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Munda Water Supply Components
Western Province, Solomon Islands

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Acronyms

ADB	Asian Development Bank
ANZECC	Australian and New Zealand Environment Conservation Council
AP	Affected Persons
ASL	Above Sea Level
AXO	Abandoned Explosive Ordnance
BCD	Bid and contact documents
BMP	Building materials permit (issued by Dept of Minerals - Ministry of Mines, Minerals and Rural Energy)
BOQ	Bill of quantities (in the contract)
BPS	Boosting Pumping System
CAC	Community Advisory Committee
CCP	Communications and consultation plan (of the Project)
CESMP	Construction environmental and social management plan (of the contractor)
CITES	Convention on International Trade in Endangered Species
CLO	Community Liaison Officer
CSHSMP	Construction Site Health and Safety Management Plan
CSS	Country safeguard system
DC	Development Consent
DMA	District Metered Area
EARF	Environmental Assessment and Review Framework
ECD	Environment Conservation Division (in MECDM)
EDS	Environmental Impact Assessment Decision Statement
EEZ	Exclusive Economic Zone
EHSG	Environment, Health and Safety Guidelines (of World Bank Group)
EHSO	Environment, Health and Safety Officer
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement (under the CSS)
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
ENSO	El Niño–Southern Oscillation
ERW	Explosive Remnants of War
ESMP	Environmental and social management plan
ESMF	Environmental and Social Management Framework
ESO	Environmental safeguards officer (in the PMU)
FGD	Focus group discussion
GRM	Grievance Redress Mechanism
GBV	Gender Based Violence
GI	Galvanized Iron
GM	General Manager
HDPE	High Density Polyethylene
HSP	Health and Safety Plan (part of the CESMP)
IEE	Initial environmental examination
IP	Indigenous People
IPP	Indigenous Peoples Plan

IPPF	Indigenous Peoples Planning Framework
ISDS	Integrated Safeguards Data Sheet
IUCN	International Union for Conservation of Nature and Natural Resources
JICA	Japan International Coordinating Agency
MDAPC	Ministry of Development Planning and Aid Coordination
MECDM	Ministry of Environment, Climate Change, Disaster Management and Meteorology
MID	Ministry of Infrastructure Development
Ml/d	Million liters per day
MMERE	Ministry of Mines, Energy and Rural Electrification
MOFT	Ministry of Finance and Treasury
NDS	National Development Strategy
NIIP	National Infrastructure Investment Plan
NRH	National Referral Hospital
NRW	Non-Revenue Water
PCCSP	Pacific Climate Change Science Program
PER	Public Environment Report (under the CSS)
PMU	Project Management Unit (in SW)
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QPR	Quarterly progress report
RAP	Resettlement Action Plan
RF	Resettlement Framework
RP	Resettlement Plan
ROW	Right of Way
SBD	Solomon Island Dollars (code)
SIPA	Solomon Island's Port Authority
SPM	Safeguards Procedural Manual
SPS	Safeguard Policy Statement 2009 (of ADB)
SW	Solomon Islands Water Authority trading as Solomon Water
TOR	Terms of Reference
USD	United States Dollar
UWSSSP	Urban Water Supply and Sanitation Sector Project
UXO	Unexploded Ordnance
WASH	Water Awareness, Sanitation and Health
WB	World Bank
WBSP	World Bank Safeguard Policies
WHO	World Health Organization
WSP	Water Safety Plan
WTP	Water Treatment Plant

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. The Project overall comprises capacity building, water awareness sanitation and health (WASH) component and physical works (upgrading existing water supply transmission and distribution and installing new water supply in Honiara and other provincial towns). The provincial water supply subproject covered in this IEE concerns the Munda Water Supply components including (i) The new Airport borehole system for water production and transmission to Munda town and (ii) The new storage facility and distribution network in Munda town.

2. **Safeguards approach.** This report gives an account of the initial environmental examination (IEE) of the proposed subproject, conducted as part of the subproject preparation to primarily: (i) identify and assess potential impacts arising from the implementation of the proposed subproject on the physical, biological, socio-economic, and physical cultural environment; and (ii) recommend measures to avoid, mitigate, and compensate for adverse impacts. An environmental assessment and review framework (EARF) was initially prepared to guide the process for screening, assessment, review and monitoring of components.

3. The IEE was carried out following (i) ADB's Safeguard Policy Statement (SPS 2009), (ii) WB Safeguards Policies (WBSP) as set out in the EARF and (iii) the requirements of the country safeguard system (CSS) as set out in the Environmental Act (1998), the Environment Regulations (2008) and the Environmental Impact Assessment (EIA) Guidelines (2010). The IEE, as per discussions with Environment and Conservation Division (ECD) is equivalent to a public environment report (PER) as required for development consent application for the subproject.

4. In accordance with the ADB SPS 2009, the project was initially screened by the lenders and consequently assigned Category B, requiring preparation of an Initial Environmental Examination including an Environmental Management Plan (EMP). A screening carried out during the early phase of the Project development confirmed that environmental impacts will be mainly related to the risks of nuisances during the construction phase and controllable by appropriate construction site supervision and conventional mitigation measures. The work undertaken to prepare the present IEE has further confirmed this initial categorization as Category B Project.

5. **Environmental and social benefits.** The first stage of the project will improve the water supply of the entire town population estimated at 2,620 inhabitants (2009), both in terms of quantity and quality. Water treatment will be improved through installation of a new disinfection system. This situation will significantly improve the public health and the well-being of the population on Munda.

6. **Anticipated impacts***.* The IEE reviews all potential impacts from project location, construction, and operation. Mitigation measures are proposed to avoid, minimize, or compensate for each of the impacts identified. Most of impacts identified are related to potential temporary nuisances during construction activities, mainly noise, dust, and public safety issues particularly in relation to excavation works along public road for pipeline laying and road traffic disturbances.

7. A Resettlement Plan (RP) covers the water supply components located in Munda town, Western Province. The RP is prepared following the regulatory framework of the Land and Titles Act of the Solomon Islands Government, the ADB's Safeguard Policy Statement (2009), and the World Bank's Safeguards Policies, particularly Operational Policy 4.12 on involuntary resettlement. The RP, prepared by SW in consultation with other government agencies, adheres to the principles and procedures outlined in the Resettlement Framework or the UWSSSP adopted by the Solomon Islands Government. The project approach avoids and minimizes land acquisition and resettlement impacts, wherever possible.

8. Pre-construction considerations include climate change vulnerability; updating of environmental and social management plan (ESMP) based on latest project design and components; integration of ESMP and development consent (DC) conditions in the bid and contract documents; update of the Project's communications and consultation plan (CCP); grievance redress and management; identification of materials sources, materials extraction and application for building material permit (BMP); biosecurity issues and potential introduction of alien invasive species; identification of sensitive receptors and cultural resources identification; land access arrangements; and unexploded ordnance. Actions necessary to address pre-construction considerations will be included in tender documents and construction contracts.

9. The construction phase considerations are site access and clearance including potential disruption of utilities (power and communication cables); soil erosion and sedimentation control; disposal of excavation spoils; oil and hazardous materials management; dust control; site waste management; construction noise and vibration; traffic management; community and occupational health and safety; potential social issues due to influx of workers; potential damage to hidden archaeological and cultural assets; impacts on rare and endangered species; and terrestrial habitat alteration. Contractors will be required to prepare Construction Environmental and Social Management Plan (CESMP) based on the ESMP included as part of the environmental and social assessment. This CESMP will reflect their construction approach and methodology to ensure appropriate environmental and social management during the construction period including COVID-19 preparedness and response.

10. Operational considerations of the water supply components will include health and safety risks during operation and maintenance e.g., handling and storage of chlorine. Other impacts identified during operation are potential impacts of natural disasters on the water supply components, generation of site waste and storage, use and transport of hazardous materials. Operational impacts will be addressed by incorporating the necessary measures, such as a water safety plan, use of appropriate operational procedures and ensure effective mitigation and monitoring plan for each component.

11. **Analysis of alternatives**. Analysis of alternatives include the "no project alternatives", alternative for water resources such as use of Kindu Spring, Kindu Sinkhole, Dunde Borehole, and alternative location for water storage tanks.

12. **Grievance redress mechanism**. A GRM consistent with the requirements of the ADB SPS (2009) will be established to prevent and address community concerns, reduce risks, and assist the project to maximize environmental and social benefits. It is based on the GRM developed by SW and already operational. SW has already established a grievance redress mechanism (GRM), and this is being applied to the project. The GRM is designed to deal with grievances from the public in relation to SW managed projects at all stages of a project cycle.

13. **Environmental and social management plan**. Based on the Project's ESMP, contractors will be required to prepare their CESMP to ensure appropriate environmental and social management during the construction period. In responding to the Project's ESMP, the CESMP 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.

14. **Consultation, Participation and Disclosure**. SW conducted consultations during Project preparation and will continue to do so during the construction phases following the guidance set out in the Project's CCP. SW will publicly disclose any prepared project safeguard documents. During feasibility study stage, stakeholder consultations were conducted in May 2019 and 11 May 2020 to provide initial information and generate community feedback about the proposed project.

15. **Conclusion and recommendations**. The findings of the IEE show that no further environmental assessment is required. The IEE has been used to support the national environmental clearance and the development consent application(s). The recommendations are:

- The IEE and associated ESMP will be included in the bid documents along with the conditions of development consent(s).
- Based on the ESMP, detailed Environmental, Social, Health and Safety (ESHS) specifications will be prepared and attached as General Technical Specifications in the section 6 (Owner's Requirements) of the bidding documentation.
- It will be a requirement of the contract that each contractor develops and submits to SW a Contractor ESMP which will describe contractor organization and methods for the implementation of all ESHS specifications in full compliance with applicable safeguards. CESMP shall be approved by SW-PMU prior to the start of any physical works on site.
- Construction contracts will also require the contractors to respond to the Project's CCP and GRM in their CESMP.
- ESHS training of SW personnel for operation and maintenance of water supply facilities. 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.

1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

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 Sector Project (UWSSSP). This 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.

2. The Ministry of Finance and Treasury (MOFT) is the Project executing agency and SW is the implementing agency, operating through a Project Management Unit (PMU). To ensure compliance with required safeguards the PMU will ensure that the Project will be implemented in accordance with the Project's Environmental Assessment and Review Framework (EARF) and resettlement framework (RF).

3. The 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 subproject 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).

4. In addition to the EARF, this Initial Environmental Examination (IEE) has been prepared for the provincial water supply component identified for Munda. The IEE provides the baseline conditions at the site, an assessment of the environmental and social impacts and risks created by the components during pre-construction, construction, operations, and maintenance. It is based on field visits to the proposed component areas; review of available information; and discussions with government agencies and communities in component areas. The IEE, as per discussions with Environment and Conservation Division (ECD) is equivalent to a public environment report (PER) as required for development consent application for the components.

5. Following the EARF, the Project has been screened as Category B based on the significance of its environmental and social 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 and social management plan (ESMP).

1.2 SCOPE AND OBJECTIVES OF THE STUDY

6. The main objective of this assessment is to identify potential environmental and social impacts of the Munda water supply subproject and the necessary measures that will ensure the proposed project mitigates any potential adverse impacts on the environment and communities during project construction and implementation.

7. The assessment was undertaken in full compliance with the country safeguards system (CSS) including Environment Act 1998 and Regulation 2008. In addition, appropriate sectoral legal provisions relevant to such project have also been referred to for the necessary considerations during the pre-construction, construction, and operation of the project.

8. Specific objectives of the study include (but not limited to) the following:

- Define the project area for each component and establish the environmental baseline conditions through review of available information and data and additional surveys/investigations where required;
- Describe the works and activities that will be undertaken at each of the locations;
- Based on the above identify environmental and social impacts associated with the proposed project implementation;
- Describe the consultation activities and feedback;
- Establish a comprehensive environmental and social management plan (ESMP) which will address the impacts expected during pre-construction, construction, and operation phases of the project.

2.0 ADMINISTRATIVE, LEGAL AND POLICY FRAMEWORK

9. The environmental safeguard requirements of the Project will be implemented to comply with Solomon Islands' laws and regulations (as comprised in the CSS), the ADB-SPS and WB-SP.

2.1 COUNTRY SAFEGUARDS SYSTEM

2.1.1 ENVIRONMENT ACT (1998)

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

11. The Environment Act requires one of two levels of environmental assessment, depending on the scale and anticipated impacts of a development proposal as listed in the Second Schedule: (i) Public Environment Report (PER) or (ii) environmental impact statement (EIS) for developments which may cause more serious impacts. The Environment Regulations 2008 (see below) further defines the procedures for undertaking the environmental assessment of projects and the process of issuing development consent (DC).

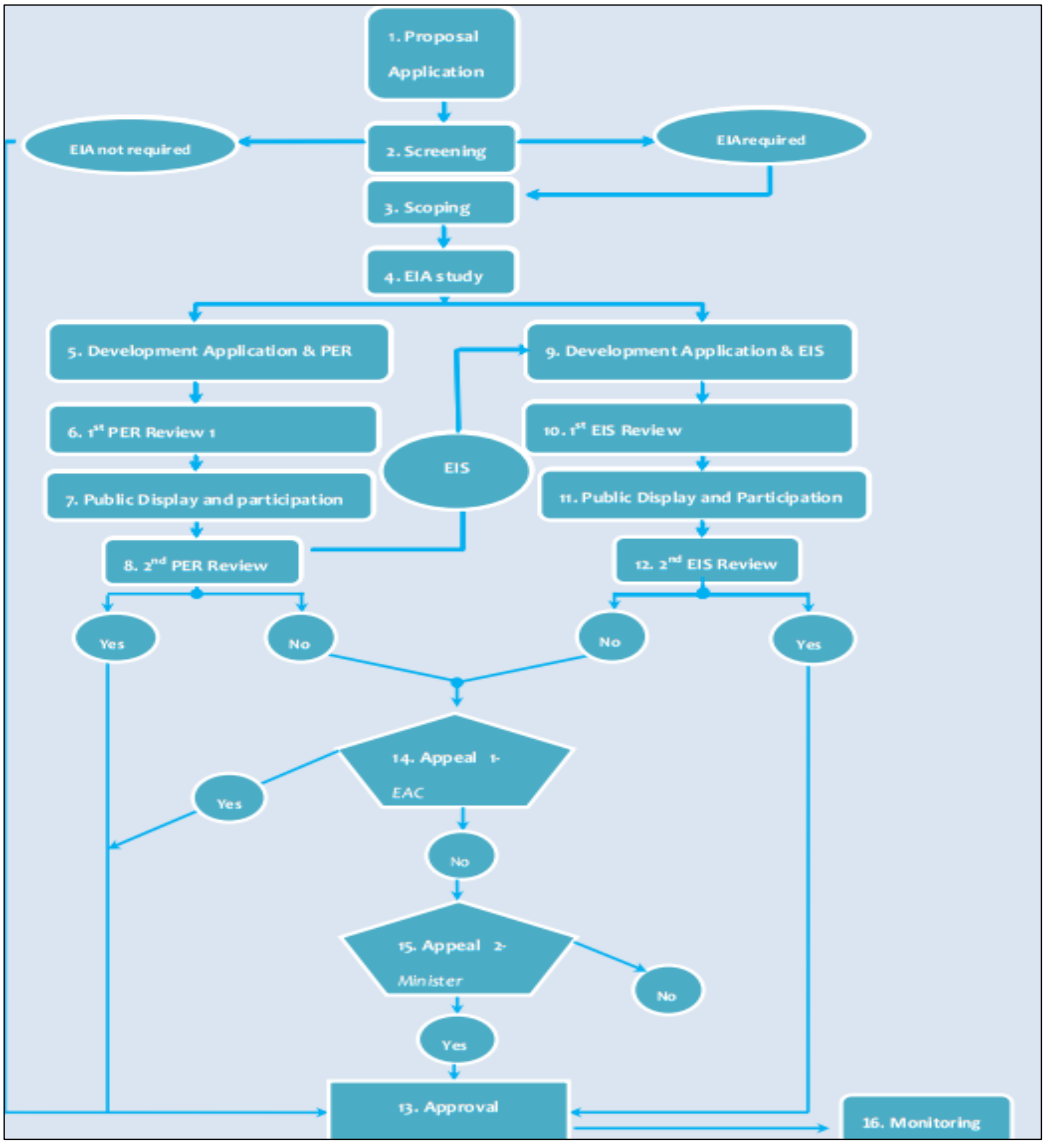
12. Environmental standards for the Solomon Islands are still being developed. However, MEDCM generally advises project proponents to follow internationally recognized standards such as those of the World Health Organization (WHO). In addition, the Project will comply with World Bank Group's Environmental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

2.1.2 ENVIRONMENT REGULATION (2008)

13. The Environment Regulation was published in 2008 and enforced to effectively ensure the implementation of the Environment Act. The Environment Regulations 2008 entails detailed requirements for EIA on "prescribed' developments listed in second schedule of the Environment Act. All prescribed developments require a simple assessment through "screening" or "scoping" process, to see what form of additional assessment is required. Most development projects require a PER, while many major projects will also need a second stage of appraisal which include technical, economic, environmental, and social investigations presented in an EIA or EIS report. All types and forms of major development activities are included in the schedule as a 'prescribe development" activity and need to undergo some form of environment impact assessment as detailed in the regulation.

14. **Environment Impact Assessment Guideline, 2010**: The EIA guideline is designed to administer the schedule 16 of the Environment Act 1998. The guideline comprises of EIA procedural descriptions, stakeholders in the EIA process (see **Figure 2-1**) and fees required for development type. "The guideline was prepared by the ECD with the aim of simplifying the procedures in the Act, provide basic advice and guidance to government officers, planners, developers, resource owners on the environment impact assessment process" (MECDM, 2010).

Figure 2-1: Procedural Steps of EIA



15. **Environmental Permits required for the Project**: Under the Environment Regulation (2008), any developer must submit an EIA Report to the MECDM for any prescribed development. The Ministry would also require an environmental management plan (EMP) and a corporate policy for each of the companies that involved in the project development.

16. The Director shall not issue any license under this part, if the following had occurred:

- The PER or EIS did not support the application;
- The discharge of waste, noise, odor, radiation, or other forms of pollution is inevitable; or
- The discharge of waste or emission of noise, odor or electromagnetic radiation would be harmful to the environment.

17. **Environmental Impact Assessment Decision Statement (EDS)**: The EDS will be issued by the Ministry of Environment upon satisfactory review of the EIA. The process is that upon receiving the PER or the EIS Report, the Director of Environment shall

convene a meeting (or a Public Hearing) and the Director shall receive both oral and written submission from any person in relation to the application.

18. The Director, within 15 working days, will issue a development consent if there is no objection made on the application.

19. The Director may also amend the license if the discharge or emission will be carried out in manner consistent with all relevant environmental policies.

20. **Application to this Sub Project**: During preliminary phases of UWSSSP an initial IEE undertook the different steps (1 to 4). Following detailed design an initial development consent application will be submitted to MEDCM. Following revision of the IEE, a Public Hearing (Step .7) will be held in Munda. To streamline the public consultation process, the resettlement plan (RP) that is being developed under the project will be also disclosed and discussed at these public hearings. MEDCM confirmed during consultation, that the level of assessment conducted and reported as IEE for a category B project (according to ADB's SPS) is equivalent to a PER of the Solomon Islands' Environment Act of 1998.

2.1.3 WATERS RESOURCE BILL

21. **Rivers and Water Act (1996)** was enacted to administer and control developments that would impact on a river. The Act, however, only applies to rivers that have been designated under the Act. This means that all activities taking place within and around the vicinity of the declared Rivers are governed under the Rivers and Waters Act 1996.

22. **Waters Resource Bill (2006)** has been prepared to go through parliament and if approved, passed, and published, it will supersede the Rivers and Water Act (Revised edition1996). The purpose of the Act is:

- To provide for the integrated water resource management of Solomon Islands;
- To promote the most efficient, fair and beneficial use of natural water;
- To ensure the natural water resources are available for the sustainable use for the benefit of all present and future Solomon Islanders;
- To provide for the protection of natural watercourses and water catchments;
- To provide for the control of activities occurring over or beside waterways or watercourses.

23. The Act requires a Waters Resources Advisory Board, whose function is to advise the Minister on matters pertaining to the Act and consult with the Director of Water Resources on technical matters. The Director with his/her staff shall administer, manage, and implement the Act accordingly to achieve the purpose of the act. The Act covers all water bodies, rivers, streams whether in a registered or non-registered, public, or private or customary land in Solomon Islands.

24. The Water Resources Department is located within the Ministry of Mines, Energy & Rural Electrification (MMERE). The Ministry has the authority to control the use and development of all water catchments and riverbanks. Logging, mining and sands and gravel extraction in water catchments, riverbanks and riverbeds may be restricted by the Ministry according to the requirements of the catchment management and conservation. Section 21 of the Act provides for the Ministry to recommend to the Board to declare a water body such as a catchment, groundwater, or flood control zone as a Water Control Area. If approved by the Minister and published, mining of sand and gravel will be prohibited. This also includes any contraction, altering, removing or in any way impede or be likely to impede flow or movement of surface water. This clause of the Act is significant

as it may have a direct impact to sand and gravel extraction in the future if the current activities are not sustainably managed.

25. The Act clearly states that a development must not obstruct, divert or dam the river, if so, it must make application to the Minister who upon receiving the request will direct the Director and/or his officers to assess and if agrees will issue a license accordingly.

2.2 OTHER RELEVANT LAWS

26. **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.

27. **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.

28. **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 may require a PER and will require preparation of an extraction plan.

29. **Mines and Minerals Regulations 1996**. complements and gives a clear detail of the Mines and Minerals Act. It further elaborates on the needs for a better step for achieving a sound minerals resource administration and management in the country. The Regulation has provisions that specify mineral rights holders which include BMP holders, to adhere to good mining practice so that their activities result in minimum ecological damage or destruction, prevent avoidable damage to trees and avoid harm to freshwater, marine and animal life.

30. **Labor Act 1978**. This act deals with protections for workers. Part IX Care of Workers requires the employer to: provide workers with rations (Article 65); protect workers and dependents from malaria (Article 66); provide workers with an accessible supply of clean, non-polluted water for drinking, washing and for other domestic purposes (Article 67); make sufficient and proper sanitary arrangements for workers (Article 68); provide accommodation for the worker and family if they are not conveniently located to the workplace (Article 69). Article 70 requires the employer to provide medical care at the workplace including: (i) treatment facilities, medicines, first aid equipment and transportation facilities; (ii) responsibility to move workers as quickly as possible either to the employer's treatment facilities or to the nearest medical facilities; (iii) treatment for workers or hospitalization; and (iv) should a worker die the employer is obliged to pay for funeral costs. Article 71 states that the employer may be required to provide medical facilities and services of a medical practitioner and the employer is to maintain a register of workers treated.

31. **Safety at Work Act 1996**. states that it is the duty of every employer to provide a safe workplace and to ensure the health and safety of employees under his control. This Act is linked to the Labor Act of 1978.

32. **Biosecurity Act 2013**. This Act is to prevent the entry of animal and plant pests and disease to Solomon Islands; to control their establishment and spread in Solomon Islands, to regulate the movement of animal, plant pest and diseases and of animals and plants and their products; to facilitate international cooperation in respect of animal and

plant diseases and related matters. The Act is supported by Bio-Security Regulations 2015.

33. **Wildlife Protection and Management Act 1998**. This law provides for the protection, conservations, and management of wildlife in Solomon Islands by regulating the export and import of certain animals and plants. It is also intended to address the compliance of the obligations imposed on Solomon Islands under the Convention on International Trade in Endangered Species (CITES). It provides lists of: (i) "Prohibited or Restricted Exports" in Schedule I, (ii) and "Regulated and Controlled Species" in Schedule II. It was amended in 2017 to strengthen Solomon Islands' compliance to the requirements of CITES.

2.2.1 INTERNATIONAL AGREEMENTS

34. 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 provided as **Appendix 1** of this document.

2.3 ADB SAFEGUARD POLICY

35. 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.

36. In accordance with the SPS, screening and categorization of a project (including its 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. The water supply component has been deemed category B for environment based on the significance of its potential environmental impacts and risks. An IEE (equivalent level to a PER) is the appropriate level of assessment for a category B project.

37. An EARF has been prepared which establishes the process and procedures that must be followed for the screening, assessment, review and monitoring of each component that will be prepared during Project implementation. The EARF will ensure that during implementation, the components 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). As prescribed in the EARF, the IEE was prepared for this project component.

38. The SPS requires compliance with the ADB Environment, Health and Safety Guidelines (EHSG). The EHSG requires that workers be provided with a safe and healthy working environment, considering inherent risks, any hazards in the work areas, including physical, chemical, and biological hazards. The EHSG requirements are integrated into the ESMP.

2.4 WORLD BANK SAFEGUARDS POLICIES

39. The WBSP aims 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.

40. The WBSP include ten safeguard policies established to inform decision making, ensuring that projects financed by the WB are environmentally and socially sustainable. The Munda water supply subproject may trigger the following policies: Environmental Assessment (OP/BP 4.01), Natural Habitats (OP/BP 4.04), Indigenous Peoples (OP/BP 4.10), Physical Cultural Resources (OP/BP 4.11) and Involuntary Resettlement (OP/BP 4.12). **Table 2-1** presents these policies and their applicability to the component.

41. The EHSG 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 EHSG are applied as required by their respective policies and standards. The General EHSG are designed to be used together with the relevant industry sector EHSG which provide guidance on issues in specific industry sectors. When host country regulations differ from the levels and measures presented in the EHSG, projects are expected to achieve whichever is more stringent.[1]

42. The World Bank Policy on Access to Information, 01 July 2015 is the policy governing public accessibility of information in the Bank's possession. Based on this policy, the Bank allows access to any information in its possession that is not on a list of exceptions[2]. In addition, over time the Bank declassifies and makes publicly available certain information that falls under the exceptions. Notwithstanding the broad intent of this Policy, the Bank reserves the right, under exceptional circumstances, to disclose certain information covered by the list of exceptions, or to restrict access to information that it normally discloses. For this IEE Report, any personal information of staffs and stakeholders particularly those who are involved during the public consultations (stakeholders' consultation and focus group discussions) will be safeguarded to respect the personal privacy and protect the confidentiality of personal information about them.

[1] The General and Industry Sector EHSG are available at the following link - Environmental, Health, and Safety Guidelines (ifc.org)

[2] The list of exceptions is available at the following link - Policy & Procedure Framework (worldbank.org)

Table 2-1: World Bank Safeguard Policies: Main Objectives, Applicability and Triggered by the Subproject[3]

Safeguard Policies	Main Objective	Applicability	Application to Munda Water Supply Components
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.	This policy is applicable when a project or subproject has potential to cause negative environmental impacts in its area of influence.	**Triggered:** Environmental risks associated with the project include 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. 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 (RP) establish the process to mitigate these impacts. Consultations with stakeholders and affected communities are used to inform the decision-making process.
OP 4.04 Natural Habitats	This policy recognizes that the preservation of natural habitats is essential to protect original biodiversity, for the preservation of environmental services and products for human society and for long term sustainable development. 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. By funding projects, the Bank expects the	This policy is used by any Project or subproject 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). 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 has not	**Triggered:** The policy OP4.04 was triggered for the project to be consistent with the ISDS. The IEE established that the project is not located in areas where there will significant changes (loss) or degradation of natural habitats, be it directly (through the construction) or indirectly (with the human activities caused by the project). Construction will occur in areas of highly modified ecosystems and impacts during operations on environmental and socioeconomic values will be minor.

[3] This table was taken from the EARF of the UWSSSP. The application to the Munda Water Supply is explained in the last column.

Safeguard Policies	Main Objective	Applicability	Application to Munda Water Supply Components
	proponents to apply the precautionary principle in the management of natural resources, in order to ensure opportunities for sustainable environmental development.	essentially modified the area's primary ecological functions.	
OP 4.10 Indigenous Peoples	For all projects proposed for 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. 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. 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.	This policy is applied when the Project affects direct or indirectly indigenous people.	**Triggered:** The OP4.10 policy is triggered for the project to be consistent with the World Bank Integrated Safeguards Data Sheet (ISDS, p.16 May 2018). However, the project is in areas where Indigenous Peoples are the sole or most direct project beneficiaries. They are not a discriminated, marginalized group, but part of the majority population, sharing the same culture, identity, and characteristics. IP aspects have been integrated into the Project Design ensuring FPIC principles, and broad community support for the project. The project will focus on rehabilitating failed water supply infrastructure or providing new infrastructure, this will benefit the community. An RF will be prepared which sets out the methodology for land acquisition / access 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.

Safeguard Policies	Main Objective	Applicability	Application to Munda Water Supply Components
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 development projects that it finances. 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.	This policy is used by any Project or subproject considered as potential to cause changes (loss) or degradation of physical cultural resources. 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. 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 subproject.	**Triggered:** The project involves construction works in modified urban and peri-urban areas, where it is unlikely that unknown physical cultural resources will be encountered. However, a Chance Find procedure will be included in the CESMP to ensure appropriate measures are taken in the event cultural resources are encountered. The chance find procedure is a project-specific procedure that outlines what will happen if previously unknown heritage resources, particularly archaeological resources, are encountered during project construction or operation. The procedure includes record keeping and expert verification procedures, chain of custody instructions for movable finds, and clear criteria for potential temporary work stoppages that could be required for rapid disposition of issues related to the finds. It is important that this procedure outlines the roles and responsibilities and the response times required from both project staff, and any relevant heritage authority, as well as any agreed consultation procedures.[4]
OP 4.12 Involuntary Resettlement	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	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	**Triggered:** The project involves the rehabilitation and expansion of failed water supply infrastructure, as well as the development of new water supply infrastructure. Water networks will likely be subject to lease arrangements. Involuntary

[4] Guidance Note 8 - International Finance Corporation

Safeguard Policies	Main Objective	Applicability	Application to Munda Water Supply Components
	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.	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. In these cases, the World Bank requires the establishment of a Resettlement Action Plan (RAP), based on the RF for any project or subproject.	resettlements, if required, are expected to take place at a very limited scale. A 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.

2.5 OTHER RELEVANT POLICIES

43. The following policies are important consideration in terms of services provided by SW in the country.

2.5.1 NATIONAL DEVELOPMENT STRATEGY (NDS)

44. The National Development Strategy (NDS) is a very comprehensive policy that strategizes ways to achieve the development aspirations of the country. The NDS focuses on two key areas: social and economic livelihoods. These two key areas are enshrined into the NDS National Vision "Improving the Social and Economic Livelihoods of all Solomon Islanders".

45. Therefore, to achieve all those NDS Objectives, SW as one of the country's SOE ensures that it provides access to clean water to its clients. Being an SOE, SW strives to improve the quality and accessibility of water it provides to households, government houses, business houses and industries in the urban areas. Such is important to improving the social and economic livelihoods of people and more so to support growth and economic development of the country.

2.5.2 CLIMATE CHANGE POLICY

46. The Solomon Islands Government through the MECDM launched the Climate Change Policy, highlighting steps the government would take in aiding the country and its people to exist and adapt to present imminent climate change and its impact. The Policy aims to integrate climate considerations within the framework of national policies and guiding the government and its partners so as to ensure the people, natural environment and economy of the country are resilient and able to adapt to the predicted impacts of climate change.

47. **National Climate Change Policy 2012-2017** is the guiding framework to: (a) integrate climate considerations and support the implementation and achievement of the National Development Strategy and other regional and international policies and frameworks; and (b) to guide the government and its partners' efforts in ensuring that; (i) the people, natural environment, and economy of the country are able to adapt to the predicted impacts of climate change; and (ii) the country benefits from clean and renewable energy, energy efficiency, and mitigation technologies that improve people's livelihoods and the national economy.

2.5.3 NATIONAL ENERGY POLICY

48. The National Energy Policy recognizes the importance of reducing dependency on imported fossil fuel. Solomon Islands have abundant of resources renewable energy source such solar, hydropower, geothermal, biomass and wind energy.

2.5.4 UNEXPLODED ORDNANCE

49. WWII ordnance found in the Pacific Islands can be defined as either unexploded ordnance (UXO) or abandoned explosive ordnance (AXO). UXO is defined as explosive ordnance that has been primed, fused, armed, or otherwise prepared for use in armed conflict but has failed to explode. AXO is defined as explosive ordnance unused during an armed conflict and subsequently abandoned or left behind. UXO and AXO are defined collectively as Explosive Remnants of War (ERW). Solomon Islands was the scene of bitter fighting during World War II. While this was over 60 years ago, UXO may still be found around Solomon Island. Should UXO be discovered at the project site, the contractor is to immediately cordon off the area, arrange the evacuation of nearby residences and inform relevant division within the Royal Solomon Island Police Force (RSIPF) to remove the UXO. Currently all UXO/AXO finds are reported to the RSIPF who arrange the pickup, transport, storage, and ultimate disposal of the finds.

50. Based on a risk assessment, construction sites will be swept for and cleared of UXOs/AXOs prior to construction by SW; it is nevertheless important that a procedure for handling the UXOs/AXOs during the construction is included in the contractor's Construction Environment and Social Management Plan (CESMP). This will be the responsibility of the contractor. Ultimately, SW will be responsible for the supervision and monitoring of the contractor.

3.0 PROJECT DESCRIPTION

3.1 MUNDA WATER SUPPLY COMPONENT'S LOCATION

51. The WS components are in Munda in the Western Province, in the Solomon Islands.

52. The Munda WS components covered in this IEE and to be financed under UWSSSP cover the following:

- The new Airport borehole system for water production with a total production of 0.6 MLD and transmission to Munda town with a total length of about 1.5 km.
- The new storage facility with 600 m^3 tank and distribution network in Munda town with a total length of about 14.7 km.

3.1.1 AIRPORT BOREHOLE SYSTEM FOR WATER PRODUCTION, STORAGE AND TRANSMISSION

53. The scope of works will include the following:

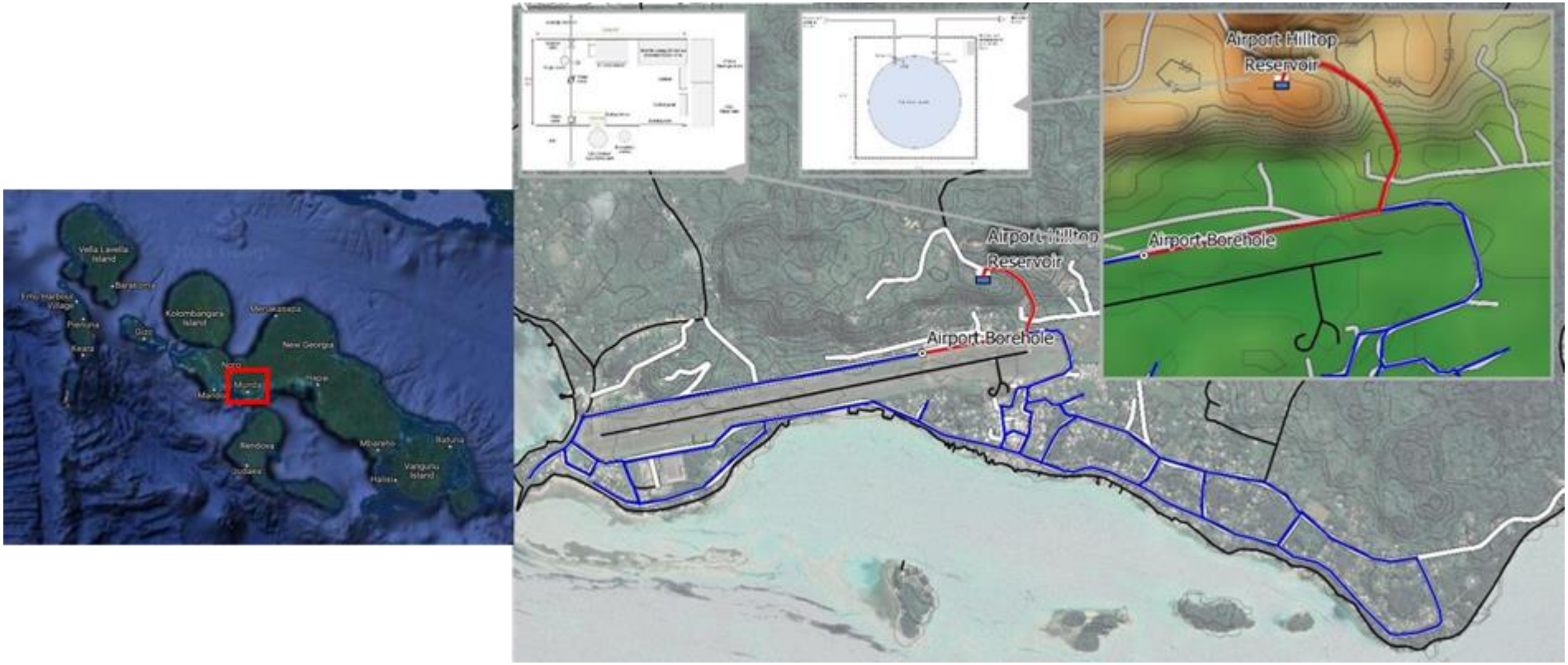
- Replacement of all the electromechanical equipment necessary for the rehabilitation of the Airport's well and for achieving the targeted production of 0.6 MLD.
- Installation of a new disinfection system based on injection of sodium hypochlorite solution at the Airport site (adaptable to gas chlorination in the future).
- Construction of a new storage reservoir on the hill north of Munda town.
- Construction of new transmission pipes from the airport site to the new reservoir and from the new reservoir to the north inlet of the new distribution network

54. Groundwater will be extracted from the existing Airport Borehole. The electromechanical and electrical equipment will be replaced to achieve the targeted production flow and to meet the required quality and safety standards. The groundwater will be disinfected at the extraction site and then pumped up to the Airport Hilltop Reservoir located on top of the hill north of Munda town. Lifting of water from the Airport to this Hilltop Reservoir will be achieved directly by the borehole's submersible pump. There will be no storage nor additional lifting pump at the airport. From the Hilltop Reservoir, the water will flow by gravity down to the distribution network supplying the Hospital, Airport, Munda and Dunde areas.

55. The Airport Hilltop Reservoir is located on a site pre-identified early in the project which elevation has been measured at 58 m MSL.

56. **Figure** 3-1 illustrates the Airport Borehole Production and Transmission System.

Figure 3-1: Location of Munda and Overview of Airport Borehole Production and Transmission System



Source: Munda Water Supply DD, October 2020
Google Maps

Airport Borehole Site

57. **Location**. The borehole site is located along Munda airport about 73 m north of the runway. **Figure** 3-2 shows the map of the location of the existing borehole building.

Figure 3-2: Location of Existing Airport Borehole

Source: Munda Water Supply DD, October 2020

58. **Plate** 3-1 shows the existing borehole and building.

