

Initial Environmental Examination

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SOLOMON ISLANDS URBAN WATER SUPPLY AND SANITATION SECTOR PROJECT

HONIARA CITY URBAN WATER SUPPLY AND SANITATION SUBPROJECTS

Prepared by the Solomon Water, Solomon Islands
for the Asian Development Bank

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CURRENCY EQUIVALENTS

(as of November 2018)

Currency Unit Solomon Islands Dollar (SBD)

USD 1.00 = SBD 8.023

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
ADWF	Average Dry Weather Flow
AUD	Australian Dollar
BCD	Bid and contract documents
BMP	Building materials permit (issued by Dept of Minerals - Ministry of Mines, Minerals and Rural Energy)
BOD	Biochemical oxygen demand
BOQ	Bill of quantities (in the contract)
CAC	Community Advisory Committee
CCP	Communications and consultation plan (of the Project)
CD	Chart datum
CEMP	Construction environmental management plan (of the contractor)
COD	Chemical oxygen demand
DDSC	Design and supervision consultant (supporting the PMU)
CSS	Country safeguard system
ECD	Environment Conservation Division (in MECDM)
EHSG	Environmental, Health, and Safety Guidelines (of World Bank Group)
EMP	Environmental management plan
ESO	Environmental safeguards officer (in the PMU)
FGD	Focus group discussion
GRM	Grievance Redress Mechanism
HDPE	High Density Polyethylene
HSP	Health and Safety Plan (part of the CEMP)
IEE	Initial environmental examination
IES	International environment specialist (in the DSC)
MDAPC	Ministry of Development Planning and Aid Coordination
MECDM	Ministry of Environment, Climate Change, Disaster Management and Meteorology
MID	Ministry of Infrastructure Development
MI/d	Million liters per day
PCCSP	Pacific Climate Change Science Program
PER	Public Environment Report (under the CSS)
PMU	Project Management Unit (in SW)
PDWF	Peak Dry Weather Flow
PWWF	Peak Wet Weather Flow
ROW	Right of Way
SBD	Solomon Islands Dollar (code)
SPS	Safeguard Policy Statement 2009 (of ADB)
STP	Septage treatment plant
SW	Solomon Islands Water Authority trading as Solomon Water
TOR	Terms of Reference
TSS	Total suspended solids
USD	United States Dollar
WB	World Bank
WBSP	World Bank Safeguard Policies
WTP	Water Treatment Plant

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EXECUTIVE SUMMARY

1. *The Project.* The Asian Development Bank (ADB), World Bank (WB) and Solomon Islands government (the government) have established the Solomon Islands Urban Water Supply and Sanitation Sector Project (UWSSSP). The Project aims to improve access to safe water and improved sanitation in urban and peri-urban areas by implementing high priority components identified in Solomon Water's 30-Year Strategic Plan and 5-Year Action Plan.

2. *Safeguards approach.* The sector Project overall comprises capacity building, a water awareness sanitation and health (WASH) component, and physical works—upgrading existing water supply transmission and distribution and sewerage networks (including sewer outfalls) and installing new water supply and sewage treatment facilities—in Honiara and other provincial towns. Several of the components will be identified and developed following Project approval and during implementation. An environmental assessment and review framework (EARF) has been prepared to guide the process for screening, assessment, review and monitoring of components that are designed and implemented following approval. This initial environmental examination (IEE) is the assessment of the components that have been defined during project preparation.

3. This IEE was conducted in accordance with ADB's Safeguard Policy Statement 2009 (SPS), with WB Safeguards Policies (WBSP) and the requirements of the Solomon Islands Environmental Act (1998), Environment Regulations (2008) and Environmental Impact Assessment Guidelines (2010). It was reviewed for compliance with WBSP and no discrepancies were identified. The Project is deemed Category B for environment per ADB's environmental screening, based on the most sensitive component, because the impacts are largely site-specific, related to the construction phase and can be readily mitigated and/or managed. This category is also appropriate under the WBSP. The IEE found no significant negative environmental impacts or risks that could not be mitigated. It determined that a full environmental impact assessment is not warranted. The IEE will serve as the Project's final environmental assessment and will be updated based on detailed design following approval.

4. *Component/Subproject Description.* The four proposed components or subprojects covered in this IEE are located in Honiara:

- i. Mataniko and White River trunk mains: Located in western and central parts of Honiara, this subproject will construct trunk mains, distribution mains, and replacement or refurbishment of wells and pumps.
- ii. Service reservoir capacity augmentation: This will increase water storage capacity through construction of additional water tanks in the elevated areas of Panatina and Titingge.
- iii. Sewer outfall rehabilitation: This will construct three new sewerage outfalls at Point Cruz, Naha, and King George VI.
- iv. Sewage pumping stations refurbishment: Located in western, central and eastern parts of Honiara, this subproject will include refurbishment of two existing sewerage pumping stations, construction of eight new sewerage pumping stations, and the construction of sewage transmission pipelines between pumping stations.

5. The fifth subproject in Honiara, a septage treatment facility, will construct a one-hectare reed beds filter septage treatment plant, tentatively east of Honiara in the same area as the existing landfill (Ranadi). As a precise location has yet to be secured for this facility, this component will be designed and implemented following Project approval in accordance with the process and procedures set out in the EARF.

6. *Anticipated impacts.* Scoping and assessment of the four subprojects has identified social and environmental considerations for the Project's pre-construction, construction and operational phases.

- Pre-construction considerations include climate change vulnerability; updating of the IEE and its environmental management plan based on detailed design and submission of application for development consent; (EMP); integration of the updated IEE and EMP and development consent conditions in the bid and contract documents; update of the Project's communications and consultation plan (CCP); grievance redress and management; disruption of utilities and services; identification of materials sources, materials extraction and application for building materials permits; biosecurity issues and introduction of alien and/or invasive species; land access arrangements;. Actions necessary to address pre-construction considerations will be included in tender documents and construction contracts.
- The construction phase impacts are site access and clearance; soil erosion and sedimentation control; haulage and stockpiling of construction materials; oil and hazardous materials management; dust control and on-site air pollution; solid waste management; benthic disturbances; construction noise and vibration; traffic management; community and occupational health and safety; potential damage to archaeological and cultural assets. Contractors will be required to prepare construction environmental management plans (CEMPs) based on the EMP included as part of the environmental assessment and reflecting their construction approach and methodology to ensure appropriate environmental management during the construction period.
- Operational considerations of the water supply and sewerage systems will include health hazards due to unplanned delivery of poor water quality; health and safety risks of reservoir, sewerage operation; and ongoing coastal water quality impacts resulting from the upgraded and rationalized sewage outfalls. Operational impacts will be addressed by incorporating the necessary measures, such as a water safety plan, in the design and use of appropriate operational procedures and by ensuring effective mitigation and monitoring plan for each subproject.

7. There will be no displacement of people and no impacts on rare or endangered terrestrial or aquatic species. Subproject sites are in urban or peri-urban settings and will not require terrestrial habitat alteration. As Project facilities will be constructed in relatively flat areas, there will be no significant modification of site topography.

8. *Environmental management plan.* Based on the Project's EMP, contractors will be required to prepare their construction EMP (CEMP) to ensure appropriate environmental management during the construction period. In responding to the Project's EMP, the CEMP is to be site and activity specific reflecting the contractor's construction methodology and approach and include all sub-plans (health and safety plan, traffic management plan, erosion and sediment control plan, waste management plan, hazardous substances management plan) as required.

9. *Climate change adaptation.* The Project will address the critical need for climate change resilience, given Honiara's vulnerability to the effects of intense rainfall. During the design phase hydrology and onsite flooding studies, including projected rise in sea levels, will be conducted for all proposed construction sites. For reservoirs, water supply trunk mains, sewerage pipelines and proposed structures in coastal areas, engineering assessment of potential site erosion will determine appropriate erosion protection.

10. *Institutional arrangements and capacity building.* The Ministry of Finance and Treasury is the executing agency and Solomon Water (SW) is the implementing agency for this Project. SW's Project Management Unit (PMU), supported by design and supervision consultants (DSC) will supervise the construction contractors and ensure that CEMPs are properly implemented and monitored. The PMU will designate an environment officer¹ who will work with the international environmental specialist in the DSC and will receive training and capacity building. Overall the DSC will: (i) support the PMU's environmental management; and (ii) provide training and guidance on environmental monitoring and use of a wastewater laboratory for both environmental monitoring and wastewater treatment facilities operation.

11. *Consultation and Participation.* SW conducted consultations during Project preparation and will continue to do so during the detailed design and construction phases following the guidance set out in the Project's CCP.

12. *Grievance redress mechanism.* The Project will adopt and adapt the grievance redress mechanism (GRM) currently used by the Ministry of Infrastructure Development (MID) for infrastructure projects. This will ensure procedures meet the requirements of Solomon Islands, SPS and WBSP..

13. *Conclusion and recommendations.* The findings of the IEE are that apart from updating based on detailed design no further environmental assessment is required. As part of the updating the IEE will be formatted as a PER and support the development consent application(s). The recommendations are:

- Following update, specific mitigation and/or design specifications of each subproject EMP will be included in the design process and integrated into the bid document along with any conditions of the development consent(s).
- It will be a requirement of the contract that each contractor will be required to develop and submit a CEMP prior to any physical works commencing.
- Construction contracts will also require the contractors to respond to the Project's CCP and GRM in their CEMP.
- Training of SW's personnel on operation and maintenance of the rehabilitated and new assets, including the wastewater laboratory should start before actual operation.
- Improved and strengthened operation stage monitoring of health and safety is required to reduce risks to the public and SW personnel.
- SW will continue the process of public consultation and information disclosure during detailed pre-construction, construction and operation phases as guided by the Project's CCP.

¹ Exact designation will be confirmed by PMU in due course

I. INTRODUCTION

1. The Asian Development Bank (ADB) and World Bank (WB) are supporting the Government of Solomon Islands (the government) to develop the Solomon Islands Urban Water Supply and Sanitation Development Sector Project (the Project) (

2. Figure I-1). The Project aims to improve access to safe water and improved sanitation in urban and peri-urban areas by implementing high priority components of the Solomon Water (SW) 30-Year Strategic Plan and 5-Year Action Plan. Project outputs include: secure and safe urban water supplies; effective, efficient and safe urban sanitation services; enhanced awareness of hygiene and water issues and sustained improved hygiene behavior; and the financial and technical sustainability of SW, the state-owned enterprise responsible for the management and development of urban water resources and sewerage services in Solomon Islands.

3. The Project will be implemented by SW and the Ministry of Finance and Treasury (MOFT) will be the executing agency. SW is establishing a project management unit (PMU) which will be supported by a design and supervision consultant (DSC). The DSC will include safeguard specialists who will provide training and capacity building to PMU, government staff (including regulatory agencies) and contractors as required.

4. The Project is designed as a sector modality which means that not all components or subprojects are known at the time of appraisal. As such, to comply with safeguard requirements an environmental assessment and review framework (EARF) has been prepared which establishes the process and procedures that must be followed for the screening, assessment, review and monitoring of each component or subprojects that will be prepared during Project implementation. The EARF will ensure that during implementation, the components and the Project overall, will comply with the requirements of the country safeguards system (CSS), WB's Safeguard Policies (WBSP) and the ADB's Safeguard Policy Statement 2009 (SPS). In addition to the EARF, this initial environmental examination (IEE) has been prepared for the four subprojects that have been developed during Project preparation. The IEE provides an assessment of the environmental impacts and risks created by the subprojects during pre-construction, construction, operations and maintenance. It is based on field visits to the proposed subprojects' areas; review of available information; and discussions with government agencies and communities in subproject areas.

5. This IEE has been prepared in accordance with the Project's EARF. The Project has been screened as Category B for environment due to the significance of its environmental impacts and risks which are largely site-specific, mainly related to the construction phase and many of which can be readily managed or mitigated through implementation of the measures identified in the environmental management plan (EMP).

Figure I-1: Location Map of subprojects in Honiara



Source: Project preparation consultants (2018).

II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

6. The environmental safeguards requirements of the Project will be implemented to comply with Solomon Islands' laws and regulations and the SPS and WBSP.

A. Country Safeguards System

7. **Environmental Laws and Regulations.** The Environment Act (1998) provides the legal basis for environmental protection and management. It provides the foundation of the Solomon Islands' environmental impacts assessment (EIA) system, under the jurisdiction of the Environment Conservation Division (ECD) of the Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM).

8. Depending on whether a proposed development is listed as a 'prescribed activity', the Environment Act requires one of two levels of environmental assessment, depending on the scale and anticipated impacts of a development proposal: (i) public environment report (PER) or (ii) environmental impact statement (EIS) for developments which may cause more serious impacts. The Environment Regulations 2008 further define the procedures for undertaking the environmental assessment of projects and the process of issuing development consent. ECD has confirmed that the IEE—as the level of assessment appropriate for Category B projects — is more or less equivalent to the PER of Schedule 1 activities which include the four subprojects or components covered here. Following Project approval and detailed design, the IEE will be updated and formatted as a PER for each subproject to facilitate application for development consents for each subproject.

9. Environmental standards for the Solomon Islands are still being developed. However, ECD generally advises project proponents to follow internationally recognized standards such as those of the World Health Organization (WHO). In addition, the Project will comply with World Bank Group's Environmental Health and Safety Guidelines (EHSG) which include standards for a range of parameters including air and water quality.

B. Other Relevant Laws

10. **The Environmental Health Act (1980)** provides for the management and control of public health in the Solomon Islands. It defines local authority responsibilities in relation to the construction, operation, and management of sewerage systems, including sewage disposal works. It also provides penalties for the willful pollution of a water supply source.

11. **The Town and Country Planning Act (1997)** provides for the administration of town and country planning in Solomon Islands; preparation of local planning schemes; and control and development of land. It applies to all urban areas.

12. **The Mines and Minerals Act (2008) regulates** the mining and extraction of aggregate or gravels from rivers. It requires that building material permits (BMP) be applied for prior to any extraction of construction or building materials. The application for BMP and may require a PER and will require preparation of an extraction plan.

13. **International conventions.** Solomon Islands is a signatory to a number of international agreements (treaties and conventions) with environmental and conservation implications as well as for the protection, promotion and safeguarding of cultural heritage and traditional knowledge. These are listed in Appendix 1.

C. ADB Safeguard Policy

14. Any investment funded or administered by ADB must comply with the requirements of the SPS. The SPS promotes the sustainability of project outcomes by protecting the environment and people from potential adverse impacts. The SPS comprises three safeguards—environment, involuntary resettlement, and indigenous peoples—which aim to avoid adverse impacts on the environment and people and if it is not possible to avoid then to minimize, mitigate, and/or compensate for adverse impacts; and to help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

15. In accordance with the SPS, screening and categorization of a project (including its subprojects and/or components) is undertaken to reflect the significance of potential project impacts or risks; to identify the level of assessment and institutional resources required for the safeguard measures; and determine disclosure requirements. Consequently, the SPS categorizes potential projects or activities into categories of impact (A, B, C or FI) to determine the level of environmental assessment required. The UWSSSP has been deemed category B for environment based on the significance of its potential environmental impacts and risks. An IEE is the appropriate level of assessment for a category B project.

16. The SPS requires compliance with the EHSR.

D. World Bank Safeguards Policies

17. The WBSP aim to prevent and mitigate potential damage to the environment and communities generated in the development process. The WBSP provide the environmental and social safeguard requirements that must be complied with during the identification, preparation and implementation of WB-financed programs and projects.

18. The WBSP applying to the Project include ten safeguard policies established to inform decision making, ensuring that projects financed by the WB are environmentally and socially sustainable. The Project triggers five of these policies: Environmental Assessment (OP/BP 4.01), Natural Habitats (OP/BP 4.04), Physical Cultural Resources (OP/BP 4.11), Indigenous Peoples (OP/BP 4.10) and Involuntary Resettlement (OP/BP 4.12). Table II-1 presents these five policies and their applicability to the Project.²

19. The EHSR are technical reference documents with general and industry-specific examples of good international industry practice. When one or more members of the World Bank Group are involved in a project, these EHSR are applied as required by their respective policies and standards. The General EHSR are designed to be used together with the relevant industry sector EHSR which provide guidance on issues in specific industry sectors. The EHSR contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. The applicability of the EHSR should be tailored to the hazards and risks established for each sub-project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are taken into account. The applicability of specific technical recommendations should be based on the professional opinion of qualified and experienced persons. When host country regulations differ from the levels and measures presented in the EHSR, projects are expected to achieve whichever is more stringent.

20. The General and Industry Sector EHSR are available at the following link - <http://www.ifc.org/ehsguidelines>. Contractors, as part of their construction environmental

² The Project preparation commenced in early 2018 and therefore the WB's new Environmental Safeguard Framework (ESF) does not apply. The ESF applies to projects and programs developed from October 2018.

management plan (CEMP), will be required to prepare an occupational and community health and safety plan for each subproject..

Table II-1: World Bank Safeguard Policies: Main Objectives, Applicability and Triggered by the Project

Safeguard Policies	Main Objective	Applicability	Application to the Project
OP 4.01 Environmental Assessment	The objective of this policy is to ensure that projects financed by the World Bank are environmentally sound and sustainable, and that decision making is improved through adequate analysis of actions and their possible risks and environmental impacts in the natural environment (air, water and soils); human health & security; physical-cultural resources; and global and transboundary and global environmental aspects.	<p>This policy is applicable when a project or sub-project has potential to cause negative environmental impacts in its area of influence.</p> <p>Depending on the project and the nature of its impacts, various instruments can be used. An ESMF (equivalent to EARF) is required for projects that comprise several sub-projects which will be fully defined only during project implementation. An ESIA/ESMP (equivalent to IEE) is required for projects that are fully defined during preparation.</p>	<p>Triggered:</p> <p>Environmental risks associated with the project include continued contamination impacts resulting from the discharge of untreated sewage, temporary noise, waste and air quality impacts associated with construction, potential limited vegetation clearing for the purpose of creating access to new water supply sources or pipelines, constructing the water treatment plants, etc.</p> <p>An Initial Environmental Examination (IEE (equivalent to WB ESIA/ESMP), the EARF (equivalent to WB ESMF) and Resettlement Framework (RF) (equivalent to WB RPF) and Resettlement Plan (RF) establish the process to mitigate these impacts. Consultations with stakeholders and affected communities are used to inform the decision-making process.</p>
OP 4.04 Natural Habitats	<p>This policy recognizes that the preservation of natural habitats is essential to protect original bio-diversity; for the preservation of environmental services and products for human society and for long term sustainable development.</p> <p>Therefore, the Bank supports the protection, management and restoration of natural habitats by funding projects as well as via political dialogue, sector work and the economic sector.</p>	<p>This policy is used by any Project or sub-projects considered as potential originator of significant changes (loss) or degradation of natural habitats, be it directly (through the construction) or indirectly (with the human activities caused by the project).</p> <p>OP4.04 defines a natural habitat as land and water areas where (i) the ecosystems' biological communities are formed largely by native plant and animal species, and (ii) human activity</p>	

Safeguard Policies	Main Objective	Applicability	Application to the Project
	By funding projects, the Bank expects the proponents to apply the precautionary principle in the management of natural resources, in order to ensure opportunities for sustainable environmental development.	has not essentially modified the area's primary ecological functions."	
OP 4.10 Indigenous Peoples	<p>For all projects proposed Bank funding that affect indigenous peoples, the Bank requires the borrower to undertake free, prior and informed consultation with affected Indigenous Peoples to ascertain their broad community support for projects affecting them</p> <p>The project financed by the Bank must include measures to: (a) avoid adverse effects on indigenous populations; or (b) when it is not possible to avoid the effects, minimizes, mitigates, or compensates for such purposes.</p> <p>The projects financed by the Bank are designed with the assurance that indigenous people receive social and economic benefits that are culturally appropriate and adequate gender and inter-generations.</p>	This policy is applied when the Project affects direct or indirectly indigenous people.	<p>The project is located in areas where Indigenous Peoples are the sole or the overwhelming majority of direct project beneficiaries.</p> <p>The project will focus on rehabilitating failed water supply and sanitation infrastructure or providing new infrastructure, this will benefit the community as a whole..</p> <p>An RF has been prepared which sets out the methodology for land acquisition / acces for the project, if needed. Once land access is required, the process will include consultations with local government, local communities and various community groups (i.e. youth and women groups). The IEE/EARF will ensure free and prior informed consultation is undertaken and broad community support is achieved for the project.</p> <p>The preparation of separate Indigenous Peoples (IP) instruments is not required; however, the project design and safeguards instruments integrate elements of an Indigenous Peoples Planning Framework (IPPF) and Indigenous Peoples Plan (IPP) into the RF.</p>
OP 4.11 Physical Cultural Resources	The objective of this policy is to assists countries to avoid or mitigate adverse impacts on physical cultural resources from	This policy is used by any Project or sub-projects considered as potential to cause changes (loss) or degradation of physical cultural resources.	<p>Triggered:</p> <p>The project involves construction works in modified urban and peri-urban areas, where it is unlikely that</p>

Safeguard Policies	Main Objective	Applicability	Application to the Project
	<p>development projects that it finances.</p> <p>Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people's cultural identity and practices.</p>	<p>OP 4.11 defines physical cultural resources as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance.</p> <p>Depending on the project and the nature of its impacts, various instruments can be used. An Environmental Assessment capturing impacts on physical cultural resources is required for the project and sub-projects.</p>	<p>unknown physical cultural resources will be encountered. However, a chance find procedure is included in the IEE to ensure appropriate measures are taken in the event cultural resources are encountered.</p>
OP 4.12 Involuntary Resettlement	<p>The objective of this policy is to (i) avoid or minimize involuntary resettlement, where feasible and explore all viable alternative project designs; (ii) assist displaced people in improving their former living standards, income earning capacity, and production levels, or at let in restoring them; (iii) encourage community participation in planning and implementing resettlement; and (iv) provide assistance to affected people regardless of the legality of land tenure.</p>	<p>This policy does not cover only physical relocation but any loss of income sources resulting in: (i) relocation or loss of shelter; (ii) loss of assets or means of livelihood; (iii) loss of income sources or means of subsistence, whether or not the affected people must move to another location. This policy also applies to the involuntary restriction of access to legally designated parks and protected areas, resulting in adverse impacts on the livelihood of the displaced persons.</p> <p>In these cases, the World Bank requires the establishment of a Resettlement Action Plan (RAP), based on the Resettlement Framework (RF) for any project or sub-project.</p>	<p>Triggered:</p> <p>The project involves the rehabilitation and expansion of failed water supply and sanitation infrastructure, as well as the development of new water supply and sanitation infrastructure. Water and sewerage networks will likely be subject to lease arrangements. Involuntary resettlements, if required, are expected to take place at a very limited scale.</p> <p>A Resettlement Framework (RF) has been prepared to assess potential impacts and outline measures to avoid, mitigate or manage these impacts. In the case land access is required, a Resettlement Plan (RP) will be developed. Communities will be consulted to ensure there are no pending issues. A formal grievance redress mechanism will be established to channel and manage potential grievances arising during project implementation.</p>

III. PROJECT DESCRIPTION

A. Overview

21. The four subprojects covered in this IEE and to be financed under the Project are located in Honiara City, Guadalcanal:

- Mataniko and White River trunk mains;
- Service reservoir capacity augmentation;
- Sewer outfall rehabilitation; and
- Sewage pumping stations refurbishment.

22. Construction activities for subprojects will generally include site clearing and marking of alignments; identification, extraction, haulage and stockpiling of construction materials; trench excavation by soil excavators or manual means; pipe laying and testing; trench backfilling and surface restoration; replacement or refurbishment of existing equipment; and cleaning and closure of construction sites. Construction equipment will typically include dump trucks, service trucks, payloaders, small road rollers, small concrete mixers, excavators, small compactors and small lifting cranes.

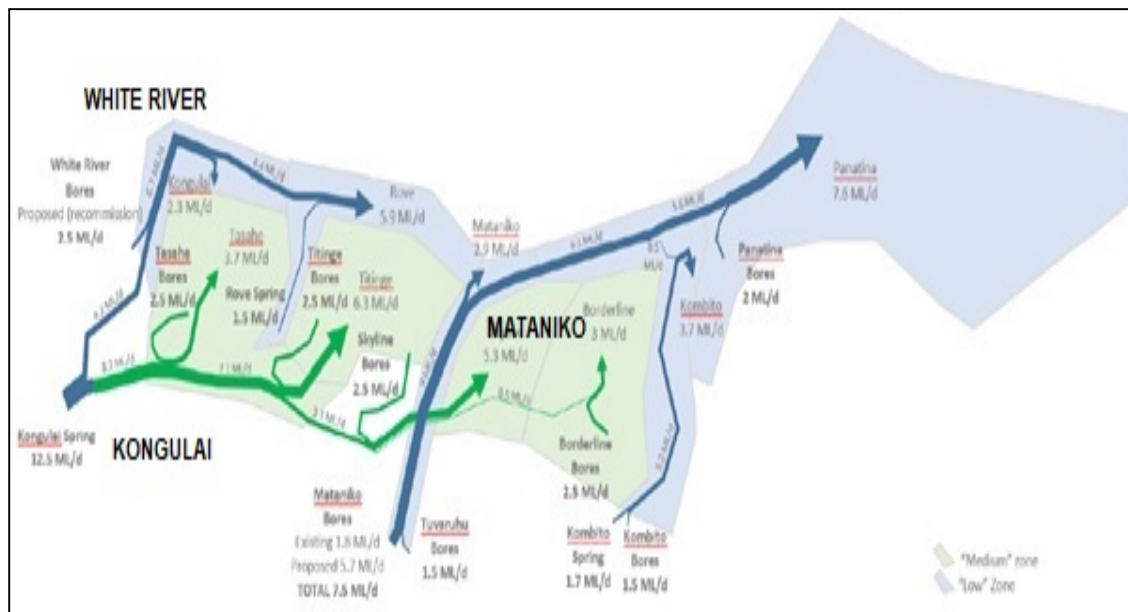
23. Where subprojects require pipeline construction, the pipes will be laid in prepared trenches (either equipment or manually excavated) to a desired depth and provided with sand bedding for pipe protection. Trenches will be backfilled with selected earth in layers, watered, rammed, and compacted to the satisfaction of the supervising engineer. Pipelines will be inspected and tested hydraulically after installation.

B. Mataniko and White River Trunk Mains subproject

B.1 Location and Present Situation

24. The proposed Mataniko and White River trunk mains subproject will improve the water service in Mataniko, Kongulai, and White River areas (Figure III-1). The existing water supply network requires continuous maintenance and improvement works due to the age of the system. It also has a large proportion of small diameter distribution pipelines, exacerbated by inadequately sized trunk mains feeding the zonal networks, resulting in poor supply pressures across the networks.

Figure III-1: Mataniko, Kongulai, and White River Areas



Source: Egis Eau. 2018b

B.2 Proposed Components

25. The subproject will construct: (i) three trunk mains (total length 5,450m) in the Mataniko area; (ii) one trunk main (2,760m) in Kongulai area; (iii) two distribution mains (total 3,400m) in White River area; and (iv) replacement or refurbishment of wells and pumps in the White River area. The White River wells will be recommissioned after cleaning and conducting yield tests.

B.3 Trunk and Distribution Mains Construction Activities

26. Pipe-laying activities will be relatively straight-forward given the size of pipes (400mm to 560mm) and the alignment of the pipelines alignment will be along existing roads. Replacement or refurbishment of wells and pumps will be confined to the well head area, requiring only a small construction footprint which will be enclosed by a fence.

