Finau Yaubula Environmental Services (Fiji)

Proposed Maintenance Dredging Work, along the Port of Lautoka

Environmental Management Plan

FIJI PORTS CORPORATION LIMITED

Prepared by:

Finau Yaubula Environmental Service (FIJI) 2024

Environmental Management Plan for the Proposed Maintenance Dredging Work, along the Port of Lautoka

Report Prepared for:

Mr Vajira Piyasena

Fiji Ports Corporation Limited

Signature:

Date: 20-05-2024

Report Prepared by:

Name	Signature	Date
Mr Ilaitia Finau		15/05/24
Dr. Paulo Vanualailai		15/05/24
Mr Mosese Bati		15/05/24

RECEIVED
20 MAY 2024
Ministry of Environment

RESPONSIBILITY

Fiji Ports Corporation Limited agrees to assume full responsibility for the contents of the EMP document and implementation of the recommendations contained within it.

FIJI PORTS CORPORATION LIMITED G.P.O BOX 780, SUVA

20-05-2024

Date

Mr. Vajira Piyasena
Chief Executive Officer
Fiji Ports Corporation Limited

Finau Yaubula Environment Service (FYES)
Lot 37, Vesivesi Road
Kinoya
GPO Box 17718
Suva
Fiji
Email: 247fyes@gmail.com
Ph: +679 9739133
TIN: 06 – 03653 – 0 – 1

Table of Contents

List of Figures

List of Pictures

List of Tables

Acronyms & Abbreviations

GEMP	Environment Impact Assessment
EMP	Environment Management Plan
ES	Environment Statement
FRA	Fiji Roads Authority
FPCL	Fiji Ports Corporation Limited
FPTL	Fiji Ports Terminal Limited
LCC	Lautoka City Council
NLC	Native Land Commission
LOU	Land Owning Unit
BPC	Ba Provincial Council
MRD	Mineral Resource Department
DOE	Department of Environment
MSAF	Maritime Safety Authority of Fiji
ITLTB	I'Taukei Land Trust Board
TOR	Terms of Reference

1.0 INTRODUCTION

1.1 Purpose of the Document

This Maintenance Dredging Environment Management Plan (GEMP) report is prepared as one of the conditions for the attainment of the approval for the maintenance dredging of accumulated sediments along the berthing area of the Port of Lautoka by Fiji Ports Corporation Limited (referred to as FPCL thereafter). FPCL is proposing to dredge a total area of 63, 510 m^2 with total volume of 124,970 m^3 from 6 proposed zones (Zone A – Zone F).

Lautoka is the second largest port of entry in Fiji and handles the bulk of Fiji's sugar and woodchips exports along with a considerable volume of containerized and general cargo. The border control agencies, Customs and Bio Security are also located inside the port facility and provide their services to the port users. The major cargo commodities being handled in the Port of Lautoka are containers, automobiles, general cargo, wheat, and clinker.

The Lautoka Port has a total land area of around 2 ha. The approach channel is capable of catering vessels with a maximum draft of 10.5 meters. Minimum depth alongside container berth is 11.5 meters and maximum permissible draft alongside cargo berth is 10.5 meters. The height of the berth from the water level is 3.5meters.

Lautoka port has three alongside berth facilities with a maximum depth of 11 meters and has the capacity to accommodate 2800 TEUs container or handy-max sized general cargo vessels. The 295 Meter Queens Wharf is the main berth offered to the large vessels that call at Lautoka. Approximately 150 meters of this berth is constructed as a modern quay facility whilst 140 meters still remain on piles.

North Quay is operated by FPCL and Fiji Sugar/Woodchips Terminal is operated by the respective companies.

Wharf	Length (m)	Depth (m)
Queens West	150	9.5
Queens North	145	9.8
Queens East	145	8.3

