Initial Environmental Examination: Update

PAL: 42439

December 2017

Republic of Palau: Koror/Airai Sanitation Project

Malakal Sewer Treatment Plant Project Works

Prepared by Palau Public Utilities Corporation

for the Asian Development Bank (ADB)
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EXECUTIVE SUMMARY

1. This initial environmental examination (IEE) update presents the potential environmental impacts and appropriate mitigation for proposed earthworks and construction of new sewage treatment plant infrastructure on Malakal Island in Koror State, at the site of the existing sewage treatment plant. The IEE update has been prepared in accordance with the requirements of the Asian Development Bank (ADB) Safeguard Policy Statement (SPS, 2009) and conforms to environmental assessment requirements defined in the Republic of Palau's Environmental Quality Protection Board (EQPB), Environmental Impact Statement (EIS) Regulations (1996).

2. **Background.** The IEE prepared under the Project Preparatory Technical Assistance (PPTA) assessed similar sewage treatment technology, namely the process known as Sequencing Batch Reactor treatment. This IEE update, reviews minor changes from the PPTA assessment, as treatment plant design has been finalized. Note the plant will require an EQPB Pollution Discharge Permit prior to operations. This permit review and approval is dependent on final design for a proposed new outfall pipeline and discharge diffuser array.

3. The proposed treatment plant (project) location is shown in Figure 1, below. The project proposes to utilize the site of the existing treatment plant, primary pond, the location of which is elevated about 10 meters above the main roadway. The primary pond infrastructure will be removed, and earthworks will prepare the site for the new plant (see Figure 2: STP Site Layout Plan in Section III, below).

![Figure 1: Proposed Malakal Sewage Treatment Plant Location](image-url)
4. The project will provide environmental and public health benefits such as improved coastal marine water quality from vastly improved treatment of sewerage, compared to the current, disfunctional, treatment plant. The new plant will reduce public health risk and odor nuisance from the existing treatment plant facility, and eliminate exposure to untreated sewage from spills and pond overflows, associated with the existing treatment plant infrastructure.

5. Adverse environmental and social impacts of the Project will mainly be temporary construction impacts, and permanent commitment of Koror State public lands accommodating the plant site.

6. Adequate mitigation measures will be implemented to reduce construction impacts, and; to construct a relatively unobtrusive plant structure, with minimal visual impact from the roadway and public park site. Negative impacts will be prevented, eliminated, or minimized to an acceptable level if the Environmental Management Plan (EMP) required under the IEE is effectively implemented.

7. **Assessment of Impacts.** The proposed works are assessed as having minimal impacts on the significantly altered terrestrial environment, which consists entirely of built environment within the existing primary pond site. Project works will bring positive impacts to the Palau community with the improvements in the wastewater treatment system, and reduced public health risk and odor nuisance compared to the existing treatment plant facility.

8. The main adverse impacts are associated with the preparatory earthworks and construction of the treatment plant, and associated appurtenances, such as pipelines and minor roadworks within the site confines. These impacts include the potential for increased runoff and sedimentation into the adjacent Icebox Park and marine waters, possible sewage overflows during temporary bypass works, and disruption to ingress and egress to the Koror State Animal Shelter facility, and nearby upland farming areas.

9. **Categorization.** The project's anticipated environmental impacts are classified as Category B under the ADB Safeguard Policy Statement, 2009. Such projects are judged to have some adverse environmental impacts, but to a lesser degree, or significance, then those for Category A Projects. An initial environmental examination (IEE) is required to determine if significant environmental impacts, warrant a more comprehensive environmental impact assessment (EIA) to be prepared. If an EIA is not warranted, then the IEE is considered the final environmental assessment report. The IEE, and accompanying environmental management plan (EMP) will be updated if necessary at the detailed design phase by the project management unit responsible for implementing the project.

10. **Implementation arrangements.** The Ministry of Finance will be the executing agency (EA) and the Palau Public Utilities Corporation (PPUC) will be the implementing agency (IA) for the project. A Project steering committee (PSC) will be established to provide strategic direction and guidance for the project and will meet at least once every quarter. A project management unit (PMU) will be established within PPUC and will be responsible for the overall design and implementation of the project. Consultants will be recruited to assist the
PMU to implement the project. Overall responsibility for implementing the Environmental Management Plan rests with the PMU (PPUC), which during design and construction will be supported by the project Implementation Assistance (PIA) consultants.

11. Policy, Legal and Administrative Framework. The Palau Environmental Quality Protection Board (EQPB) is the governing body for environmental protection in the Republic of Palau. The Palau National Code, Chapter 24 Environmental Protection Act administered by the EQPB contains regulations for the protection of surface and marine waters, air quality, and management of potential impacts from earthworks, sanitation systems, and new infrastructure development.

12. The Historical & Cultural Preservation Act, Title 19 PNCA, empowers the Ministry of Community and Cultural Affairs, Bureau of Arts and Culture, to promulgate guidelines for identifying historical sites or tangible cultural property. Prior to construction of a project the Bureau of Cultural Arts and Culture (BAC) must be notified by an application for Historical Clearance from the project proponent, and possible affects to historical or culturally significant sites assessed. BAC may require the project proponent to submit a historical survey prepared by a qualified archaeologist. Historical Clearance must be obtained prior to start of construction. HPO has issued Clearance #6048 for the proposed treatment plant site.

13. The above national regulations, along with Koror State law and building and zoning regulations, are directly applicable to this project. The Koror State Planning Commission has approved the project, the site which is located on Koror State Public lands, with a building permit approval issuance, for overall KASP project works, located in Koror State.

14. Environmental Management Plan. The Project Management Unit (PMU) within the PPUC will be responsible for setting up the environmental management system, consisting of inspection, monitoring, reporting, and initiating corrective actions or measures. In the design stage, the PMU will pass the EMP to the design consultants for incorporating mitigation measures into the detailed designs. The EMP will be updated at the end of the detailed design, and finally be passed to the construction contractors. To ensure that contractors will comply with EMP provisions, the PMU will prepare and provide the following specification clauses for incorporation into the bidding procedures: (i) a list of environmental management requirements to be budgeted by the bidders in their proposals; (ii) environmental clauses for contractual terms and conditions, and (iii) the full IEE report for compliance. The PMU and contractors will each nominate dedicated, trained, and qualified environment specialists to undertake environmental management activities and ensure effective EMP implementation.

15. Information Disclosure, Consultation and Participation. Environmental information on the project was, and will be disclosed. The IEE, and updates, will be disclosed according to the provisions of the ADB Public Communications Policy, 2011, and by the requirements of the laws of the Republic of Palau. The IEE and updates will be made available for review by interested stakeholders at the EQPB and PPUC offices upon submission.
16. The Koror State Planning Commission has approved the project, the site which is located on Koror State Public lands, with a building permit approval issuance, for overall KASP project works, located in Koror State.

17. The stakeholder consultation process disseminated information to the public, project affected communities, and key environmental stakeholders. Information was provided on the scale and scope of the project, and the expected impacts and proposed mitigation measures, through consultation with government departments, local authorities, and the public in meetings.

18. The process also gathered information on relevant concerns of the local community for the project, to address these concerns in the project design and implementation stages. Concerns were focused on the assurance of sustainable operations by the utility, and upon establishment of reasonable, affordable tariffs. No significant environmental concerns were raised during consultations, and the local community anticipates the substantial benefits from the project, in water, sewer, and electrical system improvements.

19. **Grievance Redress Mechanism.** To settle unforeseen issues effectively, an effective and transparent channel for lodging complaints and grievances has been established. Public participation, consultation and information disclosure undertaken as part of the IEE process have discussed and addressed major community concerns. Continued public participation and consultation has been emphasized as a key component of successful project implementation. Because of this public participation and safeguard assessment during the initial stages of the project, significant issues of grievance are not expected. However, unforeseen issues may occur. To settle such issues effectively, an effective and transparent channel for lodging complaints and grievances has been established.