Plate 3-1: Airport Borehole System

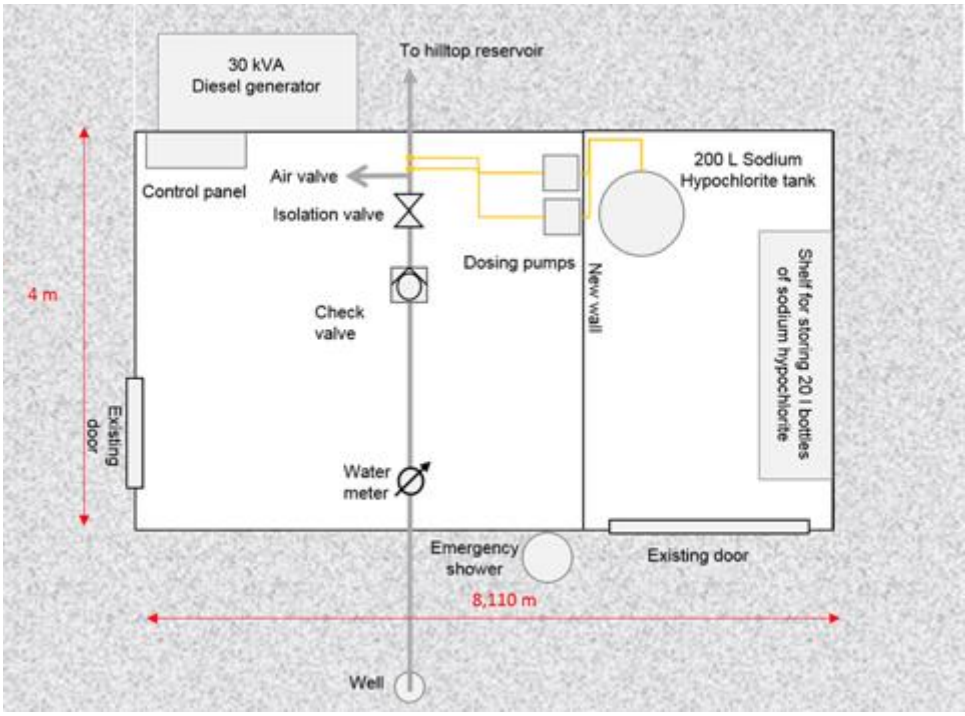
Source: Munda Water Supply DD, October 2020

59. **Composition**. The Airport Borehole System will be composed of the following components:

- The existing building with the existing borehole,
- A control and instrumentation panel inside the building,
- A 200 L tank and 2 dosing pumps for the sodium hypochlorite disinfection system,
- A storage shelf for the 20 L sodium hypochlorite disinfection bottles and 1 cabinet for the safety gears,
- An emergency shower,
- A 30-kVA electrical diesel generator,
- Footprint will be the same as the existing site (building + borehole).

60. **Figure** 3-3 illustrates the composition of the pumping station.

Figure 3-3: Pumping Station of Airport Borehole System



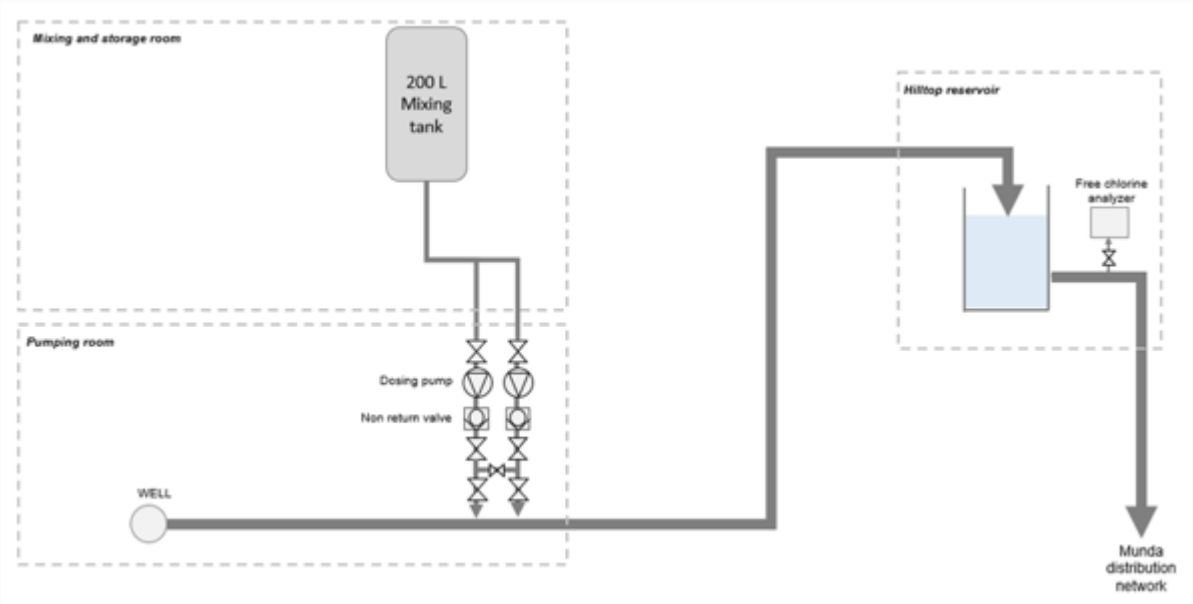
Source: Munda Water Supply DD, October 2020

Airport Borehole Disinfection System

61. Chlorinated water will be injected in the discharge pipe at the airport site. Chlorinated water will be produced from a sodium hypochlorite solution. There will be 2 injection pipes: one duty and one standby. The standby pipe will be used in case of clogging of the duty line.

62. **Figure** 3-4 shows the disinfection system.

Figure 3-4: Disinfection System of Airport Borehole System



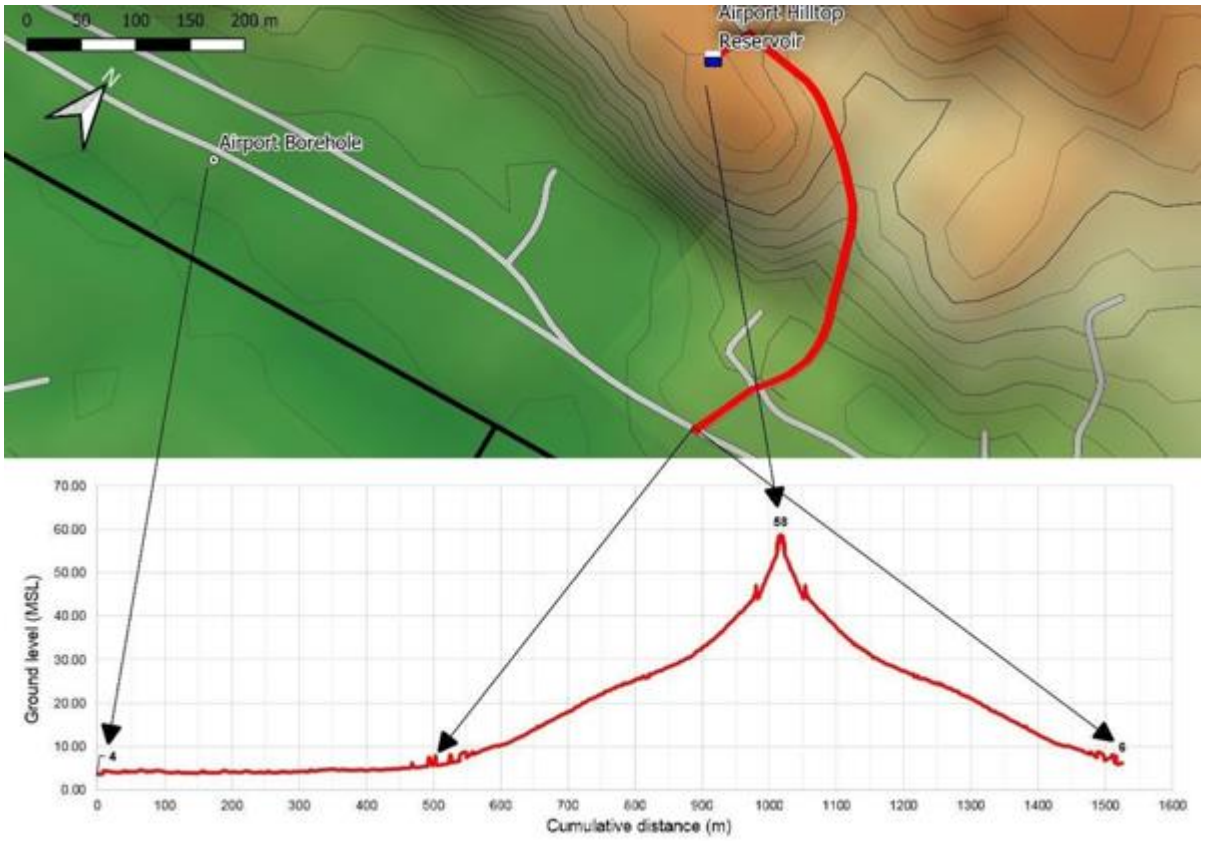
Source: Munda Water Supply DD, October 2020

Transmission

63. The pipe will be installed under the existing road along the airport and up to the top of the hill. The total length is about 1,525 m (Section 1 is 1,015 m from the Airport site up to the Hilltop Reservoir, Section 2 is 510 m down to the inlet of the distribution network.). The easement to be considered is 5 m (2.5 m from each side of the pipe).

64. **Figure** 3-5 shows the route and the ground level elevation.

Figure 3-5: Pipe Route and Ground Profile of Airport Borehole System



Source: Munda Water Supply DD, October 2020

Airport Hilltop Reservoir

65. The Airport Hilltop Reservoir will be located on the hill north of Munda with an elevation of 58 m MSL.

66. **Composition**. The Airport Hilltop Reservoir site will be composed of the following components:

- A 600 m^3 glass-fused-to-steel tank which will provide 1-day storage capacity for this system.
- An isolation valve on the inlet of the tank.
- An isolation valve, an air valve, a Woltman flowmeter and an isolation valve on the common outlet.
- A bypass for the tank that will be located downhill, and which is not shown in the sketch below.
- 1 small booth for the RTU.
- Footprint will be around 500 m^2. The site is large enough to accommodate two 600 m^3 reservoirs.

67. The existing site is covered with scattered vegetation that shall be prepared for construction of the new storage site. The works include but are not limited to the following:

- Site preparation including cuttings of trees and grass, and temporary fencing of the entire site;

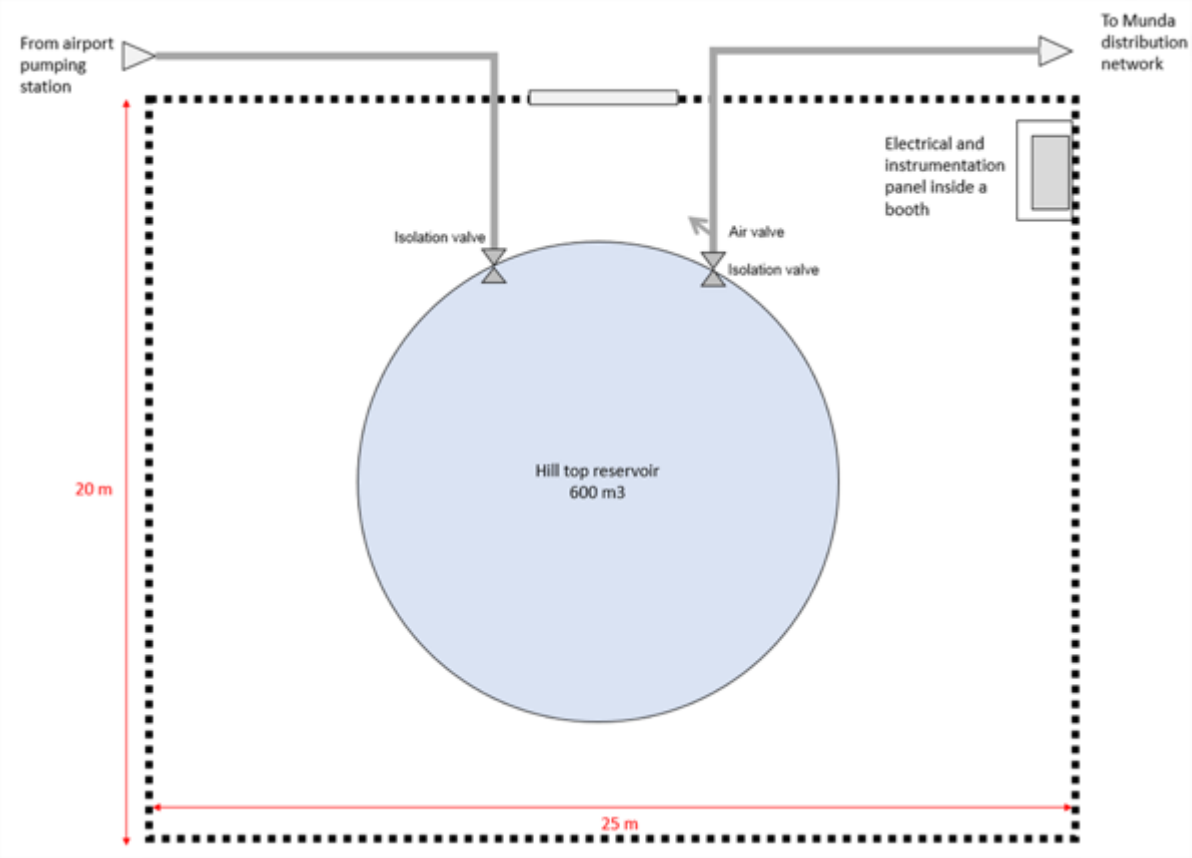
- Road access preparation; this road will be used for construction access and maintenance access after the Works, the existing road is covered with loose gravel and 15 degree slope climb and generally flat at the top,
- Necessary earthwork and backfilling to create a flat platform at +58 m ASL;
- Construction of the storage facility;
- Lighting of the site;
- Landscaping including pavement from gate to reservoir and instrumentation panel;
- Improvement of access from main road to gate
- Site restoration.
- Coordination with all public authority when needed (public roads).

68. The existing platform is large enough to accommodate a material storage area.

69. The final and detailed description is left to the Contractor initiative, based on its diagnostic of the existing facilities.

70. **Figure** 3-6 shows the layout of the Hilltop Reservoir.

Figure 3-6: Layout of the Hilltop Reservoir of Airport Borehole System



Source: Munda Water Supply DD, October 2020

3.1.2 DISTRIBUTION NETWORK

71. The network will be supplied from the new Airport Hilltop Reservoir. The 600 m^3 storage capacity will provide 1-day autonomy.

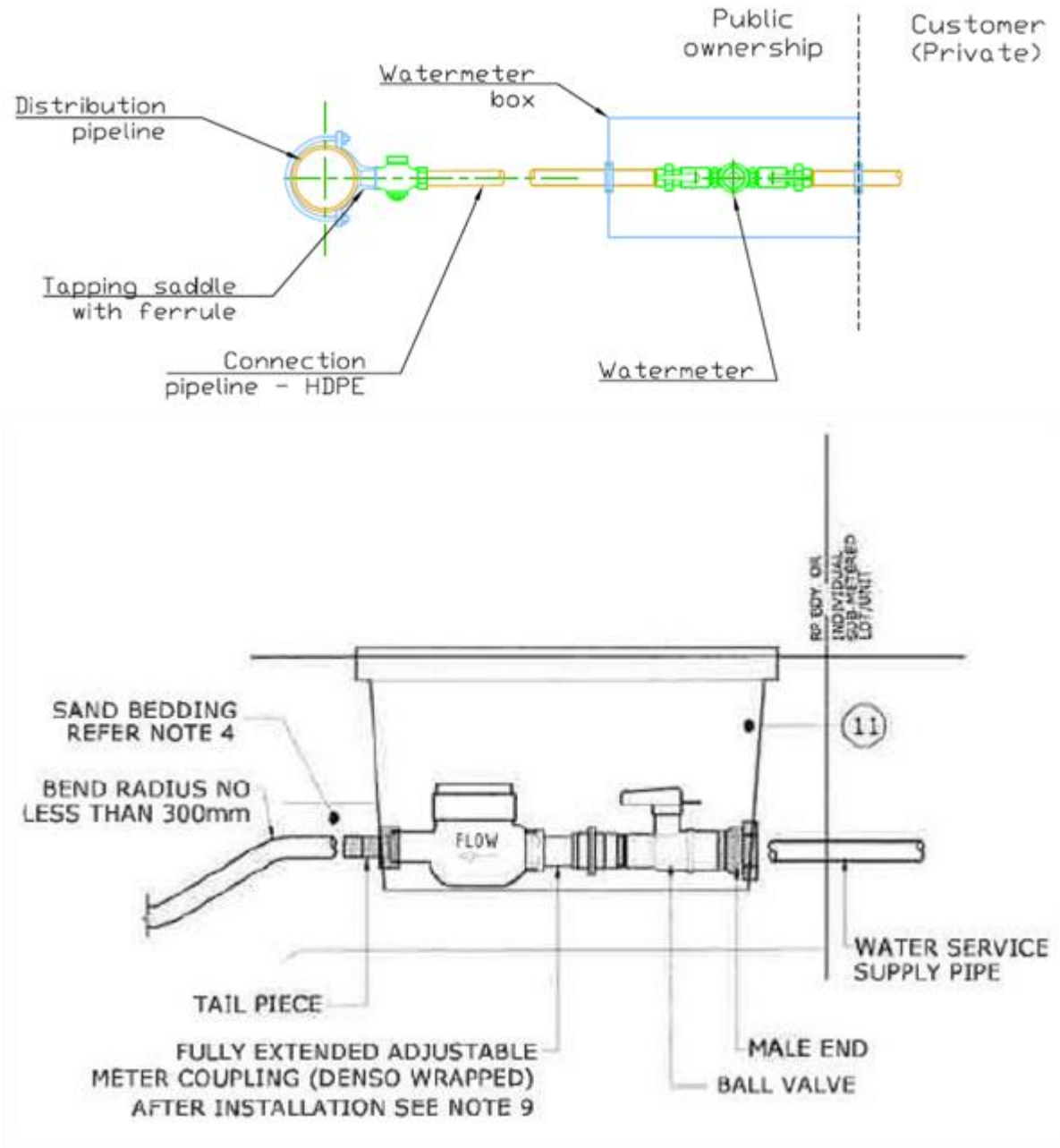
72. A single pressure zone will be created and will be supplied directly from the Airport Hilltop Reservoir. The single pressure zone will be divided into two zones:

- WEST zone: for the hospital area.
- EAST zone: for the airport, the Munda and Dunde area.

73. It is assumed that majority of customers are individual domestic customers or small commercial customers. These customers will be connected with 20 mm service connections. Larger connections such as 25 mm, 30 mm or 40 mm are for larger establishments such as hospitals, hotels, large restaurants, schools, and government offices. The distribution system will allow 440 connections (considering 1 connection for 5 persons).

74. **Figure** 3-7 illustrates the typical service connection with the boundary between public and private ownership. Private ownership starts at the outlet of the water meter.

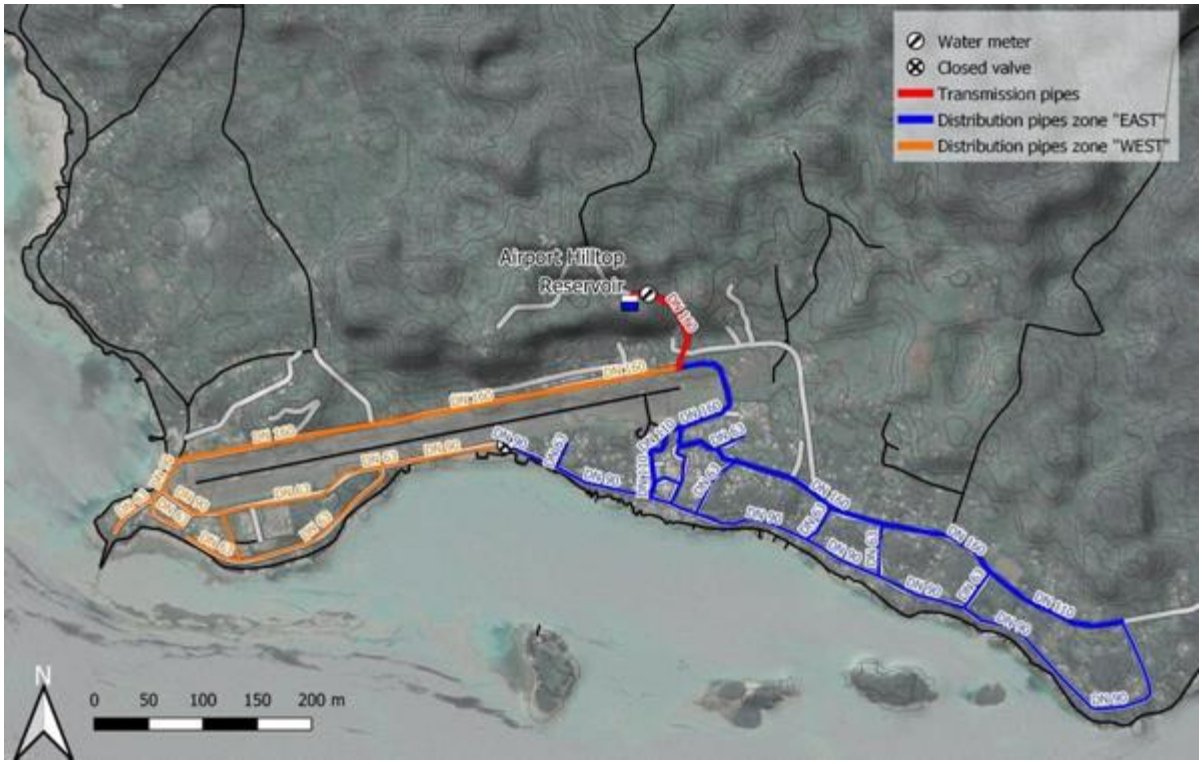
Figure 3-7: Typical Service Connection



Source: Munda Water Supply DD, October 2020

75. **Figure** 3-8 presents the proposed distribution network. **Table** 3-1 summarizes the length of pipes per diameter.

Figure 3-8: Proposed Distribution Network



Source: Munda Water Supply DD, October 2020

Table 3-1: Pipe Length by Diameter of Proposed Distribution Network

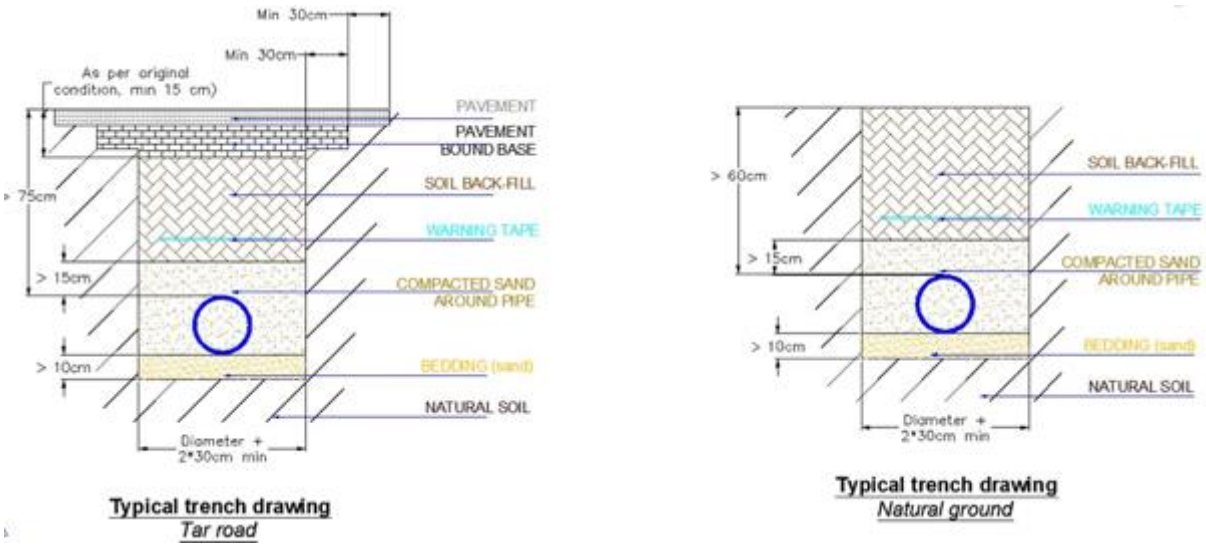
HDPE PN 12.5	Length (m)
63	4,200
90	4,200
110	1,050
160	5,250
Grand Total	**14,700**

Source: Munda Water Supply DD, October 2020

76. Pipelines will generally be installed using trenching methods along roads. Roadsides will be favored to limit formed road surface damage and reinstatement as well as potential settlement.

77. **Figure** 3-9 shows the general requirements for pipe trenching and installation which will depend on the type and quality the road.

Figure 3-9: Layout for Pipe Trench and Installation



Source: Munda Water Supply DD, October 2020

3.2 Schedule

78. Construction of the facilities is envisaged to take 18 to 24 months (work inputs include 50 employees for Munda WS components, of which 10 are foreign). Employees will find local accommodation in Munda. Construction facilities such as site offices and laydown areas will be the responsibility of the contractor and will be located on the site footprint. The works are targeted to be completed from 8 am to 5 pm Monday to Friday. Should out-of-hours works be required, consultation will be undertaken with the community.

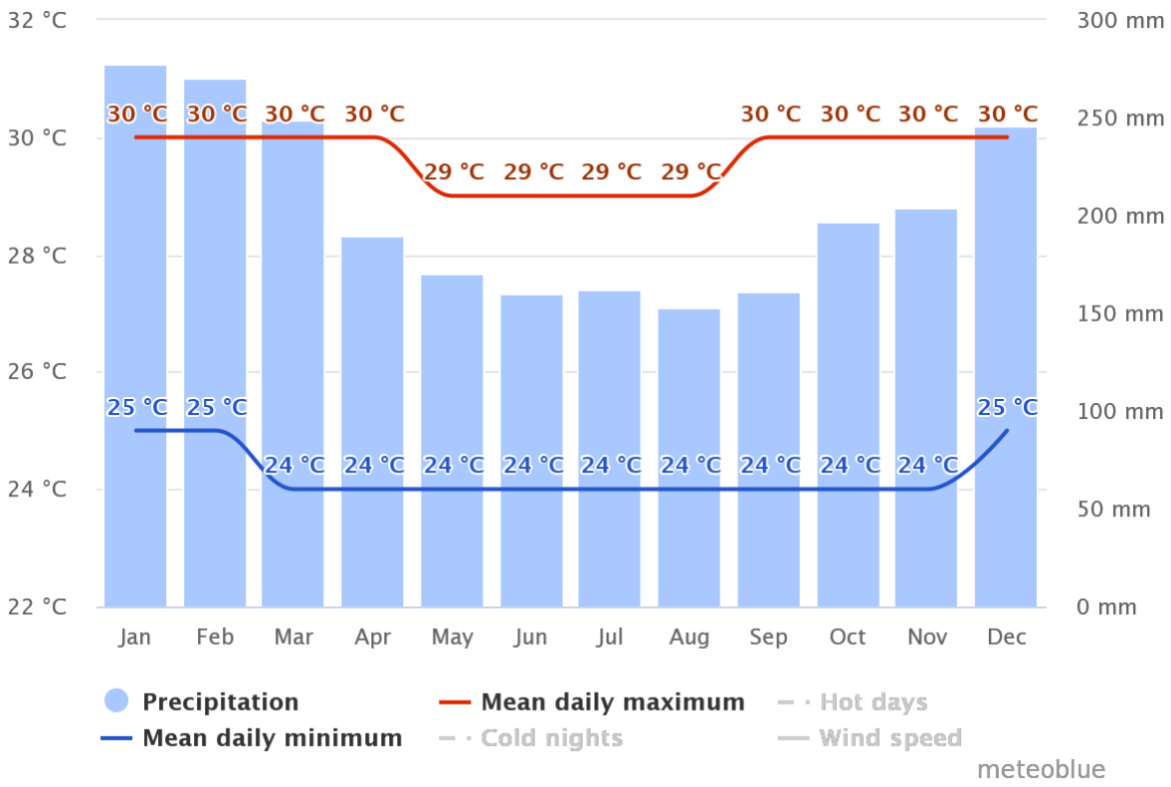
4.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1 PHYSICAL ENVIRONMENT

4.1.1 CLIMATE

79. As shown in the meteoblue climate diagram in **Figure** 4-1 which are based on 30 years of hourly weather model simulations, the maximum and minimum temperature of an average day in Munda ranges from 29 °C to 30 °C and 24 °C to 25 °C, respectively. The hottest months are from September to April while the coldest months are from March to November. Lastly, the month of January has the most precipitation around 278 mm while the month of July has the least precipitation around 153 mm.

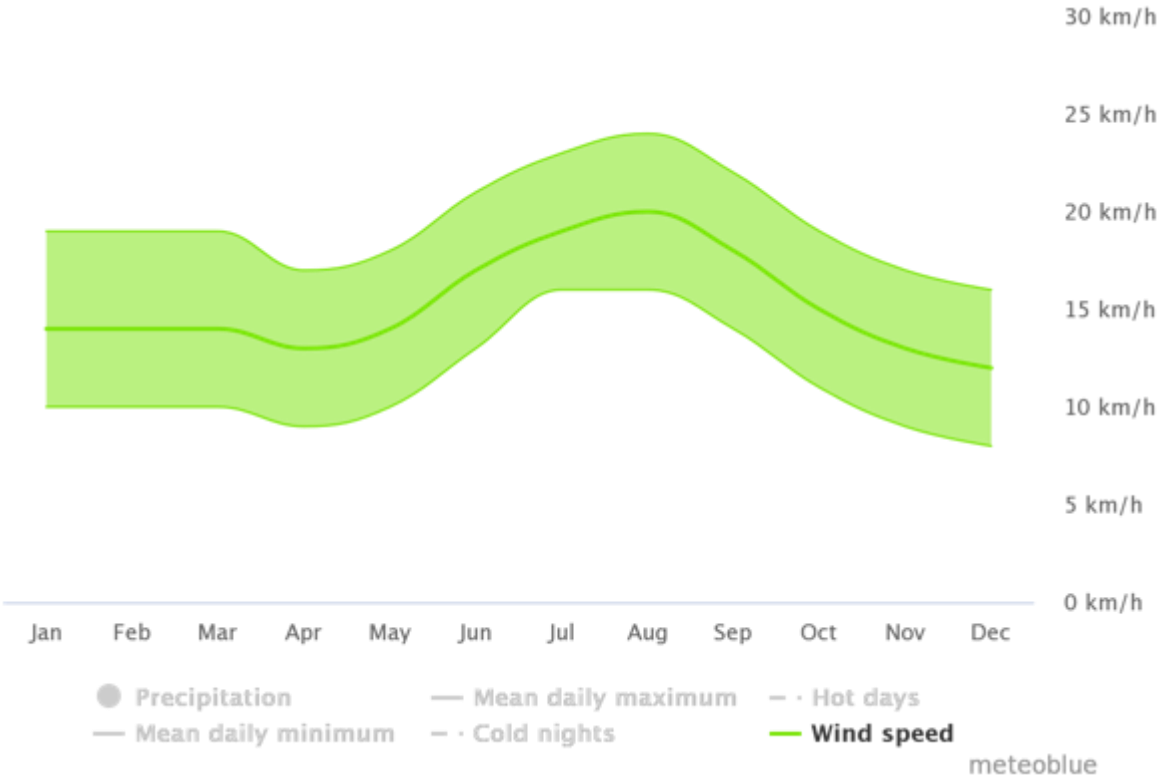
Figure 4-1: Climate in Munda (Modelled)



Source: Meteoblue

80. As shown in the meteoblue climate diagram in **Figure** 4-2 which are based on 30 years of hourly weather model simulations, the month of August have the strongest wind speed of 20 km/h (minimum is 16 km/h, maximum is 24 km/h) while the month of December has the least wind speed of 12 km/h (minimum is 8 km/h, maximum is 16 km/h).

Figure 4-2: Wind Speed in Munda (Modelled)

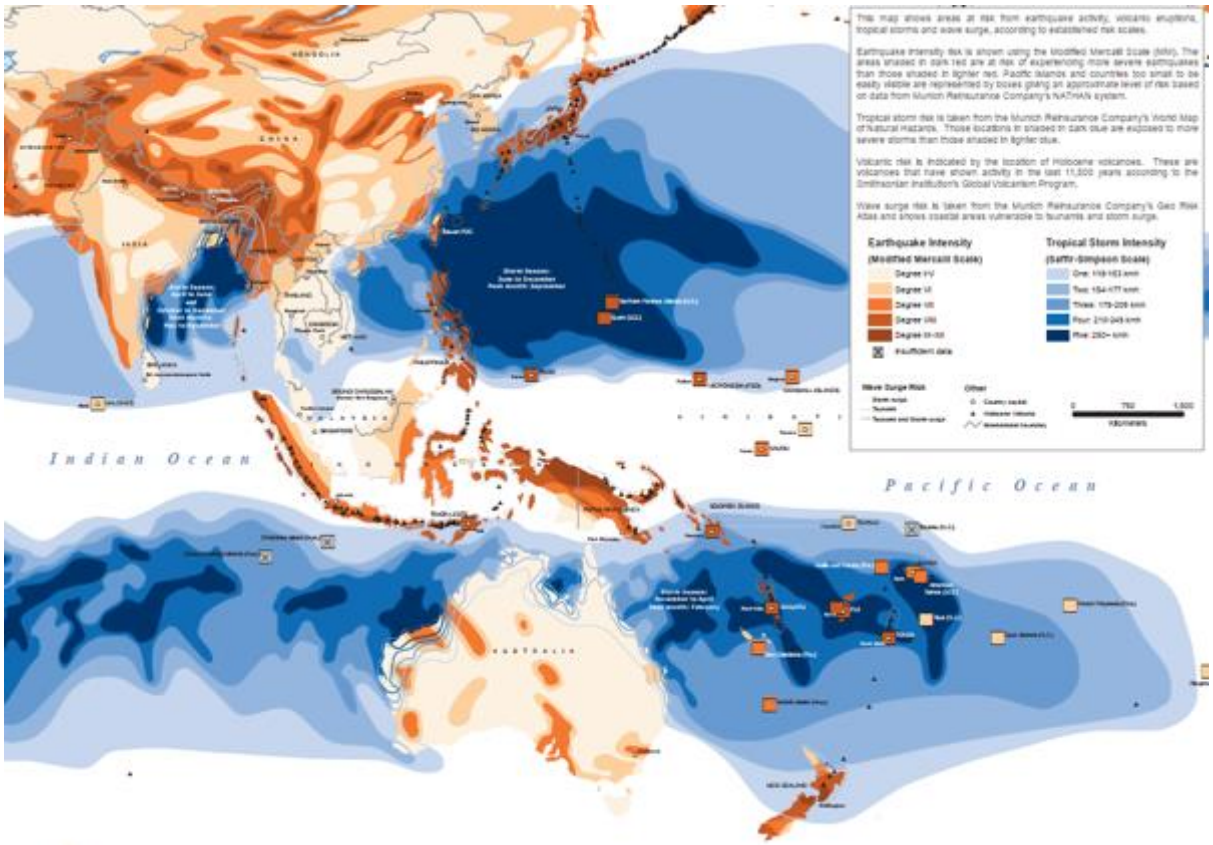


Source: Meteoblue

81. The Pacific-Australia Climate Change Science Program (PCCSP) deemed the available data of cyclones as not suitable for assessing long-term trends. It however, 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 provided the following additional information: (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 (EEZ) 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) in the Solomon Islands EEZ. Fifteen of the 22 intense events occurred in seasons when an El Niño was present.

82. As shown in **Figure** 4-3, Munda is in an area with tropical storm intensity zone 1: 118-153 km/h based on Saffir-Simpson Scale.

Figure 4-3: Major Natural Hazards in Asia and Pacific



Source: Office for the Coordination of Humanitarian Affairs (OCHA). 2016.

83. For the past 20 years, the sea in Solomon Island has risen around 7-10 mm per year (three times of the global average of 3-5 mm per year) since 1993. From the study conducted in Solomon Islands, the wave energy plays an important role in the coastal erosion. Islands exposed to higher wave energy in addition to sea level rise experienced greatly accelerated loss[5]. As shown in **Figure** 4-4, the airport borehole and airport hilltop reservoir are not located in the land projected to be below annual flood level in 2050. Further studies, evaluating impact in relation to tides, cyclones, etc. will be conducted to provide more details.

[5] The Conversation

Figure 4-4: Land Projected to be Below Annual Flood Level in 2050

Source: coastal.climatecentral.org.
Note: Land below water level in red color. Elevation data used is Legacy data.

84. PCCSP projected the changes in the annual and seasonal mean climate for Solomon Islands under four emissions scenarios and are given for 20-year periods centered on 2030, 2050, and 2070, relative to a 20-year period centered on 1995 (see **Table** 4-1).

Table 4-1: Projected Changes in Annual and Seasonal Mean Climate in Solomon Islands

Variable	Season	2030	2050	2070	Confidence (magnitude of change)
Surface air temperature (°C)	Annual	0.6 (0.4–0.9)[a]	0.8 (0.6–1.2)	0.8 (0.4–1.2)	Medium
		0.7 (0.4–1)	1 (0.7–1.4)	1.2 (0.9–1.8)	
		0.6 (0.5–0.9)	0.9 (0.7–1.4)	1.3 (1–2)	
		0.7 (0.5–1)	1.3 (1–1.9)	2.1 (1.5–3)	
Maximum temperature (°C)	1-in-20year event	0.6 (0.2–0.8)	0.7 (0.4–1)	0.7 (0.3–1)	Medium
		0.6 (0.3–0.8)	0.9 (0.4–1.3)	1.2 (0.7–1.8)	
		NA (NA–NA)	NA (NA–NA)	NA (NA–NA)	
		0.8 (0.4–1.2)	1.4 (0.9–2.1)	2.2 (1.5–3.2)	
Minimum temperature (°C)	1-in-20year event	0.6 (0.2–0.9)	0.7 (0.4–1)	0.7 (0.3–1)	Medium
		0.6 (0.3–0.9)	0.9 (0.5–1.3)	1.1 (0.6–1.5)	
		NA (NA–NA)	NA (NA–NA)	NA (NA–NA)	
		0.7 (0.5–1.2)	1.5 (1–2.1)	2.2 (1.5–3.3)	
Total rainfall (%)	Annual	3 (-1–8)	3 (-1–7)	3 (-3–8)	Low
		3 (-2–9)	3 (-4–9)	4 (-2–12)	
		4 (-1–9)	3 (-3–8)	5 (-3–14)	
		3 (-1–7)	3 (-3–9)	5 (-3–14)	
Total rainfall (%)	Nov-Apr	3 (-2–9)	3 (-1–9)	3 (-3–9)	Low
		2 (-2–9)	2 (-4–7)	4 (-2–13)	
		3 (-2–9)	2 (-4–9)	4 (-3–11)	
		3 (-2–9)	3 (-5–10)	5 (-4–13)	
	May-Oct	3 (-4–8)	3 (-4–12)	3 (-5–11)	Low
		3 (-4–11)	4 (-3–11)	4 (-3–11)	

Total rainfall (%)		4 (-3–13)	5 (-4–13)	5 (-8–16)	
		3 (-2–8)	3 (-6–9)	5 (-7–15)	
Mean sea level (cm)	Annual	13 (8–18)	22 (14–31)	32 (19–45)	Medium
		12 (7–17)	22 (14–31)	35 (21–48)	
		12 (7–17)	22 (14–30)	34 (21–47)	
		13 (8–18)	25 (16–35)	42 (28–58)	

Note: a - 1st line values very low emissions; 2nd line values low emissions; 3rd line values medium emissions; 4th line values very high emissions; NA = data are not available; the range of values in parenthesis.
Source: SI: UWSSSP EARF, 26 March 2019

85. In the Solomon Islands, the southeast trade winds are usually established in April and continues 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).

86. The PCCSP also concluded that the available data of wind-waves are not suitable for assessing long-term trends, however, it has noted that wind-waves around the Solomon Islands vary across the country. Seasonally, waves are influenced by the trade winds and the West Pacific Monsoon (WPM), and display variability on interannual time scales with the El Niño–Southern Oscillation (ENSO).

