of surface streams, corresponding to the rain shadow and sub-surface drainage.

70. **Geology**. The Samoan islands are composed almost wholly of basic volcanic rocks such as olivine basalt, picrite basalt and olivine dolerite. Most of the soils are formed from weathered basaltic volcanic flows, including lava, scoria and volcanic ash. Soils are generally free draining, porous and relatively shallow.

71. A coral reef surrounds the islands for nearly half of the coastline, except where there are steep cliffs and where young lava flows have filled the lagoon. Coral sand is found along most of the coastline, up to 5m above sea level. Alluvium is not common, but forms the parent material for the most versatile soils.

72. Earth tremors continue on a frequent basis in Samoa (as measured by the MNRE Meteorology Division at Mulinuu, Apia) and Samoa remains vulnerable to future volcanic activity. The last recorded eruptions were on Savai'i in 1902 and 1905-1911. The Samoa islands are subject to violent earthquakes with the last one occurring in 2009. While the epicentre was located far offshore, the tsunami resulting from this earthquake affected the south-western part of Upolu, destroying land along the coast and killing 115 people.

4.2. Overview of Biological Environment

73. **Biodiversity**. Samoa's unique biodiversity is a result of its geographic isolation, which has led to the evolution of unique species and communities of plants and animals, many of which are indigenous to only one island or island group within the Pacific region. These species usually have small population sizes, making them particularly vulnerable to loss from over-exploitation and habitat degradation.

74. Some 11 terrestrial and 65 marine species found in Samoa are listed as globally threatened on the 2009 IUCN Red List of Threatened Species (Conservation International et al., 2010). It is thought that the true number of threatened species in Samoa is significantly higher than this, perhaps in the hundreds (Conservation International et al., 2010).

75. **Flora.** It is estimated that Samoa supports 775 native vascular plant species of which approximately 30% of the angiosperms are endemic. There are about 280 genera of native angiosperms. In addition, there are about 250 introduced plant species and 47 threatened plants. A 1992 survey classified Samoa's vegetation into 19 plant communities within five broad categories, as follows:

(i) Littoral vegetation: Four communities of vegetation situated on the seashore were recognised: herbaceous strand or beach; littoral shrub-land; Pandanus scrub; and littoral forest. Much of these vegetation types has been lost or degraded. The best remaining examples are at Aleipata Islands, O Le Pupu-Pue National Park and sites on the South (central) coast of Savai'i.

(ii) Wetland vegetation: Four communities are recognised: coastal marsh; montane marsh; mangrove scrub/forest; and swamp forest. There has been a very serious loss of wetlands, particularly in the lowlands, and only a few intact areas of each type remain.

(iii) Rainforest: Four communities are recognised on an altitudinal gradient: coastal; lowland; montane; and cloud forest. Cloud forests are restricted to Savai'i with the summit reaching over 1800 m. The few remaining significant areas of coastal forest are at the Aleipata Islands, Apolima and possibly Tafua Crater. The montane habitat is considered to have the richest flora of any forest community in the country. On Upolu, no montane sites were found that had good forest or were recovering (from cyclone damage) and there was substantial impact from several weeds. On Savai'i, the forests are recovering faster at higher elevations where there is little human activity, whereas the process is much slower at lower areas where forest cutting has added to the problem.

(iv) Volcanic vegetation: Two communities, lowland volcanic scrub and upland volcanic scrub, are recognized and these occur only on recent lava flows on Savai'i.

(v) Disturbed vegetation: Four communities, derived from a combination of human activities and weather, are recognized: managed land; secondary scrub; secondary forest; and fernlands.

76. About 25% of the plants found in Samoa are endemic and 32% are endemic to the Samoan archipelago. A further 500 or so plant species have been introduced to the islands since the first Samoans brought the coconut, taro and other species for cultivation about 3,000 years ago. Currently about half the plants in Samoa are exotic. While some of these plants are beneficial for agriculture, others are considered to be weeds.

77. **Terrestrial fauna.** Samoa's fauna consists of 21 butterfly species, 11 species of reptiles, 43 resident bird species (eight of which are endemic), and three flying fox species.

78. **Avifauna**. Bird Life International records 81 bird species in Samoa. This includes 31 breeding native land birds, one possibly extinct native land bird (the Samoan Moorhen), four breeding introduced birds, approximately 10 breeding seabirds and 35 migrants or vagrants. Nine of the land birds are endemic to Samoa and another seven are regional endemics or near endemics.

79. Twelve species are globally considered to be Restricted Range species, but not classed as of immediate conservation risk. Six species are considered to be of national conservation concern as determined through the National Biodiversity Strategy and Action Plan.

80. **Sea and Shore Birds**. Based on the available literature, approximately 13 seabird and shorebird species that are of global or national conservation concern have been recorded in Samoa. Other species of global concern are either migrants, visitors or status unknown in Samoa. These include the Phoenix Petrel (*Pterodroma alba*); Tahiti Petrel (*Pseudobulweria rostrata*) and Collared Petrel (*Pterodroma brevipes*). The globally threatened Bristle-thighed Curlew (*Numenius tahitiensis*) is a regular northern winter migrant in small numbers.

81. **Land Mammals**. There are four species of native mammal present in Samoa, in addition to introduced pests. The Tongan or white-necked flying-fox (*P. tonganus*) is the most widespread. The Samoan flying fox (*Pteropus samoensis*) is relatively common but is thought to be in slow decline. A small insectivorous bat, the sheath-tailed cave bat (*Emballonura semicaudata*) is now believed to be extinct in Samoa. Another bat species, *Insular myotis* may be present. Flying foxes are important for the long-term survival of the forests as they pollinate the flowers of many species and also disperse the seeds of the fruits that they eat throughout the forest. It has been estimated that almost one in three Samoan forest trees depend on flying foxes in some way.

82. **Reptiles.** There are at least nine species of terrestrial reptiles in Samoa including geckos and skinks.

83. **Protected areas**. Samoa has three National Parks and 22 reserves and conservation areas totalling 10,794 ha or 5% of the total land area (MNRE, 2009). All forest outside protected areas is by definition considered production forest. In the marine environment, Samoa has one marine reserve, two marine protected areas and an estimated 71 village fisheries marine reserves. The entire Samoan exclusive economic zone is a declared sanctuary for whales, dolphins, turtles and sharks (MNRE, 2009).

84. The first National Park established in Samoa was the O Le Pupu-Pue National Park in Togitogiga, in 1978. Two new National Parks were established in 2003; Mauga o Salafai, the first to be located on Savai'i, and Lake Lanoto'o which is the first Ramsar Convention Wetland site in Samoa, and is located at the center of the volcanic ridge on Upolu.

85. Key biodiversity areas (KBA) support the regular occurrence of one or more globally threatened species assessed as critically endangered, endangered, or vulnerable according to the IUCN Red List.

86. The eight terrestrial KBAs identified in Samoa cover a total of 940 km^2 or approximately a third of the total land area of Samoa, including representation of 12 of the 13 native terrestrial vegetation communities in the country. The seven marine KBAs cover approximately 173 km^2 or 23% of the inshore reef area of Samoa. Currently, six of the eight terrestrial KBAs and three of the seven marine KBAs have been completely or partially established as conservation areas by the GOS or by local village communities. Two additional KBAs have small community-based fisheries sites within their boundaries.

4.3. Overview of Socio-Economic Environment

87. **Population**. According to the 2011 Population and Housing Census, the total population of Samoa is 187,820 which comprised of 96,990 males, and 90,830 females. This is an increase of 3.9 percent of the population when compared with the population census in 2006 with 180,741 persons. The population is divided into four major statistical regions namely: Apia Urban Area (AUA), North West Upolu (NWU), rest of the Upolu and Savaii. The 2011 census shows that AUA region constituted 19 percent of the total population and 81 percent of the rural population. The Samoan way of life is based on the traditional villages, managed and operated under the Village Council known as Pulega Mamalu a Aliii ma Faipule. The Village Council plays a significant role in the village such as establishing the village protocols and disciplinary actions to manage and maintain peace and harmony amongst the villagers.

88. The Fuluasou SHP is located within the peri-urban area of Apia. The AUA covers approximately 60 km^2. Apia is characteristically urban with non-agricultural activities and is growing in population. Urbanization of the area is occurring with areas of Vaimauga East (comprising village settlements such as Laulii, Letogo, Vailele, Fagalii) and Faeata West (comprising village settlements such as Vaitele, Saina, Siusega, Ulululoa, Tuanaimato) with mixed land uses. The Fuluasou SHP will provide the urban area of Apia with power.

89. The 2011 census defines Apia as the districts of Vaigauga West and Faleata East with a population of 36,735 or 21% of the country's population. The census statistics show that the migration rate within Samoa to Apia was 17% (and to North West Upolu was 19%) compared with the rest of the country which is experiencing negative migration rates. This illustrates that the population of Samoa is becoming increasingly urban as people choose to move to Apia from other areas of Upolu and Savai'i.

90. Table 4.1 shows growth in the four urban districts in greater urban Apia, where the urban population has increased by more than 21 percent since 1981.

Table 4.1: Urban population change in Samoa from 1981-2011

Population Indicator	1981	1991	2001	2011	Change
Total population	156,349	161,296	176,848	187,820	Growth
Apia Urban Area (two districts)	33,170	35,489	38,836	36,735	Decline
Greater Urban Apia (four districts)	45,881	48,616	60,872	73,470	Growth
% Change (four districts)	NA 1971-1981	5.9% 1981-1991	25.2% 1991-2001	20.7% 2001-2011	Static
% Share of National Population (four districts)	29%	30%	34.4%	30%	Static

Source: GOS – PUMA (2013)

91. Within the villages of Apia, population growth rates vary widely with the most significant growth in the western parts of Apia. This change in the distribution of population towards the west has resulted in greater demand for services including power.

92. **Economy.** Samoa's economy is dominated by subsistence agriculture and related activities, which support around three-quarters of the total population, including almost the entire rural population. The economy is also dominated by external aid and by remittances from Samoans residing and working abroad.

93. Samoa's economy has suffered from tropical cyclones. The destruction of tree crops, forests and infrastructure by cyclones has affected economic performance, especially primary production, and these impacts on the environment and the people could be felt for over three years after each cyclone. More recently, Cyclone Evan struck in December 2012. Its economic impact is still unknown but could be as significant as that which resulted from the 2009 Tsunami.

94. **Transport.** The two main islands of Samoa are well served by coastal ring roads and Upolu has three cross-island roads. The completion of the current road improvement program should see all the main roads upgraded and tar-sealed. The main international port is Apia, with an inter-island ferry service operating between Mulifanua at northwest Upolu and Salelologa at southeast Savai'i. The islands were once linked by air service between Faleolo near Mulifanua on Upolu and Maota near Salelologa on Savai'i, but this air service was discontinued in 2006. Another airport is located in North-West Savai'i at Asau. The main international airport is Faleolo Airport in northwest Upolu.

95. **Water sources and supply.** Historically, community water supplies from groundwater have been derived from coastal springs commonly found around the coastal villages. Groundwater is most readily available from freshwater lenses, but aquifer yields are constrained by the risk of inducing saline intrusion. With the high rainfall and virtually no drought period, the flows of such springs are sustained throughout the year. There are minor perched aquifers, sustained by less permeable strata, which may be of local significance for inland springs.

96. Surface water is abstracted from catchment areas of the central highlands of Upolu and south-east of Savai'i. There are 28 surface water intakes on Upolu producing an average of 42.5 million m^3 of water per year and two on Savai'i (ADB, 2013). The Vaisigano catchment is the most critical catchment for Apia providing much of the water supply for the town. The SWA has a number of water supply intakes in the Vaisigano river and a main treatment works at Alaoa upstream from the damaged Fale o le Fe'e powerhouse.

97. **Energy.** The EPC operates 22kV transmission networks on Upolu and Savai'i and is in the process of completing staged upgrades to transmission and generation infrastructure through the ADB's Power Sector Expansion project. While the bulk of Samoa's existing transmission network is via overhead cable, newer sections of the network include underground cabling.

98. Upolu currently has a combination of hydro-generation and diesel generation as the primary source of electricity. The main Upolu power station, located at Tanugamanono, has been in operation since the mid-1970s. EPC operates four run-of-river and one dam-based hydroelectric power stations with a total capacity of around 12 MW. Hydro generators on Upolu generated a total of 35.248 GWh in 2010/11, representing 36% of Samoa's total electricity. This was slightly less than typical due to the prevailing drought conditions at the time.

99. Under the EPC Expansion Plan, a new diesel power station has been constructed at Fiaga to replace the existing Tanugamanono power station. The Fiaga power station consists of four new diesel engines (5.78MW each) all-generating at 11kV. Also, three existing diesel units will be relocated from Tanugamanono to Fiaga generating at 6.6kV.

100. New transmission lines of 33kV connect Fiaga Power Station to the new Fuluasou Substation, which supplies 22kV feeders. Tanugamanono will continue to operate as a substation serving distribution feeders and terminating transmission line from five existing hydro projects. A new underground transmission cable connects Fuluasou to Tanugamanono. There will be a total of 10 feeders from three major substations supplying electricity on Upolu.

101. The overwhelming majority of Upolu's load is located in the Apia area, with the remainder spread out around the coastal ring and the cross-island road. Some sections of the network experience poor power quality. Upolu had a peak demand of 13.5 MW in 2000.

102. **Land use.** The landscape on Upolu generally consists of a narrow coastal plain, with rocky, rugged, volcanic terrain making up the inner parts of the islands. The vegetation in these areas is primarily composed of lowland and montane rain forests, with small areas of riverine, swamp, mangrove, and beach forest. The islands have undergone extensive deforestation, as a consequence of timber operations and clearance of land for agriculture. A large proportion of the lowland forest on Upolu has been cleared or highly modified, but the montane forests are less disturbed and have a rich variety of endemic flora and fauna.

103. Land use capability assessments in 1990 categorized Samoa's land area into four main classes (ADB, 2013):

(i) Land with few limitations for agricultural use (39,600 ha);

(ii) Land with moderate limitations for agricultural use and few limitations for forestry use (area unknown);

(iii) Land with severe limitations for agricultural use and moderate to severe limitations for forestry use (59,400 ha); and

(iv) Land unsuitable for agricultural or forestry use (69,000 ha).

104. **Land ownership.** There are four types of land ownership in Samoa with over 80% of total land being in customary ownership. The rest is divided between freehold, GOS, and land vested in Samoa Trust Estates Corporation and Samoa Land Corporation. About 15% of land in Samoa is publicly owned and is generally known and recognized as Government land. Under statutory law, access to Government land is through lease or exchange of either freehold land or customary land. Freehold land takes up 4% of the total land area.

105. Customary land vested in accordance with Samoan custom and usage is primarily managed by the matai who is the head of an extended family. As trustee for his/her family, the matai is responsible for the management and allocation of the land for various uses by family members. These lands are protected from alienation by sale by the Constitution of the Independent State of Samoa 1960, except by way of lease or licence in accordance with the Alienation of Customary Land Act 1965.

106. An emerging form of land tenure is leased land, which is land under lease arrangements between the lessor (landowner) and the lessee (applicant). All types of land, whether Government, freehold or customary, can be leased out to individuals, corporations and community or to private investors. In this regard, leasing can provide a viable option to access the land necessary for private sector growth. Ideally, leasing allows the use of land without alienating it from traditional landowners.

107. The Government closely controls the leasing of customary land. The Minister of MNRE, as the trustee of customary lands, is vested with the power to manage and administer lease arrangements between the leasor and the leasee. The Minister's involvement in land leasing is designed to ensure that landowners are protected from entering into inappropriate land deals or making unwise decisions, and to prevent alienation of customary land or ownership from the landowner.

108. **Physical cultural resources**. The Heritage Policy (2002) policy provides a framework for the sustainable management of Samoa's natural and cultural heritage sites (UNESCO, 2007). The MNRE is responsible for the implementation of the Heritage Policy (2002).[3] The objectives of the policy are:

(i) to create public awareness and improve understanding of Samoa's natural and cultural heritage;

(ii) to promote national sites ofsignificant heritage values fur preservation;

(iii) to incorporate heritage preservation into environmental planning and assessment;

(iv) to strengthen stakeholder participation in the planning and implementation of heritage preservation programmes; and

(v) To develop global partnerships to support the preservation of national heritage (including World Heritage Convention).

109. The MNRE has confirmed to EPC that no archaeological sites or sites with cultural significance are contained within the proposed SHP development area at Fuluasou (I. Aiolupotea, EPC, pers. comm. 01/04/15).

110. At the Fuluasou SHP, construction of the existing SHP facility is likely to have modified or destroyed any pre-existing physical cultural resources, if they were ever present. Given that the new facility is to be rebuilt in the same location there is a low risk of encountering any new (unknown) archaeological sites.

111. Procedures for managing the discovery of archaeological sites are covered in COEP 6 – Earthworks. This includes the requirement to identify the presence of cultural resources that may be unearthed or disturbed prior to conducting earthworks. In the event that a cultural resource is discovered, earthworks shall cease and PUMA be notified of the discovery. Work shall cease until authorisation to proceed is received from PUMA.

4.4. Fuluasou SHP Site

112. The Fuluasou SHP is an existing scheme which is to be rebuilt. A description of the proposed redevelopment of this facility is given in section **Error! Reference source not ound.**. A location map is shown in Figure 2-2 and a detailed site plan is given in Figure 2-3. The ecological context of this site, together with the potential presence of critical habitat, is described below.