20. **Conclusion and Recommendations.** The project is expected to provide environmental and social benefits such as reduced public health risk from exposure to untreated sewerage, and, improved coastal marine water quality. Associated and cumulative benefits include, improved management, and sustainability of sanitation infrastructure, and increased tourism potential.

21. Potential adverse environmental and social impacts include, construction impacts (runoff and sedimentation into adjacent marine waters), possible sewage overflow during temporary bypass works into the adjacent Icebox park area and marine waters, and diminished aesthetic enjoyment of the park during the construction period. Note these same adverse impacts are currently experienced by the public during operation of the existing treatment plant, due to the dilapidated condition of plant works.

22. Key findings are summarized below:

- Adverse environmental impacts will mainly be construction impacts, which are expected to be minimal for the land based works. However, temporary sewage bypass works, to enable new plant construction, has the potential causing overflows and spillage.
Adaptation measures for climate change, and extreme weather events, have been taken into consideration during final design and project implementation. Priority measures include climate proofing for storm surge, intense rainfall, and long-term sea level rise. The site of the treatment plant to an elevated area, above the existing treatment plant, and approximately 10 meters above sea level, gives assurance of adequate adaptive measures.

The treatment plant design basis of design is to achieve water quality standards acceptable to EQPB regulation, and comparable to regional standards in island nations, in the Pacific area (see Section III). These design standards exceed those approved by EQPB in the former permit issued for the existing treatment plant, in 2002 (PEA-261-02).

23. This IEE, and update, along with accompanying EMP, is considered sufficient to meet ADB’s and the ROP’s environmental requirements, in respect to the rehabilitation and improvement of sewer system works in Palau. Additional impact assessment may be necessary, depending on project options chosen. The IEE and EMP must then be updated accordingly.

I. INTRODUCTION

24. This Initial Environmental Examination (IEE) Update presents the potential environmental impacts and appropriate mitigation and enhancement measures for the construction and operation of a sewerage treatment plant, adjacent to the existing treatment plant, on Malakal Island, within Koror State.

25. The IEE has been prepared in accordance with the requirements of the Asian Development Bank (ADB) Safeguard Policy Statement (SPS 2009) and conforms to environmental assessment requirement defined in the Republic of Palau’s Environmental Quality Board (EQPB), Environmental Impact Statement Regulations (1996), and related guidelines. The project’s anticipated environmental impacts are classified as Category B1 under the ADB SPS 2009.

26. This IEE Update provides an assessment of potential environmental benefits, potential adverse environmental impacts, and risks associated with the proposed sewerage, system infrastructure improvements, and includes (i) a summary of the local and national, standards, and guidelines; (ii) description of the project and anticipated environmental impacts and mitigations measures; (iii) information disclosure, consultation and participation, (v) a grievance redress mechanism, and (vi) and detailed environmental management plans (EMP) sewer operations, including an implementation schedule and performance indicators.

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1 Category B (Safeguards Policy Statement, 2009): A proposed Project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A Projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for Category A Projects. An initial environmental examination is required.
A. Background and Rationale

27. After the preparation, submission, and EQPB approval of the IEE, under the PPTA, in 2012, the Project Implementation Assistance Consultant, proposed a change in the sewage treatment technology and infrastructure, from a “sequencing batch reactor” (SBR) plant to what is termed an “oxidation ditch” type plant.

28. Further discussion, through 2016 and 2017, with the PMU and ADB representatives, reached agreement on returning to the SBR treatment technology, and finalizing design. This IEE update assesses this final design and associated earthworks, in pursuit of the issuance of an EQPB Earthmoving Permit allowing plant construction.

II. POLICY, LEGAL AND ADMINISTRATION FRAMEWORK

A. National and Local Legal Framework

1. National Environmental Framework

29. The EQPB is the governing body for environmental protection in the Republic of Palau. The Palau National Code, Chapter 24 Environmental Protection Act administered by the EQPB contains regulations for the protection of surface and marine waters, air quality, and management of potential impacts from earthworks.

30. Environmental Impact Statement (EIS) Regulation (Chapter 2401–61). The EIS Regulation is Palau’s central environmental planning legislation with the aim of ensuring that environmental concerns are given appropriate consideration in decision making for all new infrastructure projects. The EIS Regulation applies a two-step assessment process to determine the level of assessment required, similar to the ADB environmental safeguard policy.

31. In the first step of the assessment process, an Environmental Assessment (EA) is required for planned activities that propose: (i) use of national or state lands; (ii) use of national or state funds, with some exceptions; (iii) any use within any land which has been or may be classified as conservation district by the Republic or one of its state’s land use commissions; (iv) any use directly or indirectly impacting coastal waters and wetlands as defined in the Republic of Palau Marine and Fresh Water Quality Regulations; (v) any use within any historic site as designated by the Palau Historic Preservation Office; or (vi) any required action which the Board determines may have a significant impact on the environment. The EA is an initial evaluation to determine whether an action may have a significant environmental effect. The EA is evaluated by the EQPB to determine if the action has the potential to have a ‘significant effect on the environment’, in which case a second stage of assessment is required and an EIS must be completed.
32. Marine and Freshwater Quality Regulations (Chapter 2401–11). The Marine and Freshwater Quality (MFWQ) Regulations provide classification of both surface water and groundwater quality criteria and standards. The purpose to the MFWQ regulations are to (i) identify the uses for which the various waters of the Republic of Palau shall be maintained and protected, (ii) specify the water quality standards required to maintain the designated uses, and (iii) prescribe regulations necessary for implementing, achieving, and maintaining the specified water quality, and to protect health, welfare, and property, and to assure that no pollutants are discharged into these waters without being given the degree of treatment or control necessary to prevent pollution. The regulation requires for any new point source of pollution, that the source shall meet and maintain the highest statutory and regulatory requirements, does not discharge into a drinking water source (groundwater or surface water), and sewage must receive the degree of treatment necessary to protect the beneficial uses of waters of the Republic of Palau before discharge. These regulations are directly applicable to the project design and implementation, and have been considered as part of this IEE update.

33. The regulations define water use classifications for freshwater and coastal marine waters, based on the beneficial uses. The coastal marine waters which may be impacted by the project include Class AA, Class A, and Class B waters. In other coastal marine waters around Koror and Airai, the marine waters are classified Class A or AA.

34. The MFWQ regulations define the following water quality standards for each classification.

Table 1: Marine and Freshwater Quality Standards

<table>
<thead>
<tr>
<th>Water Quality Standards</th>
<th>Marine Waters</th>
<th>Freshwater</th>
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<tbody>
<tr>
<td></td>
<td>AA</td>
<td>B</td>
</tr>
<tr>
<td><strong>Microbiological</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A Fecal Coliform</td>
<td>230/100 ml</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>70/100 ml^m</td>
<td>-</td>
</tr>
<tr>
<td>B Fecal Coliform</td>
<td>-</td>
<td>400/100 ml</td>
</tr>
<tr>
<td></td>
<td>200/100 ml^m</td>
<td>-</td>
</tr>
<tr>
<td>C Enterococci</td>
<td>60/100 ml</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>33/100 ml^m</td>
<td>-</td>
</tr>
<tr>
<td>D Shellfish Areas</td>
<td>Where shellfish for human consumption is harvested the micro-biological standard for Class AA and 1 Waters shall apply</td>
<td></td>
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<table>
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<th>pH</th>
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^2 EQPB Water Quality Laboratory has adopted this standard for freshwater also (K. Ngrichechol, EQPB WQ Lab Supervisor, pers. comm.)
## Water Quality Standards