27. This type of work is estimated to employ maximum 100 workers at peak construction, about 40 of whom are expected to be skilled workers from outside Honiara.

C. Service Reservoir Capacity Augmentation subproject

C.1 Location and Present Situation

28. The service reservoir capacity augmentation subproject will increase Honiara's water storage capacity through construction of additional water tanks at Panatina and Titingge areas (refer **Error! Reference source not found.**).

29. Honiara's current available storage capacity is around 45% of average daily demand. SW aims to increase storage capacity to around 56% of the average daily demand.

Figure III-2: Titingge Water Reservoir Site

Source: Egis Eau. 2018c.

C.2 Proposed Components

30. The subproject will involve construction of ground water reservoirs and around 950m of associated connector pipelines. At Panatina reservoir site, two units of circular steel 3 million liter per day (ML/d) tanks will be constructed; two units of circular steel 3 ML/d tanks will be constructed at the Titingge reservoir site. These reservoirs will be connected to the existing system.

C.3 Reservoir Construction Activities

31. Earthwork activities will be kept to a minimum as the sites are relatively flat. Peak construction is expected to employ 50 workers, 30 of whom are likely to be skilled workers from outside Honiara.

D. Sewer Outfall Rehabilitation subproject

D.1 Location and Present Situation

32. The sewer outfall rehabilitation subproject will involve three new outfalls to be located at Point Cruz, Naha, and King George VI (KGV). The proposed new outfalls will have discharge points without diffusers at: (i) -30m chart datum (CD)³ for Point Cruz, (ii) -47m CD for Naha, (iii) and -40m CD KGV to achieve the minimum dispersion requirements (150 EC/100ml only in 50% of cases; 1000 EC/100 ml in 10% of cases, when wind currents bring the plume directly to the coast) to satisfy the ANZECC microbiological water quality guidelines for marine and freshwater recreational areas (2003).

33. SW aims to reduce the current 17 sea and river outfalls to 3 or 5. Until the future wastewater treatment plant is operational, the Point Cruz Outfall will be retained to handle additional flows from the west. The Naha Outfall will handle the combined wastewater flows from thirteen existing outfalls east of the Mataniko River. A new outfall is needed for the new KGV gravity mains, which will handle all wastewater flows from the existing Ranadi-1 Outfall including flows from the Panatina area. Indicative locations of the proposed outfalls are provided in Figure III-3.

Figure III-3: Location Map of Proposed New Outfalls

³ Related to the admiralty chart datum, which is approximately the level of the lowest astronomical tide, located 0.4m below mean sea level (MSL) (0m CD = -0.4m MSL).



Source: Egis Eau. 2018d.

D.2 Proposed Components

34. The Naha and KGVI outfalls are designed according to SW's 2047 scenario for sewerage (Table III-1). The Point Cruz outfall is based on a 2037 scenario, by which time the future WWTP will make the Point Cruz outfall redundant. All outfalls will use HDPE PE100 SDR17 material, selected on the basis of its flexibility, cost-efficiency, and resistance.

Table III-1: Proposed Outfalls Flows

OUTFALL	ADWF (MLD)	PDWF (MLD)	PWWF (MLD)	ADWF (m ³ /s)	PDW (m ³ /s)	PWWF (m ³ /s)
Point Cruz (2037 flows)	5.4	11.4	27.1	0.063	0.132	0.314
Naha (2047 flows)	15.9	33.3	80.7	0.184	0.385	0.934
KGVI (2047 flows)	2.8	5.9	14.1	0.033	0.068	0.163

Notes: ADWF: Average Dry Weather flow; PDWF: Peak Dry Weather Flow = ADWF x 2.1; PWWF: Peak Wet Weather Flow = ADWF x 5.0

Source: Egis Eau. 2018d.

35. Details of the proposed sewer outfalls are presented in Table III-2. HDPE pipes have good resistance to hydrodynamic action (waves and currents), ground movement (soil liquefaction, scouring, differential settling, sliding, etc.), installation related forces, and impacts from floating wood, or anchors, trawls.

Table III-2: Details of Proposed Outfalls

Outfall Name	Outside Diameter (mm)	Inside Diameter (mm)	Depth of discharge (mCD)	Distance to the coast (m)
Point Cruz	500	440.6	-30.0	715
Naha	1,000	881.4	-47.0	785
KGVI	400	352.6	-40.0	495

Source: Egis Eau. 2018d.

D.3 Sewer Outfall Construction Activities

36. Details of the pipeline materials transport and stockpiling will be determined during the detailed design phase. However, it is common practice to float long pipeline sections to the site or assemble on-site by welding 12m-long sections and then weighted with concrete rings. The pipeline laid in trench will be backfilled with the dredged materials. Typical construction equipment used for this type of construction activities include deck barges, cranes, excavators, and tugboats.

37. The total workforce for this type of construction works is estimated to be 100 workers at peak construction, 70 of whom are likely to be skilled workers from outside Honiara.

E. Sewage Pumping Stations Refurbishment subproject

E.1 Location and Present Situation

38. The Honiara Sewerage System currently serves only around 20% of SW water customers with 12 independent wastewater catchments. The subproject will comprise refurbishment of the existing sewage pump stations at Point Cruz and King George VI; construction of eight new pumping stations; and construction of associated sewage transmission pipelines between pumping stations. The new pumping stations are Rove, Tuvaruhu, Vara Creek, National Referral Hospital/Mataniko, Naha, Panatina, Solbrew, and Soap. The structures (wet well, rising main, and emergency storage) are designed based on horizon 2037, while the pump specifications are given according to 2026 design horizon (Table III-3).

Table III-3: Pumping Stations Projected Design Flows

WWPS name	Design flows			
	ADWF 2026 (L/s)	PWWF 2026 (L/s)	ADWF 2037 (L/s)	PWWF 2037(L/s)
Rove	6.6	13.2	26.4	52.7
Point Cruz	17.4	34.8	51.6	103.3
Tuvaruhu	0.0	0.7	0.3	0.7
Vura	1.0	2.1	1.0	2.1
NRH/Mataniko	37.2	74.4	86.7	173.4
Naha (lifting station)	60.0	120.0	116.8	233.6
Panatina	7.4	14.8	7.4	14.8
Solbrew	14.8	29.5	14.8	29.5
King George VI	2.2	4.4	2.2	4.4
Soap	32.6	65.1	32.6	65.1

ADWF = average dry weather flow; PWWF = peak wet weather flow

Source: Egis Eau. 2018e.

E.2 Proposed Components

39. The sewerage pumping stations will have inlet manhole, wet well, valve chamber, emergency storage, and submersible pumps. Inlet manholes of the sewerage pumping stations will be equipped with manual vertical bar screens (50mm space) to protect the pumps against damage due to solids conveyed by the sewage. All sewerage pumping stations will have single wet-well to temporarily retain the sewage inflows and house the pumping system.

40. Submersible pumps will be installed in wet-wells to allow less costly and smaller footprint pumping stations. The valve chamber will house all the necessary gate valves and check valves for the operation of the pumping stations. The emergency storage structure will help avoid sewage overflows in case of pumping station failure. The associated sewage transmission pipelines between pumping stations are rising mains and gravity main. In order to ensure better constructability and to optimize the pumping stations' footprint, it is recommended to construct a circular shaped wetwell, less than 3m

diameter, at Rove, Tuvaruhu, Vara Creek, Panatina, Solbrew, and Soap, and a square or rectangular shaped wetwell above 3 m diameter at National Referral Hospital/Mataniko and Naha.

E.3 Sewerage Construction Activities

41. The use of pipe jacking method will be evaluated during detailed design. Pipe jacking is a technique for installing underground pipelines by tunneling. It provides a structurally sound and watertight pipeline as the tunnel is excavated. A thrust wall is constructed to provide a reaction against which to jack. A thrust ring is used to transfer the loads to the pipe to ensure that the jacking forces are distributed around the circumference of the pipe being jacked.

42. At peak construction, the total workforce for this type of work is estimated to be 100-150 workers, 50-60 of whom are expected to be skilled workers from outside Honiara.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

43. **Topography and geology.** Honiara, the capital city of Solomon Islands, is located at the northwestern coast of Guadalcanal. The island of Guadalcanal is mostly steep and rugged with a mountainous zone in the southern half of the island rising to over 2,300 m with a northwest-to-southeast trending spine. The mountains are flanked on the northern side by foothills that form an intermediate zone of intensely dissected plateaus, hills and rolling ridges (Hackman 1980). Guadalcanal Plains in the northern part is an alluvial zone with minimal relief. Honiara is a narrow low-lying coastal strip of land bounded by hills in the south.

44. The soils of Guadalcanal are a mixture of volcanic and sedimentary rocks, humus-rich, and base-poor. Willow loams and clays are at high altitudes, while young loams, clays and peats are in valleys and coastal plains.

45. **Groundwater.** Honiara City's main rock formation is limestone with large cave system where water is flowing like underground rivers such as the Kongulai spring (JICA. 2006). Kongulai spring has been the biggest source for water supply of Honiara. However, its discharge has reduced since October 2005. Small fractures have formed small springs from which groundwater is seeping out gradually such as Rove Spring and Kombito Spring.

46. **River systems.** Honiara has four major water catchments, and a number of small coastal watersheds. The major water catchments are the Mataniko, Rove, White River, and Lungga. Mataniko River cuts through the central built-up area of Honiara, while Lungga River meanders in the eastern part. The Mataniko River, Rove, and White River are used as recipients of solid and liquid wastes.

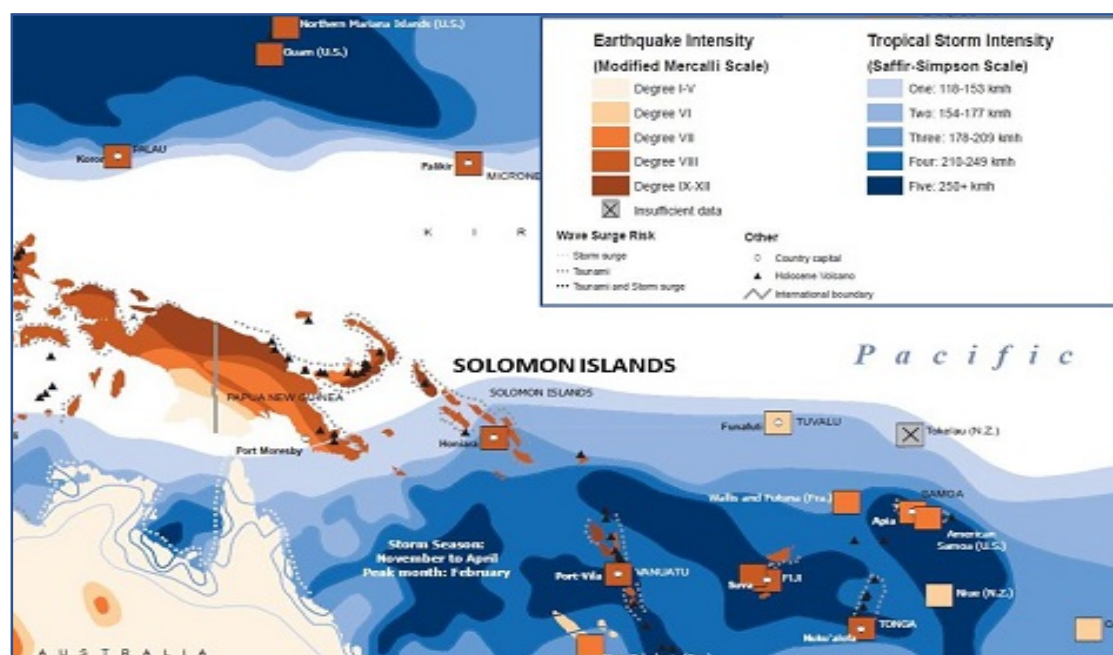
47. **Severe flooding of Honiara.** Honiara is vulnerable to severe flooding and has suffered flooding as a result of extreme rainfall since 2009. Most recently demonstrated in April 2014 when a slow-moving tropical depression delivered more than 732mm of rain over four days in Honiara. The resulting flooding affected approximately 52,000 people and caused severe damage to several residential and commercial areas and urban infrastructures.

Natural hazards. Solomon Islands has been identified by the WB as one of the top 15 countries exposed to multiple hazards (

48. Figure IV-1). The Project area is within a tropical storm intensity zone 3 (178-209 km/h on the Saffir-Simpson Scale). It is located in an earthquake zone of intensity VIII of the Modified Mercalli Scale (OCHA. March 2016): an intensity which is considered 'severe' and can cause considerable damage in ordinary substantial buildings with partial collapse; it can cause great damage to poorly built structures.

49. The threat from tsunamis is real in Solomon Islands due to the occurrence of strong earthquakes. The tsunami that was triggered by a magnitude 8.1 earthquake in April 2007 caused significant damage and loss of life (PCMISC. 2016). In February 2013, an 8.0-magnitude undersea earthquake generated a tsunami that hit Santa Cruz and other islands, causing damage.

Figure IV-1: Major Natural Hazards in Asia and Pacific



Source: OCHA. 2016.

50. Climate and climate change. The Pacific-Australia Climate Change Science Program (PCCSP) in 2014 reported that annual and half-year minimum temperatures have been increasing at Honiara since 1953 (Figure IV.3). Minimum temperature trends are generally stronger than maximum temperature trends. There have been significant increases in warm nights and decreases in cool nights at Honiara, consistent with global warming. Annual and half-year rainfall trends show little change at Honiara since 1950. At Honiara, there is a decreasing trend in the number of rain days since 1955.

51. The PCCSP deemed the available data of cyclones as not suitable for assessing long-term trends. However, it noted that tropical cyclones were most frequent in El Niño years (39 cyclones per decade) and least frequent in La Niña and neutral years (21 cyclones per decade). It reported: (i) tropical cyclones affect Solomon Islands mainly between November and April; (ii) an average of 29 cyclones per decade developed within or crossed the Solomon Islands exclusive economic zone between the 1969/70 to 2010/11 seasons; and (iii) twenty-two of the 82 tropical cyclones (27%) between the 1981/82 and 2010/11 seasons were severe events (Category 3 or stronger). Fifteen of the 22 intense events occurred in seasons when an El Niño was present.

52. Winds. In the Solomon Islands, the southeast trade winds are usually established in April and continue until the end of October. During this season, more than 75% of the winds are easterly, and 60% are from east to southeast. The trade wind is steadier and stronger over the southern part of the group of islands. From November to April, the winds blow predominantly between the northeast and northwest, though great variability marks this season, and appreciable percentages of east and south winds occur (US National Geospatial-Intelligence Agency. 2017).

Marine water quality. The available water quality data of the Honiara coastal waters are from the 2013 port improvement study (

53. Table IV-1). The values are typical of a coastal environment in the tropics after a rainfall event (Egis Eau. 2018d). The range of values indicated the influence of urban wastes entering the coastal waters.

Table IV-1: Marine Water Quality Around Honiara Port

Parameter	Unit	Values ^a
pH		7.8 – 8.1
O ₂	mg/l	93.5 – 96.3
TSS	mg/l	< 3
Total N	mg/l	< 0.3
Total P	mg/l	0.014 – 0.027
COD	mg/l	< 400
BOD	mg/l	3.2 – 3.7
Secchi Depth	m	4.2 - 11
Total Coliform	cfu/100ml	130 – 2,900

^a range of values of sampling in 2013 near the Honiara Port a few days after heavy rain

Adapted from: JICA. 2013. The Second Preparatory Survey Report for Outline Design on the Project for Improvement of Honiara Port Facilities in Solomon Islands.

54. Air quality. There are no available air quality levels data of Honiara as there are currently no environmental standards being implemented for air quality.

55. In general, the peri-urban areas of Honiara, where proposed components will be located, have no major sources of anthropogenic emissions and noise generators. For these areas, it is therefore expected that the average ground level concentrations of sulfur dioxide (SO₂), nitrogen dioxide (NO₂), and particulate matter (PM₁₀) will not exceed the values in IFC's guidelines (EHS Guidelines of April 2007) which are 20 ug/Ncm, 40 ug/Ncm, and 20 ug/Ncm, respectively.

56. For urban areas, such as along the main roads (Mendana Avenue and Kukum Highway), particulate matter concentrations are expected to be in elevated levels due to increased vehicular traffic, particularly during the daytime rush hour periods. Road paving activities of Kukum Highway is also contributing to localized increased concentrations of particulate matter.

C. Ecological Resources

57. Marine ecology. Typical of coastal cities, Honiara nearshore has been receiving fluxes of urban surface waters and runoffs laden with urban nutrients and pollutants. The Mataniko River is a typical contributor of these processes. The coastal ecology has been modified.

58. The available information on marine ecology and marine species of the Honiara coastal intertidal and subtidal marine environments is based on the marine assessment of the existing coastal intertidal and subtidal marine environments associated with the Port of Honiara (ADB. 2018). Baseline survey results highlighted: (i) silt is the dominant benthic surface substrate; (ii) no sessile benthic invertebrate species were observed; (iii) observed mobile vertebrates, including finfish, have very low population and species diversity; (iv) the substrate has significant amount of domestic solid waste (plastic and glass bottles) and other bulky wastes; (v) benthic substrate of the old wharf is highly modified and can be considered to have relatively low habitat and ecological value; and (vi) there are no marine or coastal designated protected areas or areas of significant biodiversity, endangered, threatened, or endemic species or habitats within or nearby the area of influence.

59. In the old wharf, the seabed substrate is relatively homogenous throughout the assessment site and is characterized by a bottom layer of coarse sand derived from terrigenous and coral reef origins and a top fine silt layer derived from river discharge. It

this area, finfish population numbers and species diversity was very low with only a few individuals. Observed species include moray eel, *Gymnothorax* sp. and lion fish (*Pterois miles*). Diving activities in the old wharf found very limited number of marine invertebrates species and mostly dominated by Echinoderms, such as sea urchin (*Diadema savignyi*), starfish (*Linckia laevigata*), pin cushion star (*Culcita novaeguineae*), sea cucumber (*Pearsonothuria graeffei*). Very low numbers of Molluscs were also found. Rock oysters (*Crassostera* sp.) were found attached to port structures and rocks/dolos. A juvenile giant clam (*Tridacna squamosa*) was also found. The eastern side of the port of Honiara is devoid of coral reefs and associated reef benthic resources due to the port's past extensive shoreline reclamation activities. The marine macro algae density and species assemblages were very low, and the observed dominant species was from the genus *Halimeda* sp.

60. The reef systems to the west of Honiara Port are dominated by gently sloping subtidal reef flat. Observed dominant species are branching corals form (*Acropora*, *Pocillopora*), encrusting (*Acropora*, *Millipora*) and the sub massive digitate (*Porities*, *Monitipora*, *Favities*). Soft coral colonies (*Sarcophyton* sp.) were present throughout the upper and lower reef slope and reef edge. Finfish population numbers and species diversity was very low. Observed finfish species were dominated by reef dwelling planktivores (small fish) and herbivores (Acanthuridae, Scaridae). A limited number of marine invertebrate species were also observed in this area and dominated by Echinoderms such as long spine black sea urchin (*Diadema savignyi*), blue starfish (*Linckia laevigata*), and sea cucumber (*Pearsonothuria graeffei*). Also observed were giant clam (*Tridacna maxima*), small crayfish (*Panulirus vesicolor*). No sea grass or mangroves were identified.

61. **Beach and nearshore habitats.** The coastal area of Honiara has few beaches with probably little lateral movement of the deposited sediments. The main sediment sources are the Mataniko River and Lungga River. The cone-shape of sediments at the Mataniko River mouth indicates that there is no strong littoral drift to one side or the other. The littoral drift starts probably to the east at the urban area boundary, just before the Lungga River mouth, with a drift dominantly oriented to the east (Egis Eau. 2018d). Most of the sections where there are existing outfalls are receiving raw sewage since most of the existing outfalls have broken pipeline at its landfall connection and have been seen discharging raw sewage to the beach. Solid wastes can also be seen littered on the beach area (see Photo insert). In general, the nearshore area bathymetry has an average slope of 2.5% to 3% between the coastline and to -10m depth and curve to -50m depth, except at the Point Cruz area where the slope is very steep (more than 20%) and around the Mataniko River mouth where the slope is gentle between the coastline and up to -10m depth (Egis Eau. 2018d).

Figure IV-2: Existing outfalls discharging sewage to beach areas



62. Protected areas and species. There is one reserve area in Guadalcanal (Marau Sound) and this is located far from the subproject areas within Honiara at the eastern end of the island. The International Union for Conservation of Nature and Natural Resources (IUCN) has identified five marine turtle species as protected species in Solomon Islands in the Red List. These species are not known to inhabit beaches or dune areas within Honiara; they have been observed at Marau Sound and occasionally at the far western end of the island.

D. Socio-Economic Resources

63. Population. At the last census (2009), Honiara City's 64,609 inhabitants represented 12.5% of Solomon Islands' total population (**Error! Reference source not found.**). Average annual growth rates ranged from -0.9% to 4.9% for the period 1999 to 2009 in 12 wards. The combined average annual growth rate in those wards was 2.7%. It is generally known that with temporary migrants and informal settlers the population of Honiara can be in the order of 150,000.

64. In 2017 SW reported that chlorinated water was supplied to nearly 8,500 connections (55% of households in the urban area surrounding Honiara), while the sewerage system served an estimated equivalent population of 9,998. The subprojects will serve the projected population in Honiara's urban and peri-urban areas.

Table IV-2: Summary of Demographics (Honiara Population Census)

Indicator	Total	Males	Females
Total Population	64,609	34,089	30,520
Average annual increase, 1999-2009 (in numbers)	1,547	669	878
Average annual growth rate, 1999-2009 (%)	2.7	2.2	3.4
Population density (number of people/km ²)	2,953		
Urbanization			
Urban Population	64,609	34,089	30,520
Per cent urban (%)	100.0		
Average annual urban growth rate, 1999-2009 (%)	2.7		

Reproduced from: SINISO. 2010.

65. Health. Tertiary health care needs are provided by the Honiara National Referral Hospital, while most primary healthcare services are provided through health facilities such as health centers, dispensaries, and aid posts. In general, malaria and tuberculosis are the major public health concerns in Solomon Islands, along with sexually transmitted infections, acute respiratory tract infections, diarrhea, viral hepatitis, dengue fever, and measles (SINISO and MOHMS. 2017).

66. Noise levels. There is no available noise data for Honiara. In general, the peri-urban areas of Honiara, where the proposed components will be located, have the usual sources of noise. For urban areas, such as along the main roads (Mendana Avenue and Kukum Highway), noise levels are expected to be higher due to traffic volumes, particularly during the daytime rush hour periods.

67. Economy. Honiara is the economic, commercial and administrative center of Solomon Islands. Its economic base is dominated by the services sector, including wholesale businesses, retail stores, banks, tourism services shops, restaurants, and hotels. However, the economy is growing and the government forecasts that the construction, manufacturing, and utilities sectors will contribute more to the country's gross domestic product.

68. Domestic food consumption is supported by several markets such as the Honiara Central Market in Central Honiara. Vendors from the five surrounding provinces, namely Central, Western, Guadalcanal, Malaita, and Isabel have been selling fish in the Honiara Central Market with fish sales estimated at over AUD2 million per annum (M. Keen and others. 2017).

69. Honiara has a higher cost of living than the rest of the country. Using the poverty line measure, specified as the minimum expenditures needed to obtain basic food and non-food goods, a government survey in 2012-2013 reported that Honiara's poverty line per adult equivalent per year (\$10,300) was almost three times that of the cheapest area in the country. This was attributed to poor infrastructures, markets not integrated, costly transport, expensive services, and very high urban housing prices (National Statistics Office and The World Bank. 2015).

70. **Land use.** Honiara has a land area of 22.73 km². By 2012, 65% of the city's developable land was already fully developed, 1.5% was held by private developers, and 13.5% occupied by informal settlements (UN-Habitat. 2012). Today, commercial developments have continued on the narrow coastal strip of land with more industrial developments towards the east. More commercial building constructions are ongoing in the Chinatown area and further to the Panatina area.

71. **Transport, communication, and energy.** Land transportation route is mainly served by one route along a narrow strip of coastal land bounded by small hills. This main route consists of several road sections serially connected with Mendana Avenue at the central area and the Kukum highway going to the east. Minor roads, found in the lower, middle and upper catchments of Honiara, are connected to the main land transportation route. Honiara is served by Henderson Airport where several airlines and organizations operate. It is the only point of entry in the Solomon Islands for international flights. Maritime transport is mainly served by the Honiara Port at Point Cruz area, owned and operated by the Solomon Islands Ports Authority. The port is experiencing increasing demand for: (i) goods exportation and importation and (ii) inter island transport of goods and people.

72. Cellular phone services are available in Honiara and the government reported that in 2017, majority of the population have access to the mobile services networks of either Our Telekom or Bmobile Vodafone.

73. Honiara's electricity is supplied by the Solomon Islands Electricity Authority/Solomon Power using several energy sources. The main power stations are Lungga (80.73 GWh of electricity produced in 2017) and Honiara (1.65 GWh of electricity produced in 2017).

74. Water supply system. SW operates Honiara's large urban water supply system, which is presently supplied by various wells and springs (

75.

76. Figure IV-3). SW reports that around 58% of the total average daily production comes from 3 spring sources, while the balance comes from 27 wells. The biggest water source is the Kongulai Spring, supplying 38% of the total average daily production (SW. 2017). Chlorinated water is supplied to nearly 8,500 connections (55% of households in the urban area surrounding Honiara). Per capita demand was 177 L/person/day in 2017.

Figure IV-3: Present Honiara Water Supply System



Source: SW. 2017.

77. Sewerage system. Honiara's sewerage system serves mainly commercial and government areas (SW. 2017). The system serves only around 20% of SW water customers. The system includes 12 independent wastewater catchments (Figure IV-4) that discharge wastewater through 15 sea outfalls on the Honiara seafront and two located on the Mataniko River.

78. The wastewaters of three subsystems (Rove, Tuvaruhu and Vara Creek) flow into communal septic tanks before discharging to a water body. The Rove subsystem discharges to the sea, while the Tuvaruhu and Vara Creek subsystems discharge to the Mataniko River. Other subsystems discharge raw sewage to the sea through outfalls. The Point Cruz and KGVII subsystems each have a sewage pumping station for discharges through a sea outfall. Other subsystems discharge by gravity to their sea outfalls. The system has 36km of PVC and AC pipeline networks with diameters ranging from 100 mm to more than 200 mm.

Figure IV-4: Present Honiara Sewerage System



Source: SW. 2017.

E. Physical Cultural Resources

79. In Solomon Islands, special, sacred or restricted sites, or 'tambu' areas represent the history, lineage and society of different clans and lines. The National Solomon Islands Museum keeps a National Tambu Site Register, which records several thousand sites of Solomon Islands. Based on information from the Register and the Honiara City Council, there are no recognized physical cultural resources within the Project area. There is no information on visible archaeological records such as stone-faced terraces, platforms, and walls representing earlier village sites, agricultural complexes, and shrines, in the subproject areas.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

80. The subprojects will create both common and site-specific impacts. Separate EMPs have been developed for each subproject.

A. Design and Pre-construction Phase

81. Design and pre-construction considerations include need for environmentally responsible procurement; climate change vulnerability; grievance management; disruption of utilities and services; disposal of excavation spoils; potential damage to archaeological and cultural assets; extraction of construction materials; and biosecurity matters. Adequate dispersion of sewage discharges is another issue that needs to be addressed during the design stage.