Table 1: Summary of the Lautoka Wharf

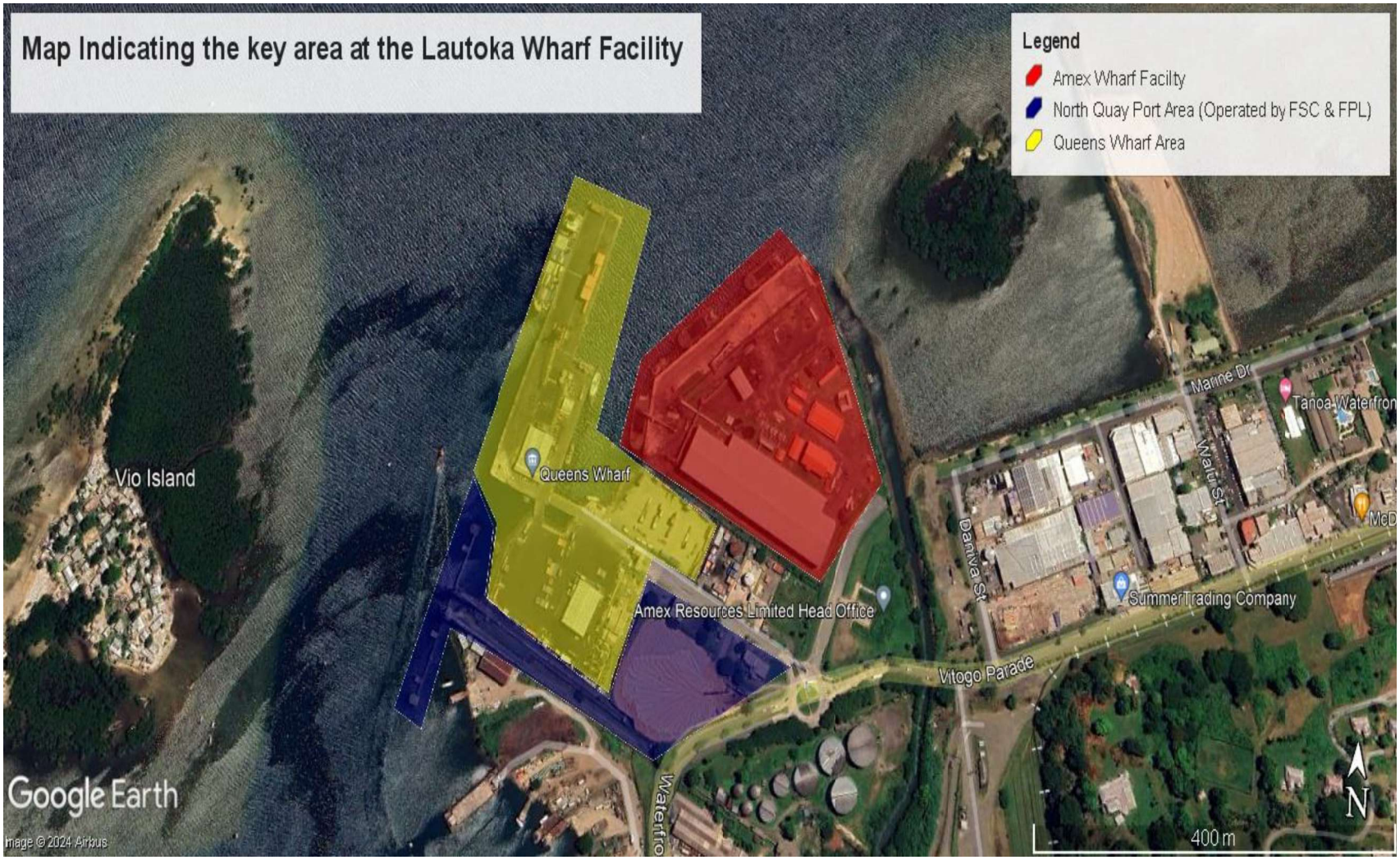


Figure 1: The figure above is showing the key designate area at the Lautoka Port Facility. Source FYES

The need of the berthing of Port of Lautoka and is an important component of keeping the berthing area safe berthing area. Therefore, this GEMP documents seeks to cover future maintenance dredging activity that will be conducted by FPCL in the future port maintenance works.

FPCL wishes to apply for the dredging permit/license from the relevant approving authority accompanied by the much-needed maintenance GEMP report from certified GEMP consultant to formalize the maintenance dredging works.

1.2 Objective of the Proposed Dredging Work

The main objective of the proposed dredging works is for FPCL to get the much-needed approval to start dredging and removing sediments from the area on interest, which is about a 40 meters radius from the edge of the Port of Lautoka structure. The sediments accumulated within the berthing area has become a hazard for ships berthing at the wharf especially at low tide. The Dredging of channels, berths, swing basins and silt traps is one of the critical asset management strategies required to be undertaken to achieve the performance and regulatory requirements to allow the safe navigation of vessels throughout all port waters.

In order to achieve compliance, the proposed maintenance dredging is to be undertaken to:

- optimise the performance of channels and berths within port waters.
- maintain the declared depths of the shipping channels, berths, approaches and associated swing basins.
- maintain the depths and capacity of all sundry areas of the port.
- manage the placement of dredged material within the proposed maintenance dredging area.

1.3 Project Timetable

FPCL is intending to initiate as soon as all the appropriate approval has been attained from the relevant authority. However, dredging program will be altered as required to work within the zone that is available for the dredging work to proceed within the area and is highly depending on the shipping schedule.

1.4 Background Information and Consents

The proposed dredging is to be carried out within the Qoliqoli (fishing boundary) belonging to the Yavusa Vitogo of Ba Province. The application for the dredging license for the purpose of wharf maintenance is being sought from the Lands Department and other related stakeholders. With this proposed dredging, there is a great need to consult key people and stakeholders in order to ascertain the effective operations of the project without unnecessary hindrances. The names of the people consulted regarding the consent the maintenance dredging is listed below:

- CEO FPCL
- Senior Maintenance Engineer FPCL
- Momo na Taukei Vidilo Namoli, Tikina Vitogo
- Mr George Vugakoto Maritime Safety Authority of Fiji
- CEO Lautoka City Council
- Manager Eastern I'Taukei Land Trust Board
- Ms. Kelera Department of Environment
- Director Department of Lands
- Mr. Iferemi Waqasese Lautoka Board of Health
- Roko Tui Ba Provincial Council

1.5 FPCL Background

Fiji Ports Corporation Limited (FPCL) commenced operations on 01 July 2005 after two reforms in the Port industry. More commonly referred to as Ports Authority (PAF) Fiji Ports Corporation Limited was registered as a company on 18 August 2004 and operates under the Seaports Management Act 2005. PAF was created 01 November 1975 as a statutory body under an act of Parliament of the Ports Authority of Fiji Act (No 20). Reorganization was carried out in March 1998, which reformed PAF into two entities:

i. Maritime and Ports Authority of Fiji (MPAF); and

ii. Ports Terminal Limited (PTL).