<table>
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<th>Classes</th>
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<tbody>
<tr>
<td></td>
<td>AA</td>
<td>B</td>
</tr>
<tr>
<td>A</td>
<td>7.7 – 8.5</td>
<td>7.7 – 8.5</td>
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<td>B</td>
<td>-</td>
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</table>

### Nutrients

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<th>Freshwater</th>
</tr>
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<tbody>
<tr>
<td>A Ratio N:P</td>
<td>11.1 – 27.1</td>
<td>6.1 – 18.1</td>
</tr>
<tr>
<td>B Concentration of N/P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C Total P mg/l as P</td>
<td>&lt; 0.025</td>
<td>&lt; 0.500</td>
</tr>
<tr>
<td>Total N mg/l as N</td>
<td>&lt; 0.4</td>
<td>&lt; 0.8</td>
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### Dissolved Oxygen

<table>
<thead>
<tr>
<th>Classes</th>
<th>Marine Waters</th>
<th>Freshwater</th>
</tr>
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<tbody>
<tr>
<td>A All Waters</td>
<td></td>
<td>&lt; 25% var.</td>
</tr>
<tr>
<td>B Levels mg/l</td>
<td>&gt; 6.0 / 75%</td>
<td>&gt; 4.5</td>
</tr>
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### TDS, Salinity

< 10% change from natural isohaline conditions or outside the range of 29 – 35 ppk

### Temperature

< 0.9 °C change from natural conditions

### Turbidity

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<tr>
<th>Classes</th>
<th>Marine Waters</th>
<th>Freshwater</th>
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<tbody>
<tr>
<td>A &lt; 1 NTU</td>
<td>&lt; 2 NTU</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>&lt; 5% var.</td>
</tr>
<tr>
<td>D</td>
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### Radioactive Material


B No radionuclides to be present in amounts that exceed Republic of Palau Public Water Supply Regulations

C The concentration of radioactive material shall not result in the accumulation of radioactivity in plants or animals that would result in a hazard to human or aquatic life.

### Oil & Petroleum Products

A Visible Sheen Concentration of oil should not be detectable as a visible sheen or discoloration of the surface or cause an objectionable odor.

B Tainting Fish or Taste Concentrations should not cause tainting of fish or other aquatic life, be injurious to indigenous biota or cause objectionable taste to drinking water.
35. **Earthmoving Regulations (Chapter 2401–01).** The earthmoving regulations apply to any construction or other activity which disturbs or alters the surface of the land. The regulations require preparation of an erosion and sedimentation control plan by a person trained and experienced in erosion and sedimentation control methods and techniques. The plan should outline a description of the project works and required control measures to mitigate the potential impacts of sedimentation. The plan must be submitted to the EQPB Board along with clearance from the Historical Preservation Office of the State Planning Commission, for review. A permit is required from the EQPB prior to any excavation works commencing.

36. **Toilet Facilities and Wastewater Disposal System (TFWDS) Regulations (Chapter 2401–13).** The TFWDS Regulations establish standards for toilet and wastewater disposal systems. The regulations require minimum standards governing the design, construction, installation, and operation of toilet and wastewater disposal systems for the purposes of (i) minimizing environmental pollution, health hazards, and public nuisance from such systems and facilities; (ii) protecting the health of the septic tank user and all neighbors; and (iii) ensuring that sewerage will not contaminate drinking water supply, be accessible to insects, rodents, or other possible carriers of disease which may come into contact with food or drinking water, pollute or contaminate the waters used for swimming, or generally pose a public health nuisance or hazard.

37. The TFWDS regulation is focused on household sanitation systems, such as septic tanks, and connection requirements to the public sanitation system in areas where it is available. The regulation does not provide discharge standards or design specifications for the larger scale public sewerage infrastructure works under this project.

38. **Air Pollution Control Regulations (Chapter 2401–71).** The most relevant section of the Air Pollution Control Regulations to sanitation planning is the prohibition on odors, which forbids the emission of odors causing a nuisance and/or negative impact to public health.

39. **Koror State Mangrove Protection Act.** This act prohibits the cutting and/or harvesting of trees and vegetation below the high tide line, in mangroves and wetland areas. The project will not include clearing of any areas of mangrove.
40. **Conservation Areas.** Koror State has not established any Conservation Area at the treatment plant site, or outfall pipeline area.

**B. ADB Guidelines and Policies**

41. The ADB SPS (2009) provides a basis for this IEE update. With respect to environment, these policies are accompanied by the ADB Environmental Safeguard, Good Practice Sourcebook, 2012. The policy promotes international good practice as reflected in internationally recognized standards such as the World Bank Group’s Environmental, Health and Safety Guidelines.

42. All projects funded by ADB must comply with ADB Safeguard Policy as set out in the SPS (2009). The purpose of the environmental safeguards is to establish an environmental review process to ensure that projects undertaken as part of programs funded under ADB loans are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and are not likely to cause a significant environmental, health, or safety hazards.

43. The SPS (2009) requires a number of additional environmental considerations to that generally undertaken in accordance with the ROP Environmental Protection Act and related legislation. ADB requirements include: (i) identification of project environmental risks and respective mitigation measures and project assurances; (ii) development of a project level environmental Grievance Redress mechanism (GRM) including documentation in the EMP; (iii) definition of the project area of influence; (iv) undertaking a physical cultural resources damage prevention analysis; (v) identification of climate change mitigation and adaptation strategies; (vi) identification of biodiversity conservation and natural resources management requirements; and (vii) ensuring that the EMP includes an implementation schedule and (measurable) performance indicators.

**III. DESCRIPTION OF THE PROJECT**

44. KASP Project proposed works for sewage treatment have been modified from the original Initial Environmental Examination (IEE) report submission to the Palau Environmental Quality Protection Board (EQPB), in 2012, and the PPTA Feasibility Report (ADB 2012). During design development and finalization, KASP has considered several sewage treatment processes, including “Oxidation Ditch” technology, “Rotating Biological Contactor (RBC)” technology, and finally decided on “Sequencing Batch Reactor (SBR)” technology. The basis of design for the plant, prepared by the contractor and submitted to PPUC, is found in Appendix A: Basis of Design Report. Full design plan drawings will be submitted to EQPB, in hard copy and electronic file (PDF), and referenced here as Appendix B: Project Design Drawings.
Figure 2: Malakal STP Site Layout Plan
45. **Detailed Works.** Proposed works for the wastewater system, within the Park and adjacent area include:

- Removal of the existing concrete primary pond liner.
- Excavation into the slope area, northwest of the pond area.
- Constructing new

46. **Detailed Work Plan.**

47. Estimated wastewater effluent flows from the plant, are given below in Appendix A: Basis of Design, which details a peak hydraulic flow of 12720 m³ per day. Appendix B: Design Drawings details the proposed earthworks and plant construction.
IV DESCRIPTION OF ENVIRONMENT

48. Description of the environment for the entire KASP Project area is included, in detail, in the IEE prepared for the PPTA 7382-PAL Sanitation Sector Development Project. This IEE Update will focus on the specific area within Koror State, which encompasses the proposed treatment plant site, and adjacent areas relevant to this project.

C. Physical Environment

1. Climate

49. Recent climate events affecting the project area, and the whole of Palau, include a record period of drought, with the driest October to March 2015, and driest March to April 2016 recorded, making 2015 the driest year recorded in 80 years of observations in Palau (NOAA ENSO Applications Climate, May 2016 Bulletin), this followed the onset of the strongest El Nino Southern Oscillation event ever recorded.