4.4.1. Protected Areas

113. The Fuluasou SHP is located on land owned by the GOS, excluding one private property that has an easement for the penstock route. The site of the Fuluasou SHP has no legal protection for conservation purposes. The closest legally protected area is the Mount Vaea Scenic Reserve located on the summit of Mount Vaea approximately four kilometres to the east. This area includes the Stevenson Memorial Reserve which is the burial ground of author Robert Louis Stevenson.

114. The Fuluasou dam and reservoir (Plates 4.1 and 4.2) is located on the edge of the Apia Catchments KBA. The dam and start of the penstock route is contained within the KBA, although the now derelict powerhouse (Plate 4.3) and the majority of the penstock route sit outside of the KBA boundary.

[3] This law has not been revised as the Samoan Law Reform proposed to create a separate body, the Samoan Heritage Authority, to administer this statute (ADB, 2013).

115. The Apia KBA totals 8,335 hectares and supports seven globally or nationally threatened species: Samoan bush palm, tooth-billed pigeon, ground dove, mao, Samoan broadbill, Samoan flying fox and the land snail *Thaumatodon hystrucelloides*. The KBA is threatened by invasive species, hunting and development (Conservation International et al., 2010).

Plate 4-1: The spillway at the existing dam

Plate 4-2: Fuluasou dam reservoir

Plate 4-3: Existing derelict powerhouse

Plate 4-4: Dry riverbed near the powerhouse

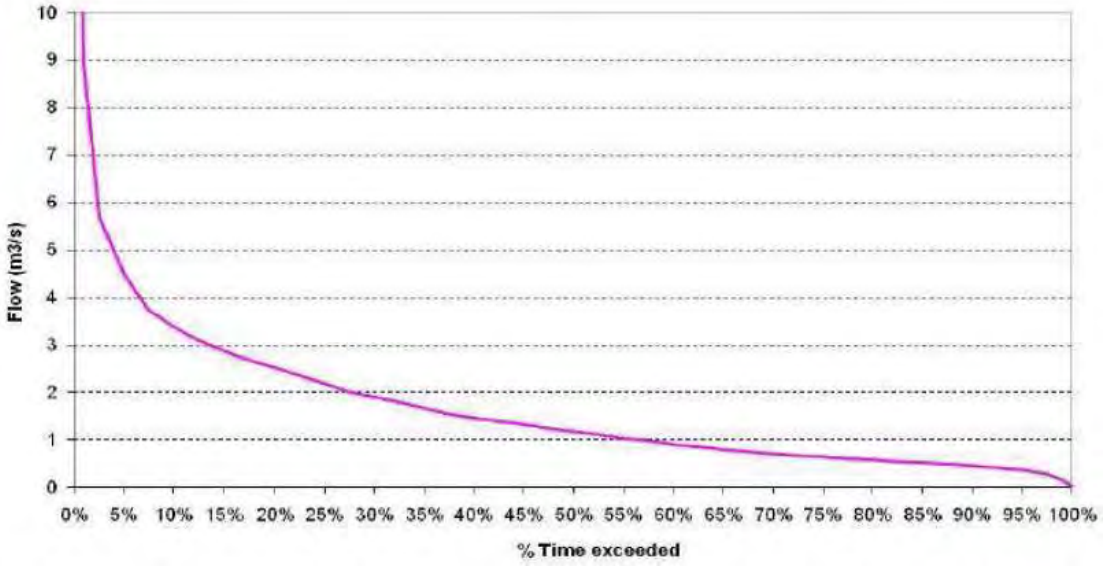
4.4.2. Catchment and Hydrology

116. The Fuluasou SHP is located on the Fuluasou River. The Fuluasou River catchment arises in the forested central mountains of Upolu around Lake Lanoto'o. There are two unnamed branches of the river which converge above the site of the dam. The eastern branch of the river has a water intake for the SWA. A second SWA intake is located at the existing dam.

117. The catchment of the existing Fuluasou dam is 17.2 km^2 (Egis International, 2011). Flows range from 0.04 m^3/s to over 10 m^3/s, with a median discharge rate of 1.18 m^3/s (Figure 4.1).

118. During the site visit in September 2014, the river was flowing at the dam but became dry downstream between Papaseea Road and the coast (Plate 4.4).

Figure 4-1: Fuluasou flow duration curve



Source: Egis International (2011)

4.4.3. Fish and Aquatic Macroinvertebrates

119. A survey of freshwater ecology at the Fuluasou reservoir and powerhouse location was conducted in August 2013 (Atherton, Jenkins, & Stirnemann, 2013).

120. Two introduced pest fish species were found, *Poecilia mexicana* in the reservoir and *Gambusia affinis* at the powerhouse. No native species were found during this survey, although in September 2014 an unidentified native goby (possibly *Sicyopterus sp.*) was observed in the river near Papaseea Road (K. Hall, MWH, pers. obs.). A total of three crustacean species were found, comprising of two species at each of the two monitored sites (Atherton, Jenkins, & Stirnemann, 2013). All crustacea recorded were common indigenous species. No aquatic snails were recorded at the site.

121. During the August 2013 survey the Fuluasou River at the powerhouse was 15 cm deep, contained a lot of rubbish and smelled of faecal contamination (Atherton, Jenkins, & Stirnemann, 2013). During the September 2014 visit, the river at this location was completely dry (Plate 4.4). At the dam site, the river was flowing on both occasions. The Fuluasou dam is a barrier to non-climbing fish species. The dam has silted up over time and was partially dug out by the SWA in 2013, causing significant turbidity downstream (Atherton, Jenkins, & Stirnemann, 2013). More extensive excavation is required to regain storage for the new Fuluasou SHP (MWH, 2014).

4.4.4. Vegetation

122. A map of vegetation types at the Fuluasou SHP is shown in Figure 4-2. This shows that the Fuluasou SHP construction footprint crosses built up areas, the Faleata Golf Course, and secondary forest adjacent to Fuluasou River.

123. The powerhouse and lower portion of the proposed penstock route consist of urban land use. The penstock route crosses the Faleata Golf Course (Plate 4.5), a private estate called the Riverside Complex and a single residential house built on government land. This section of the route consists of open ground, dwellings, roads, mown grass and some mature exotic trees and crops. The small clearing around the derelict powerhouse is comprised of exotic grasses, weed trees (primarily *Castilla elastica*) and climbers, however the MNRE WRD has recently planted some native seedlings (Plate 4.6). These are spaced about two to five metres apart and are less than a metre tall.

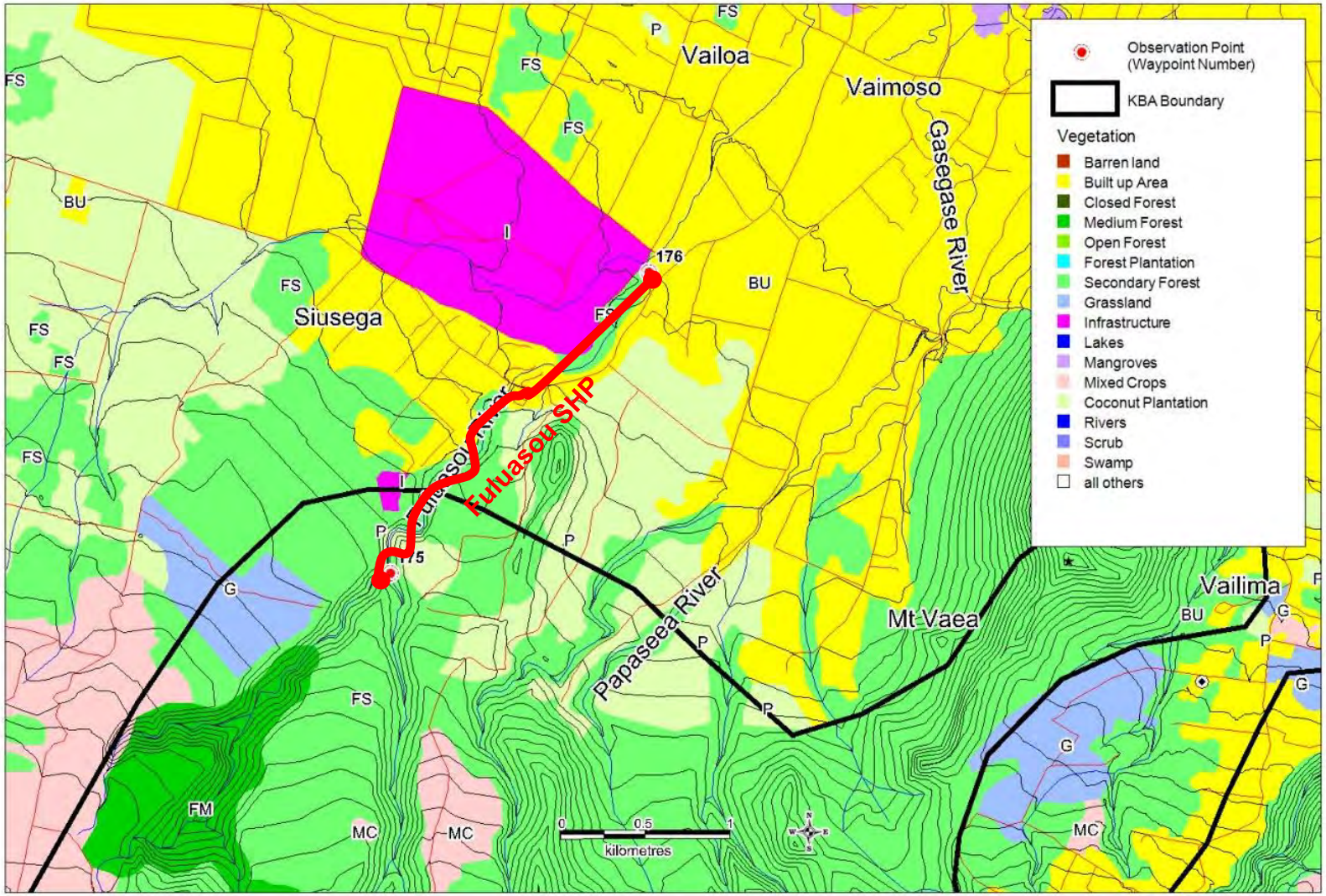


Figure 4-2: Vegetation types at the proposed Fuluasou SHP

Source: Atherton, Jenkins & Stirnemann (2013)

Figure 4-3: Aerial photograph of the Fuluasou SHP showing vegetation cover and avifauna point count locations

Plate 4-5: Faleata Golf Course fairway viewed from the Fuluasou river bank

Plate 4-6: The derelict powerhouse site with young plantings (highlighted in yellow)

124. Upstream of Papaseea Road an unformed EPC access road follows the existing penstock route to the dam (Plates 4.7 and 4.8). The road follows the river bank and penstock with adjacent secondary vegetation, dominated by exotic grasses, groundcovers and weeds with Panama rubber trees (*Castilla elastica*), African rubber tree (*Funtumia elastica*) and albizia (*Falcataria moluccana*). Occasional crops and wild ornamental species also occur.

125. The higher sides of the valley immediately west of the access road include mixed lowland forest dominated by exotic trees, but with a small portion of native species such as tava (*Pometia tomentosa*), maota mamala (*Dysoxylum samoense*), lopa (*Adenanthera pavonina*), fu'afu'a (*Leinhovia hospita*), tavai (*Rhus taitensis*) and giant fern (*Angiopteris evecta*). The valley-side vegetation has been modified or felled in some places (Plate 4.9).

126. Lowland rainforest occurs upstream of the dam. This is still dominated by exotic trees including Panama rubber tree, albizia, African rubber tree, African tulip (*Spathodea campanulata*), with lower growing giant taro (*Colocasia gigantea*) and ornamentals. Native trees include tava, maota mamala, fu'afu'a, malili (*Terminalia richii*), moso'oi (*Cananga odorata*) and magele (*Trema cannabina*) with perching lilies (*Asplenium nidus*) and ferns, including giant fern. Riparian vegetation in the two tributaries upstream is partially modified. The downstream portion of the western tributary is occupied by the reservoir, and crops have been planted along the banks (Plate 4.10). The eastern tributary (Plate 4.11) has a SWA reservoir with road access, and there was eviedence of human habitation, including walking and hunting tracks.

127. No rare or endangered plants have been recorded in the project area (Atherton, Jenkins, & Stirnemann, 2013).

Plate 4-7: The existing penstock has an easement through a private property

Plate 4-8: The penstock has been crushed by falling trees during past cyclones

Plate 4-9: Existing penstock overgrown by rubber trees

Plate 4-10: Felled trees at Samoa Tradition Resort next to the river and access road

Plate 4-11: Fuluasou reservoir and true left tributary looking upstream

Plate 4-12: True right branch of Fuluasou River showing the mainly exotic canopy

4.4.5. Avifauna

128. An avifauna survey at the Fuluasou SHP site in August 2013 identified two exotic and 12 native bird species (Atherton, Jenkins, & Stirnemann, 2013). In September 2014, a total of 20 avifauna species was identified, consisting of three exotic and 17 native bird species (Table 4.2).

129. Ten additional species were recorded in 2014 that were not observed in 2013: brown noddy, crimson-crowned fruit dove, domestic chicken, great frigatebird, Pacific pigeon, reef heron, white-tailed tropic bird, white-rumpted swifted, white tern and white-throated pigeon. Four species were observed in 2013 that were not recorded in 2014: scarlet robin, Samoan fantail, Polynesian triller and blue-crowned lorry. The difference in species is likely to be the result of differing survey times and methodologies, rather than changes in habitat type or quality.

130. One near-threatened species, the Samoan triller (*Lalage sharpei*) is present and occurred during both surveys. This endemic species occurs in forested areas, forest edges and clearings. It is relatively uncommon on Upolu but more widespread and common on Savai'i (Watling, 2004).

131. No birds of special conservation interest have been recorded at this site (Atherton, Jenkins, & Stirnemann, 2013).

4.4.6. Other Fauna

132. Pacific black skinks (*Emoia nigra*) and azure tailed skinks (*Emoaia impar*) were observed in the project area during the September 2014 site visit (Plate 4-13).

133. No introduced pests were observed during the 2013 and 2014 site visits.

Plate 4-13: Azure-tailed skink basking on rocks in the dry Fulusou riverbed

Table 4.2: Avifauna species identified during surveys at the Fuluasou SHP

Scientific Name	English Name	Samoan Name	Threat Status (IUCN)	Power-house 11/09/14 9:10 GPS 001	Penstock 11/09/14 9:59 GPS 002	Reservoir 11/09/14 11:03 GPS 004	Other - - -	All Sites
Acridotheres tristis	Common mynah	Maina fanua	Introduced		X		X	**X**
Aerodramus spodiopygius	White-rumpted swiftlet	Pe'ape'a	Least concern			X	X	**X**
Anous stolidus	Brown noddy	Gogo	Least concern			X		**X**
Aplonis atrifusca	Samoan starling	Fuia	Least concern	X	X	X		**X**
Aplonis tabuensis	Polynesian starling	Fuia vao	Least concern	X				**X**
Columba vitiensis	White-throated pigeon	Fiaui	Least concern				X	**X**
Dacula pacifica	Pacific pigeon	Lupe	Least concern				X	**X**
Egretta sacra	Reef heron	Matu'u	Least concern				X	**X**
Foulehaio carunculata	Wattled honeyeater	Iao	Least concern	X	X			**X**
Fregata minor	Great Frigatebird	Atafa	Least concern				X	**X**
Gallirallus philippensis	Banded rail	Ve'a	Least concern				X	**X**
Gallus gallus	Domestic chicken	Moa	Introduced	X				**X**
Gygis alba	White tern	Manusina	Least concern		X	X		**X**
Lalage sharpei	Samoan triller	Miti	Near threatened	X	X			**X**
Myzomela cardinalis	Cardinal honeyeater	Segasegamau'u	Least concern			X	X	**X**
Pachycephala flavifrons	Samoan whistler	Vasavasa	Least concern				X	**X**
Phaethon lepturus	White-tailed tropic bird	Tava'e	Least concern				X	**X**
Ptilinopus porphyraceus	Crimson-crowned fruit dove	Manutangi	Least concern	X	X	X	X	**X**
Pycnonotus cafer	Red-vented bulbul	Manu palagi	Introduced	X	X			**X**
Todirhamphus sp.	Kingfisher	Ti'otala	Least concern			X		**X**
TOTAL SPECIES:				**7**	**7**	**7**	**11**	**20**

Source: Project AF studies (MWH 2014)

4.4.7. Presence of Critical Habitat

134. Critical habitat is defined by ADB for purposes of informing investment decisions as a 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 (ADB, 2009).

135. Critical habitats include those areas either legally protected or officially proposed for protection, such as areas that meet the criteria of the Word Conservation Union classification, the Ramsar List of Wetlands of International Importance, and the United Nations Educational, Scientific, and Cultural Organization's world natural heritage sites (ADB, 2009).

136. An assessment of the presence of critical habitat in the Fuluasou SHP project area based on the ADB SPS criteria is provided in Table 4.3.