In the ensuing years, it became evident that there still existed anomalies that were detrimental to the efficient and successful managing of Fiji's Ports to attain the desired results.

FPCL was borne out of this second reform under the Public Enterprise Act. Prior to establishment of the PAF, ports operation was run jointly by a number of Government Departments, the stevedoring and cargo handling controlled by overseas shipping companies with its agents in Fiji.

The establishment of PAF under an Act of Parliament in 1975 following recommendations by the Ports Commission of Inquiry which studied operations and administrations of ports in Fiji. The setting up of the Authority saw the integration of all port operations into a single autonomous BODY. FPCL operates the two main ports of entry into Fiji – Queens Wharf, Lautoka and the Queens Wharf, Lautoka. Fiji Ports leases and operates Levuka Wharf, Ovalau.

FPCL oversees the operations and International Ship and Port Facility Security (ISPS) requirements for Fiji's secondary ports of Malau Wharf, Labasa, Vanua Levu (owned by Fiji Sugar Corporation), Rotuma Port, Rotuma (owned by Rotuma Council), Wairiki Wharf, Nabouwalu, Vanua Levu (owned by Tropik Woods Industries Ltd), and Vuda, Viti Levu (owned by oil multinational companies).

FPCL also oversees and operates a range of port facilities including local interisland, fishing and local and international barge port facilities located at Muaiwalu I and II, Walu Bay, Lautoka, and in Lautoka adjacent to the Queens Wharf, through the provision of Ports infrastructure and related services delivered in a manner that meets industry safety and security standards. Given Fiji's strategic location in the centre of the South Pacific, these Ports continue to face ever an increasing demand on services. Fiji Ports' overall operational objective is to progressively upgrade all Port facilities and services in ways that will bring benefit to clients, stakeholders and customers while continuing to improve productivity and efficiency levels.

The Port of Lautoka is Fiji's second largest, busiest and biggest container and general port providing the maritime gateway to the country's capital city of Lautoka.

Approximately 95% of Fiji's Imports and Exports is traded through Fiji Ports Corporation Limited Ports and handled by Ports Terminal Limited.

1.5.1 Vision

To be Smart, Green Gateway for trade in the Pacific Region.

1.5.2 Mission

To invest significantly in new and upgraded seaport and ship repair facilities to support and enhance the economic growth and prosperity of Fiji as well as, providing key economic and lifestyle linkages throughout Fiji and our Pacific region. We will provide expertise to drive regional safety and capacity in respect of maritime infrastructure.

1.5.3 Values

1.5.3.1 Professionalism

FPCL is guided by the highest level of honesty and integrity in everything FPCL do and will always demonstrate fair, open, honest and ethical business practices; FPCL aims to treat its people, customers, and stakeholders with respect; FPCL conduct is a measurement of high standards of professional integrity.

1.5.3.2 Progressive Leadership

FPCL will promote a proactive and creative environment that supports a work culture of collaboration and teamwork and aim to develop leaders who enthusiastically embrace achievement and innovation; FPCL encourages the continuous learning, training and development of our people; FPCL always try to do better.

1.5.3.3 Commercial Stewardship

FPCL manage its business and activities in a commercial manner and ensure that competitive and compensatory financial returns provide for a long and prosperous future for the organization; FPCL is committed to being accountable to effective business planning, and Bard our people for achieving success.

1.5.3.4 Corporate Citizenship

FPCL integrates corporate citizenship and social responsibility into every aspect of our operations; FPCL recognize that it is a privilege to share the marine and land assets of Fiji Ports with the community, and the people in the various associated regions, and that FPCL have responsibility to the community to communicate openly with residents, participate in, and support development, and ensure that our actions protect the environment and Fiji culture.

1.5.3.5 Strategic Innovation

Through our people and our development strategy, FPCL will challenge the status quo of the maritime transportation and logistics sector and become recognized leaders in the industry by being responsive to the changing needs of maritime and industrial sectors, and by bringing value to our customers through being an effect live link in the supply chain.

1.5.3.6 Employee Wellbeing/Diversity

As a company, FPCL hold advancing the health, safety and well-being of our workforce as an absolute priority; it's a commitment that encompasses the environments in which employees work, and the communities in which they live; FPCL aim to be a leader in diversity aiming always to be nondiscriminatory in respect to culture, race, sex or age, and consequently providing a fair and accepting workplace.