82. Environmental management system and environmentally responsible procurement. Throughout the Project, for implementation of environmental safeguards to be effective, a robust environmental management and monitoring system will need to be established. The PMU will ensure that the EMP is updated, as required, based on detailed design and incorporated into the bid documents. The bid documents will also specify other environmental management requirements such as: (i) requirements to comply with applicable standards; (ii) the contractor designating a full-time environmental, health and safety officer (EHSO) and deputy EHSO and recruiting a community liaison officer (CLO) from the local community and the reporting/communication lines and channels; (iii) the monitoring and reporting requirements; and (iv) delivery of induction, training and awareness sessions for workers and the community. Prior to works commencing at each subproject site, the contractor will prepare and submit a site-specific construction EMP (CEMP) to the PMU, the CEMP will be based on the project EMP and detail the construction methodology and program to be undertaken at each site, identify the risks associated with that construction methodology and detail mitigation measures to avoid or reduce the risks. The PMU and DSC will review and clear the CEMP and advise the supervising engineer that the CEMP may be approved and no objection to commencement of works given.

83. Once works commence, the EHSO will conduct monitoring of compliance of activities with the approved CEMP and the DSC and PMU will undertake inspections and audits of the effectiveness of the contractor's implementation of the approved CEMP. The DSC will devise the checklist to be used for the inspections and audits and will consolidate the inspection/audit findings along with summaries of the contractor's monthly reporting. WB and ADB will undertake review missions which will report on, inter alia, overall implementation of environmental safeguard requirements.

84. As early as practicable after commencement, the project will establish a grievance redress mechanism (GRM) to address concerns and resolve complaints and issues raised on any aspect of Project and subproject implementation. Safeguards concerns will be addressed through the GRM.

85. The CEMP will outline how the contractor will implement the relevant elements of the GRM and how and when they will provide information about construction activities and timing to the community. The contractor will be expected to provide information about the works, impacts and mitigation/control measures to the community in a timely and effective manner. The contractor's liaison and communication with the community, managed by the CLO, will be guided by the Project's CCP.

86. Workers and sub-contractors will be inducted to the site and this will include awareness and training on the provisions and requirements of the CEMP and how it is to be implemented.

87. Climate change vulnerability. Climate change resilience is a critical consideration because Honiara is vulnerable to the effects of intense rainfall. Changes in the intensity of extreme weather events and gradual change in climate parameters such as precipitation could damage proposed water supply and sewerage facilities. Flooding could be compounded by the effects of sea level rise to affect the structural integrity of the proposed structures and prevent the system operating effectively.

88. Mitigation. A hydrology and onsite flooding study will be conducted during the design phase for all sites where proposed structures are to be constructed. In general, onsite flooding study of the 100-year flood will reasonably provide information to site the proposed facilities in specific acceptable locations. The study should be able to adequately describe the nature of the flood hazard and the degree of flood risk for the specific sites. Results of the study will be used in designing the proposed facilities and the preparation of engineering specifications to ensure that these facilities are less vulnerable to the predicted flood events.

89. Engineering assessment on potential site erosion will be made during the design phase for each site to determine the type of erosion protection that will be appropriate. This applies to the reservoir sites of the Service Reservoir Capacity Augmentation subproject, routes of the water supply trunk mains of the Mataniko and White River Trunk Mains subproject, and routes of the sewerage pipelines of the Sewage Pumping Stations Refurbishment subproject. For proposed structures in the coastal area, such as the pumping stations and landward pipeline sections of outfalls of the Sewer Outfall Rehabilitation subproject, erosion due to sea level rise and increased wave action should be evaluated to determine the appropriate engineering measures for protection against coastal erosion. Sea level rise may also affect the hydraulics of the sewer outfalls resulting in increased pumping energy required for effective wastewater conveyance.

90. Grievance redress. The SPS and WBSP require that any complaints and concerns of the affected people must be addressed promptly at no cost to the complainant and without retribution. The actions to address this particular SPS requirement will be initiated prior to the start of the construction activities.

- Early during Project implementation SW will establish the Project's grievance redress mechanism (GRM);
- publicize the existence of the Project's GRM through public awareness campaigns, billboards, public notifications, etc.;
- ensure that the names and contact numbers of GRM representatives are placed on notice boards at agreed locations; and
- the contractors' CEMP reflect the elements of the GRM the contractors will be responsible for implementing and require contractors to maintain their own grievance register.

91. Disruption to utilities and services. Proposed subprojects may disrupt existing utilities during construction since water supply pipelines and sewerage pipelines will be installed along roads in the urban area. Construction activities may affect the existing water supply and sewerage lines, electricity lines, and communication lines. Prior to construction activities, SW and the contractors will:

- During detailed design SW and the DSC will coordinate with utility providers to obtain information about locations of services and utilities;
- coordinate with the other utility companies regarding potential disruptions;
- make provisions to preserve the operation of current facilities, and
- notify affected households and establishments well in advance of disruptions.

92. Improper disposal of excavation spoils. Construction activities of subprojects have the potential to generate excess excavation materials for the installation of water supply pipelines, sewerage pipelines, and other structures. Improper disposal of excavation spoils can be avoided by addressing the issue prior to the start of construction activities. The owner's Engineer will:

- require the contractors to submit a plan for the disposal of excess excavation spoils, and
- undertake inspection and approval of the contractors' suggested disposal sites prior to actual construction.

93. Damage to unknown archaeological and cultural assets. While there is no information at present of any archaeological and cultural assets that may be affected by excavations works, precautions will be taken to avoid potential damage to any archaeological and cultural assets. These will include:

- inclusion of a chance finds procedure in the EMP; and
- inclusion of provisions in tender and contract documents requiring the contractors to immediately stop excavation activities and promptly inform the local authorities and the Solomon Island National Museum on the presence of any unknown archaeological and cultural assets.

94. Extraction of local construction materials. Construction activities are expected to use local construction materials such as soil, sand, gravel, and rocks. The contractor will be required to obtain the local materials only from sources that have the required government environmental approvals. Before the start of activities, the contractor will provide the Owner's Engineer with a Materials Procurement Plan providing information on the sources of materials, transporting modes to sites, stockpiling schemes, and schedules of deliveries. The information will include locations, scale of operations, method of transport of materials, schedule of use relative to the overall construction schedule, and the associated environmental mitigation measures to be instituted in those locations. Quarries and borrow pits will be required to meet the following criteria:

- Either existing operations with development consents/BMP will be used or the contractor will be required to obtain development consents/BMP for any new source they open
- borrow pits will be covered by required government permits or approvals,
- will not be located within 300 meters of any urban area sensitive receptors,
- topsoil will be saved for rehabilitation during closure of the quarries and borrow pits, and
- will be provided with drainage and sediment flow controls
- proper closure of the quarries and borrow pits will be required. This will include fencing and placement of warning sign to the public.

95. Land access and use. All subprojects' proposed facilities are accessible by road. The Mataniko and White River Trunk Mains subproject and Sewage Pumping Stations Refurbishment subproject is readily accessible by urban roads, including Mendana Avenue and Kukum Highway which heavily travelled roads lined by commercial and institutional establishments. The sites of the Service Reservoir Capacity Augmentation subproject are located in elevated sections of Honiara which are sparsely populated and relatively flat grassy areas, accessible by road. The sewer outfall rehabilitation subproject has landside connections which are relatively flat and accessible from the road. The Pt. Cruz outfall will be access through the property of the Solomon Islands Ports Authority. Landfall connections of both Naha and KGV outfalls area readily accessible from the highway. Summary information on land access and use issues are presented in Table V-1.

Table V-1: Summary Land Information of Proposed Sites

subproject	Access/ IR Situation	Land Status
Mataniko and White River Trunk Mains	Existing trunk mains run along the existing roads; new trunk mains will be in the same roads; coconuts and other fruit trees planted by people along the road may be affected by proposed pipe laying	road reserves
Service Reservoir Capacity Augmentation	Titingge site is accessible from a road; both reservoir sites are relatively flat grassy areas surrounded by slopes; land acquisition of 2,500m ² each for the Panatina and Titingge reservoirs sites	private land for both reservoir sites
Sewer Outfall Rehabilitation	Pt. Cruz outfall will be access through the property of the Solomon Islands Ports Authority (SIPA); Naha outfall location is readily accessible along the main highway; both Pt. Cruz outfall and KGVl outfalls access sites have existing structures, while the Naha outfall location has none; general topography at all landfall connections are relatively flat	private land for both Naha and KGVl outfalls access sites; Pt. Cruz outfall access site owned by SIPA
Sewage Pumping Stations Refurbishment	The proposed KGVl pumping station will be in the same site as the existing pumping station located inside the school grounds; the Pt. Cruz pumping station is the same site of the existing pumping station located inside a fenced off property within the Honiara CBD; all proposed new pumping stations will be located within the road reserve, except for the one at the National Referral Hospital (NRH) where a space is available at the hospital's existing wastewater treatment area; all sites are readily accessible along the main highway; general topography of all sites are relatively flat	private land for both Naha and KGVl sites; Pt. Cruz site owned by SIPA; NRH site owned by NRH; road reserve for all other proposed new pumping stations

Sources: subprojects' FS reports; preliminary IR investigations (draft report being prepared)

96. Sewage outfall dispersion. Discharge of raw sewage through deep sea outfalls will have impacts on nearby water quality, more specifically with regards to nutrients and microbiological parameters. In the event of shore driven winds and currents, beach water quality may be affected and impact recreational users and shellfish.

97. During detailed design, final dispersion calculations will need to be undertaken to ensure dispersion requirements are met at all times. Water quality results in terms of faecal contaminants will be assessed against the ANZECC microbiological water quality guidelines for marine and freshwater recreational areas (2003), in the absence of national marine water quality standards.

98. Initially, microbial dilution is considered as the main design parameter in the absence of any treatment of the sewage prior to discharge (Egis Eau. 2018d). While there are no standards for outfall dilution requirements in Solomon Islands, SW's 5-yr Action Plan set a screened sewage dilution value of 100:1, which is expected to achieve the desired health and environmental targets for effluents. However, as requested by SW, the outfall feasibility study (Egis Eau. 2018d) uses as criteria the ANZECC microbiological water quality guidelines for marine and freshwater recreational areas (2003): (i) 150 EC/100ml only in 50% of cases and (ii) 1000 EC/100 ml in 10% of cases, when wind currents bring the plume directly to the coast.

99. To initially determine the appropriate length of the outfalls that will give acceptable dilution, sea dispersion calculations have been carried out using the Visual-Plume software, developed by the USEPA. Consequently, Visual-Plume results indicated acceptable dilution at 100 m from the coast can be achieved for the outfalls at Point Cruz, Naha, and KGVl with values of 214:1, 166:1, and 463:1, respectively, for occasions where wind and currents direct the plume to the Honiara coast. These results correspond to outfall discharge points of 715m, 785m, and 495m from the shoreline for Point Cruz, Naha, and KGVl, respectively. However, the frequency of exceedance calculation has not been carried out yet and needs to be run during detailed design to confirm compliance with both ANZECC criteria.

Table V-2: Results of Outfall Discharges Dispersion Calculations with Visual-Plume Software

Outfall Name	Horizon	Effluents flowrate (m ³ /s) ^b	Pipe ID (mm)	Effluent discharge velocity (m/s)	Depth of discharge (mCD)	Distance to the coast (m)	Dilution at 100m from the coast ^c	E. coli concentration per 100ml at 100m from coast ^d
POINT CRUZ	2037	0.314	440.6	2.1	-30.0	715	214	7,019
								702
NAHA	2047	0.934	881.4	1.5	-47.0	785	166	6,700
								670
KGVl	2047	0.163	352.6	1.7	-40.0	495	463	8,186
								819

Notes:

^a Visual-Plume Software developed by USEPA for discharge plume dispersion calculations;

^b assumed concentration of E.coli at discharge point for raw sewage and stormwater are 2.16E+07 /100ml and 2.16E+06 /100ml, respectively;

^c for shoreward ocean currents: < 6.9% at Point Cruz and Naha, and <5.2% at KGVl;

^d E. coli concentration per 100ml at 100m from coast (T90=1.5hrs) as calculated, 1st value for raw sewage dilution, while 2nd value for stormwater dilution

Source: Egis Eau. 2018d.

100. **Introduction of alien or invasive species.** To prevent spread of alien and/or invasive species, imported plant, equipment and materials and the vessels that import them will be subject to clearance procedures under the Bio-Security Act and Regulations and may require issue of phytosanitary certificates from Biosecurity Solomon Islands.

B. Construction Phase Impacts on the Physical Environment

101. **Impact areas.** The water supply pipelines and sewerage pipelines will be installed along Mendana Avenue and Kukum Highway. Mendana Avenue is the main road connecting the western and eastern parts of Honiara. It is an urban road lined on both sides with various urban developments and passes to the central business district. It connects to Kukum Highway which is lined on both sides with various urban developments. Kukum Highway is main road connecting the western and central part of Honiara to the international airport at Lungga.

102. **Mataniko and White River trunk mains subproject.** Impact areas of this subproject includes Mataniko Road to the Kukum Highway and along the White River route up to Mendana Avenue. For the Mataniko route, the trunk mains start from Tuvaruhu

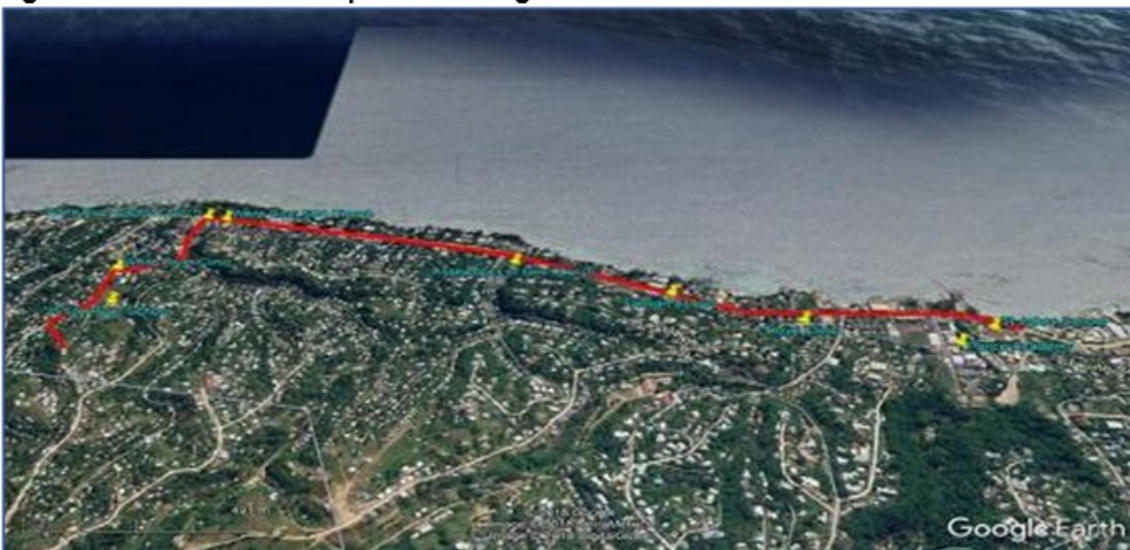
then to Lower West Kola reservoir and then to the Mataniko junction and ultimately to Panatina area. Sensitive receptors along the Mataniko route are: Tuvaruhu School, Tuvaruhu Anglican Church, Varamata Church, Honiara High School, Planned Parenthood Clinic, Mataniko Clinic, Rhema School, Rhema Family Church, Coronation School, HIPS School, Chung Wah School, National Referral Hospital (indicated in Figure V-1). For the White River route, trunk starts mains from Kongulai springs then to White River reservoir, then to Mendana junction up to Rove. Sensitive receptors along this route are: White River Mosque, White River School, White River Clinic, White River Baptist Church (indicated in Figure V-2).

Figure V-1: Sensitive Receptors of Mataniko Road up to Naha Outfall



Source: PPA consultant. 2018; red pins = sensitive receptors

Figure V-2: Sensitive Receptors of Kongulai to Rove

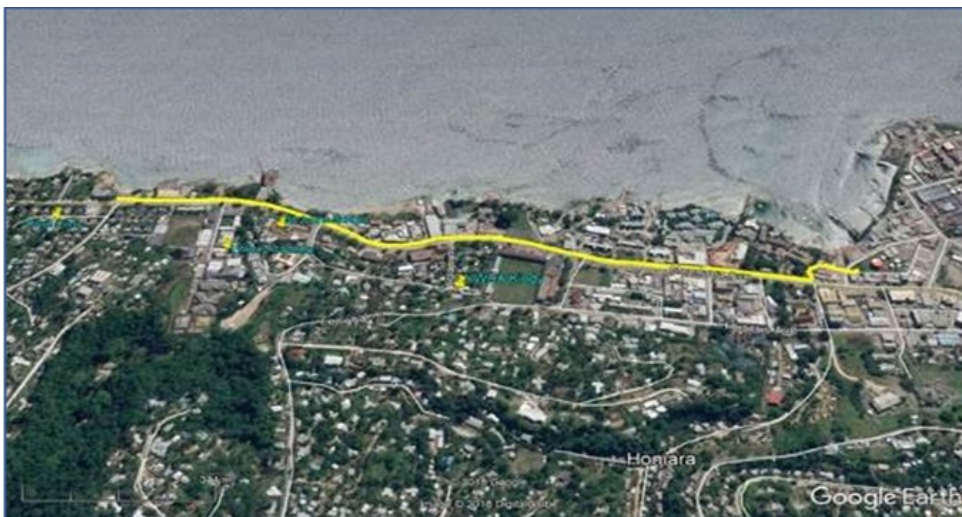


Source: PPA consultant. 2018; yellow pins = sensitive receptors

103. **Service reservoir capacity augmentation subproject.** Impact areas of the Service Reservoir Capacity Augmentation subproject are the reservoir sites at Panatina and Titingge. There are no sensitive receptors at the Titingge reservoir site.

104. **Sewage pumping stations refurbishment subproject.** Impact areas of this subproject are the sewerage pipeline routes from the Rove to Point Cruz along Mendana Avenue, then to the Mataniko junction along the Kukum Highway, to Naha outfall site and the Panatina and Ranadi areas. Sensitive receptors are: Rove Clinic, Police Academy, St Johns School, YWCA Kindy (indicated in Figure V-3).

Figure V-3: Sensitive Receptors of Rove to Pt. Cruz



Source: Project preparation consultant. 2018; yellow pins = sensitive receptors

105. Sensitive receptors associated with the Mataniko to Naha Outfall include about 20 schools, churches and clinics, shown in Figure 5.1. For the King George sewerage pumping station and Ranadi areas, the sensitive receptors include King George VI School, King George VI Clinic, Eden Early Childhood Education School (indicated in Figure V-4).

106. The impact areas of the sewer outfall rehabilitation subproject are the offshore outfalls' alignment and the onshore sections of each sewer outfall. There are no nearby schools, churches, and clinics but marine environmental values will be impacted.

Figure V-4: Sensitive Receptors of Panatina Ranadi



Source: PPA consultant. 2018; red pins = sensitive receptors

107. **Modification of site topography.** Construction activities will not involve significant modification of the construction site topography. Site clearance and vegetation removal will not be an issue for the Mataniko and White River trunk mains and service reservoir capacity augmentation subprojects because pipelines will be constructed along existing roads with existing right-of-Way (ROW). For the service reservoir capacity augmentation subproject, site clearance and vegetation removal will be contained within very small areas of grassland. The sewer outfall rehabilitation subproject will construct short pipelines in urban areas; for seaward sections of the outfall, pipeline installation will be limited to trench excavations for the pipelines to be installed.

108. **Soil erosion and sedimentation.** Potential sources of sediment runoffs are site clearing, ground leveling, excavations for structures' foundation, and pipelaying. These activities can release soil materials to the surrounding areas if not provided with sediment control measures. Soil materials can be carried by runoff to the natural drainage system or to adjacent lots during rainy periods.

109. For the service reservoir capacity augmentation subproject, construction activities will not involve large earthworks since the sites of the proposed water supply reservoirs for Panatina and Titingge sites are above ground reservoirs. The relatively flat terrain and small area requirement for each 3 ML tank will generate moderate sediments runoffs during construction. The contractor will be required to install small interceptor dikes, pipe slope drains, grass bale barriers, silt fence, sediment traps, and temporary sediment basins to divert surface runoffs away from the exposed areas, prevent sediments from moving offsite, and reduce the erosive forces of runoff waters.

110. For the sewer outfall rehabilitation subproject, installation of a marine outfall in the sea will involve pipeline trench excavation, pipeline laying, and soil cover placement. Sediments generation will be due to the disturbance of the bottom marine sediments. The contractor will be required to control the release of sediments to the surrounding water body by use of silt curtains or other appropriate methods during outfall pipeline installation in the sea. Silt curtains will contain the disturbed and resuspended sediments and allow them to drop within the water column by controlling dispersion.

111. For all subprojects the contractor will be required to prepare an erosion and sediment control plan as part of their CEMP.

112. **Storage, use and transportation of hazardous materials.** Typical in most construction works, use of oil products and other hazardous materials are expected in the construction activities of the proposed project. Fuel, oil, grease, paints, and solvents associated with the operation of heavy equipment and vehicles may accidentally be released to the environment during construction and adversely affect water quality and aquatic life. Mitigation measures include:

- Prepare a hazardous substances management plan and an emergency response plan as part of the CEMP;
- provide maintenance shops, fuel and oil depot with impermeable flooring with sump where wash water and sludge can be collected for proper disposal;
- refuel and service equipment only in specified areas adequately equipped to avoid leaks and spills that could contaminate soil and water resources;
- store chemicals, hazardous substances and fuel on-site within an enclosed and covered secure area that has an impervious floor and impervious bund around it,
- locate storage area away from water-courses, flood-prone areas, work camps, and danger areas,
- provide equipment maintenance areas and fuel storage areas with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency;

- regularly check containers for leakage and undertake necessary repair or replacement;
- provide spill kits in the vicinity of the storage and fuel/oil areas and train workers in their deployment;
- store hazardous materials above flood level and in an appropriately sized bund (approx. 110% of total volume);
- ensure all storage containers are in good condition with proper labeling; and
- store waste oil, used lubricant and other hazardous wastes in tightly sealed containers to avoid contamination of soil and water resources.

113. Measures for clean-up and handling of contaminated materials will include:

- immediate clean-up of spills,
- oil stained wastes and used oil to be collected and disposed of through recyclers / authorized waste handlers and disposal in authorized waste facilities;
- ensure availability of spill cleanup materials such as absorbent pads,
- restoration of temporary work sites will include removal, treatment, and proper disposal of oil contaminated soils,
- discharge of oil contaminated water into the environment to be prohibited; and
- construction personnel designated to handle of fuels/hazardous substances to be trained particularly in spill control procedures.

114. **Air pollution.** On-site air pollution from dust generation and use of vehicles and equipment can be expected during dry periods from activities associated with site clearing, ground leveling, and excavations for pipe laying. Intermittent episodes of localized air pollution from dark smoke emitting equipment may also occur. Wind blowing on large stockpiles of construction materials such as soil and aggregates. Contractors will be required to:

- conduct regular water spraying of roads, work areas and other construction-related facilities to minimize dust generation;
- ensure construction materials stockpiles are covered or sprayed with water, as appropriate, to prevent fine materials from being blown;
- prohibit use of equipment and vehicles that emit dark sooty emissions;
- provide trucks transporting loose construction materials such as sand, gravel, and spoils with tight tarpaulin cover or other suitable materials to avoid spills and dust emission; and
- prohibit burning of all types of wastes generated at the construction sites, workers' camps as well as other project-related facilities and activities.

115. **Improper solid waste management.** Construction activities are expected to generate solid wastes including used wood materials, steel works cuttings, paint and solvents containers, used packaging materials, on-site office solid wastes, used oil from equipment, unused aggregates, and surplus earth materials. These solid wastes may cause aesthetic problems and will be potential sources of contaminants for surface runoffs and pollution of nearby water bodies. Contractors will be required to:

- Prepare a waste management plan as part of the CEMP;
- provide garbage bins and facilities within the project site for temporary storage of construction waste and domestic solid waste;
- separate solid waste into hazardous, non-hazardous and reusable waste streams and store temporarily on-site in secure facilities with weatherproof flooring and roofing;
- ensure that wastes are not haphazardly dumped within the subproject site and adjacent areas;
- regularly dispose of wastes to the Ranadi Landfill; and
- prohibit burning of all types of wastes.

116. After completion of work activities, contractors will be required to remove construction wastes from sites and implement the required restoration of disturbed sites.

117. All these shall be reflected in the CEMP which shall contain a subproject specific waste management plan and describing all waste types, amounts, disposal method, transport documentation requirements, and details of licensed waste treatment/recycling facilities for each waste stream.

118. Demolition wastes shall be assessed for recycling and disposal, including the determination if any of the wastes are hazardous and prescribe the appropriate handling and disposal for such wastes.

119. **Removal of existing outfalls and beach clean-up.** The sewer outfall rehabilitation subproject will install three new outfalls to be located at Point Cruz, Naha, and KGVI. This is in line with SW's strategy to reduce the current 17 outfalls to three. Consequently, there is a need to remove during the construction phase the unwanted existing outfalls components and the subsequent cleanup of the beach area of these outfall locations.

120. The contractor will be required to:

- prepare an inventory of the existing outfalls components to be removed;
- a removal and disposal plan for existing outfalls components, including the assessment if any of the wastes are hazardous and prescribe the appropriate handling and disposal for such wastes;
- a beach cleanup plan for the beach area of the existing outfalls, including the assessment if any beach portions are heavily contaminated and need to be transported to a disposal site.

C. Construction Impacts on the Biological Environment

121. **Impacts on rare or endangered species.** There are no Red List terrestrial or aquatic species in the Project influence area. Even though there have been no sightings of turtles in the Honiara area, the CEMP to be developed for sewer outfalls subproject will include measures to ensure that any turtles will not be affected; this may include the timing of excavation of outfall trench and pipe installation to avoid turtle nesting season.

122. **Terrestrial habitat alteration.** Construction activities will not involve alteration of important terrestrial habitats since the subproject sites have been in urban or peri-urban settings for a long time already. The sites for the water supply and sewerage pipeline routes, sewer pumping stations, and reservoirs, are along existing roads.

123. **Benthic disturbance.** Installation of a marine outfall will involve pipeline trench excavation, pipeline laying, and soil cover placement. As discussed previously, silt curtains will be installed to prevent disturbed sediments being released into the water body during construction and dispersed in a wide zone and resuspended sediments affecting water quality and the penetration of light to lower sections of the seawater column.

D. Construction Impacts on the Socio-Economic Environment

124. **Construction noise and vibration.** Trucks and construction equipment, which can generate noise of 80 dB(A) from a distance of 30 meters are the potential sources of noise during construction. The issue is mostly applicable along the roads where water supply pipelines and sewerage pipelines will be installed and the sites for reservoirs and

pumping stations. Construction noise will largely increase the daytime noise levels of the roads which can be expected to be around 60 dB(A) during peak hours based on experience. Significant vibration from construction activities are not expected since pipeline installation will not involve heavy compaction activities. Contractors will be required to:

- provide prior notification to the community on schedule of construction activities;
- whenever applicable, provide noisy equipment with noise reduction covers;
- position stationary equipment that produce elevated noise levels, such as diesel generators and air compressors, as far as practicable from houses and other receptors;
- prohibit operation of noisy equipment and construction works in populated areas and where sensitive receptors are found during nighttime (19:00 – 06:00);
- in necessary nighttime operation, ensure prior notification and consultation will be made with affected people and local officials, and implement suitable noise reduction measures;
- locate concrete batching plant, and rock crushing plant at a reasonable distance away from inhabited areas and sensitive receptors;
- conduct regular noise level monitoring to determine compliance with WHO guidelines for noise which should not to exceed 55 dB(A) near residential areas during daytime and 45 dB(A) for nighttime.

