

2018

Nature Island Resort Environmental Assessment



Preparer



O.K. Kesolei

KAMPOR Analytical

Table of Contents

1. Executive Summary of Project.....	4
2. Introduction.....	7
2.1 Identification of the applicant	
2.2 Identification of the Assessment Preparer	
2.3 Organization consulted	
2.4 EA Process Documentation	
3. Assessment Methodology.....	9
4. Project Descriptions.....	10
4.1 Purpose and need for action	
4.2 Location of the project site	
4.3 Total Area to be disturbed	
Volume of fill materials	
Source of fill materials	
4.4 Site Development plan for all facilities to be constructed	
4.5 Project Phases	
4.5.1 Pre-construction	
4.5.2 Construction	
4.5.3 Operational	
4.5.4 Abandonment	
4.6 Project Schedule of work activities	
4.7 Project Cost	
5. Environmental Setting Prior to Project.....	14
5.1 Physical	
5.1.1 Land Use	
5.1.2 Soil	
5.1.3 Water Quality	
5.1.4 Water Flow	
5.1.5 Air	
5.1.6 Solid Waste	
5.2 Biological environment (marine)	
5.3 Socio-cultural, economic and political	
5.3.1 Socio Cultural	
5.3.2 Economic and Political	
6. Alternatives Including the Proposed Action	33
6.1 Environmental Consequences of the Alternatives	
6.2 Proposed Action	
7. Impacts Assessment.....	34
7.1 Marine Environment	
7.1.1 Water Quality & flow	
7.1.2 Water navigation and safety	
7.2 Magnitude of Project	
7.3 Erosion and sediment runoffs	
7.4 Air Quality and Noise	
7.5 Public infrastructures (sewage, water, electricity)	
7.6 Refrigeration & Air Condition Equipments	
7.7 Solid waste	
7.8 Socio-cultural and economic	
8. Proposed mitigation for preferred action	38
8.1 Erosion and sediment control	
8.2 Marine protection initiatives	

8.3 Control measures for air and noise	
8.4 Waste Management	
8.5 Environmental management & monitoring	
8.6 Climate Change (structural design)	
8.7 Energy Conservation Measure	
8.8 Socio-cultural	
9. Impact Summary and conclusion.....	41
10. Accountability Statement of EA Preparer(s).....	43
11. Appendices	43
A-1. Toshi katsu Baules Land use right	
A-2. Airai State Government Management Agreement-	
B. Site Development Design Plans	
C. Project Work Schedule	
D. EQPB Water Test Result	
E. Erosion and Sediment Control Plan	
F. Historical Preservation Clearance	
G. Grease Trap Design	
H. Toilet & Shower specification	
I. Small Freezer specification	
J. Ngellil Island Bird Survey Report	
K. Percolation Test Result	
L. Generator House Fuel Spill Concrete Containment	
M. Service Contract for Septic System	
N. UXO Clearance	
12. List of Figures	44
Figure 1 Palau Map: Project Location	
Figure 2 Site Map showing developed project area	
Figure 3 Soil Map of Ngellil Island	
Figure 4 Water sample sites on Jan. 4.2018	
Figure 5 Map of water current measured on Jan. 4, 2018	
Figure 6 Map of Line Intersect Transect (T1)	
Figure 7 Map of line intersect T2	
Figure 8 PALARIS Vegetation Map	
Figure 9 Map trails and vegetation surveyed	
Figure 10 Historical Sites and vegetation in south east portion of Ngellil Island	
Figure 11 Photo plate of Development Plan	
13. List of Tables	44
Table 1 Proposed Development Plan	
Table 2 EA activity summary	
Table 3 Nature Island Resort Total Project Cost	
Table 4 Marine Water Test Result compared to standards	
Table 5 Marine survey checklist I	
Table 6 Pond Trail	
Table 7 Long Trail Vegetation List	
Table 8 Lookout Trail Vegetation List	
Table 9 Bird Assessment on Jan. 4, 2018	
Table 10 Interview Result of Airai Community Members by KAMPOR Analytical	
Table 11 Calculation of sewage quantities during hotel operation phase	
Table 12 Summary of environmental impacts and mitigation measures	
14. References	44

1.0 Summary of Project

The Proponents wish to expand the Nature Island Resort, former Pleasure Island Resort. The proposed expansion development plan will involve earthmoving activities, both on land and in water. The earthwork includes dredging, clearing of vegetations and rocks to construct the following hotel facilities: four story building to contain, a kitchen, restaurant, lookout area and a single honeymoon suite with toilet & shower; kayak house; fire wood storage shed; water tanks building; remodeling of the summer house into a lobby area with expansion of the roof deck towards the ocean; generator house; pathways for hiking; a farm; a docking pier including a marine dredging for boat accessibility. Existing staff room will be demolished and constructed into a two story replacement.

Majority of these development plans have been completed. The objective of the environmental assessment is to comply with the requirements and enforcement action of the Palau Environmental Quality Protection Board to enable completion of the development activities on Table 1: Proposed Development Plan and Figure 11: Photo plate of Development Plan.

Table1. Propose development plan.

No.	Current/planned facilities	Status as of December 24, 2017
1.	Staff housing	The current staff housing toward south of the hotel will be demolished and converted to two story staff house
2.	Fire wood house	Completed
3.	Storage shed	Completed
4.	Lobby area	Existing Summer house converted to Lobby area with 1 toilet; remaining work is expansion of roof area
5.	New trail (700 ft L X 4 ft. W) for phone cable	Completed trail with a wooden bridge/platform along side of the salt water pond at the beginning of the path; trail follows PNCC Phone cable.
6.	Dock/pier	Completed wooden pier
7.	Burning of trash	Large organic wastes are burn
8.	3 access paths (150 ft. L X 4 ft. W, 270 ft. L X 4 ft. W & 240 ft. L X 4 ft. W)	Construction of the 3 paths are completed; vegetations and rocks were removed to widen the trail and construct stairways for safety; 3 paths with varying weed of 2-4 ft. to enable access to Yap Money Quarry site with access to water tanks; lagoon and lookout point.
9.	Water Catchment Storage Building	Completed with aluminum and plastic tanks installed; additional concrete tank is being proposed to increase storage capacity; water is treated with chlorine.
	Toilet & bath buildingg-3 each	Completed common bathrooms with 3 low flush toilets and showers facilities.
11.	Dredged area	Completed dredged, using propeller from outboard motor ,from beach front outward to enable boat access during low tide.
12.	Four story building with kitchen/restaurant/lookout area	Partly completed 3 stories. Fourth floor is still to be completed and will incorporate toilet and shower.

	and honeymoon suite	Grease trap will be installed. Food is brought in prepared, only to be warmed and served at the restaurant. One small freezer will be used for food storage.
14.	new septic tank and leach field	Partially completed with leach field remaining to be constructed
15.	Solar panels	Completed and the harnessed solar energy is adequate for full operation of the resort.
16.	Generator house	Completed roofed housing; used as a back-up generator; concreted secondary containment to be constructed
17.	Proposed farm	Farm is at its initial stage; located on the trail toward Yap Money Quarry site; utilize organic waste from resort for composting as fertilizer

The project is located on Ngellil Island, also known as Toshi Island, which is part of Ngerusar Hamlet and lies southeast of Airai State (Figure 1: Project Location). The project is within both private and state land. The Proponents have a land use right for the private land in addition to an agreement with Airai State Government for the use of public land. The Proponents provide needed service to Airai State Government in advancing community eco-tourism activities in the “*Metuker Er A Bisech*”. This agreement mandates Proponent to help establish, operate and manage attraction facilities, including providing safe guided hiking trails for twenty five years. The proposed project will provide the Proponent with a business opportunity that is in line with both Airai State and the Palau Responsible Tourism Framework. The Proponents will play an essential role to ensure that “*Palau’s visitor experience is the living brand and that responsible tourism practices reflect optimal retention of revenue in the local economy*”⁷.

The development plan will include utility backup systems such as a generator, water storage tank and a second on-site septic system with leach field. Proponents do not have an alternative rock island property to build this rock island based eco-tourism commercial facility. The project will have short term temporary sedimentation and noise pollutions from the equipments during construction activity. Control measures should be put in place to minimize these impacts. Long term impacts of sewage will be mitigated by use of efficient water fixtures in addition to routine maintenance services for septic system. The use of a fan for cooling systems and solar energy will minimize impacts derived from use of generator. A routine water quality monitoring program for both marine and water from catchment system will be established.

During the field assessment on January 4, 2018 the velocity of in-coming surface current at the project site was 17 ft. / min. The water quality met the set standards for the designated use of the marine area. At least nine different marine species of fish, corals, invertebrates and plants were observed at the site. A total of 57 plant species, including a rare and endemic *Cycas Micronesica*, were identified along the three nature trails. Twelve bird species, including the IUCN threatened Nicobar Pigeon, were seen or heard at the project site. Routine water and bird monitoring program should be implemented to ensure standards in the surrounding marine areas remain swimmable and the bird diversity is maintained.

Visual observations indicate that the shallow reef area in-front of the beach is mostly disturbed and now consists mostly of rubbles and sand substrates. The seagrass bed that was intact in 2009 at this area has been destroyed by dredging activities. These destructive activities warranted fines from the Palau EQPB as so ordered in November and December 2017.

The objectives of this report are to be in compliance with the enforcement order and to successfully meet essential components of the environmental protection required by the Palau Environmental Quality Protection Board in order to complete remaining resort improvements. This report provides critical information on existing environmental conditions, alternatives, and mitigation of possible impacts to help accomplish the preferred action (proposed project) while minimizing adverse environmental impacts.