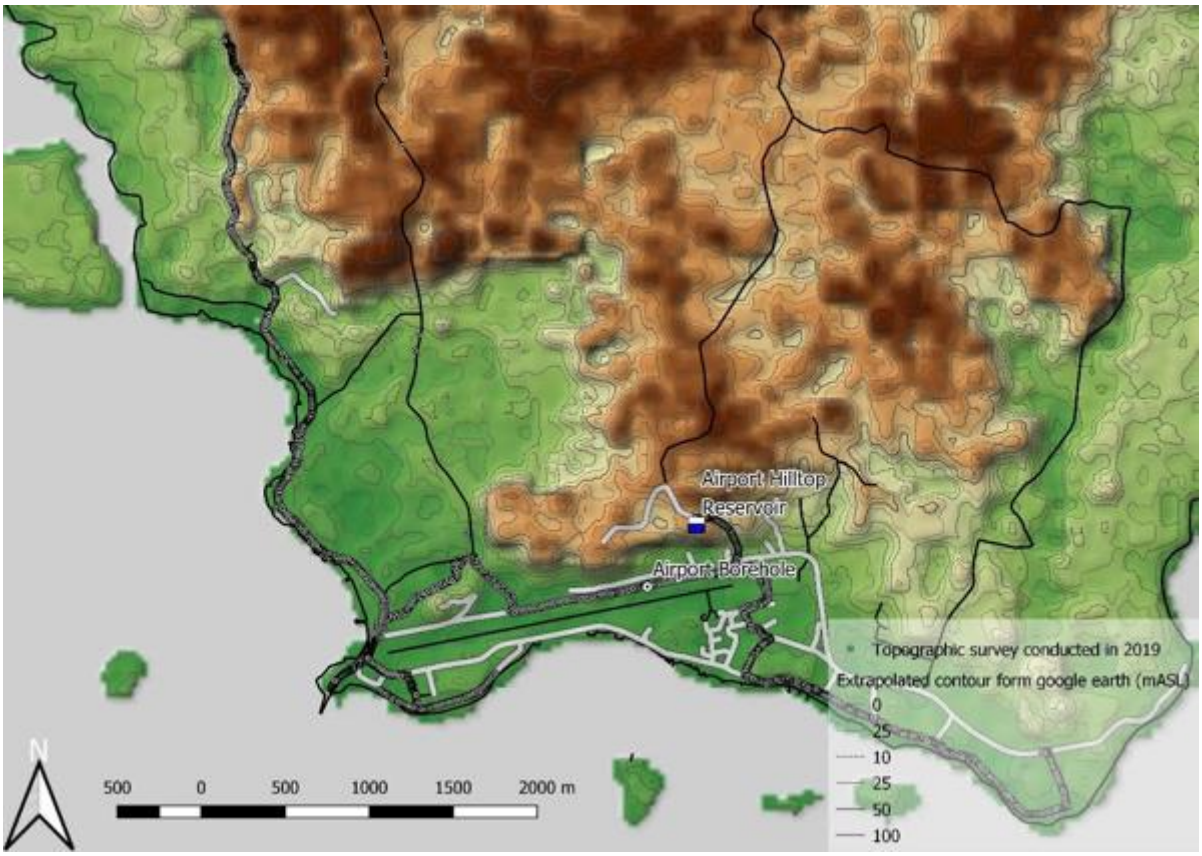
87. The potential impacts of climate change to the proposed Munda WS components are further discussed in Section 5.1.1 of this report.

4.1.2 TOPOGRAGPHY

88. A topographic survey of all existing roads of Munda was conducted last 2019. The result of this survey was used for modelling the distribution system. **Figure** 4-5 shows the topographic map of Munda.

89. As shown in the ground profile in **Figure** 3-5, the elevation of Airport Borehole and Airport Hilltop Reservoir are around 4 and 58 m MSL, respectively.

Figure 4-5: Topographic Map of Munda



Source: Munda Water Supply DD, October 2020

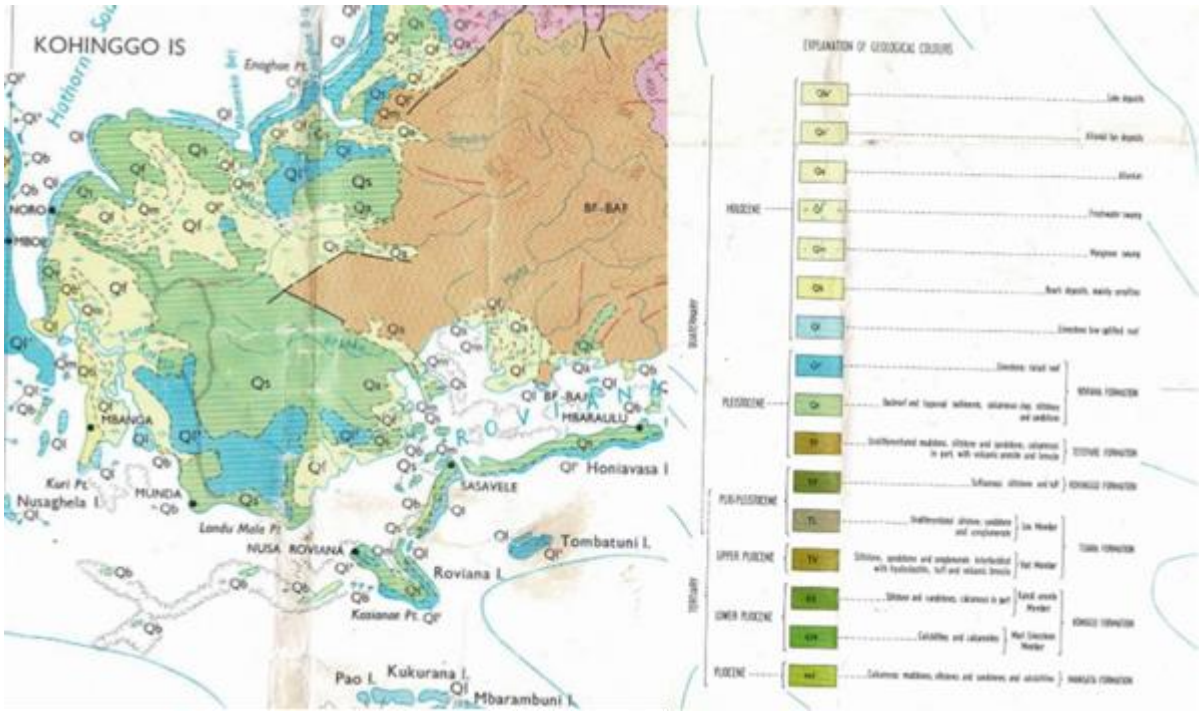
4.1.3 GEOLOGY AND SOILS

90. There are 27 soil groups in Solomon Islands. Depending on parent material and land use, soils exhibit a range of fertility. The basalt volcanic derived soils are generally rich in nitrogen, phosphorous and organic carbon, but poor in potassium. The most fertile and agriculturally important of all soils found in Solomon Islands are the recent alluvial soils located on the northern Guadalcanal alluvial plains (Hansell & Wall, 1974).

91. The geology of the New Georgia Island that covers Munda are mostly the Holocene and Pleistocene. The proposed storage tank is located on the Pleistocene, which is the Roviana Formation. The area is surrounded by the Holocene which are mostly freshwater and mangrove swamps.

92. **Figure** 4-6 shows the geology map of West New Georgia area.

Figure 4-6: Geology Map of West New Georgia Area



Source: Geotechnical Investigation Report – Munda Water Supply Project

93. Drilling work at the proposed site of storage tank was done up to 10 m depth. The Standard Penetration Test (SPT) was done at every 1-meter depth for 10 m. The borehole sample obtained is filled materials and mostly gravelly sand. **Table** 4-2 presents the tabulated coordinates and depths of borehole. The result of the geotechnical survey is provided as **Appendix 2** of this document.

Table 4-2: Geographic Coordinates and Depths of Each Boreholes

Description	Coordinates		Depth, m
	Easting	Northing	
Munda BH 1	309403.00 m E	9079660.00 m S	10

Source: Geotechnical Investigation Report – Munda Water Supply Project

94. The soil test done for storage tank shows that the filled materials required will be needed to level the ground surface of the area.

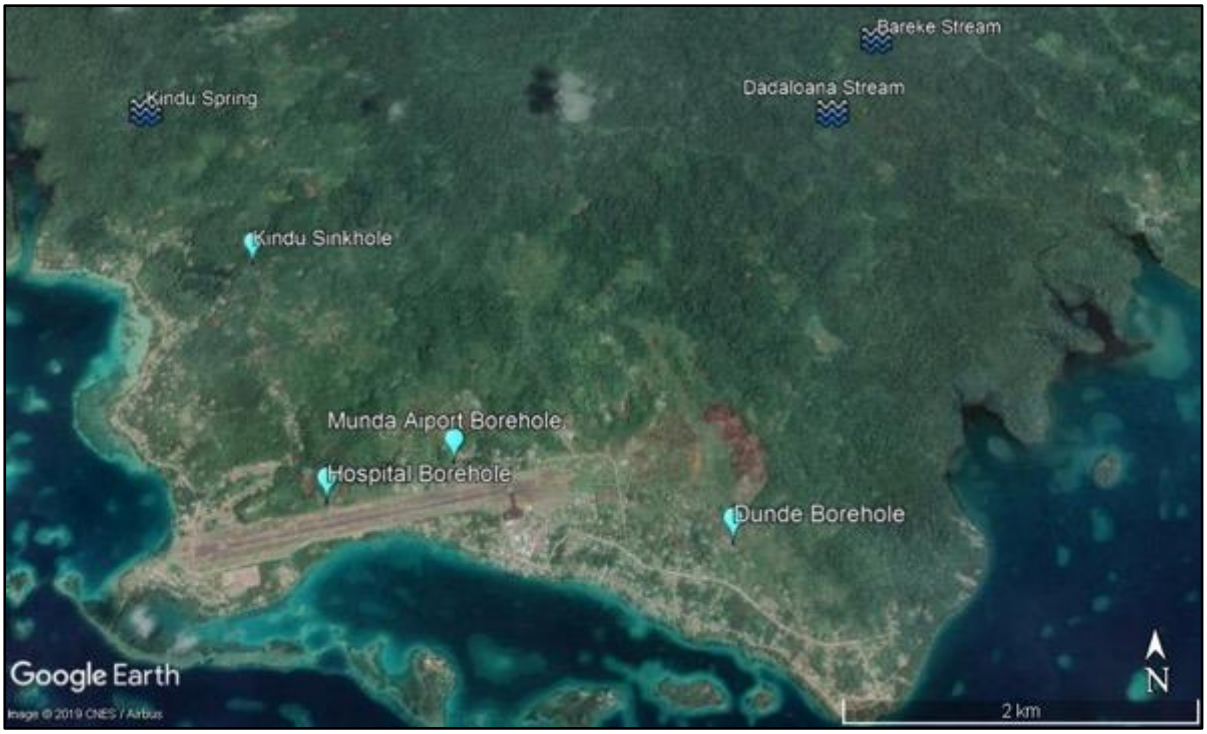
95. Solomon Islands has been identified by the WB study as one of the top 15 countries exposed to multiple hazards. Solomon Islands experience earthquake of magnitude 4.5 and above on average 12 times every month. In recent years, Solomon Islands experience some of the most devastating earthquake in magnitude 7 & 8 in the Richter scale. The threat from tsunamis is real in Solomon Islands due to the occurrence of strong earthquakes.

96. As shown in **Figure** 4-3, Munda is in an area with earthquake intensity degree VIII based on Modified Mercalli Scale. An earthquake intensity degree VIII is considered 'severe' and can cause considerable damage in ordinary substantial buildings with partial collapse; it can cause great damage to poorly built structures.

4.1.4 WATER RESOURCES

97. Several surface and ground water sources can be found in Munda. **Figure** 4-7 shows the location of identified water sources.

Figure 4-7: Location of Identified Water Source



Source: Munda Water Supply FSR, May 2020

Groundwater Resources

98. **Boreholes**. Under current conditions, groundwater is the main resource together with rainwater harvesting. Several groundwater sources have been developed over time, most of which are located around the airport. **Table** 4-3 summarizes the different groundwater resources around Munda airport.

Table 4-3: Munda Airport Groundwater Resources

Type	Location	Current Status	Comment
Airport Borehole	Halfway along airport 309094 mE 9079292 mS	One Submersible pump (Lowara Z 631 04-6)	Tested at 8 L/s, not in current use
Hospital Borehole	Western side of airport 307933 mE 9079101 mS	2 pumps	Operating several hours per day but understood to be brackish
Dunde Borehole	East of airport 310562mE 9079133mS	Not in use	Needs re-drilling
Fire-fighting borehole	Behind old terminal 309438 mE 9079059 mS	Replaced with dug well	Not operating
Solar power project borehole	Southwest side of airport	Hand pump	Operating but brackish
Private boreholes	Southeast of airport at Dunde	Hand pumps	Operating

Source: Munda Water Supply FSR, May 2020

99. The major source of groundwater recharge in the airport area is rainfall and runoff from runway which outflows from the north in Tertiary limestone.

100. The existing borehole on the northern side of the runway was previously used by the provincial government to supply water towards the town. It consists of a borehole, with submersible pump feeding a storage tank (RL 23 m) at the back of the police quarters, with water then flowing by gravity to surrounding households.

101. A short pumping test was performed 21 June 2019 on the runway borehole for a period of about three hours. During the test, the pumping rate maintained a constant 8 L/s (0.7 MLD). The water level dropped about 0.5 m and after the test, it returned rapidly to the pre-pumping level. No tidal effect was recorded, and salinity levels remained well under the limit at which taste is impaired. The approximate elevation of groundwater is 3.7 m AMSL.

102. The hospital borehole in the west is currently supplying water to the hospital and United Church Headquarters. Based on the interview with the Hospital Secretary, the borehole is also affected by the tides.

103. **Plate** 4-1 shows the photographs of existing boreholes.

Plate 4-1: Existing Airport and Hospital Boreholes

Airport Borehole	Dug well and Pumping Station at Hospital Borehole

Source: Munda Water Supply FSR, May 2020

104. **Kindu Spring (Kioahara)**. Kindu Spring is a source located towards the north part of Munda which is already equipped with a weir. Four galvanized pipes of DN 50 mm collect water from the weir. Two out of the four pipes are in use to supply Goldie College and Tabaka Rural Training Centre. The pipeline to the Kindu community and Hellena Goldie Hospital is currently damaged.

105. The existing weir creates a small storage with capacity of nearly 4.5 m3 (4 m x 1 m x 0.9 m). Flow from the weir was significant and is running all year long based on the interview with the community. The source is located on customary land, but the local community seems to be willing to allow use of the source. Clarification will be sought about land availability at the design stage should this source be used as part of the project.

106. The elevation of the spring is 8 m. During WWII, water was previously abstracted by a pumping system lifting it to nearby concrete reservoir.

107. This resource is abundant with a potential yield estimated to be not less than 1 MLD. However, because of its karstic nature, the spring is likely to experience flow reduction during droughts and increased turbidity during wet weather periods. Although karstic aquifers are less vulnerable than surface waterbodies, treatment (rapid sand filtration) is recommended to address expected variability of the raw water quality.

108. **Plate** 4-2 shows the photographs of Kindu Spring.

Plate 4-2: Kindu Spring

Source: Munda Water Supply FSR, May 2020

109. **Sinkhole**. There are several sinkholes in Munda. A shallow sinkhole (Kindu) in the northwest of the airport, close to Noro Road (307545.00 m E 9080853.00 m S), with approximate depth of 6.3 m was excavated by American forces during WW II. It was equipped with two 75 mm diameter pipelines. A reasonable water is available in the sink hole with a water level of approximately RL 15 m showing that the limestone has low permeability.

110. There is another sinkhole in the backyard of a private property north of the airport borehole likely to be connected to the same aquifer. It is not known who uses this source or how frequently.

111. **Plate** 4-3 shows the existing sinkholes.

Plate 4-3: Existing sinkholes

Sinkhole at Kindu	Sinkhole Near the Airport Borehole

Source: Munda Water Supply FSR, May 2020

Surface Water Resources

112. There are several surface waterbodies in Munda. It must be noted that the transmission line will not interact with any of these water courses:

- Kolonoki is a stream located north of Munda. It was bombed by the US Army to create a pool for water extraction during WW II.
- Dadaloana stream is one of the tributaries of Bareke River. It is also the mainstream that leads from Kolonoki water sources.
- Bareke is the main river that flows out to the Roviana Lagoon. It is one of the streams that is also part of the Munda Trail during the WW II. The area had been heavily bombed during the WW II.

113. These streams present several constraints associated with the nature of the catchment area. They are indeed vulnerable resources with expected low flow during droughts and are subject to high turbidity during wet weather periods. Moreover, the sites were located far away from the town. Hence, the use of surface streams is not recommended to cover future water demand. **Plate** 4-4 shows two of these surface water resources (Dadaloana and Bareke).

Plate 4-4: Two Surface Water Resources

Dadaloana Stream at the Bridge on the Munda Trail	Bareke stream on the Munda Trail

Source: Munda Water Supply FSR, May 2020

114. The main source of water that will be extracted to supply water for the residents on Munda, Airport, Dunde and the Hospital area would be from the ground water source at the existing Airport Borehole. Groundwater will be extracted and disinfected, before it is pumped up to the to the reservoir located at the Hilltop north of Munda Town (Polevesu). Water will be supplied to residents through the new distribution network that will be established. From the Hilltop Reservoir, the water will flow by gravity down to the distribution network supplying the Hospital, Airport, Munda and Dunde areas.

115. The transmission pipeline or distribution network will not cross or interact with any watercourses surrounding Munda nor will any construction activities surrounding the areas affect any of the watercourses identified.

4.1.5 WATER QUALITY

116. As part the study, a water quality survey for different potential sources was conducted in June 2019. The results of the survey are presented in the **Table** 4-4. In terms of water quality, it is proposed to follow the Drinking Water Guidelines of the World Health Organization,

117. Total Coliform and E.Coli are present in all samples. Munda airport borehole is less affected. In addition to houses around the borehole, potential sources of contamination around the airport are infiltration from the airstrip and from the dumpsite located along the road, 400 m East of the borehole. Although existing data does not indicate contamination from those, as groundwater flow direction would suggest, further testing are recommended.

118. Munda airport borehole sample presents normal levels of dissolved solids (207 mg/l). The most common dissolved solid constituents are calcium, phosphates, nitrates,

sodium, potassium, and chloride. Low level of nitrates and calcium are observed, but chloride parameters are intermediate and explains dissolved solid results.

119. High concentration of chloride is also impacting alkalinity, hardness, and conductivity levels without being harmful for health. Although levels less than 10 mg/L are desirable, chloride has no health standard and salty taste, or metal corrosion appears only with levels more than 250 mg/L. A short pumping test was also performed in June 2019 on the runway borehole for a period of about 3 hours. During the test, the pumping rate maintained a constant 8 L/s (0.7 MLD). The water level dropped about 0.5 m and after the test returned rapidly to the pre-pumping level. No tidal effect was recorded, and salinity levels remained well under the limit at which taste is impaired. The approximate elevation of groundwater is 3.7 m above mean sea level

Table 4-4: Result of Water Quality Monitoring

Parameters	Unit	Munda Airport BH	Kindu Sinkhole	Kindu spring
pH	UpH	6.43	7.5	7.26
Turbidity	NTU	0.93	0.3	0.22
Total dissolved solids	mg/L	207	26	219.2
Conductivity	µS/cm	319	41	333.8
Alkalinity	mg/L CaCO3	140	40	-
Hardness Magnesium	mg/L CaCO3	-	395	-
Hardness Calcium	mg/L CaCO3	70	69	-
Chloride	mg/L	89	1	-
Nitrate	mg/L	4.05	4.175	-
Aluminium	µg/L	29	300	-
Chemical Oxyegen Demand	mg/L	10.76	11.09	-
Escherichia Coli	MPN/100 mL	3	14.5	>200.5
Total coliform	MPN/100 mL	64.3	829.7	>200.5

Source: Munda Water Supply FSR, May 2020

120. As expected, given the geological layer of limestone, Kindu sinkhole water is considered as moderately hard (hardness value greater than 200 mg/L). There are no health concerns associated with drinking hard water, however it is often undesirable because it can cause lime buildup (scaling). Softener systems could be considered. In addition, alkalinity is much less than total hardness which are probably driven by elevated levels of aluminum. There is no clear standard from the WHO for aluminum and 0.3 mg/L remains a safe level. If chemical treatment is used (using aluminum sulfate as coagulant), operators should avoid excessive aluminum dosage and ensure good mixing at the point of application.

121. Regarding Kindu spring, conductivity and dissolved solids are monitored, the same with Munda Airport borehole.

4.1.6 AIR QUALITY

122. There are no available air quality data for Munda. Environmental standards for air quality are still under development in Solomon Islands.

123. In general, the areas of Munda, where proposed components of the subproject will be located, have no major sources of anthropogenic emissions. For these areas, it is therefore expected that the average ground level concentrations of sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and particulate matter (PM_{10}) will not exceed the values in IFC's guidelines (EHS Guidelines of April 2007) which are 20 µg/Ncm, 40 µg/Ncm, and 20 µg/Ncm, respectively.

4.1.7 SEAWATER SALINITY AND TEMPERATURE

124. Seawater temperature is almost constant in time and depth between the surface and at -50 m WD around the Solomon Islands (NOAA. 2006): (i) at surface: 29°C as annual value, varying between 28.5°C (July-Sept) and 29.5°C (Jan-Mar); (ii) at -50 m: 28.5°C as annual value, varying between 28.0°C (July-Sept) and 28.5°C; and (iii) at -100 m: 26.5°C as annual value, varying between 26.0°C (July-Sept) and 28.5°C. Similarly, seawater salinity is also almost constant in time and depth between the surface and at -50 m WD around Solomon Islands: (i) at surface: 34.6 psu with seasonal variations lower than 0.2 psu; (ii) at -50m: 34.8 psu with seasonal variations lower than 0.2 psu; and (iii) at -100m: 35.4 psu with seasonal variations lower than 0.1 psu.

4.2 BIOLOGICAL ENVIRONMENT[6]

125. The biodiversity of Solomon Islands is recognized as the most geographically complex area on Earth. Surrounded by double chain of six main islands and thousands of smaller islands, all of which are purely oceanic in origin, this geologic and geographic complexity is reflected in the archipelago's biological diversity, which forms part of the East Melanesian Islands Biodiversity. This hotspot comprises high species-level diversity for both plants and animals, many of which are found nowhere else in the world (Mittermeier et al. 2004).

126. Solomon Islands also has the second highest terrestrial biodiversity in the Pacific (exceeded only by Papua New Guinea), with an estimated 5,599 described species, including: 2,597 plants, 245 birds, 75 mammals, 87 reptiles, 19 amphibians, and 777 fish and 1,799 invertebrate species, as per the IUCN Red List (Menazza and Balasinorwala 2012).

127. The coastal and marine biodiversity is categorized as part of the global marine biodiversity hotspot and serves as a potential refuge and reservoir for the marine life known as the Coral Triangle region. The terrestrial biodiversity of Solomon Island is listed under the global 200 forest ecoregions.

128. Western Province is identified as one of the Ecologically and Biologically Significant (EBSAs) and Key Biodiversity Areas (KBAs). The Northwest New Georgia Island (where Munda is situated) including the Roviana- Vonavona lagoons are an important marine habitats and representative samples that can assist in regeneration for future conservation planning and development decisions. Roviana-Vonavona Lagoon is identified as biologically significant areas as important for the healthy functioning of the oceans and the services that they provide. They provide important hawksbill and green

[6] Solomon Islands, The National Biodiversity Strategic Action Plan 2016-2020

turtle nesting areas and dugongs are which are known to frequent seagrass meadows. The Roviana- Vonavona Lagoon have extensive seagrass meadows, mangroves, and important coral reef system. These areas are not within the subproject footprint and will not be impacted. The map on **Figure** 4-8 shows the Ecologically and Biologically Significant (EBSAs) Areas in Western Province particularly the Roviana and Vonavona Lagoon.

Figure 4-8: Ecologically and Biologically Significant (EBSAs) and Key Biodiversity Areas (KBAs) in the Western Province

129. The people in Solomon Islands including those living within the project corridor in Munda are connected to their environment whether it be terrestrial, coastal, or marine. The terrestrial flora is very important to the local livelihood and cultural practices. The forest trees provide construction materials for house construction, boat buildings, carvings and timber which is commercially purposes. Many plant species are used by local people for their medicinal values in treating ailments and other plant species such as ngali nut and coconut have been processed for their oils and were export overseas and used locally.

130. Local fauna is also a source of delicacy for local population in the villages. Native species such as possums and Iguana are hunted for food while tropical forest birds have cultural significance to certain people.

131. **Plate** 4-5 shows the locals selling mud shells, root crops, coconut crabs and coconut baskets at Munda Market.

Plate 4-5: Locals Selling Mud Shells, Root Crops, Coconut Crabs and Coconut Baskets at Munda Market

132. For the Roviana people living in and around Munda Station, marine flora and fauna also support the livelihood of people providing a great source of protein for the daily diet. Sea food is a daily source of protein in each household. People eat sea grapes, sea weeds, and mangrove pods. Sea weeds are also being sold in local and international markets. The reef fish are also a great source of protein and sometimes it is being sold in the local markets or eskies along the roadsides.

133. Significantly both terrestrial and marine flora and fauna plays important roles in the ecosystem. They provide shade, control soil and coastal erosion, maintains soil quality and chemistry, recycling of nutrients to the soil, shelter against wind, rain and waves and including the absorption of carbon dioxide, filtering of water and purification of wastes. The unique marine and terrestrial landscapes each of the islands possesses provides a hub for tourism which is slowly growing in the islands.

134. The Western Province is the main tourism hub in the Solomon Island. Munda is a tourist destination in the Western Province and hosts the second International Airport in the Solomon Islands. There are several homestays and resorts in and around Munda and including within the Roviana and Vonavona Lagoon and provides great tourism activities and adventures.

4.2.1 COASTAL AND MARINE BIODIVERSITY

135. The coastal biodiversity of Solomon Islands is composed mostly of coral reefs, mangroves, intertidal zones, estuaries, seagrass, algae, vegetation, and estuaries ecosystem including species found in areas between 50 m below mean sea level and 50 meters above the high tide level or extending landward to a distance of 100 km from shore. On the other hand, the marine biodiversity includes the living organisms in areas where the sea is deeper than 50 meters.

136. Solomon Islands has record on 485 out of 494 coral species. The associated coral reef fish stand at a record of 1,019 species from 82 families and 348 genera. In general, the coral reefs are categorized as either fringing, barrier or atoll. Patch reefs are also present where the coral reefs form patches within a matrix of sand and seagrass.

137. Coral reefs support extraordinary diversity of species by providing food, shelter, nursery and feeding grounds for many fish species and crustaceans. The reefs protect coastal areas from storms and erosions by forming natural break waters. The livelihood of people living in Munda and the neighbouring villages along the Roviana and Vonavona Lagoons and those from other New Geogia Island depend heavily on the coral reefs for subsistence fishing and the marine resources as source of daily food and surpluses are usually sold for income.

138. The mangrove and seagrass ecosystems cover the willow sub tidal and intertidal zones of the islands. Mangroves cover about 65,000 hectares with a record of 17 species and 2 hybrids species from 15 genera and 13 families.

139. As Munda is situated in the southern shores of New Georgia Island, mangroves are more extensive along the inner Roviana lagoon, particularly on the inner eastern part of the Roviana lagoon,. There is also mangrove forest west on Munda towards Noro along the Vonavona Lagoon and between Vonavona and Kohinggo Islands the Mangrove forests (predominately Rhizophora) fringe many parts of the lagoon. Mangroves plays an important role in the marine coastal zones as it provides habitats for various species, forests filter and bind land-based sediments and helps recycle nutrients. Mangroves also serve as nurseries for a number of fish species, and numerous species migrate regularly between mangroves and coral reefs. And in the Solomon Islands mangroves also contribute significantly to the livelihood of many Solomon Islanders by serving as fishing grounds and a source of firewood, construction materials, and even food,

140. Seagrass meadows in the lagoon are predominantly subtidal with a narrow intertidal fringe, often adjacent to mangroves. Species include *Thalassia hemprichii*, *Cymodocea rotundata*, *Cymodocea serrulata*, *Halodule uninervis*, *Enhalus acoroides* and *Halophila ovalis*. The Dugongs are known to frequent these meadows and also important for turtle feeding and subsistence fisheries.

141. In terms of highly mobile and migratory species, there are 8 species of whales, 9 species of dolphins, 1 species of dugong, 5 species of turtles and a lot of species of sharks present in water of Solomon.

142. Commercially, tuna species which include the yellow fin tuna, south pacific albacore tuna, skipjack tuna and bigeye tuna have huge contribution to country's economy. Solomon Island's Tuna accounts for around 7 percent of the total western and central Pacific Ocean catch with an estimated US180 million. Tuna is caught by pole and like, purse seining and long lining and most catch are by foreign fishing vessels. SolTuna based in Noro Town in Western Province is the country's only Tuna Processing Facility.

4.2.2 TERRESTRIAL BIODIVERSITY[7]

143. Solomon Island, recognized as the "Centre of Plant Diversity", has 4,500 plant species where 3,200 are known to be indigenous. The vegetation is categorized as coastal strand vegetation, riverine forest, lowland forest, montane forest, or non-forest communities. Seasonal dry forest and grass lands can be found in parts of Guadalcanal and Central province.

144. The mountain ecosystems are hosting some of the renown globally endangered species particularly birds which are continually put under threat from invasive species. It is

[7] Solomon Islands, The National Biodiversity Action Plan 2016-2020

characterized by cloud forest, which has been described to descends to 1,200 m on Guadalcanal and Kolombangara, 650 m on Vangunu and Makira and 600 m on Gatokae.

145. In terms of animal species, Solomon Island has 163 species of bird (69 endemic), 14,511 species of terrestrial insects which include 130 species of butterflies (30 endemic) and 31 cicada species, 53 species of mammals (19 endemic), 80 species of reptiles and 21 species of frogs.

4.2.3 TERRESTRIAL FLORA

146. Six distinct vegetation or forest types are distinguished in Solomon Islands, which vary in magnitude from one province to another, and reflect the geological formation, ranging from acidic volcanic origin in the bigger islands to alkaline limestones in low-lying atolls. According to Whitmore (1969), the range and types of plant species present is fairly similar between islands despite their geographical spread. These are, however, affected by six factors: soil type (based on parent rock), climate (e.g. rainfall and temperature), topographical features, altitude, natural catastrophes (cyclone and earthquakes), and human activities.[8]

147. The six vegetation types are: lowland rainforest, hill forests, montane forests, freshwater swamp and riverine forests, saline swamp forests, and grassland and other non-forest areas.

i. Grassland and other non-forest areas: comprise predominantly non-tree species, mainly herbaceous species. Predominant species include *Imperata cylindrica*, *Dicranoptera linearis* and *Themeda australis*. Examples of commonly occurring species are *Mimosa invisa*, *Morinda citrifolia*, *Saccharum spontaneum*, *Polygala paniculata* and *Timonius timon*. Some of these species (e.g. *M. invisa*) are very common in disturbed areas.
ii. Saline swamp forests are subject to tidal influence as they are found in estuaries and foreshores. Examples of species comprising this vegetation include *Barringtonia asiatica*, *Calophyllum inophyllum*, *Casuarina equisetifolia*, *Terminalia catappa*, *Intsia bijuga*, *Inocarpus fagifer*, *Pandanus spp.*, *Barringtonia racemosa* and species of mangroves
iii. Freshwater swamp and riverine forests are commonly found in poorly drained land at low altitudes with little micro-relief. Species such as *Inocarpus fagifer*, *Mextroxylon salomonense*, *M. sagu*, *Barringtonia racemosa* are found here, although some important timber species are also present (e.g. *Terminalia brassii* and *Dillenia salomonensis*).
iv. Lowland rainforests: include forests often with complex structure due to greater number of species from upper or hill forest and patches of freshwater swamp forest. Occasional cyclones and human activities often disturb this forest type as evident in a high incidence of re-growth and secondary species. Species predominant in this vegetation include timber species such as *Campnosperma brevipetiolata*, *Dillenia salomonensis*, *Endospermum medullosum*, *Parinari salomonensis*, *Terminalia calamansanai*, *Schizomeria serrata*, *Maranthes corymbosa*, *Pometia pinnata, Gmelina moluccana, Elaeocarpus sphaericus* and *Vitex cofasus*. Most indigenous fruit trees are also found in this forest including *Canarium spp, Syzygium malaccensis, Magnifera minor, Spondius dulce, Barringtonia procera, B. edulis, Artocarpus altilis, Gnetum gnemon*, and *Burkella obovata*.
v. Hill forests: occur 100–600 m and on well-drained soils and exhibit complex structure with varying tree heights and canopy density. Some species in the lowland forest are

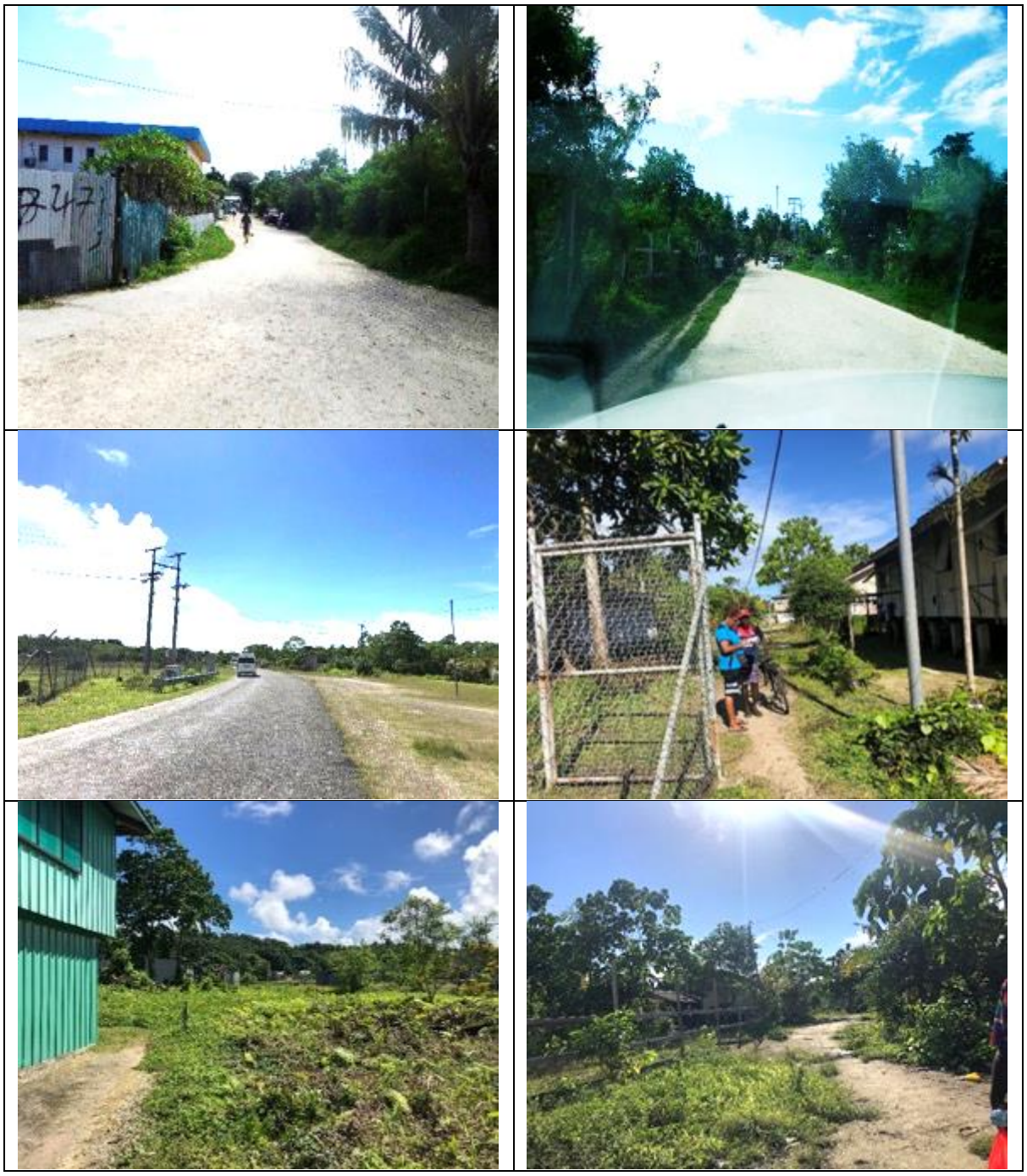
[8] T.C. Whitmore (1969): The vegetation of the Solomon Islands, Volume 255, Issue 800, The Royal Society

also present here, as well as those species commonly found in the montane forest. Species forming this forest include *Pometia pinnata, Gmelina moluccana, Elaeocarpus sphaericus, Campnosperma brevipetiolata, Dillenia salomonensis, Endospermum medullosum, Parinari salomonensis, Terminalia calamansanai, Schizomeria serrata, Maranthes corymbosa*, and *Vitex cofasus*. Fruit tree species such as *Canarium spp., Gnetum gnemon* and *Artocarpus altilis* are also present.

vi. Montane forests: refer to forests found generally above 600 m, on ridge tops and mountain summits, but can be found in lower elevations under harsher conditions. These are characterized by a dense and compact canopy with small lighter tree crowns. Species in this forest type include *Callophyllum kajewskii, Callophyllum pseudovitiense, Eugenia spp., Dacrydium spp.*, *Pandanus spp., Racembambos scandens* and ferns.

148. In the subproject corridor in Munda, the flora is highly disturbed with secondary regrowth. Along the residential areas, hedges, and ornamental plants are planted along the road edges to identify property boundaries and fruit trees such as *Musa sp* (banana), *Nephelium lappaceum* (Rambutan), *Psidium guajava* (Guava), *Carica papaya* (Pawpaw), *Cocos nucifera* (Coconut), *Mangifera indica* (Mango), *Citrus grandis* (pomelo), *Syzygium sp* (local apple) and *Barringtonia edulis* (Cut nut). Other secondary regrowth observed include *Ficus septica*, *Ficus spp*, *Premna, Morinda Citrifolia* (noni), *Macaranga spp*, *Premna spp*, Sword fern and *Pandanus utilis*. **Plate** 4-6 shows the typical vegetation in Munda.

Plate 4-6: Typical Vegetation in Munda



149. The terrestrial flora associated specifically with the infrastructure type within the subproject area shares resemblances as it is within the same locality.

Airport Hilltop Reservoir (Polevesu)

150. At the Airport Hilltop Reservoir at Polevesu, vegetation ranges from undergrowth vegetation to forestry tree species, ferns, orchids, Ficus sp, pandanus and palms. The forestry tree species identified include *Pometia pinnata* (akwa), *Vitex cofassus* (vasa), *Elaeocarpaceae* (mix white) and *Alstonia scholaris*. During construction of the reservoir, a significant amount of regrowth including a fewof the forestry tree species will be

removed to make clearance for the construction of the reservoir. Some of the forestry commercial tree species identified are high value timber species and are these include vitex cofassus, pometia pinnanta and alstonia schlaris. The landowner will be compensated for the loss of the commercial timber species. Mixed crop gardening is also evident within the vicinity of the reservoir site and crops planted include pumpkins, papaya, chili, beans, egg plants, capsicum and slippery cabbage. The crops will be removed, and the garden owner will be compensated for the loss. A record of the crops to be compensated is shown in **Plate** 4-7. The access to the Reservoir site will use an existing road, which is covered with loose gravel, 15-degree slope climb and generally flat at the top.

Plate 4-7: Typical Vegetation at the Airport Hilltop Reservoir Site at Polevesu

Airport Borehole Site

151. At the borehole site halfway along Munda International Airport, the ground cover is dominated by invasive grasses including *Milkania micrantha, Ipomoea triloba (L)* and *Sphaerostephanos unitus (L)*. The grasses are always trimmed and maintained as it is in the vicinity of the international airport. Few shrubs including *Ficus septica* and *Ficus copiosa* and also *Carica papaya* are found growing naturally at the site. These vegetations will be cleared during the constructions works on the site. **Plate** 4-8 shows the typical vegetation at borehole site.