Table 4.3: Critical habitat assessment for the Fuluasou SHP project area

SPS Criteria	Existing Information	Is Criterion Met?
Areas of high biodiversity value	The Fuluasou site is modified by existing infrastructure and residential development. The habitat is considered to be of low value.	No.
Habitat required for the survival of critically endangered or endangered species	No critically endangered or endangered species have been identified within the Fuluasou project area. No habitat required for the survival of critically endangered or endangered species was identified.	No
Area having special significance for endemic or restricted-range species	The project site includes the presence of endemic species, but is not considered to have special significance for these species.	No
Sites that are critical for the survival of migratory species	No evidence was found that the site is critical for migratory species.	No
Areas supporting globally significant concentrations or numbers of congregatory species	Small numbers of brown noddies and white terns breed upstream of the existing reservoir. No globally significant concentrations of congregatory species were identified.	No
Areas with unique assemblages of species or that are associated with key evolutionary processes or provide key ecosystem services	No evidence was found that the site supports a unique assemblage of species. No evidence was found that the site is not associated with key evolutionary processes. The damaged SHP to provide electricity generation to the city of Apia. The development will improve electricity supply to Apia.	No
Areas having biodiversity of significant social, economic, or cultural importance to local communities	No biodiversity of significant social, economic or cultural importance was identified.	No.
Areas either legally protected or officially proposed for protection	The site has no legal protection. The scheme is located on the edge of the Apia Catchments KBA. The existing dam and reservoir are located within the KBA but most of the penstock route and powerhouse are outside the KBA.	No. Part of the scheme falls within the KBA, but this is existing infrastructure that will be upgraded as part of the development.

Source: After ADB SPS (2009)

137. The site around the Fuluasou SHP is modified from the presence of an existing dam and penstock, as well as urban development.

138. It is not considered to meet criteria for high biodiversity values, or as a site of significance for endemic, range-restricted, migratory or congregationally species. It does not have unique assemblages of species or significance to local communities.

139. The Fuluasou SHP is partially located within the Apia Catchments KBA which is an area proposed for protection due to the presence of several threatened species. The dam, reservoir and start of the penstock route is contained within the KBA, although the powerhouse and the majority of the penstock route sits outside of the KBA boundary.

140. Even though part of the Fuluasou SHP is located within the Apia Catchments KBA, it is considered that the presence of existing infrastructure, highly modified nature of the site and absence of threatened species means that the project site does not meet the ADB criteria for critical habitat.

5. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

141. The following section provides an assessment of the project's likely impacts on physical, biological, socio-economic and physical cultural resources, and identifies mitigation measures to ensure all such environmental impacts will be avoided or managed/reduced to acceptable levels.

142. The mitigation measures identified below will be implemented in accordance with the environmental management plan (EMP) presented in Section 7.

5.1. Design Phase and Pre-Construction Impacts

143. The preliminary design of the SHP has been completed. It is expected that detailed design will be undertaken over an 18 month period prior to the commencement of construction (R. Spittle, pers. comm., 25/03/15). Appropriate design can assist in reducing the environmental impact of the project. The measures taken to reduce the environmental footprint of the proposed SHP through optimisation of site selection and design are described below.

5.1.1. Climate Change Adaptation

144. Infrastructure needs to be resilient to the effects of climate change. This is particularly significant for the project where reinstatement of a SHP is necessary due to previous cyclone damage. Resilence will be achieved through robust design and construction that addresses the anticipated increased in frequency and intensity of cyclones, storms, flooding and sea level rise in Samoa.

145. There have been several well-documented events that show the increasing trend of extreme weather such as tropical storms and typhoons in the Pacific. For example, cyclone Evan (09 December 2012) with strong winds and heavy rain was the strongest storm in 20 years.

146. Most climate change modelling shows that tropical storms will increase in frequency and severity, and will be characteristic of expected future weather patterns in the project area. Many of these extreme weather events can be linked to the El Niño/La Niña-Southern Oscillation (ENSO) pattern, but ENSO is predicted to also have an effect in modifying trade winds in the Pacific, strengthening of tropical deep convection, and alteration of cyclone trajectory.

147. Some of the identified risks posed by climate change and natural hazards in the Pacific, and specific to the energy sector, are described in Table 5.1. This table is adapted from ADB's report Climate Risks and Adaptation in the Power Sector (ADB, 2012). It includes various adaptation options that could be considered for the risks identified in respect of small run-of-river type hydropower projects that are the subject of this IEE.

Table 5.1: Summary of impacts and adaptations on hydroelectricity infrastructure

Climate change/hazard	Potential Impact	Potential Resilience Measure	Complementary Measures
Sea-level rise	Most hydro is located inland and not directly affected by sea-level rise, possibly increased rate of deterioration of concrete structures due to increased salinity from sea-level penetration upstream.	Materials substitution for less corrosive materials.	Coastal zone protection to protect estuaries and watersheds.
Increase/decrease in rainfall	Energy from hydropower relies on rainfall and reduced river flow over a period of time could reduce or disrupt entirely energy generation.	Where flow is expected to increase, modify the number and type of turbines that are better suited for expected water flow rates, reduce expected turbine lifetime due to higher suspended sediment loads, modify canals to better handle changes in water flows, modify spillway capacities.	Develop improved hydrological forecasting techniques and adaptive management operating rules; develop basin-wide management strategies that take into account the full range of downstream environmental and human water uses; restore and better manage upstream land including afforestation to reduce floods, erosion, silting, and mudslides. Improved watershed modeling to inform better management.
Cyclones/hurricanes and frequent strong storms	Flooding of riverbanks could adversely affect stream flow particularly where hydropower is generated. Transmission/distribution lines and poles are damaged.	Design more robust infrastructure for heavier flooding and extreme events.	
Increased temperatures	Higher evaporation rates, reduced turbine efficiency	Water cooling systems in turbines.	
Earthquakes	Damage to infrastructure, oil spills and fire hazards.	Use design standards applicable to high earthquake risk areas.	

Source: ADB (2013)

148. **Climate resilience.** The location of infrastructure is important for climate resilience. The site for the proposed Fuluasou SHP is elevated and located well inland, and is therefore less exposed to the effects of storm surges and sea level rise that affect coastal infrastructure.

149. However, the SHP also needs to be designed to cope with cyclones and associated extreme weather impacts, especially flooding, landslips and damage from falling trees.

150. Mitigating the risks of climate change has been addressed in the project design in the following way:

(i) Penstock – will be buried (except for pipe bridges) to minimise any future damage from soil erosion or falling trees;

(ii) Powerhouse – the powerstation will be elevated above the river to reduce the risk of flooding. The level of the powerhouse discharge outlet will be designed to prevent any flood-induced backflow so avoiding flooding of the powerhouse and damage to equipment; and

(iii) Erosion prevention – key components of the SHP infrastructure will be protected from potential erosion and bank instability. Such measures could include: additional river bank protection / rock armor placed around the intake structures and powerhouse tailrace; and enhanced slope protection works along steep sections of the headrace canal routes (e.g. benching, cut off drains, masonry etc). Erosion protection will be implemented if and when required during design and operation of the SHP.

151. It is noted that power distribution lines and their receiving buildings and support infrastructure including schools, clinics, airstrips and community households are largely located in Apia and nearer to the coast. They are therefore more exposed to extreme events such as intense storm surges, tropical cyclones and inundation of low lying areas. Addressing the climate resilience of this supporting infrastruccture is outside the scope of this project.

152. **Reduction of greenhouse gas emissions.** Fuluasou will achieve a net reduction of greenhouse gas emissions of around 1,729 tons of CO_2 per year. This corresponds to fuel savings of 645 litres per year.

Table 5.2: Energy savings and greenhouse gas emission

Subprojects	Renewable electricity production/year (MWh)	Equivalent of fossil fuel saving (ltr)	Equivalent tons of CO_2 emissions (0.670 Ton CO_2/MWh)
Fale o le Fe'e	3340	835	2238
Alaoa	4780	1195	3203
Samasoni	3870	967	2593
Fuluasou	2580	645	1729
Faleaseela	1060	265	710
Faleata	500	125	335
Tafitoala	1820	455	1219
Total	**20,110**	**5262**	**13,469**

Source: ADB (2013)

5.1.2. Hydrology

153. The Fuluasou SHP will be designed to allow for environmental flows in the downstream catchment. An environmental flow (also known as an ecological flow), is water that is left in a river ecosystem, or released into it, for the specific purpose of managing the condition of that ecosystem (World Bank, 2005). There is no international standard for calculating environmental flows (World Bank, 2005). A large number of methodologies exist, some more complex than others. Some methods set fixed standards for minimum flow while others vary according to the season, flow regime of the river, sensitivity of the receiving environment, or catchment changes monitored over time.

154. Hydrological parameters that have been adopted as environmental flows internationally include, *inter alia* (MWH, 2009):

(i) Mean Annual Low Flow (MALF)

(ii) Percentage of the Mean Annual Low Flow (MALF) for example 80% MALF

(iii) Seven-day five-year Average Recurrence Interval (ARI) low flow

(iv) Percentage of Mean Annual Flow (MAF) for example 95% of MAF

155. **Samoa standard for environmental flows.** The National Water Allocation Policy 2008 (NWAP) of Samoa provides for the sustainable management of water resources and establishes the principles on which water will be allocated for all purposes, including the natural environment.

156. The NWAP operates a licence system that grants a volumetric entitlement for water from specific water sources. All public and private water users who take water from surface water or groundwater require a water licence, with the exception of surface water takes for individual dwellings, firefighting and emergency response needs (NWAP s8.2.8.2). The NWAP establishes the following principles to maintain healthy rivers (NWAP s7.4.1.8):

(i) The important role of rivers is recognised in supporting native flora and fauna of Samoa, and their important influences on estuarine and coastal ecosystems;

(ii) A river should not be dried up completely by water abstraction at times when the river would naturally be flowing;

(iii) Water abstraction should not cause serious deterioration in the quality of water in rivers;

(iv) The natural variability of flow in rivers should be retained as far as feasible.

157. The NWAP proposes to develop a "safe yield" for all important rivers and aquifers in Samoa. As part of this process, an in-stream flow regime is to be developed for each of the five highest priority rivers in Upolu, including Fuluasou and Vaisigano. Once completed, flow regimes for other rivers will be developed as needed on a site-specific basis.

158. The GOS has not yet developed environmental flow requirements for rivers and streams within Samoa. The MNRE currently recommends that environmental flows are calculated at 95% of the flow duration curve, and the agency is currently working to transform this figure into a national standard (ADB, 2013).

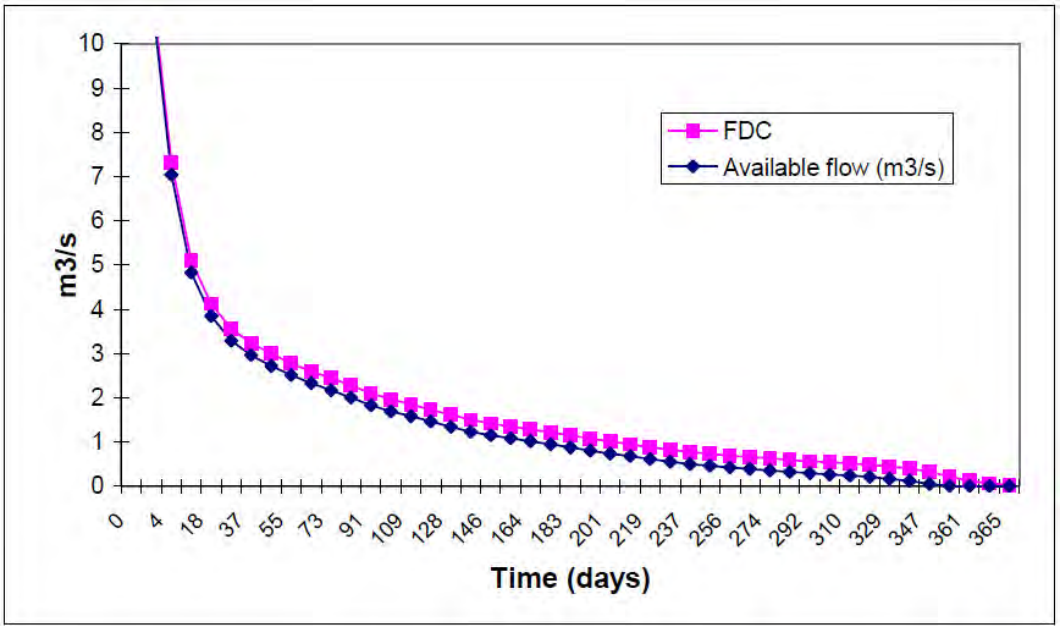
159. Flow data for the Fuluasou River is available at the Fuluasou dam (Egis International 2011a). Under the MNRE standard, 95% of the flow duration curve equates to 0.36 m^3/sec. This means that all flows above 0.36 m^3/sec would be available for the hydro scheme, up to a (yet to be designed) maximum level. During storm events, flows would exceed the capacity of the hydro scheme and would discharge to the river.

160. **10% of annual median flow.** Based on French regulations, Egis International has recommended that 10% of the annual median flow be provided for environmental flows at the Fuluasou SHP (Figure 5-1). For Fuluasou, 10% of the annual median flow this equates to 0.17 m^3/sec (Egis International, 2011). This figure shows that the environmental flow based on 10% of annual median flow is approximately half the value derived from the MNRE recommendation (95% of flow duration curve).

161. **80% MALF.** The IEEs prepared for the new SHPs and the SHPs to be rehabilitated (ADB, 2013) recommend that environmental flows be at least 80% of the seven day mean annual low flow (MALF). This figure was recommended to maintain steady populations of fish in upper catchment areas. Calculations of 80% of MALF were not provided in the above report, presumably due to lack of hydrological data. A proposed environmental flow of at least 80% MALF at Fuluasou was supported by Atherton et al. (2013a; 2013b).

162. Full hydrological data is unavailable for the SHP site and therefore the seven day MALF cannot be calculated accurately. Using the flow duration data from Egis International (2011a; 2011b) as a proxy, the estimated 80% MALF calculations for Fuluasou SHP is 0.22 m^3/sec.

Figure 5-1: Fuluasou flow duration curve with 10% of annual median flow as environmental flows



Source: Egis International (2011)

163. The calculations for 80% of 7-day MALF provide lower flows than the MNRE recommendation, but higher than the flows recommended by Egis International (2011a; 2011b).

164. **Recommended approach for environmental flows.** A summary of the environmental flows estimated from the three approaches discussed above in given in Table 5.3.

Table 5.3: Estimates of environmental flows for the SHPs under different methodologies

Method*	Fuluasou SHP (m3/sec)	Method source
95% of flow duration curve	0.36	Samoa NWAP, 2008
10% of annual median flow	0.17	Egis International, 2011
80% of 7-day MALF	0.22	ADB, 2013

Source: Project AF studies (WH 2014)

165. In the absence of a single international standard for environmental flows and incomplete hydrological information at these sites, it is recommended that the environmental flows at the Fuluasou SHP be set at the 95th percentile of the flow duration curve. This is consistent with the MNRE guideline and interim national standard, and provides a more conservative basis for minimum flows than the other two methods. It is understood that the flow estimates used to calculate the figures in Table 5.3 account for the existing SWA intake located upstream of the SHP intake structures. Also, the above figures fully allocate the available water to the SHP scheme but preclude the future use of water for other users. Note that the figures in Table 5.3 have been derived from existing flow data (Egis International 2011a; 2011b). It is assumed that this data is accurate however this has not been verified.

5.1.3. Biodiversity

166. **Vegetation.** The site is known to support mature native trees which are a key food source for a number of avifauna species. The retention of mature trees would reduce the impact of the project on bird pecies.

167. It recommended that these trees are retained by aligning the pentstock route to avoid some or all of these trees. The following mitigation is proposed:

(i) The location and footprint of the penstock route and its associated right of way will be aligned to retain as many mature trees as possible; and

(ii) Prior to commencement of construction, mark all mature trees within and near to the SHP project footprint that are to be protected.

168. **Fish passage.** Many indigenous fish in Samoa are diadromous, moving between fresh and salt water as part of their lifecycle. For this reason, limiting barriers to fish passage assists in the maintenance of these fish populations.

169. The existing dam constitutes a barrier to non-climbing fish species, although it is surmountable for climbing species. Given that this is an existing structure and aquatic ecology values are low, there is little justification to provide a fish pass at this structure.

170. The following general ecological principles should be applied during detailed design of the SHP:

(i) Prevention of adverse flow turbulence through the structure and ensure water surface drops are not excessive;

(ii) Ensuring fish are not obstructed from downstream migration;

(iii) Maintenance of natural flow and sediment processes in the waterway;

(iv) Protection of riparian and in-stream habitat, terrestrial and aquatic ecosystems;

(v) Ensuring stream water quality is not degraded;

(vi) Installation of fish screens on intake and outlet structures; and

(vii) Where possible, using bridges in preference to culverts for stream and river crossings (to limit piping of streams and loss of aquatic habitat).

5.2. Construction Phase Impacts on the Physical Environment

171. Construction of the Fuluasou SHPs is expected to commence in January 2016 and last for approximately 12 months.

172. It is envisaged that the environmental mitigation measures discussed below (and as summarised in the EMP in section 7 of this IEE) will be included within the contract specifications and the Contractor's construction environmental management plan (CEMP).

5.2.1. Air Quality

173. Construction activities and vehicle movements can generate dust and affect local air quality. As with noise, this will be temporary and sporadic over the 12 month construction period depending on site works that have potential to generate dust e.g. excavating, earthmoving and material transport during dry weather.