It is recommended that Proponents pay the assessed fine as ordered by the EQPB as mitigation for destructed ecosystem. The proposed work to proceed within the footprint of disturbed areas taking the following mitigations into account: no further disturbance of the reef flat, install erosion control measures prior to work on staff housing and septic system leach field, continuing to maintain ESCP throughout construction activities, plant exposed soil area with local vegetations, implement regular water monitoring program, ensure safe integrity of the structures and keeping adequate number of people on the structure at any given time, ensure public access to the surrounding historical and tourist sites, support and involve hotel guests in community coastal cleanups, train and employ community members, and put in place a maintenance service for on-site sewage system, back-up systems for water and electricity, implement solid waste segregation program by installing recycle bins with signage to encouraging guests participation in waste minimization and provide eco-system related training to the community members of Airai State.

KAMPOR Analytical interviewed the people in Ngerusar Hamlet of Airai State. Those community members who were aware of the resort project were generally supportive of it. The primary concern is the impact of the human waste, along with permit requirement compliancy and public access to the site. One of the project's positive impacts identified in the interview was that the hotel development is as a source of revenue to the state. The Proponents should adhere to reporting requirements of the Historical Preservation Office clearance.



Fig.1: Palau Map with Project Location

2.0 Introduction

- 2.1 The Proponents currently operate an eco-resort with various tour activities including Island Discovery Stand-up Board Paddling, Kayaking, Snorkeling, Hiking and Trekking, Night Adventures, Island Adventures, Sea Kayaking, Jungle Kayaking and Blue Cave in Ngellil Island. Conduct business as Nature Grace Palau Corporation Their contact is P.O. Box 6115 Ngetkib, Airai, Republic of Palau 96940, Phone: 587-4746 and E-mail: info@naturegracepalau.com.

In January 2010, the Palau EQPB permitted (PEA -150-09) Toshi Buales & Shinji Chibana to construct and operate the Treasure Island Resort with an on-site wastewater collection system. TEI compiled an Environmental Assessment to support the EQPB Application. The EQPB permitted limited scope of the proposed projects to include only the construction and operation of the following: 8 unit tourist guest rooms, restaurant and kitchen, storage room, common toilet with onsite wastewater disposal system (septic tank sized 16 X 7 X 8 feet with 5 trenches, spaced 3 feet apart and 45 feet long leach field). Permit did not allow development in the ocean.

The company is now operating under a different name, Nature Island Resort, which is managed by Saburo Isike. Since 2010, there have been major improvements of the facilities, both in numbers and size, most of which have been completed at the time of assessment. These unpermitted development activities prompted the Palau EQPB to take enforcement action with penalties of \$150,000 in November and December 2017.

- 2.2 The KAMPOR Analytical is a consulting service entity founded in 2015 by Ongerung Kambes Kesolei and his wife Portia Franz. Kambes & Portia have more than 30 years combined experience working for the Palau EQPB. Kambes has an Associate Degree in Science and worked as EQPB Lab Technician, PICRC Chief Aquarist, Ngardmau State PAN Coordinator, Consultant for ADB KASP and an Editor for Tia Belau Newspaper. Portia has a Masters degree in science and worked as an Administrator for the Office of Health Preparedness, Policy and Research at Ministry of Health, EQPB Executive Officer, Palau Community College Cooperative Research & Extension Researcher/Extension Specialist and EQPB Laboratory Supervisor.

As a Team, Kambes and Portia have provided consultancy services on several government and non-government projects in Palau in areas of environment, development, social, health and water monitoring.

Mr. Naito Soaladaob, vegetation expert who is a retired government worker, provided the expertise on vegetation survey for this project. He spent most of his career with Division of Entomology, retired in 1997 and is currently working at the Belau National Museum.

Ms. Heather Ketebengang has a B.A. in Interdisciplinary Studies on Environmental Studies and Minor in Geography. She currently works at Palau Conservation Society as the Program Coordinator. She has years of experience in bird survey and monitoring in Palau with several publications such as “State of Palau’s Birds 2010 and Noteworthy bird observations from the Caroline and Marshall Islands 1988-2009”.

2.3 Organizations consulted

The applicant consulted the EQPB and Airai State Building Office. Airai State Government had executed a Management Agreement with Proponents authorizing the use of the area for twenty five years (Appendix A1 & A2).

On December 21, 2017 KAMPOR Representatives (EA Preparers) discuss with EQPB Staff, Carlos Wasisang, Compliance Office and Mike Blesam, Assistant Executive Officer the scope of the proposed action and the impacts that need to be assessed in the preparation of the Environmental Assessment (EA). The impact of waste water was identified as the main environmental impact that needs to be addressed and made part of the EA objective.

On February 2, 2018, the Proponents with EA Preparers (KAMPOR Analytical representatives) held a Scoping Meeting with the Palau EQPB Staff Members, Ms. Kimie Ngirchchol, Lab Supervisor, Ms. Lynna Thomas, Compliance Specialist, Mike Blesam, Assistant Executive Officer and Ms. Soledad R. Lazaro, Engineer.

The proposed development plan activities were discussed with waste water management as the main concern. There may be a need to uncover the septic systems for inspection. Other impacts that need to be assessed in the EA were as follow:

- »» final development plan designs
- »» Waste water estimated load with septic system design, layout and connection of facilities to the existing and the proposed new system
- »» Percolation test for new septic system leach field
- »» Sludge clean up as maintenance of septic system
- »» Monitoring of catchment water system, schematic of the system and water treatment process
- »» Bird Survey
- »» Airai State Permit
- »» Generator house secondary containment.

2.4 EA Process Documentation

Table 2: EA activity summarized with timeline of work performed by KAMPOR Analytical.

<i>Activity</i>	<i>Date</i>
Inquired EQPB Assistant Executive Officer Mike Blesam and Compliance Officer Carlos Wasisang on the scope of EA	Dec. 21, 2017
Initial meeting with project to discuss full development plan	Dec. 24, 2017
Initial site visit with project	Dec. 24, 2017
Follow-up meeting with project to discuss complete development plans	December 26, 2017
Conducted a primary assessment of the site with Naito Soaladaob, vegetation expert. Qualitative swim for marine transect, water analysis & current measurement were also conducted.	January 4, 2018
Conducted a bird survey on Ngellil Island	February 1, 2018
Proponents and EA Preparers had a Scoping Meeting with Palau EQPB Staff	February 2, 2018
Interview of community members	Jan. - Feb. 2018
Meeting of Proponents and EA Preparer to finalize development plan and ESCP.	Feb. 9, 2018

3.0 Assessment Methodology

The Methodologies used for this assessment were literature reviews, interviews of resource users/community members, environmental baseline surveys and monitoring. EQPB Guide to Environmental Assessment (Aug. 2000) and the Amendments to EQPB Earthmoving Regulations (July 2015) served as guidance in preparing this assessment to ensure that a comprehensive review of the environmental impacts of the proposed project is undertaken.

Various techniques were used to assess range of environmental and technical issues as part of the EA. The compilation of an inventory of environmental resources was carried out by assessing previous EA prepared by The Environmental Inc (TEI), conducting baseline monitoring, documenting resources and interviewing community members regarding the environment and the resources that have been lost as a result of unpermitted construction activities and potential impacts of the remaining work for the proposed development plan.

3.1 PALARIS Maps, Private Land Use Right, Airai State Management Agreement and Google Earth maps were used to delineate the land and marine areas to be surveyed.

3.2 Field Assessment Methods

3.2.1 Preliminary swim, initial walk and wade were conducted to record all marine species observed and document the flora, fauna and substrate cover within the impacted marine area.

3.2.2 Line Intercept Transect, a quantitative method, was used for marine species survey. Two transects were used to assess the sessile benthic community within the marine area in-front of the resort where unpermitted dredging and construction of a pier had occurred. A swimming survey was conducted for the dredged area, identified as T1. The second transect (T2) was conducted within the vicinity of marine transect area carried out in May 2009 by TEI. Invertebrates, fish, sea grass & corals observed are listed in Table 5. Percentage cover of rubble, sand and seagrass were also quantified.

3.2.3 Grab marine water samples were collected at four different locations (within the site, up current and down current of the beach front, pond, and lagoon) and tested for enterococci, turbidity, salinity and pH by the Palau EQPB Lab.

3.2.4 The water current was measured at the beach in front of the resort at high tide using float.

3.2.5 Vegetation survey was conducted along the sides of hiking trails by Mr. Naito Soaladaob, a Palauan vegetation expert. Table 6, Table 7 and Table 8 for list of vegetations observed at the three nature trails.

3.2.6 Bird survey was carried out, at two locations using the EQPB approved Bird Survey Protocol, by bird expert, Ms. Heather Ketebengang. Bird species observed or

heard on Jan.4, 2018 and February 1, 2018 are listed in Table 9 and Appendix J, respectively.

- 3.3 Solid wastes (debris) in the project site were noted (Photo plate 1).
- 3.3 Percolation Test for new on-site waste water leach field was conducted on January 4, 2018 (Appendix K: Percolation Test Result).
- 3.4 Clearance for unexploded ordinance was obtained from Bureau of Public Works Safety Officer (Appendix N: UXO Clearance)

4.0 Project Description

4.1 Purpose and need for action

The proposed project is to expand the Nature Island Resort development which will involve earthmoving activities that include dredging, excavating, clearing of rocks and vegetations to construct additional hotel facilities (Table 1: Proposed Development Plan). All earth work have been completed except the new proposed on-site sewage leach field and a two story staff housing still to be built. Structures already in construction or completed include a four story building that contain, a kitchen, restaurant, lookout area and one honeymoon suite with toilet & shower; a building to house staff; housing for firewood; storage shed; remodeled summer house into lobby area; generator house; pathways for hiking trail, additional on-site septic system, farm, a docking pier, and dredged navigation access for motor boat during low tide.

The Proponents of the project wish to undertake this business development for the benefit of the people of Palau by showcasing Palau natural beauty through eco-tourism hotel practices, contribute effort to the accomplishment of the Airai State Government Eco-Tourism Plans and ROP Government Responsible Tourism Policy Framework's vision in ensuring a pristine paradise Palau for everyone⁷, cater to tourist experience living hotel accommodations' designed and constructed to provide local experience in Palauan natural life style, and help generate resort business and state revenues.