Figure 4: Monthly Rainfall During El Nino Years for Palau

50. Following the peak of the El Nino event in December 2015, climate transitioned within a few months’ time to La Nina conditions, with mean tide rising 20 cm above the historical mean, and 45 cm above the low mean recorded at the height of the El Nino event (pers. comm. Dr. P. Colin, Coral Reef Research Foundation, Palau). Despite predictions of another possible El Nino event, in early 2017, by mid-year climate conditions remained normal and the probability of El Nino conditions developing diminished considerably.
51. **Climate Change**-The International Panel on Climate Change (IPCC) Assessment Report 5 (AR5) recognizes that developing countries particularly Small Island Developing States such as Palau are particularly vulnerable to climate change. Projected sea level increases to the year 2100 are 0.35m to 0.70m (AR5: RCP 4.5:), this rise, in combination with extreme sea level events, such as swell waves, storm surges, and ENSO events, present severe sea inundation and erosion risks for low lying islands (IPCC AR5). Locations currently experiencing adverse impacts such as coastal erosion and inundation will continue to be affected due to increasing sea levels. The contribution of mean sea level rise to increased coastal high water levels, coupled with the likely increase in tropical cyclone maximum wind speed, is a specific issue for tropical small island states.

52. The Pacific-Australia Climate Change Science and Adaptation Planning Program Technical Report, Ch 10, Palau, 2014, notes that For the period to 2100, the latest global climate model (GCM) Projections and climate science findings indicate:

- El Niño and La Niña events will continue to occur in the future *(very high confidence)*, but there is little consensus on whether these events will change in intensity or frequency;
- Annual mean temperatures and extremely high daily temperatures will continue to rise *(very high confidence)*;
- Average rainfall is Projected to increase *(high confidence)*, along with more extreme rain events *(high confidence)*;
- Droughts are Projected to decline in frequency *(medium confidence)*;
- Ocean acidification is expected to continue *(very high confidence)*;
- The risk of coral bleaching will increase in the future *(very high confidence)*;
- Sea level will continue to rise *(very high confidence)*; and
- Wave height is Projected to decrease in the dry season *(low confidence)* and wave direction may become more variable in the wet season *(low confidence)*

**Temperature:** While relatively warm and cool years and decades will still occur due to natural variability, there is Projected to be more warm years and decades on average in a warmer climate.

**Rainfall:** There will still be wet and dry years and decades due to natural variability, but most models show that the long-term average is expected to be wetter. The effect of climate change on average rainfall may not be obvious in the short or medium term due to natural

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3IPCC, AR5 2014 (the Intergovernmental Panel on Climate Change is a scientific body established by the United Nations Environment Programme and the World Meteorological Organization in 1988 as the leading international body on the assessment of climate change)

4Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX): Summary for Policy Makers, Intergovernmental Panel on Climate Change (IPCC), November 2011
variability. These Projections are similar to those in Australian Bureau of Meteorology and CSIRO (2011).

**Drought:** The overall proportion of time spent in drought is expected to decrease under all global climate model scenarios.

**Tropical Cyclone (Typhoon):** There is a growing level of agreement among models that on a global basis the frequency of tropical cyclones is likely to decrease by the end of the 21st century. These Projections are consistent with those of Australian Bureau of Meteorology and CSIRO (2011).

**Sea Level Rise:** Mean sea level is Projected to continue to rise over the course of the 21st century. There is very high confidence in the direction of change. Several global climate models (CMIP5, RCPs) simulate a rise of between approximately 3 to 7 inches (8–18 cm) by 2030. Interannual variability of sea level will lead to periods of lower and higher regional sea levels. In the past, this year to year variability has been about 8 inches (20 cm), and it is likely that a similar range will continue through the 21st century. Sea level data at Palau measured since 1950 is about 0.35 inches (9 mm) per year.\(^5\)

53. Sea level is also generally higher during La Niña events, with three of the top 10 water levels recorded at Palau occurring during La Niña and none during El Niño (Australian Bureau of Meteorology and CSIRO, 2011). Tide gauge data show the strong annual variability in tide heights, and indicate that ENSO events are a significant component of high water levels.

54. ENSO events also modulate temperature and rainfall in the western equatorial Pacific Ocean. Droughts generally occur in the first four to six months of the year following an El Niño. During severe El Niño events, rainfall can be suppressed by as much as 80%. The dry season begins earlier and ends much later than normal. (Pacific Climate Change Science Program: Ch 10 Palau reports, 2011 and 2014). Variability in temperature and rainfall, during ENSO events is shown below:

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\(^5\)Pacific Climate Change Science Program: Ch 10 Palau report, 2014
Figure 5: ENSO Events: impacts on rainfall and temperature

Observed time series of annual average values of mean air temperature (red dots and line) and total rainfall (bars) at Koror, Palau. Light blue, dark blue and grey bars denote El Niño, La Niña and neutral years respectively. Solid black trend lines indicate a least squares fit.

55. Planning for the future climate change scenario will help mitigate potential impacts to the project, vulnerable ecosystems, and quality of life indicators for Palau residents. Of additional concern, is if disasters occur more frequently and/or with greater magnitude. Potential threats to wastewater infrastructure will likely include:

- Increased sea water inundation
- Increased erosion and subsidence of coastal areas
- Increased frequency of intense rainfall events, and subsequent flooding
- Increase in tropical cyclone intensity, though reduced frequency
- Increase in drought intensity, though reduced frequency

56. Planning for the potential impacts of climate variability will help to mitigate against potential impacts which may include (i) sea water inundation resulting in failure of near shore sanitation infrastructure, and (ii) increased risk of contamination of near shore marine waters. Planning considerations should include: (i) planning new infrastructure at a suitable elevation above the current high tide level (utilizing accurate topographic survey), (ii) provision for protective flood berms around existing above ground infrastructure at low elevations above the current hide tide level, (iii) ensuring new infrastructure is designed to withstand extreme weather events.

57. The vulnerability of fragile ecosystems such as coral reefs and coastal zones, as well as rare or endangered species is further increased by climate variability, droughts, water
pollution, soil erosion, poor land management and land degradation, and unsustainable development.

2. Geology and Soils

a. The USDA Natural Resources Conservation Service Soils Survey of Palau describes soils in the proposed construction area as filled, level land, that is well drained with a moderate potential for runoff (Soil Map Unit 654-Orthents-Urban land complex, 0-50% slopes). The filled area lies at the toe of a fairly steep slope, comprised of silty loam (Soil Map Unit 637-Palau silt loam, 12-30% slopes).

3. Freshwater Resources

58. There are no surface water resources at the proposed plant site or vicinity.

4. Marine Resources

59. Marine waters surrounding the existing, and proposed, sewage treatment plant area are classified as ‘Class B’, under the EQPB Marine and Freshwater Quality Regulations, due to their location proximate to Malakal Harbor. The uses to be protected in this class of waters, are small boat harbors, commercial and industrial shipping, bait fishing, compatible recreation, the support and propagation of aquatic life, and aesthetic enjoyment. It is the objective for this class of waters that discharge of any pollutant be controlled to the maximum extent possible and that sewage and industrial effluent receive the highest degree of treatment practicable under existing technological and economic conditions (EQPB Regulations 2401-11-05).

60. The EQPB has issued public advisories following test results that exceed biological standards. The “Prohibited Water Use Advisory” states “High levels of Enterococci bacteria is a health hazard and could cause illnesses, therefore, immediately, a “Prohibited Water Use Advisory” for water related activities such as swimming, fishing and seafood gathering is in effect for the marine waters near this area until further notice”. The public advisories typically follow serious sewer overflows reported, previously by the Bureau of Public Works and now by PPUC, to the EQPB. The EQPB samples waters during the overflows or shortly after, and may issue a public advisory if fecal bacteria exceed standards. Such overflows, as from the two sewage ponds, associated with the existing treatment plant, have prompted EQPB to post advisories to the public for water activities.