174. Mitigation measures shall include:

(i) Cover stockpiles;

(ii) Cover trucks with a secure tarpaulin when carrying fine/dusty material;

(iii) Reduce vehicle speed through settlement areas;

(iv) Avoid prolonged idling in settlement areas;

(v) Utilize vehicles with low emissions;

(vi) Regularly clean construction vehicles (including wheels); and

(vii) Watering/damping of roads adjacent to residential areas to prevent dust during dry/windy conditions.

175. Implementation of good practice methods as noted above will minimise the risk of dust nuisance and poor air quality during construction.

5.2.2. Erosion

176. Erosion could occur during construction of access roads, and headrace canals, especially where they cross steep slopes, and in the river channel adjacent to the intake/sand trap and tailrace. Erosion could also be caused by extraction of material (such as sand and gravels) during construction.

177. Erosion could result in the loss of topsoil and vegetation, aggravate the risk of mud and landslides, and result in increased siltation/sedimentation of the river and its tributaries from runoff (see also section 5.2.3).

178. The scale of the construction activities and limited footprint of the project means there will be limited direct loss of top soil. However, indirect loss of topsoil could occur through erosion as described above. Following site clearance top soil will be stockpiled for later use in landscaping or made available to the local community for their use.

179. Mitigation measures shall include:

(i) Application of COEP 6 – Road Construction and Erosion Control, COEP 7 – Slope Stability, COEP 8 – Quarry Development and Operations, and COEP 9 – Gravel Extraction, as relevant;

(ii) Contractor to prepare an erosion and sedimentation control plan (ESCP) as part of CEMP;

(iii) Construction materials, such as sand needed for concrete should come from existing quarries, in compliance with Ministry of Works recommendations;

(iv) Schedule excavation activities in the dry season

(v) As far as practicable, utilise and upgrade existing access roads to avoid the need for separate excavation corridors;

(vi) Minimizing the vegetation clearance corridor for all components;

(vii) Ensuring slope cuts are appropriately designed and engineered for the prevailing conditions (geotechnical, climate etc.);

(viii) Installing cut-off drains when excavating on steep slopes;

(ix) Cut slopes to be re-vegetated with native species as soon as practicable to minimize the exposure of bare surfaces;

(x) Install bank protection in the river channel adjacent at intake, outlet and other key infrastructure to prevent erosion and scour;

(xi) Stockpile topsoil for later use in revegeation; and

(xii) As far as possible ensure cut to fill balance.

180. The relatively small scale nature of the project coupled with rigorous implementation of an ESCP incorporating the above mitigation measures should ensure that the potential impact of erosion and loss of topsoil due to the project will be minimized to acceptable levels.

5.2.3. Water Quality

181. There is potential for surface water contamination from runoff of suspended sediment (e.g. from exposed stockpiles, and slope erosion) and from chemicals used during construction (e.g. fuel, oil, paint and concrete).

182. The Contractor will need to minimise the extent of earthworks during the construction period to reduce the area of exposed soil. They will also need to implement sediment control devices, particularly when working in areas of steep gradients.

183. Construction activities will involve the use of machinery as well as manual labour. Manual clearance and earthworks will generally minimise the area of disturbed soil and therefore the potential for sediment runoff. Manual labour should be used when practical and is recommended for sensitive receptors such as vegetation clearance near watercourses.

184. The risk of water quality impacts from spills (e.g. chemicals/fuel) should be avoided by keeping all hazardous liquids in a secure and adequately bunded storage area (see section 5.2.6).

185. It is recommended that a range of mitigation measures will be implemented during construction to avoid or minimize the discharge of sediment and other contaminants to water courses. These mitigation measures will include:

(i) Application of COEP 6 – Road Construction and Erosion Control and COEP 13 – Earthworks, as relevant;

(ii) Contractor to prepare Erosion and Sedimentation Control Plan as part of CEMP;

(iii) As much as practicable, utilising and upgrading existing access roads to avoid the need for separate excavation corridors thereby minimizing the excavation footprint;

(iv) Minimizing the vegetation clearance corridor or footprint for all components;

(v) Re-vegetate and/or cover/stabilize exposed surfaces and excavated materials

(vi) Installation of sediment control devices (silt traps and the like) and implementing effective construction site drainage such that runoff is directed to sediment traps before discharge to water courses;

(vii) If the waterway has continuous flow, other control measures, such as flotation sediment curtains, should be used to minimise the effects of sediment downstream;

(viii) Use of cut-off drains above excavated areas on steep slopes to reduce erosion;

(ix) Close construction supervision to ensure the above measures are implemented; and

(x) Scheduling of earthworks to be conducted in the drier months;

186. Effective implementation of the above mitigation measures will ensure that the potential short term impacts on water quality due to construction of the project will be relatively minor.

5.2.4. Stockpile Management

187. Moderate amounts of sand, cement and other equipment and materials will be required for construction. It is envisaged that a dedicated borrow pit / quarry will not be required for the project and that sufficient could be obtained from existing quarries.

188. Sources for construction materials will be identified by the Contractor and will be detailed in materials and spoil management plan (MSMP) as part of the CEMP.The MSMP will include the following:

(i) Required materials, potential sources and estimated quantities available;

(ii) Impacts related to identified sources and availability;

(iii) Excavated material for reuse and recycling methods to be employed;

(iv) Excess spoil to be disposed of and methods proposed for disposal (e.g. revegatated to minimise sediment ruoff to streams);

(v) Endorsement from MNRE and Ministry of Works, and local landowners for use of sources and disposal of excess spoil; and

(vi) Methods of transportation to minimize interference with normal traffic.

189. Effective implementation of the MSMP by the Contractor as outlined above will ensure that potential environmental impacts associated with the management and disposal of construction materials will be adequately addressed.

5.2.5. Waste Management

190. Uncontrolled waste disposal during construction can cause impacts including water and land pollution and effects on public safety. Waste management measures for the project will seek to reduce, recycle and reuse waste as far as practicable and dispose of residual waste in an environmentally sustainable way.

191. As part of the CEMP prepared by the Contractor, waste management measures will be included in a waste management plan (WMP) to cover all matters related to solid and liquid waste disposal arising from construction related activities (including storage, transport, disposal and accidental spills).

192. The WMP will include the following:

(i) Expected types of waste and volumes of waste arising;

(ii) Designation of waste disposal areas agreed with local authorities;

(iii) How segregation of wastes is to be observed;

(iv) Methods for appropriate storage and disposal of hazardous materials (refer section 5.2.6 below);

(v) Methods for managing organic waste, including consideration of composting and reuse of some materials (such as timber from felled trees and mulch from chipping and shredding of cleared vegetation);

(vi) How recyclables will be recovered;

(vii) Disposal of residual solid waste, which will be collected and removed from work sites and disposed in designated waste disposal facilities.

193. The Contractor's WMP, as part of the CEMP, will need to be approved in writing by PUMA prior to start of construction.

5.2.6. Hazardous Materials

194. Hazardous substances such as paint, chemicals, oils and lubricants can cause significant impacts if used and/or disposed of incorrectly.

195. The Contractor will control access to and the use of hazardous substances and manage waste disposal appropriately and in a safe manner. This will be set out in the hazardous materials section of the WMP.

196. The hazardous materials section of the WMP will include but not necessarily be limited to the following measures:

(i) Ensure that safe storage of fuel, other hazardous substances are agreed by PUMA and follow national and local regulations and codes of practice;

(ii) Fuel, oil and other toxic material will be stored in secure, bunded facilities at least 20m from any watercourses and protected from weather to prevent soil and water contamination;

(iii) Ensure all storage containers are in good condition with proper labelling;

(iv) Store hazardous materials above possible flood level;

(v) Used oil and other toxic and hazardous materials shall be disposed of off-site at a facility authorized by the PUMA;

(vi) Adequate precautions will be taken to prevent oil/lubricant/hydrocarbon discharge to soil or water;

(vii) Discharge of contaminated water from site shall be prohibited;

(viii) Chemical spill clean-up kits will be available on site at all times, appropriate for the hazardous substances stored on site; and staff will be trained in their use.

(ix) Chemical spills, if any, will be immediately cleaned up and appropriate management will be put into place to prevent recurrence.

197. Provided the WMP is prepared and implemented in accordance with the above recommendations, no adverse environmental impacts are anticipated from waste generated during project construction.

5.3. Construction Phase Impacts on Biological Environment

5.3.1. Vegetation

198. The Fuluasou SHP construction footprint is approximately 27.41 hectares in area (Table 5.4 and Figure 5-2). The construction footprint has been conservatively estimated to be a 100 metre wide corridor, which may be up to an order of magnitude larger than the true construction footprint but accounts for uncertainties regarding the detailed design and construction methodology. It also allows for indirect impacts, such as disturbance from edge effects that may extend beyond the the immediate boundary of the development.

Table 5.4: Fuluasou SHP construction footprint and key sites for avifauna conservation

Description	Total Area (ha)*	Area within Fuluasou SHP Footprint (ha)	Percentage within Fuluasou SHP Footprint (%)
Construction Footprint - Total construction footprint (100m wide corridor)	27.41	27.41	100%
Catchment			

Description	Total Area (ha)*	Area within Fuluasou SHP Footprint (ha)	Percentage within Fuluasou SHP Footprint (%)
- Total area of Fuluasou catchment	Not available	27.41	100%
Vegetation Cover			
- Secondary vegetation (mainly exotic trees)	-	13.62	49.69%
- Mixed forest (native & exotic)	-	1.97	7.19%
- Open modified vegetation (plantations, grass)	-	2.52	9.19
- Urban land use (houses, golf course)	-	9.29	33.89%
Mao Key Sites			
- Total area of all key sites in Samoa (MNRE, 2006)	92,283.40	0.67	0.0007%
- Area of 'Fuluasou and Leafe Catchment' key site (MNRE, 2006)	4,311.92	0.67	0.015%
Manumea Key Sites			
- Total area of all key sites in Samoa	11,312	0	0%

*Calculated from GIS mapping unless otherwise stated.

Source: Project AF studies (MWH 2014)

199. Approximately 18 hectares of vegetation clearance will be required to construct the Fuluasou SHP, being located along the penstock and potentially around the reservoir. An additional 9.3 hectares of construction activity will be undertaken within residential landuse and the golf course where few trees or shrubs occur (Table 5.4).

200. The effects of vegetation clearance will be the localised loss of native and exotic trees, shrubs and groundcovers, loss of habitat, and reduction in habitat values.

201. Loss of native forest habitat is minimal at Fuluasou SHP due to the modified nature of the site, presence of existing access roads, dam, reservoir, and damaged penstock. Vegetation clearance will primarily impact disturbed, exotic vegetation. Few native trees will be impacted as most are located upstream of the existing reservoir or on the steep banks above the river and outside of the likely area to be cleared.

202. Little or no increase in edge effects is expected to be caused by the vegetation removal at Fuluasou SHP given the extent of existing access roads, high level of disturbance and past and current vegetation clearance.

203. Replanting following completion of construction is considered to adequately mitigate the vegetation removal at Fuluasou SHP. Other than aareas occupied by essential SHP infrastructure, all disturbed areas will be replanted on completion of construction.

204. Mitigation measures to be undertaken by the constractor shall include:

(i) Vegetation clearance shall be minimised to the extent necessary to allow for the construction of the SHP.

(ii) Vegetation clearance is to be conducted outside of the main breeding season for land birds which is August to January (Watling, 2004).

(iii) Where possible, a minimum five metre wide strip of vegetation is to be retained between the construction footprint and the Fuluasou River. Where this is not possible due to design and access constraints, this vegetation shall be hand-cleared to minimise disturbance and sediment discharge to the river.

(iv) Native trees and shrubs are to be replanted in along the construction corridor to revegetate bare soil and replace vegetation removed during construction.

(v) A Restoration Plan is to be prepared for the site specifying the number, species, size and location of native trees and shrubs to be planted within the construction footprint.

(vi) Plantings are to be native trees and shrubs that are occur within the catchment. Invasive species shall not be used for replanting.

(vii) All plantings are to be maintained for a minimum of five years, by way of monthly checks for survival, manual or chemical weed control, and replacement planting.

(viii) Strict security is to be put in place to prohibit vehicular and pedestrian access from the site and surrounding catchment outside hours of construction.

5.3.2. Avifauna and other terrestrial fauna

205. The clearance of vegetation, combined with the noise and activity from construction activities, and presence of workers, will lead to the localised disturbance and loss of habitat for birds, herpetofauna and bats. Note that the site is already disturbed by way of vegetation clearance and urban development so these impacts are less significant than if the site was more isolated.

206. The Fuluasou SHP construction footprint is partially located within the Apia Catchments KBA and includes a very small area (0.0002%) of the Fuluasou and Leafe Catchment key site for mao, the boundary of which extends to the existing dam (Figure 5-2). As such a small area is affected, and habitat is largely unsuitable for threatened avifauna, no mitigation for threatened species is proposed.

207. The replacement planting proposed to mitigate for vegetation clearance (above) is considered to be sufficient to mitigate for the loss of terrestrial fauna habitat at Fuluasou. An additional mitigation measure includes workers being prohibited from poaching or hunting any birds or wildlife from within the project area or adjacent catchment.

208. Such measures will successfully minimise long-term and short-term impacts to terrestrial fauna.

5.3.3. Aquatic ecology

209. During construction, impacts on the river ecosystem can occur through works in streams and rivers, damming and diverting flows and piping of streams, and from sediment runoff to water bodies from land-based construction activities.

210. Mitigation measures addressed earlier in section 5 to prevent erosion, water quality degradation, and management of waste material and hazardous materials will also benefit aquatic ecology.

211. Additional mitigation measures to be implemented include:

(i) In-stream work should be scheduled for the driest time of the year to minimize erosion and silt generation. This will also minimize conflict with the majority of fish migration patterns;[4]

(ii) Diversions and damming of river flow minimized as far as practicable;

(iii) In-stream construction to be completed as quickly as possible to lessen the impact on fish and habitats;

[4] Most fish species present are amphidromous meaning species that spawn in freshwater, the free embryos drift downstream to the sea where they undergo a plaktonic phase, before returning to the rivers to grow and reproduce. Upstream migration is thought to be triggered in part by high freshwater pulses into adjacent marine systems during heavy rainfall

(iv) Fish screens are to be installed on all inlets and outlets to minimise restrictions on fish passage;

(v) Ensure that all stormwater runoff from earthworks and stabilised surfaces are diverted away from watercourses through the use of bunds and trenches;

(vi) Aquatic ecology monitoring of fish and macroinvertebrate communities is to be conducted on an annual basis prior to, during and post-construction.

(vii) Water quality monitoring of pH, total suspended solids, TPH, and heavy metals, is to be conducted on an annual basis prior to, during and post-construction;

212. At Fuluasou, dredging of the reservoir is to occur which has the potential to release silt-laden water downstream. Mitigation for dredging works are to include:

(i) Work to be conducted only during the dry season during low flows;

(ii) Dredging is to be staged, working from upstream to downstream of the reservoir;

(iii) Use of silt curtains around the area of staged works to contain sediment discharges;

(iv) Dredged material to be stockpiled on land to be dewatered naturally. The stockpile is to be bordered by sediment control devices such as bunds or silt curtains;

(v) Dredged material is to be reused on site (if possible) or disposed of at a designated area on site. Alternatively it shall be transported off site to landfilll

(vi) No vegetation clearance is to occur as a result of dredging disposal.