1.5.4 Responsibilities

Fiji Ports Corporation Limited's core responsibilities are:

• Provision and management of Port infrastructure;

• Landlord and property development functions;

• Facilitation of the efficient provision of Port services;

• Ensuring the maintenance of safety and environmental standards within the Port; and

• Ensuring the delivery of community service obligation of Government that are essential for the socioeconomic development of the country but which are not commercially viable through appropriate contract with Government for the provision of this service.

1.6 Description of the Existing Site & Operation

There are three berthing area along the Lautoka main Wharf and six Zones (Zone A – Zone F see Figure 2). FPCL is the main owner of the property of the Port of Lautoka; however, the daily Terminal operation is handled and operated by Fiji Ports Terminal Limited (FPTL).

1.7 Description of the Operation

Port of Lautoka is Fiji's second largest, busiest and biggest container and general port providing the maritime gateway to the country's capital city of Lautoka. Operations at the ports owned by

FPCL are handled by FPTL. Previously a 100% government-owned operation, PTL is now a 100% subsidiary of FPCL and is managed and operated by FPCL[1]. Other marine services comprising towage, launches, and lines work and both FPCL and private operator offer pilotage. The Port of Lautoka caters for the following types of vessels:

i. Liquid Bulk - Liquid bulk cargo includes any cargo carried in closed tanks and poured or pumped into the carrying vessel;
ii. Cruise Liners - ship that carries people on voyages for pleasure, typically calling in at several places;
iii. RORO (Roll on/off) - vessel which is used for the transportation of automobile vehicles. Also known as car carriers, these vessels have special inclines (ramps) constructed so as to make the loading and the unlading of vehicles and cargo easier and more convenient(See Figure 1);
iv. LOLO (Lift on/off) – the used of cranes either onboard or eternal for loading and offloading goods; and
v. Dry Bulk and occasionally Research Vessels and Foreign Navy Vessels.

Most of the activities within the docking area include cargo handling and stevedoring. There are demarcated areas where on the wharf various cargoes can be temporarily kept before it is approved to be taken out of the port area.

Picture 1: A LOLO vessel berthed at the Queens Wharf, Lautoka. Source FYES

[1] https://dlca.logcluster.org/display/public/DLCA/2.1.+Fiji+Port+Assessment

FPCL's and FPTL's operations are fully integrated and computerized and achieve international best-practice standards of throughput (20 containers/hour). Port of Lautoka handles the best part of export and import cargo in Fiji.

Figure 2: Schematic drawing of the Lautoka Main Wharf. Source FPCL

2.0 DESCRIPTION OF MAINTENANCE DREDGING OPERATION

2.1 Maintenance Dredging Operation/Method

FPCL is proposing to carry out its maintenance project by dredging the materials that have built up close to the wharf main structure. Dredging will be done by using the hopperbarge that will be equipped with two excavators. One is the traditional dredging Komatsu PC4508 meter long reach excavator will be mounted with a hydraulic clamshell to provide more control for the operator whilst dredging at such depth without imposing excessive loads on the spuds (see Picture below).

Picture 2: Typical dredging operation using the cut suction dredger Source https://jenkinsmarine.co.uk/services/dredging/.

The contractor will use a cut suction dredger to dredge the material from the proposed area. The dredger will be positioned with the assistance of the tug and work boat. The spuds will be lowered into the seabed with the head lowered onto the sea floor and the material cut and sucked up. The materials will be piped directly and spread out within the dump site. The first 300 meters of the pipe will be above of the pipe on the sea floor.

The dredger will operate at slow speed and undertakes visual monitoring for mobile marine fauna A survey vessel will survey and monitor the excavated area when the barge takes the material to the dumpsite. Depending on the traffic on the Port of Lautoka, the maintenance dredging work will run two shifts to make use of the available space at the berthing area. The total dredged volume of material that is going to be dredged from the area is approximately 124,970 m^3.

The proposed maintenance dredging depth is as follow:

Zone	Elevation (Lat m)	Area (m^2)	Volume (m^3)
A	-13	7,660	12,300
B	-7	2,350	6,200
C	-7	5,120	13,500
D	-13	40,210	78,500
E	-13	8,170	14,470
Total		**63,510**	**124,970**

The Fiji Navy Hydrographical team will re-survey the dredged area to ensure that desired depths have been attained.

2.2 Setting Boundary

The dredged area is to be confined within areas as applied for by the FPCL. As part of the maintenance work, FPCL is proposing to dredge about 40 meters around the physical wharf structure (see Figure 1). It is to be noted that of the three areas of interest, the maintenance dredging works will primarily focus on maintenance dredging the areas that do not meet the desired depth. Therefore, from the bathymetric map provided by the Fiji Navy, FPCL have identified key areas where maintenance dredging works will take place (see Figure 3, 4 & 5).

2.2.1 Dumpsite

The coordinates of the proposed dumpsite:

Site Coordinates		
1	1 17°35'48.41386" S	177°26'27.1356" E
2	2 17°35'42.50492" S	177°26'43.49060" E
3	3 17°35'50.85644" S	177°26'47.29685" E
4	4 17°35'57.01171" S	177°26'28.83720" E

Table 2: Indicating the GPS coordinates of the dumpsite.