125. The contractor will be required to exert extra efforts in reducing the noise generation from their activities near residential areas and other sensitive receptors.

126. Vehicular traffic congestion and hindrance to public access. Construction activities and any temporary or partial road closures may cause traffic congestion and hinder public access. Contractors will be required to:

- prepare a traffic management and control plan as part of the CEMP and provide traffic management personnel to direct the flow of traffic in the vicinity of the construction sites and construction-related facilities;
- closely coordinate with local authorities for any closure of roads or rerouting of vehicular traffic;
- provide prior notification to the community on schedule of construction activities;
- provide traffic signs in the vicinity of the construction sites to direct motorists and pedestrians;
- schedule construction activities with consideration to periods of heavy presence of people such as festivities, processions, parades, etc. to minimize disruption to local activities.

127. Potential social issues due to influx of workers. Presence of workers from outside the Project area may cause some social issues such as potential for conflict with local residents and risk spread of communicable diseases including STIs and HIV. Measures to mitigate such risks and impacts will include:

- induction of all workers on Project requirements regarding safeguards (including child protection), GRM and CCP requirements;
- Agreement to and implementation of protocols (including code of conduct) concerning the workers contact with the local communities;
- contractor(s) to engage an approved service provider implementation a communicable disease awareness and prevention program;
- priority be given to accommodating workers in existing hotels, motels, dormitories and the like and construction of a camp for workers only in the instance suitable existing accommodation is not available;

- ensuring that sufficient water supply and temporary sanitation facilities are provided for workers at work sites in order that community infrastructure is not overburdened;
- security at contractor's camp and yard to control unauthorized access and prevent entry of the public (especially children).

128. Occupational health and safety. Hazards to construction workers include sharp edges, falling objects, flying sparks, chemicals, noise and various potentially dangerous situations. It is contractors' duty to protect their employees from workplace hazards that can cause injury. A clean environment is also necessary to enable the workers to maintain good health and hygiene. Contractors will be required to:

- prepare and implement a health and safety plan (HSP) as part of their CEMP,
- ensure that a properly equipped and resourced first aid station is available at all times,
- provide potable water and adequate sanitation facilities,
- provide adequate and well-ventilated camps and clean eating areas,
- provide separate sleeping quarters for male and female workers,
- provide personal protective equipment (PPE) suitable to tasks and activities undertaken to minimize exposure to a variety of hazards, and
- provide fire-fighting equipment and fire extinguishers in workshops, fuel storage facilities, construction camps, and any sites where fire hazard and risk are present,
- ensure that all workers are aware of emergency response and medical evacuation procedures.

129. The contractor's HSP will provide guidance to its staff on how good work practices can be carried out on every activity in the construction site to prevent accidents to the workers and the general public. This will include emergency procedures and the required resources, clear description of responsibilities and management, specific requirements of occupational health and safety policies and regulations, training requirements, and site safety rules. The HSP is one of the inputs to the contractor's CEMP.

130. Community health and safety. Many of the measures to manage occupational health and safety will help mitigate the risk to the community. The movement of construction vehicles, trench excavations, and various activities may pose hazards to the public, particularly along Mendana Avenue and Kukum Highway. Reservoir and pumping station sites, including any deep excavations, may also pose hazards to the public. Contractors will be required to:

- implement the various plans to minimize health and safety risks to the public;
- use barriers and install signage to keep the public away from constructions sites and excavation sites;
- provide prior notification to the community on schedule of construction activities;
- provide security personnel in hazardous areas to restrict public access;
- operate construction night light in the vicinity of construction sites;
- provide adequate safe passage for public, as necessary, across construction sites; and
- ensure that any access to properties or establishments that have been disrupted or blocked by the ongoing construction activities, are reinstated as quickly as possible or alternative access is provided.

E. Operation Phase Environmental Impacts

131. Operational phase impacts will include risks to employee and public safety; health hazards due to poor water quality and sewerage system operation; and foul odor migrating off-site. In addition, beach water quality may be impacted by the discharge of raw sewage in deep sea outfalls.

132. Operators will prepare health and safety manuals to address the prevention, reduction and control of occupational injury and illness in operating water supply and sanitation facilities. The manuals will include information on: (i) clearly identifying conditions that may cause acute worker health and safety problems, (ii) requirements that all workers should comply during normal operations and emergency situations, and (iii) training requirements for health and safety in operating the facility.

133. Reservoir operational risk and safety. Water supply tanks do not inherently pose significant risk to workers. However, the use of chlorine gas as a disinfectant may pose particular safety risks. To reduce the operational risk and safety of water supply tank:

- workers will be trained on health and safety aspects of operating a water supply tank;
- A facility health and safety manual will be prepared;
- chlorine gas cylinders will be kept in separate safety rooms and equipped with fully automated chlorine gas shutoff systems;
- A system will be established for safe use and handling of chlorine materials in the work place;
- Workers will be provided with the appropriate PPE for chlorine use and handling;
- a five-foot-high fence will be erected to control access and avoid exposing the public to any hazard due to the presence of the water supply tank.

134. Health hazard due to unplanned delivery of poor water quality. Contamination in water sources may be due to the presence of bacteria, viruses, protozoa, or chemicals. The unplanned delivery to customers of poor water quality from Project facilities can be prevented in a broader scale by:

- implementing SW's water safety plan as advocated by the WHO. The water safety plan enables SW to (i) prevent contamination of its water sources, (ii) treat the water to reduce or remove contamination that could be present to the extent necessary to meet the water quality targets, and (iii) prevent re-contamination during storage, distribution and handling of drinking water. It is a best practice approach in ensuring delivery of potable water to consumers. SW has updated its water safety plan to conform with WHO requirements;
- to control microbial contamination, SW will continue to practice water chlorination and ensure that adequate residual disinfection will be maintained.

135. Health and safety risks from sewerage system operation. Sewage spills due to accidents can seriously threaten the health and safety of personnel. Methane gas may accumulate within the confined spaces of the structure and may be explosive in certain concentrations range. To address the health and safety risk of the sewerage system:

- facility hazards identification will be conducted during the initial operation phase of the pumping stations and updated as necessary;
- a written facility health and safety manual will be prepared.

136. Unplanned outages and emergencies. Unplanned outages and emergencies in the water supply system will cause loss of adequate water pressure in the network or in worst cases will result to no water being delivered to customers. This may affect public health due to the lack of potable water. There is also the risk of bacterial contamination of the water supply network from contaminated seepages when water pressure is low or no water at all in the pipelines. Seepages may enter the water supply network through leaks, cracks, faulty seals, and other openings. When significant quantity of pathogens has entered the water supply network, chlorine residual normally sustained in the water supply network may not be enough to maintain the necessary water disinfection level. This will have adverse health effects to the consumers and in worst cases will result to outbreak of waterborne disease. Most common causes of unplanned outages and

emergencies are lack of adequate backup power supplies, equipment failure, damage to WTP, reservoirs, water pipelines and appurtenances, and accidents.

137. To address the unplanned outages and emergencies of the water supply system:

- Identification of potential causes of unplanned outages and emergencies shall be conducted during operation of the water supply system and updated as necessary;
- Written management procedures for unplanned outages and emergencies as required by the water safety plan implementation (advocated by WHO).
- Regular inspection and maintenance of the backup power supplies and the associated automatic transfer switch of the backup power at the water treatment plant and water pumping stations to ensure uninterrupted operation during power failure;
- Regular inspection and maintenance of pumping systems and emergency backup systems to ensure that these are in good working conditions;
- Implement flushing and disinfection, as necessary, during unplanned outages and emergencies to prevent microbial contamination of the water supply system;
- Written standard operating procedures manual to be available at the facilities to provide guidance to the water supply system's staff on how to handle unplanned outages and emergencies;
- Regular training of water supply system's staff on how to handle unplanned outages and emergencies.

138. **Improve overall sewage discharges to the sea.** Operation of the proposed rehabilitated sea outfalls at Point Cruz, Naha, and KGVl will greatly improve the overall situation of the city's sewage discharges to the sea. At present, some outfalls have been broken and are continuously discharging sewage to the beach. The consolidation of the outfalls from 17 to three would result to a better operational management. The proposed rehabilitated 3 outfalls will have better sewage dilution at their discharge points since sufficient distance from the shoreline will be maintained. The outfalls at Point Cruz, Naha, and KGVl will have discharge points of 715m, 785m, and 495m from the shoreline, respectively. Discharge depth will be between 30 and 40m deep.

139. Enhancement measures.

- proposed lengths of the three outfalls have to be confirmed during detailed design to ensure that proper lengths were selected for effective dilution. This can be done by running an appropriate dispersion modelling of the outfalls using more information generated during the detailed design stage
- during operation, regular monitoring and effective maintenance of the outfalls are necessary to ensure that there will be no broken sections in order to maintain sufficient distance from the shoreline of the discharge points.

VI. CONSULTATION AND INFORMATION DISCLOSURE

140. Information disclosure, public consultation, and public participation are part of the overall planning, design and construction of the proposed subprojects.

141. **Public consultation.** In July 2018 SW conducted an initial public consultation to formally discuss the proposed subprojects with 24 stakeholders (six female and 18 male), including representatives of various civic organizations, community leaders and government officials. Stakeholders expressed support for the proposed subprojects and raised the following issues: (i) construction procedures affecting roads and the need to coordinate with other government agencies; (ii) the need for SW to cover more areas for the proposed sewerage system improvements; (iii) the need for a sewage treatment plant since sewage disposal is big issue for the city's environment due to pollution; and (iv) the need to address the procedural requirements for project implementation.

142. A second consultation round was held during February 2019, which was attended by 48 stakeholders comprising local and national government, CSOs, NGOs and land owners.

143. Outcomes of the consultation meetings can be found in the Annexes.

144. **Consultations during Project implementation.** The Project's CCP will be updated early in Project implementation. The CCP will guide the future consultation and participation activities to be facilitated and undertaken by SW. Whenever necessary, stakeholder consultations will be conducted for specific issues that may arise during the design phase. Stakeholder consultations will be continued throughout the construction phase on an area by area basis to address any potential problems. These will be conducted by SW's PMU, contractors, and implementation consultants prior to commencement of construction activities. The construction consultations will address stakeholders' specific concerns related to construction activities in their area, including the scheduling of activities and the potential nuisances to the public. Records of environmental and social complaints, received during consultations, field visits, informal discussions, and/or formal letters, together with the subsequent follow-up and resolutions of issues will be kept by SW's PMU.

VII. GRIEVANCE REDRESS MECHANISM

145. All subprojects will be implemented in accordance with the GRM established for the overall Project, to ensure that any complaints and concerns may be addressed promptly at no cost to the complainant and without retribution. The GRM will receive, evaluate, and facilitate the resolution of people's concerns, complaints, and grievances about subproject environmental and social performance. It will aim to resolve grievances and complaints in a timely and satisfactory manner. The GRM procedures will be disclosed to the public in consultation meetings during the design phase of the subprojects and before the start of construction activities.

A. Construction Activities Grievances

146. It is proposed the project adopt the GRM process used by the Ministry of Infrastructure Development (MID) for infrastructure projects. MID's GRM is described in its Safeguards Procedure Manual (SPM). The MID's SPM was developed in coordination with ECD in order to reflect requirements set out in the Environment Act.

147. The SPM stipulates that the contractor establish and maintain a community advisory committee (CAC) for all activities. Membership of the CAC will include the village/tribal chiefs, elders, women representatives, and land-owning groups residing within the subprojects' locations. The CAC should have no less than 5 members. The CAC's functions include: (i) solving problems/issues arising between the contractor and the community; (ii) advises the contractor on matters affecting environment and social well-being of the community due to construction activities; (iii) provide enabling environment for the participation of women in the subprojects' implementation and management at community level; and (iv) keep a register of grievances. Annex 4 of MID's SPM presents the CAC guidelines.

148. **First Level GRM.** Most grievances during construction can easily be handled by the contractor's representatives at the construction site. However, all complaints arriving at the contractor's site office will be forwarded to the CAC and entered in a register that is kept at the site. A duplicate copy of the entry is given to the complainant for their record at the time of registering the complaint. The register will reflect: (i) date, name, contact address, and reason for the complaint; (ii) issue to be dealt with by the CAC; (iii) who has been directed by the CAC to deal with the complaint and date; and (iv) date when the complainant was informed of the decision and how the decision was conveyed.

149. **Second Level GRM.** If the complaint cannot be resolved by the contractor's representative and the CAC, the contractor will forward the complaint to SW's PMU Manager who will further discuss the matter with the CAC. The PMU Manager has a maximum of 14 days to resolve the complaint and convey a decision to the complainant. If the PMU Manager dismisses the complaint, the complainant will be informed of his/her rights in taking the matter to the next step. A copy of the decision will be sent to ECD. If the complainant is not satisfied with the PMU Manager's decision, he/she may take the complaint to SW's General Manager who will appoint a third-party arbitrator to form part of a GRM Committee to hear the complaint. The GRM Committee will be chaired by SW's General Manager, SW's PMU Manager, SW's Project Engineer, the contractor, and the appointed third-party arbitrator.

150. **Third Level GRM.** If the complainant is not satisfied with decision of the GRM Committee, he/she may take further action through an appropriate legal channel such as the local court.

151. A consultation and communication plan (CCP) will be developed after completion of the separate reports being prepared for the project concerning stakeholder analysis and communication strategy. The CCP will be anchored on these reports and will be updated as the need arises. It will guide the consultations to be done further during project implementation.

152. A consultation and communication plan (CCP) will be developed after completion of the separate reports being prepared for the project concerning stakeholder analysis and communication strategy. The CCP will be anchored on these reports and will be updated as the need arises. It will guide the consultations to be done further during project implementation.

B. Complaints to the Environment Conservation Division

153. In Solomon Islands, complaints about environmental performance of projects issued a Development Consent may also be brought to the attention of ECD of the MECDM. ECD is mandated by law (Environment Act of 1998 and the Environment Regulations of 2008) to monitor the projects issued with a development consent and address concerns, complaints, and grievances of the public regarding project performance.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

A. Introduction

154. Environmental assessment of has determined that the Project will have less than significant impacts on the local environment. Subprojects can be implemented in an environmentally acceptable manner with appropriate mitigation measures to avoid or minimize the environmental impacts. The EMP includes: (i) implementation arrangement, (ii) mitigating measures to be implemented, and (iii) required monitoring associated with the mitigating measures. It also describes institutional roles and responsibilities during pre-construction, construction, and operation phases.

B. Institutional Arrangements

155. The MOFT is the Project executing agency and SW is the implementing agency, operating through a PMU supported by a DSC which will include various specialists.

156. **Project Management Unit.** SW has established a PMU to prepare and implement the Project. The PMU will be supported by a DSC. The PMU will include an environment safeguards officer (ESO)⁴ who will receive training and capacity building from the international environmental specialist (IES) included in the DSC. Together the ESO and IES will ensure that all subprojects are implemented in accordance with the Project's EARF, environmental assessments are prepared, and development consents are obtained, and compliance with each subproject EMP and development consent conditions is monitored and reported.

157. **Construction contractors.** The contractors undertaking the works will be responsible for ensuring that their activities comply with the environmental safeguard requirements of the contract including the technical specifications. The contractor will prepare a CEMP for review and approval by the PMU and DSC. The CEMP will be activity, site and subproject-specific and detail how the contractor intends to meet the environmental management requirements identified in the EMP of the IEE/PER. It will be designed to ensure that appropriate environmental management practices are applied throughout the construction period. The CEMP will include all of the site-specific and sub-plans necessary to meet the standards and targets set out in the EMP. The contractor will be required to employ a full-time environmental health and safety officer (EHSO) to ensure compliance with all requirements concerning environmental, health and safety, and labor regulations during construction. For the sewer outfalls subproject, the contractor is required to engage a specialist suitably qualified in marine ecology as either the EHSO, or at a minimum to prepare the CEMP and to be on call during the works.

158. **Environment Conservation Division.** The ECD will review the development consent applications and issue, either with or without conditions, the consents. The ECD will be invited to participate in joint inspections and audits during construction activities.

159. A summary of the environmental management responsibilities for the Project is presented in Table VIII-1.

Table VIII-1: Summary of environmental management responsibilities in the Project

Project Implementation Organization	Management Roles and Responsibilities
Asian Development Bank / World Bank	<ul style="list-style-type: none"> Review and clear IEEs/EMPs Review bidding documents and clear CEMPs

⁴ Exact designation will be confirmed by PMU in due course

Project Implementation Organization	Management Roles and Responsibilities
	<ul style="list-style-type: none"> • Review executing agency and implementing agency's submissions for procurement of goods, equipment, works and services • Conducts project review missions, midterm review mission and project completion review mission to assess project implementation progress of all outputs, compliance of project to covenants including safeguards requirements • Review semi-annual and annual EMR
Ministry of Finance and Treasury (executing agency)	<ul style="list-style-type: none"> • Guide and monitor overall project execution • Financial and procurement oversight • Ensure flow of funds to the implementing agency and the timely availability of counterpart funding • Review and coordinate evaluation of bids for works, goods, and consultant services
Project Steering Committee (PSC)	<ul style="list-style-type: none"> • Responsible for oversight and providing guidance and strategic direction to SW with respect to project implementation • Ensure that the PMU is provided with the necessary resources to effectively carry out its duties and responsibilities.
Solomon Islands Water Authority (implementing agency)	<ul style="list-style-type: none"> • Responsible for overall project implementation and monitoring at the implementing agency level • Ensure adequate funding available for the PMU • Submit semi-annual and annual monitoring reports to ADB • Assist in resolving complaints brought through the GRM that have not been resolved at lower levels
SW Project Management Unit	<ul style="list-style-type: none"> • Responsible for overall project management, implementation and monitoring • Responsible for supervision of design and supervision consultants • Responsible for SW's application for a Development Consent • Update the IEEs and EMPs based on the detailed design and submit to ADB for clearance • Ensure environmental safeguard concerns are incorporated in the detailed engineering design • Disclose safeguard documents, as appropriate • Conduct awareness and consultations as per the CCP • Submit monthly, quarterly, semi-annual, and annual monitoring report to SW Management • Review and clear the CEMP of contractors • Review contractor's monthly reports • Implement the GRM and maintain records of complaints/grievances • Ensure the contractor observes the GRM requirements • Ensure contractor compliance with required resources for mitigation measures as reflected in the CEMP
PMU Environment Officer	<ul style="list-style-type: none"> • Ensure IEEs/EMPs are updated based on the final detailed designs and their disclosure in locations and form accessible to the public; • Coordinate with the preparer of bid documents for the inclusion of IEEs/EMPs and CEMP frameworks in the bidding documents and civil works contracts; • Ensure required government permits and clearances acquired by SW prior to actual construction activities; • Establish system for monitoring environmental safeguards of the Project as described in the IEEs/EMPs;

Project Implementation Organization	Management Roles and Responsibilities
	<ul style="list-style-type: none"> • Review, monitor, and evaluate the effectiveness of implemented mitigation measures and recommend corrective actions whenever necessary; • Prepare monthly environmental monitoring reports for consolidation to the semi-annual monitoring reports for SW and ADB; • Ensure grievance redress mechanism is activated prior to the start of construction; • During construction, conduct site visits and coordinate with the project engineers to ensure that required environmental mitigation measures are implemented at the construction sites, and • Coordinate with the contractors' environment and safety officers to ensure that environmental awareness trainings for workers are done.
Design and supervision Consultants	<ul style="list-style-type: none"> • Responsible for overall design and supervision and monitoring • Assist the PMU in updating the IEEs and EMPs based on the detailed designs • Evaluate the CEMPs and recommend to PMU for approval • Evaluate the contractors' overall work schedules relative to the requirements of the approved CEMPs • Undertake site inspections prior to execution of construction activities to ensure contractors' compliance to EMP/CEMP requirements • Ensure contractor's implementation of EMP/CEMP • Assist the PMU in GRM implementation • Submit monthly, quarterly, semi-annual, and annual monitoring reports to PMU • Submit a report to PMU on project's environmental compliance performance upon completion of the construction activities
Contractor	<ul style="list-style-type: none"> • Prepares and submit prior to construction the CEMP for review by DSC's Environment Specialist and for approval by PMU • Understand the EMP requirements and allocate necessary resources for implementation • Activates an Environmental Health and Safety Officer (EHSO) to ensure that the contractor complies with all requirements concerning environmental, health and safety, and labor regulations during construction • Implement construction activities with the required mitigation measures • Conduct environmental monitoring as required by EMP • Act promptly on complaints and grievances concerning the construction activities in accordance with the project's GRM • Submit monthly progress reports on CEMP/EMP implementation to PMU
ECD of MECDM	<ul style="list-style-type: none"> • Responsible for processing of SW's application for a Development Consent • Monitors construction progress for compliance with the terms of the issued Development Consent • Monitors implementation of the mitigation measures and the EMP in general
Ministry of Mines, Energy and Rural Electrification (MMERE)	<ul style="list-style-type: none"> • Responsible for processing of contractor's application for a building material permits (BMP) in regard to mining and extraction of aggregates or gravel from rivers • Monitors contractor's compliance with the terms of the issued BMP

C. Capacity Development Program

160. During pre-construction and construction period, the consultants who are providing support to the environmental management activities of SW's PMU will provide training and guidance to SW's staff on how to use a wastewater laboratory for both environmental monitoring and wastewater treatment facilities operation. Since SW is operating the sewerage system and will also operate in the future a wastewater treatment plant, it is important that SW acquire the capacity for wastewater testing. Hands-on training will increase staff's level of proficiency in using a wastewater laboratory and generate the required data for environmental monitoring and treatment facilities operation.

161. The consultants' tasks relative to the wastewater laboratory capacity building will include the following:

- a) Prepare a list of equipment and chemicals to be procured for a small laboratory to test wastewater parameters indicated in General EHSR for Wastewater and Ambient Water Quality (2007);
- b) Provide guidance to SW staff on how to use a wastewater laboratory in assisting the operation of the proposed septage treatment facility and the planned wastewater treatment plant;
- c) Prepare a training module on "Wastewater Laboratory Operation" and conduct training for SW's staff;

162. **Indicative Costs.** The costs estimated for implementation of environmental safeguards (including capacity building, including the initial set-up for a wastewater laboratory) for the Project are set out in Table VIII-2. SW has allocated a space for a wastewater laboratory in its future office building.

Table VIII-2: Estimated Budget for Safeguards Implementation

Item	Total Cost (USD)
PER development and reporting	Incl. in DSC
Development consent applications	5,000
Monitoring and training	100,000
Laboratory (equipment, tools, chemicals, etc.)	75,000
Total	180,000

D. Environmental Mitigations and Monitoring Matrices

163. The EMP (including monitoring requirements) are presented below.

Table VIII-3: Environmental Mitigation and Monitoring Plan of Mataniko and White River Trunk Mains subproject

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	of Monitoring Cost
PRE-CONSTRUCTION								
Climate change vulnerability of Mataniko and White River trunk mains		Climate change adaptation measures are: (i) results of engineering assessment on potential site erosion of the routes of the Mataniko and White River trunk mains will be the basis for climate change adaptation considerations; and (ii) appropriate erosion protection for the trunk mains will be determined to avoid structural failures of the pipeline when unprotected against soil erosion.	Part of detailed design cost	Design Consultant	SW's PMU	engineering drawings and specifications considered climate change adaptation features	verify engineering drawings and specifications/ once	minimal cost
Improper implementation of the Mataniko and White River Trunk Mains subproject's EMP		Tender documents and construction contract of the Mataniko and White River Trunk Mains subproject will include provisions that will: (i) require the contractors to prepare their respective Contractor's Environmental Management Plan (CEMP) prior to the start of the construction activities with details of staff, resources, implementation schedules, as well as monitoring and reporting procedures; (ii) issue a CEMP framework as guidance for the contractor in preparing a CEMP as part of his bid proposal; and (iii) require the Owner's Engineer to review and approve the CEMP prior to site mobilization.	Part of contractors' bid cost	Design Consultant and Contractor	design and supervision consultant (DSC) and SW's PMU	CEMP prepared by contractors	CEMP submittal by contractors to Engineer/ prior to commencement of site works	part of consultant's task (minimal cost)
Complaints due to project-related impacts		SW's PMU and the contractors will: (i) establish the approved project's grievance redress mechanism (GRM); (ii) publicize the existence of the project's GRM through public awareness campaigns, website, billboards, public notifications, etc; (iii) ensure that the names and contact numbers of representatives of the	Part of contractors' bid cost	Contractor and SW's PMU	DSC and SW's PMU	consultation meetings; specific provisions in tender documents on nuisance &	verify meetings documentation; Verify tender documents; verify the in-placed CACs/ after completion of	part of consultant's task (minimal cost)

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	of Monitoring Cost
		contractors and SW's PMU are placed on notice boards at agreed locations and/or website.				problems to public; GRM activated with community advisory committees (CACs) created	meetings; once after tender documents prepared	
Disruption of utilities and services		SW and the contractors will: (i) coordinate with the other utilities companies regarding the potential disruptions; (ii) make provisions to preserve the operation of current facilities, and (iii) affected households and establishments will be notified well in advance of such disruptions.	Part of contractors' bid cost	Contractor and SW's PMU	DSC and SW's PMU	contractor's coordination with the other utility companies; notification of affected households and establishments	verify contractor's coordination meetings and notifications/ after completion of meetings and notifications	part of consultant's task (minimal cost)
Improper disposal of excavation spoils		The owner's Engineer will: (i) require the contractors to submit a plan for the disposal of excess excavation spoils, and (ii) undertake inspection and approval of the contractors' suggested disposal sites prior to actual construction	Part of DSC cost	DSC	SW's PMU	contractor's disposal plan for excess excavation spoils	DSC disposal sites' inspection/ after contractor's submittal	part of consultant's task (minimal cost)
Potential damage to unknown archaeological and cultural assets		Tender documents and construction contract will include a provision that will: (i) require construction activities to be stopped immediately upon discovery of any unknown archaeological and cultural assets; and (ii) the contractor will promptly inform the local authorities and the Solomon Island National Museum about the presence	Part of specs preparation cost	Design Consultant	SW's PMU	specific provision in tender documents on archeological/ cultural relics	verify tender documents/ once after tender documents prepared	part of consultant's task (minimal cost)
CONSTRUCTION								
Soil erosion and sediment of construction sites		The contractor will divert surface runoffs away from the exposed areas and prevent sediments from moving offsite. Measures may include, as appropriate for site conditions: (i) small interceptor dikes, (ii) pipe slope drains, (iii) grass	Part of contractors' bid cost	Contractor	DSC and SW's PMU	disturbed sites; use of appropriate sediment controls	visual inspection of sites; plans verification/ daily during rainy periods	part of DSC contract; minimal cost to SW