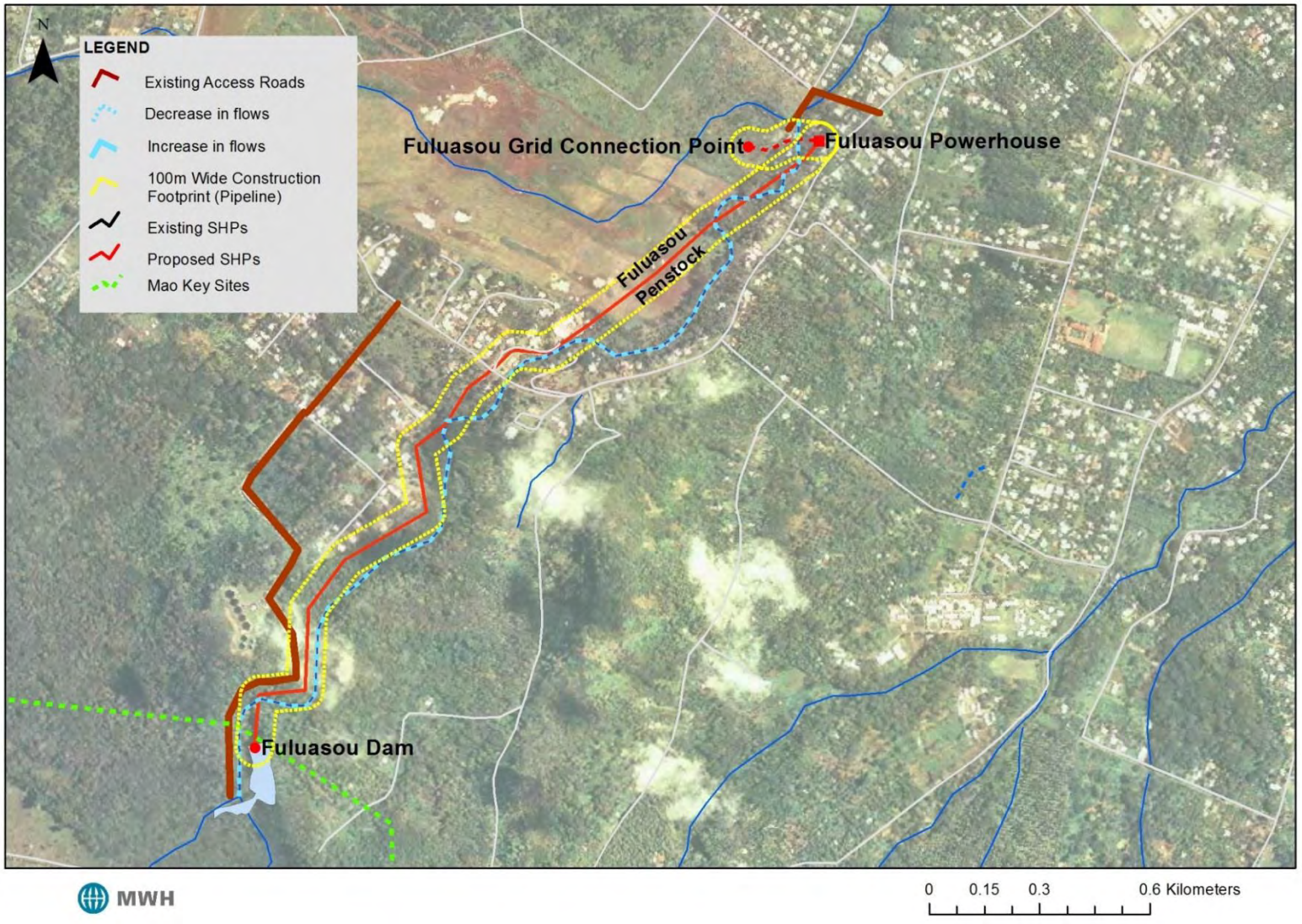


Figure 5-2: Fuluasou SHP construction footprint and predicted area of impact

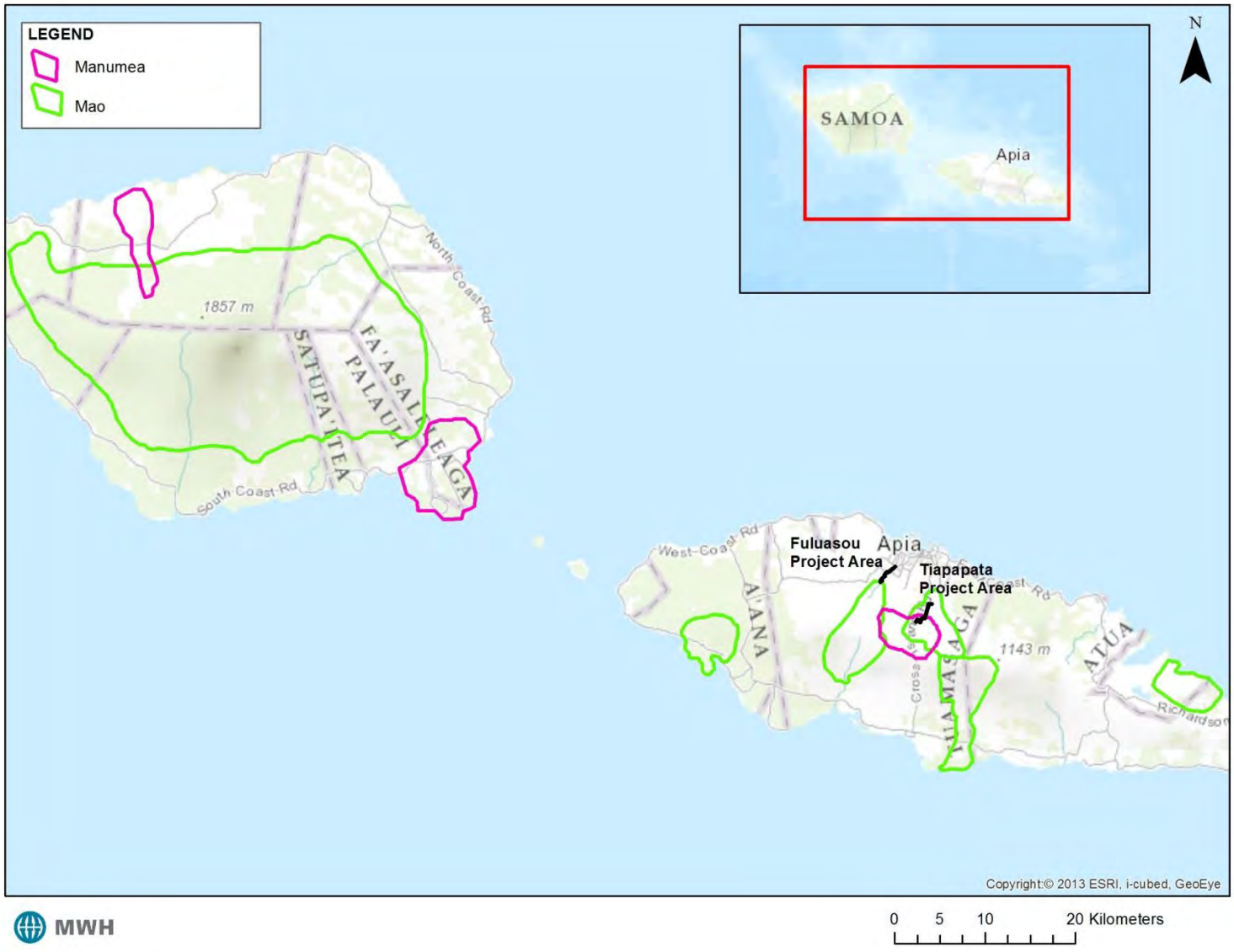


Figure 5-3: Fuluasou SHP construction footprint showing key sites for avifauna conservation

5.4. Construction Phase Impacts on Socio-Economic Environment

5.4.1 Noise and Vibration

213. Noise and vibration impacts may occur from the operation of machinery at the site and construction site traffic transporting materials and equipment.

214. Noise and vibration can cause disturbance to local residents and businesses, interfere with hunting activities, and cause displacement of wildlife. Disturbance to residents and businesses will be most acute in built up areas, such as the penstock route of the Fuluasou SHP.

215. Noise and vibration impacts are expected to occur periodically over the 12 month construction period depending on the nature of site works and their proximity to noise-sensitive receivers. Implementation of good noise control practice during construction, as noted in the mitigation measures below, will minimise the risk of adverse impacts.

216. Mitigation measures shall include:

(i) Adherence to the national Noise Policy (PUMA, 2011);

(ii) Using well-maintained powered mechanical equipment equipped with silencers, sound baffles or similar;

(iii) Providing information on construction acitivites to residents (sign close to the entrance of access roads, announcements in papers and distributing of leaflet information related to the works or contacting them individually);

(iv) Adherence to legal working hours to avoid disturbance early in the morning, at night, on Sundays or public holidays and restricting noisy activities to between 0900 and 1700[5];

(v) Daily inspections to check construction vehicles, plant and machinery are in good working order; and

(vi) Setting up a complaints register at the construction site office together with a sign at the entrance providing the name and telephone contact details for the Contractor's noise control officer.

5.4.2 Establishment of Site Office and Works Yard

217. It is estimated that a maximum 50 workers will be required at the SHP site, with approximately 20 of these skilled workers and the rest unskilled. Unskilled workers will be sourced from settlements in the area and skilled workers will stay in hotels and rented houses. There will be no campsite at the site.

218. A site office and work's yard (storage and plant station etc) will be established for the duration of the construction period. The Contractor will be required to adopt good management practices to ensure that both physical and social impacts associated with a camp and/or office/yard are minimized. As noted above, fuels and chemicals, raw sewage, wastewater effluent, and construction debris associated with the construction site office and storage maintenance area will be disposed of appropriately and in accordance with regulations. Waste will be disposed of under controlled conditions, as set out in the WMP (refer to section 5.3.6).

[5] Day period is defined as 0700 to 1800, evening period is defined as 1800 to 2200 and night period is defined as 2200 to 0700. Construction activities conducted at times not specified in the table above will require special approval from relevant authorities. These may include the night period, Sundays and all other times within residential and education compounds or close to other sensitive receivers.

219. Social impacts include potential for conflict between temporary construction workers from outside and local residents and communities; risk of spread of communicable diseases including STIs and HIV; and risk of contamination of local water sources.

220. The proposed measures to mitigate the above risks and impacts include:

(i) Apply relevant provisions of COEP 5 – Construction Camps;

(ii) Induction of workers shall be required under the project's consultation and participation plan (CPP). Grievance redress mechanisms (GRM) and protocols are to be established for contact between local communities and the construction workforce and included in the CEMP provisions;

(iii) Implementation of a communicable disease awareness and prevention program targeting risk of spread of STIs and HIV as outlined in the project's poverty and social assessment and gender action plan (GAP);

(iv) As per CPP requirements the Contractor will put up notice boards regarding the scope and schedule of construction, as well as certain construction activities causing local disruptions or access restrictions;

(v) The facilities (site office and work's yard) will be fenced and sign-posted to prevent unauthorized access by the general public;

(vi) Potable water, clean water for facilities/toilets with sufficient water supply, worker canteen/rest area and first aid facilities will be provided onsite. Adequate toilet facilities shall be installed and open defecation shall be prohibited. Separate toilets shall be provided for male and female workers;

(vii) To reduce possible disease vectors, standing and open water (including puddles, ponds, drains etc) within the camp or office/yard shall not be permitted;

(viii) To reduce risk of contamination of local water sources, wastewater effluent from Contractors' yard (if any) will be passed through gravel/sand beds or an oil separator and contaminants will be removed before discharging it into natural water courses. Oil and grease residues shall be stored, handled and disposed of as per the agreed WMP;

(ix) Post-construction, the Contractor shall remove their temporary facilities and cleaned up the affected area to the satisfaction of PUMA. The area shall be rehabilitated and waste materials removed to disposal sites approved by local authorities.

221. Effective implementation of the above measures will ensure that potential social impacts associated with the Contractor's site office and works yard will be adequately mitigated.

5.4.3 Traffic

222. Haulage of construction materials and SHP plant to site can create traffic congestion and/or nuisance if not managed carefully. Trucks can transport dirt and debris onto roads and create dust if not properly managed.

223. Mitigation measures shall include:

(i) Application of COEP 12 – Traffic Control During Construction;

(ii) Consultation with Ministry of Works as to most suitable haulage routes;

(iii) Traffic control measures (to be identified in the CEMP) e.g. site vehicle movements planned to reduce nuisance/congestion in residential areas;

(iv) Avoiding site vehicles idling in the vicinity of sensitive receivers (e.g. schools, church, health facilities). Construction vehicles should be prohibited from useing private driveways or to access these to turn or park; and

(v) Vehicles to be well maintained and cleaned (e.g. using a hose or wheel wash) prior to leaving the site to ensure dirt and debris are not dropped on public highways.

5.4.4 Worker Health and Safety

224. Ensuring the health and safety of employees is the responsibility of the Contractor. A health and safety plan (HSP) is to be submitted by the Contractor as part of the CEMP. The HSP will cover both occupational health and safety (for site workers) and community health and safety (for persons potentially affected by the works).

225. The purpose of the HSP is to establish routine safety measures and reduce risk of accidents during construction. The HSP will be appropriate to the nature and scope of construction activities, be based on industry best practice and at a minimum will be compliant with national regulations.[6] It will also, so far as is reasonably practicable, meet the World Bank's Environmental Health and Safety Guidelines (ESHG).

226. The HSP will include agreement on consultation requirements (workers and communities) established in the project's CPP, establishment and monitoring of acceptable practices to protect safety, links to the complaints management system for duration of the works (in accordance with agreed GRM), and a system for reporting and investigation of accidents, incidents and near misses.

227. Health and safety measures to be implemented by the Contractor include:

(i) Preparation of a HSP to include the identification, assessment and management of all hazards on site, and to be regularly reviewed and updated (at least bi-montly) in order to ensure the safety of all employees, the community and the environment.

(ii) Before construction commences, the Contractor shall conduct awareness training for all workers on environmental, health and safety matters relevant to the site works, and as set out in the HSP;. ;

(iii) Regular meetings will be conducted to maintain awareness levels of health and safety issues and measures to protect the environment;

(iv) Legal working hours and official holidays to be respected. Any minimum wage requirements to be observed;

(v) Before starting work, the workforce shall be provided with appropriate personnel protective equipment (PPE) suitable for their site construction activities such as safety boots, helmets, gloves, protective clothes, goggles, and ear protection, at no cost to the workers. Site agents/foremen will follow up to see that the safety equipment is used and not sold on;

(vi) The site office and works yard will be equipped with first aid facilities including first aid kits in construction vehicles. A suitable vehicle will be available for transport to Apia town for medical or emergency treatment if required;

(vii) Provision of potable water supplies, rest area and toilets/ablution facilities at work locations;

(viii) Emergency response and preparedness procedures, including drills; and

[6] Occupational Safety and Health Act 2002

(ix) All measures related to workers' health and safety shall be free of charge to the workforce.

228. The HSP (covering the workforce, site visitors and public safety) is to be submitted by the Contractor for approval by PUMA before construction commences.

5.4.5 Community Health and Safety

229. Community safety can be put at risk by works in public areas and when personnel and vehicles travel through residential areas.

230. General measures and requirements of the HSP which apply equally to community and workers have been discussed above. The HSP will cover measures to minimize risk to community safety including:

(i) Communication to the public through public/community consultation as per the provisions of the CPP including notice boards and meetings etc. regarding the scope and schedule of construction, as well as certain construction activities causing local diversion or access restrictions;

(ii) Secure barriers (e.g. fences) and signboards shall be installed around the site office and construction areas to deter access to or through the sites;

(iii) The general public/local residents shall not be allowed onto site;

(iv) Provision of safety hazard warning signs at the periphery of the site warning the public not to enter; and

(v) Strict enforcement of speed limits through residential areas and where sensitive receptors such as schools, hospitals, and other populated areas are located.

231. Such measures, properly implemented and monitored, will ensure risks to community health and safety during construction are managed to acceptable levels.

5.4.6 Physical Cultural Resources

232. Physical cultural resources refer to archaeological or other cultural remains. Even though no physical cultural resources are known to exist at the site, the precautionary principle should apply, to minimize risk to any sites or archaeological remains during excavation or other intrusive works.

233. To reduce risk or damage and address chance finds the following will apply:

(i) Apply relevant provisions of COEP 6 – Earthworks;

(ii) The CEMP will include procedures for chance finds, including coordination between the Contractor and the government authorities; and

(iii) The technical specifications will include the following: If the Contractor locates any archaeological artefact or site or suspected archaeological artefact or site they shall immediately cease operations and notify the engineer and PUMA forthwith. Work will cease until authorized by the PUMA.

234. Such measures will manage risk to physical cultural resources to acceptable levels.

5.5 Operational Impacts on Physical Environment

235. Following completion of construction, the Fuluasou SHP is expected to become operational in 2018. The Fuluasou SHP has a design life of approximately 80 years (R. Spittle MWH, pers. comm., 30/03/15).

236. **Hydrology**. The operation of the SHP will result in a change to the hydrology of the existing watercourses.

237. The operation of the Fuluasou SHP will result in a decrease in flows in the Fuluasou River between the dam and powerhouse (Figure 5-2). There will be no change in flow from downstream of the powerhouse, as water is being returned to the same catchment.

238. Mitigation measures to addess hydrology issues are to be developed during the design phase to ensure that environmental flows are achieved (refer section 5.1.2). The EPC will need to ensure that environmental flows are implemented and adhered to, particularly during low flow conditions.

239. **Water quality**. Operation of the SHP is not expected to result in any changes to water quality.

240. **Erosion**. The appropriate design and construction of the SHP will minimise the risks of erosion (as discussed in sections 5.1 and 5.2 above). This will also address the possibility for localised erosion and scour during operation.

241. **Waste and hazardous materials**. No waste or hazardous materials is expected to be generated through the operation of the Fuluasou SHP. Existing waste management procedures will continue at the Fuluasou substation.

5.6 Operational Impacts on Biological Environment

242. **Biodiversity**. The impacts of biodiversity during operation of the scheme is largely influenced by the effectiveness of mitigation, maintenance and monitoring implemented from the completion of construction, and by the strength of security measures to prevent unauthorised access.

243. At the Fuluasou SHP, planting of native vegetation will improve biodiversity values for flora and fauna. Weed control will be required to ensure that plantings survive and grow to maturity.

244. Indirect impacts of SHP construction and operation include improved access for people and vehicles, potentially leading to unrestrained forestry clearance, hunting of wildlife, cropping, grazing and agriculture. At Fuluasou, there are existing access roads present and little change is likely to occur.

245. The impacts on aqautic biodiversity at the SHP site includes a reduction in stream flows (and associated loss of habitat), the creation of barriers to fish passage, and risks of entrainment into infrastructure. Periodic dredging of the Fuluasou Reservoir will also be required to maintain storage capacity. Mitigation for these impacts have been addressed in previous sections and includes the use of environmental flows to maintain river levels and fish screens on inflow and outflow pipes.