4.2 Location of the project site

The proposed project site is located at Ngellil Island situated southeast of Airai State, within both private and public lands (Appendix A-1 and Appendix A-2 Land use rights).

Fig. 2: Site Map showing developed project.



4.3 Total area to be disturbed

The project Proponents have a land use right agreement from Mr. Toshikatsu Baules, inherited by Dixie Tmetuchel, for the use of private land on the island toward southeast of Airai State known as “Ngellil and/or Toshi Island. The Proponents also has a Management Agreement with Airai State Government to provide expertise in the management of eco- tourism services of “*Meturker Er A Bisch*”.

The entire private lot, estimated at approximately 3,956 m² by TEI, will be developed into eco-tourist resort area with support facilities. The trails, farms and water storage tank’s building will be situated within the government leased land. The wooden pier and dredged area are located at beach front in the ocean.

4.4. Site Development Plan for all facilities

See Appendix B for site development plans and Figure 7 for Development Overview Photo plate.

4.5 Project Phases

The Proponents will design and build the project with the help of hired workers (Appendix C-Project Work Schedule).

4.5.1 Pre-construction

Prior to commencing earth work, the Project Proponents will implement the EQPB approved Erosion and Sedimentation Control Plan (ESCP). The Project Proponent will also be responsible for maintaining and repairing both temporary and permanent erosion control measures for the entire project period.

Workers will use the existing staff housing and toilet facilities.

4.5.2 Construction

The construction activities will resume after EQPB's approval of ESCP (Appendix E). There will be no further dredging and other marine related work activities.

The construction of a second on-site septic system and the renovation of staff housing will start upon installation of ESCP facilities.

Information signs for safety measures will be posted to notify the public and visitors of the start of the project.

Solid wastes generated during construction work will be transported by motor boat to the resort office in Ngetkib and will be disposed off at the Airai Sanitary Landfill.

4.5.3 Operational

Ten permanent workers will be hired for the operation of the resort at its full capacity. Only five workers are at the resort site on regular basis.

Compliance of rules and regulations for both national and Airai State governments for hotel business operations will be required. Management will secure any required permits from EQPB, Environmental Health, Airai State, and other relevant agencies prior to conducting needed services, repair, maintenance or expansion work. Daily duties of workers will include implementation of a maintenance plan for all major equipments and waste segregation to help prevent any source of contamination.

4.5.4 Abandonment

The Proponents have committed large amount of investment into this project with 25 years lease agreements, hence abandonment is slim to none. The Proponents and resort management will undertake all activities under the guidance of EQPB for site restoration effort should the project be abandoned.

4.6 Project schedule of work activity

Refer to Appendix C for project work schedule.

4.7 Project cost

Assuming the project is carried out as scheduled, the proposed project would cost approximately \$2.7 Million dollars for the entire design, construction, furnishing, and operation of the resort. The source of funding for this project is from a private investor (Table 3. Total Project Cost).

Table 3: Nature Island Resort Total Project Cost

Category	Budget	Remarks
Original investment	US\$700,000.00	
Resort Rooms	US\$800,000.00	Each room initial investment of about US\$100,000
Public Utilities	US\$400,000.00	Restaurant / bathroom / lobby / beach / pier
Logistics facilities	US\$180,000.00	Kayak house/Staff quarters/ warehouse /Farm
Hiking Trail	US\$400,000.00	The total length of about 5 miles hiking trail
Scenic tourist facilities	US\$100,000.00	
design fee	US\$50,000.00	
management fee	US\$100,000.00	
Miscellaneous	US\$50,000.00	
Total	US\$2,780,000.00	

5.0 Environmental setting prior to project



KAMPOR Analytical conducted several site visits to assess the existing physical and biological conditions of the proposed project site. An assessment of the site was conducted by Mr. Ongerung Kambes Kesolei, Portia Franz, Naito Soaladaob, and

Heather Ketebengang from December 24, 2017 to February 1, 2018. Mr. Kesolei conducted marine transect survey, took photographs and assessed marine ecosystem. Naito Soaldaob carried out the vegetation survey along the trails. Bird survey was conducted by Ms. Heather Ketebengang at two sites. Marine water samples were collected by Portia, during the site assessment on January 4, 2018, and tested by EQPB Laboratory (Appendix E- EQPB Water Test Results).

5.1 Physical

5.1.1 Land & water use

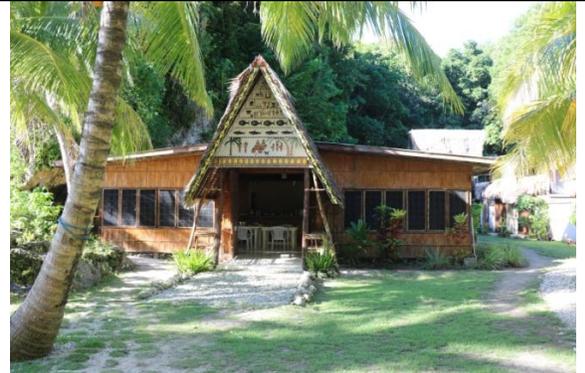
The project site is a rock island, located southeast of Airai State, and was previously approved by EQPB, on January 10, 2010, for construction and operation of 8 hotel rooms, restaurant and kitchen, storage room and common toilet facilities with on-site septic system and leach field. The areas surrounding the resort facilities are undisturbed rock islands.

Some recent developments in the area include a clam aquaculture farm for the Airai community organization located in the lagoon toward north of the project site. According to resort management, this clam project did not last long and is no longer active. There is a nature trail that runs alongside of PNCC phone cable from the lagoon side to the resort. Another nature trail runs toward northwest to Yap Quarry Historical site. There is also a second Yap quarry site located toward west of the resort facilities.

Photo Plate 1: Proposed and completed projects, 12/24/17.



Wooden Pier (3 ft. by 100 ft)



Lobby Area (Remodeled Summer House)



8 rooms originally permitted by EQPB



Firewood Shed



Storage Area/Canoe Shed permitted by EQPB



Common Use Toilet and Shower (3 each) permitted by EQPB.

5.1.2 Soil

The entire project lot to be developed has three different soil types as indicated in the Palau Automated Land and Resources System (PALARIS) Soil Survey Map. Ngedebus, highly organic fine sandy loam, 0-3 % slope make up the area where most of the resort facilities are laid out. The rest of the developed facilities, mainly the water tank facility, the four story building and the trails are on the Peleliu -Chelbacheb-Rock outcrop complex, 80-150 % slopes soil type. The intermittent salt water pond has the water, brackish soil type.

The properties of soils found at the project site, according to USDA Soil Survey are as follow:

628—Ngedebus highly organic fine sandy loam, 0 to 3 percent slopes

Map unit setting

Major land resource area: 196 (Coral Atolls of Micronesia)
Elevation: -1 to 6 meters (-3 to 20 feet)
Landscape: Limestone islands, barrier islands, atolls, areas of karst
Aspect: No dominant orientation
Mean annual precipitation: 3,000 to 4,650 millimeters (118 to 183 inches)
Mean annual air temperature: 27.0 degrees C (81 degrees F)

Map unit composition

Ngedebus and similar soils—75 percent
Minor components—25 percent

Characteristics of the Ngedebus soil

Landform: Beach terraces, back-barrier beaches, beach ridges, beaches, generally on the lagoon side of atolls
Hillslope position: Toeslopes
Geomorphic position: Treads, risers
Parent material: Water- and wind-deposited coralline sandy material
Slope: 0 to 3 percent
Slope shape (down/across): Linear/convex
Depth class: Very deep
Most limiting permeability (Ksat): More than 36 cm/hr (more than 14.17 in/hr); very high
Available water capacity: About 9.2 centimeters (3.6 inches); low

647—Peleliu-Chelbacheb-Rock outcrop complex, 80 to 150 percent slopes

Map unit setting

Major land resource area: 194 (Low Limestone Islands of Western Micronesia)
Elevation: 2 to 214 meters (7 to 702 feet)
Landscape: Rock islands
Aspect: No dominant orientation
Mean annual precipitation: 3,300 to 4,650 millimeters (130 to 183 inches)
Mean annual air temperature: 27.0 degrees C (81 degrees F)

Map unit composition

Peleliu and similar soils—40 percent
Chelbacheb and similar soils—30 percent
Rock outcrop—25 percent
Minor components—5 percent

Characteristics of the Peleliu soil

Landform: Saddles, swales, karrens, karst cones, karst towers
Hillslope position: Footslopes, toeslopes, backslopes, shoulders, summits
Geomorphic position: Head slopes, side slopes
Parent material: Coralline colluvium over residuum weathered from limestone; probably includes additions of volcanic ash and tropospheric dust; the bedrock includes the Peleliu and Palau Limestone Formations.
Slope: 80 to 150 percent
Slope shape (down/across): Linear/concave
Percentage of the surface covered by rock fragments: About 5 percent by subangular boulders, 60 percent by subangular cobbles, 10 percent by subangular gravel, and 15 percent by subangular stones

656—Water, brackish

Map unit setting

Major land resource area: 194 (Low Limestone Islands of Western Micronesia); 193 (Volcanic Islands of Western Micronesia)