Plate 4-8: Typical Vegetation at Borehole Site

Transmission line and corridor

152. Vegetation observed at the access road leading to the Hilltop Reservoir where the new transmission pipes from the borehole at the airport site to the new reservoir at Airport Hilltop (Polevesu) include but not limited to *Aphina purpurata*, *Hibiscus tililica*, Macaranga sp, *Milkania micrantha, Ipomoea triloba (L), Sphaerostephanos unitus (L),* and other shrubs and vines. Vegetations along the road edge as shown in **Plate** 4-9 will be cleared to allow for construction of the transmission pipeline.

Plate 4-9: Typical Vegetation Along Access Road/Pipeline Corridor to Airport Hilltop Reservoir Site at Polevesu

Distribution Networks and corridor

153. Along the villages of Dunde, Kekehe, and including the Airport and Goldie Hospital, the distribution network follows through the coastal road. The coastal vegetation along this areas include but not limited to mangrove species and associated coastal plants such as *Schleintzia insularum*, *Thespesia populnea*, *Batis maritina*, *Ficus scabra*, *Scaevola coriacea*, *Scavola taccada*, *Vitex trifolia*, *Cocos nucifera*, *Cordia subcordata*, Lumnitzera, *Hibiscus tiliaciuus*, *Milletia pinnata*, *Premna serratifolia*, *Morinda citrifolia* (Noni), *Terminalia catappa*, *Barrintonia asiatic* and shrubs, vines and grasses which include *Canavalia cathartica*, *Ipomea pes-capre*, *Cenchrus calyculatus*, *lepturus repens* were observed. Within house boundaries ornamental plants are grown to beautify the surroundings. This include Plumeria (Frangipany), *C. terminalis* (Cordyline), *Codiaeum variegatum sp* (Croton), *Grapetophyllum pictum*. **Plate** 4-10 and **Plate** 4-11 show the typical vegetation along roadside at Dunde, Goldie Hospital and Kekehe Village, respectively.

Plate 4-10: Typical Vegetation Along Roadside and Pipeline Corridor at Dunde

Plate 4-11: Typical Vegetation Along Roadside at Helena Goldie Hospital and Kekehe Village

154. Other along the coast, the vegetation consists mostly of mangrove species and associated coastal plants including *Hibiscus tiliaciuus, Milletia pinnata, Premna serratifolia, Morinda citrifolia* (Noni) *Ipomea pes-capre*, *Terminalia catappa* (Beach Almond), *Barrintonia asiatic* and shrubs, vines and grasses were observed.

155. It is envisaged that most of the roadside vegetation along the distribution network path will be removed to allow for the construction of the pipelines to take place. Crops that are of agricultural value that are to be removed will be compensated to the rightful owner.

4.2.4 TERRESTRIAL FAUNA

156. The Solomon Islands terrestrial fauna is extremely diverse. It is believed that the country has a greater diversity of land animals with a high level of endemism than any other Pacific Island country (UNDP et al., 2002). Fauna includes 223 species of birds (173 residential terrestrial species and 50 other species of shore/sea birds and visitors) including 19 species globally threatened; 52 mammals, 61 species of reptiles (25 are endemic), and 17 species of frogs. There is a relatively high level of island endemism in the country.

157. The western part of Solomon Islands which include the New Geogia Group of Islands, Marovo and Shortland Islands are home to some of the terrestrial fauna that are endemic in the Solomon Islands. The montane forest of Kolombangara Island and lowland forest of Tetepare are host to a diverse terrestrial fauna which there are endemic species as well as numerous unique forms of widespread Pacific species represented nowhere else in the Solomons.

158. In the uninhabited Islands of Tetepare, the lowland forest provides habitat 57 bird, 13 mammal, five amphibian, and 19 reptile species. Of these, eight species previously unknown to western scientists on include: one frog (Solomon Islands Giant Treefrog, *Cornufer hedigeri*), three reptiles (Mourning Gecko, *Lepidodactylus lugubris* Common Forest Blindsnake, *Rhamphotyphlops depressus*; and Red Blindsnake *Acutotyphlops infralabialis*), and four mammals (Island Tube-nosed Bat, *Nyctimene major*; Admiralty Flying Fox, *Pteropus admiralitatum*; Dwarf Flying Fox, *Pteropus woodfordi*; and a Monkey-faced Bat species, *Pteralopex sp.*).

159. The montane forest of Kolombangara Island supports some of the richest bird communities of the New Georgia Groups islands, including at least two endemic species of bird. Additionally, it is likely that the rare and endangered Heinroth's shearwater (*Puffinus heinrothi*) and possibly Beck's petrel (*Pseudobulweria becki*) nest along the lush and inaccessible interior walls of the montane crater rim - nesting areas for both of these species have never been documented. The moss-covered montane forests of the central caldera support numerous rare Solomon Islands bird species such as the pale mountain pigeon (*Gymnophaps solomonensis*), the yellow-legged pigeon (*Columba pallidiceps*), Meek's lorikeet (*Charmosyna meeki*), and Mayr's swiftlet (*Collocalia orientalis*), as well as some widespread birds with poorly documented occurrence in the Solomons such as a probable resident form of the peregrine falcon (*Falco peregrinus*). A spectacular new species of Platymantine frog currently being described from the island's elfin cloud forests.

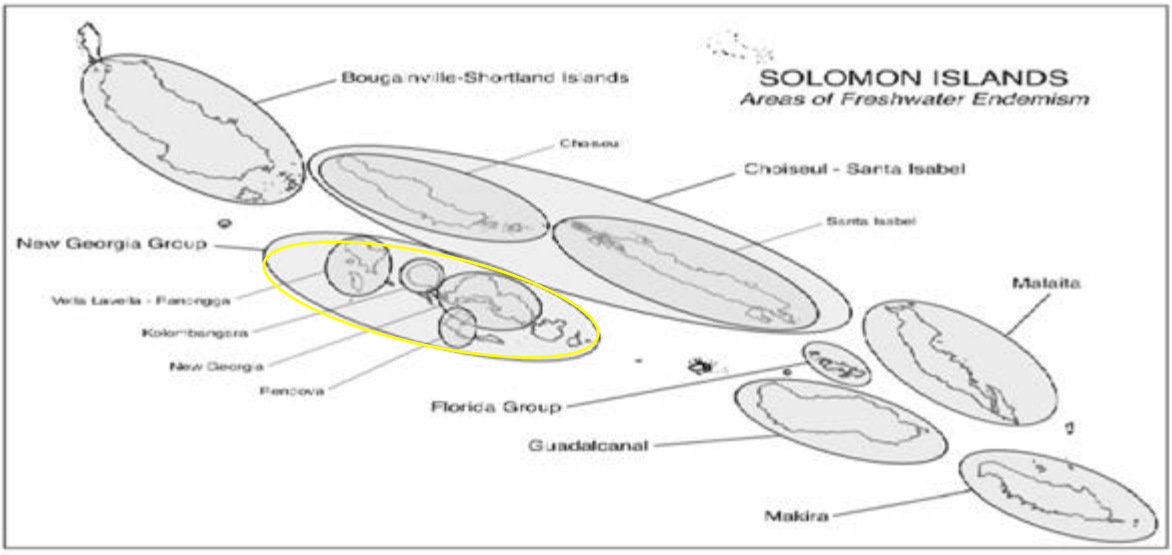
160. Field visit observation and information from key informant, fauna around the project snakes, lizards, pigeon, cockatoo, flying fox, blyth’s hornbill (hornbill), *Megapodius freycinet eremita* (megapod) and including domesticated animals.

4.2.5 FRESHWATER ECOLOGY

161. Solomon Island records 43 species of freshwater fish and 175 species of inland water insect (45 endemic). The freshwater biodiversity remains as the poorest amongst the classes of biodiversity which requires greater need for biodiversity assessment.

162. The freshwaters of the Solomon Islands show a high level of biodiversity and endemism, especially among the aquatic insects.[9] **Figure** 4-9 shows areas of freshwater endemism in Solomon Islands and this include the Project sites which was part of the New Georgia Islands.

Figure 4-9: Map Showing Areas of Freshwater Endemism in Solomon Islands



Source: Polhemus, D et al: 2008

163. The 2008 survey undertaken of the freshwater ecosystems in the Solomon Islands recorded 93 species of Heteroptera representing 28 genera in 12 families of which 60% are endemic at the species level and at least 31 of the species collected are new to science. Sixty-three species of Odonata representing 37 genera and 12 families were recorded of which 44% are endemic at the species level and at least 1 new species was discovered. Nine described species of *Gyrinidae*, representing two genera and ten described species of *Simuliidae*, representing 2 genera were reported of which 90% of both are endemic at the species level.

164. Attributed to their mountainous physiography, the larger islands in the Solomon Islands archipelago have Gobioid fishes as the dominant freshwater fauna, represented by members of the *Gobiidae, Eleotridae* and *Rhyacichthidae* families. Fourty-three species of fish belonging to 26 genera and 14 families were reported with no endemic species. One species of Gobiidae (*Lentipes solomonensis*) subsequently was found to be endemic through additional analysis.

165. For the Western Solomons, as per the assessment on the Freshwater Biotas of Solomon Islands (2008), New Georgia Group of Islands is significantly a distinct area of aquatic endemism. Certain local endemic species, such as the undescribed *Pseudagrion* damselfly and including certain single island endemics in Odonata (*Teinobasis simulans*), Heteroptera (*Metrobatopsis lannae*), and Diptera (*Morops solomonense*, *Simuliium kerei*) are found in the island. Towards the east of New Georgia are the of Vangunu and Nggatokae. These two high islands hold significant areas of upland habitat drained by rocky streams and would be capable of harboring endemic freshwater invertebrates. However, since the island is heavily logged of its forests, and no studies have undertaken,

[9] Dan A. Polhemus, et.al (2008): Freshwater Biotas of the Solomon Islands - Analysis of Richness, Endemism and Threats, Bishop Islands Analysis of Richness, Endemism and Threats, Bishop Museum Bishop Museum Technical Report 45 Honolulu, Museum Bishop Museum Technical Report 45 Honolulu.

so the composition of their freshwater biotas remains unknown. The Island of Rendova appears to be a discrete area of endemism for Heteroptera (*Rhagovelia, n. sp*.) and Odonata.

166. No aquatic assessment was undertaken for the subproject site in Munda during the field visit, however, as Munda is situated on the Island of New Georgia, it is assumed that certain local endemic species, such as the undescribed Pseudagrion damselfly and certain single island endemics in Odonata (*Teinobasis simulans*), Heteroptera (*Metrobatopsis lannae*), and Diptera (*Morops solomonense, Simuliium kerei*) maybe found in the streams or rivers.

4.2.6 MARINE AND TERRESTRIAL PROTECTED AREAS

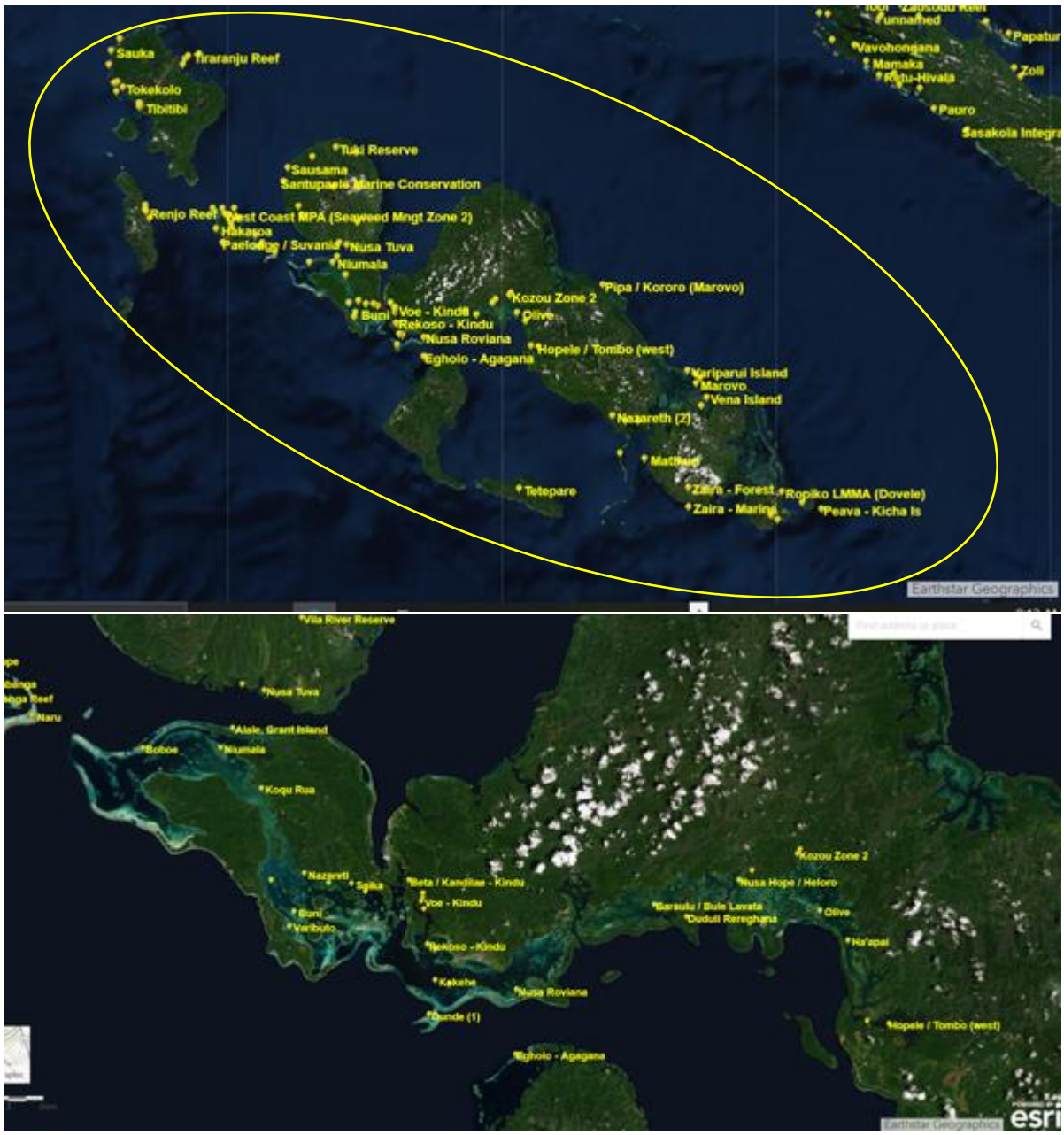
167. There are 22 Marine Protected Areas (MPA) established in the Solomon Islands and one designated marine conservation area (Arnavon Marine Conservation Area). Most of the marine management in the country has been undertaken by coastal communities through various measures applied within locally managed marine areas (LMMAs) designed to achieve local objectives related to fisheries, food security and livelihoods. These LMMAs are established and administered under the Fisheries Management Act 2015 or as CBMA implemented under the Protected Areas Act 2010. It is reported that in total 127 MMA (2016) are located throughout the nation. **Figure** 4-10 illustrates the MPA and MMAs in the Solomon Islands.

Figure 4-10: Marine Protected and Managed Areas in the Solomon Islands

168. In the Western Province, the local communities managed their resources as (Locally Managed Marine Areas) LMMA. Currently, a total of 53 LMMA have been established in the Western Province, of which 21 have been legally gazette by the Ministry of Fisheries and Marine Resources while others are awaiting gazettal while another LMMA is currently proposed (refer to **Figure** 4-11). The LMMA's are informally designated and include the customary management areas established in Roviana and Vonavona Lagoons. These

two lagoons have high marine diversity and are important nurseries for bumphead parrotfish and humphead wrasse. They form part of the Bismarck Solomon Seas Ecoregion (BSSE), an ecoregion defined by World Wildlife Fund (WWF). The list of protected areas and status in Western Province is provided in **Appendix 3**.

Figure 4-11: Protected Areas in Western Province and Surrounding Munda in Particular.



Source: MECDM

169. There are 17 reported terrestrial protected areas in the Solomon Islands. These are summarized below and detailed in **Appendix 4.**

- Two in Guadalcanal Province;
- Four areas in the Western province;
- Three in Choiseul Province;
- Three in Isabel Province;
- Two in Makira Province;

- Two in Malaita Province; and
- One in Temotu Province.

4.2.7 THREATENED AND PROTECTED SPECIES

170. According to the Solomon Islands Biodiversity Strategic Action Plan (2016-2020), the list of threatened species, which includes 21 bird species, 2 amphibians,16 fishes, 20 plants, 20 mammals, 4 insects, 2 bivalves' species, 134 anthozoan species, and 6 reptiles.

171. No threatened or protected species of flora and fauna were observed in the vicinity of project area in Munda.

Endemic Species

172. The Solomon Islands is included in the east Melanesian Island biodiversity hotspot and as such has a high level of endemism, predominately associated with the nation's fauna. This includes 19 mammals (14 bats and 5 rats), 67 birds, 19 reptiles, 3 amphibians (frogs), 2 butterflies and 1 vascular plant.

Status of Invasive Species

173. An exotic aquatic species known to be generally present in the water ways of Guadalcanal is the tilapia species *Oreochromis mossambicus* which was introduced into the country in the 1950's. This species is also currently cultured by one of the residents at the site for consumption purposes. Discussions on the *Oreochromis mossambicus* have already been done above under the section on background of the project. Within the terrestrial environment other exotic species that occur within the site includes the rain tree (*Samanea saman*), the paper mulberry tree (*Broussonetia papyrifera*), the little fire ant (*Wasmannia auropunctata*), the giant African snail (*Achatina fulica*) and the coconut rhinoceros beetle (*Oryctes rhinoceros*).

4.3 SOCIO-ECONOMIC ENVIRONMENT

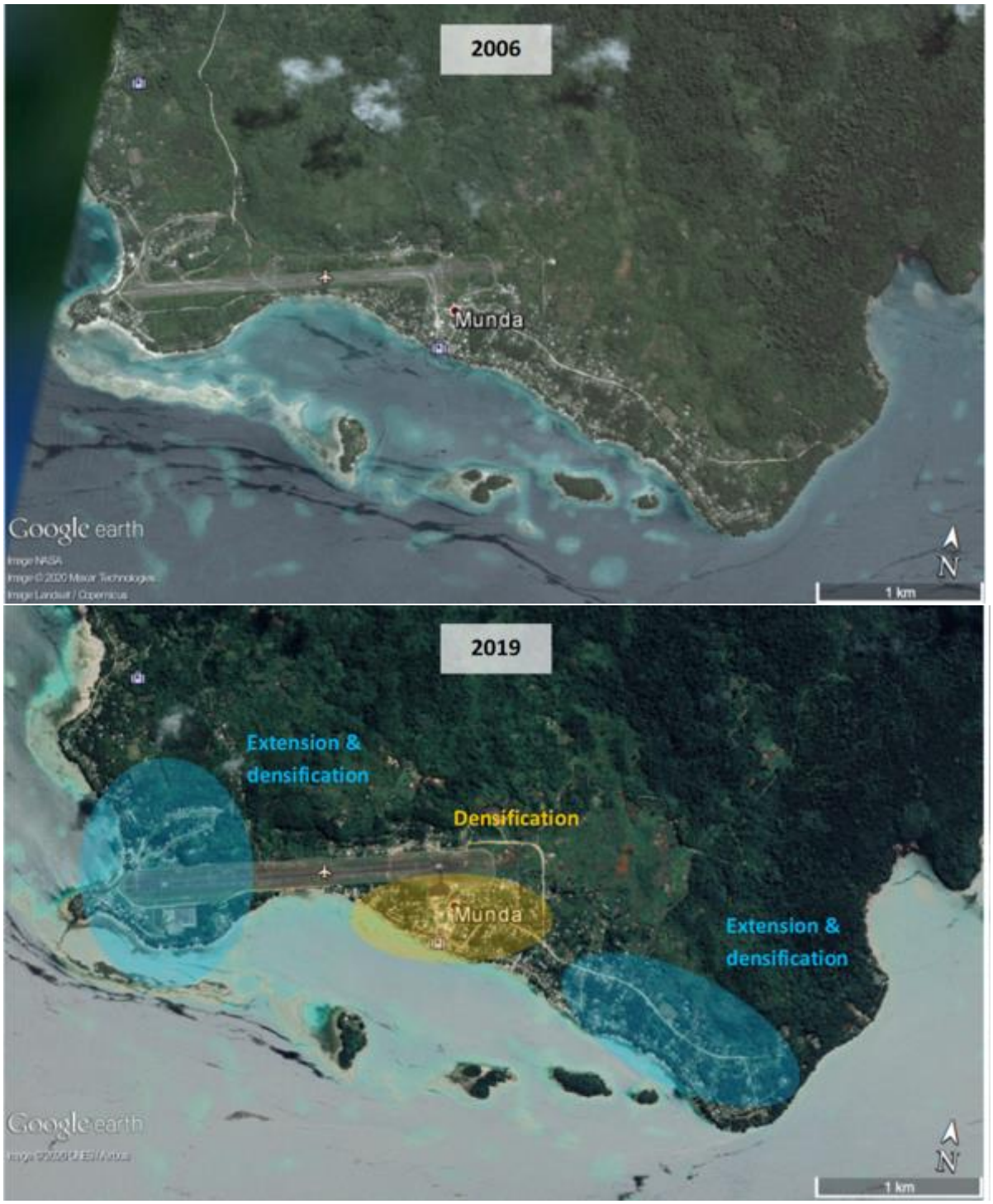
4.3.1 POPULATION PROFILE

174. The latest census from 2009 indicates a Munda population of 2,620 inhabitants, nearly half of which are considered as urban. The town is generally spread along the coast and around the airport, from Kindu (Northern & Western area) to Dunde (Eastern area), with a generally low population density.

175. The estimated number of inhabitants in 2020 is based on the 2009 census and a population growth rate of 3.5% per year is assumed, higher than the 1.6% average annual growth rate previously observed in Western province but consistent with inward migration from rural areas.

176. **Figure** 4-12 show the satellite image showing both densification of the town center and extension with new settlements on the outskirt of town, notably in Kindu and Dunde areas.

Figure 4-12: Satellite Image of Munda in 2006 and 2019



Source: Munda Water Supply FSR, May 2020

177. In terms of number of beneficiary household/population within the wider Munda town, a single pressure zone will be divided into west zone for the hospital area and east zone for the airport, Munda and Dunde area. Majority of customers are individual domestic customers or small commercial customers. The distribution system will allow 440 connections (considering 1 connection for 5 persons).

4.3.2 ECONOMIC CONTEXT

178. Solomon Islands' per-capita gross domestic product of USD $600 ranks it as a lesser developed nation, and more than 75% of its labor force is engaged in subsistence and fishing. Most manufactured goods and petroleum products must be imported. Until 1998, when world prices for tropical timber fell steeply, timber was Solomon Islands' main export product and, in recent years, Solomon Islands forests were dangerously overexploited. Other important cash crops and exports include copra and palm oil.

179. Munda airport has recently been upgraded to handle international flights with new flights connecting the town to Australia. This is expected to have a significant impact on Munda's economic development and demography. In addition, the airport terminal is planned to be upgraded in a near future, thus expecting to boost further urban development. The fishery and industrial activity in Noro have a positive impact on Munda. There are also various institutional and small businesses in Munda (hotels, guest houses, shops, hospital, etc.) which are expected to develop as the town grows.

4.3.3 CULTURAL COMPONENT

180. 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.

181. A tambu site (traditional sacred area) is identified at Lodukoma at Dunde Village. The tambu site is situated within the vicinity of the project corridor. As shown in **Plate** 4-12, this tambu site has been subjected to disturbances from past developments such as expansion of settlements and road constructions and upgrades.

Plate 4-12: Local Resident of Lodukoma Pointing Out the Tambu Site

4.3.4 BUILT ENVIRONMENT

Road Access

182. The road from the airport to Munda, Dunde and the hospital is often busy with vehicles (cars/buses/trucks) passing by. It is also used by the residents for their daily commute.

The road leading up to the Hilltop reservoir carries comparatively less traffic compared with to the other roads..

Water Supply

183. There are two water supply systems in Munda. One system is operated by the Rural Water Supply and Sanitation of the Western Provincial Government with the direct supervision of the provincial Works Department. The second system is operated by the Hellena Goldie Hospital that also provides water to the United Church Headquarters at Kindu.

184. **Water Treatment Plant.** Currently, there is no water treatment plant in Munda.

185. **Storage**. There are three small reservoirs identified in Munda:

- The water reservoir operated by the Provincial Government is a 4 m^3 bolted panel steel tank located near the police housing quarter.
- Hospital reservoir with a capacity of 10 m^3 (2 x 5 m^3 PVC tanks)
- One small reinforced concrete reservoir with a capacity of about 5 m^3 has been identified in Kindu spring (Kioahara) that had been used to supply water to the Kindu Community and to the Hellen Goldie Hospital.

186. **Plate** 4-13 shows the photographs of reservoir.

Plate 4-13: Existing Reservoir

Water Reservoir Operated by Provincial Government	Small Reservoir near Kindu Spring

Source: Munda Water Supply FSR, May 2020

187. **Reticulation System**. Regarding the distribution network, it is understood that only a short length of 100 mm galvanized iron has been installed in the 1970s and operated by the Provincial government.

Energy/Power

188. Solomon Power, a state-owned electricity utility, provides electricity to the national capital (Honiara) and eight provincial centers (Auki, Buala, Gizo, Kirakira, Lata, Malu'u, Noro-Munda, and Tulagi). All grid-connected electricity generation in Solomon Islands is currently fueled by diesel[10] and new solar power plants which are ADB funded. These

[10] Provincial Renewable Energy Project (RRP SOL 46014)

projects are to be commissioned in Munda, Gizo, Malu'u, Lata, and Tulagi in early 2021 but were delayed due to the COVID-19 pandemic restrictions.

Information and Communication Technology

189. Telecommunication services in Gizo and surrounding areas are provided by Telekom and B-mobile.

Health

190. The Ministry of Health and Medical Services is the key health provider in the Solomon Islands. Health services are concentrated in the urban centers with a hierarchy of facilities available ranging from nurse aide posts and rural clinics to National Referral Hospital (NRH). Of the nine provinces in the Solomon Islands, eight have a public hospital. There are approximately 22 doctors per 100,000 of population and 205 midwifes and nurses per 100,000. 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 (SINSO and MHMS, 2017).

191. In terms of coronavirus disease (COVID-19), the first case in Solomon Islands was recorded on October 3 and as of January 2022, there are 31 confirmed cases with zero deaths in Solomon Islands[11]. Solomon Islands is in state of public emergency due to the pandemic. Social distancing and other methods to limit the possibility of transmission are encouraged but not enforced.

192. Solomon Islands has a high incidence of water-borne diseases. Diarrheal diseases are the sixth most common cause of deaths, accounting for 4% of deaths or 28 deaths per 100,000 people. The high incidence of water-borne diseases can be primarily attributed to limited access to safe water and improved sanitation and poor hygiene awareness and behaviors.[12]

193. In Western Province, there is 1 faith-based hospital, 1 provincial hospital, 3 area health centers, 23 rural health centers and 31 nurse aide posts. The new Gizo Hospital run by Solomon Islands Government is a 60-bed facility and is the country's second referral hospital. The Helena Goldie Hospital in Munda is managed by the United Church [13]

194. The province has extended its health services and facilities to most people in the rural areas. About 95% of the population in the province has access to basic health services The most common health problems in the province are malaria, pneumonia, and diarrhea.

Education

195. As per the 2009 census data (highest level of education completed), about 3% of males and 1% of females had tertiary education; 15 % of males and 9% of females attended secondary education; 59% of males and 51% of females completed only primary level, and 19% of males and 35% females had no schooling completed. Schools such as Solomon Islands National University was initiated in 2012 from the Solomon Islands College of Higher Education which was basically pooled from all the existing government schools in 1984, namely, the Solomon Islands Teachers College, Public Administration

[11] The Weather Channel
[12] Sector Assessment (Summary): Water and Other Urban Infrastructure and Services, UWSSSP
[13] Solomon Islands Health System Review, 2015

Training School, Ranadi Marine Training School, Honiara Nursing Training school, and Honiara Technical Institute. The University of the South Pacific (USP) Solomon Islands Campus at Honiara provides tertiary education to students of the South Pacific. The Woodford International School offers the International Baccalaureate Primary Program from early childhood to Year 5 and then the Cambridge International Middle Years and High School Program up to the Cambridge Advanced Level Program in Year 12.

196. Western Province has an adult literacy rate of 94%, the highest in the country (including Honiara) and considerably more than the national average of 76.6%. A major contributing factor is the number of schools, with Western Province having the highest number of schools in the country and their relatively even distribution among populated areas. Enrolments rates (5–19-year-olds) in Western Province are 65.4%, well above the national average of 56.3%.[14]

197. In 2012, the Western Province had 123 primary schools, 29 community high schools, five secondary schools, and six rural training centers. There are 17 registered centers (early childhood centers for 3-5 years) in the Western Province which are managed by the Western Education Authority.[15]

198. Several schools have national secondary school status in Western Province such as Goldie College on New Georgia Island, Kukundu Adventist High School on Kolombangara Island, Biulah Provincial Secondary School in Roviana, Jones Adventist College, and Vonunu Provincial Secondary School on Vella Lavella Island.

Noise Level

199. There are no available noise level data for Munda. Environmental standards for noise level are still under development in Solomon Islands. In general, the areas of Munda, where proposed components of the subproject will be located, have no major sources of noise generators. For these areas, it is therefore expected that the average noise level will not exceed the values in IFC's guidelines (EHS Guidelines of April 2007) which are 55 dB (A) and 45 dB (A) near the residential area during daytime and nighttime, respectively and 70 dB (A) near industrial and commercial area.

[14] Solomon Islands: Emergency Assistance Project, 2007
[15] Solomon Islands: Western Province Situation Analysis, 2014

5.0 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATING MEASURES

200. **Impact Assessment Methodology**. The potential environmental and social impacts for the project have been identified and their significance assessed. The durations of the impacts are assessed with reference to the scope of work, the physical, biological, and socio-economic environment at the project site. Mitigation measures are designed to avoid and/or minimize each of the potential physical, biological, and socio-economic environment impacts. Impacts may be minor, moderate, major, or negligible based on the scale of impact itself and whether it is mitigated or not.

201. The components will create both common and site-specific impacts. It must be noted that there are impacts that are temporary such as impacts during construction phase. This chapter provides a summary of these and measures to mitigate these impacts.

5.1 IMPACTS RELATED TO PROJECT LOCATION AND DESIGN

202. Pre-construction considerations include climate change vulnerability; updating of ESMP based on latest project design and components; integration of ESMP and development consent (DC) conditions in the bid and contract documents; update of the Project's communications and consultation plan (CCP); grievance redress and management; identification of materials sources, materials extraction and application for BMP; biosecurity issues and potential introduction of alien invasive species; identification of sensitive receptors and cultural resources identification; land access arrangements; and unexploded ordnance.

5.1.1 IMPACTS FROM CLIMATE CHANGE

203. Potential impacts of climate change and natural hazards on infrastructure were identified during the preparation in 2012 of the Solomon Islands' National Infrastructure Investment Plan (NIIP). A summary of impacts due to climate change and natural hazards and their corresponding adaptation measures were identified. These sets of information on impacts and adaptation measures were adopted in the preparation of the Solomon Water's 30-Year Strategic Plan (2017) and are the same set of information from the NIIP document.

204. A recent review by the Pacific Region Infrastructure Facility on Solomon Islands public investment management indicated that the NIIP is still being used as guide for Solomon Islands' public investment management along with other national government plans.

205. **Table** 5-1 summarizes the impacts and adaptation for water infrastructure.

Table 5-1: Summary of Impacts and Adaptation for Water Infrastructure

Climate Change / Hazard	Potential Impact	Resilience Measures	Complementary Measures
Sea Level Rise	▪ Rising sea levels/coastal erosion causes damage to water supply infrastructure; ▪ Saltwater intrusion into groundwater lenses	▪ Use non-corrosive materials;	▪ Demand side management; ▪ Reduce pressure on coastal groundwater sources; ▪ Undertake regular water quality assessments

Increase / Decreases in Rainfall	▪ Water shortages; ▪ Water demand patterns may increase; ▪ Competition and conflict between different water users; ▪ Increased runoff can decrease water supplies by reduced infiltration into the groundwater	▪ Improved artificial water storage,; ▪ Improve water efficiency and water loss measures;	▪ Long-term demand side management; ▪ Long-term water availability studies and planning; ▪ Integrated multi-user assessment of supply needs; ▪ Ensuring groundwater recharge zones
Cyclones	▪ Damage to water infrastructure could undermine the quality and quantity of water	▪ Design critical supply infrastructure for hazards	▪ Contingency planning
Earthquakes	▪ Damage to water infrastructure could undermine the quality and quantity of water	▪ Design critical supply infrastructure for hazards	▪ Emergency water supplies planned

Source: SI: UWSSSP EARF, 26 March 2019

206. **Flooding considerations.** Extreme high rainfall events are expected to affect proposed components in the future. While the separate climate change study prepared for this project concluded that the big flood in 2014 would still be considered an unusual event by 2050, the 1-in-70-year event could still be expected, and the flood magnitude should be considered in the planning and design of large civil engineering infrastructure. Site erosion and flooding of the facilities are therefore expected if no adaptation will be implemented. Erosion and flooding could affect the structural integrity of the proposed structures. This can result in service interruptions or total failure of the facilities with serious water shortages that may escalate into a major public health emergency.

207. **Influence of Seasonal Drought**. It is important to consider the influence of drought when selecting a suitable water source. The target is to provide uninterrupted water supply (24x7) to the customers. However, unavoidable circumstances such as occurrence of serious dry spells is also considered.

208. As part of mitigation measures, a hydrology and onsite flooding study was conducted during the design phase. The study described the nature of the flood hazard and the degree of flood risk for the specific sites. Results of the study have been considered for the design of the proposed facilities and the preparation of engineering specifications to ensure that these facilities are less vulnerable to the predicted flood events.

209. Engineering assessment on potential site erosion has been made during the design phase for each site to determine the type of erosion protection that will be appropriate using in particular information from the site-specific geotechnical studies. This applies to borehole system, the reservoir and routes of water supply pipelines.

210. In addition, the project conceptual design fully integrates the applicable climate-proofing measures for water supply projects recommended by ADB as presented in **Table** 5-2**.**

Table 5-2: Climate-Proofing Measures for Water Supply Subproject

COMPONENT	CLIMATE-PROOFING MEASURES
Water supply	▪ Reduction of nonrevenue water; ▪ Water metering; ▪ Enhancing storage capacity;
Water treatment and quality	▪ Protection of the water source; ▪ Integrated water resources management
Water distribution	▪ Adjustment to operation below design capacity

Source: EARF 2019

5.1.2 PROJECT LAND ACCESS ARRANGEMENTS

211. This impact includes permanent access to lands of the proposed components either in public or private property.

212. Any requirements for permanent access to land will be governed by the Projects resettlement framework and resettlement plans or due diligence reports subsequently prepared. For unanticipated impact on loss of access during project implementation, SW will prepare correction plans and or amendments in Resettlement Plan to mitigate identified impact. Land acquisition and resettlement plans (LARP) were prepared for the proposed Munda water supply projects.

5.1.3 EXTRACTION OF LOCAL CONSTRUCTION MATERIALS AND ENVIRONMENTALLY RESPONSIBLE PROCUREMENT

213. 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.

214. Estimated amounts associated with each component are provided in **Table** 5-3.

Table 5-3: Estimated amount of local construction materials

Subproject	Gravel (m^3)	Cement (m^3)	Fine Aggregate (m^3)	Coarse Aggregate (m^3)
Munda	18	52	16	31

Note: These quantities include the facilities, site drainage, trenches, fence, roads

215. Before the start of activities, the contractor will provide the PMU 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. This will be included in CESMP.

5.1.4 UNEXPLODED ORDNANCE (UXO)

216. During WWII, the project site was subjected to intense battles and while this occurred over 60 years agoPrior to construction, a UXO survey (and subsequent UXO clearance if necessary) will be undertaken by a specialized company mandated by SW. SW will appoint specialist for UXO survey/clearance before the start of construction.

217. In case UXO is discovered during construction, the contractor is to immediately cordon off the area and arrange the evacuation of nearby residences and inform the Royal Solomon Islands Police Force of the find.

5.1.5 POTENTIAL INTRODUCTION OF ALIEN SPECIES

218. This impact includes the materials such as imported plant and equipment and vessels that import them. All construction equipment i.e., bulldozers, excavators, backhoes will be sourced locally i.e., from Munda or nearby areas and as such will limit any bio-security concerns focusing on plant invasive species/disease control.

219. 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. It is the importer's responsibility to ensure all machinery that arrives in the Solomon Islands to be free from biosecurity risk material, such as soil, seeds, plant and animal material. The contractor will prepare invasive species management plan as part of CESMP.

5.2 POTENTIAL CONSTRUCTION IMPACTS AND MITIGATING MEASURES

220. The construction phase considerations are site access and clearance including potential disruption of utilities (power and communication cables); soil erosion and sedimentation control; disposal of excavation spoils; oil and hazardous materials management; dust control; site waste management; construction noise and vibration; traffic management; community and occupational health and safety; potential social issues due to influx of workers; potential damage to hidden archaeological and cultural assets; impacts on rare and endangered species; and terrestrial habitat alteration. Contractors will be required to prepare Construction Environmental and Social Management Plan (CESMP) based on the ESMP included as part of the environmental and social assessment. This CESMP will reflect their commitments and construction methodologies to ensure appropriate environmental and social management on the project sites including COVID-19 preparedness and response.

221. Sensitive receptors along the project corridor of impact are:

- Villages/Residential Areas
- Schools – 2 schools including Kokeqolo School
- Hospital - Helena Goldie
- Tabu Sites
- Munda Market
- Hotel/Accommodations
- Churchs
- Police Station
- Buildings (shops, offices).

There are no environmental sensitive receptors or protected areas near the project sites and pipeline corridors.

222. **Figure** 5-1 shows the map of sensitive receptors along the project corridor.

Figure 5-1: Map of Sensitive Receptors Along Project Corridor

Airport Hilltop Reservoir in Polevesu and Surrounding Areas

Munda Station

Helena Goldie Hospital and Western End of Airport

Kekehe

Dunde

5.2.1 POTENTIAL CONSTRUCTION IMPACTS AND MITIGATING MEASURES ON PHYSICAL RESOURCES

Soil Erosion and Sedimentation Control

223. Potential sources of sediment runoffs are site clearing, ground leveling, excavations for structures' foundation, and pipe-laying. Soil materials can be carried by runoff to the natural drainage system or to adjacent lots during rainy periods.

224. 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.

225. For all components, the contractor will be required to prepare an erosion and sediment control plan as part of their CESMP. The geotechnical report will be provided as part of the contract documentation. This includes investigation and interpretation of onsite geology, allowing potential contractors to consider their proposed methods and the suitability of site for erosion control.

Disposal of Excavation Spoils

226. Construction activities of components have the potential to generate excess excavation materials for the installation of water supply facilities and other structures.

227. Improper disposal of excavation spoils can be avoided by addressing the issue prior to the start of construction activities. The PMU 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.

Storage, Use and Transportation of Hazardous Materials

228. The use of oil products and other hazardous materials will be required for the construction activities. Fuel, oil, grease, paints, and solvents associated with the operation of heavy equipment and vehicles will be handled on site. Maintenance of equipment will generate hazardous waste such as used engine oil, oil filters, empty containers of hazardous products (paints, solvents). All these products may accidentally be released to the environment and adversely affect water quality and aquatic life. Mitigation measures, where required, include:

- Prepare a hazardous materials and waste management plan and an emergency response plan as part of the CESMP;
- ensure all storage containers are in good condition with proper labeling; and
- store diesel fuel, waste oil, used lubricant and other hazardous materials in tightly sealed containers located in dedicated storage facility providing retention capacity (secondary containment to 100% of the tank capacity) in case of leakages.