246. Mitigation for construction impacts on biodiversity has largely been addressed in previous sections (5.1 and 5.3).

5.7 Operational Impacts on Socio-Economic Environment

247. **Noise**. The SHP will increase noise levels in the vicinity of the generator and powerhouse. This has the potential to disrupt local residents. Other parts of the SHP infrastructure have no moving parts and are not expected to produce noise.

248. The national Noise Policy states that noise generated from any power generator must not exceed an average of 75dB during the day and 60dB in the evenings and at night.

249. The Fuluasou SHP powerhouse is located within 50m of the nearest dwelling. The existing environment is urban with some noise-generating activities already present in the vicinity including the Fuluasou substation, Samoa Aquatic Centre, commercial premises and residential buildings. No acoustic assessment has been conducted, however it is likely that the generator will increase background noise levels.

250. Mitigation measures recommended to addess noise during operation include:

(i) Adherence to the national Noise Policy (PUMA, 2011);

(ii) The generator for the Fuluasou SHP shall be housed in a concrete building with sound sound proofing-or similar, to minimise the generation of noise.

251. **Traffic**. There is expected to be little to no increase in traffic as a result of the operation of the Fuluasou SHP.

252. The Fuluasou SHP powerhouse is adjacent to the existing Fuluasou substation. This site already has operational staff from EPC that visit the site, it is within urban Apia and is well serviced by roads and parking.

253. **Health and safety**. Health and safety for employees during the operation of the SHPs will be the responsibility of EPC. All staff are to be suitably trained and supervised to undertake their work safely.

254. Security of SHP infrastructure will be required at the Fuluasou SHP to discourage trespassing, the risk of accidents and vandalism. Burying the penstock removes the risk of unathoritsed access and vandalism to this section of the SHP but security, fencing and/or signage will be required at other parts of the sites.

255. At Fuluasou, existing security access gates can be retained but should be locked to prevent unauthorised access.

6. CONSULTATION, PUBLIC INFORMATION AND DISCLOSURE

6.1. Consultation and Public Information

256. Since 2011, the EPC has held several public consultations to prepare the project. During the preparation of the draft Resettlement Plan, complementary meetings were held with affected persons. Minutes of these meetings are to be found in the annexes of the draft Plan.

257. Consultation was undertaken for Fuluasou SHP following field visits conducted to the hydropower plant areas, meetings with the affected households and a review of the layout of the hydropower plant scheme. Based on the available information, the potential impact and land area for the components of the hydropower schemes has been estimated and outlined in the draft resettlement plan.

258. **Landowners and directly affected families**. A total of four families and two government agencies will be affected by the Fuluasou SHP. The existing components of the SHP fall within government land, including easements. The rehabilitation and reconstruction of the SHP will mainly follow the existing route. The survey map of MNRE for the existing components of the Fuluasou SHP shows that 44 acres of land was acquired in the present reservoir area by the colonial administrator, Government of New Zealand, between 1947 and 1949.

259. During the field visit conducted in July 2013 it was found that three households are encroaching on the acquired Government land area on part of the existing penstock and one household is cultivating land by encroaching on land by the reservoir. Two of the families have built houses by the existing penstock. The one family has built the main house and kitchen within half a meter of the penstock. The other family has built a kitchen and cultivated a garden close to the penstock. With the construction of the new penstock, the houses may be affected but where possible will be accommodated.

260. The old penstock route traverses the Faleata Golf Course. The golf course is managed by the Samoa Land Corporation Ltd, a government entity. The Craig Family Construction Company, located next to the Faleata Golf Course, built an apartment building in 2011 which encroaches over the easement of the old penstock. All the affected parties were consulted in 2013 and follow up meetings were held in September 2014 with Mr Craig and the Samoa Land Corporation.

261. At the meeting held with Mr Craig on 17 September 2014, it was agreed that the penstock would follow the existing legal easement from the dam to the powerhouse except for a slight realignment inside his property where a house and a new apartment were encroaching over the existing easement. It is understood that the EPC agreed to resurvey the realignment to accommodate these buildings, and also to ensure that the proposed penstock would be 2 meters away from the corner of a warehouse located on his property. EPC will register the new realignment of the legal easement on Mr Craig's property in exchange for the original legal easement at no cost.

262. **Other stakeholders**. The old penstock is currently above ground and it was explained that the new penstock would be placed underground. Mr Craig had concerns that his property could be damaged by the construction works and requested that there be minimal damage and disruption during the works. The new penstock will pass through the Faleata Golf Course. The EPC has consulted the Samoa Land Corporation on a number of occasions and has received verbal consent that it agrees in principle to the construction of an underground penstock traversing the golf course. Based on consultation during the PPTA study in 2013, Ms. Tupia and the Manager of the golf course (at the time) stated that they would like to have details of the proposal from EPC.

263. A meeting was held on 18 September 2014 with the current General Manger, Ms. Peseta Tiotio, and the plan of the proposed route was discussed with her. Ms Tiotio requested that the old penstock route be used through the golf course to ensure that there would be the least amount of damage and disruption to the course. She was concerned about significant disruption to the golfing activities. It was agreed that the route would follow the old route to minimize the disruption. The route would pick up from where it would be realigned through the Craig property. The EPC agreed to further discussions with the Corporation when details of the design were finalized and when the construction methodology was known. The nature of the disruption, the likely duration of the construction of the penstock and how the Corporation will be compensated for the loss of revenue would be confirmed at that stage.

264. The Tafeamaalii Philip Kerslake, Manager, Technical Division of the SWA was consulted previously and was concerned about whether rehabilitation of the dam and other facilities would create an inconvenience to the water supply system during the Commonwealth Youth Games in 2015 at the Tuanaimato Sports Complex (5-11 September 2015). The SWA would want a constant and reliable water supply to the facilities during the games. The construction of the Fuluasou SHP will commence after the conclusion of the Youth Games and so there will be no disruption to the water supply.

265. The SWA mentioned that the existing water facility installation may not be affected, unless the water mains from the intake need future repairs. The SWA will require access to their intake, which currently runs through the connection of the two streams. The SWA water mains are currently located underground of the existing access road and precautions will be required with the laying of the underground penstock. The EPC will need to work closely with SWA in preparing a schedule for the refurbishment of the Fuluasou dam, in the design of the access to the water intake, and with the construction of the new underground penstock.

6.2. Disclosure

266. Following the requirements of SPS and Public Communications Policy (ADB, 2011), project documents, including this IEE, will be disclosed on the ADB website and made available locally by EPC. The EPC will consult MNRE and update and reformat the IEE as required to comply with the requirements for a CEIA under the EIA Regulations and submit with the development consent applications as part of the statutory process. A water permit will also be required under Water Resources Management Act.

267. The IEE and EMP cleared by ADB will be updated and along with any conditions of development consent or water permit will be integrated into the contract documents including:

(i) A requirement for the Contractor to seek MNRE approval and update the EMP in the case of significant changes to the design;

(ii) The Contractor will prepare a CEMP based on the EMP from the approved CEIA for review and approval by the PMC and PUMA before commencement of construction. The CEMP will demonstrate the manner (method statements, detailed sub-plans, location, responsibilities, schedule/ timeframe, budget, etc.) in which the Contractor will implement the mitigation measures specified in the EMP and any additional measures required by MNRE as part of consent and permit; and

(iii) The GRM as described in the EMP.

268. Project documents will be disclosed and made available to the public and communities in an appropriate form and manner and kept in an accessible place as per the project's CPP. Appropriate measures from the CPP and GRM shall be included in the tender documents.

7. ENVIRONMENTAL MANAGEMENT PLAN

7.1 Introduction

269. The EMP covers all phases of the project implementation from preparation through commissioning and operation. It aims to ensure the monitoring of environmental impacts and implementation of mitigation measures.

270. The EMP includes the following information: implementation arrangements including: (i) institutional roles and responsibilities for EMP implementation throughout all stages of the project (procurement, design, construction, operation); (ii) capacity building requirements for the executing agency to ensure ADB's environmental management requirements are properly understood and fully implemented; and (iii) establishing and reporting of the GRM; and environmental mitigation and monitoring requirments covering: (i) potential environmental impacts that could occur during each stage of the project (pre-construction/design, construction, operation); (ii) proposed mitigation measures to address each impact identified; (iii) agency responsible for implementing each mitigation measure; (iv) monitoring tasks to ensure mitigation measures have been implemented effectively during each stage of the project; (v) schedule and responsibility for monitoring; and (vi) indicative costs associated with implementation of all aspects of the EMP.

7.1.1 Mitigation Measures

271. Environmental protection and mitigation measures will: avoid impacts where possible; mitigate environmental impacts; achieve compliance with national environmental regulations and ADB safeguard standards; provide compensation or offsets for lost environmental resources; and when possible, enhance environmental resources.

272. To ensure that mitigation measures contained in the EMP are successfully implemented appropriate steps will be taken to ensure that:

(i) The EMP from the appoved CEIA and updated as required following detailed design is to be included in the tender documents;

(ii) The tender document specifies that the Contractor will engage experienced staff to prepare and implement the required CEMP and other measures and undertake monitoring specified in the EMP

(iii) In response to the approved EMP and tender documentation, and based on the specific construction methodologies to be employed, the Contractor will prepare a CEMP for approval;

(iv) The Contractor is to submit their CEMP (including but not limited to site clearance procedures, site drainage, waste and material management, pollution control, traffic, noise and dust management,health and safety plan, environmental awareness training, GRM, and their associated supporting plans identified in this IEE) to EPC and PUMA for review and approval;

(v) Project documents are disclosed and made available to the public;

(vi) The GRM is made known to the public prior the start of the project; and

(vii) EPC ensures there are sufficient resources to oversee EMP implementation at the project site.

273. The EMP matrix incorporating the activities, impacts and mitigation measures required for the the proposed Fuluasou SHP, including monitoring requirements, is set out in Table 7.1.

7.2 Implementation of the EMP

7.2.1 Roles and Responsibilities

274. The MOF is the executing agency for the project and EPC is the implementing agency. As such EPC, though the existing PMU, will be responsible for overall implementation of the project. The PMU will be supported by the PMC. EPC through the PMU will be responsible for ensuring, on a day-to-day basis, that the EMP is implemented during each stage of the project (design, procurement, construction and operation). This includes ensuring that all GOS and ADB requirements and procedures relating to environmental safeguards are complied with.

275. Implementation of mitigation measures and monitoring during the construction and operational phases will be the responsibility of the EPC PMU. The construction and rehabilitation mitigation measures contained in this EMP will be included as necessary activities in the contract documents.

276. EPC will be responsible for ensuring that sufficient resources are in place to undertake its environmental safeguard responsibilities. The PMU will be supported by a PMC during all aspects of project implementation. The International Environmental Specialist (IES) and Environment Officer (EO) will support the PMU in the following tasks:

(i) Consult with PUMA and update and reformat the IEE as necessary to meet the requirements for a CEIA under the EIA Regulations and make the application for development consent on behalf of EPC and obtaining consent and additional permits as required;[7]

(ii) Consult with MNRE and support EPC to prepare an action plan to give effect to all of the mitigation and management measures, the action plan will include assisting the contractor to mark out construction limits and clearly identify mature trees to be protected during construction activities;

(iii) Preparation of the tender documents including integration of the EMP from the approved CEIA and draft method statements for various aspects of the EMP such as HSP, MSMP and WMP;

(iv) Ensuring that EPC, PMU and the Contractor are aware of any consent and permit conditions and their implications for project implementation;

(v) Work with the PMU's social specialists in respect of implementation of the CPP, GAP and GRM;

(vi) Supporting the EPC in tender evaluation with respect to the Contractor's environmental management capability and proposed EMP provisions;

(vii) Providing awareness training/induction on good environmental practice and the EMP requireemnts (updated as necessary based on detailed design) to the appointed Contractor;

(viii) Review and approval of Contractor's submitted CEMP, including site-specific requirements and methodology prior to contractor mobilization to the site;

(ix) Monitoring compliance of the Contractor with the approved CEMP and other provisions of the contract;

(x) Provide support and capacity building to MNRE's Forestry Division and DEC's Terrestrial Conservation Unit to properly enforce the Forestry Management Act and Protection of Wildlife Regulation;

[7] Initial and informal consultations indicate that PUMA will require CEIA rather than PEAR for this project given the sensitivity of project location. It should be noted that the CEIA is not equivalent to EIA under SPS.

(xi) Review of Contractor's monthly reports on effectiveness of safeguards application and any remedial measures undertaken;

(xii) Providing inputs to quarterly progress reports and six-monthly safeguards monitoring reports to be submitted to EPC and ADB; and

(xiii) Capacity building of EPC in environmental management and supervision aspects of project implementation.

277. The PMC will include an IES to oversee that the engagement of the specialist to prepare the AMMP and that it is implemented, the restoration plan is included in the turnkey contract package as an Employer's Requirements and Special Condition of Contract, and EMP design and construction requirements are fully integrated into the tender documents and assist EPC meet all its obligations for EMP and safeguards implementation, as outlined above.

278. A key aspect of the IES's role will be training and capacity building of the EO and other EPC staff (including management) in implementation of its obligations under applicable GOS regulations, as well as general training in safeguards to raise the awareness and build capacity of environmental management in EPC operations.

279. The EPC has a unit dedicated to social and environmental matters. The EO will lead the supervision of the EMP implementation and associated monitoring. It is advisable to temporarily reinforce the EPC's environmental capacity by seeking the assistance of IES to ensure the proper integration of the EMP measures into the Contractor work plan and the preparation of the CEMP. The IES will be contracted and paid from the grant budget and will provide intermittent assistance to the EPC environment division helping it to fulfil its supervision and monitoring responsibilities. The expert will also provide monitoring reports for the ADB. The EO with the guidance of the IES will undertake the incorporation of EMP provisions into the contract documents.

280. The Contractors will be engaged by EPC for construction and rehabilitation activities. Each Contractor will be responsible for the implementation of construction and rehabilitation activities for one site. The Contractors will have the responsibility for implementing the impact mitigation measures in the construction phase and the EO will supervise their performance. The Contractor will appoint staff who are specifically responsible for preparation and implementation of the CEMP. Based on the detailed design of the project, the Contractor will be required to prepare the CEMP, which describes the contactor's construction methodology and measures and plans for implementing the EMP, as specified in the tender contract. This includes maintaining a site diary and a grievance registry. The CEMP shall be approved by the EPC prior to the Contractor's mobilization to the site. The Contractor will be required to report on the implementation status of the EMP to EPC.

7.2.2 Grievance Redress Mechanism

281. EPC does not have a formal GRM. It has enquiry boxes where the public can deposit complaints or suggestions. The EPC Public Relations Officer (PRO) will extract documents from the inquiry box and distribute them to the relevant EPC persons for their response. Currently no records of complaints are currently held for existing SHPs and individual responses are not sent to complainants.

282. EPC will need to develop a mechanism for complaints to be taken into account and resolved, and information provided back to the complainant. The GRM needs to be a step-by-step procedure to receive, register and track all grievances raised by the community. The current referral procedure as used by PUMA could be adapted by EPC to address potential project and wider complaints in a more organized way.

283. For the project the following will be implemented as the GRM:

(i) Members of the public will have rights to make grievances known to the EPC and for them to be addressed, to the extent practicable and reasonable. During project construction, a Supervising Field Engineer, EPC PMU Head, EPC's PRO and, as required, members of the Environmental and Social Unit shall be available to address public concerns.

(ii) The Contractor is required to record any complaints received directly along with notes detailing how and when the issue was resolved.

(iii) The affected people will file their complaint through matai, women's council or village chief to the EPC–PMU community liaison team. The name and contact details of these individuals will be presented on a notice board within the village and/or town of the project area. Complaints can be also filed in person, via email or via a letter to EPC. The EPC liaison team will hear grievances and initiate appropriate remedial action;

(iv) For complaints over major issues, such as compensation, damage to property, or occupation of land during construction without due agreement, EPC-PMU will respond within 24 hours and arrange a meeting with appropriate personnel, including a representative of EPC-PMU to hear the complaint;

(v) If a solution, agreeable to all parties, is not reached within a period of seven days, depending on the nature of the grievance (e.g. land issue or environmental issue) the complainant may file the grievance with the Secretary of MNRE or Secretary of the Samoa Land Board, who will hear his/her grievance when the Board meets monthly;

(vi) If the complainant remains dissatisfied with the corrective action proposed, he /she may take his/her complaint to the Magistrate's Court. It is not anticipated that the level of complaints from the project will be such that current resources of the Court will be stretched. However, should this situation arise, the Court will appoint a Magistrate to deal specifically with project-related cases to avoid lengthy delays.

284. A register of project complaints will be maintained by the EPC–PMU, recording dates, name of complainant action taken and personnel involved. The Contractor will also be required to keep a register of complaints or issues and how and when they are resolved. These will be incorporated into the Contractor's Monthly Reports.

285. A summary on grievances and their status will be reported through regular progress reports and safeguard monitoring reports.

286. The process of documenting the GRM will include the following elements:

(i) Tracking forms and procedures for gathering information from the Contractor and complainant(s);

(ii) Updating the complaints database routinely (at least weekly);

(iii) Identifying grievance patterns and causes, promoting transparency and information disclosure, and periodically evaluating the effectiveness of the GRM, the environmental controls and their implementation; and,

(iv) EPC ensuring that the GRM is effective and accessible with the public made aware of the GRM and how to use it.