6. Air Quality

61. Persistent nuisance and noxious odor are experienced in vicinity of the existing sewage treatment plant, due to the dilapidated state of the physical plant and substandard operation.
D. Ecological Environment

1. Terrestrial Flora and Fauna

62. The proposed site for the new treatment plant is currently occupied by the primary intake pond, associated with the existing treatment plant infrastructure. As such it is entirely built area with an access road and grassed grounds surrounding the concrete lined intake pond.

2. Marine Flora and Fauna

63. The proposed site for the new treatment plant lies 40 meters from the shoreline, the main roadway lies between the plant site and the shoreline (see Figure 1: Proposed Malakal Sewage Treatment Plant Location). The plant site is about 10 meters elevation above sea level. Therefore, no direct impacts to marine flora and fauna are anticipated.

E. Social Environment

1. Socioeconomic Environment

64. Residents and tourists alike recreate in the Icebox Park, located on the shoreline of Malakal Bay and across the main roadway from the existing sewage treatment plant. Picnicking, swimming and wading are an important use of the park by visitors, along with other sporting activities. Park use is constant throughout the day, with highest use during weekends and holidays, this despite the frequent presence of nuisance odors for the existing sewage treatment plant.

65. Adjacent to the existing treatment works is a government building which houses offices of the Ministry of Marine Resources. The construction of a new mariculture facility is currently underway, adjacent to the Marine Resources building.

4. Land Ownership and Use

66. The proposed treatment plant site is considered Koror State public land, and the Koror State Public Lands Authority has approved its use for the plant site, in its easement grant approval and permitting of the KASP project works (submitted to EQPB on November 11, 2016)

5. Cultural and Traditional Features

67. The Ministry of Community and Cultural Affairs, Historic Preservation Office (HPO) has issued Clearance for the proposed plant site, under its review for temporary treatment works, required prior to the new plant’s construction (Historic Clearance #6048).

6. Noise
68. Vehicle traffic consists of private and commercial cars and trucks, traversing the main roadway, below the proposed plant site, associated with the park site and government facilities located past the existing treatment plant. Noise will be elevated during construction of the new plant, but impacts to specific, sensitive, noise receptors is not anticipated, given the 40 meters distance, and 10 meters elevation, of the plant site, above the Icebox Park area.

7. Traffic

69. Motor vehicle traffic levels on the roadway adjacent to Icebox Park, are typically moderate. Construction vehicle traffic will increase during plant construction and may cause minor difficulties with vehicle movement along the park’s entrance road.

8. Public Health

70. The EQPB has issued public advisories following water quality test results that exceed biological standards. The “Prohibited Water Use Advisory” states “High levels of Enterococci bacteria is a health hazard and could cause illnesses, therefore, immediately, a “Prohibited Water Use Advisory” for water related activities such as swimming, fishing and seafood gathering is in effect for the marine waters near this area until further notice”. The public advisories typically follow serious sewer overflows reported, previously by the Bureau of Public Works, and now by PPUC, to the EQPB. Such overflows, as from the two sewage ponds, associated with the existing treatment plant, have prompted EQPB to post advisories to the public for water activities.

V. ANALYSIS OF ALTERNATIVES

F. No Project Alternative

71. Compared to the with-Project scenario, the without-Project scenario would see continued inefficient and ineffective sewage treatment management, with regards to the existing sewage treatment plant, which is dilapidated, and essentially non-functioning.

72. With the eventual rehabilitation of the existing treatment plant site, the two sewage ponds, and remaining infrastructure, will be eliminated, greatly enhancing the aesthetics of the shoreline public park area.

G. Discussion of Alternative Solutions

73. After the preparation, submission, and EQPB approval of the IEE, under the PPTA, in 2012, the Project Implementation Assistance Consultant, proposed a change in the sewage treatment technology and infrastructure, from a “sequencing batch reactor” (SBR) plant to what is termed an “oxidation ditch” type plant

74. Further discussion, through 2016 and 2017, with the PMU and ADB representatives, reached agreement on returning to the SBR treatment technology, and finalizing design. This IEE update assesses this final design and associated earthworks, in pursuit of the issuance of an EQPB Earthmoving Permit allowing plant construction.
75. The location of the new treatment plant has remained consistent, with the existing primary pond location being the preferred site. This location has is set back from the main roadway and park area, at an elevation about 10 meters above the roadway. The plant site will not be visible from the roadway and park area.

VI. ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

76. The potential environmental and social impacts of the proposed project have been assessed in line with ADB's Safeguard Policy Statement, including assessment of the possible benefits and impacts with regards to (i) sustainable natural resource management; (ii) pollution prevention and abatement; (iii) health and safety; and (iv) climate change. Similar to previous ADB initiatives that improved water and sanitation services in the Palau, the project will clearly generate environmental and related benefits, in excess of the adverse environmental impacts incurred during project implementation and operations.

77. The project will construct wastewater infrastructure, in an environmental setting where habitat has been highly modified by the built environment associated with the existing treatment plant infrastructure, therefore no impact to natural habitats is anticipated.

A. Design and Pre-construction Impacts

1. Impacts on Physical Resources

These impacts relate to topography, geology, and soils impacts; and consideration of climate change, for the project at the design and pre-construction stage. Also considered, at this stage, are the appropriate implementation of mitigation measures, to monitor and ensure compliance with environmental regulations and provide environmental and social protection. Proper implementation will ensure continuously improving environmental protection activities during design, construction, and operation to prevent, reduce, or mitigate adverse impacts.

78. Climate Change/Natural Hazard considerations. Planning for the potential impacts of climate variability, and natural hazards, will help to mitigate against potential impacts which may include: (i) sea water inundation resulting in failure of wastewater systems infrastructure. (ii) increased risk of contamination for the community and near shore marine waters from sewage overflows.

79. Mitigation measures include:

- Planning new infrastructure at a suitable elevation above the current high tide level (utilizing accurate topographic survey), or alternatively, include design to prevent inundation during flood events.

- Ensuring new infrastructure is designed to withstand extreme weather events, such as sea water inundation.
▪ Additional adaptation measures outlined in the main IEE, Appendix D: Climate Change Vulnerability Matrix shall be considered and incorporated into the design stage, where practicable, to mitigate the future impact of climate change.

80. **Topography, geology, and soils.** For the project land based earthworks will not have significant impacts on the existing topography, geology, and soils; the site works will be in areas of built environment and previously filled areas. Soils in the project area consist of clays and silty loam.

81. **Construction permits.** Permits will be obtained from EQPB for Earthmoving, activities, and Clearance obtained from the Historic Preservation Office. The project is also subject to building permit requirements from Koror State. Approval by the Koror State Public Land Authority and Planning Commission are also pending.

### 2. Impacts on Ecological Resources

82. **Terrestrial Ecology.** As stated above, land based earthworks for the project, will not have significant impacts on the existing topography, geology, and soils, or significant terrestrial habitat. The project design proposes that site works will be in areas of built environment and previously filled areas. The terrestrial ecology has been extensively modified by the built environment at the site, and no mitigation for terrestrial ecological impacts is considered necessary.

83. **Marine Ecology.** The proposed site for the new treatment plant lies 40 meters from the shoreline, the main roadway lies between the plant site and the shoreline (see Figure 1: Proposed Malakal Sewage Treatment Plant Location). The plant site is about 10 meters elevation above sea level. Therefore, no direct impacts to marine flora and fauna are anticipated from earthworks and other associated construction activities for the treatment plant.

84. Mitigation measures include avoiding and/or minimizing the requirement for disturbance of surface soils in the design phase where ever possible, to avoid the occurrence of accelerated erosion and possible sedimentation into marine waters.