Elevation: Sea level

Landscape: Open ocean, marine lakes, lagoons

Landform: Marine lakes, salt- or brackish-water sewage lagoons

Aspect: No dominant orientation

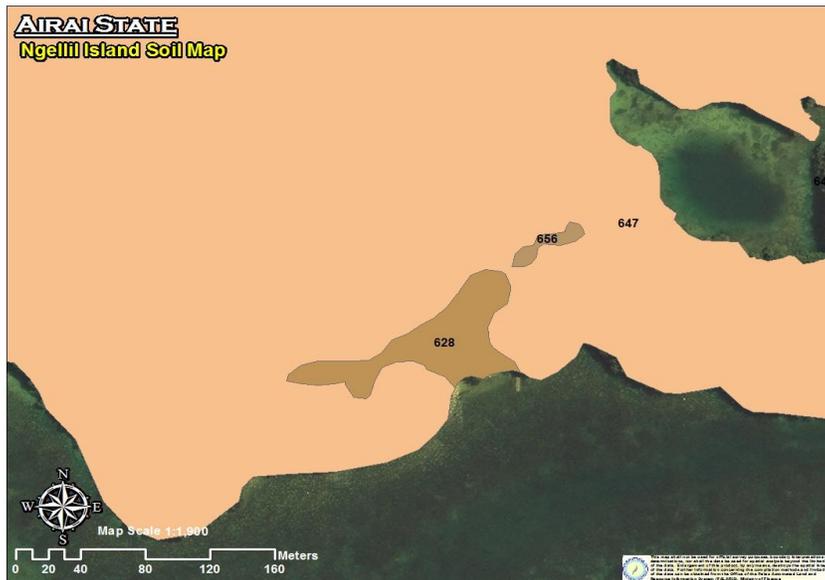
Mean annual precipitation: 3,300 to 4,650 millimeters (130 to 183 inches)

Mean annual air temperature: 27.0 degrees C (81 degrees F)

Map unit composition

Water, brackish—100 percent

Fig. 3: Soil Map of Ngellil Island



5.1.3 Water Quality

The project lot is situated on Ngellil Island located at southeast of Airai State. Water in this area would be designated, under EQPB Regulations' water use classification, as Class "A" Waters.

The current uses to be protected in this class of marine water are recreational, including fishing, swimming, bathing, and other water contact activities. It is the objective that in this class of waters usage for recreation purposes and aesthetic enjoyment shall not be limited in any way (EQPB Marine & Fresh Water Quality Regulations: 2401-11-05 (B) (1), (2).

The water quality was determined by EQPB Laboratory from three grab marine samples and one pond water sample collected at high tide on January 4, 2018. Test results of marine samples indicated a good water quality at the area, in line with the EQPB water quality standards for the designated Class A water (Appendix D- EQPB Water Test Result and Table 4: Comparison of Marine Water Test Result to Standards).

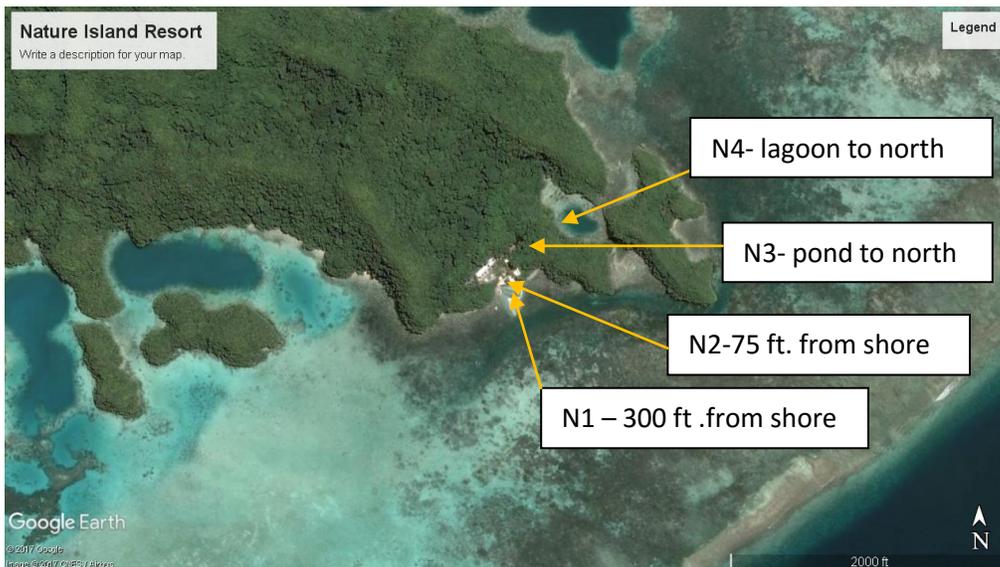
The pond water has some bacterial contamination and high turbidity reading due to its proximity to the Lagoon Trail and resort activities. It is not readily flushed out by the outgoing tidal influence and receives contaminated run-off from trail earthwork and resort activities. The sample collected by TEI in July 29, 2009 at site 75 feet from shore was slightly more contaminated with enterococci count of 63/100ml and turbidity of 1.5 NTU.

Table 4: Comparison of Marine Water Test Result to Standards*

Parameter	Class A Standard*	Sample 1 300 feet from shore	Sample 2 75 feet from shore	Sample 3 Pond to North	Sample 4 Lagoon to the North
Turbidity	(A) Turbidity (NTU) shall Not be greater than 1 NTU.	0.8 NTU	1.3 NTU	2.1 NTU	1.2 NTU
pH	(A) pH variation shall be within 7.7 and 8.5 pH units	7.8	8.0	7.9	7.9
Enterococci	(C) Enterococci count shall not exceed a geometric mean of 33/100ml ... not shall any give sample shall exceed 60/100ml.	0 MPN/ 100 ml	0 MPN/ 100 ml	20 MPN/ 100 ml	0 MPN/ 100 ml
Salinity (ppt)		33.8 ppt	33.8 ppt	33.1 ppt	33.4 ppt

* Source: EQPB Marine & Fresh Water Quality Regulations

Fig. 4: Water sample sites on January 4, 2018



5.1.4 Water Flow

The Palau prevailing wind from the end of November through May was the Northeast to East trade wind. The weather was sunny and clear with wind direction on January 4, 2018 from east to west at 14 miles per hour according to Palau National Weather Service Office. The qualitative analysis of wind-tidal influence on the water pattern was carried out on January 4th. The flow of water current at high tide was measured using a weighted float with a measuring tape to measure distance. The current flow from east headed south as measured at one location in front of resort beach (C1), was at velocity rate of 17 feet per 1 minute.

Fig. 5: Map of water current measured on January 4, 2018.



5.1.5 Air

The ambient air quality of the project site is excellent. The only potential sources of air pollutions are exhausts from backup generator when in use, water pump engine and the burning of trash. The backup generator is not frequently used due to the adequacy of the solar panel system to provide electrical needs for the resort. These minor air pollutants are temporary in nature and are quickly disbursed by the wind and therefore do not have adverse affect to the air quality in the area.

Occasionally the trashes are burnt as part of solid waste management. Due to distance from landfill, the large organic wastes not manageable to compost are burnt on site. The Proponents desired that burning of allowable solid wastes made part of an EQPB's approved permit condition for the Resort's Operation Management Plan. Since its citation for non-compliance, the resort management have been acquiring permit to burn trash about once a week.

Picture of vegetation and wooden trash remain after burning at western part of the resort.



5.1.6 Solid Waste

Most of the solid waste generated during the operations of the resort include, plastic bottles, cans, styrofoam plates & cups, plastic forks, spoons, and general refuse. The solid wastes generated daily amounts to one 33 gallon bag.

The management of generated solid wastes includes the following:

- » Plastics and aluminum bottles are segregated for recycling and are brought back to Ngetkib Office for proper disposition.
- » Other general non-organic refuse is brought to Airai State Landfill.
- » Organic wastes are separated for composting and fertilizer use at the farm
- » Burning of large organic trash is part of the waste management system.

Photo Plate 1: Pictures of plastic trash found in areas surrounding the resort facility.





5.2 Biological environment

5.2.1. Marine Habitat & wildlife



The proposed project involved dredging of water ways and building a wooden pier which necessitate the preparation of a marine assessment as an additional requirement for aquatic related earthmoving (EQPB Earthmoving Regulations 2101-1-14).

The marine assessment of the proposed fill project was conducted by walk, wade, and snorkel on January 4, 2018. The surveyor recorded visual observations of marine species, along with general habitat conditions and substrate types. Common names of the fish, corals and invertebrates were noted down to species level whenever possible. Photographs were taken to document existing site conditions and also for identification of marine life and habitat.

Visual observations indicate the marine area in-front of the resort beach is mostly disturbed as compared to the 2009 condition assessed by The Environmental Inc (TEI). Two surveys - swim through and a transect survey were conducted from within the dredged (disturbed area) at high tide and in an area as close to transect conducted in 2009. These transects were used to represent the overall composition of the marine ecosystem (see Fig. 6 & 7 Maps above and Table 5: Marine survey checklist).

The first swim through, Transect 1 (T1), was made from the entrance where the floats are located at the distance of about 225 feet and headed straight to the beach. Starting from the entrance and moving inside 50 feet, is a seagrass bed with an estimated over 90% seagrass cover. Only six (*cheuas*) species of sea cucumber were observed in the swim through. After the 50 feet, the reef bottom has been highly altered. The interview of resort staff indicated that a 50 hp engine was used to move the sand to create a deep enough channel for boat access at low tide. The altered bottom is completely made up of sand with sections consisting of rubble materials. Only a school of young Goatfish (bang) was observed at this transect.

Fig. 6: Map of line intersect, T1.



The second survey was conducted using a 75-foot transect that starts on the shore at the base of large *Btaches* Tree and extended sea ward. The line transect area was as close to the same area as the July 2009 transect survey made by TEI. As compared to the 2009 dominated seagrass cover, the current area at the front of the beach has been converted to rubble/sand substrate with few sea grass colony. The surveyed area indicated a highly disturbed area with rolling sand dunes (*cheleliuis*) at the bottom. No fish, sea cucumbers or other sea life was observed in the 75-foot transect. The whole length of transect indicated a bottom substrate of 52% sand and 48% rubbles.

Environmental Parameters during the marine survey:

- Time: 9 a.m. to 2 p.m.
- Good visibility
- Wind direction from east to west at 14 miles per hour
- Moderate calm sea
- High tides were 9:16 a.m. at 6.0 feet and 8:45 p.m. at 6.7 feet
- Low tide was 3:05 p.m. at 2.1 feet.