2.3 List of Equipment's

Proposed machinery to be used for maintenance dredging activity:

- Tugboat
- Work Boat
- 2 Fire Boats
- Dive Gear
- One 33 ton Excavator fitted with Eccentric ripper or alternative to break up the clinker.

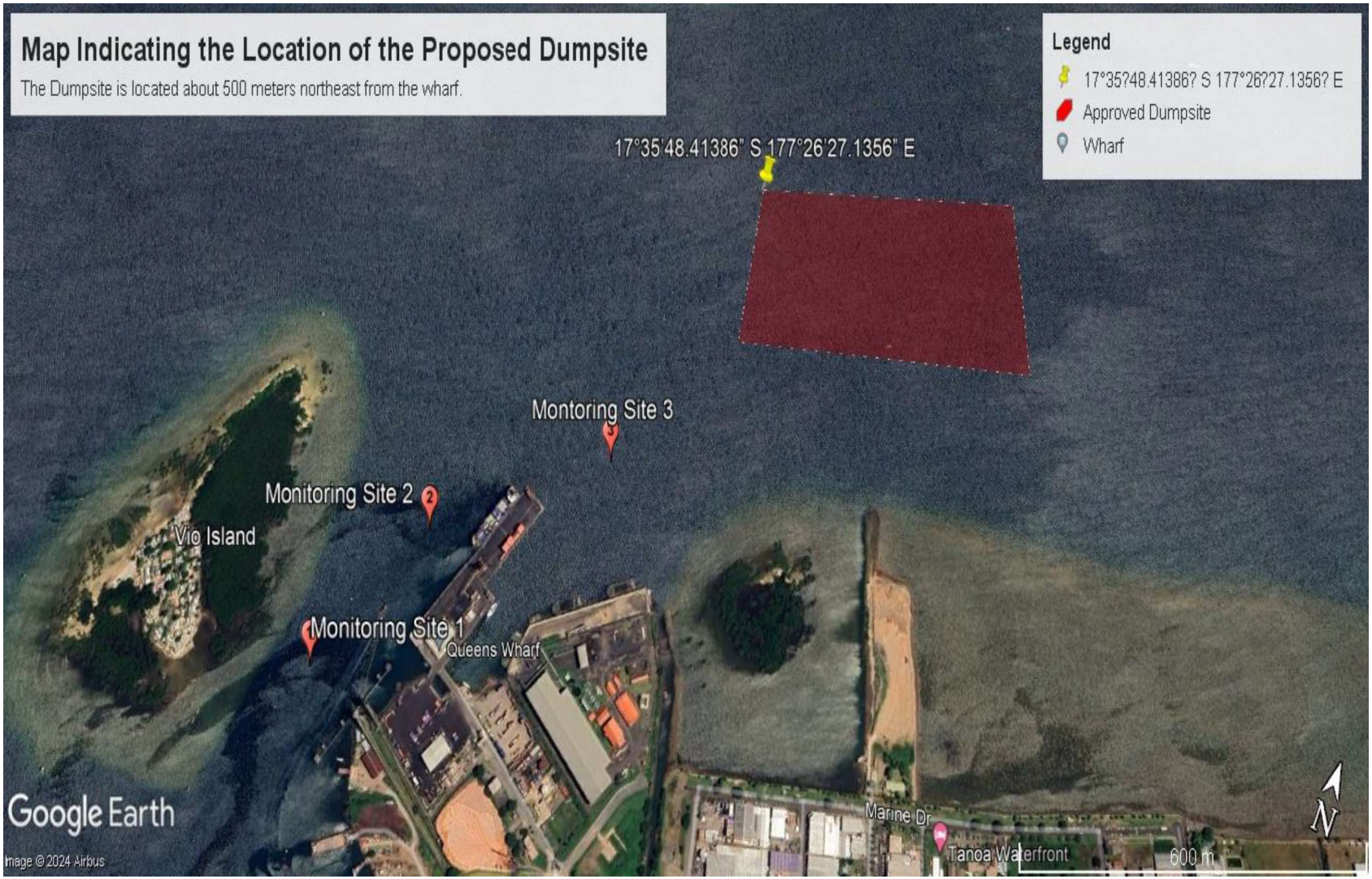


Figure 3: Indicating the area of the proposed dumpsite.