### 3. Impacts on Socio-economic Resources

85. Inclusion of mitigation measures in contract documents for the project, and assurance that the PMU (PPUC), has adequate capacity to implement the Environmental Management Plan (EMP), including training of contractor personnel in the requirements of the EMP, will eliminate or minimize anticipated impacts. The EMP will require updating following the detailed design phase, and award of contracts.

86. Mitigation measures include:

▪ All land acquisition and resettlement issues are resolved.
The Project will pass through the EQPB Environmental Impact Statement (EIS) process, and review by the Board.

Appropriate environmental mitigation and monitoring measures are included in the environmental management plan (EMP). The proposed environmental mitigation measures will form part of the design documents for the project and will be adequately budgeted, and included in the contracts for procurement of goods and services. All contractors and subcontractors will be required to comply with the EMP.

Contract tender documents will direct the contractor to provide qualified staff for environmental, safety and health, management and monitoring, as specified in the Contractor's EMP (CEMP).

Submission of a construction environmental management plan will be required by the contractor, with approval by the Project Implementation Assistance (PIA), through the PMU. The plan will address erosion and sedimentation control, waste and materials management, control plans for traffic, noise, and dust.

87. **Land acquisition and resettlement.** No land acquisition or resettlement issues are associated with the project works. As stated above, Koror State approvals are necessary for the project to proceed within the public lands.

**B. Construction Impacts**

88. The project construction phase has the potential to result in adverse environmental impacts. The construction phase, which will occur over a one year period will involve construction of the infrastructure described in Section III. The proposed construction works have the potential to cause adverse environmental impacts to soil, water, air, and marine flora, and fauna.

2. **Impacts on Physical Resources**

89. **Climate Change/Air Quality.** Construction vehicles, equipment, and generators will emit greenhouse gases during the period of construction, but will not be a significant contributor to overall greenhouse gases. Construction vehicles, equipment, and generators will be serviced regularly to reduce emissions.

90. **Water Quality.** Earthworks associated with the project have the potential to result in increased sediment runoff entering the coastal marine environment. Earthworks will be required for the construction of the sewer treatment plant, and pipeline sections connecting to the outfall pipeline.

91. **ROP water quality standards for Class B waters,** which are adjacent to the project land works, require that the discharge of any pollutant be controlled to the maximum extent possible and that sewage and industrial effluent receive the highest degree of treatment practicable under existing technological and economic conditions.
Water quality impacts from earthworks can be mitigated as follows:

- Use of sediment retention fencing, berms, and sandbags around excavations to restrict the release of sediment from the construction site.

- Assure sediment laden water from dewatering works is discharged to an area where it is contained, and sediment allowed to settle out, prior to runoff into marine waters.

- Immediately re-vegetate and/or stabilize exposed surfaces and stockpiles of excavated materials.

- Monitor water quality for near shore waters adjacent to land works.

Disposal of spoil. Spoil will be generated from sewer plant and pipeline installation. Mitigation includes: (i) Spoil will either be reused as fill; or (ii) spoils are provided to the Bureau of Public Works, Solid Waste Division, for use as waste cover at the M-Dock landfill. Spoil amounts should be negligible as most works will utilize the existing plant footprint.

Generation of solid wastes and disposal. Construction works will result in general waste and construction solid waste. Management of waste should include minimization, reuse, recycling through the use of multi-compartment collection bins, composting of solid waste where appropriate, regular collection, and disposal to the landfill. However, it is noted that the amounts of general waste for recycling and composting generated by the project will not be significant.

Removal and disposal of any asbestos concrete pipe needs to be supervised by a competent person, with worker training provided that assures workers understand the significance of the hazards and how to protect themselves. Disposal should consist of placing the pipe in a leak proof container or wrapping, marked with the warning statement "Danger Asbestos-Containing Material". With the absence of any proper landfill facility authorized to accept asbestos waste, it would be practicable to obtain approvals to bury the contained pipe in a suitable location, with proper signage advising the public not to disturb.

Solid waste disposal impacts can be mitigated as follows:

- Contactor will prepare a Waste Management Plan (WMP) as part of the CEMP to cover waste disposal procedures, and to include a spill cleanup plan

- Multi-compartment collection bins will be provided by the Contractor for waste segregation and subsequent reuse and recycling

- Burning of construction waste will be prohibited

Solid waste will be collected from the work sites on regular basis and disposed at the M-Dock landfill, under the direction of Bureau of Public Works, Solid Waste Division.

Asbestos concrete pipe sections will be placed in leak proof containers or wrapping, and marked with the cautionary statement “Danger Asbestos-Containing Material. The pipe sections will be buried at an authorized location, approved by EQPB and Bureau of Public Works, with proper signage advising the public not to disturb. All handling and disposal will be supervised by a competent person, trained in asbestos abatement.

Hazardous materials. The use and storage of hazardous materials during construction can impact on physical soil and water resources if they accidentally spill or leak into the environment and if hazardous materials are not properly disposed of.

Hazardous materials that will be stored as part of the construction of the project will be machinery fuels and oil. Hazardous waste in the form of used batteries, fuel drums and oily wastes may require disposal as part of the construction works. To mitigate the impacts of hazardous materials use the contractor will be required to implement the following:

- Hydrocarbons and toxic material will be stored in adequately protected sites consistent with international best practices to prevent soil and water contamination.
- All areas intended for storage of hazardous materials will be quarantined and provided with adequate facilities to combat emergency situations.
- Segregate hazardous wastes (oily wastes, used batteries, fuel drums) and ensure that storage, transport and disposal shall not cause pollution and shall be undertaken consistent with international best practice.
- Ensure all storage containers are in good condition with proper labeling.
- Regularly check containers for leakage and undertake necessary repair or replacement.
- Store hazardous materials above possible flood level
- Discharge of oil contaminated water shall be prohibited.
- Used oil and other toxic and hazardous materials shall be disposed of off-site at a facility authorized by permit, or safely transported off island to an authorized facility.
- Ensure availability of spill clean-up materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored.

2. Impacts on Ecological Resources

Terrestrial ecology. The project design proposes that site works will be in areas of built environment and previously filled areas. The terrestrial ecology has been extensively
modified by the built environment at the site, and no mitigation for terrestrial ecological impacts is considered necessary.

99. The project will not introduce any alien species that are not yet established in the region of the project, or promote species that are known to be invasive in the given environments. All vessels carrying equipment and materials to the project will be subject to inspection by agriculture quarantine inspectors, and may be refused entry into the ROP if they are known or suspected of being infected or infested with disease or pests.

100. Mitigation measures include:

- Prohibition of burning vegetation and residual bushes and grasses when clearing the plant site
- Only cutting flora which are a direct obstacle to project infrastructure works.
- All vessels carrying equipment and materials for the project will be subject to inspection by agriculture quarantine inspectors

101. Marine ecology. There are no marine based works proposed for the project. This should result in, no or limited, construction impacts to the adjacent marine environment, if erosion control plans and best management practices are implemented for adjacent land based works.

102. Possible impacts to marine ecology from sewer treatment plant construction will be mitigated as shown below:

- Use of sediment retention fencing, berms, and sandbags around excavations to restrict the release of sediment from the construction site.
- Assure sediment laden water from dewatering works is discharged to an area where it is contained, and sediment allowed to settle out, prior to runoff into marine waters.
- Immediately re-vegetate and/or stabilize exposed surfaces and stockpiles of excavated materials.
- Monitor water quality for near shore waters adjacent to land works.