229. 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, spill kits, etc.,
- 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 fuels/hazardous substances to be trained particularly in spill control procedures.

Dust and On-site Air pollution

230. 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 smoke emitting equipment may also occur as well as wind blowing on large stockpiles of construction materials such as soil and aggregates.

231. 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.

Generation of Solid Waste

232. 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 be potential sources of contaminants for surface runoff and pollution of nearby water bodies. In addition, improper closure of temporary work sites may create impacts following subproject completion.

233. Contractors will be required to:

- Prepare a waste management plan as part of the CESMP;
- 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;
- encourage re-use of excavated excess soil;
- regularly dispose of wastes to an accepted disposal site as approved by SW-PMU; and
- prohibit burning of all types of wastes.

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

235. All these will be reflected in the CESMP which will 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.

5.2.2 POTENTIAL CONSTRUCTION IMPACTS AND MITIGATING MEASURES ON BIOLOGICAL RESOURCES

Impacts on biodiversity

236. Construction impacts on biodiversity are anticipated to be very limited. The small scale of the project and its implementation in areas of components, already modified by human occupation and use, will minimize impacts. The pipeline and the secondary mains will be laid along the road, within the right-of-way of the previous installations.

237. Minimum vegetation clearing will occur of mainly grass and shrubs. Few secondary vegetation trees either of natural or planted origin (palm tree) will be removed.

238. Clearing of vegetation along the pipeline route will be for 1.5 km and 14.7 km for the transmission line and distribution network, respectively. After the pipeline has been laid and backfilled, the site will be regularly maintained for access.

239. The removal of a small number of trees from land plots or adjacent road trees should not significantly affect local biodiversity. Trees in such areas are generally not sheltering significant fauna because of the disturbance created by the road traffic and the presence of residences.

240. Mitigation measures include:

- Strictly limiting vegetation clearing to areas necessary for construction activities;
- Provide immediate fencing of project sites to protect external areas from accidental vegetation clearing;
- Promote restoration of damaged or destroyed vegetation by planting tree seedlings;
- Any remaining land cleared, and not required for construction, may be seeded with grass or native plants as required as part of the revegetation program to stabilize the areas from erosion;
- Secure tree cutting permit and other permits and clearances from government agencies, if needed

241. Where possible, replanting of disturbed sites using local provenance species and that the emerging vegetation type and composition be similar, or at least close, to that was present before the components. Consider vegetation types and densities that produce a quick coverage as well as vegetation types of cultural and economic significance preferred by end-users.

5.2.3 POTENTIAL CONSTRUCTION IMPACTS AND MITIGATING MEASURES ON SOCIO-ECONOMIC RESOURCES

Disruption of Utilities and Services

242. Proposed components may disrupt existing built environment during construction since water supply pipelines will be generally installed along roads in the urban area. Construction activities may affect existing transportation, water supply system, solid waste management, electricity and communication lines, health services and building infrastructures.

243. Prior to construction activities, SW and the contractors will:

- SW will coordinate with utility providers to obtain information about locations of built environment;
- Coordinate with the other utility companies regarding potential disruptions;
- Make provisions to preserve the operation of current facilities;
- Notify affected households and establishments well in advance of disruptions;
- Re-establish water services once old networks are disconnected; and
- Doing disruptive works during low demand period.

244. There are no construction works that would require stopping existing supply for an extended period, given that most of the works will be done in parallel with the existing system running. The contractor will provide a temporary alternative water supply if there will be disruption which will be more than 24 hours. Temporary disruption is only expected when a new system is put in service and connected to the raw water pipe.

Construction Noise and Vibration

245. Trucks and construction equipment may significantly increase noise level and create a nuisance for nearby residential areas. The issue is mostly applicable along the roads where water supply pipelines will be installed and the site for reservoir. Reference noise levels of various construction equipment (in dBA) are provided in **Table** 5-4.

Table 5-4: Noise Levels of Various Construction Equipment (in dBA)

Equipment Type	15 m	30 m	50 m	100 m	200 m
Excavator / Backhoe	78	72	67	61	53
Bulldozer	78	72	67	61	53
Jackhammer	89	83	78	72	66
Air compressor	75	69	64	58	52
Vibrator	76	70	65	59	53
Mixer	75	69	64	58	52
Truck	76	70	65	59	53

246. In terms of standard applicable for monitoring of noise level at different receptor, the guidelines from International Finance Corporation – Environmental, Health and Safety (IFC-EHS) can be followed. From the guideline, noise impacts should not exceed the levels presented in **Table** 5-5 or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

Table 5-5: Noise Level Guidelines in Different Receptors

Receptor	One Hour L_{Aeq} (dBA)	
	Daytime (07:00 – 22:00)	Nighttime (22:00 – 07:00)
Residential; institutional; educational	55	45
Industrial; commercial	70	70
Source: IFC-EHS Guidelines		

247. Significant vibration from construction activities is not expected in pipeline route since pipeline installation will not involve heavy compaction activities. For the reservoir site, method to lessen vibration may be required due to consolidation and compaction to strengthen the foundations.

248. Contractors will be required to:

- Before site works commence, a Noise and Vibration Control Plan shall be prepared by the Contractor as part of CESMP. The plan shall document the noise baseline and provide details of mitigation measures, specific locations and schedule where such measures shall be implemented to minimize impacts to sensitive receptors (residential areas, schools, hospitals, etc.) due to construction works, transport of construction materials and other project-related activities;
- Conduct regular noise level monitoring using noise meter (the limits near residential area are 55 and 45 dB(A) during daytime and nighttime, respectively;
- Restrict noisy activities to daytime (08:00-17:00) and avoid nighttime activities;
- Provide prior notification to the community on schedule of construction activities;
- Whenever applicable, provide noisy equipment with noise reduction covers; all construction equipment and vehicles shall be well maintained, regularly inspected for noise emissions, and shall be fitted with appropriate noise suppression equipment consistent with applicable national regulations;
- 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 (17:00 – 08:00);

- If nighttime operation, ensure prior notification and consultation will be made with affected people and local officials, and implement suitable noise reduction measures.

249. The contractor will be required to reduce the noise generation from their activities near residential areas and other sensitive receptors.

Vehicular Traffic Congestion Hindrance to Public Access

250. Construction activities and any temporary or partial road closures may cause traffic congestion and hinder public access.

251. Contractors will be required to:

- prepare a traffic management plan (TMP) by contractor as part of the CESMP and provide traffic management personnel to direct the flow of traffic in the vicinity of the construction sites and construction-related facilities. The TMP will need to set out process for agreeing and communicating road closures and haulage routes as well as H&S measures related;
- 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.

Occupational Health and Safety

252. Hazards to construction workers include sharp edges, falling objects, flying sparks, chemicals, noise, and various potentially dangerous situations including working at heights and in confined spaces. 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.

253. Health and safety will be managed in accordance with the Safety at Work Act 1987 and best practice will be employed where gaps exist. This specifically refers to the use of Australian and New Zealand standards, guidelines, and codes of practice.

254. The contractor is required to have a full-time health and safety representative that will be responsible for ongoing compliance including regular auditing and updates to project specific health and safety documentation. The contractor will prepare the health and safety plan to include the following procedures listed below.

255. Contractors will be required to:

- prepare and implement a health and safety plan (HSP) as part of their CESMP;
- ensure that a properly equipped and resourced first aid station is available at all times;
- provide potable water and adequate sanitation facilities including several hand washing stations to comply with Covid 19 obligations;
- if required, provide adequate and well-ventilated camps and clean eating areas;
- provide separate sleeping quarters for male and female workers;
- provide PPE suitable to tasks and activities undertaken to minimize exposure to a variety of hazards;

- 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.

256. The contractor's health and safety plan (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 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 CESMP.

257. Considering the most recent COVID-19 threat, the following measures will be implemented to manage risks on construction sites and in workers' housing. The detailed guidance is provided as **Appendix 5** to **Appendix 7** of this document.

- Avoid physical interaction and maintain physical distancing requirements;
- Limit the capacity of common areas;
- Regular cleaning and disinfection particularly heavily trafficked areas and common areas;
- Promote good personal hygiene such as frequent hand washing with soap and water or alcoholic gel;
- Provide appropriate personal protective equipment (PPE) such as face mask, face shield, etc;
- Monitoring of health status of workers and visitors before entering the site and housing

Community Health and Safety

258. The movement of construction vehicles, trench excavations, and various activities may pose hazards to the public. Any deep excavations may also pose hazards to the public.

259. Many of the measures to manage occupational health and safety will help mitigate the risk to the community. 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.

Potential Social Issues Due to Influx of Workers

260. Presence of workers from outside the Project area may cause some social issues such as potential for conflict with residents, risk spread of communicable diseases including STI, HIV and COVID-19 and potential gender-based violence (GBV) related concerns.

261. Measures to mitigate such risks and impacts will include:

- Induction of all workers on Project requirements regarding safeguards (including child protection), GRM and CCP;
- Agreement to and implementation of protocols (including code of conduct) concerning the workers contact with the local communities;
- Contractor required to recruit approved service provider to deliver communicable diseases (STI, HIV and COVID-19 etc.) awareness and prevention program;
- Hosting in local accommodation for workers not recruited from Munda
- No child labor will be employed in the project. The contractor must ensure that all workers are adults above the age of 18 years. The PMU will require the contractor to provide records of workers by age. The PMU will monitor risks of child labor and raise community awareness of the harm caused by children dropping out of school to work;
- Ensuring that sufficient water supply and temporary sanitation facilities including handwashing facilities are provided for workers at work sites in order that community infrastructure is not over-burdened;
- Security at contractor's camp and yard to control access and prevent entry of the public (especially children);
- Workers' participation in addressing GBV issues will be set in an environment where women can openly converse with about these concerns.
- Implementation of GBV awareness training program for contractors (including subcontractors) site personnel

Impacts on Cultural Heritage Resources

262. There is a tambu site (sacred site) at Lodukoma, Dunde as described Section 4.3.3. This tambu site has been subjected to disturbances from past developments such as expansion of settlements and road constructions and upgrades. During construction work, the tambu site will be barricaded with a "caution tape" to notify workers of the tambu site. Also, construction work will be strictly supervised in this location.

263. Precautions will be taken to avoid potential damage to any archaeological and cultural assets discovered during works. The contractor will be requested to develop and implement a "chance find" procedure throughout the construction works to account for any undiscovered items identified during construction/excavation works. The procedure will include workers training, stop of works, preservation of discovered item, information chain, visit of a specialist if required (Solomon Island National Museum).

5.3 POTENTIAL OPERATIONAL IMPACTS AND MITIGATING MEASURES

264. Operational considerations of the water supply components will include health and safety risks during operation and maintenance e.g., handling and storage of chlorine. Other impacts identified during operation are potential impacts of natural disasters on the water supply components, generation of site waste and storage, use and transport of hazardous materials. Operational impacts will be addressed by incorporating the necessary measures, such as a water safety plan, use of appropriate operational procedures and ensure effective mitigation and monitoring plan for each component.

5.3.1 POTENTIAL OPERATION IMPACTS AND MITIGATING MEASURES ON PHYSICAL RESOURCES

Natural Disaster Impacts

265. It is anticipated that there are unforeseen events in the future due to extreme weather events.

266. SW will develop an emergency response plan in response to natural disasters. SW's staff including communities nearby will be trained on all SOPs associated with disaster management and implementation of the plan.

Generation of Site Waste

267. During operation, it is anticipated to generate solid and liquid waste from storage and office.

268. All solid and liquid waste generated from storage and office will be collected and disposed of in an approved manner and in an approved location.

Storage, Use and Transport of Hazardous Materials

269. The use of disinfectant and other hazardous materials will be required during operation. Maintenance of equipment will generate hazardous waste such as used engine oil, oil filters, empty containers of hazardous products (disinfectant). These products may accidentally be released to the environment. Mitigation measures, where required, include:

- Preparation of a hazardous materials and waste management plan and an emergency response plan;
- ensure all storage containers are in good condition with proper labeling; and
- store disinfectant and other hazardous materials in tightly sealed containers located in dedicated storage facility providing retention capacity (secondary containment to 100% of the tank capacity) in case of leakages.

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

- immediate clean-up of spill;
- 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, spill kits, etc.,
- 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 disinfectant/hazardous substances to be trained particularly in spill control procedures.

5.3.2 POTENTIAL OPERATION IMPACTS AND MITIGATING MEASURES ON SOCIO-ECONOMIC RESOURCES

Health and Safety Risks during Operation and Maintenance

271. Water supply infrastructures do not inherently pose significant risk to workers. It must also be noted that the infrastructures are being designed following the ANZ standards.

272. The use of chlorine as a disinfectant may pose safety risks particularly in the new disinfection facility to treat the incoming water. In addition, noise and transportation during operation and maintenance may pose safety risks not only to workers but also to nearby community.

273. To reduce the operational health and safety risk of water supply facilities, the following measures must be implemented:

- Workers will be trained on health and safety aspects of operating a water supply facilities;
- A facility health and safety manual will be prepared. An eyewash and shower system will be installed inside the disinfection system.
- A system will be established for safe use and handling of chlorine materials in the workplace;
- Workers will be provided with the appropriate PPE for chlorine use and handling; and
- 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 facilities.

Health Hazard Due to Unplanned Delivery of Poor Water Quality

274. Contamination in water sources may be due to the presence of bacteria, viruses, protozoa, or chemicals. It will result to unplanned delivery to customers of poor water quality from Project facilities.

275. 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 thru provision of protection zones to prevent pollution from encroachment, logging, etc., (ii) treat the water to reduce or remove contamination that could be present to the extent necessary to meet the water quality targets and ensure water quality monitoring is conducted as indicated in the Environmental Monitoring Plan, 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.
- SW will continue to practice water chlorination and ensure that adequate residual disinfection will be maintained to control microbial contamination.

Unplanned Outages and Emergencies

276. 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 reservoirs, water pipelines and appurtenances, and accidents.

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

- Identification of potential causes of unplanned outages and emergencies will 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 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.

6.0 ANALYSIS OF ALTERNATIVES

6.1 NO PROJECT ALTERNATIVE

278. Due to its resources that are limited consisting of rainwater, which is used to supplement existing sources, and groundwater which is known to be of limited extent and subject to salinity, Munda will experience water scarcity in the coming years when it is expected to increase with population.

6.2 ALTERNATIVE FOR WATER RESOURCES

279. Munda has several water resources which can be harnessed to cover future water demand. **Table** 6-1 presents a summary of the different water sources.

Table 6-1: Analysis of Water Resources

Source	Elevation (m ASL)	Estimated Yield (MLD)	Cons	Pro
Kindu Spring	8	1.3 to 1.5 *	▪ Customary Land ▪ Distance to the city center and accessibility ▪ Bacterial pollution ▪ Turbidity suspected in wet weather conditions	▪ Abundant supply
Kindu Sinkhole	≈ 15	Unknown	▪ Customary Land ▪ High E. Coli rate and hardness	▪ Existing Sinkhole
Dunde Borehole	Unknown	0.6 *	▪ Needs further drilling ▪ Limited capacity	▪ Location close to city center
Munda Airport Borehole	3	0.6 *	▪ Limited capacity ▪ Low elevation	▪ Location ▪ Land availability and existing pumping station ▪ Good water quality

* to be confirmed
Source: Munda Water Supply FSR, May 2020

280. Accordingly, the airport borehole appears to be the best option to supply the new system in short term, able to provide enough water with good quality provided that a chlorination system is installed. From a financial perspective, it is also a valuable option, given that the facility is already existing and can be made operational for a limited investment. Moreover, this solution does not generate land issues and enables to have a production site close to the center of town and quickly operational.

281. Looking at the long-term requirements and future resource development, two options are proposed:

- Kindu Spring appears as an abundant water source. Based on field visits, it is estimated that 1 MLD can be obtained from Kindu spring, thus covering long term demand. However, its use will require a significant investment to convey water to the town as it is located approximately 6km away from the center of town and the airport terminal. In addition, pumping will be necessary given the limited hydraulic head at the source which has been confirmed during the topographic survey. As mentioned previously,

the karstic character of the aquifer is expected to lead to turbidity peaks, thus requiring the construction of a treatment plant.

- Additional boreholes, possibly in Dunde or other areas previously identified. No treatment is foreseen apart from chlorination. The development of groundwater could be staged with two additional boreholes in order to meet long term demand.

282. Potential areas have been identified for potential future groundwater development as shown in **Figure** 6-1. The criteria used for the selection of those zones are:

- Zones where groundwater capacity can be expected based on observations of existing resources and geological data
- Away from the coast to prevent potential salinity impact
- Generally upstream of existing settlements considering expected groundwater flow
- Close to access road
- Distance to supplied area

283. The GW 1 corresponds to Dunde borehole area.

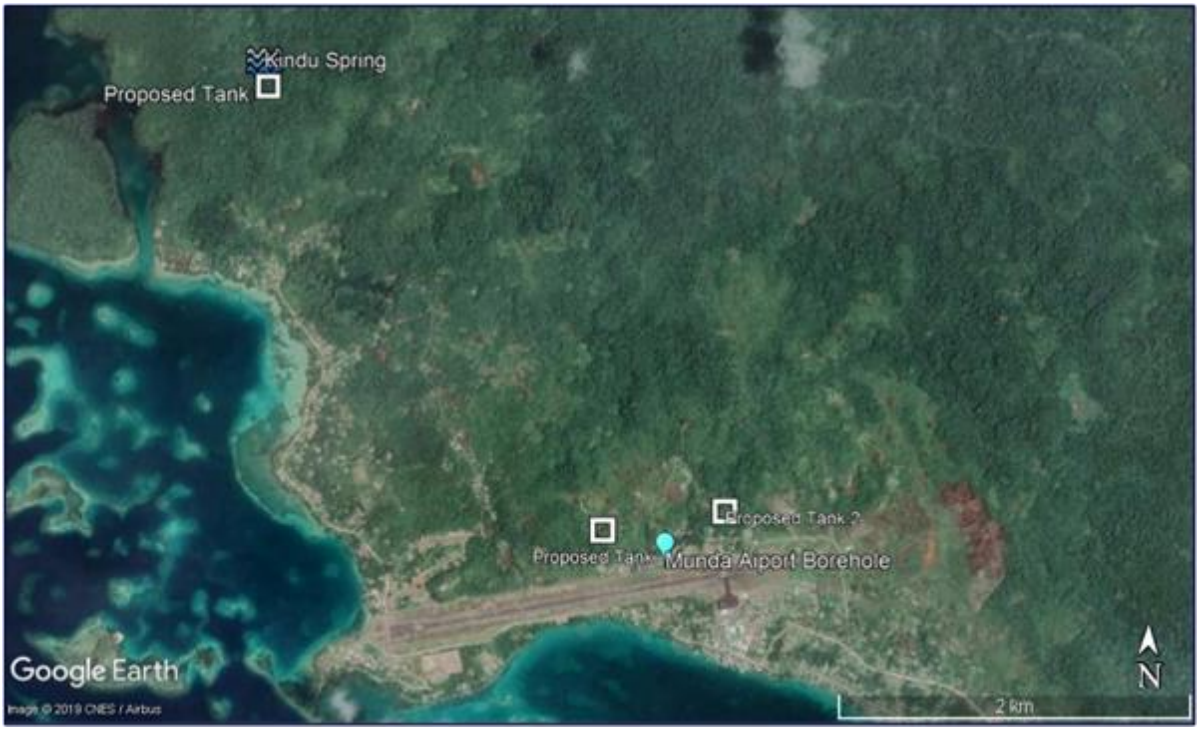
Figure 6-1: Potential Groundwater Development Areas

Source: Munda Water Supply FSR, May 2020

6.3 ALTERNATIVE LOCATION FOR WATER STORAGE TANKS

284. Different locations have been investigated and are presented in **Figure** 6-2. The preferred site was selected due to its location close to the town, elevation, and accessibility. It is located on a customary land, but initial talks have been held with the landowners.

Figure 6-2: Proposed Location of Water Storage Tanks



Source: Munda Water Supply FSR, May 2020

285. An alternative option would be to use the proposed reservoir as a balancing tank by supplying directly into the reticulation system from the borehole. While this option enables to optimize the cost by reducing the length of transmission pipe by about 1 km, it also affects the functioning of the system and requires careful sizing and operation of the borehole system to make full use of the storage. In addition, contact time for chlorine will be affected.

286. Besides, the option to pump directly to the network using a booster pump at the borehole site without storage, using a pressure tank and/or variable frequency drive is not recommended. The failure of the submersible or booster pump would immediately stop the supply without any storage providing autonomy. Furthermore, direct pumping without storage would not provide sufficient contact time for the chlorine. Lastly, the adequate sizing of the pumping for such solution would be problematic in a context where water demand is expected to quickly change, thus requiring the pumping system to cover a very large range of flows from 0 to the estimated hourly peak demand under acceptable pressure conditions.

7.0 GRIEVANCE REDRESS MECHANISM

7.1 PURPOSE

287. This Grievance Redress Mechanism (GRM) is designed to deal with grievances from the public in relation to Solomon Water managed projects at all stages of the project cycle. To date, the GRM has been delivered in English. Awareness of the GRM has been made through consultations in English and Pidgin. Documentation is currently in English but can be provided in Pidgin in future.

288. The mechanism allows for affected parties to make known grievances as they arise and aims to provide a predictable, transparent, timely and credible process to all parties, resulting in outcomes that are fair, effective, and lasting.

289. Inward communications to SW will be filtered at the initial query stage as being project specific or general enquiries by the customer relations team within SW. All external project communications and sites have project identifiers and unique names that allow customers to identify the potential project. Project specific queries will be dealt with confidentially by the Community Liaison Officer (CLO) and a determination made as to the nature and whether a grievance need be raised. Generally, this will involve contacting the requestor.

290. The Grievance redress shall be highlighted to all employees of the contractor and shall be included in the site induction. Where 3rd party agreements are struck with groups or individuals the GRM shall be highlighted, and the contact details of the Project Manager shall be communicated. It shall be noted that this is in addition to their rights under Solomon Islands Law which is applicable in all senses.

291. The Project Managers, as the delegated authority on the contracts will be responsible for managing grievances within the PMU.

7.2 PROCESS

292. The SW GRM is a three-stage process during any stage of which the grievance may be considered, by both parties, to have been resolved and closed off. The Grievance Log Information Sheet associated with the GRM is listed in **Appendix 8**.

7.2.1 STAGE 1

293. Any grievance should first be made known to Solomon Water Project Manager (PM) in charge of the project being implemented. This may initially be verbally however a monitoring form must be prepared and signed off by the party raising the grievance – support to filling in the form can be provided by Solomon Water to the aggrieved party.

294. On receipt of the Grievance Monitoring form the PM will hold a meeting with the aggrieved party to resolve the grievance within 5 working days of the grievance being raised. Following the discussion, the grievance may either be resolved or need to be escalated to Stage 2.

295. A Stage 1 Grievance Outcome form should be prepared by the PM confirming either:

- The grievance has been resolved and the means of resolution;
- The grievance has not been resolved; and outlining Solomon Water Projects Team position on the grievance.

296. The Stage 1 Grievance Outcome form should be signed by both parties and a copy provided to the party raising the grievance. This form should include next steps in the process if they consider the issue not resolved.

7.2.2 STAGE 2

297. If the grievance is not resolved under Stage 1, the grievance should then be referred to the General Manager (GM) of SW.

298. The GM will be provided with the Stage 1 Grievance Outcome form and a meeting arranged with the aggrieved party within 10 working days of issue of the form to discuss and try to resolve the grievance.

299. Based on the discussion the GM will issue a Stage 2 Grievance Outcome form confirming either:

- The grievance has been resolved and the means of resolution;
- The grievance has not been resolved and outlining SW GM position on the grievance.

300. The Stage 2 Grievance Outcome form should be signed by both parties and a copy provided to the party raising the grievance. This should include next steps in the process if the issue has not been resolved.

7.2.3 STAGE 3

301. If the grievance is not resolved under Stage 2 the grievance should then be referred to a three-member Grievance Tribunal[16] comprised of:

- A member of the Board of SW;
- The PS (or designate) of the MMERE;
- independent member selected by GM SW and Board Chairman.

302. All prior Grievance Outcome reports will be made available to the Tribunal; A meeting with the aggrieved party shall be held within 10 working days of issue of the Stage 2 Grievance Outcome Form.

303. Within 5 working days of the Tribunal meeting a formal response will be issued to the aggrieved party outlining the Tribunal's decision on the grievance raised.

304. The Tribunal's decision will be final.

7.3 MISCELLANEOUS

305. Whenever a grievance is resolved to the satisfaction of both parties, at whichever Stage this is achieved a written record of the agreement must be made and signed by both parties.

[16] The composition of the Grievance Tribunal should always ensure at least one female member and where the complainant is female should consist of two female members and one male member.

306. At all stages of the process the aggrieved party has the right to be represented by a third party at their own cost. The GRM nor its final decision does not affect the legal rights of the individual.

307. Provisions can be made for persons who cannot read, may have a learning disability, and/or need the written record provided in a written language other than English e.g. having it read to them, translated to a different language etc. when there is a need recognized by local community feedback.

308. SW are responsible to maintain an accurate register of grievances and the way they are dealt with.

309. SW Staff are all familiar with the GRM process and how to raise a grievance. As grievances require close out, a plaintiff must be identified. This preserves the ability to clarify and follow up grievances and agree outcomes. A SW staff member or any person may raise a grievance on behalf of someone but there must be a contact available for correspondence and close out. SW keeps private details of peoples raising grievances, the specific details of, and any details of settlements on a separate drive on their server which is accessible only to executive staff. Absolute confidentiality cannot be assured as SW encourages raising of grievances to any officer or contract staff regardless of station.

310. Each stage in the process allows an appeal through escalation. After the SW Grievance Redress process has been completed to Stage 3, if the plaintiff is still not satisfied, they will be advised that they have legal measures available to them including the right to appeal through the Solomon Islands judicial system.

311. SW Projects Team must hold a grievance review meeting at least once every 6 months to report on all grievances received and in process.

312. A Grievance Log must be maintained by the SW Projects Team and an annual report provided to the GM of SW – this should identify grievances raised (month and to date), grievances resolved (month and to date) and balance of grievances outstanding with specific actions pending. Key information to be included in the grievance log can be found in **Appendix 8**, and includes the type of problem or grievance:

- land related
- compensation
- construction
- resettlement site
- other (specify)

8.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 INTRODUCTION

313. The role of ESMP is to outline the mitigation measures to be considered during project implementation and operation to avoid or control adverse environmental and social impacts and the actions deemed necessary to implement these measures.

314. It has determined on environmental assessment that the Project will have low significant impacts on the environment. Social impacts are not expected to be significant with land acquisition and resettlement impacts generally avoided and residual impacts mitigated as detailed in the LARP report. The Project can be implemented in an environmentally acceptable manner provided that the mitigation measures to avoid or reduce the environmental and social impacts will be provided. This ESMP includes: (i) implementation arrangement, (ii) mitigating measures to be implemented; (iii) required monitoring and reporting associated with the mitigating measures. It also describes the institutional roles and responsibilities during pre-construction, construction, and operation phases.

8.2 INSTITUTIONAL ARRANGEMENT

315. **MOFT & SW**: The MOFT is the Project executing agency and SW is the implementing agency, operating through a PMU including specialists associated with environmental and social safeguards.

316. **Project Management Unit:** SW has established a PMU to prepare and implement the Project. The PMU will include an environment safeguards officer (ESO) and Resettlement Specialist who will receive training and capacity building from the international environmental specialist (IES) and international social specialist (ISS). Together the ESO, IES and ISS will ensure that all components are implemented in accordance with the Project's EARF, RP and environmental assessments are prepared, and development consents are obtained, and compliance with each component ESMP and development consent conditions is monitored and reported.

317. **Construction Contractors:** The contractors undertaking the works will be responsible for ensuring that their activities comply with the environmental and social safeguard requirements of the contract including the ESHS technical specifications. The contractor will prepare a CESMP for review and approval by the PMU prior to any physical works. The CESMP will be activity, site and project-specific and detail how the contractor intends to meet the environmental and social management requirements identified in the ESMP. It will be designed to ensure that appropriate environmental and social management practices are applied throughout the construction period. The CESMP will include all the site-specific and sub-plans necessary to meet the standards and targets set out in the ESMP. The contractor will be required to employ a full-time health and safety officer and an environmental officer as necessary to ensure compliance with all requirements concerning environmental, health, safety, social and labor regulations during construction.

318. Environmental Conservation Department: The ECD will review the development consent applications and issue the consents, either with or without conditions. The ECD will be invited to participate in joint inspections and audits during construction activities.

319. A summary of the environmental and social management responsibilities for the Project is presented in **Table** 8-1**.**

Table 8-1: Summary of Environmental and Social Management Responsibilities in the Project

Project Implementation Organization	Management Roles and Responsibilities
Asian Development Bank / World Bank	▪ Review and clear IEEs/ESMPs ▪ Review bidding documents and clear CESMPs ▪ 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 ▪ Provide environmental and social safeguards capacity building to the PMU during missions and remotely as required. ▪ Review semi-annual and annual environmental and social monitoring report
Ministry of Finance and Treasury (executing agency)	▪ 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
Project Steering Committee (PSC)	▪ 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)	▪ 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 and WB ▪ Assist in resolving complaints brought through the Grievance Redress Mechanism (GRM) that have not been resolved at lower levels
SW Project Management Unit	▪ Responsible for overall project management, implementation, and monitoring ▪ Responsible for SW's application for a Development Consent ▪ Update the IEE and ESMPs based on the detailed design and submit to ADB and WB 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 CESMP 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 CESMP

Project Implementation Organization	Management Roles and Responsibilities
	▪ Issue the Community Advisory Committee guidelines to the contractor at Bid Award
PMU Environment/Social Officer	▪ Ensure IEE/ESMPs 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 IEE/ESMPs and CESMP 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 and social safeguards of the Project as described in the IEE/ESMPs ▪ 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 GRM is activated prior to the start of construction ▪ During construction, conduct quarterly and additional *ad hoc* site visits as necessary and coordinate with the project engineers to ensure that required environmental and social mitigation measures are implemented at the construction sites, ▪ Provide training for contractors' environment and safety officers to ensure they understand the ESMP requirements; and ▪ Coordinate with the contractors' EHSO to ensure that environmental and social awareness trainings for workers are done.
PMU Land Officer	▪ Responsible in dealing with land acquisition issues as detailed in LARP
Owner Engineer (OE) or Supervision Engineer (SE) or Project Implementation and Supervision Consultant (PISC) safeguard specialist	▪ Assist PMU in supervising environmental implementation of the project in compliance with safeguards and contract terms ▪ Supervision, monitoring and reporting of CESMP implementation ▪ Provide appropriate action/plan to PMU to correct any non-compliance issue ▪ Assist PMU in preparing of the environmental safeguards monitoring reports for ADB/WB ▪ Assist PMU in organization of training and capacity development
Contractor	▪ Prepare and submit the CESMP prior to construction for review and approval of PMU ▪ Understand the ESMP requirements and allocate necessary resources for implementation ▪ Employ a full-time health and safety officer and an environmental officer as necessary to ensure compliance with all requirements concerning environmental, health, safety, social and labor regulations during construction. In addition, the archaeological findings will be handled by environmental officer in consultation with PMU land officer. ▪ EHSO also provides capacity building and training for workers on CESMP requirements as needed ▪ Implement construction activities with the required mitigation measures

Project Implementation Organization	Management Roles and Responsibilities
	▪ Conduct environmental and social monitoring as required by ESMP ▪ Act promptly on complaints and grievances concerning the construction activities in accordance with the project's GRM ▪ Submit monthly progress reports on CESMP/ESMP implementation to PMU ▪ Publish a construction notice in local media and distribute the notice to affected community members prior to the commencement of construction on-site. ▪ Establish a Community Advisory Committee (CAC) within 4 weeks of the publication of the construction notice. ▪ Hold a minimum of three (3) CAC meetings at the start, during and at the completion of construction works. ▪ Contractor's Terms of Reference for the EHSO (Secretary for the CAC) will include the role, tasks and activities described in the CAC Guidelines.
Environment Conservation Division (ECD)	▪ 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 ESMP in general
Ministry of Mines, Energy and Rural Electrification (MMERE)	▪ Responsible for processing of contractor's application for a BMP regarding mining and extraction of aggregates or gravel from rivers ▪ Monitors contractor's compliance with the terms of the issued BMP

Source: Adapted from EARF, 2019.

8.3 INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

320. 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.

321. The PER documenting the mitigation measures and consultation process will be submitted to MECDM and will be available for public review. The PER Report will be available to the public from SW website.

322. The Stakeholder Engagement Plan (SEP) for the project documents the information disclosure, consultation, and public participation measures to meet ADB and World Bank standards for ongoing and meaningful consultation during construction and operational works.

8.4 ENVIRONMENTAL MANAGEMENT SYSTEM

323. 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 ESMP 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 component site, the contractor will prepare and submit a site-specific construction ESMP (CESMP) to the PMU, the CESMP will be based on the project ESMP 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 will review and clear the CESMP and advise the supervising engineer that the CESMP may be approved and no objection to commencement of works given.

324. Once works commence, the EHSO will conduct monitoring of compliance of activities with the approved CESMP and the PMU will undertake inspections and audits of the effectiveness of the contractor's implementation of the approved CESMP. The PMU 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.

325. As early as practicable after commencement, the project will operate 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.

326. The CESMP 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.

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

8.5 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

328. The ESMP (including monitoring requirements) for Munda water supply system components are presented from **Table** 8-2 to **Table** 8-3**.**

Table 8-2: Environmental and Social Management Plan for Laying of Water Supply Pipelines

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
PRE-CONSTRUCTION							
Climate change vulnerability	Climate change adaptation measures are: i. use non-corrosive materials; ii. improved artificial water storage; iii. improve water efficiency and water loss measures; iv. design critical supply infrastructure for hazards; v. demand side management; vi. reduce pressure on coastal groundwater sources; vii. undertake regular water quality assessments; viii. long-term demand side management; ix. long-term water availability studies and planning; x. integrated multi-user assessment of supply needs; xi. ensuring groundwater recharge zones; xii. contingency planning xiii. emergency water supplies planned xiv. appropriate design of the proposed facilities and the preparation of	Part of detailed design cost	Design Consultant	SW's PMU	Engineering drawings and specifications	Verification of engineering drawings and specifications Once	Minimal cost to SW (verification of documents only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	engineering specifications to ensure that these facilities are less vulnerable to the predicted flood events; xv. appropriate design of erosion protection						
Improper implementation of ESMP	Tender documents and construction contract will require the following: i. issuance of Contractor's Environmental Management Plan (CESMP) framework to bidders; ii. preparation of CESMP prior to construction activities; iii. review and approval of CESMP by the PMU prior to site mobilization	Part of contractors' bid cost	Design Consultant and Contractor	PMU	CESMP	CESMP submission prior to commencement of site works	Minimal cost to SW (part of consultant's task)
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 campaigns, website, billboards, etc. iii. ensure that the contact details are placed on notice boards and/or website.	Part of contractors' bid cost	Contractor	PMU	▪ Consultation meetings ▪ Tender documents ▪ GRM activated with community advisory committees (CACs)	Verification of meeting documents, tender documents and in placed CACs After completion of meetings Once after preparation of tender documents prepared	Minimal cost to SW (part of consultant's task)

Activity/Environmental Impact	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 and environmentally responsible procurement	The contractor will be i. required to obtain the local materials only from sources that have the required government environmental approvals; ii. provide the PMU with a Materials Procurement Plan providing information on the sources of materials, transporting modes to sites, stockpiling schemes, and schedules of deliveries.	Part of contractors' bid cost	Contractor	PMU	Government permits, license of quarries and borrow pits Operational and abandonment plan	Visual inspection of source Verification of operational and abandonment plan Weekly	Minimal cost to SW (visual inspection of source and verification of plans only)
Land Access Arrangements	SW will use existing road carriage way/easement for the water supply pipeline. The land is government owned. Arrangement for SW's use will be facilitated by their land acquisition specialist	To be part of the project cost.	SW	SW land acquisition specialist	Detail design minimizes relocation	Avoid any need for relocation. Need is not foreseen. In event of a possibility then this will be managed closely by the SW land acquisition specialist	Minimal cost to SW (relocation will be managed by SW land acquisition specialist)
UXO Survey	i. Prior to construction, a UXO survey will be undertaken by a specialized company mandated by SW; ii. SW will appoint specialist for UXO survey/clearance before the start of construction;	Part of SW cost	SW	PMU Land Officer	Survey has been carried out by approved personals	Certificate showing the project area is UXO free	SW costs

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	iii. In case UXO is discovered during construction, the contractor is to immediately cordon off the area and arrange the evacuation of nearby residences and inform the Royal Solomon Islands Police Force of the find.						
Potential Introduction of Alien Species	i. The 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. ii. The contractor needs to prepare invasive species management plan as part of CESMP	Part of importation cost	Contractor /Importer	PMU	Certificates from Biosecurity Solomon Islands	Verification of certificates Once after acquisition of certificates	Minimal cost (part of consultant's task)
Environmental Capacity Development	i. The contractor prior to mobilization will conduct orientation for its staff/workers and subcontractors on the provisions of the CESMPs focusing of the mitigating measures to minimize impact of construction.	Part of contractors' bid cost	Contractor	PMU	Number of training conducted and workers trained	Attendance sheets	Part of contractors cost

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	ii. The training will also include the PMU staff on key elements of ESMP implementation and monitoring programs						
CONSTRUCTION							
Disruption of utilities and services	SW's PMU and the contractors will: i. coordinate with utility providers to obtain information about locations of built environment; ii. Coordinate with the other utility companies regarding potential disruptions; iii. Make provisions to preserve the operation of current facilities; iv. Notify affected households and establishments well in advance of disruptions; v. Re-establish water services once old networks are disconnected; and vi. Doing disruptive works during low demand period The contractor will provide a temporary alternative water supply if there will be disruption which will be more than 24 hours.	Part of contractors' bid cost	Contractor	PMU	Coordination with the other utility companies Notification of affected households and establishments	Verification of coordination meetings and notifications After completion of meetings and notifications	Minimal cost to SW (verification of documents only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
Soil erosion and sedimentation control	The contractor will be required to i. 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; ii. prepare an erosion and sediment control plan as part of their CESMP.	Part of contractors' bid cost	Contractor	PMU	▪ Disturbed sites ▪ Use of appropriate sediment controls	Visual inspection of sites Verification of plans Daily during rainy periods	Minimal cost to SW (visual inspection of sites and verification of plans only)
Impact on biodiversity	Mitigation measures include: i. Strictly limiting vegetation clearing to areas necessary for construction activities; ii. Provide immediate fencing of project sites to protect external areas from accidental vegetation clearing; iii. Promote restoration of damaged or destroyed vegetation by planting tree seedlings; iv. Any remaining land cleared, and not required for construction, may be	Part of contractors' bid cost	Contractor	PMU	▪ Disturbed sites ▪ Plans and permits and clearances from relevant government agencies	Visual inspection of sites Verification of plans and permitting requirements	Minimal cost to SW (visual inspection of sites and verification of plans and permitting only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	seeded with grass or native plants as required as part of the revegetation program to stabilize the areas from erosion. v. Secure tree cutting permit and other permits and clearances from concerned government agencies; if needed						
Disposal of excavation spoils	The PMU 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 contractor bid cost	Contractor	PMU	Contractor's disposal plan	Inspection of disposal site After submission of disposal plan	Minimal cost to SW (visual inspection of sites and verification of plans only)
Storage, Use and Transportation of Hazardous Materials	Mitigation measures include: i. Prepare a hazardous materials and waste management plan and an emergency response plan as part of the CESMP; ii. ensure all storage containers are in good condition with proper labeling; and iii. store diesel fuel, waste oil, used lubricant and other hazardous materials in	Part of contractors' bid cost	Contractor	PMU	Measures required to prevent accidental releases Records of accidental releases Measures for clean-up and handling of contaminated materials	Visual inspection of storage area; Verification of records Daily and as necessary	Minimal cost to SW (visual inspection of storage area and verification of records only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	tightly sealed containers located in dedicated storage facility providing retention capacity (secondary containment to 100% of the tank capacity) in case of leakages Measures for clean-up and handling of contaminated materials include: i. immediate clean-up of spills; ii. oil-stained wastes and used oil to 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, spill kits, etc.; 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 to be prohibited; and vi. construction personnel designated to handle fuels/hazardous				Training records of personnel for hazardous materials;		