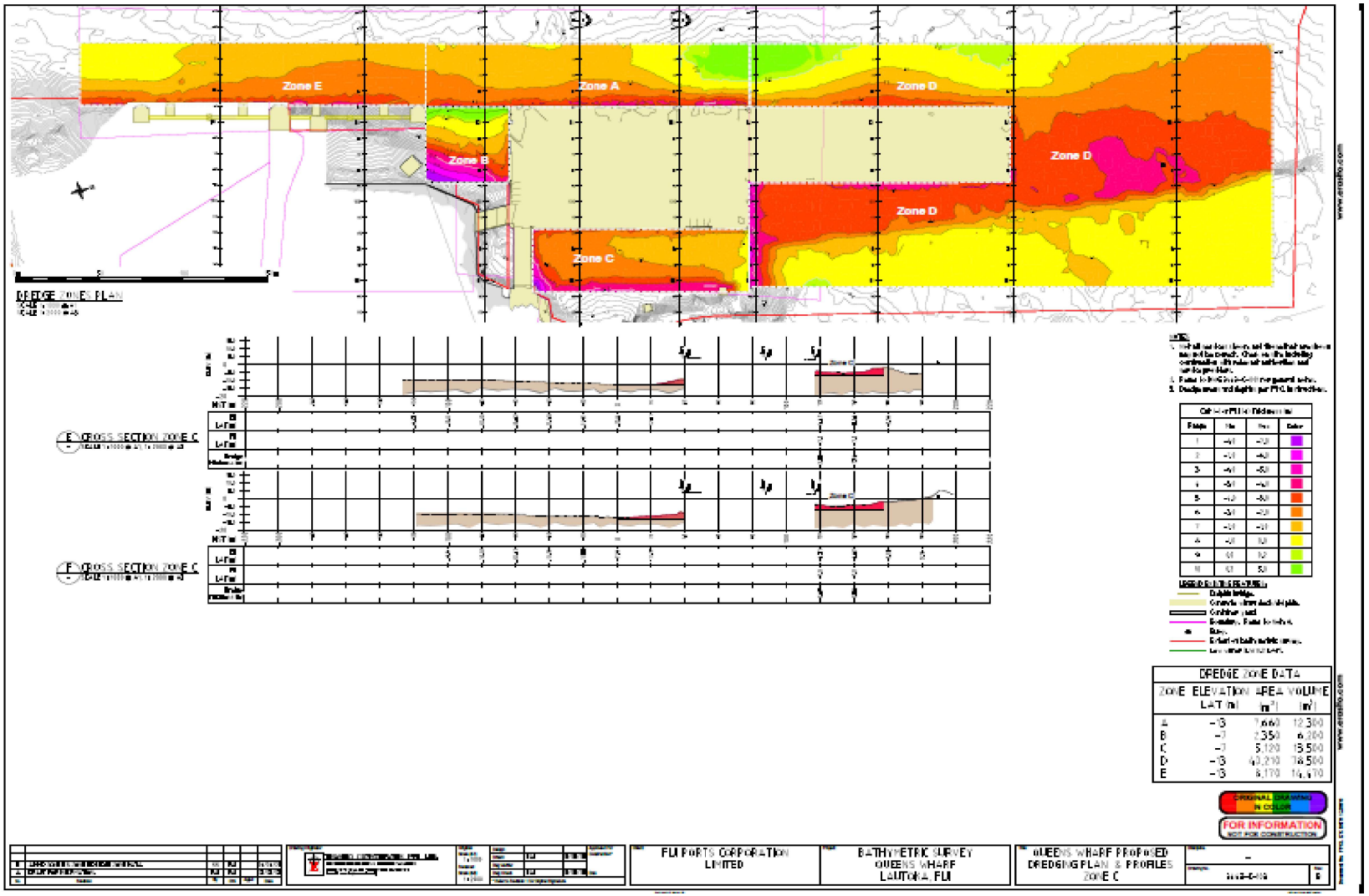


Figure 4: Indicating the Locating the three proposed dredging area. Source FYES

2.4 Project Location

The table below provides the GPS boundaries of the proposed maintenance dredging area.

Point	Latitude	Longitude
A	18° 8'12.56"S	178°25'25.81"E
B	18° 8'8.70"S	178°25'20.72"E
C	18° 7'51.64"S	178°25'28.31"E
D	18° 7'53.75"S	178°25'35.71"E
E	18° 7'54.79"S	178°25'35.06"E
F	18° 7'53.72"S	178°25'29.28"E
G	18° 8'8.35"S	178°25'22.74"E
H	18° 8'11.79"S	178°25'26.56"E