3. Impacts on Socio-economic Resources

103. Construction camp, offices, and laydown areas. It is doubtful that a construction camp will need to be built, as the workforce will be small, but public accommodations are also very limited. There are hotels, limited apartment rentals, and some barracks type accommodation available. The PPUC utility has limited laydown area at the power plant site, and at the Water and Wastewater Division yard, to accommodate storage of materials and equipment. Temporary housing and offices, with laborers from off island, could create disturbances and conflicts. Impacts can be mitigated by the following:
Laydown areas are established within PPUC facilities, or at agreed to private and public lands

Workforce accommodations and office facilities utilize hotels or rental properties

Any camps established are through the approval of Koror State Government, and landowners

Camps are provided with sufficient potable water, shower and toilet facilities (designated male and female)

All sites utilized for contractor facilities are restored to the landowner’s satisfaction at end of project. Site cleanup will be inspected and approved by PPUC’s environmental manager.

The use of local labor to the greatest extent possible

104. **Worker health and safety.** Worker health and safety requirements must comply with acceptable standards such as the World Bank Environmental Health and Safety Guidelines. The contractor will prepare a health and safety plan (HSP), including an activity hazard analysis (AHA); these will be subject to approval by PPUC’s environmental manager and PIAC, prior to the start of any works. The contractor will appoint a competent person as Safety Manager, who will conduct initial training for workers, prior to the startup of works, and hold weekly safety meetings through the project duration. Training topics will include review of the HSP and AHA, first aid,

105. Personal protective equipment (PPE) will be provided by the contractor and will include at minimum, safety boots, hardhats, high visibility vests, eye and ear protection, gloves and other protective clothing as necessary.

106. Potential impacts to worker health and safety include (i) unsanitary living and working conditions; (ii) contaminated food and water; (iii) communicable disease; (iv) air and noise pollution(v) work site accidents. These potential impacts and prevention measures will be addressed in the HSP.

107. Mitigation measures proposed to ensure worker health and safety include:

- Contractor prepared Health and Safety Plan, including an Activity Hazard Analysis, approved by PPUC environmental manager and PIAC

- Contractor appoints a competent person as safety manager, supervising all health and safety matters

- Contractor safety manager conducts initial worker training and review of AHA. Weekly safety meetings are conducted through the duration of project
• All workers provided with appropriate PPE, as issued by the safety manager. The safety manager trains all workers in the proper use of PPE.

108. **Community safety.** Impacts of concern to the crowded residential community of Koror will focus on contractor vehicle and equipment traffic safety, and work site safety. Main residential streets carry high vehicle traffic volumes and are typically crowded with pedestrians. The contractor safety manager must prepare a comprehensive traffic safety plan, to be included in the HSP, with review and approval by PPUC and Koror State Government. The safety manager will appoint full time traffic control personnel with stop and go signs, to direct local and construction traffic around all work sites. Work site access will be restricted by fences or other barriers to prevent residents, especially children, from entering unsafe areas. Mitigation for impacts includes:

• Contractor traffic safety plan, included in the HSP, and approved by PPUC and Koror State Government.

• Full time traffic control personnel at all work sites

• Restricted and controlled work site access

109. **Noise.** Construction vehicle and heavy machinery operation has the potential to result in significant noise impacts. Noise volume of construction machinery is generally between 80 ~ 110 dB, while heavy vehicle noise intensity is generally about 90 dB, and general traffic about 60 dB. As the majority of the construction works will be within the urban sections of Koror, or close to residential dwellings, it will be important to reduce noise impacts where possible. Typical daytime residential noise level is 55 dB, noise from construction should be mitigated so that it does not exceed a maximum of 3 dB above this background level at the nearest receptor location off site. Project equipment and machinery must comply with commonly accepted standards (such as Part 204 of US Federal Regulations-Noise Emission Standards for Construction Equipment (40 CFR 204)), and select low-noise technology and equipment, use of vibration dampers for equipment components with large vibration, and maintaining equipment in good repair. The use of construction noise barriers (typically temporary plywood wall structures) may be warranted for specific sites, such as pump station and treatment plant works, to provide abatement from noise impacts to nearby residents. The contractor safety manager will monitor noise levels at all work sites and document any complaints from residents, then take remedial action. Mitigation for noise impacts will include:

• Construction vehicles and equipment comply with international standards for noise emissions

• Vehicles and equipment are maintained in good working order

• Construction noise barriers are erected where necessary
• Construction works should be restricted outside the hours 07:00 and 18:00, or as agreed based on consultation with the community, Koror State Government, and EQPB

• The contractor safety manager will monitor noise levels at all work sites and document any complaints from residents, then take remedial action

111. **Dust.** Dust and sand build up on the paved residential roads in Koror, as there is limited road sweeping conducted by public works. Mitigation for dust generation by construction works will require the contractor to keep roads in the vicinity of work sites cleaned of dust and sand to avoid impacts from fugitive dust, created by vehicles and equipment traffic. Trucks delivering fill material will be covered by tarps during transport.

112. **Sites of significance.** The Ministry of Community and Cultural Affairs, Historic Preservation Office (HPO), has indicated that there are no cultural or traditional features of significance in the project area, especially as the project works will lie wholly within the footprint of previously filled and constructed areas of the existing treatment plant complex. HPO has issued Clearance #6048 for the proposed treatment plant site.

113. In case such resources are found, all construction work will be put to a halt and consultations will be held with the local authorities (KSG), Project staff, and HPO on how to proceed. Such events and the subsequent decisions and actions will be reported in the environmental progress reports. In any case, to mitigate impacts to cultural or traditional features found, the project will not remove any physical cultural resources unless explicit approval is granted from HPO and KSG.

C. Operation Impacts

3. **Impacts on Physical Resources**

114. **Marine Water Quality.** The project will result in greatly improved sewage treatment infrastructure, meeting water quality standards approved by EQPB, as shown in Appendix A: Basis of Design, for the new treatment plant.

115. Additionally, it is proposed to construct a new effluent outfall pipeline, adjacent to the existing outfall pipeline, due to the advanced age of the pipe. Design for the new pipeline and discharge diffuser array is being finalized. Additional studies if water currents at the discharge location will be conducted, as will a marine benthic survey of existing marine life (as required under EQPB Earthmoving Regulations for “aquatic-related earthmoving” (Chapter 2401-1-14). The plant will need to obtain a Pollution Discharge Permit from EQPB, prior to operations.

2. **Impacts on Ecological Resources**

116. **Marine ecology.** The release of treated sewage effluent into marine waters at the outfall discharge could have impacts on benthic, and demersal, ecosystems. Impacts would result from proximity to (i) elevated levels of inorganic nutrients, (ii) elevated levels of
particulate matter, and (iii) reduction of available light from higher turbidity\(^7\). Sensitive habitats include corals and seagrasses, with impacts favoring algal populations, and changing and reducing overall species diversity.

117. Mitigation measures for sewage effluent discharge impacts should be directed to monitoring of water quality to assure there is no public health threat from exposure to contaminated water. Advisories should be posted by the EQPB, should fecal coliform counts in water samples exceed safe standards, cautioning the public not to swim or wade in the park waters. Additionally, intermittent survey of marine benthic habitat, proximate to the outfall discharge, should be conducted, and compared to the prior survey to be conducted for permitting approval.

118. **Solid Waste Management.** The plant will be generating a sludge product from the treatment process for bio-solids, in addition to trash, debris, and sediment screened out prior to flow into the plant. These solid waste materials will be contaminated with various pathogens and must be handled safely and disposed in a suitable isolated facility. At present, the only option for disposal for sludge and screenings waste, is the M-Dock solid waste landfill in Ngerbeched hamlet, in Koror town proper. The landfill is considered to be filled over capacity, and a new national landfill facility is proposed by Government, but will take several years before it will be operational.

3. Impacts on Socio-economic Resources

119. **Wastewater system improvements.** The project will result in improved sewage infrastructure in the park area, most significantly the connection of the presently non-serviced area at the U-Corp commercial area, and connection of the Palau Vacation Hotel. Additionally, the construction of a sanitary public toilet facility within the park, will replace the existing poorly maintained toilet facility, which relied on a pump out tank. These improvements will assure that sewage is not entering adjacent marine waters, through spillage from pump out activities, or subsurface leaching from substandard septic systems.