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	substances to be trained particularly in spill control procedures						
Dust and On-site Air pollution	The contractors will be required to: i. conduct regular water spraying of roads, work areas and other construction-related facilities to minimize dust generation; ii. ensure construction materials stockpiles are 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. 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 v. prohibit burning of all types of wastes generated at the construction sites, workers' camps as well as other project-	Part of contractors' bid cost	Contractor	PMU	Dust generation Smoke emitting equipment, Open burning of materials	Visual inspection of sites Daily	Minimal cost to SW (visual inspection of sites only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	related facilities and activities.						
Generation of Solid Waste	The contractors will be required to: i. prepare a waste management plan as part of the CESMP; ii. provide garbage bins and facilities within the project site for temporary storage of construction waste and domestic solid waste; iii. separate solid waste into hazardous, non-hazardous and reusable waste streams and store temporarily on-site in secure facilities with weatherproof flooring and roofing; iv. ensure that wastes are not haphazardly dumped within the subproject site and adjacent areas; v. encourage re-use of excavated excess soil; vi. regularly dispose of wastes to an accepted disposal site as approved by SW-PMU; and vii. prohibit burning of all types of wastes	Part of contractor bid cost	Contractor	PMU	Contractor's disposal plan	Inspection of disposal site After submission of disposal plan	Minimal cost to SW (visual inspection of site and verification of plans only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
Construction noise and vibration	The contractors will be required to: i. Before site works commence, a Noise and Vibration Control Plan shall be prepared by the Contractor as part of CESMP; ii. Conduct regular noise level monitoring using noise meter (the limits near residential area are 55 and 45 dB(A) during daytime and nighttime, respectively; iii. Restrict noisy activities to daytime (08:00-17:00) and avoid nighttime activities; iv. Provide prior notification to the community on schedule of construction activities; v. Whenever applicable, provide noisy equipment with noise reduction covers; all construction equipment and vehicles shall be well maintained, regularly inspected for noise emissions, and shall be fitted with appropriate noise suppression equipment consistent	Part of contractors' bid cost	Contractor	PMU	Noise level Normal operation schedule	Noise meter Daily / as necessary	Minimal cost to SW after purchasing of noise meter reader

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	with applicable national regulations; vi. Position stationary equipment that produces elevated noise levels, such as diesel generators and air compressors, as far as practicable from houses and other receptors; vii. Prohibit operation of noisy equipment and construction works in populated areas and where sensitive receptors are found during nighttime (17:00 – 08:00); viii. If nighttime operation, ensure prior notification and consultation will be made with affected people and local officials, and implement suitable noise reduction measures						
Vehicular Traffic Congestion Hindrance to Public Access	The contractors will be required to: i. prepare a traffic management plan (TMP) by contractor as part of the CESMP and provide traffic management personnel to direct the flow of traffic in the vicinity of the	Part of contractors' bid cost	Contractor	PMU	Traffic signs in vicinity of construction sites Schedule of festivities, processions, parades, etc.	Verification of traffic management plan Visual inspection of sites Daily	Minimal cost to SW (visual inspection of site and verification of plans only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	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; v. schedule construction activities with consideration to periods of heavy presence of people such as festivities, processions, parades, etc. to minimize disruption to local activities.						
Occupational health and safety at work sites	The contractors will be required to: i. prepare and implement a health and safety plan (HSP) as part of their CESMP; ii. ensure that a properly equipped and resourced first aid station is available at all times;	Part of contractors' bid cost	Contractor	PMU	Construction of health and safety plan First aid station, PPE, emergency response equipment and sanitation facilities	Verification of health and safety plan Verification of health and safety record Visual inspection of site Daily	Minimal cost to SW (visual inspection of site and verification of plans and records only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	iii. provide potable water and adequate sanitation facilities including several hand washing stations to comply with Covid 19 obligations; iv. if required, provide adequate and well-ventilated camps and clean eating areas; v. provide separate sleeping quarters for male and female workers; vi. provide PPE suitable to tasks and activities undertaken to minimize exposure to a variety of hazards; vii. provide fire-fighting equipment and fire extinguishers in workshops, fuel storage facilities, construction camps, and any sites where fire hazard and risk are present; viii. ensure that all workers are aware of emergency response and medical evacuation procedures. Refer to Appendix for COVID-19 measures				Health and safety records (near miss, first aide, lost time accident)		
Community health and safety	The contractors will be required to:	Part of contractors' bid cost	Contractor	PMU	Construction safety policy	Verification of construction safety policy and	Minimal cost to SW (visual

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	i. implement the various plans to minimize health and safety risks to the public; ii. use barriers and install signage to keep the public away from constructions sites and excavation sites; iii. provide prior notification to the community on schedule of construction activities; iv. provide security personnel in hazardous areas to restrict public access; v. operate construction night light in the vicinity of construction sites; vi. provide adequate safe passage for public, as necessary, across construction sites; and vii. 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. Refer to Appendix for COVID-19 measures				Hazards in the area Safety control such as signages, lightings, and barriers Health and safety records (near miss, first aide, lost time accident) Adherence to measures and ADB/WB COVID-19 guidelines	health and safety record Visual inspection of site Daily	inspection of site and verification of plans only)

Activity/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 workers	Measures include: i. induction of all workers on Project requirements regarding safeguards (including child protection), GRM and CCP; ii. agreement to and implementation of protocols (including code of conduct) concerning the workers contact with the local communities; iii. contractor required to recruit approved service provider to deliver communicable diseases (STI, HIV and COVID-19 etc.) awareness and prevention program; iv. construction of camp specific for workers; v. no child labor will be employed in the project; vi. ensuring that sufficient water supply and temporary sanitation facilities including handwashing facilities are provided for workers at work sites in order that community infrastructure is not over-burdened;	Part of contractors' bid cost	Contractor	SW's PMU	Implementation of workers induction, required protocols, and disease awareness and prevention program Administrative signages	Verification of records Visual inspection of site At start of work Monthly	Minimal cost to SW (visual inspection of site and verification of records only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	vii. security at contractor's camp and yard to control access and prevent entry of the public (especially children); viii. workers' participation in addressing GBV issues will be set in an environment where women can openly converse with about these concerns. ix. implementation of GBV awareness training program for contractors (including subcontractors) site personnel						
Impacts on Cultural Heritage Resources	The contractor will be requested to develop and implement a "chance to find" procedure throughout the construction works to account for any undiscovered items identified during construction/excavation works. The procedure will include workers training, stop of works, preservation of discovered item, information chain, visit of a specialist if required (Solomon Island National Museum).	Part of specs preparation cost	Design Consultant	PMU	Tender documents	Verification of tender documents Once after preparation of tender documents	Minimal cost (part of consultant's task)
Improper closure of construction sites after subproject completion.	Site restoration and removal of all temporary facilities, excess	Part of contractors' bid cost	Contractor	PMU	Disturbed sites, staging areas	Visual inspection of sites	Minimal cost to SW (visual

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	materials, equipment, plant, and excavated materials on site; all dumping will be to approved locations. Replanting of disturbed sites in accordance with replanting plan.				and workers camps.	Review and "clear" site remediation through issue of certificate Once when all site work is complete	inspection of site only)
OPERATIONS							
Natural Disaster Impacts	i. SW will develop an emergency response plan in response to natural disasters; ii. SW's staff including communities nearby will be trained on all SOPs associated with disaster management and implementation of the plan.	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	Emergency response plan Records of training	Verification of emergency response plan and records of training Weekly verification	Minimal cost (verification of documents only)
Generation of Site Waste	All solid and liquid waste generated from storage and office will be collected and disposed of in an approved manner and in an approved location.	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	Disposal plan	Inspection of disposal site After submission of disposal plan	Minimal cost to SW (visual inspection of site and verification of plans only)
Storage, Use and Transport of Hazardous Materials	Mitigation measures include: i. prepare a hazardous materials and waste management plan and an emergency response plan; ii. ensure all storage containers are in good	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	Measures required to prevent accidental releases Records of accidental releases	Visual inspection of storage area; Verification of records Daily and as necessary	Minimal cost to SW (visual inspection of storage area and verification of records only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	condition with proper labeling; and iii. store disinfectant and other hazardous materials in tightly sealed containers located in dedicated storage facility providing retention capacity (secondary containment to 100% of the tank capacity) in case of leakages. Measures for clean-up and handling of contaminated materials will include: i. immediate clean-up of spills, ii. oil-stained wastes and used oil to 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, spill kits, etc., 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 to be prohibited; and				Measures for clean-up and handling of contaminated materials Training records of personnel for hazardous materials;		

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	vi. construction personnel designated to handle disinfectant/hazardous substances to be trained particularly in spill control procedures.						
Health and safety risks during operation and maintenance	Mitigating measures include: i. workers will be trained on health and safety aspects of operating a water supply facilities; ii. a facility health and safety manual will be prepared. An eyewash and shower system will be installed inside the chlorine room. iii. a system will be established for safe use and handling of chlorine materials in the workplace; iv. workers will be provided with the appropriate PPE for chlorine use and handling; and v. 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 facilities.	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	Written management procedures SOPs	Verification of management procedures, SOPs and records Weekly verification Implementation of SOPs	Minimal cost (verification of documents only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
Health hazard due to unplanned delivery of poor water quality	Mitigating measures include: i. implementing SW's water safety plan as advocated by the WHO; ii. SW will continue to practice water chlorination and ensure that adequate residual disinfection will be maintained to control microbial contamination.	Part of SW's operational cost	SW's Operations Department	SW's Operations Dept. Mgt.	WSP Physical, Chemical and Biological parameters	Verification of WSP implementation Water sampling and laboratory test Monthly for plan and for bacteria; Annual for physical & chemical	Part of SW's operational cost
Unplanned Outages and Emergencies	Mitigating measures include: i. identification of potential causes of unplanned outages and emergencies will 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 of the backup power at the	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	Written management procedures SOPs	Verification of management procedures, SOPs and records Weekly verification Implementation of SOPs	Minimal cost (verification of documents only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implementation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	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.						

Table 8-3: Environmental and Social Management Plan for Construction of Reservoir

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
PRECONSTRUCTION							
Climate change vulnerability	Climate change adaptation measures are: i. use non-corrosive materials; ii. improved artificial water storage; iii. improve water efficiency and water loss measures; iv. design critical supply infrastructure for hazards; v. demand side management; vi. reduce pressure on coastal groundwater sources; vii. undertake regular water quality assessments; viii. long-term demand side management; ix. long-term water availability studies and planning; x. integrated multi-user assessment of supply needs; xi. ensuring groundwater recharge zones; xii. contingency planning xiii. emergency water supplies planned xiv. appropriate design of the proposed facilities and the preparation of	Part of detailed design cost	Design Consultant	SW's PMU	Engineering drawings and specifications	Verification of engineering drawings and specifications Once	Minimal cost to SW (verification of documents only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	engineering specifications to ensure that these facilities are less vulnerable to the predicted flood events; xv. appropriate design of erosion protection						
Improper implementation of ESMP	Tender documents and construction contract will require the following: i. issuance of Contractor's Environmental Management Plan (CESMP) framework to bidders; ii. preparation of CESMP prior to construction activities; iii. review and approval of CESMP by the PMU prior to site mobilization	Part of contractors' bid cost	Design Consultant and Contractor	PMU	CESMP	CESMP submission prior to commencement of site works	Minimal cost to SW (part of consultant's task)
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 campaigns, website, billboards, etc.; iii. ensure that the contact details are placed on notice	Part of contractors' bid cost	Contractor	PMU	▪ Consultation meetings ▪ Tender documents ▪ GRM activated with community advisory committees (CACs)	Verification of meeting documents, tender documents and in placed CACs After completion of meetings Once after preparation of tender documents prepared	Minimal cost to SW (part of consultant's task)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	boards and/or website.						
Extraction of local construction materials and environmentally responsible procurement	The contractor will be i. required to obtain the local materials only from sources that have the required government environmental approvals; ii. provide the PMU with a Materials Procurement Plan providing information on the sources of materials, transporting modes to sites, stockpiling schemes, and schedules of deliveries.	Part of contractors' bid cost	Contractor	PMU	Government permits, license of quarries and borrow pits Operational and abandonment plan	Visual inspection of source Verification of operational and abandonment plan Weekly	Minimal cost to SW (visual inspection of source and verification of plans only)
Land Access Arrangements	The land is government owned. Arrangement for SW's use will be facilitated by their land acquisition specialist	To be part of the project cost.	SW	PMU Land Officer	Detail design minimizes relocation	Avoid any need for relocation. Need is not foreseen. In event of a possibility then this will be managed closely by the SW land acquisition specialist.	Minimal cost to SW (relocation will be managed by SW land acquisition specialist)
UXO Survey	i. Prior to construction, a UXO survey will be undertaken by a specialized company mandated by SW; ii. SW will appoint specialist for UXO survey/clearance before the start of construction;	Part of SW cost	SW	PMU Land Officer	Survey has been carried out by approved personals	Certificate showing the project area is UXO free	SW costs

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	iii. In case UXO is discovered during construction, the contractor is to immediately cordon off the area and arrange the evacuation of nearby residences and inform the Royal Solomon Islands Police Force of the find.						
Potential Introduction of Alien Species	i. The 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. ii. The contractor needs to prepare invasive species management plan as part of CESMP	Part of importation cost	Contractor /Importer	PMU	Certificates from Biosecurity Solomon Islands	Verification of certificates Once after acquisition of certificates	Minimal cost (part of consultant's task)
Environmental Capacity Development	i. The contractor prior to mobilization will conduct orientation for its staff/workers and subcontractors on the provisions of the CESMPs focusing of the mitigating measures to minimize impact of construction.	Part of contractors' bid cost	Contractor	PMU	Number of training conducted and workers trained	Attendance sheets	Part of contractors cost

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	ii. The training will also include the PMU staff on key elements of ESMP implementation and monitoring programs						
CONSTRUCTION							
Soil erosion and sedimentation control	The contractor will be required to i. 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; ii. prepare an erosion and sediment control plan as part of their CESMP.	Part of contractors' bid cost	Contractor	PMU	▪ Disturbed sites ▪ Use of appropriate sediment controls	Visual inspection of sites Verification of plans Daily during rainy periods	Minimal cost to SW (visual inspection of sites and verification of plans only)
Impact on biodiversity	Mitigation measures include: i. Strictly limiting vegetation clearing to areas necessary for construction activities; ii. Provide immediate fencing of project sites to protect external areas from accidental vegetation clearing;	Part of contractors' bid cost	Contractor	PMU	▪ Disturbed sites ▪ Plans and permits and clearances from relevant government agencies	Visual inspection of sites Verification of plans and permitting requirements	Minimal cost to SW (visual inspection of sites and verification of plans and permitting only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	iii. Promote restoration of damaged or destroyed vegetation by planting tree seedlings; iv. Any remaining land cleared, and not required for construction, may be seeded with grass or native plants as required as part of the revegetation program to stabilize the areas from erosion. v. Secure tree cutting permit and other permits and clearances from concerned government agencies; if needed						
Disposal of excavation spoils	The PMU 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 contractor bid cost	Contractor	PMU	Contractor's disposal plan	Inspection of disposal site After submission of disposal plan	Minimal cost to SW (visual inspection of sites and verification of plans only)
Storage, Use and Transportation of Hazardous Materials	Mitigation measures include: i. Prepare a hazardous materials and waste management plan and an emergency	Part of contractors' bid cost	Contractor	PMU	Measures required to prevent accidental releases	Visual inspection of storage area; Verification of records	Minimal cost to SW (visual inspection of storage area and verification

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	response plan as part of the CESMP; ii. ensure all storage containers are in good condition with proper labeling; and iii. store diesel fuel, waste oil, used lubricant and other hazardous materials in tightly sealed containers located in dedicated storage facility providing retention capacity (secondary containment to 100% of the tank capacity) in case of leakages Measures for clean-up and handling of contaminated materials include: i. immediate clean-up of spills; ii. oil-stained wastes and used oil to 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, spill kits, etc.; iv. restoration of temporary work sites will include removal,				Records of accidental releases Measures for clean-up and handling of contaminated materials Training records of personnel for hazardous materials;	Daily and as necessary	of records only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	treatment, and proper disposal of oil contaminated soils; v. discharge of oil contaminated water into the environment to be prohibited; and vi. construction personnel designated to handle fuels/hazardous substances to be trained particularly in spill control procedures						
Dust and On-site Air pollution	The contractors will be required to: i. conduct regular water spraying of roads, work areas and other construction-related facilities to minimize dust generation; ii. ensure construction materials stockpiles are 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. provide trucks transporting loose construction materials such as sand, gravel, and spoils with tight tarpaulin cover or	Part of contractors' bid cost	Contractor	PMU	Dust generation Smoke emitting equipment, Open burning of materials	Visual inspection of sites Daily	Minimal cost to SW (visual inspection of sites only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	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.						
Generation of Solid Waste	The contractors will be required to: i. prepare a waste management plan as part of the CESMP; ii. provide garbage bins and facilities within the project site for temporary storage of construction waste and domestic solid waste; iii. separate solid waste into hazardous, non-hazardous and reusable waste streams and store temporarily on-site in secure facilities with weatherproof flooring and roofing; iv. ensure that wastes are not haphazardly dumped within the subproject site and adjacent areas; v. encourage re-use of excavated excess soil;	Part of contractor bid cost	Contractor	PMU	Contractor's disposal plan	Inspection of disposal site After submission of disposal plan	Minimal cost to SW (visual inspection of site and verification of plans only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	vi. regularly dispose of wastes to an accepted disposal site as approved by SW-PMU; and vii. prohibit burning of all types of wastes						
Construction noise and vibration	The contractors will be required to: i. Before site works commence, a Noise and Vibration Control Plan shall be prepared by the Contractor as part of CESMP; ii. Conduct regular noise level monitoring using noise meter (the limits near residential area are 55 and 45 dB(A) during daytime and nighttime, respectively; iii. Restrict noisy activities to daytime (6:00-19:00) and avoid nighttime activities; iv. Provide prior notification to the community on schedule of construction activities; v. Whenever applicable, provide noisy equipment with noise reduction covers; all construction equipment and vehicles shall be well	Part of contractors' bid cost	Contractor	PMU	Noise level Normal operation schedule	Noise meter Daily / as necessary	Minimal cost to SW after purchasing of noise meter reader

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	maintained, regularly inspected for noise emissions, and shall be fitted with appropriate noise suppression equipment consistent with applicable national regulations; vi. Position stationary equipment that produces elevated noise levels, such as diesel generators and air compressors, as far as practicable from houses and other receptors; vii. Prohibit operation of noisy equipment and construction works in populated areas and where sensitive receptors are found during nighttime (19:00 – 06:00); viii. If nighttime operation, ensure prior notification and consultation will be made with affected people and local officials, and implement suitable noise reduction measures						
Occupational health and safety at work sites	The contractors will be required to: i. prepare and implement a health	Part of contractors' bid cost	Contractor	PMU	Construction of health and safety plan	Verification of health and safety plan	Minimal cost to SW (visual inspection of

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	and safety plan (HSP) as part of their CESMP; ii. ensure that a properly equipped and resourced first aid station is available at all times; iii. provide potable water and adequate sanitation facilities including several hand washing stations to comply with Covid 19 obligations; iv. if required, provide adequate and well-ventilated camps and clean eating areas; v. provide separate sleeping quarters for male and female workers; vi. provide PPE suitable to tasks and activities undertaken to minimize exposure to a variety of hazards; vii. provide fire-fighting equipment and fire extinguishers in workshops, fuel storage facilities, construction camps, and any sites where fire hazard and risk are present; viii. ensure that all workers are aware of emergency response				First aid station, PPE, emergency response equipment and sanitation facilities Health and safety records (near miss, first aide, lost time accident)	Verification of health and safety record Visual inspection of site Daily	site and verification of plans and records only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	and medical evacuation procedures. Refer to Appendix for COVID-19 measures						
Community health and safety	The contractors will be required to: i. implement the various plans to minimize health and safety risks to the public; ii. use barriers and install signage to keep the public away from constructions sites and excavation sites; iii. provide prior notification to the community on schedule of construction activities; iv. provide security personnel in hazardous areas to restrict public access; v. operate construction night light in the vicinity of construction sites; vi. provide adequate safe passage for public, as necessary, across construction sites; and vii. ensure that any access to properties or establishments that have been disrupted or blocked by the ongoing construction activities, are	Part of contractors' bid cost	Contractor	PMU	Construction safety policy Hazards in the area Safety control such as signages, lightings, and barriers Health and safety records (near miss, first aide, lost time accident) Adherence to measures and ADB/WB COVID-19 guidelines	Verification of construction safety policy and health and safety record Visual inspection of site Daily	Minimal cost to SW (visual inspection of site and verification of plans only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	reinstated as quickly as possible or alternative access is provided. Refer to Appendix for COVID-19 measures						
Potential social issues due to influx of workers	Measures include: i. induction of all workers on Project requirements regarding safeguards (including child protection), GRM and CCP; ii. agreement to and implementation of protocols (including code of conduct) concerning the workers contact with the local communities; iii. contractor required to recruit approved service provider to deliver communicable diseases (STI, HIV and COVID-19 etc.) awareness and prevention program; iv. construction of camp specific for workers; v. no child labor will be employed in the project; vi. ensuring that sufficient water supply and temporary sanitation facilities including handwashing facilities are provided for	Part of contractors' bid cost	Contractor	SW's PMU	Implementation of workers induction, required protocols, and disease awareness and prevention program Administrative signages	Verification of records Visual inspection of site At start of work Monthly	Minimal cost to SW (visual inspection of site and verification of records only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	workers at work sites in order that community infrastructure is not over-burdened; vii. security at contractor's camp and yard to control access and prevent entry of the public (especially children); viii. workers' participation in addressing GBV issues will be set in an environment where women can openly converse with about these concerns. ix. implementation of GBV awareness training program for contractors (including subcontractors) site personnel						
Impacts on Cultural Heritage Resources	The contractor will be requested to develop and implement a "chance to find" procedure throughout the construction works to account for any undiscovered items identified during construction/excavation works. The procedure will include workers training, stop of works, preservation of discovered item, information chain, visit of a specialist if required	Part of specs preparation cost	Design Consultant	PMU	Tender documents	Verification of tender documents Once after preparation of tender documents	Minimal cost (part of consultant's task)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	(Solomon Island National Museum).						
Improper closure of construction sites after subproject completion.	Site restoration and removal of all temporary facilities, excess materials, equipment, plant, and excavated materials on site; all dumping will be to approved locations. Replanting of disturbed sites in accordance with replanting plan.	Part of contractors' bid cost	Contractor	PMU	Disturbed sites, staging areas and workers camps.	Visual inspection of sites Review and "clear" site remediation through issue of certificate Once when all site work is complete	Minimal cost to SW (visual inspection of site only)
OPERATIONS							
Natural Disaster Impacts	i. SW will develop an emergency response plan in response to natural disasters; ii. SW's staff including communities nearby will be trained on all SOPs associated with disaster management and implementation of the plan.	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	Emergency response plan Records of training	Verification of emergency response plan and records of training Weekly verification	Minimal cost (verification of documents only)
Generation of Site Waste	All solid and liquid waste generated from storage and office will be collected and disposed of in an approved manner and in an approved location.	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	Disposal plan	Inspection of disposal site After submission of disposal plan	Minimal cost to SW (visual inspection of site and verification of plans only)
Storage, Use and Transport of Hazardous Materials	Mitigation measures include: i. prepare a hazardous materials and waste management plan and	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	Measures required to prevent accidental releases	Visual inspection of storage area; Verification of records	Minimal cost to SW (visual inspection of storage area and

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	an emergency response plan; ii. ensure all storage containers are in good condition with proper labeling; and iii. store disinfectant and other hazardous materials in tightly sealed containers located in dedicated storage facility providing retention capacity (secondary containment to 100% of the tank capacity) in case of leakages. Measures for clean-up and handling of contaminated materials will include: i. immediate clean-up of spills, ii. oil-stained wastes and used oil to 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, spill kits, etc., iv. restoration of temporary work sites will include removal, treatment, and proper disposal of oil contaminated soils,				Records of accidental releases Measures for clean-up and handling of contaminated materials Training records of personnel for hazardous materials;	Daily and as necessary	verification of records only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	v. discharge of oil contaminated water into the environment to be prohibited; and vi. construction personnel designated to handle disinfectant/hazardous substances to be trained particularly in spill control procedures.						
Health and safety risks during operation and maintenance	Mitigating measures include: i. workers will be trained on health and safety aspects of operating a water supply facilities; ii. a facility health and safety manual will be prepared. An eyewash and shower system will be installed inside the chlorine room. iii. a system will be established for safe use and handling of chlorine materials in the workplace; iv. workers will be provided with the appropriate PPE for chlorine use and handling; and v. a five-foot-high fence will be erected to control access and avoid exposing the public to any hazard due to the presence of	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	Written management procedures SOPs	Verification of management procedures, SOPs and records Weekly verification Implementation of SOPs	Minimal cost (verification of documents only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	the water supply facilities.						
Health hazard due to unplanned delivery of poor water quality	Mitigating measures include: i. implementing SW's water safety plan as advocated by the WHO; ii. SW will continue to practice water chlorination and ensure that adequate residual disinfection will be maintained to control microbial contamination.	Part of SW's operational cost	SW's Operations Department	SW's Operations Dept. Mgt.	WSP Physical, Chemical and Biological parameters	Verification of WSP implementation Water sampling and laboratory test Monthly for plan and for bacteria; Annual for physical & chemical	Part of SW's operational cost
Unplanned Outages and Emergencies	Mitigating measures include: i. identification of potential causes of unplanned outages and emergencies will 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	Part of SW's operational cost	SW's Operations Dept.	SW's Operations Dept. Mgt	Written management procedures SOPs	Verification of management procedures, SOPs and records Weekly verification Implementation of SOPs	Minimal cost (verification of documents only)

Activity/Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Mitigation Cost	Implemen-tation	Supervision/ Monitoring	Aspects/ Parameters to be monitored	Means of Monitoring/ Frequency	Monitoring Cost
	associated automatic transfer switch of the backup power 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.						

8.6 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

329. The Environmental and Social Monitoring Plan (ESMoP) presents a set of critical environmental parameters that will allow SW to ensure environmental compliance and sustainability of the project operations.

330. Environmental monitoring is required across all phases of subproject implementation. The monitoring meets two objectives to ensure: (i) that mitigation measures are effective in reducing/managing impacts, and identify corrective actions as required; and (ii) that safeguard requirements are being complied with by the contractor and the implementing agency (on behalf of government).

331. The ESMoP for Munda water supply components are presented from **Table** 8-4 and **Table** 8-5.

332. **Pre-construction monitoring**. Details are in the ESHS specifications which are part of the bidding documentation and which form part of the contract. Relevant aspects of the ESMP shall be incorporated in these documents. The PMU shall verify if these aspects are incorporated in the said documents first during submission of the draft documents and later during submission of the draft final documents.

333. **Construction monitoring.** Contractors are expected to implement the relevant aspects of each project's ESMP as per their approved CESMP during execution of the construction activities as stipulated in their contracts. The contractors' CESMP will detail the monitoring plan (based on the component ESMP and the attached monitoring plans) with details on staff, resources, implementation schedules, and monitoring procedures (parameters, frequency etc.).

334. Compliance with the approved CESMP will be the basis for inspections and audits by PMU and the ADB and WB. The bidding document will include provisions requiring the contractor to submit their CESMP which will include a section on monitoring which should be linked to allocation of budget and staff for implementation.

335. **Reporting.** Overall, the Project will establish a system of reporting. The contractor will prepare monthly reports which will include a section on compliance with the approved CESMP, corrective actions, training and the like. This will also record any grievances lodged and project communications undertaken by the contractor. The PMU will review and consolidate information from the monthly reports of all components. The quarterly progress report (QPR) prepared by the PMU will include a section on safeguards implementation summarizing the monthly reports (including training and capacity development activities).

336. A semi-annual safeguard monitoring report will be submitted to ADB and WB. This report will be based on the QPR and will include the environmental performance of each component.

Table 8-4: Environmental and Social Monitoring Plan for Laying of Water Supply Pipelines

Concern	Parameter to be Monitored		Sampling & Measurement Plan			Responsible	Annual Estimated Cost
			Method	Frequency	Location		
Pre-construction and construction phase							
Solid and hazardous waste generation	• Weight or volume of wastes generated		Weighing/log-book recording	Daily	Construction areas	Contractor; PMU	Minimal cost (verification of documents only)
Siltation of nearby surface water	Parameter	Acceptable Limits	Grab sampling and use of turbidity tube	Monthly	Surface water upstream and downstream near project site	Contractor; PMU	$50 per event per station
	• Turbidity (to be calibrated against TSS for initial measurements)	• 20 NTU (default trigger values for slightly disturbed marine ecosystems)					
Air quality and noise	Parameter	Acceptable Limits	Noise meter and handheld PM_{10} dust meter	Monthly	Project Site	Contractor; PMU	Minimal cost to SW after purchasing of meter reader
	• Dust	• 20 µg/Ncm (IFC Guideline for PM_{10})					
	• Noise	• 55 dBA (Daytime), 45 dBA (Nighttime) (IFC-EHS Guidelines for residential, institutional, educational) • 70 dBA (Daytime and Nighttime) (IFC-EHS Guidelines for industrial, commercial)					
Employment	• Number of locally employed personnel • No workers are underage		Logbook/ database registration	Daily	Administration office of the project site	Contractor; PMU	Minimal cost (verification of documents only)
Occupational health and safety	• No. of work-related illnesses/injuries • No. of safety man-hours • Worker training records		Logbook/ database registration	Daily	Administration office of the project site	Contractor; PMU	Minimal cost (verification of documents only)

Concern	Parameter to be Monitored		Sampling & Measurement Plan			Responsible	Annual Estimated Cost
			Method	Frequency	Location		
Pre-construction and construction phase							
Relation with local communities and authorities	• Complaints from nearby community		Logbook/ database registration	Daily	Administration office of the project site	Contractor; PMU	Minimal cost (verification of documents only)
Operation Phase							
Solid waste generation	• Weight or volume of wastes generated		Weighing/log-book recording	Daily/Weekly	Project Site	SW's Operations Department	Minimal cost (verification of documents only)
Water Quality	Parameter	Acceptable Limits	Grab sampling and laboratory analysis	Monthly for bacteria; Annually for physical & chemical	Identified sampling locations	SW's Operations Department	Part of SW's operational cost
	• Bacteria, • Physical, • Chemical Parameters	• Refer to WHO Guideline					
Occupational health and safety	• No. of work-related illnesses/injuries • No. of safety man-hours • Worker training records		Logbook/database registration	Daily	Administration Office of the Project	SW's Operations Department	Minimal cost (verification of documents only)

Table 8-5: Environmental and Social Monitoring Plan for Construction of Reservoir

Concern	Parameter To Be Monitored		Sampling & Measurement Plan			Responsible	Annual Estimated Cost
			Method	Frequency	Location		
Pre-construction and construction phase							
Solid and hazardous waste generation	• Weight or volume of wastes generated		Weighing/log-book recording	Daily	Construction areas	Contractor; PMU	Minimal cost (verification of documents only)
Siltation of nearby surface water	Parameter	Acceptable Limits	Grab sampling and use of turbidity tube	Monthly	Surface water upstream and downstream near project site	Contractor; PMU	$50 per event per station
	• Turbidity (to be calibrated against TSS for initial measurements)	• 20 NTU (default trigger values for slightly disturbed marine ecosystems)					
Air quality and noise	Parameter	Acceptable Limits	Noise meter and handheld PM_{10} dust meter	Monthly	Project Site	Contractor; PMU	Minimal cost to SW after purchasing of meter reader
	• Dust	• 20 µg/Ncm (IFC Guideline for PM_{10})					
	• Noise	• 55 dBA (Daytime), 45 dBA (Nighttime) (IFC-EHS Guidelines for residential, institutional, educational) • 70 dBA (Daytime and Nighttime) (IFC-EHS Guidelines for industrial, commercial)					
Employment	• Number of locally employed personnel • No workers are underage		Logbook/ database registration	Daily	Administration office of the project site	Contractor; PMU	Minimal cost (verification of documents only)
Occupational health and safety	• No. of work-related illnesses/injuries • No. of safety man-hours • Worker training records		Logbook/ database registration	Daily	Administration office of the project site	Contractor; PMU	Minimal cost (verification of documents only)

Concern	Parameter To Be Monitored	Sampling & Measurement Plan			Responsible	Annual Estimated Cost
		Method	Frequency	Location		
Pre-construction and construction phase						
Relation with local communities and authorities	• Complaints from nearby community	Logbook/ database registration	Daily	Administration office of the project site	Contractor; PMU	Minimal cost (verification of documents only)
Verification of ownership or formal lease arrangement	• Records of consultations • Contracts for local materials	Database registration	Once	Administration office of the project site	Contractor; PMU	Minimal cost (verification of documents only)
Storage of hazardous materials (diesel, chlorine, etc.)	• Weight or volume of hazardous materials	Weighing/log-book recording	Daily	Construction areas	Contractor; PMU	Minimal cost (verification of documents only)
Operation Phase						
Solid and hazardous waste generation	• Weight or volume of wastes generated	Weighing/log-book recording	Daily/Weekly	Project Site	SW's Operations Department	Minimal cost (verification of documents only)
Contamination of water sources	• Water source protection measures e.g., fencing, signage, zoning, etc.	Water Safety Plan	Once	Project Site	SW's Operations Department	Part of SW's operational cost
Water Quality	Parameter: • Bacteria, • Physical, • Chemical Parameters, • Chlorine Residual Acceptable Limits: • Refer to WHO Guideline	Grab sampling and laboratory analysis	Monthly for bacteria; Annually for physical & chemical	Identified sampling locations	SW's Operations Department	Part of SW's operational cost
Occupational health and safety	• No. of work-related illnesses/injuries • No. of safety man-hours • Worker training records	Logbook/database registration	Daily	Administration Office of the Project	SW's Operations Department	Minimal cost (verification of documents only)
Storage of hazardous materials (diesel, chlorine, etc.)	• Weight or volume of hazardous materials	Weighing/log-book recording	Daily	Project Site	SW's Operations Department	Minimal cost (verification of documents only)

9.0 PUBLIC CONSULTATION AND PARTICIPATION

9.1 CONSULTATION ACTIVITIES

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

9.2 DURING FEASIBILITY STUDY STAGE

338. During the feasibility study stage, a series of stakeholder consultations and focus group discussions (FGD) were held on May 2019 and on 11 May 2020 in Munda and then in August 2021. The first consultation was held to provide initial information and generate community feedback about the proposed water supply improvement project. The follow-up consultation provided updated information about the project, confirm support, and identify any stakeholder concerns and recommendations. These consultations confirmed continued high-level support for the project by Munda communities including possible APs. The minutes of first consultations are provided as **Appendix 9** of this document. Key community concerns/suggestions during consultations include:

- (i) Why water connection is not reaching households in Likohana to Croks bar and Kindu being within the town?
- (ii) Request for a T connection for households moving in-land.
- (iii) Some people do not want to pay for water connection.
- (iv) Type of wastewater treatment by SW?

Key community recommendations include:

- (v) Pipeline not to affect private properties.
- (vi) Use of cash water (prepay) meter?
- (vii) To continue having community consultations about project progress.

The above concerns are mainly related to the network distribution which is not in the scope of the project. The above recommendations are incorporated in the project process.

9.3 CONSULTATIONS DURING PROJECT IMPLEMENTATION

339. Due to the changes on project components, it is recommended for SW to update the stakeholders with the changes through consultation activities. In line with this, 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 particularly in resolving and mitigating project impact affecting any sector of the community. 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.

340. Community based information, education activities will be undertaken to increase community awareness and participation in water catchment protection. Community of elders, women and youth can be organized into a local management group that will lead in the community based -protection activities.

10.0 CONCLUSION

341. The subproject covered in this assessment will offer benefits to Munda by ensuring adequate supply of potable water and delivering high priority elements of SW's 30-Year Strategic Plan and 5-Year Action Plan.

342. The environmental and social screening process has highlighted the environmental and social issues and concerns of the proposed components. Based on the screening for potential environmental and social impacts and risks of the proposed components, there are no significant negative environmental and social impacts or risks that cannot be mitigated or managed. The ESMP prepared for each component will be updated and used as the basis for preparation of the CESMP to be prepared by the contractor. Monitoring and reporting of the approved CESMP will ensure that each component can be implemented in an environmentally acceptable manner. There is no need for further environmental assessment. This IEE will accompany the development consent application for each component.

343. In addition, each component is hereby recommended with emphasis on the following:

- Tendering process will advocate environmentally responsible procurement by ensuring the inclusion of ESMP provisions in the bidding and construction contract documents.
- Contractor's submission of a CESMP will be included in the construction contract.
- Contract provisions on the creation and operation of the community advisory committees.
- Training of SW's personnel on operation and maintenance before actual operation.
- 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
- SW will continue the process of public consultation and information disclosure during detailed design and construction phases.
- The existence of the Project's GRM will be publicized through public awareness campaigns, billboards, public notifications, etc. GRM procedures will be disclosed to the public in consultation meetings.

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12.0 APPENDICES

Appendix 1: Solomon Islands International Agreements

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

2. **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.

3. **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.

4. **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) Cartegena Protocol on Biosafety. Acceded 2004. Protection of human health and the environment from possible adverse effects of modern biotechnology.

5. **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 (UNFCC). Ratified 1994, and (iv) Kyoto Protocol. Ratified 2003. Reduce greenhouse gases especially CO2 by an average of 5.2% by 2012.

6. **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: Result of Geotechnical Investigation Report

Borehole Log

7. The SPT N value shows presence of gravelly sand with an N value of 21 below 450 mm; therefore, the value of load bearing capacity is generally showing about 300 kPa and above.

8. Below 1m, the hammer drops 30 times for the first 150mm and 70 times for the additional 150mm. At 2m depth, the hammer drops 57 times and 72 times for the additional 150mm. Drilling with coring recovery sampling was observed at 3m to 6m depth. There was no sample recovered at 7m depth, that is why SPT were done at 7.5m depth with N value of 26. At 8m depth, the SPT N value is 62. At 9m depth, the hammer drops 47 times for the first 150mm and 60 times for the second 150mm. At 10m depth, the hammer drops 26 times for the first 150mm and 70 times for the second 150mm.

Laboratory Analysis

9. **Unconfined Compression Test**. The unconfined compression test was done using Schmidt Hammer. **Table 1** shows the test results of rock strength.