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ of Frequency	Monitoring Cost
		bale barriers, (iv) silt fence, (v) sediment traps, and (vi) temporary sediment basins; total exposed area will be minimized as the conditions allow						
Extraction of local construction materials		The contractor will provide sufficient information on the quarries and borrow pits to be used including commercial sources; The following will be required for quarries and borrow pits: (i) only licensed quarries will be used or the contractor will obtain its own licenses (ii) borrow pits will be covered by required government permits or approvals, (iii) will not be located within 300 meters of any urban area sensitive receptors, (iv) topsoil will be saved for rehabilitation during closure of the quarries and borrow pits, (v) will be provided with drainage and sediment flow controls, and (vi) closure will include fencing and placement of warning sign to the public	Part of contractors' bid cost	Contractor	DSC and SW's PMU	government permits or approvals of quarries and borrow pits; operational plan; drainage and sediment flow controls; tops soil management	visual inspection of sites; plans verification/ weekly	part of DSC contract; minimal cost to SW
Oil and other hazardous materials releases.		To prevent accidental releases, the contractors will be required to implement the following: (i) provide maintenance shops, fuel and oil depot with impermeable flooring with sump where wash water and sludge can be collected for proper disposal; (ii) refueling and servicing of equipment should only be carried out in specified areas adequately equipped to avoid leaks and spills that could contaminate soil and water resources; (iii) chemicals, hazardous substances and fuel will be stored on-site within an enclosed and covered secure area that has an impervious floor and impervious bund around it, (iv) storage area will be located away from water-courses, flood-prone areas, work camps, and danger areas, (v) equipment maintenance areas and fuel storage areas will be provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency; (vi) regularly check containers for leakage and undertake necessary repair or replacement; (vii) store	Part of contractors' bid cost	Contractor	DSC and SW's PMU	measures required to prevent accidental releases; measures for clean-up and handling of contaminated materials; training records of personnel for hazardous materials; records of accidental releases	visual inspection of sites; records verification/ daily	part of DSC contract; minimal cost to SW

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ of Frequency	Monitoring Cost
		hazardous materials above flood level; (viii) ensure all storage containers are in good condition with proper labeling; and (ix) store waste oil, used lubricant and other hazardous wastes in tightly sealed containers to avoid contamination of soil and water resources; Measures for clean-up and handling of contaminated materials include: (i) undertake immediate clean-up of spills, (ii) oil stained wastes and used oil should be collected and disposed of through recyclers / authorized waste handlers and disposal in authorized waste facilities; (iii) ensure availability of spill cleanup materials such as absorbent pads, (iv) restoration of temporary work sites will include removal, treatment, and proper disposal of oil contaminated soils, (v) discharge of oil contaminated water into the environment will be prohibited; and (vi) construction personnel designated to handle of fuels/hazardous substances will be trained particularly in spill control procedures						
On-site air pollution due to construction activities		The contractor will be required to do the following: (i) regular water spraying of roads, work areas and other construction-related facilities to minimize dust generation; (ii) construction materials stockpiles and spoils with potential for significant dust generation to be covered or sprayed with water, as appropriate, to prevent fine materials from being blown; (iii) prohibit use of equipment and vehicles that emit dark sooty emissions; (iv) hauling trucks transporting loose construction materials such as sand, gravel, and spoils to be provided with tight tarpaulin cover or other suitable materials to avoid spills and dust emission; and (v) prohibit burning of all types of wastes generated at the construction sites, workers' camps as well as other project-related facilities and activities.	Part of contractors' bid cost	Contractor	DSC and SW's PMU	dust generation, water spraying, cover of stockpiles, smoke emitting equipment, open burning of materials	Visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	Monitoring Cost
Improper solid waste management		<p>The contractor will be required to: (i) provide garbage bins and facilities within the project site for temporary storage of construction waste and domestic solid waste; (ii) separate solid waste into hazardous, non-hazardous and reusable waste streams and store temporarily on-site in secure facilities with weatherproof flooring and roofing; (iii) ensure that wastes are not haphazardly dumped within the project site and adjacent areas; (iv) regular disposal of wastes to the Ranadi Landfill; (v) prohibit burning of all types of wastes; (vi) remove the construction wastes from the sites after work completion, and (vii) implement the required restoration of disturbed sites.</p> <p>The CEMP shall contain a subproject specific waste management plan and describing all waste types, amounts, disposal method, transport documentation requirements, and details of licensed waste treatment/recycling facilities for each waste stream.</p>	Part of contractors' bid cost	Contractor	DSC and SW's PMU	construction wastes; waste separation, temporary on-site waste storage, regular disposal records, surplus materials not removed upon completion	Visual inspection of sites/ daily	part of DSC contract; minimal cost to SW
Construction noise and vibration		<p>The contractor will exert extra efforts in reducing the noise generation from his activities near residential areas and the following nearby sensitive receptors: Tuvaruhu School, Tuvaruhu Anglican Church, Varamata Church, Honiara High School, Planned Parenthood Clinic, Mataniko Clinic, Rhema School, Rhema Family Church, Coronation School, HIPS School, Chung Wah School, National Referral Hospital, White River Mosque, White River School, White River Clinic, White River Baptist Church.</p> <p>The contractor will: (i) provide prior notification to the community on schedule of construction activities; (ii) provide noisy equipment with noise reduction covers whenever applicable; (iii) position stationary equipment that produce elevated noise levels, such as diesel generators and air compressors, as far as practicable from houses and other receptors; (iv) prohibit</p>	Part of contractors' bid cost	Contractor	DSC and SW's PMU	noise levels not to exceed 55 dB(A) near residential areas during daytime and 45 dB(A) for nighttime; noisy equipment not to be operated between 19:00 – 06:00hrs; regular noise level monitoring by contractor	Use of sound levels meter; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
		operation of noisy equipment and construction works in populated areas and where sensitive receptors are found during nighttime (19:00 – 06:00); (v) make prior notification and consultation with the affected people and local officials for necessary nighttime operation; (vi) locate concrete batching plant, and rock crushing plant at a reasonable distance away from inhabited areas and sensitive receptors; and (vii) conduct regular noise level monitoring to determine compliance with WHO guidelines for noise which should not to exceed 55 dB(A) near residential areas during daytime and 45 dB(A) for nighttime						
Vehicular traffic congestion and hindrance to public access		<p>The contractor will pay more attention at Mataniko Road up to the Kukum Highway and along the White River route up to Mendana Avenue and Mataniko junction and ultimately to Panatina area</p> <p>The contractor to: (i) prepare a traffic plan and provide traffic management personnel to direct the flow of traffic in the vicinity of the construction sites and construction-related facilities; (ii) closely coordinate with local authorities for any closure of roads or rerouting of vehicular traffic; (iii) provide traffic signs in the vicinity of the construction sites to direct motorists and pedestrians; and (iv) minimize disruption to local activities by timing the construction activities with consideration to the schedules of festivities, processions, parades, etc.</p>	Part of contractors' bid cost	Contractor	DSC and SW's PMU	contractor's traffic plan and traffic management personnel; traffic signs in vicinity of construction sites; contractor's work schedule related to festivities, processions, parades, etc.	traffic plans verification; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW
Community health and safety		The contractor to: (i) use barriers and install signage to keep the public away from constructions sites and excavation sites; (ii) provide security personnel in hazardous areas to restrict public access; (iii) operate construction night light at the vicinity of construction sites; and (iv) whenever necessary, provide adequate	Part of contractors' bid cost	Contractor	DSC and SW's PMU	work sites safety plan; warning signs, barricades, and night lamps for open excavations,	work sites safety plan verification; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
		safe passageways for the public crossing the construction sites whose access to properties, establishments, etc. has been disrupted or blocked by the ongoing construction activities				lighting system for nighttime operations; adequate safe passageways for the public crossing the construction sites		
Potential social issues due to influx of imported workers		Measures include: (i) induction of the workers on requirements of the project's regarding community health and safety, grievance redress mechanism, and consultation and communications plan; (ii) implementation of protocols concerning the workers contact between the local communities; (iii) implementation of a communicable disease awareness and prevention program on the risk of disease spreading including sexually transmitted diseases and the human immunodeficiency virus; and (iv) contractor's camp and yard will be secured by a fence and provided with warning signs to control unauthorized access and prevent entry of the public.	Part of contractors' bid cost	Contractor	DSC and SW's PMU	Check implementation of workers induction, required protocol, awareness and prevention program on the risk of disease spreading, workers camp fencing	records verification and visual inspection / at start of work and monthly	part of DSC contract; minimal cost to SW
Pollution and health risks due to workers' camp		The contractor will be required to: (i) install proper sanitary facilities to prevent the indiscriminate discharge of sanitary wastes at the camps' surroundings, (ii) implement proper solid waste management, and (iii) prevent surface runoffs from flowing into the workers camps by using temporary diversion drains, catch drains, and silt-traps	Part of contractors' bid cost	Contractor	DSC and SW's PMU	sanitary toilets, garbage bins, runoff controls in camps	visual inspection of sites/ once before start of construction and once monthly	part of DSC contract; minimal cost to SW
Occupational health and safety at work sites		The contractor to implement good practices on occupational health and safety at the construction sites by: (i) implementing a construction site health and safety management plan (CSHSMP), (ii) ensuring that an equipped first aid station is available at all times, (iii)	Part of contractors' bid cost	Contractor	DSC and SW's PMU	health and safety plan; first aid station; PPE, sanitation facilities; fire-	health and safety plan verification; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
		providing the workers with potable water and adequate sanitation facilities, (iv) providing the workers with adequate and well-ventilated camps and clean eating areas, (v) providing the workers with separate sleeping quarters for male and female workers, (vi) providing the workers with personal protective equipment (PPE) to minimize exposure to a variety of hazards, and (vii) providing fire-fighting equipment and fire extinguishers in workshops, fuel storage facilities, construction camps, and any sites where fire hazard and risk are present.				fighting equipment and fire extinguishers		
OPERATIONS								
Health hazard due to unplanned delivery of poor water quality		SW will implement an updated water safety plan as advocated by the WHO to: (i) prevent contamination of the water sources, (ii) treat the water to reduce or remove contamination that could be present and meet the water quality targets, and (iii) prevent re-contamination during storage, distribution and handling of drinking water	Part of SW's operational cost	SW's operations personnel	SW's Operations Dept. Mgt.	water safety plan implemented; E. Coli bacteria; physical & chemical water parameters	verify water safety plan implementation; water sampling and laboratory test/ monthly for plan and for bacteria; annual for physical & chemical	part of SW's operational cost
Public health risk due to unplanned outages and emergencies of the water supply system		Mitigations include: (i) identification of potential causes of unplanned outages and emergencies shall be conducted during operation of the water supply system and updated as necessary; (ii) written management procedures for unplanned outages and emergencies as required by the water safety plan implementation (advocated by WHO); (iii) regular inspection and maintenance of the backup power supplies and the associated Automatic Transfer Switch (ATS) of the backup power supplies at the water pumping stations to ensure uninterrupted operation during power failure; (iv) regular inspection and maintenance of pumping systems and emergency backup systems to ensure that these are in good working conditions; (v) implement flushing and disinfection, as necessary, during unplanned outages and emergencies to prevent microbial contamination of the water supply	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	written management procedures for unplanned outages and emergencies (per water safety plan); schedules of inspection and maintenance of pumping systems, emergency backup systems, and automatic transfer switch of the backup	verify regular inspection and maintenance/ weekly; verify implementation of operating procedures manual/ weekly; verify implementation of water supply flushing and disinfection plan/ after incidents	minimal cost since it is only visual inspection

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	of	Monitoring Cost
		system; (vi) written standard operating procedures manual to be available at the facilities to provide guidance to the water supply system's staff on how to handle unplanned outages and emergencies; (vii) regular training of water supply system's staff on how to handle unplanned outages and emergencies				power supplies at the water pumping stations; standard operating procedures manual for unplanned outages and emergencies; flushing and disinfection plan for unplanned outages and emergencies; training of water supply system's staff; unplanned outages and emergencies			

Source: PPA consultants. 2018.

Table VIII-4: Environmental Mitigation and Monitoring Plan of Service Reservoir Capacity Augmentation subproject

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
PRECONSTRUCTION								
Climate change vulnerability of reservoir sites at Panatina and Titingge areas		Climate change adaptation measures are: (i) results of engineering assessment on potential site erosion of the reservoir sites at Panatina and Titingge areas will be the basis for climate change adaptation considerations; and (ii)	Part of detailed design cost	Design Consultant	SW's PMU	engineering drawings and specifications considered climate change adaptation features	verify engineering drawings and specifications/ once	minimal cost

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	appropriate erosion protection for the reservoir sites will be determined to avoid structural failures of the reservoirs and the associated pipelines						
Improper implementation of the Service Reservoir Capacity Augmentation subproject's EMP	Tender documents and construction contract of the Service Reservoir Capacity Augmentation subproject will include provisions that will: (i) require the contractors to prepare their respective Contractor's Environmental Management Plan (CEMP) prior to the start of the construction activities with details of staff, resources, implementation schedules, as well as monitoring and reporting procedures; (ii) issue a CEMP framework as guidance for the contractor in preparing a CEMP as part of his bid proposal; and (iii) require the Owner's Engineer to review and approve the CEMP prior to site mobilization.	Part of contractors' bid cost	Design Consultant and Contractor	design and supervision consultant (DSC) and SW's PMU	CEMP prepared by contractors	CEMP submittal by contractors to Engineer/ prior to commencement of site works	part of consultant's task (minimal cost)
Complaints due to project-related impacts	SW's PMU and the contractors will: (i) establish the approved project's grievance redress mechanism (GRM); (ii) publicize the existence of the project's GRM through public awareness campaigns, website, billboards, public notifications, etc; (iii) ensure that the names and contact numbers of representatives of the contractors and SW's PMU are placed on notice boards at agreed locations and/or website.	Part of contractors' bid cost	Contractor and SW's PMU	DSC and SW's PMU	consultation meetings; specific provisions in tender documents on nuisance & problems to public; GRM activated with community advisory committees (CACs) created	verify meetings documentation; Verify tender documents; verify the in-placed CACs/ after completion of meetings; once after tender documents prepared	part of consultant's task (minimal cost)
Disruption of utilities and services	SW and the contractors will: (i) coordinate with the other utilities companies regarding the potential disruptions; (ii) make provisions to preserve the operation of current	Part of contractors' bid cost	Contractor and SW's PMU	DSC and SW's PMU	contractor's coordination with the other utility companies; notification of affected	verify contractor's coordination meetings and notifications/ after completion of	part of consultant's task (minimal cost)

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	facilities, and (iii) affected households and establishments will be notified well in advance of such disruptions.				households and establishments	meetings and notifications	
Improper disposal of excavation spoils	The owner's Engineer will: (i) require the contractors to submit a plan for the disposal of excess excavation spoils, and (ii) undertake inspection and approval of the contractors' suggested disposal sites prior to actual construction	Part of DSC cost	DSC	SW's PMU	contractor's disposal plan for excess excavation spoils	DSC disposal sites' inspection/ after contractor's submittal	part of consultant's task (minimal cost)
Potential damage to unknown archaeological and cultural assets	Tender documents and construction contract will include a provision that will: (i) require construction activities to be stopped immediately upon discovery of any unknown archaeological and cultural assets; and (ii) the contractor will promptly inform the local authorities and the Solomon Island National Museum about the presence	Part of specs preparation cost	Design Consultant	SW's PMU	specific provision in tender documents on archeological/ cultural relics	verify tender documents/ once after tender documents prepared	part of consultants task (minimal cost)
CONSTRUCTION							
Soil erosion and sediment of construction sites	The contractor will divert surface runoffs away from the exposed areas and prevent sediments from moving offsite. Measures may include, as appropriate for site conditions: (i) small interceptor dikes, (ii) pipe slope drains, (iii) grass bale barriers, (iv) silt fence, (v) sediment traps, and (vi) temporary sediment basins; total exposed area will be minimized as the conditions allow	Part of contractors' bid cost	Contractor	DSC and SW's PMU	disturbed sites; use of appropriate sediment controls	visual inspection of sites; plans verification/ daily during rainy periods	part of DSC contract; minimal cost to SW
Extraction of local construction materials	The contractor will provide sufficient information on the quarries and borrow pits to be used including commercial sources; The following	Part of contractors' bid cost	Contractor	DSC and SW's PMU	government permits or approvals of quarries and borrow pits; operational plan;	visual inspection of sites; plans verification/ weekly	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	will be required for quarries and borrow pits: (i) only licensed quarries will be used or the contractor will obtain its own licenses (ii) borrow pits will be covered by required government permits or approvals, (iii) will not be located within 300 meters of any urban area sensitive receptors, (iv) topsoil will be saved for rehabilitation during closure of the quarries and borrow pits, (v) will be provided with drainage and sediment flow controls, and (vi) closure will include fencing and placement of warning sign to the public				drainage and sediment flow controls; tops soil management		
Oil and other hazardous materials releases.	To prevent accidental releases, the contractors will be required to implement the following: (i) provide maintenance shops, fuel and oil depot with impermeable flooring with sump where wash water and sludge can be collected for proper disposal; (ii) refueling and servicing of equipment should only be carried out in specified areas adequately equipped to avoid leaks and spills that could contaminate soil and water resources; (iii) chemicals, hazardous substances and fuel will be stored on-site within an enclosed and covered secure area that has an impervious floor and impervious bund around it, (iv) storage area will be located away from water-courses, flood-prone areas, work camps, and danger areas, (v) equipment maintenance areas and fuel storage areas will be provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and	Part of contractors' bid cost	Contractor	DSC and SW's PMU	measures required to prevent accidental releases; measures for clean-up and handling of contaminated materials; training records of personnel for hazardous materials; records of accidental releases	visual inspection of sites; records verification/ daily	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	maintained to ensure efficiency; (vi) regularly check containers for leakage and undertake necessary repair or replacement; (vii) store hazardous materials above flood level; (viii) ensure all storage containers are in good condition with proper labeling; and (ix) store waste oil, used lubricant and other hazardous wastes in tightly sealed containers to avoid contamination of soil and water resources; Measures for clean-up and handling of contaminated materials include: (i) undertake immediate clean-up of spills, (ii) oil stained wastes and used oil should be collected and disposed of through recyclers / authorized waste handlers and disposal in authorized waste facilities; (iii) ensure availability of spill cleanup materials such as absorbent pads, (iv) restoration of temporary work sites will include removal, treatment, and proper disposal of oil contaminated soils, (v) discharge of oil contaminated water into the environment will be prohibited; and (vi) construction personnel designated to handle of fuels/hazardous substances will be trained particularly in spill control procedures						
On-site air pollution due to construction activities	The contractor will be required to do the following: (i) regular water spraying of roads, work areas and other construction-related facilities to minimize dust generation; (ii) construction materials stockpiles and spoils with potential for significant dust generation to be covered or	Part of contractors' bid cost	Contractor	DSC and SW's PMU	dust generation, water spraying, cover of stockpiles, smoke emitting equipment, open burning of materials	visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	sprayed with water, as appropriate, to prevent fine materials from being blown; (iii) prohibit use of equipment and vehicles that emit dark sooty emissions; (iv) hauling trucks transporting loose construction materials such as sand, gravel, and spoils to be provided with tight tarpaulin cover or other suitable materials to avoid spills and dust emission; and (v) prohibit burning of all types of wastes generated at the construction sites, workers' camps as well as other project-related facilities and activities.						
Improper solid waste management	<p>The contractor will be required to: (i) provide garbage bins and facilities within the project site for temporary storage of construction waste and domestic solid waste; (ii) separate solid waste into hazardous, non-hazardous and reusable waste streams and store temporarily on-site in secure facilities with weatherproof flooring and roofing; (iii) ensure that wastes are not haphazardly dumped within the project site and adjacent areas; (iv) regular disposal of wastes to the Ranadi Landfill; (v) prohibit burning of all types of wastes; (vi) remove the construction wastes from the sites after work completion, and (vii) implement the required restoration of disturbed sites.</p> <p>The CEMP shall contain a subproject specific waste management plan and describing all waste types, amounts, disposal method, transport documentation requirements, and details of licensed</p>	Part of contractors' bid cost	Contractor	DSC and SW's PMU	construction wastes; waste separation, temporary on-site waste storage, regular disposal records, surplus materials not removed upon completion	visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	waste treatment/recycling facilities for each waste stream.						
Construction noise and vibration	<p>The contractor will exert extra efforts in reducing the noise generation from his activities near residential areas.</p> <p>The contractor will: (i) provide prior notification to the community on schedule of construction activities; (ii) provide noisy equipment with noise reduction covers whenever applicable; (iii) position stationary equipment that produce elevated noise levels, such as diesel generators and air compressors, as far as practicable from houses and other receptors; (iv) prohibit operation of noisy equipment and construction works in populated areas and where sensitive receptors are found during nighttime (19:00 – 06:00); (v) make prior notification and consultation with the affected people and local officials for necessary nighttime operation; (vi) locate concrete batching plant, and rock crushing plant at a reasonable distance away from inhabited areas and sensitive receptors; and (vii) conduct regular noise level monitoring to determine compliance with WHO guidelines for noise which should not to exceed 55 dB(A) near residential areas during daytime and 45 dB(A) for nighttime</p>	Part of contractors' bid cost	Contractor	DSC and SW's PMU	noise levels not to exceed 55 dB(A) near residential areas during daytime and 45 dB(A) for nighttime; noisy equipment not to be operated between 19:00 – 06:00hrs; regular noise level monitoring by contractor	Use of sound levels meter; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW
Vehicular traffic congestion and hindrance to public access	The contractor to: (i) prepare a traffic plan and provide traffic management personnel to direct the flow of traffic in the vicinity of the construction	Part of contractors' bid cost	Contractor	DSC and SW's PMU	contractor's traffic plan and traffic management personnel; traffic signs	traffic plans verification; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	sites and construction-related facilities; (ii) closely coordinate with local authorities for any closure of roads or rerouting of vehicular traffic; (iii) provide traffic signs in the vicinity of the construction sites to direct motorists and pedestrians; and (iv) minimize disruption to local activities by timing the construction activities with consideration to the schedules of festivities, processions, parades, etc.				in vicinity of construction sites; contractor's work schedule related to festivities, processions, parades, etc.		
Community health and safety	The contractor to: (i) use barriers and install signage to keep the public away from constructions sites and excavation sites; (ii) provide security personnel in hazardous areas to restrict public access; (iii) operate construction night light at the vicinity of construction sites; and (iv) whenever necessary, provide adequate safe passageways for the public crossing the construction sites whose access to properties, establishments, etc. has been disrupted or blocked by the ongoing construction activities	Part of contractors' bid cost	Contractor	DSC and SW's PMU	work sites safety plan; warning signs, barricades, and night lamps for open excavations, lighting system for nighttime operations; adequate safe passageways for the public crossing the construction sites	work sites safety plan verification; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW
Potential social issues due to influx of imported workers	Measures include: (i) induction of the workers on requirements of the project's regarding community health and safety, grievance redress mechanism, and consultation and communications plan; (ii) implementation of protocols concerning the workers contact between the local communities; (iii) implementation of a communicable disease awareness and prevention program on the risk of disease spreading including sexually	Part of contractors' bid cost	Contractor	DSC and SW's PMU	Check implementation of workers induction, required protocol, awareness and prevention program on the risk of disease spreading, workers camp fencing	records verification and visual inspection / at start of work and monthly	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	transmitted diseases and the human immunodeficiency virus; and (iv) contractor's camp and yard will be secured by a fence and provided with warning signs to control unauthorized access and prevent entry of the public.						
Pollution and health risks due to workers' camp	The contractor will be required to: (i) install proper sanitary facilities to prevent the indiscriminate discharge of sanitary wastes at the camps' surroundings, (ii) implement proper solid waste management, and (iii) prevent surface runoffs from flowing into the workers camps by using temporary diversion drains, catch drains, and silt-traps	Part of contractors' bid cost	Contractor	DSC and SW's PMU	Sanitary toilets, garbage bins, runoff controls in camps	visual inspection of sites/ once before start of construction and once monthly	part of DSC contract; minimal cost to SW
Occupational health and safety at work sites	The contractor to implement good practices on occupational health and safety at the construction sites by: (i) implementing a construction site health and safety management plan (CSHSMP), (ii) ensuring that an equipped first aid station is available at all times, (iii) providing the workers with potable water and adequate sanitation facilities, (iv) providing the workers with adequate and well-ventilated camps and clean eating areas, (v) providing the workers with separate sleeping quarters for male and female workers, (vi) providing the workers with personal protective equipment (PPE) to minimize exposure to a variety of hazards, and (vii) providing fire-fighting equipment and fire extinguishers in workshops, fuel storage facilities, construction camps, and any sites where fire hazard and risk are present.	Part of contractors' bid cost	Contractor	DSC and SW's PMU	health and safety plan; first aid station; PPE, sanitation facilities; fire-fighting equipment and fire extinguishers	health and safety plan verification; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
OPERATIONS							
Health hazard due to delivery of poor water quality	SW will implement its updated water safety plan as advocated by the WHO to: (i) prevent contamination of the water sources, (ii) treat the water to reduce or remove contamination that could be present and meet the water quality targets, and (iii) prevent re-contamination during storage, distribution and handling of drinking water	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	water safety plan implemented; E. Coli bacteria; physical & chemical water parameters	verify water safety plan implementation; water sampling and laboratory test/ monthly for plan and for bacteria; annual for physical & chemical	part of SW's operational cost
Reservoirs operational risk and safety	measures to reduce the operational risk and safety of water supply tank include: (i) workers will be trained on health and safety aspects of operating a water supply tank; (ii) a facility health and safety manual will be prepared to address the prevention, reduction and control of occupational injury and illness. The manual will among others: clearly identify conditions that may cause acute workers health and safety problems, specify requirements that all workers should comply during normal operations and emergency situations, and specify training requirements for health and safety; (iii) reduce the risks associated with the use of chlorine gas as disinfectant by observing the following: chlorine gas cylinders will be kept in separate safety rooms and equipped with fully automated chlorine gas shutoff system, establish a system for the safe use and handling of chlorine materials in the work place, and provide the workers with the appropriate PPE for chlorine use and handling; and (iv)	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	use of facility health and safety manual, chlorine handling procedures, workers' PPE for chlorine use and handling, facility fence	visual inspection; records verification/ weekly	minimal cost since it is only visual inspection

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	provide the facility with a five-foot-high fence to control access and avoid exposing the public to any hazard due to the presence of the water supply tank.						
Public health risk due to unplanned outages and emergencies of the water supply system	Mitigations include: (i) identification of potential causes of unplanned outages and emergencies shall be conducted during operation of the water supply system and updated as necessary; (ii) written management procedures for unplanned outages and emergencies as required by the water safety plan implementation (advocated by WHO); (iii) regular inspection and maintenance of the backup power supplies and the associated Automatic Transfer Switch (ATS) of the backup power supplies at the water pumping stations to ensure uninterrupted operation during power failure; (iv) regular inspection and maintenance of pumping systems and emergency backup systems to ensure that these are in good working conditions; (v) implement flushing and disinfection, as necessary, during unplanned outages and emergencies to prevent microbial contamination of the water supply system; (vi) written standard operating procedures manual to be available at the facilities to provide guidance to the water supply system's staff on how to handle unplanned outages and emergencies; (vii) regular training of water supply system's staff on how to handle unplanned outages and emergencies	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	written management procedures for unplanned outages and emergencies (per water safety plan); schedules of inspection and maintenance of pumping systems, emergency backup systems, and automatic transfer switch of the backup power supplies at the water pumping stations; standard operating procedures manual for unplanned outages and emergencies; flushing and disinfection plan for unplanned outages and emergencies; training of water supply system's staff; unplanned outages and emergencies	verify regular inspection and maintenance/ weekly; verify implementation of operating procedures manual/ weekly; verify implementation of water supply flushing and disinfection plan/ after incidents	minimal cost since it is only visual inspection

Source: PPA consultants. 2018.