7.3 Monitoring

287. Environmental monitoring will be carried out and the results will be used to evaluate the extent and severity of actual environmental impacts against the predicted impacts and the performance of the environmental protection measures, or compliance with regulations, as set out below.

288. **Monitoring program.** The project monitoring program will focus on the environment within the project's area of influence and for threatened avifauna in the wider catchment.

289. **Monitoring parameters.** Monitoring parameters are detailed in the EMP matrix (Table 7.1). The monitoring program will, wherever feasible, focus on parameters which can be monitored by appropriate local specialists and equipment.

290. **Management.** During construction, the EPC will make appropriate arrangements for monitoring according to the progress of implementation. Monitoring reports will be made available to the EPC and PUMA (MNRE) as required, but no less that a monthly basis during construction. When complaints are received from the public (either directly or via the formal grievance redress mechanism), monitoring staff will conduct additional inspections immediately and report back accordingly on the cause, following which action will be taken to remedy where needed.

291. **Monitoring costs.** The continuing activities of the EPC's monitoring program during construction will be funded from the construction budget; EPC's ongoing monitoring costs (after the completion of construction) will be covered by their operational budget.

292. **Reporting.** The Contractor will prepare monthly reports which will include a description of CEMP implementation, any non-compliances or corrective actions required, what actions were taken and when these issues were remedied. These reports will be submitted to the PMU. The PMU will prepare quarterly progress reports which will cover safeguards aspects, including a summary of the Contractor's monthly reports and CEMP compliance monitoring undertaken by PUMA. EPC will also prepare safeguards monitoring reports to be submitted to ADB every six months.

293. **Disclosure**. The moitoring reports will be disclosed locally and uploaded to ADB's website.

Table 7.1: EMP matrix for proposed Fuluasou SHP

Environmental Issue/project activity	Mitigation and/or Enhancement Measures				Monitoring Plan			
	Measures and Actions	Responsible to Implement	Timing to Implement	Cost	Parameters to Monitor	Frequency & Verification	Responsible to Monitor	Cost
DESIGN & PRE-CONSTRUCTION								
Obtain development consent (other permits as required) and project disclosure	1. Consult MNRE and PUMA, update and re-format IEE as require to comply with CEIA and make development consent application and water permit application under statutory process 2. Ensure PUMA -approved CEIA and EMP and any conditions of development consent are included in Contract documents 3. Disclose project documents and establish GRM	PMU/PMC	Start of preconstruction and before start of civil works	Cost included in PMU/PMC admin and project costs	Environmental approval for the project (and SHP rehabilitation works per site) obtained from MNRE	Prior to signing of Contract and start of site works Once	PMU	Cost met by PMU/PMC staffing and project
Climate change adaptation measures to be properly considered and incorporated into design as necessary	1. Design criteria in respect of extreme weather events and peak floods. Critical structures include: (i) intake and discharge structures; (ii) headpond; (iii) powerhouse; and (iv) canal and penstock (including pipe bridges)	PMU/PMC	Contract documents preparation	Included in overall project cost	Civil design specifications in tender document Contractor's detailed civil design	Prior to signing off Contract and start of site works Once	PMU/PMC (IES & EO) PMU/PMC (IES & EO)	Included in overall project cost
Minimising vegetation clearance	1. All mature trees (and their dripline) within the project footprint shall be identified and clearly marked for protection during construction. 2. The location and footprint of the penstock route and its associated right of way will be aligned to retain as many mature native trees, including any *Dysoxylum* trees, as possible.	PMU/PMC	During detailed design phase	Design of the penstock route is included in overall project cost	Survey conducted and results incorporated into detailed design	Verify that survey is conducted (once). During detailed design phase	PMU/PMC (IES & EO)	Met by PMU/PMC staffing
Environmental design for maintenance of aquatic ecosystem – establish minimum flows	1. Project design to include provision for environmental flows 2. Environmental flows will be set at least at the 95th percentile of the flow duration curve 3. Environmental flows to be inherent in the intake structure design in order to avoid manual overrides during periods of low flow	PMU/PMC	SHP design Contract documents preparation	Included in overall project cost	Eco flows established; Hydraulic design specifications in tender document; Contractor's detailed hydraulic design	Prior to signing off Contract and start of site works Once	PMU/PMC (IES & EO)	Included in overall project cost
General ecological principles applied to design	1. Prevention of adverse flow turbulence 2. Infrastructure to allow for fish passage 3. Maintenance of natural waterway processes 4. Protection of terrestrial and aquatic habitat 5. Prevent degradation of water quality 6. Installation of fish screens on intake and outlet structures 7. Use of bridges in preference to culverts for river crossings	PMC	SHP design	Included in overall project cost	Design documents; stream, river and ecosystem health	Part of site and ecological monitoring	PMU	Included in overall project cost
Environmentally responsible procurement	1. EMP from approved CEIA updated as required following detailed design, refers as required to other plans, included in bid documents 2. Specify in tender document that Contractor shall engage appropriately qualified and experienced staff to take responsibility for environmental management and safety issues 3. Contractor to submit site specific Construction Environmental Management Plan (CEMP) based on EMP and contract for approval by PUMA/PMC 4. Contractor to recruit qualified and experienced staff to oversee implementation of environmental and safety measures specified in the EMP and contract	PMC, PMU, Contractor	Bid preparation and before start of civil works	Included in bid cost	Inclusion in bid docs Check compliance with items	Bid preparation stage Before start of site works	PMU / EO & IES	Cost met by PUMA project staffing
Environmental capacity development	1. EPC to commit to provide sufficient resources for project duration to oversee EMP implementation 2. PMC to train PUMA/EO in implementation of EMP as well as general training in safeguards requirements. A mix of	EPC, PMU, PMC, Contractor	Initiate during procurement period and continue throughout project	IES and EO cost included as part of PUMA (project) costs Contractor orientation	ADB loan covenants IES TOR, PMC progress reports to EPC/ADB Tender documents and	Prior to start of site works and throughout construction phase	PMU	Cost met by PUMA project staffing

Environmental Issue/project activity	Mitigation and/or Enhancement Measures				Monitoring Plan			
	Measures and Actions	Responsible to Implement	Timing to Implement	Cost	Parameters to Monitor	Frequency & Verification	Responsible to Monitor	Cost
	workshops and on-the-job training to be used 3. Conduct Contractor / workers' orientation on EMP provisions		construction	included in Contract cost	check during construction.			
Raise awareness of Contractor on env. management	1. Induction on requirements of country and ADB safeguards and environmental awareness training for Contractor staff	PMC	Before submission of CEMP	Cost included in project and contract	Approved CEMP	Before submission of CEMP	SEIA/ PMU	Cost met by PMU/PMC
Vegetation clearance planning	1. Following detailed design, in consultation with MNRE's Forestry Division and DEC's Terrestrial Conservation Unit, prepare a revegetation plan for the site specifying the number, species, size and location of native trees and shrubs to be planted timing of the replanting, monitoring and maintenance plan (including pest and weed control), and a bill of quantities for this item. 2. The revegetation plan will be included in the civil works contract package as a special condition of contract; 3. Mature trees to be protected from removal identified, marked and protected (fenced)	EPC, PMU/PMC and contractor	Immediately prior to, during and post construction activities	TBC	Number of trees to be protected viz removed Revegetation	Prior to start of construction civitie; During construction activities	PMU/PMC Contractor	TBC
CONSTRUCTION STAGE								
Physical Impacts								
Noise	1. Adherence to the national Noise Policy (PUMA, 2011) 2. Advance notice to nearby residents at start of construction activities 3. Construction equipment and vehicles will be maintained to a good standard, inspected daily, and shall be provided with mufflers/ silencers or similar 4. Adherence to legal working hours to avoid disturbance; schedule noisy activities between 0900 and 1700 5. Setting up a complaints register 6. Monitor and investigate complaints; remedy identified issues and propose alternative mitigation measures	Contractor	Throughout construction phase	Cost included in contract	Check implementation	Twice a month as part of routine construction monitoring	PMU	Cost met by PMU/PMC & project staff
Air quality and dust	1. Cover stockpiles and flatbeds of trucks when carrying loose materials 2. Reduce vehicle speed through settlement areas 3. Avoid prolonged idling particularly in settlement areas 4. Utilize vehicles with low emissions 5. Regularly clean construction vehicles (including wheels); and 6. Ensure watering of access road adjacent to residential areas during dry periods 7. Monitor and investigate complaints; remedy identified issues and propose alternative mitigation measures	Contractor	Throughout construction phase	Cost included in contract	Check implementation	Twice a month as part of routine construction monitoring	PUMA	Cost met by PMU/PMC & project staff
Erosion and loss of topsoil	1. Apply COEP 6, COEP 7, COEP 8 and COEP 9 as relevant 2. Contractor to prepare Erosion and Sedimentation Control Plan as part of CEMP 3. Construction materials obtained from existing quarries and comply with MWTI requirements 4. Schedule excavation activities in the dry season 5. As much as practicable, utilise and upgrade existing access roads to avoid the need for separate excavation corridors 6. Minimize vegetation clearance corridor or footprint of components 7. Ensure slope cuts are properly engineered and re-vegetated	Contractor	Throughout construction phase	Cost included in contract	Check implementation of all items; Turbidity of streams and river	Twice a month as part of routine construction monitoring	PUMA / PMC	Cost met by PMU/PMC project staff

Environmental Issue/project activity	Mitigation and/or Enhancement Measures				Monitoring Plan			
	Measures and Actions	Responsible to Implement	Timing to Implement	Cost	Parameters to Monitor	Frequency & Verification	Responsible to Monitor	Cost
	immediately after cutting 8. Install cut-off drains above excavated areas on steep slopes 9. Install river bank protection measures (masonry, gabion baskets etc) at intake, outlet and other key infrastructure to prevent erosion and scour 10. Stockpile topsoil for later use in landscaping 11. As far as possible ensure cut to fill balance							
Sedimentation and water quality (impacts due to site runoff)	1. Application of COEP 6 and COEP 13 2. Contractor to prepare Erosion and Sedimentation Control Plan as part of CEMP 3. Schedule excavation activities in the drier months 4. Align the intake access road adjacent to the headrace canal so as to avoid the need for separate excavation corridors 5. Minimize width of vegetation clearance corridor 6. Immediately re-vegetate and/or stabilize exposed surfaces and stockpiles 7. Use silt curtains when working in or near watercourses 8. Runoff to be directed to sediment traps before discharge to water course 9. Install cut-off drains above excavated areas on steep slopes to reduce erosion 10. Earthworks to be conducted during the dry season	Contractor	Throughout construction phase	Cost included in contract	Check implementation of all items	Twice a month as part of routine construction monitoring	PUMA	Cost met by PMU/PMC & project staff
Materials and Spoil Management	1. Application of CEOP 8 and COEP 9 2. Contractor to prepare Materials and Spoil Management Plan as part of CEMP 3. Construction materials, as much as possible, to be sourced from existing quarries 4. Balance cut and fill requirements to minimize need for aggregates from other sources 5. Areas for disposal to be agreed with land owner and recorded by the PUMA/PMC and monitored 6. Spoil will not be disposed of in rivers and streams or other natural drainage path 7. Spoil will not be disposed of on fragile slopes, flood ways, wetland, farmland, forest, religious or other culturally sensitive areas or areas where a livelihood is derived 8. Surplus spoil will be used where practicable for local repair works in consultation with local community 9. Spoil disposal shall not cause sedimentation and obstruction of flow of watercourses, damage to agricultural land and densely vegetated areas 10. Spoil disposal sites shall be located at least 50 m from surface water courses and shall be protected from erosion by early grassing and avoiding formation of steep slopes	Contractor, PMU, PMC	Prior to and during construction.	Cost included in contracts	Check implementation of items and MSMP provisions	Prior to commencement of construction. Monthly during construction	PUMA	Cost met by PMU/PMC & project staff
Waste Management	1. Prepare and implement Waste Management Plan as part of CEMP 2. Areas for disposal to be agreed with land owner and PUMA and checked, recorded and monitored 3. Segregation of wastes shall be observed 4. Recyclables shall be recovered and sold to recyclers	Contractor, PMU, PMC	Prior to and during construction.	Cost included in contracts	Check implementation of items and WMP provisions	Prior to commencement of construction. Monthly during construction	PMU / PMC	Cost met by PMU/PMC & project staff

Environmental Issue/project activity	Mitigation and/or Enhancement Measures				Monitoring Plan			
	Measures and Actions	Responsible to Implement	Timing to Implement	Cost	Parameters to Monitor	Frequency & Verification	Responsible to Monitor	Cost
	5. Site offices and works yard shall be provided with garbage bins 6. Burning of construction and domestic wastes shall be prohibited 7. Disposal of solid wastes into drainage ditches and public areas shall be prohibited 8. All general solid waste will be collected and removed from the work areas and disposed in local waste disposal sites as identified by PUMA							
Use of hazardous substances and hazardous waste disposal	1. Hazardous substances shall be stored in adequately protected sites consistent with international best practice 2. All areas intended for storage of hazardous materials will be bunded, secure and provided with adequate facilities to deal with emergency situations 3. Segregate hazardous wastes (e.g. oily wastes, used batteries, fuel drums) and ensure that storage, transport and disposal shall not cause pollution 4. Ensure all storage containers are in good condition with proper labeling 5. Regularly check containers for leakage and undertake necessary repair or replacement 6. Store hazardous materials above possible flood level 7. Used oil and other hazardous materials, including oil contaminated water shall be disposed of off-site at a facility authorized by the PUMA/PMC 8. Ensure availability of spill cleanup materials specifically designed for hazardous substances stored on site; designated staff shall be trained in clean-up procedures 9. Spillage will be immediately cleaned up with waste disposed to an authorized facility	Contractor	Throughout construction phase	Cost included in contracts	Check implementation of all items	Monthly	PMU	Cost met by PMU/PMC & project staff
Biological Impacts								
Removal of vegetation	1. Vegetation clearance shall be minimised to the extent necessary to allow for the construction of the SHP. 2. Vegetation clearance is to be conducted outside of the main breeding season for land birds which is August to January (Watling, 2004). 3. A minimum five metre wide strip of vegetation is to be retained between the construction footprint and watercourses. Where this is not possible, this vegetation shall be hand-cleared to minimise disturbance. 4. Following the completion of construction, the sides of all access roads are to be spread with topsoil and revegetated. Any access roads to be retained shall be the minimum width required to allow for continued maintenance of the SHPs. 5. A Revegetation Plan is to be prepared specifying the number, species, size and location of native trees and shrubs to be planted at the completion of construction. Restoration plantings shall utilise a diversity of native species, including *Dysoxylum* trees where this species forms part of the vegetation and canopy. 6. Install locked gates and security to restrict unauthroised access for people and vehicles prior to, during and post-construction (ongoing). 7. Felling of vegetation and planting of crops by construction	EPC, PMU, Contractor	Throughout construction phase	Revegetation Plan estimated to cost $3,000 Plant supply and planting estimated at US$20/tree Other costs met by PMU/PMC staffing and included in overall project costs	Check implementation of all items	Monthly	PMU	Cost met by PMU/PMC & project staff

Environmental Issue/project activity	Mitigation and/or Enhancement Measures				Monitoring Plan			
	Measures and Actions	Responsible to Implement	Timing to Implement	Cost	Parameters to Monitor	Frequency & Verification	Responsible to Monitor	Cost
	workers shall be prohibited.							
Impacts on threatened avifauna	1. No construction activity or vegetation clearance is to occur within 100 metres of an occupied nest of an endangered or critically endangered species. 2. Install locked gates and security to restrict unauthorized access for people and vehicles prior to, during and post-construction (ongoing) 3. Prohibit workers from poaching or hunting any birds or wildlife from within the project area or adjacent catchment. 4. Involve and educate the local community in the importance of the Apia Catchments KBA as habitat for avifauana and threatened avifauna.	EPC, PMU, MNRE, Consultant, Contractor	Prior to, during and post-construction	Aerial pest control is conservatively estimated to cost $200/ha, or approximately $20,000 per year. Education, community engagement estimated to cost $2,000 per year. Other costs met by PMU/PMC staffing incl. in overall project costs	Check implementation of all items Sanctions to be imposed on workers caught poaching or otherwise unlawfully accessing the site.	Monthly	PMU	Cost met by PMU/PMC & project staff
Impacts on river ecosystem	1. All petrol and hazardous materials are to be stored in a bunded area at least 20m from any watercourses 2. All stormwater runoff is to be diverted away from watercourses through bunds and trenches 3. Diversions and damming of river flows to be minimized 4. In-stream work should be scheduled for the driest time of the year 5. In-stream construction be completed as quickly as possible to lessen the impact on fish and habitats 6. Fish screens are to be installed on SHP inlets and outlets 7. Installation of infrastructure is to minimise restrictions on fish passage 8. Monitoring of pH, TSS, TPH and heavy metals 9. Monitoring of fish and macroinvertebrate communities 10. At completion of in-stream works disturbed areas shall be replanted with native vegetation	Contractor	Prior to, during and post-in-stream construction activities	Cost included in contract	Visual observation; Check implementation of all items	Weekly during works	PMU /PMC (IES & EO)	Cost met by PMU/PMC & project staff
Impacts of reservoir dredging	1. Work is to be conducted during the dry season 2. Dredging is to be staged, working from upstream to downstream 3. Use of silt curtains around the area of staged works to prevent sediment discharges 4. Dredged material to be stockpiled on land to be dewatered naturally before being removed 5. The dewatering area is to be bunded with silt curtains 6. Dredged material is to be disposed of off-site to landfill or to an existing cleared area	Contractor	During dredging activities	Cost included in contract	Visual observation Check implementation of all items	Weekly during works	PMU /PMC (IES & EO)	Cost met by PMU/PMC & project staff
Socio-economic Impacts								
Traffic	1. Application of COEP 12 – traffic control during construction 2. Traffic control measures identified in CEMP 3. Consultation with MWTI as to most suitable haulage route 4. Traffic movements planned to reduce nuisance/congestion in residential areas 5. Vehicles to be well maintained, and cleaned prior to transportation to ensure dirt, debris and weeds are not dropped on roads and streets	Contractor MWTI	Prior to construction (CEMP) Throughout construction period	Cost included in contracts	Check implementation of items	Prior to commencement of construction. Monthly during construction	PMU /PMC	Cost met by PMU/PMC & project staff
Establishment of site office and works yard	1. Induction of workers on requirements of the project's CPP, GRM and contact with local communities 2. Implementation of a communicable disease awareness and prevention program targeting risk of spread of STIs and HIV as	Contractor	1, 2: One month before start of works 3 to 9: Throughout	Cost included in contracts	Check implementation of items	Prior to commencement of construction. Monthly during	PMU /PMC	Cost met by PMU/PMC & project staff