Fig. 7: Map of line intersect T2 as close to July 2009 Transect.



Photo: Substrates originating from beach seaward



Rubbles make up the shore line out to about 16.5 feet.



Sand begins at 16.5 feet out toward the sea to about 45 feet.



Patches of sea grass are found around 45 feet seaward to about 83 feet where the dredged sand dominates the substrate. This area has changed drastically since 1999. The seagrass density dominated the substrate, starting at 33 feet in July 1999 (TEI).

Table 5: Survey checklist of marine species.

	Palauan/Common Name	Scientific name	Description
Marine Fauna			
1	<i>Char</i>	<i>Enhalus accoroides</i>	
2	<i>Char</i>	<i>Thalasia hembrichii</i>	
3	<i>Char</i>	<i>Cymodocea rotundata</i>	
Marine organisms			
1	<i>Cheuas</i>		6 species counted
2	<i>Bang (Goatfish)</i>	<i>Parupeneus barberinus</i>	
3	Sea snail		
4	Sand crab		

5	<i>Um</i>		
6	<i>Rereek</i>		
7	<i>Teber</i>		
8	Snail		

During the walk through at low tide, sea cucumbers (*ewas*) were observed on the rubbles and seagrass beds. Additionally one coral head, *Porites* species, was seen among the sea grass in-front of the beach; ghost crab and (*um*) hermit crab roam the beach; snails and *rereek* on wooden pier and school of sardines (*teber*) in shallow water.

Photo of marine organism observed at the site.	
	
<i>Teber</i> (School of Sardines)	<i>Rereek</i>
	
Sea snail	<i>Um</i>
	
<i>Actinopyga species (ewas)</i>	Ghost crab

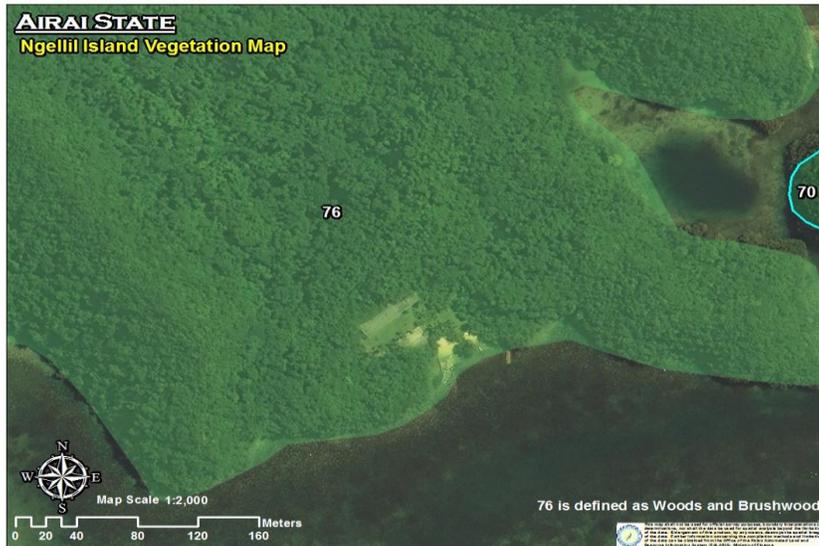
5.2.2 Endangered species

No endangered or protected species observed at the site or its immediate vicinity during marine baseline surveys as specified in the Endangered Species Act (1975).

5.2.3 Plants

The Vegetation Map obtained from PALARIS Office indicated that there is only one primary vegetation on Ngellil Island, identified as woods and brushwood vegetation. Rare and endemic *Kokael* (*Cycas Micronesica*) was found along the Lookout Trail and on the hill above the resort.

Fig. 8: PALARIS Map of vegetation on Ngellil Island.



A preliminary walk along the existing nature trails - Pond Trail and Long Trail - was conducted on Dec. 24, 2017. A second walk on January 4, 2018 was conducted for vegetation assessment on all three nature trails - Pond Trail, Long Trail and Lookout Trail. Trees, shrubs, vines and other epiphytes were identified, photographed, noted for their relative distribution, sizes and young plants. The vegetation species along the sides of the trail were identified with local names and scientific names whenever possible. Bird species heard or seen on the trails were also noted (Table 9: Bird assessment on January 4, 2018).

Fig. 9: Map of trails and vegetation survey.



A. Pond Trail

This is a short hiking trail with length of 150 meter that starts at the eastern end of the kayak shed toward the confined saltwater pond. The trail follows the eastern edge of the pond to a wooden bridge constructed around a limestone outcrop where it meets the other end and continues on a short climb of steps made of local wood until it ends by the vertical cliff facing a secluded lagoon area.

Table 6: Pond Trail vegetation list.

	Palauan Name	Scientific name	Description
1	<i>Chebiei</i>	Artocarpus mariannensis	
2	<i>Chersachel</i>	Horsfieldia palauensis	
3	<i>Rebotel</i>	Eugenia javanica	
4	<i>Blau</i>	Guettarda speciosa	
5	<i>Btaches</i>	Calophyllum inophyllum	
6	<i>Bduul</i>	Barringtonia asiatica	
7	<i>Bedel</i>	Macaranga carolinensis	
8	<i>Bobai</i>	Carica papaya	
9	<i>Orredakl</i>	Dracaena multiflora	

10	<i>Kerdeu</i>	<i>Ixora casei</i>	
11	<i>Cheledochoel</i>		Tall tree
12	<i>Chelangel</i>	<i>Pouteria obovata</i>	
13	<i>Kesiil</i>	<i>Eugenia reinwardtiana</i>	
14	<i>Tonget</i>	<i>Semecarpus venenosus</i>	
15	<i>Lulek</i>	<i>Ficus microcarpa</i>	
16	<i>Chermallucheang</i>	<i>Commersonia bartramia</i>	
17	<i>Chebeludes</i>	<i>Aophylum timoriensis</i>	
18	<i>Tuu</i>		Banana
19	<i>Bochel a uchererak</i>	<i>Hydriastele palauenesis</i>	Endemic
20	<i>Keruiiau</i>		Shrub
21	<i>Chertochet</i>	<i>Pandanus ameriikensis</i>	Endemic
22	<i>Kilkuld</i>		Fern
23	<i>Sersmekemad</i>		Shrub
24	<i>Buklbeluu</i>	<i>Microsorium punctatum</i>	
25	<i>Toilalech</i>	<i>Epipremnum carolinense</i>	
26	<i>Char ra beluu</i>	<i>Pyrrossia landeolata</i>	
27	<i>Bungeruau</i>	<i>Schefflera elliptica</i>	Name of the leafy part
28	<i>Ngurdmedob</i>	<i>Schefflera elliptica</i>	Name of the vine
29	<i>Rekreked</i>		Epiphytes

B. Long Trail

This is a relatively long nature trail - 750 feet - that starts to the west of the existing 8-unit bungalows and goes up into the limestone forest winding its way on the forest floor until it ends at the area where a huge *Lulek* tree is situated. The *Lulek* is referred to as “power tree” where hikers will stop and offer a prayer before returning. The original plan for the trail was to continue on to the other side of the rock island “*Metuker Er a Bisech*” where the Yapese stone money is located. However, that plan is not being undertaken at this point.

The vegetation along the 750 feet long nature trail is characterized by large tall trees mainly; *Chebiei*, *Chelodechoel*, *Chersachel*, *Rebotel*, *Lulek*, and *Tonget*. The trail is covered by canopy with minimal undergrowth on both sides of the trail.

Table 7: Long Trail Vegetation List.

	Palauan Name	Scientific name	Description
1	<i>Tonget</i>	<i>Semecarpus venenosus</i>	
2	<i>Bngei</i>	<i>Polyscias nodosa</i>	
3	<i>Bedel</i>	<i>Macaranga carolinensis</i>	
4	<i>Chelodechoel</i>		Tall tree
5	<i>Chersachel</i>	<i>Horsfieldia palauensis</i>	
6	<i>Rebotel</i>	<i>Eugenia javanicus</i>	
7	<i>Chebiei</i>	<i>Artocarpus mariannensis</i>	
8	<i>Lulek</i>	<i>Ficus microcarpa and Ficus prolixa</i>	
9	<i>Kerdeu</i>	<i>Ixora casei</i>	
10	<i>Sisureomel</i>	<i>Cordyline fruticosa</i>	
11	<i>Chebeludes</i>	<i>Aophylum timoriensis</i>	
12	<i>Ongael</i>	<i>Phaleria nisidae</i>	<i>Delal a kar</i>
13	<i>Kesuk er oreomel</i>	<i>Codiaeum variegatum</i>	
14	<i>Chesebuuch</i>	<i>Ponapea palauensis</i>	
15	<i>Uosech</i>	<i>Ficus copiosa</i>	
16	<i>Chertochet</i>	<i>Pandanus aimeriikensis</i>	Endemic
17	<i>Bisech er belau</i>	<i>Alocasia microrrhizos</i>	
18	<i>Besebeskumereu</i>		Vine
19	<i>Toilalech</i>	<i>Epipremnum carolinense</i>	
20	Unidentified vines		

C. Lookout Trail

About halfway through the Long Trail it diverges to create another trail up the steep side of the limestone rock island to a lookout at an altitude of over 100 feet high. The nature trail is constructed of local lumber for steps to secure proper footing all the way up to the lookout point at the top.

On the climb up, the vegetation cover becomes denser with *Kesiil* tree species. There were six rare and endemic *Kokeal* (*Cycas micronesica*) seen up the trail to the top.