Table VIII-5: Environmental Mitigation and Monitoring Plan of Sewer Outfall Rehabilitation subproject

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
PRECONSTRUCTION							
Climate change vulnerability of the Point Cruz, Naha, and KGVl sewerage outfalls	Climate change adaptation measures are: (i) results of engineering assessment of sea level rise and wave action on potential coastal erosion and loss of head of the Point Cruz, Naha, and KGVl sewerage outfalls will be the basis for climate change adaptation considerations; and (ii) appropriate erosion protection for the landward pipeline sections of the Point Cruz, Naha, and KGVl outfalls will be determined to avoid structural failures of the pipelines caused by coastal erosion	Part of detailed design cost	Design Consultant	SW's PMU	engineering drawings and specifications considered climate change adaptation features	verify engineering drawings and specifications/ once	minimal cost
Improper implementation of the Sewer Outfall Rehabilitation subproject's EMP	Tender documents and construction contract of the Sewer Outfall Rehabilitation subproject will include provisions that will: (i) require the contractors to prepare their respective Contractor's Environmental Management Plan (CEMP) prior to the start of the construction activities with details of staff, resources, implementation schedules, as well as monitoring and reporting procedures; (ii) issue a CEMP framework as guidance for the contractor in preparing a CEMP as part of his bid proposal; and (iii) require the Owner's Engineer to review and approve the CEMP prior to site mobilization.	Part of contractors' bid cost	Design Consultant and Contractor	design and supervision consultant (DSC) and SW's PMU	CEMP prepared by contractors	CEMP submittal by contractors to Engineer/ prior to commencement of site works	part of consultant's task (minimal cost)
Complaints due to project-related impacts	SW's PMU and the contractors will: (i) establish the approved project's grievance redress mechanism (GRM); (ii) publicize the existence	Part of contractors' bid cost	Contractor and SW's PMU	DSC and SW's PMU	consultation meetings; specific provisions in tender documents on nuisance & problems	verify meetings documentation; Verify tender documents; verify	part of consultant's task (minimal cost)

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	of the project's GRM through public awareness campaigns, website, billboards, public notifications, etc; (iii) ensure that the names and contact numbers of representatives of the contractors and SW's PMU are place on notice boards at agreed locations and/or website.				to public; GRM activated with community advisory committees (CACs) created	the in-placed CACs/ after completion of meetings; once after tender documents prepared	
Disruption of utilities and services	SW and the contractors will: (i) coordinate with the other utilities companies regarding the potential disruptions; (ii) make provisions to preserve the operation of current facilities, and (iii) affected households and establishments will be notified well in advance of such disruptions.	Part of contractors' bid cost	Contractor and SW's PMU	DSC and SW's PMU	contractor's coordination with the other utility companies; notification of affected households and establishments	verify contractor's coordination meetings and notifications/ after completion of meetings and notifications	part of consultant's task (minimal cost)
Improper disposal of excavation spoils	The owner's Engineer will: (i) require the contractors to submit a plan for the disposal of excess excavation spoils, and (ii) undertake inspection and approval of the contractors' suggested disposal sites prior to actual construction	Part of DSC cost	DSC	SW's PMU	contractor's disposal plan for excess excavation spoils	DSC disposal sites' inspection/ after contractor's submittal	part of consultant's task (minimal cost)
Potential damage to unknown archaeological and cultural assets	Tender documents and construction contract will include a provision that will: (i) require construction activities to be stopped immediately upon discovery of any unknown archaeological and cultural assets; and (ii) the contractor will promptly inform the local authorities and the Solomon Island National Museum about the presence	Part of specs preparation cost	Design Consultant	SW's PMU	specific provision in tender documents on archeological/ cultural relics	verify tender documents/ once after tender documents prepared	part of consultants task (minimal cost)

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	of Monitoring Cost
Beach water quality impacts from raw sewage discharge to sea	proposed lengths and discharge depth of the 3 outfalls have to be confirmed during detailed design to ensure that proper lengths were selected for effective dilution by undertaking dispersion modelling and assessing pathogen and contaminant concentrations in nearshore areas	Included in Detailed Design Consultant's scope and cost	Design Consultant	SW's PMU	Nearshore and beach water quality parameters	Results of dispersion modelling for detailed design of outfalls	Included in design consultancy cost
CONSTRUCTION							
Soil erosion and sediment of construction sites	The contractor will divert surface runoffs away from the exposed areas and prevent sediments from moving offsite by using measures appropriate for site condition; total exposed area will be minimized as the conditions allow	Part of contractors' bid cost	Contractor	DSC and SW's PMU	disturbed sites; use of appropriate sediment controls	visual inspection of sites; plans verification/ daily during rainy periods	part of DSC contract; minimal cost to SW
Extraction of local construction materials	The contractor will provide sufficient information on the quarries and borrow pits to be used including commercial sources; The following will be required for quarries and borrow pits: (i) only licensed quarries will be used or the contractor will obtain its own licenses (ii) borrow pits will be covered by required government permits or approvals, (iii) will not be located within 300 meters of any urban area sensitive receptors, (iv) topsoil will be saved for rehabilitation during closure of the quarries and borrow pits, (v) will be provided with drainage and sediment flow controls, and (vi) closure will include fencing and placement of warning sign to the public	Part of contractors' bid cost	Contractor	DSC and SW's PMU	government permits or approvals of quarries and borrow pits; operational plan; drainage and sediment flow controls; tops soil management	visual inspection of sites; plans verification/ weekly	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	of Monitoring Cost
Oil and other hazardous materials releases.	To prevent accidental releases, the contractors will be required to implement the following: (i) provide maintenance shops, fuel and oil depot with impermeable flooring with sump where wash water and sludge can be collected for proper disposal; (ii) refueling and servicing of equipment should only be carried out in specified areas adequately equipped to avoid leaks and spills that could contaminate soil and water resources; (iii) chemicals, hazardous substances and fuel will be stored on-site within an enclosed and covered secure area that has an impervious floor and impervious bund around it, (iv) storage area will be located away from water-courses, flood-prone areas, work camps, and danger areas, (v) equipment maintenance areas and fuel storage areas will be provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency; (vi) regularly check containers for leakage and undertake necessary repair or replacement; (vii) store hazardous materials above flood level; (viii) ensure all storage containers are in good condition with proper labeling; and (ix) store waste oil, used lubricant and other hazardous wastes in tightly sealed containers to avoid contamination of soil and water resources; Measures for clean-up and handling of contaminated materials include: (i) undertake immediate clean-up of spills, (ii) oil stained	Part of contractors' bid cost	Contractor	DSC and SW's PMU	measures required to prevent accidental releases; measures for clean-up and handling of contaminated materials; training records of personnel for hazardous materials; records of accidental releases	visual inspection of sites; records verification/ daily	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	of Monitoring Cost
	wastes and used oil should be collected and disposed of through recyclers / authorized waste handlers and disposal in authorized waste facilities; (iii) ensure availability of spill cleanup materials such as absorbent pads, (iv) restoration of temporary work sites will include removal, treatment, and proper disposal of oil contaminated soils, (v) discharge of oil contaminated water into the environment will be prohibited; and (vi) construction personnel designated to handle of fuels/hazardous substances will be trained particularly in spill control procedures						
On-site air pollution due to construction activities	The contractor will be required to do the following: (i) regular water spraying of roads, work areas and other construction-related facilities to minimize dust generation; (ii) construction materials stockpiles and spoils with potential for significant dust generation to be covered or sprayed with water, as appropriate, to prevent fine materials from being blown; (iii) prohibit use of equipment and vehicles that emit dark sooty emissions; (iv) hauling trucks transporting loose construction materials such as sand, gravel, and spoils to be provided with tight tarpaulin cover or other suitable materials to avoid spills and dust emission; and (v) prohibit burning of all types of wastes generated at the construction sites, workers'	Part of contractors' bid cost	Contractor	DSC and SW's PMU	dust generation, water spraying, cover of stockpiles, smoke emitting equipment, open burning of materials	Visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	Monitoring Cost
	camps as well as other project-related facilities and activities.						
Improper solid waste management	<p>The contractor will be required to:</p> <ul style="list-style-type: none"> (i) provide garbage bins and facilities within the project site for temporary storage of construction waste and domestic solid waste; (ii) separate solid waste into hazardous, non-hazardous and reusable waste streams and store temporarily on-site in secure facilities with weatherproof flooring and roofing; (iii) ensure that wastes are not haphazardly dumped within the project site and adjacent areas; (iv) regular disposal of wastes to the Ranadi Landfill; (v) prohibit burning of all types of wastes; (vi) remove the construction wastes from the sites after work completion, and (vii) implement the required restoration of disturbed sites. <p>The CEMP shall contain a subproject specific waste management plan and describing all waste types, amounts, disposal method, transport documentation requirements, and details of licensed waste treatment/recycling facilities for each waste stream.</p>	Part of contractors' bid cost	Contractor	DSC and SW's PMU	construction wastes; waste separation, temporary on-site waste storage, regular disposal records, surplus materials not removed upon completion	Visual inspection of sites/ daily	part of DSC contract; minimal cost to SW
Existing Outfalls Removal and Beach Cleanup	The contractor will be required to prepare an implement: (i) an inventory of the existing outfalls components to be removed; (ii) a removal and disposal plan for existing outfalls components, including the assessment if any of the wastes are hazardous and prescribe the appropriate handling and disposal for such wastes; (iii) a	Part of contractors' bid cost	Contractor	DSC and SW's PMU	Existing outfalls components; contaminated beach materials	Visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	of Monitoring Cost
	beach cleanup plan for the beach area of the existing outfalls, including the assessment if any beach portions are heavily contaminated and need to be transported to a disposal site.						
Marine bottom disturbance	The contractor will use silt curtains or other appropriate methods during outfall pipeline installation in the sea to prevent the transport of marine sediments out of the work sites (outfall pipeline alignment) and into the surrounding environment	Part of contractors' bid cost	Contractor	DSC and SW's PMU	silts in seawater, silt curtains or other appropriate methods to prevent the transport of sediment out of marine work sites	Visual inspection of sites/ daily	part of DSC contract; minimal cost to SW
Construction noise and vibration	The contractor will: (i) provide prior notification to the community on schedule of construction activities; (ii) provide noisy equipment with noise reduction covers whenever applicable; (iii) position stationary equipment that produce elevated noise levels, such as diesel generators and air compressors, as far as practicable from houses and other receptors; (iv) prohibit operation of noisy equipment and construction works in populated areas and where sensitive receptors are found during nighttime (19:00 – 06:00); (v) make prior notification and consultation with the affected people and local officials for necessary nighttime operation; (vi) locate concrete batching plant, and rock crushing plant at a reasonable distance away from inhabited areas and sensitive receptors; and (vii) conduct regular noise level monitoring to determine compliance with WHO guidelines	Part of contractors' bid cost	Contractor	DSC and SW's PMU	noise levels not to exceed 55 dB(A) near residential areas during daytime and 45 dB(A) for nighttime; noisy equipment not to be operated between 19:00 – 06:00hrs; regular noise level monitoring by contractor	Use of sound levels meter; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	of Monitoring Cost
	for noise which should not to exceed 55 dB(A) near residential areas during daytime and 45 dB(A) for nighttime						
Vehicular traffic congestion and hindrance to public access	The contractor to: (i) prepare a traffic plan and provide traffic management personnel to direct the flow of traffic in the vicinity of the construction sites and construction-related facilities; (ii) closely coordinate with local authorities for any closure of roads or rerouting of vehicular traffic; (iii) provide traffic signs in the vicinity of the construction sites to direct motorists and pedestrians; and (iv) minimize disruption to local activities by timing the construction activities with consideration to the schedules of festivities, processions, parades, etc.	Part of contractors' bid cost	Contractor	DSC and SW's PMU	contractor's traffic plan and traffic management personnel; traffic signs in vicinity of construction sites; contractor's work schedule related to festivities, processions, parades, etc.	traffic plans verification; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW
Community health and safety	The contractor to: (i) use barriers and install signage to keep the public away from constructions sites and excavation sites; (ii) provide security personnel in hazardous areas to restrict public access; (iii) operate construction night light at the vicinity of construction sites; and (iv) whenever necessary, provide adequate safe passageways for the public crossing the construction sites whose access to properties, establishments, etc. has been disrupted or blocked by the ongoing construction activities	Part of contractors' bid cost	Contractor	DSC and SW's PMU	work sites safety plan; warning signs, barricades, and night lamps for open excavations, lighting system for nighttime operations; adequate safe passageways for the public crossing the construction sites	work sites safety plan verification; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
Potential social issues due to influx of imported workers	Measures include: (i) induction of the workers on requirements of the project's regarding community health and safety, grievance redress mechanism, and consultation and communications plan; (ii) implementation of protocols concerning the workers contact between the local communities; (iii) implementation of a communicable disease awareness and prevention program on the risk of disease spreading including sexually transmitted diseases and the human immunodeficiency virus; and (iv) contractor's camp and yard will be secured by a fence and provided with warning signs to control unauthorized access and prevent entry of the public.	Part of contractors' bid cost	Contractor	DSC and SW's PMU	Check implementation of workers induction, required protocol, awareness and prevention program on the risk of disease spreading, workers camp fencing	records verification and visual inspection / at start of work and monthly	part of DSC contract; minimal cost to SW
Pollution and health risks due to workers' camp	The contractor will be required to: (i) install proper sanitary facilities to prevent the indiscriminate discharge of sanitary wastes at the camps' surroundings, (ii) implement proper solid waste management, and (iii) prevent surface runoffs from flowing into the workers camps by using temporary diversion drains, catch drains, and silt-traps	Part of contractors' bid cost	Contractor	DSC and SW's PMU	Sanitary toilets, garbage bins, runoff controls in camps	visual inspection of sites/ once before start of construction and once monthly	part of DSC contract; minimal cost to SW
Occupational health and safety at work sites	The contractor to implement good practices on occupational health and safety at the construction sites by: (i) implementing a construction site health and safety management plan (CSHSMP), (ii) ensuring that an equipped first aid station is available at all times, (iii) providing	Part of contractors' bid cost	Contractor	DSC and SW's PMU	health and safety plan; first aid station; PPE, sanitation facilities; fire-fighting equipment and fire extinguishers	health and safety plan verification; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	of Monitoring Cost
	the workers with potable water and adequate sanitation facilities, (iv) providing the workers with adequate and well-ventilated camps and clean eating areas, (v) providing the workers with separate sleeping quarters for male and female workers, (vi) providing the workers with personal protective equipment (PPE) to minimize exposure to a variety of hazards, and (vii) providing fire-fighting equipment and fire extinguishers in workshops, fuel storage facilities, construction camps, and any sites where fire hazard and risk are present.						
OPERATIONS							
Improve overall sewage discharges to the sea	Enhancement measures are: (i) regular monitoring and effective maintenance of the outfalls during operation to ensure that there will be no broken sections in order to maintain the sufficient distance from the shoreline of the discharge points	Part of SW's operational cost	SW's sewerage personnel for regular maintenance	SW's Operations Dept. Mgt.	broken sections of Point Cruz, Naha, and KGVII sewerage outfalls; nearshore area E. Coli bacteria concentrations	visual inspection/ weekly water testing	minimal cost since it is only visual inspection/ Operational cost of running waste water testing laboratory
Public health risk due to unplanned outages and emergencies of sewerage system	Mitigations include: (i) identification of potential causes of unplanned outages and emergencies shall be conducted during operation of the sewerage system and updated as necessary; (ii) written management procedures for unplanned outages and emergencies; (iii) regular inspection and maintenance of the backup power supplies and the associated Automatic Transfer Switch (ATS) of the backup power	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	written management procedures for unplanned outages and emergencies; schedules of inspection and maintenance of pumping systems, emergency backup systems, and automatic transfer switch of the backup	verify regular inspection and maintenance/ weekly; verify implementation of operating procedures manual/ weekly; verify implementation of water supply flushing and	minimal cost since it is only visual inspection

Environmental Issues/ Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	of Monitoring	Monitoring Cost
	supplies at the sewage pumping stations to ensure uninterrupted operation during power failure; (iv) regular inspection and maintenance of pumping systems and emergency backup systems to ensure that these are in good working conditions; (vi) written standard operating procedures manual to be available at the facilities to provide guidance to the sewerage system's staff on how to handle unplanned outages and emergencies; (vii) regular training of sewerage system's staff on how to handle unplanned outages and emergencies				power supplies at the sewage pumping stations; standard operating procedures manual for unplanned outages and emergencies; flushing and disinfection plan for unplanned outages and emergencies; training of sewerage system's staff; unplanned outages and emergencies	disinfection plan/ after incidents		

Source: PPA consultants. 2018.

Table VIII-6: Environmental Mitigation and Monitoring Plan of Sewage Pumping Stations Refurbishment subproject

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
PRECONSTRUCTION								
Climate change vulnerability of Honiara's sewerage pipelines and sewerage pumping stations		Climate change adaptation measures are: (i) results of the onsite flooding study and engineering assessment on potential site erosion of the sewerage pipelines routes and sewerage pumping stations locations will be the basis for climate change adaptation considerations; (ii) appropriate erosion protection for the sewer pipelines and pumping stations will be determined to avoid structural failures of the pipelines and pumping stations; (iii) heights of all above-ground structures will be on sufficient levels to avoid submergence during large floods; and (iv) appropriate flood protection works for the above-ground structures will be determine using results of the onsite flooding study	Part of detailed design cost	Design Consultant	SW's PMU	engineering drawings and specifications considered climate change adaptation features	verify engineering drawings and specifications/ once	minimal cost
Improper implementation of the Sewage Pumping Stations Refurbishment subproject's EMP		Tender documents and construction contract of the Sewage Pumping Stations Refurbishment subproject will include provisions that will: (i) require the contractors to prepare their respective Contractor's Environmental Management Plan (CEMP) prior to the start of the construction activities with details of staff, resources, implementation schedules, as well as monitoring and reporting procedures; (ii) issue a CEMP framework as guidance for the contractor in preparing a CEMP as part of his bid proposal; and (iii) require the Owner's Engineer to review and approve the CEMP prior to site mobilization.	Part of contractors' bid cost	Design Consultant and Contractor	design and supervision consultant (DSC) and SW's PMU	CEMP prepared by contractors	CEMP submittal by contractors to Engineer/ prior to commencement of site works	part of consultant's task (minimal cost)
Complaints due to project-related impacts		SW's PMU and the contractors will: (i) establish the approved project's grievance redress mechanism (GRM); (ii) publicize the existence of the project's GRM through public awareness campaigns, website, billboards, public notifications, etc; (iii) ensure that the names and contact numbers of representatives of the contractors and SW's PMU are placed on notice boards at agreed locations and/or website.	Part of contractors' bid cost	Contractor and SW's PMU	DSC and SW's PMU	consultation meetings; specific provisions in tender documents on nuisance & problems to public; GRM activated with community	verify meetings documentation; Verify tender documents; verify the in-placed CACs/ after completion of meetings; once after tender	part of consultant's task (minimal cost)

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
						advisory committees (CACs) created	documents prepared	
Disruption of utilities and services		SW and the contractors will: (i) coordinate with the other utilities companies regarding the potential disruptions; (ii) make provisions to preserve the operation of current facilities, and (iii) affected households and establishments will be notified well in advance of such disruptions.	Part of contractors' bid cost	Contractor and SW's PMU	DSC and SW's PMU	contractor's coordination with the other utility companies; notification of affected households and establishments	verify contractor's coordination meetings and notifications/ after completion of meetings and notifications	part of consultant's task (minimal cost)
Improper disposal of excavation spoils		The owner's Engineer will: (i) require the contractors to submit a plan for the disposal of excess excavation spoils, and (ii) undertake inspection and approval of the contractors' suggested disposal sites prior to actual construction	Part of DSC cost	DSC	SW's PMU	contractor's disposal plan for excess excavation spoils	DSC disposal sites' inspection/ after contractor's submittal	part of consultant's task (minimal cost)
Potential damage to unknown archaeological and cultural assets		Tender documents and construction contract will include a provision that will: (i) require construction activities to be stopped immediately upon discovery of any unknown archaeological and cultural assets; and (ii) the contractor will promptly inform the local authorities and the Solomon Island National Museum about the presence	Part of specs preparation cost	Design Consultant	SW's PMU	specific provision in tender documents on archeological/ cultural relics	verify tender documents/ once after tender documents prepared	part of consultants task (minimal cost)
CONSTRUCTION								
Soil erosion and sediment of construction sites		The contractor will divert surface runoffs away from the exposed areas and prevent sediments from moving offsite. Measures may include, as appropriate for site conditions: (i) small interceptor dikes, (ii) pipe slope drains, (iii) grass bale barriers, (iv) silt fence, (v) sediment traps, and (vi) temporary sediment basins; total exposed area will be minimized as the conditions allow	Part of contractors' bid cost	Contractor	DSC and SW's PMU	disturbed sites; use of appropriate sediment controls	visual inspection of sites; plans verification/ daily during rainy periods	part of DSC contract; minimal cost to SW

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
Extraction of local construction materials		The contractor will provide sufficient information on the quarries and borrow pits to be used including commercial sources; The following will be required for quarries and borrow pits: (i) only licensed quarries will be used or the contractor will obtain its own licenses (ii) borrow pits will be covered by required government permits or approvals, (iii) will not be located within 300 meters of any urban area sensitive receptors, (iv) topsoil will be saved for rehabilitation during closure of the quarries and borrow pits, (v) will be provided with drainage and sediment flow controls, and (vi) closure will include fencing and placement of warning sign to the public	Part of contractors' bid cost	Contractor	DSC and SW's PMU	government permits or approvals of quarries and borrow pits; operational plan; drainage and sediment flow controls; topsoil management	visual inspection of sites; plans verification/ weekly	part of DSC contract; minimal cost to SW
Oil and other hazardous materials releases.		To prevent accidental releases, the contractors will be required to implement the following: (i) provide maintenance shops, fuel and oil depot with impermeable flooring with sump where wash water and sludge can be collected for proper disposal; (ii) refueling and servicing of equipment should only be carried out in specified areas adequately equipped to avoid leaks and spills that could contaminate soil and water resources; (iii) chemicals, hazardous substances and fuel will be stored on-site within an enclosed and covered secure area that has an impervious floor and impervious bund around it, (iv) storage area will be located away from water-courses, flood-prone areas, work camps, and danger areas, (v) equipment maintenance areas and fuel storage areas will be provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency; (vi) regularly check containers for leakage and undertake necessary repair or replacement; (vii) store hazardous materials above flood level; (viii) ensure all storage containers are in good condition with proper labeling; and (ix) store waste oil, used lubricant and other hazardous wastes in tightly sealed containers to avoid contamination of soil and water resources; Measures for clean-up and handling of contaminated materials include: (i) undertake immediate clean-up of spills, (ii) oil	Part of contractors' bid cost	Contractor	DSC and SW's PMU	measures required to prevent accidental releases; measures for clean-up and handling of contaminated materials; training records of personnel for hazardous materials; records of accidental releases	visual inspection of sites; records verification/ daily	part of DSC contract; minimal cost to SW

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
		stained wastes and used oil should be collected and disposed of through recyclers / authorized waste handlers and disposal in authorized waste facilities; (iii) ensure availability of spill cleanup materials such as absorbent pads, (iv) restoration of temporary work sites will include removal, treatment, and proper disposal of oil contaminated soils, (v) discharge of oil contaminated water into the environment will be prohibited; and (vi) construction personnel designated to handle of fuels/hazardous substances will be trained particularly in spill control procedures						
On-site air pollution due to construction activities		The contractor will be required to do the following: (i) regular water spraying of roads, work areas and other construction-related facilities to minimize dust generation; (ii) construction materials stockpiles and spoils with potential for significant dust generation to be covered or sprayed with water, as appropriate, to prevent fine materials from being blown; (iii) prohibit use of equipment and vehicles that emit dark sooty emissions; (iv) hauling trucks transporting loose construction materials such as sand, gravel, and spoils to be provided with tight tarpaulin cover or other suitable materials to avoid spills and dust emission; and (v) prohibit burning of all types of wastes generated at the construction sites, workers' camps as well as other project-related facilities and activities.	Part of contractors' bid cost	Contractor	DSC and SW's PMU	dust generation, water spraying, cover of stockpiles, smoke emitting equipment, open burning of materials	Visual inspection of sites/ daily	part of DSC contract; minimal cost to SW
Improper solid waste management		The contractor will be required to: (i) provide garbage bins and facilities within the project site for temporary storage of construction waste and domestic solid waste; (ii) separate solid waste into hazardous, non-hazardous and reusable waste streams and store temporarily on-site in secure facilities with weatherproof flooring and roofing; (iii) ensure that wastes are not haphazardly dumped within the project site and adjacent areas; (iv) regular disposal of wastes to the Ranadi Landfill; (v) prohibit burning of all types of wastes; (vi) remove the construction wastes from the sites after work completion, and (vii) implement the required restoration of disturbed sites.	Part of contractors' bid cost	Contractor	DSC and SW's PMU	construction wastes; waste separation, temporary on-site waste storage, regular disposal records, surplus materials not removed upon completion	Visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
		The CEMP shall contain a subproject specific waste management plan and describing all waste types, amounts, disposal method, transport documentation requirements, and details of licensed waste treatment/recycling facilities for each waste stream.						
Construction noise and vibration		<p>The contractor will exert extra efforts in reducing the noise generation from his activities near residential areas and the following nearby sensitive receptors: Rove Clinic, Police Academy, St Johns School, YWCA Kindy, Tuvaruhu Anglican Church, Tuvaruhu School, Varamata SDA Church, Honiara High School, Planned Parenthood Clinic, Mataniko Clinic, Rhema Family Church, Rhema School, Coronation School, Chung Wah School, Lord Howe Settlement Anglican Church, National Referral Hospital, St Barnabas Cathedral, Jehovah's Witnesses Kingdom Hall, Kukum Clinic, Florence Young School, Kukum SDA School, dKukum SDA Church, Woodford International School, King George VI School, King George VCI Clinic, Eden Early Childhood Education School.</p> <p>The contractor will: (i) provide prior notification to the community on schedule of construction activities; (ii) provide noisy equipment with noise reduction covers whenever applicable; (iii) position stationary equipment that produce elevated noise levels, such as diesel generators and air compressors, as far as practicable from houses and other receptors; (iv) prohibit operation of noisy equipment and construction works in populated areas and where sensitive receptors are found during nighttime (19:00 – 06:00); (v) make prior notification and consultation with the affected people and local officials for necessary nighttime operation; (vi) locate concrete batching plant, and rock crushing plant at a reasonable distance away from inhabited areas and sensitive receptors; and (vii) conduct regular noise level monitoring to determine compliance with WHO guidelines for noise which should not to exceed 55</p>	Part of contractors' bid cost	Contractor	DSC and SW's PMU	noise levels not to exceed 55 dB(A) near residential areas during daytime and 45 dB(A) for nighttime; noisy equipment not to be operated between 19:00 – 06:00hrs; regular noise level monitoring by contractor	Use of sound levels meter; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
		dB(A) near residential areas during daytime and 45 dB(A) for nighttime						
Vehicular traffic congestion and hindrance to public access		<p>The contractor will pay more attention to routes from Rove to Point Cruz along Mendana Avenue, then to the Mataniko junction along the Kukum Highway, all the way to Naha outfall site and the Panatina and Ranadi areas.</p> <p>The contractor to: (i) prepare a traffic plan and provide traffic management personnel to direct the flow of traffic in the vicinity of the construction sites and construction-related facilities; (ii) closely coordinate with local authorities for any closure of roads or rerouting of vehicular traffic; (iii) provide prior notification to the community on schedule of construction activities; (iv) provide traffic signs in the vicinity of the construction sites to direct motorists and pedestrians; and (v) minimize disruption to local activities by timing the construction activities with consideration to the schedules of festivities, processions, parades, etc</p>	Part of contractors' bid cost	Contractor	DSC and SW's PMU	contractor's traffic plan and traffic management personnel; traffic signs in vicinity of construction sites; contractor's work schedule related to festivities, processions, parades, etc.	traffic plans verification; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW
Community health and safety		The contractor to: (i) use barriers and install signage to keep the public away from constructions sites and excavation sites; (ii) provide security personnel in hazardous areas to restrict public access; (iii) operate construction night light at the vicinity of construction sites; and (iv) whenever necessary, provide adequate safe passageways for the public crossing the construction sites whose access to properties, establishments, etc. has been disrupted or blocked by the ongoing construction activities	Part of contractors' bid cost	Contractor	DSC and SW's PMU	work sites safety plan; warning signs, barricades, and night lamps for open excavations, lighting system for nighttime operations; adequate safe passageways for the public crossing the construction sites	work sites safety plan verification; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
Potential social issues due to influx of imported workers		Measures include: (i) induction of the workers on requirements of the project's regarding community health and safety, grievance redress mechanism, and consultation and communications plan; (ii) implementation of protocols concerning the workers contact between the local communities; (iii) implementation of a communicable disease awareness and prevention program on the risk of disease spreading including sexually transmitted diseases and the human immunodeficiency virus; and (iv) contractor's camp and yard will be secured by a fence and provided with warning signs to control unauthorized access and prevent entry of the public.	Part of contractors' bid cost	Contractor	DSC and SW's PMU	Check implementation of workers induction, required protocol, awareness and prevention program on the risk of disease spreading, workers camp fencing	records verification and visual inspection / at start of work and monthly	part of DSC contract; minimal cost to SW
Pollution and health risks due to workers' camp		The contractor will be required to: (i) install proper sanitary facilities to prevent the indiscriminate discharge of sanitary wastes at the camps' surroundings, (ii) implement proper solid waste management, and (iii) prevent surface runoffs from flowing into the workers camps by using temporary diversion drains, catch drains, and silt-traps	Part of contractors' bid cost	Contractor	DSC and SW's PMU	Sanitary toilets, garbage bins, runoff controls in camps	visual inspection of sites/ once before start of construction and once monthly	part of DSC contract; minimal cost to SW
Occupational health and safety at work sites		The contractor to implement good practices on occupational health and safety at the construction sites by: (i) implementing a construction site health and safety management plan (CSHSMP), (ii) ensuring that an equipped first aid station is available at all times, (iii) providing the workers with potable water and adequate sanitation facilities, (iv) providing the workers with adequate and well-ventilated camps and clean eating areas, (v) providing the workers with separate sleeping quarters for male and female workers, (vi) providing the workers with personal protective equipment (PPE) to minimize exposure to a variety of hazards, and (vii) providing fire-fighting equipment and fire extinguishers in workshops, fuel storage facilities, construction camps, and any sites where fire hazard and risk are present.	Part of contractors' bid cost	Contractor	DSC and SW's PMU	health and safety plan; first aid station; PPE, sanitation facilities; fire-fighting equipment and fire extinguishers	health and safety plan verification; visual inspection of sites/ daily	part of DSC contract; minimal cost to SW
OPERATIONS								