Table 3: GPS coordinates of the area of interest. Source FYES

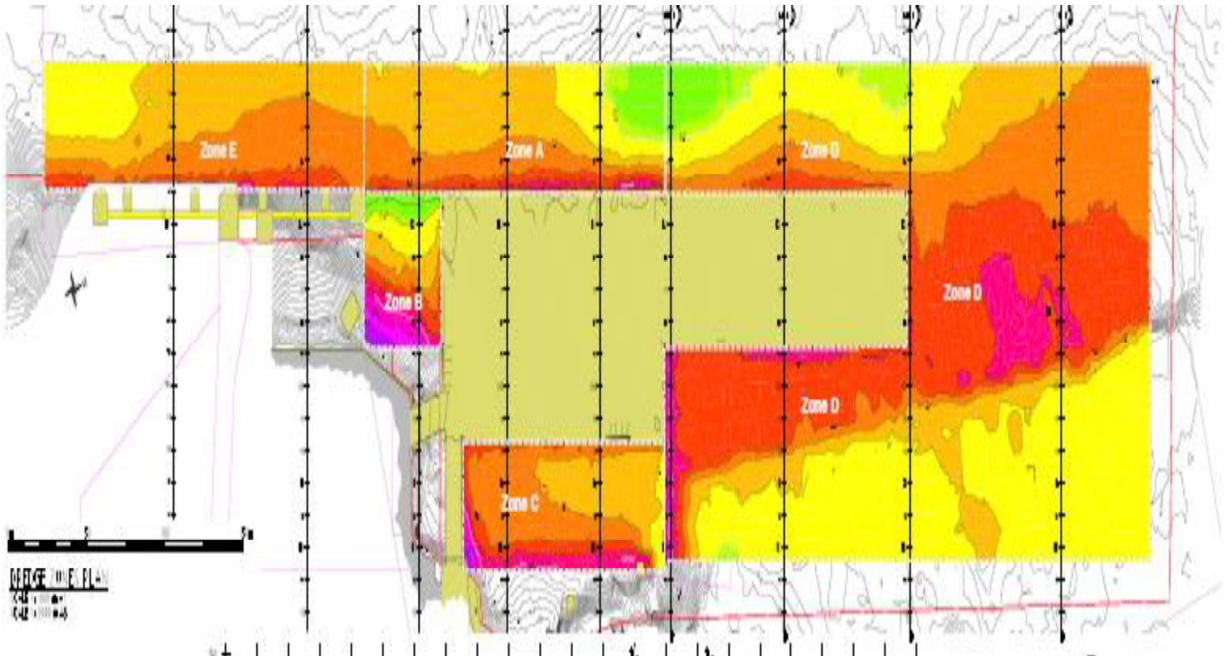


Figure 5 : The Bathymetric map above shows the depth profile around the Port of Lautoka. Source Fiji Navy

2.6 Rehabilitation Works

The objective of the rehabilitation plan will be:

- Stability: provision of a safe and stable post maintenance dredging site integrated with the surroundings landscape
- Prevention of erosion – provision of a site without significant erosion and that will not generate sediment laden water off site.
- Social acceptance – agreement by the landowners on the rehabilitation programme

The rehabilitation plan should integrate the above objectives and should be approved by the relevant approving authorities. Some overburden should be placed near the dredge area for anticipated rehabilitation needs. However, most of the overburdens will be placed on low-lying areas. Where appropriate and practicable, excavated and disturbed areas are rehabilitated with the placement of overburden and soils and then re-vegetated with suitable species.

2.7 Decommissioning

FPCL will be conducting their annual maintenance dredging depending on the rate of sediment built up around the berthing area of the Port of Lautoka. Frequency of maintenance dredging is dependent on the sediment built up and that requires hydrographic surveys to be done. This is to ensure that the depth of the Port of Lautoka within the recommended for inbound ships.

2.8 Management Structure

The company is fully committed to this proposal and there is an urgent need to proceed with this work. By way of physical commitment, the company has set up a special management team to fully comply and operate with this proposed development. Then management structure is summarized in the table 3:

Position	Roles/Powers
Inspector	*(a) Make such examination and inquiry as are necessary to ascertain level compliance* *(b) enter, inspect, and examine any dredging at all reasonable times by day and night, but so as not to impede or obstruct the working of the dredging* *(c) examine into and make inquiry respecting the state and condition of any boiler or other machinery, and, if in his opinion it is desirable to do so, report on the state of such boiler or machinery to the Chief Inspector under the Factories Act, who may take action under the provisions of that Act or any amendment or replacement thereof; (Cap. 99)* *(d) initiate and conduct prosecutions against persons offending against the provisions of these Regulations;* *(e) appear at all inquiries held respecting accidents in quarries, and, if he thinks fit, call and examine and cross-examine witnesses; and* *(f) Exercise such other powers as are necessary for carrying these Regulations into effect.*
Foreman-in-charge	*8.-(1) Every dredging shall be under the control and supervision of a foreman-in-charge:* *Provided that an inspector may, if he thinks fit, exempt any dredging from this requirement.* *14.-(1) The foreman-in-charge of every dredging shall enforce the observance of these Regulations in the dredging under his charge.* *(2) As soon as possible after the occurrence of any breach of these Regulations, he shall report the same, in writing, to the inspector, whether such breach has been committed by a person employed in the dredging or by any other person.* *(3) The foreman-in-charge, owner and agent shall in every such case deemed guilty of an offence against these Regulations unless such foreman charge, owner or agent reports such breach and proves to the satisfaction of the inspector that all reasonable means of enforcing the provisions of these Regulations, and of preventing such breach, were taken.* *(4) Notwithstanding anything contained in paragraph (3), if the foreman-in-charge of any dredging or any part thereof can prove that the necessary means for carrying out the provisions of*
Deputy	*If any foreman-in-charge is incapacitated from performing his duties or is about to be absent from the dredging for more than 14 days, he, or the owner, or agent, shall appoint some fit person to act as deputy foreman-in-charge during such incapacity or absence, and shall notify such appointment to an inspector.*