Table 8: Lookout Trail Vegetation List

	Palauan Name	Scientific name	Description
1	<i>Kokeal</i>	<i>Cycas micronesica</i>	Endemic
2	<i>Chelangel</i>	<i>Pouteria obovata</i>	
3	<i>Tilol</i>	<i>Garcinia rumiyo</i>	
4	<i>Mesecheues</i>	<i>Aglaia mariannensis</i>	
5	<i>Kesiil</i>	<i>Eugenia reinwardtiana</i>	
6	<i>Blau</i>	<i>Guettarda speciosa</i>	
7	<i>Bduul</i>	<i>Barringtonia asiatica</i>	
8	<i>Ngel</i>	<i>Morinda citrifolia</i>	
9	<i>Kerumes</i>	<i>Aidia cochinchinensis</i>	
10	<i>Tebudel</i>	<i>Wikstroemia elliptica</i>	
11	<i>Oseked</i>	<i>Ficus tinctoria</i>	
12	<i>Bekuu</i>	<i>Pandanus dubius</i>	
13	<i>Mesekerrak</i>	<i>Syzygium cumini</i>	
14	<i>Dort</i>	<i>Intsia bijuga</i>	
15	<i>Chosm</i>	<i>Premna serratifolia</i>	
16	<i>Butecherechar</i>	<i>Clerodendrum paniculatum</i>	
17	<i>Ngis</i>	<i>Pemphis acidula</i>	
18	<i>Orredakl</i>	<i>Dracaena multiflora</i>	
19	<i>Cheremallucheang</i>	<i>Commersonia bartramia</i>	
20	<i>Kirrai</i>	<i>Scaevola taccada</i>	

21	<i>Keuert</i>	<i>Drypetes nitida</i>	
22	<i>Chemechong</i>	<i>Flacourtia rukam</i>	
23	<i>Chebechab</i>	<i>Microsorium scolopendria</i>	
24	<i>Onguchet a rekung</i>		Vine

5.2.4 Bird

During January 4, 2018 assessment, the birds that were seen or heard were noted (Table 9).

Table 9: Bird observed or heard on Jan. 4, 2018.

	Palauan Name	Scientific name	Observation
1	<i>Dudek</i>	White-tailed tropicbird (<i>Phaethon lepturus</i>)	Seen
2	<i>Kiuid (endemic)</i>	Micronesian starling (<i>Aplonis opaca orii</i>)	Seen
3	<i>Bedaoch</i>	black noddy (<i>Anous minutes</i>)	Seen
4	<i>Melimdelebdeb</i>	Palau fantail, (<i>Rhipidura lepida</i>)	Seen
5	<i>Chetitalial</i>		Heard
6	<i>Chesisbarsech</i>	Palau Bush Warbler (<i>Certia annae</i>)	Seen
7	<i>Biib (endemic)</i>	Palau fruit dove (<i>Ptilinopus pelewensis</i>)	Heard
8	<i>Sechou</i>		Seen

The second bird assessment utilizing EQPB approved Bird Survey protocol developed by Belau National Museum, was conducted on February 1, 2018. The bird counts took place at the main hotel facilities area and the other on the trail further away from the disturbance of development and noise. There were total of 22 species of bird recorded during this survey conducted between 7:05 am and 7:30 a.m. Nicobar Pigeon, an IUCN threatened bird species, was seen on the first site but not on the second site. Palau Fantail was identified on the second site but not on the first. No endangered bird species observed during this survey (Appendix J: Ngellil Isalnd Bird Survey).

5.2.5 Other organisms

Other land organisms observed include *emaidechedui*, *emayong*, and *kesaku*.



5.3 Socio-cultural, economic and political

5.3.1 Socio-cultural

The Ministry of Community and Cultural Affairs, Bureau of Arts and Culture had issued a Historical Preservation Clearance No. 6210 in accordance to the requirements under the Historical and Cultural Preservation Act of 1995 (Appendix F: HPO Clearance No.6210).

The Historical map obtained from Palau Automated Land and Resource Information System (PALARIS) shows three historical sites within the southeastern part of Ngellil Island (Map 10 : Historical Sites and vegetation in southeast portion of Ngellil Island). One of the sites, identified as Scattered: Sherds encompasses part of the resort development areas.

Map 10: Historical Sites and vegetation in south east portion of Ngellil Island.



KAMPOR interviewed men and women of Airai State, mainly from Ngerusar Hamlet about the Ngellil resort development plan. Majority of those interviewed are aware of the

project. The main concern is the impact of the human waste. Compliancy with permit requirements and public access to the site were other concerns. One of the project's positive impacts as identified by community members interviewed was that the project will be as a source of revenue to the state. (Table 10: Interview Result of Airai community members by KAMPOR Analytical).

Table 10: Interview Result of Airai Community Members by KAMPOR Analytical

No.	Gender/age/resident	Remark
1	Female, 35-40 years, Airai resident	Has heard about resort development at Ngellil and emphasize compliance with relevant laws.
2	Male, 21 years, Ngerusar, Airai	Never heard of resort development at Ngellil.
3	Male, 25 years, Ngerusar, Airai	Never heard of the resort project in Ngellil.
4	Female, over 60 years, Airai resident	Never heard and not aware of the resort project in Ngellil
5	Male, 43 years, Ngerusar	Aware of the resort project in Ngellil; they are conducting illegal fishing activities in-front of the island; need to meet permit requirements
6	Male, 65 years, retired government worker, Ngerusar	Aware of the resort project and concern about human waste impact on the surrounding area
7	Male 47 years old, resident of Ngerusar	He has heard of it but don't have as much knowledge of resort project. He is concern on the human waste impact of the surrounding area and the disposal of trash generated by the lodging facility.
8	Male, 55 years old, resident of Ngerusar, gov't worker	He is concern on maintaining public access to the beach and impact of human waste
9	Male, 42 years old, resident of Ngerusar.	Not aware of the Ngellil resort development activities.
10	Female, 55 years old, resident of Ngerusar	Have hear of the resort project in Ngellil and that it be source of revenue to Airai State Government.

5.3.2 Economical and Political

Airai State, a resource owner, has the authority to lease the area within its state territory for both commercial and residential use and have executed agreement with Proponents to manage the public land area. This Ngellil Island has been utilized by community

members for multi-purpose activities both for tourist activities, historical sites and community recreational uses.

Tourism is Palau's lead economic sector. The vision of the ROP Government Responsible Tourism Policy Framework is ensuring a pristine paradise Palau for everyone⁷. The Proponent's proposed project will cater to eco-tourism thus promoting tourist experiencing the Palauan brand, and help Airai State manage its resources while generating employment opportunities and local revenue.

The Ministry of Natural Resources, Environment and Tourism and the Ministry of Justice are the national regulatory agencies charged with the protection of the endangered and protected species under the Endangered Species Act. No endangered fauna or flora identified within the project site during the assessment. The marine area has been disturbed with dredging activities destroying the sea grass cover in front of the beach. A critical marine habitat has been destroyed but does not warrant special consideration under the Endangered Species Act of 1975 and EQPB compliance order issuing penalty will provide financial mitigation for the damages. A rare and endemic species of *Kokeal* (*Cycas micronesica*) was found at the trail site.

6.0 Project Alternatives including Proposed Action

6.1 Environmental Consequences of the alternatives.

6.1.1 Alternative of No action. The proposed site will continue its recovery of the ecological habitat from destructive unpermitted dredging, construction and clearing activities. Possible siltation impacts to the adjacent marine area from these activities would have been eliminated. The original trail that provides public access to the stone yap money remained the same narrow and unsafe for the public. No additional loads of waste water and tourists' foot prints in the area. "No action alternative" would hinder the business opportunity and economic benefits for the Nature Island Resort, employment opportunities, resources management services to Airai State Government and tax revenues to state and national government.

6.1.2 Alternative site: Private ownerships of rock islands are rare here in Palau, hence there is no other ideal rock island area to conduct such private-public joint eco-tourism ventures. This site was chosen for the accessibility to lease an ideal private and government land property for mutual desire of eco-tourism development for Airai State. The waterfront, seclusion, and natural rock island settings make this area very suitable for eco-tourism and eco-resort business ventures.

6.1.3 Alternative or equally suitable development plan: The Proponents had designed the number of guest rooms to emulate the surrounding area, giving it an eco-tourism beauty blending with the natural environment. The limited number of rooms also reduced the burden for on-site support utility systems, particularly sewer and water.

6.2 Proposed Action

6.2.1 The proposed development is the Preferred Action as it will enable the Proponents to perform business opportunity in a manner that can sustain an income. The proposed project to include the completion of the unfinished facilities such as four story building to contain, kitchen, restaurant, lookout area and one honeymoon suite with built in toilet & shower; to construct a new on-site septic system with leach field; and tear down old staff housing and build a new two story staff housing, completing and retaining all other facilities will enable the Nature Island Resort to partake in successful ecotourism business.

The development plan includes majority of the facilities either completed or almost completed with only two facilities remaining to be constructed (Table 1: Proposed Development Plan). This preferred action will enable Nature Island Resort to complete structures already under construction, to operate a resort enterprise as planned and to work with Airai State Government to manage its eco-tourism related activities in Ngellil Island.

The Proponents are complying with the Palau EQPB enforcement action to meet the permit requirements and payments to Mitigation Funds for unpermitted earthmoving activities.

7.0 Impact Assessment

7.1 Marine Environment

The dredging activities have converted the sea grass area into sand dunes at the beach front of the project site. The ecological function of the sea grass cover has been permanently lost due to unpermitted dredging activities. The remaining sparse growth of sea grass will take time to re-establish the cover in the area.

7.1.1 Water Quality & flow



Siltation that degrades the water quality is the major impact that took place during un-permitted dredging activities. Sediment carried by wave action of out-going tides and water current actions were not mitigated and caused the water quality to decline and disbursed sediments into surrounding marine ecosystem. The construction of a wooden pier also contributed to some degradation.

Some wooden footings are suspended and not immersed into the ocean floor. The wooden pier seemed to have minimal effect on water flow but seemed to trap sand causing built up at the footings of the pier.