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
Health and safety risks in sewerage system operation		facility hazards identification will be conducted during the initial operation phase of the pumping stations and updated as necessary; written facility health and safety manual will be prepared to address the prevention, reduction and control of occupational injury and illness of Honiara City's sewerage system operation. The manual will among others: (i) clearly identify conditions that may cause acute workers health and safety problems, (ii) specify requirements that all workers should comply, (iii) specify management of spills, and (iv) specify training requirements for health and safety	Part of SW's operational cost	SW's Operations Dept.	SW's Mgt.	facility hazards identification conducted during initial operation; facility health and safety manual; spills and accidents	verify health and safety manual implementation/ weekly	minimal cost since it is only visual inspection
Public health risk due to unplanned outages and emergencies of sewerage system		Mitigations include: (i) identification of potential causes of unplanned outages and emergencies shall be conducted during operation of the sewerage system and updated as necessary; (ii) written management procedures for unplanned outages and emergencies; (iii) regular inspection and maintenance of the backup power supplies and the associated Automatic Transfer Switch (ATS) of the backup power supplies at the sewage pumping stations to ensure uninterrupted operation during power failure; (iv) regular inspection and maintenance of pumping systems and emergency backup systems to ensure that these are in good working conditions; (vi) written standard operating procedures manual to be available at the facilities to provide guidance to the sewerage system's staff on how to handle unplanned outages and emergencies; (vii) regular training of sewerage system's staff on how to handle unplanned outages and emergencies	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	written management procedures for unplanned outages and emergencies; schedules of inspection and maintenance of pumping systems, emergency backup systems, and automatic transfer switch of the backup power supplies at the sewage pumping stations; standard operating procedures manual for unplanned outages and emergencies; flushing and	verify regular inspection and maintenance/ weekly; verify implementation of operating procedures manual/ weekly; verify implementation of water supply flushing and disinfection plan/ after incidents	minimal cost since it is only visual inspection

Environmental Potential Impact	Issues/ Environmental	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means Monitoring/ Frequency	Monitoring Cost
						disinfection plan for unplanned outages and emergencies; training of sewerage system's staff; unplanned outages and emergencies		

Source: PPA consultants. 2018.

IX. CONCLUSION AND RECOMMENDATIONS

164. The four subprojects covered in this assessment will offer benefits to Honiara by ensuring adequate supply of potable water, improving sewerage and sanitation and delivering high priority elements of SW's 30-Year Strategic Plan and 5-Year Action Plan.

165. The environmental screening process has highlighted the environmental issues and concerns of the proposed four subprojects. The screening has considered the fact that, apart from the sites of the proposed marine outfalls, all subprojects (new reservoir and trunk mains, sewerage lines and pumping stations) are in urban and peri-urban areas. These areas are highly modified and have long been disturbed by human activities as indicated by the presence of roads, houses, and commercial developments.

166. Based on the screening for potential environmental impacts and risks of the proposed subprojects, there are no significant negative environmental impacts or risks that cannot be mitigated or managed. The EMP prepared for each subproject (Tables VIII 2-5) will be updated based on detailed design and used as the basis for preparation of the CEMP to be prepared by the contractor. Monitoring and reporting of the approved CEMP will ensure that each subproject can be implemented in an environmentally acceptable manner. There is no need for further environmental assessment. The IEE will be updated and reformatted as PER and accompany the development consent application for each component.

167. In addition to the above, each subproject is hereby recommended with emphasis on the following: (i) each separate subproject EMP will be included in the design process; (ii) contracts of design consultants will have provisions requiring the consultants to consider EMP recommendations in the design process; (iii) tendering process will advocate environmentally responsible procurement by ensuring the inclusion of EMP provisions in the bidding and construction contract documents; (iv) contractor's submission of a CEMP will be included in the construction contract; (v) contract provisions on the creation and operation of the community advisory committees, a GRM requirement, will be included in the construction contracts; (vi) training of SW's personnel on operation and maintenance of the septage treatment plant, and wastewater laboratory will start before actual operation; (vii) monitoring of health and safety requirements will be given more importance during implementation to reduce risks to the public and to SW's personnel; and (viii) SW will continue the process of public consultation and information disclosure during detailed design and construction phases.

168. It is recommended that as part of detailed design the following studies be undertaken (and reflected as necessary in the updated IEE/PER): (i) a hydrology and onsite flooding study for all the sites where proposed structures are to be constructed, (iii) engineering assessment of potential site erosion to determine the type of erosion protection that will be appropriate for all proposed sites, and (iv) confirmation of the initially determined proposed lengths of the three outfalls for the effective dilution of sewage discharges by running an appropriate outfall dispersion modelling using more information generated during the detailed design stage.

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XI. APPENDICES

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APPENDIX 1

Solomon Islands International Agreements

Solomon Island has been a party to some international agreements on the principles and actions necessary for sustainable development and environmental protection. This include international agreements with environmental and conservation implications as well as for the protection, promotion and safeguarding of cultural heritage and traditional knowledge.

Regional agreements include: (i) Pollution Protocol for Dumping. Ratified 1998. Prevention of pollution of the South Pacific region by dumping, (ii) Pollution Protocol for Emergencies. Ratified 1998. Co-operation in combating pollution emergencies in the South Pacific region, (iii) Natural Resources & Environment of South Pacific Region (SPREP Convention). Ratified 1998, and (iv) Waigani Convention on Hazardous & Radioactive Wastes 1995. Ratified 1998. Bans the importation and the trans-boundary movement and management of hazardous wastes within the South Pacific region.

International agreements on chemicals, wastes, and pollution include: (i) Liability for Oil Pollution Damage. Ratified. Liability of ship owner for pollution damage, (ii) (Marine Pollution Convention (London). Ratified. Prevention of marine pollution by dumping of wastes, (iii) POPs Convention (Stockholm). 2004. Bans use of persistent organic pollutants.

International agreements on biodiversity include: (i) CITES, ratified 1998. Regulates trade in wild animals and plants, (ii) World Heritage Convention. Acceded 1992. Protection of sites of Outstanding Universal Values, (ii) Desertification (UNCCD). Acceded 1999. Agreement to combat desertification and drought, (iii) Convention on Biological Diversity (UNCBD). Ratified 1995, and (iv) Cartagena Protocol on Biosafety. Acceded 2004. Protection of human health and the environment from possible adverse effects of modern biotechnology.

International agreements on climate change include: (i) Montreal Protocol. Acceded 1993. Phase out of substances that deplete the ozone layer, (ii) Ozone Layer Convention (Vienna). Acceded 1993. Protection of the ozone layer, and (iii) Climate Change (UNFCCC). Ratified 1994, and (iv) Kyoto Protocol. Ratified 2003. Reduce greenhouse gases especially CO₂ by an average of 5.2% by 2012.

International agreements on culture and cultural heritage include: (i) World Heritage Convention. Acceded 1992. Protection of sites of Outstanding Universal Values. (East Rennelle Island is listed as a World Heritage site), (ii) The Convention for the Safeguarding of the Intangible Cultural Heritage 2003, and (iv) The Convention of the Protection and Promotion of the Diversity of Cultural Expressions 2005.

APPENDIX 2

PHOTOGRAPHS OF PROPOSED SITES FOR FACILITIES - HONIARA



Photo No.1: China Town, Mataniko area – trunk mains site [July 2018]



Photo No.2: White River area highway – trunk mains site [July 2018]



Photo No.3: Lower West Koala reservoir site – isolated flat area [July 2018]



Photo No.4: Titingge reservoir site dominated by grasses [July 2018]



Photo No.5: Naha Outfall [July 2018]



Photo No.6: Point Cruz lift station site – existing sewage pumping station [July 2018]



Photo No.7: Central Honiara – sewer pipeline route [July 2018]



Photo No.8: Mendana Avenue – sewer pipeline route [July 2018]



Photo No.9: Ranadi Landfill presently used for solid wastes disposal [July 2018]



Photo No.10: Proposed septage treatment plant site inside Ranadi Landfill area [July 2018]

APPENDIX 3

Minutes of the Initial Public Consultation and Information Disclosure held at Star Events, Tongs Building, Point Cruz, Honiara City, 13 July 2018

Opening/ Presentations:

The public consultation started at 9:30 A.M with Ian Gooden, SW's General Manager, welcoming the participants and encouraged them to participate actively in the meeting. He gave a brief presentation regarding the proposed project. This was followed with a presentation by Mark Waite, SW's PMU, on SW's strategic plan and information regarding the Solomon Islands Urban Water Supply and Sanitation Development Sector Project. The PPA consultants presented the details of each proposed subproject. The participants were informed that this is only an initial public consultation and SW will conduct more consultations in the future.

Comments, Views, Issues and Concerns

Comment and Question No. 1. Dennis Meone, Chief Executive Officer, Solomon Islands Chamber of Commerce and Industry (CEO, SICCI)

Dennis had three points to make:

- 1) That the Information in the presentations be dispersed and made available to the wider public. For example, SICCI has 200 members, therefore it (SICC) is an avenue through which information can be channelled and made available to its members.

Information such as the next phase of the project should be made known and available, specifying who might be directly affected by any new infrastructure Solomon Water plans to install in Honiara. e.g. digging of drains or laying of pipes. Some members of the Chamber and the Business Community might or will be directly affected so these are the types of Information Dennis thinks should be made available to SICCI members so they can plan accordingly to accommodate these future changes.

- 2) His second point was a concern about the road works. The road is currently being constructed and improved. Should new infrastructure be laid, will it mean laying pipes across the newly built road?

The answer to that concern was that any new infrastructure laid will be alongside the road, not across it and if it requires crossing the road, that it will be underneath the road, not directly across the road.

- 3) Dennis would like Solomon Water to share any of its initiatives in any of the phases with SICCI so these can be shared to the Business community and the Private sector.

Comment and question No. 2. Charles Kelly, City Clerk, Honiara City Council (HCC)

Charles is optimistic and hopeful that the study currently being undertaken will not end up being shelved as some other past studies have been done. From the presentations, he is able to discern that ADB, EU and World Bank are interested and if that interest continues, it will have a positive impact on the City and the Council.

Charles thinks there is a lot of work to do regarding the logistics. At this stage however, he has not laid eyes on any plans regarding logistics yet.

However, there is much to do in the city right now. The City is growing very fast and rapidly and the more people there are, the more problems and challenges they will bring. For example, more people means more people needing more water to drink and more water to use.

Charles is of the opinion that the HCC needs to be more involved in the logistics and the plans of construction and looks forward to seeing the Council being more involved right up until the completion of the Solomon Water project.

Something worth considering is how these plans will affect the greater Honiara. The city is moving eastwards as more people shift and build towards the east. The greater Honiara has been mapped and marked.

One of the issues as more people move and shift eastwards will be the issue of provision of Water for all these people.

However, within the city itself, people are not accessing water. Some of the people are still collecting water from boreholes, even though they have already been living in these areas for the last ten to twenty (10 to 20) years. *(So how do you plan to address the issue of water in the greater Honiara especially as the city grows and shifts towards the east, if the issue of access to water within the city itself is still not being addressed?)*

Part of the study shows this can be improved on.

Charles would like to see more flexibility in the current Solomon Water (Solomon Islands Water Authority) SW)) policy especially with regards to allowing more people to have access to water. The current Policy states one must be the owner of a piece of land or one must have title to the land before water is made accessible. Because of these stringent policies, many people are not able to access water. For example, people who live in informal settlements such as Gilbert Camp and the Border line area and communities have been living in these settlements for the last 10 to 20 years and they are still collecting water from streams. They have been continually approaching HCC to support their requests and pleas for more access to piped water. Although these may be minor points, Charles hopes Solomon Water will take these minor points into account so that a document that is more practical and workable will be produced.

The City Clerk also looks forward to the Waste Water treatment plant. In the presentations, it was identified where the Outfalls are and the City Clerk now realises that the whole city does not know but that the whole sea-front in front of Honiara is 100% polluted. Yet People are still using the sea water to wash their fish.

The solution to these challenges would be through improved technology and although it is going to be an expensive exercise, the City clerk hopes ADB, EU and the World Bank will be able to resolve the challenge of pollution through the construction of a Waste- Water Treatment Plant.

Answer Mark Waite Project Manager- Project Management Unit- Solomon Water

Mark thanked Charles Kelly for his comments and mentioned that there is a plan to construct a Waste Water treatment plan but it will be later in the project, not in the first five years of the strategic plan.

Ian Gooden- General Manager Solomon Water

Ian agreed with Charles on the fact that people have been using creeks and streams for many years. However, he has also noticed in his many walks through parts of the city that people have been siphoning off water through little pipes and gadgets connected to the main pipes.

From Ian's observations, one of the biggest problems and challenges Solomon Water faces is that people generally are reluctant to pay for water and rather expect water to be delivered freely. Should people want free water, they will have to collect it themselves from the streams using their buckets but if they want Solomon Water to pump the water, treat it and deliver it to their houses, they will have to pay for the added service.

He has noticed though that most people are able to afford to pay for water, because when they make calls to complain about their water disconnections, they are using a cell phone to make the call. So it seems as if they are prioritising buying cell phones over paying water for their families because they are able to purchase a cell phone but are not prepared to pay for water which they would rather steal. This is quite a big and challenging issue which Solomon water is confronted with.

The Solomon Water Communications team headed by Michelle will be communicating the message to people and letting them know that, "People who steal water are actually stealing money from you and I because we are subsidising and paying for that water for them! It is therefore, the paying customer/client who ends up paying more as a result of people stealing water from illegal water connections."

In addition to what Mark had rightly said with regards to the waste water, Ian added that future Outfalls will be extended further out into the ocean where there is more ocean currents which will take the effluent away and give better flushing and dilution. Screens will also be put on the outfalls to screen out plastics and larger solids so that the actual biological loading into the ocean is reduced.

While the construction of the wastewater treatment plant is still many, many years away, the upgrades planned for the pump stations will have a major effect on the quality of the effluent. Because the Outfalls will be extended further out, it means the effluent will not be coming back on to the foreshore and we should be expecting these significant improvements within a year or two.

The City council has planned the city into zones with conditions on building sites for people to adhere to. The SW General Manager sought the support of the City Clerk in enforcing legislation and managing the water catchment areas in the city.

For example, Solomon Water has a catchment area in Panatina and another one in the Rove area. SW has not been actively managing and enforcing legislation in these areas but if they are to start activating legislation, they will be evicting people from these areas. There will be no point in building a house with a septic tank quite close to a bore hole because there will be direct contamination of the water source/table. It will be in enforcing the legislation around the management of the boreholes and water sources that SW is seeking the support of the City Clerk and the Honiara City Council.

With regards to Informal settlements, Solomon Water is seeking solutions as to how it could be more inclusive and accommodating of these areas. Donors such as the European Union and the ADB are showing particular interest in Solomon Water's approach.

One of the major challenges Solomon Water has encountered with informal settlements is people refusing to pay their water accounts and bills. For example, two years ago, Solomon Water officers were chased out of Burns Creek and threatened with weapons because they had gone into the area to disconnect water metres from lack of payment of bills. A lot of Solomon Water infrastructure was also smashed and damaged. For safety purposes, Solomon Water has had to withdraw their services from the area but are still optimistic and if settlers in the Burns Creek area have a changed attitude and are willing to pay for Solomon Water's services, Solomon Water is open to further discussions and negotiations.

A probable solution to the above challenge in informal settlements would be to install Cash water. Similar to Cash Power and the use of cell phones, people disconnect themselves when they choose not to pay for top ups. It would therefore be a case of, No top up for cash water, no water!!

Solomon Water has found though, that people use less water and are a lot more conscious of the cost of water when they have to pay for Cash Water. Everyone including the 'wantoks' and relatives in the house can all chip-in, each contributing \$50.00 to buy more water if the water stops. This will work better than paying for water through a water metre in which users will keep using the water and just taking it for granted until they have accumulated an account of say \$5000.00 which they will not be able to pay. In the long run, installing Cash water would be a win-win situation for everyone.

The SW General Manager again appealed to the City Clerk and the Lord Mayor to communicate, collaborate and work together with SW in dealing with and managing people in the informal settlements. If there were less people in the informal settlements or if SW had more control over how the informal settlements are developing and growing, or even if the settlers could be moved to formal settlements, SW would be able to work better to supply water.

Question and Concern 3- by Andrew Mua, Mayor of Honiara City Council

The Mayor of Honiara City Council had three points and concerns to raise.

1. The Mayor is concerned that the Sea in front of Honiara is totally contaminated and he feels that Solomon Water is ignoring the pollution of the sea in front of the city. Although it is polluted, people continue to use the sea water to wash fish that is being sold in the main Honiara market including fish sold at the Fishing village market. HCC usually carries out sampling of the sea water every two days and it has been proven over and over again that the sea water is 100% contaminated.

Due to this concern, the Mayor is asserting that rather than waiting for five years before constructing the Sewerage Treatment Plant or delaying the construction of one until the second Phase of the project, he would like to see that Solomon Water sees it as Priority to install a simple sewage treatment plant with extended outfalls further out to sea that will help to alleviate the current polluted waterfronts. He asserts that Solomon Water is ignoring the pollution caused along the sea front for example the Kukum sea front that is polluted by effluent from the GG's valley right down to Naha out into the Kukum sea front. So what he is asking for is not to wait for the second phase before constructing the Sewerage treatment plant but to prioritise it during the first phase and to deal with what is a prevalent health challenge and risk right now.

2. Secondly, the Mayor is concerned about the cutting of the road again if new infrastructure is constructed under the Solomon Water project. Two years ago there were some consultations on the construction of the road and if Solomon Water had come on board then, there would have been some understanding by everyone as to where the new infrastructure under the Solomon Water could be installed. The mayor asserts that all the damage to the roads in Honiara are done by three (3) companies, SW (Solomon Water), Telekom and SIEA (Solomon Power) and this all the way to Didao refilling station.
3. If everyone puts their heads together and these future developments are mapped out by all stakeholders and partners, there would be less damage done. Currently HCC does not have the machines to repair roads that are being dug up to make way for new infrastructure such as laying down of new pipes.
4. The Mayor's third concern is that Solomon Water activate and enact the Solomon Islands Water Authority (SW) Act. The General Manager of Solomon Water raised the issue of where SW is going to put in bore holes but to the Mayor's knowledge, he has not seen Solomon Water enforcing the SW Act which is a very powerful Act especially to evict people who build close to the bore holes. All the Mayor has seen is the disconnection of water metres in times of no payment of water. He uses the example of the Botanical Gardens where the Honiara City Council has moved in and demolished houses built in that area because they are too close to the water source. However, it was easy for HCC to do that because HCC had jurisdiction, title and ownership over the area so they were able to move in and enforce the demolition of houses and move people elsewhere. In like manner, the Mayor would like SW to take authority and enforce the SW Act especially in the Panatina Area that SW has title and ownership.
5. The Mayor's fourth concern was that he thinks the cost of the Consultancy and the Project package for the Project Management Unit is almost as much as much as the future project itself. So in his opinion, these would have been funds better utilised for the project itself.

Answer from Ian Gooden, General Manager (GM), Solomon Water (SW)

Solomon Water is doing the best it can with the resources it has. The GM showed his appreciation over the specific directives outlined by the Lord Mayor and conceded that there is contamination of the sea water with some of the outfalls. (The GM showed on a map, the areas SW is responsible for in the city, about a 1/4 of the total city) whereas the rest of the city is either on septic tanks, long drops, open defecation and use of the bush. The GM pointed out firstly, that streams and rivers in the city have become brown and black due to contamination from pig pens built over rivers and streams and secondly, from all the houses that have very poor septic tanks and exacerbated by the geology of the city which does not attenuate effluent well.

He acknowledges that in some areas, Solomon Water is putting in more sewage, but there is a very large area, about 80% of the city made up of the domestic parts of the city which is contaminating the river and the water courses as well.

Solomon Water is trying, over time, to improve the collection of sewage in the areas its work is based in, for example, in the Rove area. Rove is still not up to standards yet, but SW is trying to pump the Sewage from Rove to the foreshore right next to the cinema and it will eventually find its way to Point Cruz. Eventually, the Outfalls will be extended further out into the sea which will enable better flow and dilution.

At the moment, Solomon Water is financially constrained and it is trying to negotiate an increase in its fees with the government but this will take a couple of months. An increase in the fees would enable SW to make more improvements because at the moment, SW is absolutely reliant on donors and its own small contributions. The other areas which are priority to Solomon Water are the Tuvaruhu and the Vara Creek areas in which there is direct discharge of sewage into the Mataniko River.

Question and Comment No.4 by Henry from Climate Change, Ministry of Environment

Henry's concern was about the Sewage. Henry understands, 15% of the population living in Honiara already have access to running water.

As for sewage, it is the first time Henry has heard of the Sewage Treatment Plant that Solomon Water operates and that there is a central point of collection for sewage. As far as Henry knows, all the houses he has ever lived- in in Honiara, (and he has moved four houses since he has lived in Honiara), only use local septic tanks built purposely for those houses and not connected to any main sewage lines.

His question was whether there will be plans or future regulations for every single house in Honiara to be connected to the main sewage treatment plant? Does Solomon Water, in the future, plan to increase the number of people connected to the main sewage treatment plant?

Answer- Ian Gooden

Thirty percent (30%) of the city's population will be connected to the Sewage Treatment Plant. At the moment, Solomon Water's area of responsibility is relatively small in terms of the entire city and will increase to about 30% of the total city while the rest will be the responsibility of the Honiara City Council. While it may be small area, Solomon Water is still seeking the support of the City Council. Over time, responsibilities might change but currently, that is where SW responsibilities are.

Part of the project includes some septage facility which Mark has mentioned, but most of the city will use septic tanks which is the responsibility of the City Council to monitor and manage. Septic tanks will need regular cleaning which people need to pay for. If a septic tank is not cleaned out, the overflow will seep out and be discharged into the ground, and into the streams. In Honiara, the septic system is further exacerbated by its topography and geology, made up of coral rock which is not permeable and does not provide good biological treatment and attenuation.

Ian explained that with a septic system, a septic tank is constructed and fitted with pipes about two feet long and extended into the ground. It is covered with gravel all around and is shallow, enabling aeration and oxygen flow which allows bio-film and bugs to grow. When effluent comes into the septic tank at a very low rate, the bugs will eat the sewage. The septic tanks built in Honiara are usually constructed with an end chamber at the bottom with no disposal fuel which will allow for vaporization and transpiration. When the effluent is discharged into the septic tank, it goes directly into the ground and because the coral rock does not attenuate it, the waste water finds its way into the water course. This is the reason why Solomon Water is very concerned about human development taking place near its boreholes.

Question and Comment No.5 by Mike from Ministry of Industry and Development (MID)

Mike had three (3) comments to make:

Mike wanted more knowledge about Solomon Water's 30 year Strategic plan because he now understands that most of the infrastructure and contractors will be working along the main highways. Similarly, MID has plans for the next 10 years and Mike wonders whether Solomon Water plans to do the construction within the next ten (10) years.

The new highway being constructed is from the Honiara City Council to the Ministry of Fisheries at Kukum. The next phase of improvement will be from Ministry of Fisheries to the Airport after the development of the new International Airport which will be in three to four years' time. MID has initiated talks with ADB about funding a project for the improvement of the road from the roundabout at the Ministry of Finance right up to White river on which a new four (4) lane road is being planned.

If all these plans, (MID's plans as well as Solomon Water's plans) can be better coordinated, the work could be implemented at around the same time frame so that issues such as relocation can be avoided. MID has learnt from past experience and with the current road works that a big chunk of money has been spent just for relocation and reacquisition of land, which has been quite a considerable cost to the government and for which MID is still carrying the cost now.

If MID is aware of Solomon Water's 30 year Strategic plan, especially of future activities being planned, MID can also align their work plans and programmes with Solomon Water's. It will save MID having to lay down infrastructure and later having the infrastructure being dug up by Solomon Water when it needs to construct and lay its own infrastructure.

As the Mayor has pointed out when he mentioned the new section of road from the HCC roundabout to the Ministry of Fisheries in Kukum, the type of material being used on the road is not available here, so it will be a big challenge to repair and clean up the mess if it is dug up later after it has been newly constructed and completed. Access to Solomon Water's 30 year Strategic plan will enable MID to coordinate its work plans and programmes together and in tandem with each other. The life span of the currently constructed road will be from ten (10) to twenty (20) years so MID and Solomon Water all need to think along the same lines to avoid future costs and challenges.