Table 1: Particle Size Distribution

Depth, m	Strength, kPa
3	18,000
6	19,000
9	30,000

Source: Geotechnical Investigation Report – Munda Water Supply Project

10. The borehole results and SPT N values is showing gravel coral at proposed site of Munda storage tank.

Appendix 3: List of Protected Areas and Their Status in Western Province

No.	Management Area	Reserve Type	Status	Management Authority
1	Ladosama Reef	LocallyManaged Marine Area	Established	Local village community
2	Jorio Marine Resource Management Plan	Locally Managed Marine Area	Gazetted under the Fisheries Management Act	Local village community
3	Varu North Reef	Marine Protected Area	Gazetted under the Fisheries Management Act	WWF, WorldFish, Gizo community
4	Njari Island	Marine Protected Area	Gazetted under the Fisheries Management Act	WWF, WorldFish, Gizo community
5	Saeraghi Reef	Marine Protected Area	Gazetted under the Fisheries Management Act	WWF, WorldFish, Gizo community
6	Hot Spot Reef	Locally Managed Marine Area	Established	Community
7	Pusinau Reef	Marine Protected Area	Gazetted under the Fisheries Management Act	WWF, WorldFish, Gizo community
8	Kogulavata Reef	Locally Managed Marine Area	Proposed	Community
9	Suvania Reef	Marine Protected Area	Gazetted under the Fisheries Management Act	WWF, WorldFish, Gizo community
10	Nusatupe Reef	Locally Managed Marine Area	Established	Community
11	Babanga Reef	Locally Managed Marine Area	Established	Community
12	Naru Reef	Locally Managed Marine Area	Established	Local village community
13	Grant Island, Patuparoana	Marine Protected Area	Gazetted under the Fisheries Management Act	Local village community
14	Alale, Grant Island	Locally Managed Marine Area	Established	Community
15	Karikasi Reef	Marine Protected Area	Gazetted under the Fisheries Management Act	Local village community
16	Niumala	Locally Managed Marine Area	Established	Community
17	Bakiha Reef	Locally Managed Marine Area	Established	Local village community
18	Kolombangara Forest Reserve	Controlled Forest	Proposed	Kolombangara Island Biodiversity Conservation Association
19	Kolombangara Island	Community-Based Management Area	Gazetted under the Fisheries Management Act	Kolombangara Island Biodiversity Conservation Association
20	Koqu Rua	Marine Protected Area	Gazetted under the Fisheries Management Act	Community

No.	Management Area	Reserve Type	Status	Management Authority
21	Iriri Pasapasa	Marine Protected Area	Gazetted under the Fisheries Management Act	Local village community
22	Lodu Hokata	Marine Protected Area	Gazetted under the Fisheries Management Act	Community
23	Nazareti	Locally Managed Marine Area	Established	Community
24	Kinamara	Locally Managed Marine Area	Established	Community
25	Saika	Locally Managed Marine Area	Established	Community
26	Kida	Locally Managed Marine Area	Established	Community
27	Barasipo	Locally Managed Marine Area	Established	Community
28	Buni	Locally Managed Marine Area	Established	Community
29	Barivuto	Locally Managed Marine Area	Established	Local village community
30	Beta/Kandilae-Kindu	Locally Managed Marine Area	Established	Community
31	Kekehe	Locally Managed Marine Area	Established	Community
32	Dunde (Shark Point)	Marine Protected Area		Local village community
33	Dunde	Locally Managed Marine Area	Established	Community
34	Nusa Roviana	Locally Managed Marine Area	Established	Community
35	Sasavele/NB	Marine Protected Area/Tabu	Gazetted under the Fisheries Management Act	Local village community
36	Baraulu/Bule Lavata	Locally Managed Marine Area	Established	Community
37	Duduli Rereghana	Locally Managed Marine Area	Established	Community
38	Nusa Hope/Heloro	Locally Managed Marine Area	Established	Community
39	Ha'apai	Locally Managed Marine Area	Established	Community
40	Nusa Hope (Mangrove)	Locally Managed Marine Area	Established	Community
41	Olive	Locally Managed Marine Area	Established	Community
42	Kozou–Zone 1	Locally Managed Marine Area	Established	Community
43	Rendova Harbor	Marine Protected Area/Tabu	Established	Local village community
44	Tetepare	Community-Based Management Area/Marine Protected Areas	Proposed	Tetepare Descendants Association
45	Pipa/Kororo (Marovo	Marine Protected Area/Tabu	Gazetted under the Fisheries Management Act	Local village community

No.	Management Area	Reserve Type	Status	Management Authority
46	Variparui Island	Marine Protected Area/Tabu	Gazetted under the Fisheries Management Act	Local village community
47	Petu Island	Marine Protected Area	Gazetted under the Fisheries Management Act	Local village community
48	Vaininoturu Island	Marine Protected Area	Gazetted under the Fisheries Management Act	Local village community
49	Vena Island	Marine Protected Area	Gazetted under the Fisheries Management Act	Local village community
50	Inuzaru Island	Locally Managed Marine Area	Established	Community
51	Jericho Reef	Locally Managed Marine Area	Established	Community
52	Niami Reef	Locally Managed Marine Area	Established	Community
53	Renjo Reef	Locally Managed Marine Area	Established	Community
Source: IFC Baseline Analysis 2020				

Appendix 4: Terrestrial Protected Areas in Solomon Islands

Province	Protected Area	Size	Flora Biodiversity	Fauna Biodiversity
Guadalcanal	Lauvi Lake	200 ha	Floating meadows include three species of Cyperaceae. Extensive areas of pandanus, beach side dominated with fu'u Barringtonia asiatica. Other species are also common in the community e.g., *Hibiscus tiliaceus*. Thus, there are also many other species growing around the areas (Less, 1990).	Outstanding habitat for crocodiles. Wetland birds and the Australian dabchick which was a new record for the Solomon Islands. About 40 bird sp. are found, 9 are endemic to the Solomon Islands (Less, 1990).
	Itina Popomanaseu	30,000 ha	6 species (sp) of pioneer trees located on gravel beds of braided river sites e.g., salu; *Casuarina equisetifolia*. On slightly higher ground, 5 sp. of trees are common e.g., Akwa. Evident at the ultra-basics are mudi; (*Dillenia crennata*). Common in montane forest are trees of non-flowering plant family, Podocarpaceae including 3 sp and 5 sp of the Myrtle family. The four epiphytic rhododendrons that are unique to Solomon Islands are all found on peaks of the proposed protected area and the endemic mountain shrub, Vaccinium (Less, 1990)	Habitat for many animals including four bird species endemics to Gaudalcanal and the Gaudalcanal endemic giant rat (Uromys imperator). 1990 mammal survey of Mt Makarakomburu found a new sp. of bat along with nine other bat sp, four frog and eight reptile sp. Thirteen bird sp. were recorded including rare Guadalcanal honeyeater Guadalcanaria inexpectata. Mt Popomanaseu is only place in the Solomon Islands where terrestrial mollusk has generated endemic montane species. Restricted to these mountains include arboreal *Placostyllus selleersi* and undescribed sp. Helixarion and Trochomorpha. Birds of the Itina River proposal area recorded 44 bird sp., 13 are known to be endemic sp. in the Solomon Islands (Less, 1990).

Province	Protected Area	Size	Flora Biodiversity	Fauna Biodiversity
Western	Marovo Lagoon	70,000 ha	5 principal forest types. Lowland forest, small island and barrier island forest, mangrove forest, montane forest and heaths.	52 sp. of land and freshwater birds and 9 species are endemic to the lagoon. 10 species of Sea and shorebirds.
	Kolombangara	All forest above 460m (70,000 ha is the island	12 principal species of forest trees and moss-covered montane forest caps (Less, 1990)	Richest avifauna with 80 species recoded. 2 species are confined to montane forest and are unique to the island. (Less, 1990).
	Rendova	The island 40,000 ha	Common Montane Forest trees species are *Casuarina papuana*, lower altitude forest predominance of *Camnosperma revipetiolatum*, Others include mosses, palms, *Pometia pinnata*, *Pterocarpus indicus*. (Less, 1990).	Support unique white eye species *Zosterops rendova*. Crocodiles are evident in lakes and lagoon. Two species of frogs have been recorded from Rendova (Less, 1990).
	Faroro Islands - Shortlands	?	Dominated by akwa *Pometia pinnata*, *Vasa Vitex cofassus* and *Canarium salomonense*. Smaller trees include Myristica sp., *Laelae Celtis phillippnensis*, *Crytocarya Litsea* sp (Less, 1990).	Best nesting sites for turtles. Presence of Skink *Triblonotus ponceleti* known from only tree specimen, two from Shorthlands and one from Bougainville (Less, 1990).
Choiseul	Mt. Maetambe	22,500 ha	Dominate tree species akwa and Vasa. These two trees and Laelae are characteristics of valley bottoms, on ridge crest Eugenia sp., buni and kaumau Calophyllum sp. are common. (Less, 1990).	Seven sp. of frogs, one endemic sp., two rare butterfly sp. Presence of three giant rats, two of which are new record, 26 bird species with 6 are endemic (Less, 1990).
	South Choiseul	30,000 ha	Different forest composition from Ysabel and	Crocodiles are evident. Has significant nesting beach for turtles. Forest

Province	Protected Area	Size	Flora Biodiversity	Fauna Biodiversity
			Guadalcanal growing on ultra-basic rock. Forest is species poor with an open canopy and straggling emergent trees over dense undergrowth of pandanus, gingers, ferns and climbers. Mangrove forest found Ologholata in the north of the proposed reserve (Less, 1990).	growing on ultra-basic rock noticeably has low bird numbers. 35 bird sp., 11 are endemic (Less, 1990).
	Mt Televodo	?	The features are closely similar to the description given for the limestone forest cover occurring in Mt Maetabe (Less, 1990).	The features are closely similar to the description given for the limestone forest cover occurring in Mt Maetabe (Less, 1990).
Isabel	North western Isabel	120,000 ha	Peninsula dominated with kekete (*Campnosperma brevipetiolata*) indicating exposed to prevailing high winds and cyclones. Akwa, vasa, andoa, lu usi are also found on ridges that run through the peninsula. Where slopes are fa alo, bamboo, gingers and Macaranga sp. Akwa is common in lowland forest. Smaller trees include Agaia spp, ai aasila (*Neoscortchhinia forbesii*), laelae, Myristica sp, palms and pandanus. Patches of beach forest containing 5 species of trees (Less, 1990).	Crocodiles were evident. It contains 65% of nesting sites of green and hawksbill turtles. Sea eagles, Brahminy kite, osprey and terns are also evident. Migratory birds use the islands and tidal flats as resting and feeding area during November to January e.g., whimbrel *Numenius phaeopus* (Less, 1990).
	Mt Kubonitu	?	Supports montane forest with ailumu	Meeks Iory *Charmomosyna meek*i,

Province	Protected Area	Size	Flora Biodiversity	Fauna Biodiversity
			Diiridium *xanthandrum*, akiri Ochrosia sp, koadila *Pemphis acidula* and Eugenia spp. (Less, 1990).	white rumped swiftlet *Collocalisa spodiopygia*, pigmy parot *Micorspitta finschii*, Melanisian gray bird *Coracina caledonica* and the golden whistler *Pachycephala pectoralis*.(Less, 1990).
	Casuarina swamp	2,500 ha	Dominated with hardy malasalu *Casuarina papuana* and *Dacryduim xanthadrum*. On swapy grounds *Calophyllum vexans*, bou *Fagrea gracilipes* and gwarogwaro *Calophyllum vitiense*. Ferns and Savanna (Less, 1990).	Is designed for the forest.
Makira	Central – Bauro highlands	350,000 ha	Akwa dominate lowland forest and lower hill slopes. 8 sp of trees are also common in this zone e.g Rosswood. Above the zone where akwa is predominant 6 sp of trees are common e.g., abalolo. Common small trees are Myritica sp. and aisubu *Pimeliodendron amboinicum*. Above 700 m 5 sp. of trees are common eg aitootoo (surukakahu) *Weinmannia blumei*, Cyathea tree ferns and palms are also common. At highest altitude montane forest is found with 8 different spp of trees. Forest floor	Several of Makira's endemic sp are restricted to the mossy cloud forest of the highest ridges eg Keea (Makira mountain tail), waisure (Makira ground trash), ghoghoharighi (shade warbler) and the dusky fantail are found in these forest and nowhere else in the world. 49 Birds recorded, 5 endemics to Solomon and 5 endemics to Makira (Less, 1990).

Province	Protected Area	Size	Flora Biodiversity	Fauna Biodiversity
			is covered with moss (Less, 1990).	
	Western wetlands	2,50 ha	A tall mixed swamp forest featuring dafa *Terminalia brassii* and rufa *Eugenia tierneyana* on wet land edges. In the wetted parts of the swamps pandanus, bamboo and ferns form a complete cover one to three meters high (Less, 1990).	No information provided.
Malaita	Central Highlands	12,500 ha	Common in the lowland forests are 4 sp. of trees eg akwa, rosswood and vasa. On lower riverine terraces 3 sp. are also common e.g., lamilami, liki and akwa (Less, 1990).	57 bird sp are recorded, 9 endemics to Solomon Islands, 13 endemic to Malaita (Less, 1990).
	Maramasike Ar'are	150,000 ha	Large figs and 11 tree sp e.g., akwa are common at the end of the maramasike passage. The hill forest behind both Maramasike and Are'are commonly features 7 of the species mentioned above together with 5 other sp e.g., Cryptocarya sp. (Less, 1990).	Excellent habitat for crocodiles. About 60 bird sp. are recorded, 7 endemics to Solomon Islands and 10 endemics to Malaita (Less, 1990).
Temotu	Kauir Reserve	200 ha	Kauri Agathis macrophylla in the Solomon Islands is found only in Temotu Province (Less, 1990).	

Appendix 5: Guidance on Managing Risk from COVID-19 on Construction Sites and in Worker's Camp

Introduction:

1. The COVID-19 outbreak represents significant health and safety risks that were not anticipated during the project appraisal stage and are not reflected in any projects safeguards documents, most importantly the Environmental and Social Management Plan which includes Health and Safety.
2. In accordance with the ADB Safeguard Policy Statement (2009), the Borrower is required to assess implications of unanticipated risks and impacts and to identify and implement necessary risk mitigation measures.
3. This guidance document sets out a series of recommended measures that can be implemented to manage the risk on construction sites from COVID-19. It also includes a specific set of measures for construction work camp management which relate to both the management of COVID-19 risk as well as general Health and Safety.
4. These are general guidelines recommended by the Asian Development Bank's Southeast Asia Department based on international good practice and should be used together with country-specific COVID-19 risk management regulations or directives. The guidance document may be used as part of EMP preparation and can be shared with works contractors should they request guidance on COVID-19 risk management.

Sources of Information:

5. Guidance is being updated regularly as knowledge of COVID-19 improves. This document is based on good international practice, using guidance from World Health Organization (WHO), International Labor Organization (WHO) and national guidance from the UK and Canada and a review of other national government public information on COVID-19.

Quarantine or Isolation for COVID-19:

6. Guidance is being updated regularly as knowledge of COVID-19 improves. This document is based on good international practice, using guidance from World Health Organization (WHO), International Labor Organization (WHO) and national guidance from the UK and Canada and a review of other national government public information on COVID-19.
7. Contractors must ensure the safe quarantine or isolation of workers and that this does not impact on their employment status.

Construction site working conditions Mitigation measures for COVID-19	
1. Form a joint team to plan and organize return to work	▪ Develop or convene a joint occupational safety and health committee with members representing the employer and workers. ▪ Train team members on the basic principles for the formulation and implementation of occupational safety and health preventive and control measures. ▪ Develop and communicate a work plan on safe working for COVID-19. Such plan should be fully aligned with any government regulations and guidelines on COVID-19 prevention and control, or in the absence thereof, with international good practice guidelines as may be updated from time to time.
2. Risk assessment to decide when to work, who works and how	▪ Undertake a risk assessment to determine the preventive and control measures. ▪ Ensure preventative measures are in place before resuming or beginning construction work.
3. Adopt engineering, organizational and administrative measures	▪ Avoid physical interaction and maintain physical distancing requirements as prescribed by national policy, or in the absence thereof, international good practice. ▪ Ventilate enclosed workplaces including work camps and communal spaces. ▪ Avoid concentration of workers - limit the capacity of common areas such as work camp dining rooms and changing rooms to allow the minimum separation of 2 meters and organize one-way systems. This includes sleeping areas which must be a minimum of 2 meters between beds. ▪ Put in place training and information on COVID-19 and measures required for its management. ▪ The construction site is to be segregated to the extent possible in zones or other methods to keep different crews physically separated at all time. ▪ Stagger break and lunch schedules to minimize the number of people in close proximity to one another
4. Regularly clean and disinfect	▪ Increase the frequency of cleaning and disinfection, in particular heavily trafficked areas and common areas, including work camps. ▪ All door handles, railings, ladders, switches, controls, eating surfaces, shared tools and equipment, taps, toilets, and personal areas are wiped down at least twice a day with a disinfectant. ▪ Discourage the sharing of items such as cups, glasses, plates, tools.
5. Promote personal hygiene	▪ Provide workers with the conditions and means necessary for frequent hand washing (soap, water or alcohol gel) with a posted hand washing protocol at site entries, exits, bathrooms, communal areas, offices, and any other areas with commonly touched surfaces. ▪ Inform workers of the need to avoid physical contact when greeting, and avoid touching eyes, nose and mouth. ▪ Inform workers of the need to cover the mouth and nose with a disposable handkerchief when coughing or sneezing or the crook of their arm. ▪ Dispose of tissues in a lined and covered waste bin and wash hands afterwards
6. Provide personal protective equipment	▪ Identify appropriate PPE related to the tasks and health and safety risks faced by workers according to the results of risk

(PPE) and inform workers of its correct use	assessment and the level of risk, and provide it to workers free of charge and in sufficient number, along with instructions, procedures, training and supervision. ▪ Non-medical face-coverings (such as homemade cloth masks) should be worn as mitigation for catching and transmitting the virus, but are not to be treated as substitutes for proper handwashing.
7. Health surveillance and insurance	▪ Before entering the site, staff and visitors must confirm that they are not currently exhibiting flu-like symptoms. ▪ Monitor the health status of workers, develop protocols for cases of suspected and confirmed COVID-19. The protocol will state that: o workers with symptoms or confirmed cases must be isolated within the construction camp or stay at home for 7 days after symptoms started. o If symptoms persist after 7 days, the person must isolate until the symptoms stop. o People who have been in close contact with the person with confirmed COVID-19 be quarantined for 14 days. ▪ All workers in quarantine or isolation must be provided with adequate food, water, medical assistance and sanitation. ▪ Identify workers who have had close contact with people infected with COVID-19 and follow national medical guidance. ▪ Communicate confirmed cases of COVID-19 infection to the appropriate authorities. ▪ All workers should be provided with health insurance that includes COVID-19 treatment
8. Consider other hazards, including psychosocial	▪ Promote a safe and healthy working environment free from violence and harassment. ▪ Encourage health promotion and wellbeing in the workplace through enough rest, balance of physical and mental activity and adequate work life balance. ▪ Implement prevention and control measures for the use and storage of chemicals, particularly those used for disinfection during COVID-19.
9. Review emergency preparedness plans	▪ Develop an emergency plan adapted to COVID-19 and regularly review it ▪ Communicate this to workers
10. Review and update preventive and control measures as the situation evolves	▪ Periodically monitor prevention and control measures to determine whether they have been adequate to avoid or minimize risk and identify and implement corrective actions for continuous improvement. ▪ Establish and maintain records related to work-related injuries, illnesses and incidents, worker exposures, monitoring of the work environment and workers' health.

Source: Adapted from ILO, WHO, Canada Construction Association, and UK Government

Worker Camp Siting and Management Mitigation Measures for Health and Safety and COVID-19	
1. Siting	▪ Not in area liable to flooding, landslide or other natural disaster ▪ Not in area affected by construction dust, noise, sewage or other pollution ▪ Not in a residential area
2. Minimum housing standards	▪ a separate bed for each worker ▪ beds should not be arranged in tiers of more than two; ▪ separate accommodation of the sexes or to accommodate couples ▪ adequate natural light during the daytime and adequate artificial light ▪ adequate ventilation to ensure sufficient movement of air ▪ adequate supply of safe potable water ▪ adequate sanitary facilities (see below); ▪ adequate drainage ▪ adequate furniture for each worker to secure his or her belongings, such as a locker. ▪ common dining rooms, canteens or mess rooms, located away from the sleeping areas ▪ appropriately situated and furnished laundry facilities ▪ reasonable access to plug sockets for charging telephones and other devices ▪ rest and recreation rooms and health facilities, where not available in the community.
3. Minimum accommodation sizes	Sleeping space ▪ Inside dimensions over 198 centimeters by 80 centimeters; Sleeping room: ▪ Headroom of over 203 centimeters allowing full free movement ▪ Beds minimum 2m apart for COVID-19 risk management
4. Sanitation Facilities	▪ One toilet, one tap / basin, one toilet for every 6 people ▪ Convenient location to accommodation ▪ Provision of soap ▪ Separate facilities for men and women ▪ Ventilation to open air ▪ Fresh cold running water ▪ Clean and hygienic ▪ Septic tank / sewage treatment facility, or pit latrines located at least 200m from surface waters, and in areas of suitable soil profiles and above the groundwater levels
5. Health and Safety within worker accommodation	▪ Separate area for sick workers to prevent transmission of disease ▪ Smoke detector in sleeping area ▪ Fire safety throughout accommodation such as fire extinguishers, fire alarms, fire blankets ▪ Worker training in fire prevention and procedures ▪ Fire exit sign, adequate means of escape and clearly maintained exit5 ▪ Security lighting within camp and for sanitation block and lighting for route from sleeping area to sanitation block. ▪ Electrical cables to be in safe condition, elevated and not in areas liable to flood
6. Inspection	▪ 2 weekly inspection to inspect for cleanliness, state of repair of building, accommodation and fire equipment. ▪ Record inspection results and retain for review

Source: Adapted from ILO Workers' Housing Factsheet No. 6

Appendix 6: Safeguards Considerations for Project Implementation during Covid-19

I. INFORMATION DISSEMINATION AND PUBLIC CONSULTATIONS

1. Identify and review planned activities under the project requiring stakeholder engagement and public consultations.
2. Assess the level of proposed direct engagement with stakeholders, including location and size of proposed gatherings, frequency of engagement, categories of stakeholders (international, national, local) etc.
3. Assess the level of risks of the virus transmission for these engagements, and how restrictions that are in effect in the country / project area would affect these engagements.
4. Identify project activities for which consultation/engagement is critical and cannot be postponed without having significant impact on project timelines. For example, selection of resettlement options by affected people during project implementation. Reflecting the specific activity, consider viable means of achieving the necessary input from stakeholders (see further below).
5. Assess the level of ICT penetration among key stakeholder groups, to identify the type of communication channels that can be effectively used in the project context.
6. Based on the above, the Project Proponent needs to identify the specific channels of communication that should be used while conducting stakeholder consultation and engagement activities. The following are some considerations while selecting channels of communication, in light of the current COVID-19 situation:
   - Avoid public gatherings (taking into account national restrictions), including public hearings, workshops and community meetings;
   - If smaller meetings are permitted, conduct consultations in small-group sessions, such as focus group meetings. If not permitted, make all reasonable efforts to conduct meetings through online channels, including webex, zoom and skype;
   - Diversify means of communication and rely more on social media and online channels. Where possible and appropriate, create dedicated online platforms and chatgroups appropriate for the purpose, based on the type and category of stakeholders;
   - Employ traditional channels of communications (TV, newspaper, radio, dedicated phone-lines, and mail) when stakeholders to do not have access to online channels or do not use them frequently. Traditional channels can also be highly effective in conveying relevant information to stakeholders, and allow them to provide their feedback and suggestions;
   - Where direct engagement with project affected people or beneficiaries is necessary, such as would be the case for Resettlement Action Plans or Indigenous Peoples Plans preparation and implementation, identify channels for direct communication with each affected household via a context specific combination of email messages, mail, online platforms, dedicated phone lines with knowledgeable operators;
   - Each of the proposed channels of engagement should clearly specify how feedback and suggestions can be provided by stakeholders;
   - An appropriate approach to conducting stakeholder engagement can be developed in most contexts and situations. However, in situations where none of the above means of communication are considered adequate for required consultations with stakeholders, consider if the project activity can be rescheduled to a later time, when meaningful stakeholder engagement is possible.

II. CIVIL WORKS

A. Responsibilities of the Project Proponent

1. The Project Proponent should request details in writing from the main Contractor of the measures being taken to address the risks. The construction contract should include health and safety requirements, and these can be used as the basis for identification of, and requirements to implement, COVID-19 specific measures. The measures may be presented as a contingency plan, as an extension of the existing project emergency and preparedness plan or as standalone procedures. The measures may be reflected in revisions to the project's health and safety manual.
2. The Project Proponent should require the Contractor to convene regular meetings with the project health and safety specialists and medical staff (and where appropriate the local health authorities), and to take their advice in designing and implementing the agreed measures.

3. Where possible, a senior person should be identified as a focal point to deal with COVID-19 issues. This can be a work supervisor or a health and safety specialist. This person can be responsible for coordinating preparation of the site and making sure that the measures taken are communicated to the workers, those entering the site and the local community. It is also advisable to designate at least one back-up person, in case the focal point becomes ill; that person should be aware of the arrangements that are in place.
4. On sites where there are a number of contractors and therefore (in effect) different work forces, the request should emphasize the importance of coordination and communication between the different parties. Where necessary, the Project Proponent should request the main contractor to put in place a protocol for regular meetings of the different contractors, requiring each to appoint a designated staff member (with back up) to attend such meetings. If meetings cannot be held in person, they should be conducted using whatever IT is available. The effectiveness of mitigation measures will depend on the weakest implementation, and therefore it is important that all contractors and sub-contractors understand the risks and the procedure to be followed.
5. The Project Proponent may provide support to projects in identifying appropriate mitigation measures, particularly where these will involve interface with local services, in particular health and emergency services. In many cases, the Project Proponent can play a valuable role in connecting project representatives with local Government agencies, and helping coordinate a strategic response, which takes into account the availability of resources. To be most effective, projects should consult and coordinate with relevant Government agencies and other projects in the vicinity.
6. Workers should be encouraged to use the existing project grievance mechanism to report concerns relating to COVID-19, preparations being made by the project to address COVID-19 related issues, how procedures are being implemented, and concerns about the health of their co-workers and other staff.

B. Responsibilities of the Contractor

1. The Contractor should prepare a detailed profile of the project work force, key work activities, schedule for carrying out such activities, different durations of contract and rotations (e.g. 4 weeks on, 4 weeks off). This should include a breakdown of workers who reside at home (i.e. workers from the community), workers who lodge within the local community and workers in on-site accommodation. Where possible, it should also identify workers that may be more at risk from COVID-19, those with underlying health issues or who may be otherwise at risk.
2. Consideration should be given to ways in which to minimize movement in and out of site. This could include lengthening the term of existing contracts, to avoid workers returning home to affected areas, or returning to site from affected areas.
3. Workers accommodated on site should be required to minimize contact with people near the site, and in certain cases be prohibited from leaving the site for the duration of their contract, so that contact with local communities is avoided.
4. Consideration should be given to requiring workers lodging in the local community to move to site accommodation (subject to availability) where they would be subject to the same restrictions.
5. Workers from local communities, who return home daily, weekly or monthly, will be more difficult to manage. They should be subject to health checks at entry to the site and at some point, circumstances may make it necessary to require them to either use accommodation on site or not to come to work.
6. Entry/exit to the work site should be controlled and documented for both workers and other parties, including support staff and suppliers. Possible measures may include:
   - Establishing a system for controlling entry/exit to the site, securing the boundaries of the site, and establishing designating entry/exit points (if they do not already exist). Entry/exit to the site should be documented.
   - Training security staff on the (enhanced) system that has been put in place for securing the site and controlling entry and exit, the behaviors required of them in enforcing such system and any COVID -19 specific considerations.
   - Training staff who will be monitoring entry to the site, providing them with the resources they need to document entry of workers, conducting temperature checks and recording details of any worker that is denied entry.
   - Confirming that workers are fit for work before they enter the site or start work. While

procedures should already be in place for this, special attention should be paid to workers with underlying health issues or who may be otherwise at risk. Consideration should be given to demobilization of staff with underlying health issues.

- Checking and recording temperatures of workers and other people entering the site or requiring self-reporting prior to or on entering the site.
- Providing daily briefings to workers prior to commencing work, focusing on COVID-19 specific considerations including cough etiquette, hand hygiene and distancing measures, using demonstrations and participatory methods.
- During the daily briefings, reminding workers to self-monitor for possible symptoms (fever, cough) and to report to their supervisor or the COVID-19 focal point if they have symptoms or are feeling unwell.
- Preventing a worker from an affected area or who has been in contact with an infected person from returning to the site for 14 days or (if that is not possible) isolating such worker for 14 days.
- Preventing a sick worker from entering the site, referring them to local health facilities if necessary or requiring them to isolate at home for 14 days.

7. Requirements on general hygiene should be communicated and monitored, to include:
   - Training workers and staff on site on the signs and symptoms of COVID-19, how it is spread, how to protect themselves (including regular handwashing and social distancing) and what to do if they or other people have symptoms.
   - Placing posters and signs around the site, with images and text in local languages.
   - Ensuring handwashing facilities supplied with soap, disposable paper towels and closed waste bins exist at key places throughout site, including at entrances/exits to work areas; where there is a toilet, canteen or food distribution, or provision of drinking water; in worker accommodation; at waste stations; at stores; and in common spaces. Where handwashing facilities do not exist or are not adequate, arrangements should be made to set them up. Alcohol based sanitizer (if available, 60-95% alcohol) can also be used.
   - Setting aside part of worker accommodation for precautionary self-quarantine as well as more formal isolation of staff who may be infected.
   - Conducting regular and thorough cleaning of all site facilities, including offices, accommodation, canteens, common spaces. Review cleaning protocols for key construction equipment (particularly if it is being operated by different workers).
   - Providing cleaning staff with adequate cleaning equipment, materials and disinfectant.
   - Reviewing general cleaning systems, training cleaning staff on appropriate cleaning procedures and appropriate frequency in high use or high-risk areas.
   - Where it is anticipated that cleaners will be required to clean areas that have been or are suspected to have been contaminated with COVID-19, providing them with appropriate PPE: gowns or aprons, gloves, eye protection (masks, goggles or face screens) and boots or closed work shoes. If appropriate PPE is not available, cleaners should be provided with best available alternatives.
   - Training cleaners in proper hygiene (including handwashing) prior to, during and after conducting cleaning activities; how to safely use PPE (where required); in waste control (including for used PPE and cleaning materials).
   - Any medical waste produced during the care of ill workers should be collected safely in designated containers or bags and treated and disposed of following relevant requirements (e.g., national, WHO). If open burning and incineration of medical wastes is necessary, this should be for as limited a duration as possible. Waste should be reduced and segregated, so that only the smallest amount of waste is incinerated.
8. Consider changes to work processes and timings to reduce or minimize contact between workers, recognizing that this is likely to impact the project schedule. Such measures could include:
   - Decreasing the size of work teams.
   - Limiting the number of workers on site at any one time.
   - Changing to a 24-hour work rotation.
   - Adapting or redesigning work processes for specific work activities and tasks to enable social distancing, and training workers on these processes.
   - Continuing with the usual safety trainings, adding COVID-19 specific considerations. Training should include proper use of normal PPE. While as of the date of this note, general advice is that construction workers do not require COVID-19 specific PPE, this should be

kept under review.

- Reviewing work methods to reduce use of construction PPE, in case supplies become scarce or the PPE is needed for medical workers or cleaners. This could include, e.g. trying to reduce the need for dust masks by checking that water sprinkling systems are in good working order and are maintained or reducing the speed limit for haul trucks.
- Arranging (where possible) for work breaks to be taken in outdoor areas within the site.
- Consider changing canteen layouts and phasing meal times to allow for social distancing and phasing access to and/or temporarily restricting access to leisure facilities.
- At some point, it may be necessary to review the overall project schedule, to assess the extent to which it needs to be adjusted (or work stopped completely) to reflect prudent work practices, potential exposure of both workers and the community and availability of supplies, taking into account Government advice and instructions.

9. Consider whether existing project medical services are adequate, taking into account existing infrastructure (size of clinic/medical post, number of beds, isolation facilities), medical staff, equipment and supplies, procedures and training. Where these are not adequate, consider upgrading services where possible, including:
    - Expanding medical infrastructure and preparing areas where patients can be isolated. (Guidance on setting up isolation facilities is set out in WHO interim guidance on considerations for quarantine of individuals in the context of containment for COVID-19). Isolation facilities should be located away from worker accommodation and ongoing work activities. Where possible, workers should be provided with a single well-ventilated room (open windows and door). Where this is not possible, isolation facilities should allow at least 1 meter between workers in the same room, separating workers with curtains, if possible. Sick workers should limit their movements, avoiding common areas and facilities and not be allowed visitors until they have been clear of symptoms for 14 days. If they need to use common areas and facilities (e.g. kitchens or canteens), they should only do so when unaffected workers are not present and the area/facilities should be cleaned prior to and after such use.
    - Training medical staff, which should include current WHO advice on COVID-19 and recommendations on the specifics of COVID-19. Where COVID-19 infection is suspected, medical providers on site should follow WHO interim guidance on infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected.
    - Training medical staff in testing, if testing is available.
    - Assessing the current stock of equipment, supplies and medicines on site, and obtaining additional stock, where required and possible. This could include medical PPE, such as gowns, aprons, medical masks, gloves, and eye protection. Refer to WHO guidance as to what is advised.
    - If PPE items are unavailable due to world-wide shortages, medical staff on the project should agree on alternatives and try to procure them. Alternatives that may commonly be found on constructions sites include dust masks, construction gloves and eye goggles. While these items are not recommended, they should be used as a last resort if no medical PPE is available.
    - Ventilators will not normally be available on work sites, and in any event, intubation should only be conducted by experienced medical staff. If a worker is extremely ill and unable to breathe properly on his or her own, they should be referred immediately to the local hospital.
    - Review existing methods for dealing with medical waste, including systems for storage and disposal.
10. Given the limited scope of project medical services, the project may need to refer sick workers to local medical services. Preparation for this includes:
    - Obtaining information as to the resources and capacity of local medical services (e.g. number of beds, availability of trained staff and essential supplies).
    - Conducting preliminary discussions with specific medical facilities, to agree what should be done in the event of ill workers needing to be referred.
    - Considering ways in which the project may be able to support local medical services in preparing for members of the community becoming ill, recognizing that the elderly or those with pre-existing medical conditions require additional support to access appropriate treatment if they become ill.
    - Clarifying the way in which an ill worker will be transported to the medical facility, and

checking availability of such transportation.
- Establishing an agreed protocol for communications with local emergency/medical services.
- Agreeing with the local medical services/specific medical facilities the scope of services to be provided, the procedure for in-take of patients and (where relevant) any costs or payments that may be involved.
- A procedure should also be prepared so that project management knows what to do in the unfortunate event that a worker ill with COVID-19 dies. While normal project procedures will continue to apply, COVID-19 may raise other issues because of the infectious nature of the disease. The project should liaise with the relevant local authorities to coordinate what should be done, including any reporting or other requirements under national law.

11. WHO provides detailed advice on what should be done to treat a person who becomes sick or displays symptoms that could be associated with the COVID-19 virus (for further information see WHO interim guidance on infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected). The project should set out risk-based procedures to be followed, with differentiated approaches based on case severity (mild, moderate, severe, critical) and risk factors (such as age, hypertension, diabetes) (for further information see WHO interim guidance on operational considerations for case management of COVID-19 in health facility and community). These may include the following:
    - If a worker has symptoms of COVID-19 (e.g. fever, dry cough, fatigue) the worker should be removed immediately from work activities and isolated on site.
    - If testing is available on site, the worker should be tested on site. If a test is not available at site, the worker should be transported to the local health facilities to be tested (if testing is available).
    - If the test is positive for COVID-19 or no testing is available, the worker should continue to be isolated. This will either be at the work site or at home. If at home, the worker should be transported to their home in transportation provided by the project.
    - Extensive cleaning procedures with high-alcohol content disinfectant should be undertaken in the area where the worker was present, prior to any further work being undertaken in that area. Tools used by the worker should be cleaned using disinfectant and PPE disposed of.
    - Co-workers (i.e. workers with whom the sick worker was in close contact) should be required to stop work, and be required to quarantine themselves for 14 days, even if they have no symptoms.
    - Family and other close contacts of the worker should be required to quarantine themselves for 14 days, even if they have no symptoms.
    - If a case of COVID-19 is confirmed in a worker on the site, visitors should be restricted from entering the site and worker groups should be isolated from each other as much as possible.
    - If workers live at home and has a family member who has a confirmed or suspected case of COVID-19, the worker should quarantine themselves and not be allowed on the project site for 14 days, even if they have no symptoms.
    - Workers should continue to be paid throughout periods of illness, isolation or quarantine, or if they are required to stop work, in accordance with national law.
    - Medical care (whether on site or in a local hospital or clinic) required by a worker should be paid for by the employer.
12. Ensure continuity of supplies and project activities with the following measures:
    - Identify back-up individuals, in case key people within the project management team (PMU, Supervising Engineer, Contractor, sub-contractors) become ill, and communicate who these are so that people are aware of the arrangements that have been put in place.
    - Document procedures, so that people know what they are, and are not reliant on one person's knowledge.
    - Understand the supply chain for necessary supplies of energy, water, food, medical supplies and cleaning equipment, consider how it could be impacted, and what alternatives are available. Early pro-active review of international, regional and national supply chains, especially for those supplies that are critical for the project, is important (e.g. fuel, food, medical, cleaning and other essential supplies). Planning for a 1-2 month interruption of critical goods may be appropriate for projects in more remote areas.
    - Place orders for/procure critical supplies. If not available, consider alternatives (where

feasible).

- Consider existing security arrangements, and whether these will be adequate in the event of interruption to normal project operations.
- Consider at what point it may become necessary for the project to significantly reduce activities or to stop work completely, and what should be done to prepare for this, and to re-start work when it becomes possible or feasible.

13. Ensure proper training and communication with workers through the following:
    - Workers need to be provided with regular opportunities to understand their situation, and how they can best protect themselves, their families and the community. They should be made aware of the procedures that have been put in place by the project, and their own responsibilities in implementing them.
    - It is important to be aware that in communities close to the site and amongst workers without access to project management, social media is likely to be a major source of information. This raises the importance of regular information and engagement with workers (e.g. through training, town halls, tool boxes) that emphasizes what management is doing to deal with the risks of COVID-19. Allaying fear is an important aspect of work force peace of mind and business continuity. Workers should be given an opportunity to ask questions, express their concerns, and make suggestions.
    - Training of workers should be conducted regularly, providing workers with a clear understanding of how they are expected to behave and carry out their work duties.
    - Training should address issues of discrimination or prejudice if a worker becomes ill and provide an understanding of the trajectory of the virus, where workers return to work.
    - Training should cover all issues that would normally be required on the work site, including use of safety procedures, use of construction PPE, occupational health and safety issues, and code of conduct, taking into account that work practices may have been adjusted.
    - Communications should be clear, based on fact and designed to be easily understood by workers, for example by displaying posters on handwashing and social distancing, and what to do if a worker displays symptoms.
14. Relations with the community should be carefully managed, with a focus on measures that are being implemented to safeguard both workers and the community. The community may be concerned about the presence of non-local workers, or the risks posed to the community by local workers presence on the project site. The project should set out risk-based procedures to be followed, which may reflect WHO guidance (for further information see WHO Risk Communication and Community Engagement (RCCE) Action Plan Guidance COVID-19 Preparedness and Response). The following good practice should be considered:
    - Communications should be clear, regular, based on fact and designed to be easily understood by community members.
    - Communications should utilize available means. In most cases, face-to-face meetings with the community or community representatives will not be possible. Other forms of communication should be used, posters, pamphlets, radio, text message, electronic meetings. The means used should take into account the ability of different members of the community to access them, to make sure that communication reaches these groups.
    - The community should be made aware of procedures put in place at site to address issues related to COVID-19. This should include all measures being implemented to limit or prohibit contact between workers and the community. These need to be communicated clearly, as some measures will have financial implications for the community (e.g. if workers are paying for lodging or using local facilities). The community should be made aware of the procedure for entry/exit to the site, the training being given to workers and the procedure that will be followed by the project if a worker becomes sick.
    - If project representatives, contractors or workers are interacting with the community, they should practice social distancing and follow other COVID-19 guidance issued by relevant authorities, both national and international (e.g. WHO).