7.1.2 Water navigation and safety

The staff at the hotel indicated that dredged area allows the boat to navigate during low tide, where as before, the resort can only be reached during high tide. There were no other boats observed utilizing the area, except EQPB boat during an inspection and water sampling trip.

There are floating buoys installed around the beach front to prevent motor boats from running into beach swimming area. These buoys also serve to deter the floating debris from reaching the beach front.

7.2 Magnitude of the project

The project will utilize the entire leased private property with flat area surrounding the base of the cliff for commercial enterprise. There will be an irretrievable loss of marine habitat, particularly the sea grass community at the front of the beach due to dredging activities with motor boat.



Manual labor is used to develop the trails. Vegetations along the trails have been cleared to enlarge the trail and used as construction materials for wooden rails and rock stairs. The rocks have been uprooted or dislodged to enable alignment of the trail and have been utilized for filling of pathways and stairways.



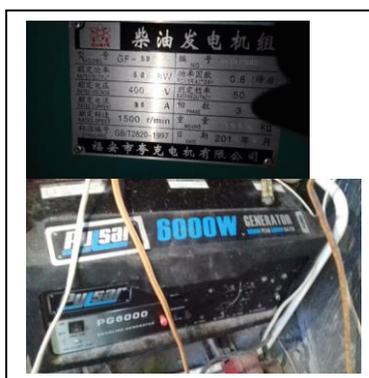
7.3 Erosion and sedimentation



Majority of the earth moving activities have been accomplished without sedimentation plan or installation. Most of the sedimentation impact occurred during the dredging, removing the sea grass cover in-front of the beach and exposing the ocean bottom to wave actions and tidal influence.

The removal of rocks and soil along the trails also caused soil erosion but the run-offs from these activities would have just seeped into the rock crevices rather than flow away from the site. The remaining major sedimentation would occur during the earth work activities for the construction of new septic system and the staff house.

7.4 Air Quality and Noise



Construction activities and operation of back-up generator will cause temporary noise and reduction of air quality (dust disbursement) for a short period of time. The area is surrounded by rock-outcrop so no disbursement of dust during construction.

Remains of burnt trash were observed during the assessment.

A commercial plane flew over the site during December visit.

7.5 Public Infrastructures

There will be no impact of this project on public infrastructure as it will have self contained utility systems. Solid waste disposal will be the only impact on continuous basis and sludge disposal at Malakal Sewage Treatment Plan during maintenance service by a private contractor (Appendix M). The generated waste will be segregated. The existing septic tank is about 6,703 gallons. The anticipated sewage to be generated daily during resort operation is about 1,757 gallons, which will take about 4 days to fill the existing septic tank. The planned new additional septic system, still to be constructed, has a capacity of about 4,309 gallons, which will hold sewage load equivalent to 2.5 days.

The non-recyclable solid wastes will be transported by motor boat to Office in Ngetkib and disposed in Airai Landfill.

The resort harness solar energy to provide electricity needs and therefore the usage of the generator will only be needed to supplement electricity needs during a twenty four hours constant rain. The resort's current operation uses 6,000 kw with 200A batteries for daily operation and the existing Solar System can produce adequate electrical needs.

Rain water is collected from the roof, stored in a tank and treated with chlorine, then pumped to the tanks on top of the hill to be distributed by gravity flow to hotel facilities. The current water storage capacity is more than 9,000 gallons. The future water storage expansion will provide additional 17,000 gallons of water for operation. The EQPB conduct routine water quality checks and have provided training to the hotel staff on how to treat the water. Bottled waters are distributed for drinking.

Nature Island Resort utilizes on-site sewage systems with leach fields. The shower and toilet are equipped with water minimization units that will greatly reduce the use of water. Due to the hotel eco-tourism principles, the tourist adheres to minimal use of water (Appendix K: Percolation Tests Result).

Table 11: Calculation of water use and estimated sewage during operation phase.

Location	Justification of water use	Calculations
Restaurant	Food is prepared on mainland of Koror and Airai and transported to Nature Island Resort restaurant only to be warmed and served to the customers. The estimated maximum guest is about 60 per day.	Since the only potential use of water is for washing hands and boil food the estimated water load is 30 gallons per day (60 people X 2 gallons/day = 120 gallons per day)
Laundry (1washers)	Estimated 1 load per day to wash hand towels at 27 gal. per load	1 load X 27 gallons/load = 27 gal/day
8 guest rooms	Maximum number of two guests per room	8 rooms X 60 gpd X 2 persons = 960 gallons per day
3 common restrooms & Showers	30 guests daily	30 quests X 10 gpd = 300 gpd
Staff	5 live-in staff	5 live-in staff X 60 gpd X = 300 gallons per day
Support Staff	5 staff during the day	5 staff X 10 gallons = 50 gpd
	TOTAL Estimated sewage	1,757 gallons per day

Source: EQPB Regulations (2401-13-15 Private System Location and Installation Table II). Daily usage for Picnic parks with bathhouses, shower and flash toilet was used to estimate loads of common restrooms.

The above sewer load is an over estimation since the toilet and shower facilities utilize special water reduction devices. Special shower fixtures has mixture ratio of 1 L water/ L of air and toilets has 1.28 gallons of water per flash as compared to the standard toilets with 3.5 gallons per flush (Appendix H - Toilet and shower specification).

7.6 Refrigeration & Air Condition Equipments

The Nature Island Resort utilizes ceiling fan and natural air for cooling and therefore does not use air condition units.

There will be one small freezer (3.5 cubic feet) in kitchen for food and drink storage. This equipment will be purchased from local hardware store ready for use and will contain about 1.94 oz. of Refrigerant R600a (see below photo for specifications).



7.7 Solid Waste Disposal

During the Operational Phase, the solid wastes generated will consist of Styrofoam plastics, boxes, aluminum cans, plastic bottles and some paper products.

The Management will implement waste segregation program. Recycle bins will be installed with signage to encourage guest participation in recycling. Workers will segregate wastes accordingly, plastic bottles, aluminum cans, papers, plastic containers, boxes, food scraps and leaves. An estimated one 33 gallons bag of non-recyclable wastes will be generated daily. These wastes will be placed in plastic bag and transported to Ngetkib office for proper disposal. Accumulated recyclables will be transported to facilities in Koror and the non-recyclable solid wastes from construction work and operational phase will be disposed at the Airai Landfill.

7.8 Socio-cultural, economic & political

The proposed project would have positive socio-cultural, economic and political benefit. The Airai State Government, as the resource owner, has issued the Management Agreement with the Proponents and will continue to review the project to make sure it meets the requirements for the benefit of the people of Airai. The people of Ngerusar are key stakeholders of natural resources usage around Ngellil Island, and the proposed project should not impede their use and enjoyment of the area.

This project is expected to have a positive impact on social-culture, economic and politics. Proponents believe that this opportunity will allow their participation in local economic development by offering tourist based services to both local and visitors. The Proponents will realize the economic benefits, provide job opportunities to the locals, and generate additional revenues through various state and local government taxes, including hotel room tax (10% or \$5 per night as required under PNCA 40 Section 1401 as amended by RPPL No. 7-37). This proposed project will contribute to Palauans job market. A visitor entry fee of \$25 will be remitted to Airai State Government.

This project will not prohibit or impede any recreational activities in the area.

The reporting requirements of the HPO Clearance should be followed.

8.0 Proposed mitigation for preferred action

8.1 Erosion and Sediment Control Plan

An Erosion and Sediment Control Plan for the remaining earth work on new septic system and staff housing must be followed (Appendix E). Ensure sediments are retained within the project site and do not impact adjacent reef with increased turbidity. Due to the soil types of the area, the land based earth moving activities will not have direct impact into the sea.

Re-plant the exposed earthen part of the trail with natural localized vegetation to reduce further erosion.

Construct fuel containments for back-up generator and the water pump engine.

Mitigation measures recommended include: installation of EQPB approved sediment fabric to contain soil erosion in the construction areas for sewage leach field and staff house (Appendix E: Erosion and Sedimentation Control Plan). All temporary and permanent control measures should be carried out in accordance with the EQPB approved ESCP and monitored with prompt corrective actions implemented as necessary. Conduct weekly inspection of all sediment control facilities and also after each heavy rain or wind; record observations and recommendations for corrective actions. Remove sediment control infrastructures and dispose off according to EQPB requirements upon completion of earthmoving activities.

8.2 Marine protection initiatives

The proposed project is in line with development plan of the Airai State Government who has contracted the proponent to provide eco-tourism management services. Proponent should stop further marine dredging activities and work with Airai State and other relevant government agencies to meet any requirements to re-establish the reef sea grass cover. Alternatively, Proponents have paid mitigation funds which should help in marine ecosystem management. Provide on-site training on practical conservation and eco-system management practices and tools to Airai community.

8.3 Control measures for air and noise

Reduce the impact of air quality by adhering to waste minimization and segregation plan, and only burn trash in accordance to EQPB guidelines and approval.

Limit construction work to mid-day time only. Any construction work that will produce loud noise should be avoided in early morning and evening periods to reduce impacts to bird species.

Conduct routine engine maintenance to ensure generator and water pump engine operate properly.

No stockpiling of soil at project site.

8.4 Waste Management

The resort should adopt green measures for cleaning, operation and maintenance during the operational phase. The solid waste management plan should include segregation of food wastes for animals, papers, aluminum and plastics (reuse, reduce, recycle) to recycle and thus minimizing general refuse to be transported to landfill. Install bins with signage to help guide guests to partake in the segregation of trash. Due to long distance of Airai Landfill, the Proponents may be allowed restrictive burning of the organic trash, including cardboard and wood, as part of the solid waste management program for the operation of the resort. This will also serve as mosquito control measure.

It is recommended that the hotel install a grease trap to help manage kitchen wastes, maintain use of low flow water fixtures, and maximize composting of the organic wastes for farm use.