Environmental Issue/project activity	Mitigation and/or Enhancement Measures				Monitoring Plan			
	Measures and Actions	Responsible to Implement	Timing to Implement	Cost	Parameters to Monitor	Frequency & Verification	Responsible to Monitor	Cost
	outlined in the project's poverty and social assessment (PSA) and gender action plan (GAP) 3. Apply relevant provisions of COEP 5 – construction camps 4. As per CPP requirements the Contractor will put up notice boards regarding the scope and schedule of construction, as well as any construction activities likely to cause disturbance or restrict access 5. The facilities (site office and work's yard) will be fenced and sign-posted and access or entry by the public will be prohibited 6. Potable water, clean water for facilities/toilets with sufficient water supply, worker canteen/rest area and first aid facilities will be provided onsite; adequate toilet facilities shall be installed and open defecation shall be prohibited; separate toilets shall be provided for male and female workers 7. Standing and open water within the camp or office/yard shall not be permitted in order to reduce disease vectors 8. Wastewater effluent from Contractors' yard (if any) will be passed through gravel/sand beds or an oil separator and contaminants will be removed before discharge to natural water courses 9. Post-construction the Contractor will remove all their temporary facilities and equipment and clean up the vacated areas to the satisfaction of the PMU		construction phase			construction		
Occupational Health and Safety	1. Contractor will conduct training for all workers on health, safety and the environment 2. Regular toolbox talks will be conducted to maintain awareness of health and safety requirements 3. Contrcator to implementa health and safety plan element of approved CEMP 4. Legal working hours and official holidays to be respected. Any minimum wage requirements to be observed 5. Before starting work, the workforce shall be provided with all appropriate personal protective equipment (PPE) suitable for their site activities at no cost; site agents/foremen will follow up to ensure that safety equipment is properly used and not sold on 6. The site office and works yard will be equipped with first aid facilities including first aid kits in construction vehicles; a suitable vehicle will be available for transport to Apia town for medical or emergency treatment if required 7. Provision of potable water supply in all work locations 8. Fencing shall be installed on all areas of excavation greater than 1m deep and at sides of temporary works 9. Contractor to maintain records of incidents, accidents and near-misses and corrective actions	Contractor	Prior to and during construction phase	Cost included in contracts	Check implementation of items	1: Before construction 2 - 8: Monthly	PMU /PMC	Cost met by PMU/PMC & project staff
Community Health and Safety	1. Communication to the public through public/community consultation as per the provisions of the CPP 2. Barriers (e.g. fences, gates) and signboards shall be installed around the camp and construction areas to deter access to or through the sites 3. The general public (including local residents) shall not be allowed in the construction sites; all visitors are to report to site reception and be inducted if entering the works areas	Contractor	At all times throughout construction phase	Cost included in contracts	Check implementation of items	Monthly	PMU /PMC Approved service provider	Cost met by PMU/PMC & project staff

Environmental Issue/project activity	Mitigation and/or Enhancement Measures				Monitoring Plan			
	Measures and Actions	Responsible to Implement	Timing to Implement	Cost	Parameters to Monitor	Frequency & Verification	Responsible to Monitor	Cost
	4. Strict imposition of speed limits through residential areas and where sensitive receptors such as schools, hospitals, and other populated areas are located							
Impacts on physical cultural resources, chance finds	1. Apply relevant provisions of COEP 6 – Earthworks 2. The CEMP will include procedures for chance finds, including a coordination mechanism between the Contractor and the MNRE/PUMA to be implemented in case of a chance discovery during works 3. The technical specifications will include the following: If the Contractor locates any archaeological artefact or site or suspected archaeological artefact or site they shall immediately cease operations and notify the engineer and PUMA forthwith. Work will cease until authorized by the PUMA	Contractor, MNRE, PUMA	As required	Included in contract	Chance find procedure incl. in CEMP; Check implementation of items	As required	PMU /PMC	Cost met by PMU/PMC & project staff
OPERATION STAGE								
Maintenance of aquatic ecosystem and resources;	1. Ensure minimum ecological flows maintained 2. Raise awareness amongst local communities on the values of protecting water catchments and constituent biodiversity and their multiple benefits if managed well 3. Encourage villages to develop conservation areas in order to manage plantation development 4. Promote tree planting programs and watershed restoration activities 5. Allow limited access to specific areas for recreational purposes and provide appropriate infrastructure for controlled recreation 6. Install information signage at access points in Samoan and English covering the rules or restrictions on access, and on development activities such as agricultural activities and the harvest of natural resources 7. Promote awareness about the dangers of invasive species	EPC, MNRE (Forest Division), SWA	Operation phase	Included in overall project cost	Watershed, River flow immediately downstream of intake	Against baselines; As required: Periodically during dry periods	EPC reporting	Included in EPC Operation and maintenance costs
Biodiversity protection and conservation	1. All plantings are to be maintained for a minimum of five years, by way of monthly checks for survival, manual or chemical weed control, and replacement planting.	EPC	Operation Phase	Plant maintenance estimated at US$50/tree/yr Aerial pest control is conservatively estimated to cost $200/ ha or approximately $20,000 per year.	Tree maintenance, weed control and replanting undertaken.	Monthly	EPC	Included in EPC O&M costs
Public safety around project facilities	1. Gates and secure fencing to be provided to ensure no public access 2. Keep out signs erected 3. Gates to be kept closed and locked at all times	EPC	Operation phase	Included in overall project cost	Security fencing intact and effective	Periodically during routine maintenance activities	EPC	Included in EPC O&M costs
CUMULATIVE IMPACTS								
Cumulative impacts caused by water abstraction	1. Ensure implementation and adherence to environmental flows 2. EPC to install flow monitoring devices at all intake to determine in-stream flows and volumes abstracted into the SHP	EPC, PMU, PMC	Operation phase	Included in overall project cost	SWA consulted. Eco flows established. Hydraulic design specifications in tender document Contractor's detailed hydraulic design	Prior to signing off Contract and start of site works.	PMU/PMC	Included in overall project cost

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Project Benefits

294. The proposed project will result in substantial diesel saving and commensurate greenhouse gas emission reduction and improve the energy infrastructure of this part of Samoa. The other benefits generated from this project are:

(i) Saving diesel consumption and importation;

(ii) Reducing the price of electricity;

(iii) Reduced dependency of Samoa on fossil fuels for energy production and diversification of its electricity sources;

(iv) Increasing the proportion of renewable energy in national energy production; and

(v) Supporting and strengthening the capacity of MNRE and other key national partners to more effectively plan and implement its responsibility for environmental protection and management.

295. The project's benefits in energy savings have been estimated and are shown in Table 5.2. In addition to the significant total savings in fuel per year is the prevention of associated pollutants from combustion of fossil fuels entering the local air-shed and attendant pollution risks from storage and use of hazardous chemicals.

8.2 Conclusions

296. The proposed Fuluasou SHP is a highly modified environment. No significant adverse environmental impacts that are irreversible, diverse, or unprecedented have been identified. The IEE concludes that the potential negative impacts arising from the construction of the Fuluasou SHP on the site of an existing (damaged) SHP will be relatively minor, localized and acceptable, providing that the set of mitigation measures described in the IEE and tabulated in the EMP are incorporated in the design and implemented properly.

297. The EMP identifies potential environmental impacts arising from the project along with a corresponding schedule of mitigation measures to ensure potential impacts that may not be avoided through optimised design are otherwise satisfactorily managed. It also includes the institutional arrangements for implementing the EMP to ensure its effectiveness on the ground.

298. This IEE, including the EMP, is considered sufficient to meet ADB's and GOS environmental safeguard requirements. No further or additional impact assessment is considered necessary at this stage.

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APPENDIX A: NESP: KEY ENVIRONMENT SECTOR OBJECTIVES RELEVANT TO THE PROJECT

The Key Environment Sector Objectives are excerpted from the National Environment and Development Sector Plan 2013-2016.

Key Environment Sector Objective 1 – to implement strategies for rehabilitating, protecting and conserving priority terrestrial (upland, lowland and coastal) habitats and species:

- **Create effective and representative terrestrial protected and conservation areas:** (i) acquire legal status for proposed terrestrial KBA network; (ii) integrate the management of existing national parks and reserves into the KBA network.; (iii) develop KBA management plans (including upscaling existing parks management plans) and secure funding for effective implementation; (iv) promote the replanting of native trees and other vegetation in the urban built environment; (v) encourage and support the creation of community managed protected areas; and (vi) secure resources to support community managed terrestrial protected and conservation areas.
- **Encourage and facilitate the participation of land owning communities in the management of KBAs:** (i) raise awareness and educate local communities of the strategic and conservation importance of the KBA network; (ii) investigate the payment of ecological services approach for engaging villages and individual land owners in the protection of critical habitats including water catchment areas, and areas of high conservation values; (iii) encourage and support ecotourism and other sustainable income-generating activities by local village groups as integral parts of KBA management; (iv) provide basic training for village representatives in habitat and species monitoring and reporting; (v) provide opportunities for local communities engaged in conservation initiatives to share their experiences and knowledge.
- **Reduce other pressures on terrestrial habitats and species:** (i) explore and where appropriate, implement ex-situ conservation measures to ensure the survival of the Manumea, Maomao and other critically endangered endemic bird species (i) assist local communities to enforce existing regulations as well as the monitoring of resources; (iii) strengthen the implementation and enforcement of existing planning frameworks by providing additional resources including additional staff.[8]
- **Strengthen the capacity of MNRE and other key national partners to more effectively plan and implement its responsibility for environmental protection and management: (i)** encourage compliance with COEPs on impact studies and project design; (ii) support PUMA training for private sectors on standards and COEPs; (iii) strengthen the enforcement of sustainable land management practices and through harmonizing the land tenure system; and (iv) strengthen integrated land use planning amongst the key national stakeholders: MNRE, MAF, MWCSD, and infrastructure services.

[8] The NESP identifies the following: review and update the 2004 National Biodiversity Strategies and Action Plan (NBSAP). Secure funding and implement the updated NBSAP priorities; review and update the 2008 – 2011 National Invasive Action Plan (NIAP). Secure funding resources and implement the updated NIAP priorities; and review and update Samoa's National Action Plan (NAP) for land degradation. Secure funding, build local capacities and implement the updated priorities.

Key Environment Sector Objective 3 – to implement strategies for the restoration of habitats critical to species and recovery of species populations of conservation concerns:

- **Policy/legal frameworks and implementation:** (i) strengthen the implementation, monitoring and enforcement of existing legislation that offers protection, management and conservation of listed species of conservation concern; (ii) promote eco-tourism operations beneficial to the conservation of species and critical habitats; (iii) implementation and monitoring of national/international obligations under CITES; (iv) encourage community programs that would assist with the recovery of the listed species of conservation concern including the re-introduction of the designated species; (v) increase and promote the awareness of the general public with regards to these species; and (vi) secure resources to assist with recovery programs and costs.

Key Environment Strategic Objective 6 – to implement strategies for protecting key environment resources such as forest land, water & fisheries:

- **Policy frameworks to help reverse deforestation and forest degradation and promote sustainable use and management of forests as well as their conservation and restoration:** (i) formulate, implement and enforce sustainable use of forest management plans and regulatory tools; (ii) rehabilitate critical degraded areas within the upland and lowland habitats; (iii) implement and enforce the Forest Policy, Forestry Management Act 2011, regulations through the MNRE Authorised Officers and Village Council, Committees; and (iv) develop effective partnerships with NGOs/CSOs (komiti tumama, schools).
- **Improve knowledge and understanding of forests resources:** (i) conduct ecological restoration programmes with communities and schools; (ii) build capacity and strengthen community engagement to sustainably manage forest resources; (iii) produce maps and spatial data for forestry, PA networks, hazards, water catchments areas etc; and (iv) enhance public awareness programmes to foster active participation from the general public, communities, schools, stakeholders in forest resource management.
- **Improve the enabling environment for sustainable forest management:** (i) formulate sustainable forest policy and management plans for protected forest areas with all stakeholders; (ii) enforce ongoing monitoring and evaluation of policies and plans with key stakeholders; (iii) promote partnerships with communities, Working Committees, private sector, tour operators etc in the management and monitoring of forests areas; (iv) mainstream and integrate forest issues into other sector policies/plans; and (v) develop community programmes to rehabilitate and restore critical degraded habitats through conservation projects for forests and sustainable land management.
- **Strengthen community engagement in sustainable forest management:** (i) active participation of communities in forest conservation projects; (ii) forest and protected area management (FPAM).

Key Environment Sector Objective 8 - to facilitate the direct participation of local communities (village councils, women, youth, private sector and other local groups) in the planning and management (including monitoring) of habitats and species in areas under communal ownership and control:

- **Broad public participation in decision-making:** (i) all members to be actively engaged in sustainable development by incorporating specific knowledge and practical know-how into national and local policy making; (ii) easy access to information and communication technologies to share information and decision makers to be accountable; (iii) initiate and support capacity building activities for local communities (NGOs etc).

- **Target villages and customary land owners whose land hosts habitats and species of high conservation value, for awareness raising activities:** (i) provide information and support to villages whose assistance and support are crucial to the protection of KBA; (ii) review and update the 2012 SOE Report Card and distribute widely to schools, village organizations and the general public; (iii) support information dissemination through the use of mass media outlets.
- **Encourage community and individual landowners' participation in business ventures that promote the sustainable use and management of natural habitats and species. Provide technical assistance and support as appropriate:** (i) consultations with communities on the payment for ecological services such as forest conservation, watershed protection, mangrove protection, marine protected areas, etc; (ii) encourage and support community involvement in ecotourism ventures; (iii) assist and support the development of renewable energy sources (biomass, solar, hydro, wind) on customary lands; and (iv) support relevant government initiatives targeting community involvement in habitat and species recovery activities including tree replanting in catchment and coastal areas, agro-forestry and permaculture systems, organic agriculture, waste management activities and other; (v)

Key Environment Sector Objective 9 - to strengthen the policy, regulatory, financial and strategic planning and management framework for environmental sustainability and disaster resilience:

- **Review and update existing legislation and regulations and enact new ones as appropriate to strengthen the capacity of MNRE and key stakeholders to enforce compliance:** (i) regular updates and monitoring for MNRE Authorised Officers on compliance measures; (ii) enhance capacity of MNRE and stakeholders on the monitoring and reporting obligations for MEAs.; (iii) strengthen the capacity of MNRE and other relevant agencies for tracking and measuring physical and biological chemical, meteorological indicators for environmental health by investing in up-to-date equipment, information gathering activities and staff training; (iv) encourage and actively support inclusive and consultative approaches to planning and, where appropriate, the co-management of habitats and species under customary land tenure.
- **Improve environmental monitoring, enforcement and compliance to support national compliance, regional and international reporting.**
- **Improve access to and management of donor funds in close collaboration with between MOF, PSC, MNRE:** (i) encourage the use of natural resource valuations and payment of ecosystems services in national and sector level planning and decision making to strengthen environmental sustainability integration in national planning and budgeting; (ii) investigate the potential means of establishing a conservation trust fund earmarked for environment conservation and protection actions; and (iii) national trust fund arrangements to be explored.

Key Environmental Strategic Objective 10 - strengthen national capacity for environmental management, coordinate the NESP implementation, environmental monitoring and assessment:

- **Improved sector coordination of environmental initiatives through a robust and effective management framework:** (i) strengthen role of MNRE as the leading agency for the overall coordination of environmental monitoring, assessment and reporting; (ii) design and implement a multi-sector and multi-agency environmental monitoring programme that consolidate all environmental monitoring under different Divisions of MNRE and other agencies; (iii) the monitoring programme to harmonize data gathering activities, monitoring methods and protocols, indicators and metrics; (iv) facilitate the establishment of a centralized clearing house mechanism within MNRE that will house

all monitoring assessments data and reports and which will be accessible to all legitimate stakeholders; and (v) facilitate the mainstreaming and integration of environment and climate and disaster resilience strategies into all sector plans.