120. **Potential impacts from sewage overflows.** However, in the event of the pump station overflowing in the park, from failed pumps or loss of electrical power, sewage would most likely flow into adjacent marine waters. Water quality would be negatively impacted, and violate EQPB marine water quality regulations, and possibly cause a public health threat to park users, from contact with contaminated water.

121. Mitigation measures for pump station overflow should include proper design that includes duplex pumps, with automatic switching to the alternate pump, should one pump fail. Backup power to the pumps should be provided by an onsite generator set, or a reliable connection to a generator set offsite. Assurance by the PPUC that both pumps are maintained

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in good working order at all times is critical. At no time should service crews remove a pump or parts, leaving only one pump in working order. This measure should be made a condition of the EQPB permit for the project.

VII. INFORMATION DISCLOSURE AND PUBLIC CONSULTATIONS

A. Legislative Framework for Public Consultation

122. Public participation and consultation in the evaluation of project design, planning and implementation is an important part of environmental impact assessment; it can directly reflect the public’s perceptions on environmental quality in the project’s area of influence. Relevant provisions in the local EQPB regulations require public consultation through public disclosure, provision for submission of written comments, design review and EQPB approval. ADB’s environmental guidelines also have detailed and strict requirements on public participation and consultation. The public consultation processes for this project therefore follow both the EQPB requirements and the ADB requirements (most recently amended in the ADB Safeguards Policy Statement of 2009).

B. Public Consultation Activities

123. Project preparation included (i) information dissemination, (ii) stakeholder consultation, and (iv) information disclosure.

4. Public Consultation

124. The EQPB will discuss the holding of a public hearing on the proposed project, which will place a sewage pumping station within the public park confines (pers. comm. Roxanne Blesam, EQPB Executive Officer). As stated above, serious opposition was voiced at the 2015 public hearing held by EQPB for a sewage holding tank proposed by the Palau Vacation Hotel to be located within the park.

5. Stakeholder Consultations during the IEE

125. Representatives from KASP (PPUC and PIAC) have met numerous times, from 2015 through 2016, with Koror State officials to garner approval for overall project works. The Koror State Planning Commission has approved the project, the site which is located on Koror State Public lands, with a building permit approval issuance, for overall KASP project works, located in Koror State.

6. Information Disclosure

126. Environmental information on the project was and will be disclosed. This IEE update will be made available for review by interested stakeholders at the EQPB upon submission. The EQPB will also distribute the IEE update to their select EA reviewers for comment. In accordance with the requirements under the Safeguard Policy Statement, ADB shall post on its website the following documents submitted by ROP/PPUC: (i) the final IEE, upon receipt by
ADB; (ii) a new or updated EIA or IEE, and a corrective action plan, if any, prepared during Project implementation, upon receipt by ADB.

VIII. GRIEVANCE REDRESS MECHANISM

127. To settle unforeseen issues effectively, an effective and transparent channel for lodging complaints and grievances has been established. Public participation, consultation and information disclosure undertaken as part of the IEE process have discussed and addressed major community concerns. Continued public participation and consultation has been emphasized as a key component of successful Project implementation. As a result of this public participation and safeguard assessment during the initial stages of the project, major issues of grievance are not expected. However, unforeseen issues may occur. In order to settle such issues effectively, an effective and transparent channel for lodging complaints and grievances has been established.

128. In the event of a grievance, the basic stages established for redress are:

   Stage 1: If a concern arises during construction, the affected person tries to resolve the issue of concern directly with the contractor and the project manager. If successful, no further follow-up is required.

   Stage 2: If the affected person is not satisfied with the reply in Stage 1, he/she can appeal to the local government after receiving the reply in Stage 1 and the local government must give a clear reply within 2 weeks.

   Stage 4: If the affected person is still not satisfied with the reply of local government, he can appeal to PPUC. PPUC, through the PMU, must report to the ADB project officer as soon as the complaint is recorded, by submitting relevant documents. PPUC, the Implementing Agency, must prepare a clear reply in consultation with the EPA (if applicable), and give it to the affected person within 30 days.

   Stage 5: If the affected person is still not satisfied with the reply of PPUC, he/she can appeal to the Office of the First Secretary (EA), after receiving the reply of Stage 4. The EA must report to ADB as soon as the complaint is recorded by submitting relevant documents, and prepare a clear reply in consultation with ADB. The EA must give the reply to the affected person within 30 days. ADB project team will assess the situation, contact the affected people and government project counterparts and design and implement the course of actions. Stages 1-4 will be further refined during the detailed design stage.

129. In addition to the established project specific channel above, ADB’s overall accountability mechanism (2003) applies. The mechanism provides opportunities for people adversely affected by ADB-financed projects to express their grievances; seek solutions; and report alleged violations of ADB’s operational policies and procedures, including safeguard policies. ADB’s accountability mechanism comprises two separate, but related, functions: (i) consultation, led by ADB’s special project facilitator, to assist people adversely affected by
ADB-assisted projects in finding solutions to their problems; and (ii) providing a process through which those affected by projects can file requests for compliance review by ADB’s Compliance Review Panel.

**IX. ENVIRONMENTAL MANAGEMENT PLAN**

130. The objective of establishing an EMP is not only to stipulate appropriate mitigation measures, but also to require establishment of institutions or mechanisms to monitor and ensure compliance with environmental regulations and implementation of the required mitigation measures. Such institutions and mechanisms will seek to ensure continuously improving environmental protection activities during preconstruction, construction, and operation in order to prevent, reduce, or mitigate adverse impacts. The EMP draws on the IEE report and on the project discussions and agreements with the relevant government agencies.

131. The EMP for the project is presented in Appendix A of the initial IEE. The EMP will be reviewed and updated at the end of the detailed design in order to be consistent with the final design, and incorporate the additional mitigation measures stipulated in the IEE update.

**X. CONCLUSION**

132. The project is expected to provide environmental and social benefits such as reduced public health risk from exposure to untreated sewerage, and, improved coastal marine water quality. Associated and cumulative benefits include, improved management, and sustainability of sanitation infrastructure, and increased tourism potential due to the increased capacity of the treatment plant to accommodate further development in Koror.

133. Aesthetic enjoyment of the Icebox Park area by the public will be enhanced with the elimination of nuisance and noxious odors, which emanate from the existing plant, and improved vantages, once the existing plant is demolished and the area rehabilitated.

134. Potential adverse environmental and social impacts include, construction impacts (runoff and sedimentation into adjacent marine waters). Solid waste disposal of sewage sludge and screenings will tax the capacity of the existing M-Dock landfill, until the proposed new landfill facility is operational.

135. Key findings are summarized below:

- Adverse environmental impacts will mainly be construction impacts, which are expected to be minimal for the land based works. However, dewatering activities must be controlled to properly dispose of sediment laden water.

- The EQPB will require issuance of a Pollution Discharge Permit for plant operations. Regulations require submission of a survey of aquatic plant and animal life near the proposed effluent outfall pipeline, and discharge area.
Adaptation measures for climate change, and extreme weather events, must be taken into consideration during final design and project implementation. Priority measures include 'climate proofing' for storm surge, intense rainfall, and long-term sea level rise.

This IEE, and update, along with accompanying EMP, is considered sufficient to meet ADB's and the ROP's environmental requirements, in respect to the rehabilitation and improvement of sewer system works in Palau. Additional impact assessment may be necessary, depending on project options chosen. The IEE and EMP must then be updated accordingly.
APPENDIX A: BASIS OF DESIGN REPORT

(ATTACHED SUBMITTAL)

APPENDIX B: PROJECT DESIGN DRAWINGS

(ATTACHED SUBMITTAL)