Appendix 7: World Bank's ESF/Safeguards Interim Note: COVID-19 Considerations in Construction/Civil Works Projects

This note was issued on April 7, 2020 and includes links to the latest guidance as of this date (e.g. from WHO). Given the COVID-19 situation is rapidly evolving, when using this note it is important to check whether any updates to these external resources have been issued.

1. Introduction

The COVID-19 pandemic presents Governments with unprecedented challenges. Addressing COVID-19 related issues in both existing and new operations starts with recognizing that this is not business as usual and that circumstances require a highly adaptive responsive management design to avoid, minimize and manage what may be a rapidly evolving situation. In many cases, we will ask Borrowers to use reasonable efforts in the circumstances, recognizing that what may be possible today may be different next week (both positively, because more supplies and guidance may be available, and negatively, because the spread of the virus may have accelerated).

This interim note is intended to provide guidance to teams on how to support Borrowers in addressing key issues associated with COVID-19, and consolidates the advice that has already been provided over the past month. As such, it should be used in place of other guidance that has been provided to date. This note will be developed as the global situation and the Bank's learning (and that of others) develops. This is not a time when 'one size fits all'. More than ever, teams will need to work with Borrowers and projects to understand the activities being carried out and the risks that these activities may entail. Support will be needed in designing mitigation measures that are implementable in the context of the project. These measures will need to take into account capacity of the Government agencies, availability of supplies and the practical challenges of operations on-the-ground, including stakeholder engagement, supervision and monitoring. In many circumstances, communication itself may be challenging, where face-to-face meetings are restricted or prohibited, and where IT solutions are limited or unreliable.

This note emphasizes the importance of careful scenario planning, clear procedures and protocols, management systems, effective communication and coordination, and the need for high levels of responsiveness in a changing environment. It recommends assessing the current situation of the project, putting in place mitigation measures to avoid or minimize the chance of infection, and planning what to do if either project workers become infected or the work force includes workers from proximate communities affected by COVID-19. In many projects, measures to avoid or minimize will need to be implemented at the same time as dealing with sick workers and relations with the community, some of whom may also be ill or concerned about infection. Borrowers should understand the obligations that contractors have under their existing contracts (see Section 3), require contractors to put in place appropriate organizational structures (see Section 4) and develop procedures to address different aspects of COVID-19 (see Section 5).

2. Challenges with Construction/Civil Works

Projects involving construction/civil works frequently involve a large work force, together with suppliers and supporting functions and services. The work force may comprise workers from international, national, regional, and local labor markets. They may need to live in on-site accommodation, lodge within communities close to work sites or return to their homes after work. There may be different contractors

permanently present on site, carrying out different activities, each with their own dedicated workers. Supply chains may involve international, regional and national suppliers facilitating the regular flow of goods and services to the project (including supplies essential to the project such as fuel, food, and water). As such there will also be regular flow of parties entering and exiting the site; support services, such as catering, cleaning services, equipment, material and supply deliveries, and specialist sub-contractors, brought in to deliver specific elements of the works.

Given the complexity and the concentrated number of workers, the potential for the spread of infectious

disease in projects involving construction is extremely serious, as are the implications of such a spread. Projects may experience large numbers of the work force becoming ill, which will strain the project's health facilities, have implications for local emergency and health services and may jeopardize the progress of the construction work and the schedule of the project. Such impacts will be exacerbated where a work force is large and/or the project is in remote or under-serviced areas. In such circumstances, relationships with the community can be strained or difficult and conflict can arise, particularly if people feel they are being exposed to disease by the project or are having to compete for scarce resources. The project must also exercise appropriate precautions against introducing the infection to local communities.

3. Does the Construction Contract Cover this Situation?

Given the unprecedented nature of the COVID-19 pandemic, it is unlikely that the existing construction/civil works contracts will cover all the things that a prudent contractor will need to do. Nevertheless, the first place for a Borrower to start is with the contract, determining what a contractor's existing obligations are, and how these relate to the current situation.

The obligations on health and safety will depend on what kind of contract exists (between the Borrower and the main contractor; between the main contractors and the sub-contractors). It will differ if the Borrower used the World Bank's standard procurement documents (SPDs) or used national bidding documents. If a FIDIC document has been used, there will be general provisions relating to health and safety. For example, the standard FIDIC, Conditions of Contract for Construction (Second Edition 2017), which contains no 'ESF enhancements', states (in the General Conditions, clause 6.7) that the Contractor will be required:

- to take all necessary precautions to maintain the health and safety of the Contractor's Personnel
- to appoint a health and safety officer at site, who will have the authority to issue directives for the purpose of maintaining the health and safety of all personnel authorized to enter and or work on the site and to take protective measures to prevent accidents
- to ensure, in collaboration with local health authorities, that medical staff, first aid facilities, sick bay, ambulance services and any other medical services specified are available at all times at the site and at any accommodation
- to ensure suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics

These requirements have been enhanced through the introduction of the ESF into the SPDs (edition dated July 2019). The general FIDIC clause referred to above has been strengthened to reflect the requirements of the ESF. Beyond FIDIC's general requirements discussed above, the Bank's Particular Conditions include a number of relevant requirements on the Contractor, including:

- to provide health and safety training for Contractor's Personnel (which include project workers and all personnel that the Contractor uses on site, including staff and other employees of the Contractor and Subcontractors and any other personnel assisting the Contractor in carrying out project activities)
- to put in place workplace processes for Contractor's Personnel to report work situations that are not safe or healthy
- gives Contractor's Personnel the right to report work situations which they believe are not safe or healthy, and to remove themselves from a work situation which they have a reasonable justification to believe presents an imminent and serious danger to their life or health (with no reprisal for reporting or removing themselves)
- requires measures to be in place to avoid or minimize the spread of diseases including measures to avoid or minimize the transmission of communicable diseases that may be associated with the influx of temporary or permanent contract-related labor
- to provide an easily accessible grievance mechanism to raise workplace concerns

Where the contract form used is FIDIC, the Borrower (as the Employer) will be represented by the Engineer (also referred to in this note as the Supervising Engineer). The Engineer will be authorized to

exercise authority specified in or necessarily implied from the construction contract. In such cases, the Engineer (through its staff on site) will be the interface between the PIU and the Contractor. It is important therefore to understand the scope of the Engineer's responsibilities. It is also important to recognize that in the case of infectious diseases such as COVID-19, project management – through the Contractor/subcontractor hierarchy – is only as effective as the weakest link. A thorough review of management procedures/plans as they will be implemented through the entire contractor hierarchy is important. Existing contracts provide the outline of this structure; they form the basis for the Borrower to understand how proposed mitigation measures will be designed and how adaptive management will be implemented, and to start a conversation with the Contractor on measures to address COVID-19 in the project.

4. What Planning Should the Borrower Be Doing?

Task teams should work with Borrowers (PIUs) to confirm that projects (i) are taking adequate precautions to prevent or minimize an outbreak of COVID-19, and (ii) have identified what to do in the event of an outbreak. Suggestions on how to do this are set out below:

- The PIU, either directly or through the Supervising Engineer, should request details in writing from the main Contractor of the measures being taken to address the risks. As stated in Section 3, the construction contract should include health and safety requirements, and these can be used as the basis for identification of, and requirements to implement, COVID-19 specific measures. The measures may be presented as a contingency plan, as an extension of the existing project emergency and preparedness plan or as standalone procedures. The measures may be reflected in revisions to the project's health and safety manual. This request should be made in writing (following any relevant procedure set out in the contract between the Borrower and the contractor).
- In making the request, it may be helpful for the PIU to specify the areas that should be covered. This should include the items set out in Section 5 below and take into account current and relevant
- guidance provided by national authorities, WHO and other organizations. See the list of references in the Annex to this note.
- The PIU should require the Contractor to convene regular meetings with the project health and safety specialists and medical staff (and where appropriate the local health authorities), and to take their advice in designing and implementing the agreed measures.
- Where possible, a senior person should be identified as a focal point to deal with COVID-19 issues. This can be a work supervisor or a health and safety specialist. This person can be responsible for coordinating preparation of the site and making sure that the measures taken are communicated to the workers, those entering the site and the local community. It is also advisable to designate at least one back-up person, in case the focal point becomes ill; that person should be aware of the arrangements that are in place.
- On sites where there are a number of contractors and therefore (in effect) different work forces, the request should emphasize the importance of coordination and communication between the different parties. Where necessary, the PIU should request the main contractor to put in place a protocol for regular meetings of the different contractors, requiring each to appoint a designated staff member (with back up) to attend such meetings. If meetings cannot be held in person, they should be conducted using whatever IT is available. The effectiveness of mitigation measures will depend on the weakest implementation, and therefore it is important that all contractors and sub-contractors understand the risks and the procedure to be followed.
- The PIU, either directly or through the Supervising Engineer, may provide support to projects in identifying appropriate mitigation measures, particularly where these will involve interface with local services, in particular health and emergency services. In many cases, the PIU can play a valuable role in connecting project representatives with local Government agencies, and helping coordinate a strategic response, which takes into account the availability of resources. To be most effective, projects should consult and coordinate with relevant Government agencies and other projects in the vicinity.
- Workers should be encouraged to use the existing project grievance mechanism to report concerns relating to COVID-19, preparations being made by the project to address COVID-19 related issues, how procedures are being implemented, and concerns about the health of their

co-workers and other staff.

5. What Should the Contractor Cover?

The Contractor should identify measures to address the COVID-19 situation. What will be possible will depend on the context of the project: the location, existing project resources, availability of supplies, capacity of local emergency/health services, the extent to which the virus already exist in the area. A systematic approach to planning, recognizing the challenges associated with rapidly changing circumstances, will help the project put in place the best measures possible to address the situation. As discussed above, measures to address COVID-19 may be presented in different ways (as a contingency plan, as an extension of the existing project emergency and preparedness plan or as standalone procedures). PIUs and contractors should refer to guidance issued by relevant authorities, both national and international (e.g., WHO), which is regularly updated (see sample References and links provided in the Annex).

Addressing COVID-19 at a project site goes beyond occupational health and safety and is a broader project issue which will require the involvement of different members of a project management team. In many cases, the most effective approach will be to establish procedures to address the issues, and then to ensure that these procedures are implemented systematically. Where appropriate given the project context, a designated team should be established to address COVID-19 issues, including PIU representatives, the Supervising Engineer, management (e.g., the project manager) of the contractor and sub-contractors, security, and medical and OHS professionals. Procedures should be clear and straightforward, improved as necessary, and supervised and monitored by the COVID-19 focal point(s). Procedures should be documented, distributed to all contractors, and discussed at regular meetings to facilitate adaptive management. The issues set out below include a number that represent expected good workplace management but are especially pertinent in preparing the project response to COVID-19.

(a) ASSESSING WORKFORCE CHARACTERISTICS

Many construction sites will have a mix of workers e.g. workers from the local communities; workers from a different part of the country; workers from another country. Workers will be employed under different terms and conditions and be accommodated in different ways. Assessing these different aspects of the workforce will help in identifying appropriate mitigation measures:

- The Contractor should prepare a detailed profile of the project work force, key work activities, schedule for carrying out such activities, different durations of contract and rotations (e.g. 4 weeks on, 4 weeks off).
- This should include a breakdown of workers who reside at home (i.e. workers from the community), workers who lodge within the local community and workers in on-site accommodation. Where possible, it should also identify workers that may be more at risk from COVID-19, those with underlying health issues or who may be otherwise at risk.
- Consideration should be given to ways in which to minimize movement in and out of site. This could include lengthening the term of existing contracts, to avoid workers returning home to affected areas, or returning to site from affected areas.
- Workers accommodated on site should be required to minimize contact with people near the site, and in certain cases be prohibited from leaving the site for the duration of their contract, so that contact with local communities is avoided.
- Consideration should be given to requiring workers lodging in the local community to move to site accommodation (subject to availability) where they would be subject to the same restrictions.
- Workers from local communities, who return home daily, weekly or monthly, will be more difficult to manage. They should be subject to health checks at entry to the site (as set out above) and at some point, circumstances may make it necessary to require them to either use accommodation on site or not to come to work.

(b) ENTRY/EXIT TO THE WORK SITE AND CHECKS ON COMMENCEMENT OF WORK

Entry/exit to the work site should be controlled and documented for both workers and other parties, including support staff and suppliers. Possible measures may include:

- Establishing a system for controlling entry/exit to the site, securing the boundaries of the site, and establishing designating entry/exit points (if they do not already exist). Entry/exit to the site should be documented.
- Training security staff on the (enhanced) system that has been put in place for securing the site and controlling entry and exit, the behaviors required of them in enforcing such system and any COVID - 19 specific considerations.
- Training staff who will be monitoring entry to the site, providing them with the resources they need to document entry of workers, conducting temperature checks and recording details of any worker that is denied entry.
- Confirming that workers are fit for work before they enter the site or start work. While procedures should already be in place for this, special attention should be paid to workers with underlying health issues or who may be otherwise at risk. Consideration should be given to demobilization of staff with underlying health issues.
- Checking and recording temperatures of workers and other people entering the site or requiring self- reporting prior to or on entering the site.
- Providing daily briefings to workers prior to commencing work, focusing on COVID-19 specific considerations including cough etiquette, hand hygiene and distancing measures, using demonstrations and participatory methods.
- During the daily briefings, reminding workers to self-monitor for possible symptoms (fever, cough) and to report to their supervisor or the COVID-19 focal point if they have symptoms or are feeling unwell.
- Preventing a worker from an affected area or who has been in contact with an infected person from returning to the site for 14 days or (if that is not possible) isolating such worker for 14 days.
- Preventing a sick worker from entering the site, referring them to local health facilities if necessary or requiring them to isolate at home for 14 days.

(c) GENERAL HYGIENE

Requirements on general hygiene should be communicated and monitored, to include:

- Training workers and staff on site on the signs and symptoms of COVID-19, how it is spread, how to protect themselves (including regular handwashing and social distancing) and what to do if they or other people have symptoms (for further information see WHO COVID-19 advice for the public)
- Placing posters and signs around the site, with images and text in local languages.
- Ensuring handwashing facilities supplied with soap, disposable paper towels and closed waste bins exist at key places throughout site, including at entrances/exits to work areas; where there is a toilet, canteen or food distribution, or provision of drinking water; in worker accommodation; at waste stations; at stores; and in common spaces. Where handwashing facilities do not exist or are not adequate, arrangements should be made to set them up. Alcohol based sanitizer (if available, 60-95% alcohol) can also be used.
- Review worker accommodations, and assess them in light of the requirements set out in IFC/EBRD guidance on Workers' Accommodation: processes and standards, which provides valuable guidance as to good practice for accommodation.
- Setting aside part of worker accommodation for precautionary self-quarantine as well as more formal isolation of staff who may be infected (see paragraph (f)).

(d) CLEANING AND WASTE DISPOSAL

Conduct regular and thorough cleaning of all site facilities, including offices, accommodation, canteens, common spaces. Review cleaning protocols for key construction equipment (particularly if it is being operated by different workers). This should include:

- Providing cleaning staff with adequate cleaning equipment, materials and disinfectant.

- Review general cleaning systems, training cleaning staff on appropriate cleaning procedures and appropriate frequency in high use or high-risk areas.
- Where it is anticipated that cleaners will be required to clean areas that have been or are suspected to have been contaminated with COVID-19, providing them with appropriate PPE: gowns or aprons, gloves, eye protection (masks, goggles or face screens) and boots or closed work shoes. If appropriate PPE is not available, cleaners should be provided with best available alternatives.
- Training cleaners in proper hygiene (including handwashing) prior to, during and after conducting cleaning activities; how to safely use PPE (where required); in waste control (including for used PPE and cleaning materials).
- Any medical waste produced during the care of ill workers should be collected safely in designated containers or bags and treated and disposed of following relevant requirements (e.g., national, WHO). If open burning and incineration of medical wastes is necessary, this should be for as limited a duration as possible. Waste should be reduced and segregated, so that only the smallest amount of waste is incinerated (for further information see WHO interim guidance on water, sanitation and waste management for COVID-19).

(e) ADJUSTING WORK PRACTICES

Consider changes to work processes and timings to reduce or minimize contact between workers, recognizing that this is likely to impact the project schedule. Such measures could include:

- Decreasing the size of work teams.
- Limiting the number of workers on site at any one time.
- Changing to a 24-hour work rotation.
- Adapting or redesigning work processes for specific work activities and tasks to enable social distancing, and training workers on these processes.
- Continuing with the usual safety trainings, adding COVID-19 specific considerations. Training should include proper use of normal PPE. While as of the date of this note, general advice is that construction workers do not require COVID-19 specific PPE, this should be kept under review (for further information see WHO interim guidance on rational use of personal protective equipment (PPE) for COVID-19).
- Reviewing work methods to reduce use of construction PPE, in case supplies become scarce or the PPE is needed for medical workers or cleaners. This could include, e.g. trying to reduce the need for dust masks by checking that water sprinkling systems are in good working order and are maintained or reducing the speed limit for haul trucks.
- Arranging (where possible) for work breaks to be taken in outdoor areas within the site.
- Consider changing canteen layouts and phasing mealtimes to allow for social distancing and phasing access to and/or temporarily restricting access to leisure facilities that may exist on site, including gyms.
- At some point, it may be necessary to review the overall project schedule, to assess the extent to which it needs to be adjusted (or work stopped completely) to reflect prudent work practices, potential exposure of both workers and the community and availability of supplies, taking into account Government advice and instructions.

(f) PROJECT MEDICAL SERVICES

Consider whether existing project medical services are adequate, taking into account existing infrastructure (size of clinic/medical post, number of beds, isolation facilities), medical staff, equipment and supplies, procedures and training. Where these are not adequate, consider upgrading services where possible, including:

- Expanding medical infrastructure and preparing areas where patients can be isolated. Guidance on setting up isolation facilities is set out in WHO interim guidance on considerations for quarantine of individuals in the context of containment for COVID-19) Isolation facilities should be located away from worker accommodation and ongoing work activities. Where possible, workers should be provided with a single well-ventilated room (open windows and door). Where this is not possible, isolation facilities should allow at least 1 meter between

workers in the same room, separating workers with curtains, if possible. Sick workers should limit their movements, avoiding common areas and facilities and not be allowed visitors until they have been clear of symptoms for 14 days. If they need to use common areas and facilities (e.g., kitchens or canteens), they should only do so when unaffected workers are not present and the area/facilities should be cleaned prior to and after such use.

- Training medical staff, which should include current WHO advice on COVID-19 and recommendations on the specifics of COVID-19. Where COVID-19 infection is suspected, medical providers on site should follow WHO interim guidance on infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected.
- Training medical staff in testing, if testing is available.
- Assessing the current stock of equipment, supplies and medicines on site, and obtaining additional stock, where required and possible. This could include medical PPE, such as gowns, aprons, medical masks, gloves, and eye protection. Refer to WHO guidance as to what is advised (for further information see WHO interim guidance on rational use of personal protective equipment (PPE) for COVID-19).
- If PPE items are unavailable due to world-wide shortages, medical staff on the project should agree on alternatives and try to procure them. Alternatives that may commonly be found on constructions sites include dust masks, construction gloves and eye goggles. While these items are not recommended, they should be used as a last resort if no medical PPE is available.
- Ventilators will not normally be available on work sites, and in any event, intubation should only be conducted by experienced medical staff. If a worker is extremely ill and unable to breathe properly on his or her own, they should be referred immediately to the local hospital (see (g) below).
- Review existing methods for dealing with medical waste, including systems for storage and disposal (for further information see WHO interim guidance on water, sanitation and waste management for COVID-19, and WHO guidance on safe management of wastes from health-care activities).

(g) LOCAL MEDICAL AND OTHER SERVICES

Given the limited scope of project medical services, the project may need to refer sick workers to local medical services. Preparation for this includes:

- Obtaining information as to the resources and capacity of local medical services (e.g. number of beds, availability of trained staff and essential supplies).
- Conducting preliminary discussions with specific medical facilities, to agree what should be done in the event of ill workers needing to be referred.
- Considering ways in which the project may be able to support local medical services in preparing for members of the community becoming ill, recognizing that the elderly or those with pre-existing medical conditions require additional support to access appropriate treatment if they become ill.
- Clarifying the way in which an ill worker will be transported to the medical facility, and checking availability of such transportation.
- Establishing an agreed protocol for communications with local emergency/medical services.
- Agreeing with the local medical services/specific medical facilities the scope of services to be provided, the procedure for in-take of patients and (where relevant) any costs or payments that may be involved.
- A procedure should also be prepared so that project management knows what to do in the unfortunate event that a worker ill with COVID-19 dies. While normal project procedures will continue to apply, COVID-19 may raise other issues because of the infectious nature of the disease. The project should liaise with the relevant local authorities to coordinate what should be done, including any reporting or other requirements under national law.

(h) INSTANCES OR SPREAD OF THE VIRUS

WHO provides detailed advice on what should be done to treat a person who becomes sick or displays symptoms that could be associated with the COVID-19 virus (for further information see WHO interim guidance on infection prevention and control during health care when novel coronavirus (nCoV) infection

is suspected). The project should set out risk-based procedures to be followed, with differentiated approaches based on case severity (mild, moderate, severe, critical) and risk factors (such as age, hypertension, diabetes) (for further information see WHO interim guidance on operational considerations for case management of COVID-19 in health facility and community). These may include the following:

- If a worker has symptoms of COVID-19 (e.g., fever, dry cough, fatigue) the worker should be removed immediately from work activities and isolated on site.
- If testing is available on site, the worker should be tested on site. If a test is not available at site, the worker should be transported to the local health facilities to be tested (if testing is available).
- If the test is positive for COVID-19 or no testing is available, the worker should continue to be isolated. This will either be at the work site or at home. If at home, the worker should be transported to their home in transportation provided by the project.
- Extensive cleaning procedures with high-alcohol content disinfectant should be undertaken in the area where the worker was present, prior to any further work being undertaken in that area. Tools used by the worker should be cleaned using disinfectant and PPE disposed of.
- Co-workers (i.e., workers with whom the sick worker was in close contact) should be required to stop work, and be required to quarantine themselves for 14 days, even if they have no symptoms.
- Family and other close contacts of the worker should be required to quarantine themselves for 14 days, even if they have no symptoms.
- If a case of COVID-19 is confirmed in a worker on the site, visitors should be restricted from entering the site and worker groups should be isolated from each other as much as possible.
- If workers live at home and has a family member who has a confirmed or suspected case of COVID- 19, the worker should quarantine themselves and not be allowed on the project site for 14 days, even if they have no symptoms.
- Workers should continue to be paid throughout periods of illness, isolation or quarantine, or if they are required to stop work, in accordance with national law.
- Medical care (whether on site or in a local hospital or clinic) required by a worker should be paid for by the employer.

(i) CONTINUITY OF SUPPLIES AND PROJECT ACTIVITIES

Where COVID-19 occurs, either in the project site or the community, access to the project site may be restricted, and movement of supplies may be affected.

- Identify back-up individuals, in case key people within the project management team (PIU, Supervising Engineer, Contractor, sub-contractors) become ill, and communicate who these are so that people are aware of the arrangements that have been put in place.
- Document procedures, so that people know what they are, and are not reliant on one person's knowledge.
- Understand the supply chain for necessary supplies of energy, water, food, medical supplies and cleaning equipment, consider how it could be impacted, and what alternatives are available. Early pro-active review of international, regional and national supply chains, especially for those supplies that are critical for the project, is important (e.g., fuel, food, medical, cleaning and other essential supplies). Planning for a 1–2-month interruption of critical goods may be appropriate for projects in more remote areas.
- Place orders for/procure critical supplies. If not available, consider alternatives (where feasible).
- Consider existing security arrangements, and whether these will be adequate in the event of interruption to normal project operations.
- Consider at what point it may become necessary for the project to significantly reduce activities or to stop work completely, and what should be done to prepare for this, and to re-start work when it becomes possible or feasible.

(j) TRAINING AND COMMUNICATION WITH WORKERS

Workers need to be provided with regular opportunities to understand their situation, and how they can best protect themselves, their families and the community. They should be made aware of the procedures that have been put in place by the project, and their own responsibilities in implementing

them.

- It is important to be aware that in communities close to the site and amongst workers without access to project management, social media is likely to be a major source of information. This raises the importance of regular information and engagement with workers (e.g. through training, town halls, tool boxes) that emphasizes what management is doing to deal with the risks of COVID-19. Allaying fear is an important aspect of work force peace of mind and business continuity. Workers should be given an opportunity to ask questions, express their concerns, and make suggestions.
- Training of workers should be conducted regularly, as discussed in the sections above, providing workers with a clear understanding of how they are expected to behave and carry out their work duties.
- Training should address issues of discrimination or prejudice if a worker becomes ill and provide an understanding of the trajectory of the virus, where workers return to work.
- Training should cover all issues that would normally be required on the work site, including use of safety procedures, use of construction PPE, occupational health and safety issues, and code of conduct, taking into account that work practices may have been adjusted.
- Communications should be clear, based on fact and designed to be easily understood by workers, for example by displaying posters on handwashing and social distancing, and what to do if a worker displays symptoms.

(k) COMMUNICATION AND CONTACT WITH THE COMMUNITY

Relations with the community should be carefully managed, with a focus on measures that are being implemented to safeguard both workers and the community. The community may be concerned about the presence of non-local workers, or the risks posed to the community by local workers presence on the project site. The project should set out risk-based procedures to be followed , which may reflect WHO guidance (for further information see WHO Risk Communication and Community Engagement (RCCE) Action Plan Guidance COVID-19 Preparedness and Response). The following good practice should be considered:

- Communications should be clear, regular, based on fact and designed to be easily understood by community members.
- Communications should utilize available means. In most cases, face-to-face meetings with the community or community representatives will not be possible. Other forms of communication should be used, posters, pamphlets, radio, text message, electronic meetings. The means used should take into account the ability of different members of the community to access them, to make sure that communication reaches these groups.
- The community should be made aware of procedures put in place at site to address issues related to COVID-19. This should include all measures being implemented to limit or prohibit contact between workers and the community. These need to be communicated clearly, as some measures will have financial implications for the community (e.g., if workers are paying for lodging or using local facilities). The community should be made aware of the procedure for entry/exit to the site, the training being given to workers and the procedure that will be followed by the project if a worker becomes sick.
- If project representatives, contractors or workers are interacting with the community, they should practice social distancing and follow other COVID-19 guidance issued by relevant authorities, both national and international (e.g., WHO).

6. Emergency Powers and Legislation

Many Borrowers are enacting emergency legislation. The scope of such legislation, and the way it interacts with other legal requirements, will vary from country to country. Such legislation can cover a range of issues, for example:

- Declaring a public health emergency
- Authorizing the use of police or military in certain activities (e.g., enforcing curfews or restrictions on movement)

- Ordering certain categories of employees to work longer hours, not to take holiday or not to leave their job (e.g., health workers)
- Ordering non-essential workers to stay at home, for reduced pay or compulsory holiday

Except in exceptional circumstances (after referral to the World Bank's Operations Environmental and Social Review Committee (OESRC)), projects will need to follow emergency legislation to the extent that these are mandatory or advisable. It is important that the Borrower understands how mandatory requirements of the legislation will impact the project. Teams should require Borrowers (and in turn, Borrowers should request Contractors) to consider how the emergency legislation will impact the obligations of the Borrower set out in the legal agreement and the obligations set out in the construction contracts. Where the legislation requires a material departure from existing contractual obligations, this should be documented, setting out the relevant provisions.

Annex

WHO Guidance

Advice for the public

WHO advice for the public, including on social distancing, respiratory hygiene, self-quarantine, and seeking medical advice, can be consulted on this WHO website: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public

Technical guidance

Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected, issued on 19 March 2020

Coronavirus disease (COVID-19) outbreak: rights, roles and responsibilities of health workers, including key considerations for occupational safety and health, issued on 18 March 2020

Risk Communication and Community Engagement (RCCE) Action Plan Guidance COVID-19 Preparedness and Response, issued on 16 March 2020

Considerations for quarantine of individuals in the context of containment for coronavirus disease (COVID-19), issued on 19 March 2020

Operational considerations for case management of COVID-19 in health facility and community, issued on 19 March 2020

Rational use of personal protective equipment for coronavirus disease 2019 (COVID-19), issued on 27 February 2020

Getting your workplace ready for COVID-19, issued on 19 March 2020

Water, sanitation, hygiene and waste management for COVID-19, issued on 19 March 2020

Safe management of wastes from health-care activities issued in 2014

Advice on the use of masks in the community, during home care and in healthcare settings in the context of the novel coronavirus (COVID-19) outbreak, issued on March 19, 2020

ILO Guidance

ILO Standards and COVID-19 FAQ, issued on March 23, 2020 (provides a compilation of answers to most frequently asked questions related to international labor standards and COVID-19)

MFI Guidance

IDB Invest Guidance for Infrastructure Projects on COVID-19: A Rapid Risk Profile and Decision Framework

KW DEG COVID-19 Guidance for employers, issued on 31 March 2020

CDC Group COVID-19 Guidance for Employers, issued on 23 March 2020

Appendix 8: Grievance Log Information

SOLOMON WATER:
GRIEVANCE REDRESS REGISTERING AND MONITORING FORM

ANNEX 1 – Grievance Log Information

Complainant Information (Person Reporting)
1. Name:
2. Address:
3. National ID:
4. Gender:
5. Contact Details - Telephone, Email
7. Type of complainant:
    - Affected person/s
    - Intermediary (on behalf of the AP)
    - Civil organization
    - Service organization (e.g., local government institution)
    - Other (specify)
9. Registration Number: - assigned by Projects Team

Complaint Details
10. Mode of receiving the grievance:
    - Letter
    - Phone call
    - Fax
    - Email
    - Verbal complaint (walk-in)
    - Other (specify)
11. Location of the problem/issue specified in the complaint:
Town:
Province:
12. Type of problem/grievance:
    - Land related
    - Compensation
    - Construction
    - Resettlement site
    - Other (specify)
13. Short description of the problem:
14. Short description of the factors causing the problem:
15. Person/agency responsible for causing the problem:
16. Past action/s taken by the complainant (if any):
17. Details of the focal point that received the complaint:

Name of the person who received the complaint:
Position: Name of the receiving office: Date:

18. Actions taken by the Receiving Office

Stage 1 Action taken; SW Responsible person; Outcome

Stage 2 Action taken; SW Responsible person; Outcome

Stage 3 Action taken; Tribunal Members; Outcome

19. Summary of Final Resolution

Appendix 9: Minutes of the Meeting of Consultations Conducted During Feasibility Study Stage

Focus Group Discussion held at Munda last 11 May 2020

Purpose of the Focus Group Discussion (FGD)

The FGD is designed to find out the customer willingness to pay for SW services and how they perceive the services now that Munda has opened a second International Airport bringing international visitors to Munda.

The key information sought from the FGD was to:

- To gauge expectations on the cost of water supply provided by SW;
- To find out if they understand the value and cost of bringing clean and safe water;
- To encourage and to hear some recommendations on what to improve on services to customers

Approach and Methodology

Focus Group Discussion Process

The FGD was held at Agnes Gateway Hotel. About 44 people (25 men and 19 women) attended the FGD. The participants represented the landowners, business owners, women's groups, youth groups, paramount chief, teachers, local men and women group such as the Mothers Union and church representatives.

The introductory session was dome by Hilda Tango who thanked and welcomed the participants of the meeting. A word of prayer was offered by a church elder and the program for the day kicked off.

- Hilda presented the overview of the project and project status.
- Mr Kenneth Bulehite presented the design and location of the proposed tank.
- Relinta presented the relevant information on services as part of awareness and information sharing regarding water charges.
- Agnes Atkin presented issues on land.

Table 1: Open Forum Questions and Answers.

Question	Response
Chief Eki: Although the sources are for long term plans, can we at Kindu be connected as well? Kindu also need water.	**Kenneth Bulehite** - Most of the sources are located in the Kindu side - We are yet to do a full UXO survey at Dunde – if we have to do drilling, then another UXO Survey must be conducted there.
Faye Lome: How far from the catchment should we build or make gardens?	K Bulehite: In order to have safe quality water, NO one should live near the catchment or the catchment area. Resettlement is another option to protect the water catchment area.
Ongu Mali - If we drink water with chlorine, will it have health impacts on us?	**Agnes Atkin** - That question is quite technical, we will take that question back for more information but a good number of people living in Honiara are consuming water supplied by Solomon Water for some time with no reactions. Generally people react differently to it.

	Kenneth Bulehite - The chlorination process is to disinfect water making it safe to consume before distribution. SW treats water to a certain standard before it is supplied. Different sources require different level of dosing and they regularly monitor
Henry Ngumi - When chlorine is put into water, how long and then it is distributed? -	**Agnes Atkin** - We will not be able to answer that question now so we will take your concern and get our water quality team to answer
Lemu Darcy - If focus is shifted to Kindu, will these tanks still work (for short term plan) or will it be shifted as well?	**Kenneth Bulehite** - These tanks will still remain but they are quite low so a tank will be put up – 300,000 litres. A test will be done on the site first.
Florence Rove - SW have anything to give back to the resource owners, such as free standpipe?	**Kenneth Bulehite** - We are trying to avoid having these stand pipes and have each houses have own water running through
Malloney Lopoto Munda is infested with artilleries and the water sources are not running thus if SW can do proper testing on these water sources for bacteria's as well	
Lemu Darcy - If focus is shifted to Kindu, will these tanks still work (for short term plan) or will it be shifted as well?	**Kenneth Bulehite** - These tanks will still remain but they are quite low so a tank will be put up – 300,000 litres. A test will be done on the site first.

Table 2: FGD Questions and Answers

No.	Questions	ANSWERS
1	Where do you get water from? List all your current water sources	- Iriri - Water tanks - Borehole - pumps
2	What do you think about the water service you currently have? - Quality - Reliability	- We don't know about the quality whether is good or not good because this are the water sources we have been using since our fathers. It is also prone

	- Safety - Maintenance	to weather or climate change/when lots of rain lots of water.
3	How do you store your water?	- Water containers - Bottles - Pots - Jerry cans
4	Where do you pay for your water?	- We do not pay any water from our current sources; mineral water is only used during workshops etc
5	How much do you pay for your water now?	- No current water by Solomon water.
6	How many buckets of water do you use in a day?	- Depending on family size however on average we use about 10 buckets a day.
7	How could the service be improved?	- Solomon Water must come into the community.
8	Will you be able to pay for a new water connection? (If yes give reason if NO give reason)	- Yes, because safe water is important and also we want reliable /quality water since we are now hosting visitors into Munda.
9	If the service were improved, how much would you expect to pay for water?	- on average $100 minimum but this will also depend on family or household size and needs.
10	What other suggestions do you want to share to improve your ability to pay your bill?	- if those responsible for improving market facilities then women will have an outlet to earn money to pay for family needs. - If locals can be offered small jobs when Solomon Water comes into the community to start construction.

Recommendations

- Possibility of doing instalment payment for New Connections
- Review of payment options
- There should be a more collaborative approach between Solomon Power and Solomon Water (for Electricity costs)
- Wide range of awareness from Solomon water to communities – bills, sanitation, procedures, cash water, meters etc.
- Strengthening partnerships between all stakeholders is the only way forward to progress.
- Construction of infrastructure takes into account Disaster Risk Reduction factors.
- Solomon Water to organise follow up meetings
- Can Solomon Water consider provincial rates or different rates for school and churches?
- Can agreements be reviewed especially with water source and landowners.
- People are demanding they want Cash Meter if Solomon Water operates in Munda

The misconception of customers thinking that work on the water storage tanks etc is a simple easy task without realising that it is a complex network of factors and the system

Conclusion

It is clear from the recommendations that even though the men's group think that the water connection fees are expensive, the people are eager to have SW come into the Munda
Community because they are willing to pay for quality clean water. Both groups now understand that clean quality water is not free and comes with a price and they also accept that since Munda is now an international airport, visitors will want to use clean, quality water.
Both men and women representatives stated that their community is ready to pay for quality consistent water.

They understand that they as landowners must resolve their internal issues and also if any disputes on land is recorded then the project will be halted as this is a very important area for the project to proceed.

There was a separate session organized for landowners after the FGD. This is to get a clearer picture on the issues faced by landownders and how they can move forward.

The assistance rendered by Laurina Bennett in getting all the representatives from the women's, the men's group, the youth representatives, community representatives as well as representative, the land owning groups has clearly demonstrated that wider consultation is critical for the success of the project. The team also noted that new council members have been elected for the Munda community and that's the channel of communication.

Plate 1: Photographs During FGD

Figure 1: Attendance Sheet FGD 11 May 2020

CONSULTATIONS WITH MUNDA COMMUNITY : FOCUS GROUP DISCUSSIONS (WOMEN)

DATE: 11/05/20 VENUE: AGNES LODGE MUNDA SIGN:

NAME	COMMUNITY	CONTACT MOBILE	
1. ELAINE BUI	DUNDE	7319160	
2. FIONA HILLY	DUNDE	7491247	
3. MANNALYN	DUNDE	7985850	
4. Audrey Ngum	Kindu	7181017	
5. Rosina Claimoda	Dunde	7129332	
6. Lena Wickham	Dunde	7164414	
7. Dua Lilo	Dunde	7471250	
8. Mary Bennett	"	7916522	
9. Amalyn Wong	"	7320455	
10. Fay Lome	Enakuri	7769112	
11. Maus Adopae	Enakuri	7435920	
(M) 12. Loti Gesuite	Dunde	7119258	
(M) 13. Jacob Daga	"	7226546	
(M) 14. JOHN PINA	"	7825011	
15. ROSCOE ZINIHITE	Noko	7915979	
16. Lemu Darg	Kindu/LHKL	7752409	
17. Pilasi Wakao	"	7403782	
(M) 18. Ziro Mihaka	KINDU	7408040	
19. Ongu Mali	Kindu	7472662	
20. Roselyn Mallanji	Kindu	7458735	
21. Florence Rove	Kanoko	7716711	
(M) 22. Harvey Talasasa			Harvey Talasasa
(M) 23 Ismael Talasasa		7333444	

CONSULTATIONS WITH MUNDA COMMUNITY : FOCUS GROUP DISCUSSIONS (MEN)

DATE: 11/05/20 VENUE:MUNDA SIGN:

NAME	COMMUNITY	CONTACT MOBILE	
1. Seuda Sisi	Dunde	7845578	
2. Marion Namuru	/	7127379	
3. Boaz Tamani	/	7486323	
4. Joseph Noneke	—	7900844	
5. B. Raego	Kindu	7894612	
6. [illegible]	Dunde	7254603	
7. Denis Mamu	Dunde	7616093	
8. HENRY NGUMI	KINDU	7548785 7210834	
9. Frank J Kere	Lambete (Dunde)	7746442	
10. Chief Eki Lee Daga	Dunde	7615236	
11. DAVID MAKINI	DUNDE	8792869	
12. RAYMOND KASA	Engakuri	7974769	
13. Micky Boso	ZIATA/Kekehe	7800053	
14. Donald Biule	Dunde	7825662	
15. Mark V. Bisili	Dunde	7110744	
16. Roni Kidoe	Kekehe	7497200	
17. Rex Biku	Kekehe	7693514	
18. Millonay	Engakuri	7830059	
19. Patrick	Mkqiki	7418725	
20. Rachel Wilfred	Dunde & Munda	7420573	
21. A'ARON SERUVATU	KINDU	7658300	