Mike's second point was on the Outfall and Sewage. He is aware of local planning schemes being put together by Honiara City Council, Ministry of Lands and the Guadalcanal Province.

Mike wants to know whether Solomon Water is aware that the location for the proposed site for the Outfall in Rove is being planned for a recreational area. It would not be very pleasant to have an outfall located next to a planned recreational site so Mike is asking if these plans have been considered by Solomon Water as they plan where to locate the Outfalls.

Mike's third concern was about the sewage line that is being planned to run from Tuvuru, Vara Creek the Mataniko area and connect to the National Referral Hospital Pump station. His concern is about the China Town area and whether it can be included along the way with the Mataniko and Vara Creek areas. It is a commercial area with lots of activities happening in its location and vicinity. Currently, most of the rubbish and solid waste from this area is being dumped in the Mataniko River creating an environmental hazard. Mike therefore, would like to see that China Town is captured along with Tuvuru, Vara Creek and Mataniko with the main sewage line that will be connected to the National Referral Hospital pump station.

Answer- Ian Gooden

Ian expressed his appreciation for Mike's comments about the road interment and also acknowledged the Lord Mayor's comments on the subject as well.

He shared his experience in working with a big roading company in New Zealand and agreed from experience, that the biggest problems his company encountered was from Water, Electricity, Telekom and companies digging the road especially if they have to dig across or over the road. If they dug along the road it was not too bad, but when they cross the road, it might mean some interment.

Ian does not want Solomon Water to dig up the brand new road in the next twenty five years. If there is a need to place pipes across the road, a tunnel dug underneath the road will probably be the best solution. Pipes can be pushed underneath the ground using a technique called the "Thrust." Solomon Water will do all it can to protect the road.

In the Rove Area, there are Sewage main trunks that will run from Rove to Point Cruz and Solomon Water will certainly be working with MID in advance on this. If there are pipe lines that Solomon Water needs to install in future, they will have them prepared for when the MID road project will be concentrated in the Rove area to White river area so that Solomon Water does not need to come back to work in the area after MID has done the work but the two organisations can complete the work together.

With regards to the China town area, Solomon Water will look more into the issue and could pick up areas along the way but currently, these areas of responsibility come under the Honiara City Council to manage.

Question and comments No. 6, by Charles Kelly, HCC Clerk.'

HCC is in the process of reviewing its City Council Building Ordinance which was developed thirty (30) years ago. It is still being used but the council wants to improve on it by inserting a Risk and Disaster Assessment clause. In particular, the current Building Ordinance lacks a Risk Assessment regarding Water. For example, building on the slopes or building too close to river beds and so forth. The Ordinance is silent on the system and process of water and the risks of contamination.

SW is on the Town and Country Planning Board and a member of SW usually attends the Board meetings. As the Building Ordinance is in the process of being reviewed, the HCC Clerk would like SW to contribute to improving the Building Ordinance by working in partnership with HCC in strengthening and improving the Ordinance. If HCC and SW can work together in partnership, they could come into agreement and be on the same page on whether those planning to build are meeting the criteria or not meeting the disaster risk assessments. If anyone does not meet all the Risk Assessments then they will not be issued with permits to build. It would be ideal if SW and HCC could forge a partnership to achieve this.

The other concern the City Clerk has is the issue of Public toilets which is not enough for the city. Because of lack of land, there are not enough Public toilets being built. The City Clerk is appealing to Solomon Water to work with HCC to identify land so that more public toilets can be built. He reiterated, the more people there are, the more problems there are to be dealt with.

Question and Comment No. 7, by Kenneth, Property Manager, Solomon Islands National University, (SINU)

Kenneth emphasised the importance of Water quality and that the quality of water will be an issue as more students are enrolled and accommodated at the Solomon Islands National University (SINU).

In a Student Protest which took place earlier in the year, one of the issues highlighted in the student's petition presented to the SINU Management was the quality of water in the students' hostels. It is an important issue because the quality of water will have impacts on the health of the students.

The second issue for Kenneth is about land. Kenneth mentioned development because he had sighted the communications about using SINU land. He asserted that he is aware of Solomon Water's proposal to use SINU land under the Solomon Water Project. However, if Solomon Water is interested in using SINU land, both SINU and Solomon Water need to continue with discussions because both SINU and Solomon Water each have their own plans. More discussions will enable both organisations to coordinate and align each other's plans together so that both are on the same page, otherwise, it will end up in a situation where each organisation just gets on with its own plans which would not be to the advantage of both.

His third point was on Sewage. Currently, the houses and buildings on each of the three SINU campuses, Panatina, Ranadi and Kukum are all using septic tanks connected to

each building. However, SINU is interested in Solomon Water's future plans of linking the sewage to a Waste Water Treatment plant and that SINU would consider being linked to the sewage treatment plant as well.

Ian Gooden (answer)

It was clarified that the water quality being referred to by Kenneth was about the piped water coming into the houses.

Ian explained that once the water goes through the water metre on to other people's property Solomon Water cannot guarantee the quality of water.

Even water collected from roofs into tanks could be dirty, however, the water provided at the water metre by Solomon Water meets World standards at about 98% of the time. Water supplies in Honiara from the Kongulai water source are chlorinated and Solomon Water is doing some extra work to improve the quality. This is because when it rains, the Kongulai water source gets some sediment and silt so it has to be shut down. Although it sounds silly, the water supply is shut down when it rains because the Kongulai gets dirty including over Kobito as well for the same reason. Solomon water is considering putting in filters on the Kongulai water supply so water can be supplied at twenty four hours a day.

However, Solomon Water does test and monitor the quality of the water. The Ministry of Health also does a bit of testing on the water so generally, about 98% of the time, Solomon water meets the World Health Standard in terms of e-coli and coliforms which may cause stomach aches and problems. So generally, Solomon Water is compliant with World Health Standards.

Solomon Water has a separate dedicated water quality team whose only role is to manage the water quality. If there is any concern by the Solomon Islands National University (SINU) on the quality of water, SINU can approach SW who could conduct some tests on SINU's property and locations and identify where the source of the problem might be.

Kenneth mentioned that tests had been done on the water in preparation for the Melanesian Arts festival, and the Police who did the tests found the water was very clean.

Question and concerns, no. 8, by Janet Tuhaika from the National Council of Women (NCW)

Janet's concern was that information presented by Solomon Water needs to be communicated across to all levels of the community/society especially to the ordinary household.

Although Janet has been living in Honiara for many years, much of the information presented is new to her and is quite technical. Janet though, is better educated and literate than most of those in her community. It is these ordinary people who really need to understand the information being presented so they will be able to appreciate not only the work that SW is doing but also the challenges that SW faces in trying to provide water.

In Janet's opinion, it is the issue of Access and Affordability to clean water that are major issues. A number of people in her community usually buy bottled water for drinking from the shops because they do not trust the water that comes from SW.

Janet also understands that SW has had issues with the Kongulai water source which is sometimes shut down by the land owners. Water source shut downs affect people, so how will the project address these issues? Janet reiterated again the issue of Access and Affordability because it affects the communities and she hopes the issues highlighted will be addressed by the sub-projects mentioned in the presentation.

Ian Gooden- Answer

Ian explained that it is the heavy rain catchment that usually affects the quality of water as the water gets dirty.

In terms of the Kongulai source, Solomon Water has been facing land issues at Kongulai and if the Lunga plant water source is up and running or is in operation, Kongulai may have to be shut down because of the land issues. Solomon Water has experienced issues

with the land owners but if they are interested in providing an ongoing solution, then Solomon Water might be prepared to continue using that water source.

Solomon Water has also had lengthy discussions and representations with the Government and its various Ministers. It has been working with the Ministry of Land to actually hold the lease to Kongulai which is currently leased by the government through the Ministry of Lands. Land ownership over water sources is a contentious issue and is the same with all Solomon Water's sources such as in Ziata in Noro, Tulagi and most of the places in which Solomon Water does not own the land. Solomon Water is working with the government to resolve these issues but it is a slow process and will take time to finalise.

Questions and concern no. 9, by Debra from the Ministry of Environment

Debra noted that the Solomon Water project will have impacts on the environment and she emphasised the importance of the project to include an Environmental Impact Assessment (EIA).

Other issues of importance highlighted by Debra are the legal requirements of obtaining land ownership and land issues as these will be of importance in considering where infrastructure will be constructed.

Answer Ian Gooden

Ian thanked Debra for raising the issue and reassured Debra that the Environmental Impact Assessments and the legal requirements in obtaining land ownership will be closely adhered to.

Question and Concern No.10 by Charles Kelly

Charles understands that although the project is a National Project the discussions have been very Honiara focused and there has been little mention of other towns outside of Honiara. He wants to know if the project mentions towns such as Noro, Auki and so forth. Charles also wants to know how much has been allocated to improve access to water in the other towns.

Charles also wants to see more tangible outcomes as he thinks there is sometimes too much talk and discussion on the process but little on deliverables and tangible outcomes.

Ian Gooden- Answer

Ian thanked Charles for his comments and remarked that Solomon Water is also interested in ensuring more action takes place. To this end, Solomon Water's first physical works and contracts will be based in Auki which Solomon water will be conducting within the next two months.

With regards to the construction of waste water plants, there is secure funding from European Union which has been available for the last three years. Secondly, Funding from ADB has also been secured and confirmed but it still needs to be signed off by the Government as the Government will be the entity overseeing/managing the funding. Some of that funding will be in the form of loans and some will be in grants.

Thirdly, Solomon Water has also been assured of the World Bank funding facility. It is not much and Solomon water will be going back to them in three years' time during WB's next funding cycle to seek more funding.

I do not want to make promises and assurances that I will not be able to carry through but since I have been here for the last three years, I have been able to deliver on some of the things I said I would deliver. I am therefore assuring you today, that I will be here for the next three years, so you are stuck with me!!But I can assure you we will do everything we can to get these projects into action, so that we can turn words into projects and projects into something that we can all see!

At the end of the day, if the donor funding does not come through, then we are in big trouble, but that is a risk that we will take. From the number of customers we have who are registered in Honiara, there are about 9,000 registered customers. If the average Honiara household comprises of five to seven people, then in total, Solomon Water is servicing about eighty thousand people.

In auki, Noro and Tulagi, Solomon Water's customer base is much smaller and is therefore only servicing a couple of thousands which is why ALL of Solomon Water's attention is in Honiara. Because of the spurt of growth in Honiara, water and waste water are absolutely important.

That is the reason, Honiara takes up about 98 % of my time and also why all of our establishment and focus is on Honiara. There are Solomon Water officers looking after the Provinces, otherwise, most of the attention is on Honiara.

Charles Kelly,

Thank you because you know, I know the system of the World Bank and the EU, it takes a long process and sometimes when they've got stuck somewhere until they go so I put my trust in you.

Ian Gooden- Response

Although we will have access to European Union money/funding, it will be channelled through ADB which will be administering it.

The World Bank money will come as a separate source of funding which will come later so it is a little bit more un secure but we are doing everything we can to secure it.

The other one is Green Climate fund. We are putting together an application which will be submitted to the Green Climate fund. So Solomon Water is not putting everything in one basket and relying on just one single donor, but it is working with several donors. Ian and Solomon Water are even talking, for example, to Taiwan because they have offered to build the stadium for the Pacific games. A while ago, Taiwan was talking to Solomon Water about Water and Waste water at the National Stadium for the Pacific games (2024?) So I negotiated with them and discussed that instead of constructing only a treatment plant just for the games ,how about supporting SW improve our infrastructure and then it will be there for the long term.

Question No. 11 by Mike of MID

In the first presentation, it was mentioned that there would be a reduction of 15 Outfalls to 4. Mike wants to know if that plan, to reduce the number of outfalls, would be the same for the sewage treatment plants.

Comment and question No. 12 by City Mayor- Andrew Mua,

Andrew made the comment that HCC does daily checks of water and HCC has found that bottled waters e.g such as Blue Water's bottled Water is not as clean or as safe as Solomon Water's piped water. HCC has found that Solomon water's piped water is cleaner than water bottled by local companies and sold in the shops because these water companies in particular, Blue Water, actually get their water from bore holes which is pumped from bore holes in the ground. The water which is being bottled is not necessarily clean and safe whereas, Solomon water's piped water is cleaner and safer to drink than bottled water sold in the shops. On the other hand, water from SW and Solomon Water line is checked and it has been proven that it is clean and safe to drink.

Ian Gooden- answer

Ian was appreciative of the comments made by the Lord Mayor on the quality of Solomon Water's piped water.

Comment and question No. 13 by City clerk, Charles Kelly.

Charles shared information on how the Honiara City Council had engaged JICA to share their knowledge and demonstrate a technology from Japan which allows for effluent to enter a chamber, pass through a soak away or soak hole before passing through a mat which absorbs and sucks in the waste water while the solids are retained in the chamber. The water can be used to water grass, flowers and trees. An example of the technology and system being used is at the Public toilet next to the Public Library. The Public Toilet

system is not connected to a septic but uses the soak away method. If one goes to the Public Library, one will be able to see nice gardens and there is no odour or smell.

If this technology from Japan can be used, and the criteria for its construction is included in the City's Risk Assessment and the Building Ordinance, this sort of technology can be used when building and constructing houses in Honiara. Most houses in Honiara are usually designed with small families in mind, including the septic tanks which are designed for small families. The reality though, is these small houses can be filled by ten (10) or more people or the whole population of one's village can come and reside with the house owner, with all of them all using a septic tank designed for small families. It is the reason small septic tanks fill up very quickly, within a span of three to four months.

In Charles opinion, it is a matter of choosing to be connected to the main sewage line or introducing the system and technology used by the Japanese.

The Building Ordinance is studying the various systems and will be determining which best suits a building plan for certain locations.

Ian Gooden- Answer

Ian knows one of these systems is set up in Saint Nicholas College. The system is ideal for an isolated area which is not near to another water source and in which land is available and one has ownership over the land.

One of the things not included in the Strategic plan is costing out the life of and the cost of the septic tank system which has to be dug every seven (7) to ten (10) years.

Solomon water has since worked out the cost of the last cycle of septic tanks versus the reticulation system and it has found a sewage system is a lot cheaper per property over a reticulated system.

The system and technology described by the City Clerk is very good technology and does work well, but in an environment such as Honiara where there is usually a lot of rain with a lot of trees, there might not be enough transpiration taking place which is most needed. Additionally, in a city environment in which people are living very close to each other, it might not be the most suitable system. However, there will be places where this system will be absolutely useful and successful to have this type of technology.

Mike MID

Mike was asking again if he could have a copy of Solomon water's 30 year Strategic plan. He was assured by Ian Gooden that a copy would be made available to him and also the website he could go to access a soft copy. Ian also assured Mike that Solomon water will be communicating what the priorities of the project are.

Mark's role entailed turning the Strategic Plan into actual Projects, and an example is the consultancy work currently conducted by Egis which concentrates on five(5) projects:- Honiara Water, Waste Water, the Trunk Mains, Gizo Water and the Reservoir. Mark's role is to oversee all these projects. The rest of the Strategy has not been turned into a priority plan yet so Solomon water would not be able to provide MID with a definite work priority plan but in the next year or so, it should be able to come up with more work priority plans based on the Strategic plan which it can share with MID. Solomon Water will certainly work with MID so it does not need to dig up the new road again.

Charles Kelly

Charles wanted to know about the situation in Gizo. Since this is a National Project, Charles wanted to know if it also includes Gizo and what the situation in Gizo is like.

Ian Gooden-Answer

Solomon Water has been talking to the Western Province for the past two years, with the Solomon Water board agreeing in principle as to what will happen in Gizo.

Solomon Water has secured donor funding for Gizo with part of the funding including salaries for staff when Solomon Water moves in to manage the facilities.

Solomon Water has not gone in to Gizo yet, because it can't create water and if it does go in tomorrow, it would create an embarrassing situation for itself and the Government because people will be asking where the water is.

If Solomon Water does move in to Gizo, it will have to be Cash water right from day one! Solomon Water has been doing a lot of work with the Ministry of Mines and Energy and they have been looking at some short term solutions in Gizo. The short term solutions may include building dams at Tirokogu, Mile 2. Some water is coming through into the town, but it is either lost or stolen before it comes into the town. The rural WASH programme has also been supplying tanks and roofs to service some villages on the other side of Gizo.

In 2012, a brand new, highly automated plant was built in Gizo. Since then, it has not been used because no water is coming to it and through it.

Solomon Water therefore believes in long term solutions.

A long term solution would be to build a dam on Kolombangara, bring the water down in pipes into the ocean and bring it up to Gizo.

The other option is desalinisation. Desalinisation could also supply water to Gizo. However, while a desalinisation plant is cheaper to build, it will be more expensive to operate and run therefore making the water more expensive. Desalinisation plants will need high maintenance costs such as replacing membranes and other parts that may break down and need replacing.

A dam built on Kolombangara on the other hand will initially be expensive to build and construct and will mean running two pipes on the ocean bed and surfacing in Gizo but in the long run will be less expensive to maintain making the water landed in Gizo much, much cheaper.

It will be similar to how Tulagi is supplied with water. In Tulagi, water is taken from the main island of Gela, and it is piped and comes on the reef and landed at Tulagi. This is all done by gravity feed and Tulagi has water twenty four hours a day. So this is one of the solutions to be looking into.

Meeting closed at 11:50 AM.

Meeting Notes Prepared by: Elsie Wickham (Egis Eau)

APPENDIX 4

Attendance Sheet of Initial Public Consultation and Information Disclosure (13 July 2018)

Date: 13 July 2018
Venue: Star Events

No	Name / Designation / Organization	M / F	Signature / Phone
1	RUEL JANDINO ENV. SPECIALIST - EGIS	M	
2	MARINO COMPETENTE PRC. SPECIALIST - EGIS	F	
3	JANET TUKHAIKA National Council of Women	F	 7440948
4	Sally Pita National Resettlement Specialist	F	 7412587
5	Charles Wira	M	 7433126
6	MANU WATIF - Solomon Water	M	 7440202
7	Schedule Director EGIS Inc. (Egis Eam)	M	
8	MARY RAMO (Telekom)	F	 7444413
9	Eddie Waihu (SINPF)	M	 7493497
10	Mike. Sagara (MID)	M	 7475513
11	Nel Oudiana (Solomon Water)	M	 8534816
12	Charles Kadanearu (S/Star)	M	 7412798
13	HENRY TUPAH (CCD)	M	 7403757

No.	Name / Designation / Organization	M / F	Signature / Phone
14	KENNETH B'O / ^{Human Resources} / SINU	M	 17494103
15	BONARD MAXINI / EHS	M	 8667856
16	ANDREW WUMA / HCC	M	7900020
17	Michelle Mladawa (SW)	F	 8556550
18	Dennis Mense ^{CEO} (Speaker)	M	 8887776
19	BRYAN PITAKIA	M	
20	Kennedy Folasi	M	
21	C. Kelly (HCC) ^{Charles Kelly}	M	
22	Peter Bulga (SDA)	M	 7522
23	Mathew Korimuna ^{Distribution Manager} SIDA	M	7496693
24	Delva Kereseka ^{Chief Financial Officer}	F	26036

APPENDIX 5

PHOTOGRAPHS OF INITIAL PUBLIC CONSULTATION AND INFORMATION DISCLOSURE



Photo No.1: Registration of participants for the initial public consultation [13 July 2018]



Photo No.2: SIWA's GM discussed SIWA's strategic plan on water supply and sanitation during the initial public consultation [13 July 2018]



Photo No.3: Project consultant discussed details of the proposed subprojects [13 July 2018]



Photo No.4: Honiara City Mayor raised some issues [13 July 2018]

APPENDIX 6

OUTCOME OF SECOND ROUND OF CONSULTATION MEETINGS (FEBRUARY 2019)

Stakeholder Questions and Answers




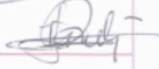





No.	Question/Comments	Raised By	Response	Response By
1	<ul style="list-style-type: none"> Ongoing Consultations 	Atenasi Ata - SICCI	<ul style="list-style-type: none"> This is start of the process; there will be further consultations during the detailed design process and approvals for designs. 	IG
2	<ul style="list-style-type: none"> Will illegal settlers be compensated more than Landowners 	John Tupe – Tintinge Landowner	<ul style="list-style-type: none"> Will depend on assessment and evaluation as per resettlement plan and as per SIG rates for resettlement and compensation 	Lulu
3	<ul style="list-style-type: none"> Coordination with phase 2 road consultants on design Pre-treatment at outfalls Industrial/Business waste and discharges 	Mike Qaqara - MID	<ul style="list-style-type: none"> Noted and will coordinate with road consultants Designs as per AS/NZ Dispersion standards for appropriate dilution and dispersion. EIA Report Assess application and type of discharge, pre-treatment if necessary 	MW MW MW
4	<ul style="list-style-type: none"> High installation cost 	Jessica Warahiru-SIWIBA	<ul style="list-style-type: none"> SIG is reviewing submissions to reduce the different fees Pre-paid meters 	
5	<ul style="list-style-type: none"> ADB policy and compensation focus on women and not youths 	Duddley Teuwauri - HCC	<ul style="list-style-type: none"> ADB policy refers to vulnerable households which includes female, youth and male that are on low income 	Lulu, Sonia
6	<ul style="list-style-type: none"> Delivery of WASH and coordination with MID 	Mike Qaqara - MID	<ul style="list-style-type: none"> International NGO to be engaged for delivery of wash in collaboration with local NGO's Happy to support coordination at design stage especially in the provinces 	MW



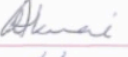






No.	Question/Comments	Raised By	Response	Response By
			<ul style="list-style-type: none"> IWC to help identify delivery mechanisms of WASH in informal settlements. 	
7	<ul style="list-style-type: none"> Why is water in SI expensive compared to Fiji or PNG 	Ellen – Ex SW and candidate for National Parliamentary Elections	<ul style="list-style-type: none"> Government subsidies in Fiji is about 80% whilst in SI it is about 2% Current cost reflects cost for providing the service 	IG
8	<ul style="list-style-type: none"> Meter reading based on estimates High water bills Schools and Churches should not be classed as Commercial customers 	Holmes - SICA	<ul style="list-style-type: none"> Raise issue with to Customer Care through Michelle to address Was considered but not allowed under SW policy/classification rules 	IG
9	<ul style="list-style-type: none"> Consideration for climate proofing of infrastructure Were environmental issues addressed in the design 	Gareth - OXFAM	<ul style="list-style-type: none"> Climate change report compiled and will support the detailed design input. GCF application will be submitted next month that addresses adaptation and not mitigation 	Sonia
10	<ul style="list-style-type: none"> Was the previous JICA improvements ineffective 	Mike Qaqara - MID	<ul style="list-style-type: none"> No but this project will build on improvements by JICA from Supply Duration of 5hrs to 22hrs, target is 24 hrs. 	MW
11	<ul style="list-style-type: none"> Note logging activities around Kongulai area 	Tautele – Kongulai Landowner rep.	<ul style="list-style-type: none"> SW is aware and is working with relevant authorities such as Forestry and ECD to address. 	Ray Andresen
12	<ul style="list-style-type: none"> Coordination and working together with SIPA for future demand Outfall at Port area 	Spencer Ala – SI Ports Authority (SIPA)	<ul style="list-style-type: none"> Agree to consult and work in close collaboration with SIPA SIPA to provide a forecast for future requirements 	IG
13	<ul style="list-style-type: none"> PPP and capacity building opportunity for local contractors Could local contractors bid for works 	Mathew - MOFT	<ul style="list-style-type: none"> Major projects would require international expertise and experience because of the value, nature and complexity of projects 	MW

No.	Question/Comments	Raised By	Response	Response By
			<ul style="list-style-type: none"> SW want to encourage local participations as subcontractors or JV Propose contractors forum for information sharing in April this year 	
14	<ul style="list-style-type: none"> Challenges for water access to informal settlements and peri-urban areas 	Elma – Live and Learn	<ul style="list-style-type: none"> IWC work to help identify delivery mechanisms of WASH in informal settlements. SW will be consulting with NGO's working in this area to support effective project design and delivery. 	IG, MW
15	<ul style="list-style-type: none"> Propose boring option over open cut construction methods for roads 	Mike Qaqara - MID	<ul style="list-style-type: none"> Noted as a key issue and concern and will look into exploring boring options 	IG
16	<ul style="list-style-type: none"> Any support to village/rural supplies to support SIDT's 'Helpem Village People' theme 	Beven - SIDT	<ul style="list-style-type: none"> SW is legislated to provide for urban areas including peri-urban areas only and not rural areas 	IG

APPENDIX 7

Attendance Sheet of Second Public Consultation and Information Disclosure (20-21 February 2019)

FULL NAME	ORGANIZATION/POSITION	EMAIL/CONTACT	SIGN
Dave Lenny	MDPAC	dlenny@mdpac.gov.sb	
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MOSES ANAMA JNR	WEST HONIARA YOUTH	gcombes@gmail.com	

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John Tupe	Titinge Landowners	MO 739580	
TAUPELE KATALLAKE	KONGULIA	B 7475257	
Jessica Warakiri	SIWIBA	7639847	
Leah Alufu'oa	SIWIBA member	7500780	
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Ellen Manuaga	Westside Lodge	794511	

DATE: 21st FEBRUARY 2019 – HONIARA STAKEHOLDERS CONSULTATION

DATE	ORGANIZATION/POSITION	CONTACT/EMAIL	SIGN
21.02.2019	^{Name organ got} Nasari KALAMANI Solbren / QC Manager	8435916 / nasari.kalamani @solbren.com.sb	
21.02.2019	John Las Tasima Kongulae Water Source	7489051	
21.02.2019	ADRA SI / Pmanager	7737837 Pmesia@adira. org.sb	TP Masia
21.02.2019	Landowner / Tasabe DAVID ANISA	7486082	DAVIN
21/02/19	SUEZ RICHARD BAKER	8423590	Richard Baker
21/02/19	MDPAC	8463722	
21/02/19	(Mamita) UNICEF / WASH Specialist	7225836	
21/02/2019	Ciqa Partners LENT DONNE	7477063	
21/02/2019	TRUDY RAMO MDPAC	7553292	

Tramo@mdp.ac.gov.sb

NAME??

DATE	ORGANIZATION/POSITION	CONTACT/EMAIL	SIGN
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"	Solomon Islands LEONARD AVIKATSI	7494625 long.leonard@sis	
"	Augustine Omearo KINTI Schol	7900642	aomearo@gmail.com
21/02/2019	HCC - Youth division Dudley Tauwauri	8546201	
21/02/2019	HCC - ADMIN NANET SOLO	7844545	
21/2/2019	Kem Properties Ltd/Director	7688888 Kwondavid@kemprop.com	
21/2/2019	General Secretary (SICA)	7575635 sgene.holmes@gmail	HOLMES SAEVE
✓	SICCI CEO Bharasi Atci	ceo@solomonshaker.com.sb	AA

NAME/

DATE	ORGANIZATION/POSITION	CONTACT/EMAIL	SIGN
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21/02/19	Bruno Mishack SOLIMON POWER	Bruno@solomonpower.com.sb 7243077	
21/02/19	RAY ANDRESON SW	4961945	
21/02/19	Asnos Atkin .SW	7419077	

APPENDIX 8**PHOTOGRAPHS OF SECOND PUBLIC CONSULTATION AND INFORMATION DISCLOSURE**