Used oil from generator should be stored in drums and brought to PPUC power plant for recycling. Construct an impermeable secondary containment for fuel and generator within a covered storage facility.

The hotel management needs to secure a servicing company to ensure that on-site sewer treatment system is routinely maintained so it will not pose health impact to guests and staff.

Secure appropriate health permits from Division of Environmental Health and Airai State, along with other necessary approvals, prior to operation of restaurant.

It is recommended that Resort Management conduct routine clean ups of debris within the area and the Ngellil island surroundings.

8.5 Environmental management and monitoring

The developer will implement a routine monitoring and corrective action plan for all ESC facilities. Install geo-textile for short term erosion control and plant native vegetation or install rock riprap for long term measure to prevent erosion and sediment runoffs on exposed areas along hiking trails.

Implement a water monitoring program through routine treatment and testing of rainwater. Ensure the marine area remains usable for different recreational activities and the water classification is intact.

It is recommended to retain services of an engineer and a biologist for the duration of the project construction to ensure monitoring and maintenance of control measures are implemented to protect water quality and the health of the marine water.

8.6 Climate Changes

The project Proponents should work with the relevant government agencies to get the appropriate building/design codes to mitigate sea level rise and fulfill all other requirements to minimize the disturbance of the rising water on beach front.

The Report of International Panel for Climate Change (IPCC), in 2001, estimated a 50-90 mm rise in sea level within the next 50-100 years. In the past few decades, ten countries and territories with native mangroves in the Pacific Islands had experienced an average rise of sea level of 2 mm per year. Sea level rise, storm surge, drought and typhoon are considered high level risks according to Palau National Hazard Profile (NRDMF 2010).

This proposed resort development is prone to higher sea level, more frequent storm surges, and extreme weather events that are threats to coastal communities in Palau.

The structural design building materials and construction should follow best building construction guidelines as part of the site development plan to mitigate this impact and ensure safety. Structural design verification for the four story building situated on side of the hill must be executed to ensure safety. Implement weight limitation/occupancy rate on the four story structure at a given time as a precautionary safety. Although the four story building design takes considerable effort to blend with the natural surround, the engineering integrity of the structure needs to be verified taking the impacts of wind action into consideration. This four story building is made up of wood with fiber-glass covered wooden floors and sits on a hill side exposed to southeasterly wind. Incorporate maximum number of people/load on each floor to ensure safety.

8.7 Energy Conservation Measure

Implement best business operating practices for energy efficiency by maximizing the use of renewable energy harnessed from the sun for electrical needs, ceiling fans, energy savings fixtures such as fluorescent lights, low flow water toilets and air-water infused showers and faucets. Maintain no air condition use on the resort facility.

A secondary impermeable concrete containment will be installed at the generator house. A supply of Spill Kit will be made available at the generator house (Appendix L: Generator House Fuel Spill Concrete Containment).

8.8 Socio-cultural

Post public notices warning the visitors of construction activities near project site. Hold regular community meetings, as needed, to address any issues raised during the project implementation. Allow community to access historical sites through resort area.

Provide work training and employ local community members to promote local ecotourism business activities.

Work with Airai Community Members to organize regular ecotourism learning activities.

Work closely with relevant national and state entities to develop accommodations, services, and experiences that are eco-friendly and meet Palau’s market demands and expectations of high-end visitors.

9.0 Impact Summary and conclusion

The Airai State Government had executed a Management Service Agreement with the Proponents for this proposed commercial project (Appendix A-2) obligating the use of the island and its resources for an extensive time (25 years). The main negative environmental impact is the unavoidable permanent destruction of a marine ecosystem due to unpermitted dredging activities. The long term impact of the project would be increased number of people on the island contributing to human wastes and their constant presence not allowing the ecosystem to recover naturally. The rare and endemic *Cycas micronesica* should be left alone and not disturbed. Additionally, the impact on the Nicobar Pigeon, an IUCN threatened bird species should also be routinely monitored.

The positive economic impact of the project is that the Proponents will succeed with their Tourist Industry business venture. The social positive impacts include the new revenue derived from the collaboration between and amongst the Proponents and Airai State Government working together on eco-tourism business and conservation initiatives, clam planting, public recreational use of the area, employment of locals, and fulfillment of the state and National Tourism Framework Goals.

Table 12: Summary of Environmental Impacts and Mitigation Measures

Identified Impact	Type		Duration		Level		Mitigation Measure	Responsible
	-	+	Short Term	Long Term	Direct	In Direct		
Pre-Construction								
Design Plans		+		+	X		Incorporate measures to ensure safety, effect of drought, tidal surge with back-up generator and water systems	Proponent/ Designer
Secure Permits								Proponents/ Manager
Installation of silt fence	X		X		X		Follow EQPB approved ESCP	Manager and workers

Construction								
Inspection of silt fence		X	X				Ensure sediment containment	Manger/Workers
Operation								
Water and Sewage holding tanks	X			X	X		Ensure monitoring and servicing	Proponents/Manager
Restaurant grease trap	X			X		X	Install system, protect public health	Manager
Refrigeration units	X			X		X	Protect ozone layer; use EQPB approved Freon	Proponents/Manager
Energy conservation	X			X	X		Harness and use Solar Energy; fan for cooling	Manager
Solid Waste	X			X		X	Implement segregation; reuse, reduce, recycle; install recycling bins	Manger/Workers
Toilet & shower facilities	X			X		X	Use low flow water fixtures	Proponents/Manager
Job opportunities	X			X		X	Employ locals; provide training; increase tax revenue; support Palau's tourism framework	Proponents/manager
Abandonment								
Not applicable								

10.0 Accountability Statement of EA Preparer (s)

ACCOUNTABILITY STATEMENT

The objectives of this Environmental Assessment (EA) were met through collection of information and assessment of the project in accordance with the dictates of reasonable and sound professional judgment adhering to the rules set forth in the Palau Environmental Quality Protection Board (EQPB) guidelines and regulations. New data/information which would make the enclosed EA inaccurate will be forwarded to the attention of the EQPB.

We certify that all the information contained in the enclosed EA is true, accurate and complete to the best of our knowledge.

In witness whereof, we hereby set out hands this 15th day of July, 2017.

Ongerung Kambes Kesolei
Print


Signature

EA Preparer/Marine Assessor
Specialization

Portia K. Franz
Print


Signature

EA Preparer/Project Lead
Specialization

SUBSCRIBED AND SWORN to before me this 16th day of July, 2017 in Koror, Republic of Palau.


Efrechia Kazuma
Clerk II

Palau Supreme Court

Clerk of Courts, Supreme Court of
the Republic of Palau

11.0 List of Appendices

- Appendix A-1: Toshi katsu Baules Land use right
- Appendix A-2: Airai State Government Management Agreement-
- Appendix B: Site Development Design Plans
- Appendix C: Project Work Schedule
- Appendix D: EQPB Water Test Result
- Appendix E: Erosion and Sediment Control Plan
- Appendix F: Historical Preservation Clearance
- Appendix G: Grease Trap Design
- Appendix H: Toilet & Shower specification
- Appendix I: Small Freezer specification

Appendix J: Ngellil Island Bird Survey Report
Appendix K: Percolation Test Result
Appendix L: Generator House Fuel Spill Concrete Containment
Appendix M: Service Contract for Septic System
Appendix N: UXO Clearance

12.0 List of Figures

Figure 1 Palau Map: Project Location
Figure 2 Site Map showing developed project area
Figure 3 Soil Map of Ngellil Island
Figure 4 Water sample sites on Jan. 4.2018
Figure 5 Map of water current measured on Jan. 4, 2018
Figure 6 Map of Line Intersect Transect (T1)
Figure 7 Map of line intersect T2
Figure 8 PALARIS Vegetation Map
Figure 9 Map trails and vegetation surveyed
Figure 10 Historical Sites and vegetation in south east portion of Ngellil Island
Figure 11 Photo plate of Development Plan

13.0 List of Tables

Table 1 Proposed Development Plan
Table 2 EA activity summary
Table 3 Nature Island Resort Total Project Cost
Table 4 Marine Water Test Result compared to standards
Table 5 Marine survey checklist I
Table 6 Pond Trail
Table 7 Long Trail Vegetation List
Table 8 Lookout Trail Vegetation List
Table 9 Bird Assessment on Jan. 4, 2018
Table 10 Interview Result of Airai Community Members by KAMPOR Analytical
Table 11 Calculation of sewage quantities during hotel operation phase
Table 12 Summary of environmental impacts and mitigation measures

14.0 References

1. Palau EQPB Act, 24 PNC, *Earthmoving Regulations*, July 2015.
2. Myers, Robert F. *Micronesian Reef Fishes: A Practical Guide to the Identification of the Coral Reef Fishes of the Tropical Central and West Pacific*, 1991.
3. Ohba, Hideo, Victor, Steven, Golbuu, Yimnang, and Yukihiro, Hideki. *Tropical Marine Plants of Palau*. Palau Coral Reef Center and Japan International Cooperation Agency, 2007.
4. Feistel, Rainer and Hagen, Eberhard. *Environmental Systems. Vol. 1-Measurement Tools: Water Systems (Ocean)*, 1969.
5. *Sengebau, Umiich, et. al. State of the Environmental Report, Republic of Palau, 2017.*
6. Office of Planning and Statistics, Bureau of Budget and Planning. *Census of Population, Housing and Agriculture for Republic of Palau*. Volume 1. Basic Tables, 2015.
7. Palau Responsible Tourism Policy Framework 2017-2021. December 2016.
8. Belau National Museum National History Section, *State of Palau's Birds*, 2015.
9. Common and Scientific Names of Trees and Shrubs of Mariana, Caroline, and Marshall Islands.
10. A Field Guide: Native Trees of Palau by Ann Kitalong.
11. United State Department of Agriculture, Natural Resources Conservation Service, Soil Survey of the Palau, Update of 1983 soil survey, Smith, 1993.