Table 4 Responsibilities of position

2.9 Staffing – Names and Roles (Positions Descriptions / Responsibilities)

Party/Position	Responsibilities/Tasks
FPCL (To appoint the Operation manager)	• *Implementation, monitoring and compliance of the EMP including the activities of the workers and Site Operator or supervisor* • *Reviewing the performance of the EMP and adjustments to improve efficiency and application.* • *Reporting to Ministry of Lands, iTLTB and Department of Environment (DOE)* • *Compliance of extraction activities with the EMP guidelines and approval conditions*
Project Manager	• *Implementations all conditions/measures in the EMP* • *Preparations and implementation of procedures in EMP* • *Supervision of all operation works.* • *Inspections and implementations of environmental performances* • *Maintain all documents and environmental records in accordance with the EMP and reporting to the Operation manager*
Site Engineer (To be confirmed once permit is granted)	• *Working in accordance with the EMP* • *Make recommendations to the Managing Director or foreman for improvements on the Environmental management of site activities.* • *Supervises all work activities (extraction, loading and dumping) and make recommendations to sub-contractors*
OHS Office	• *Implementation of all management and operation plans, including OHS for all workers and Environment safety.* • *Making recommendation to Site Engineer & Foreman*
Administration	• *Records of all work schedules and general administration works*
Tallymen	• *Records of all volumes of sediments removed.*

Table 5 Details of People involved during operation and their responsibilities.

The company is fully committed to this proposal and there is an urgent need to proceed with this work. By way of physical commitment, the company has set up a special management team to fully comply and operate with this proposed development.

Management structure - there should be a supervisor on site with approved credentials dredging management and operation.

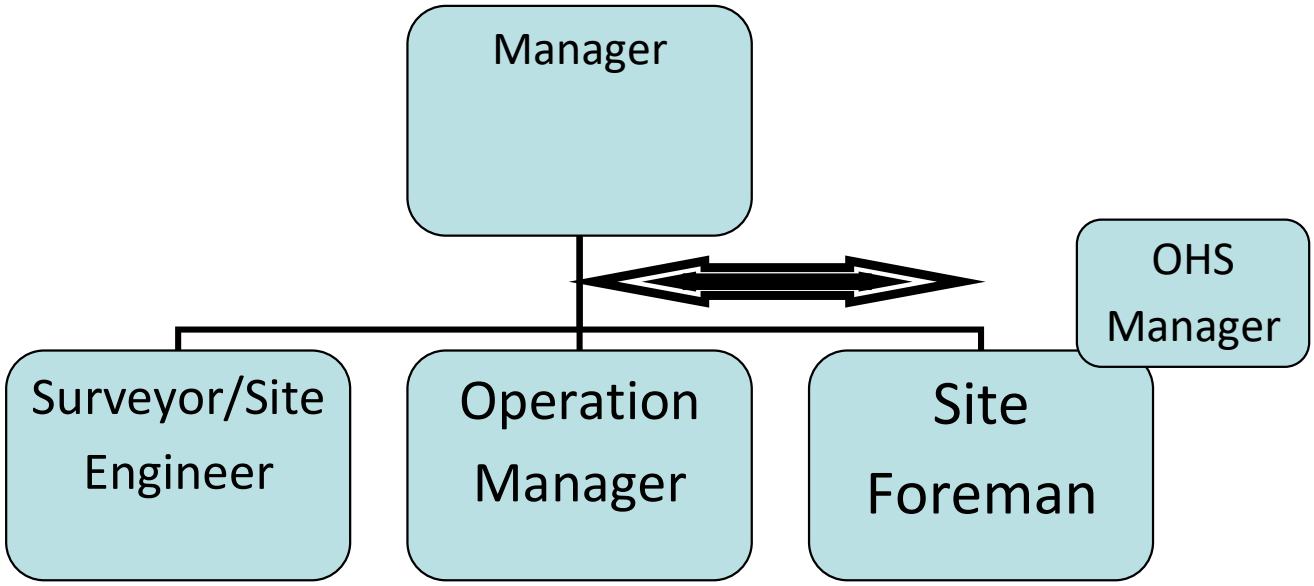


Figure 6 showing the management structure for the proposed development.

Apart from internal staff with their assigned roles, the *FPCL* has also committed itself by engaging Mr. Ilaitia Finau to be their consultant on this project for the entire duration of the project. Their roles shall be limited to project management, especially the enforcement of the Environment Management Plan (EMP) of the Environment Impact Assessment report. Additionally, they shall be engaged to consult the company on issues related to Environment Impact, Health and Safety Management.

3.0 DESCRIPTION OF EXISTING ENVIRONMENT

Lautoka is the second largest port of entry in Fiji and handles the bulk of Fiji's sugar and woodchips exports along with a considerable volume of containerized and general cargo. The border control agencies, Customs and Bio Security are also located inside the port facility and provide their services to the port users. The major cargo commodities being handled in the Port of Lautoka are containers, automobiles, general cargo, wheat, and clinker.

The Lautoka Port has a total land area of around 2 ha. The approach channel is capable of catering vessels with a maximum draft of 10.5 meters. The minimum depth alongside container berth is 11.5 meters and maximum permissible draft alongside cargo berth is 10.5 meters. The height of the berth from the water level is 3.5meters.

Lautoka port has three alongside berth facilities with a maximum depth of 11 meters and has the capacity to accommodate 2800 TEUs container or handy-max sized general cargo vessels. The 295 Meter Queens Wharf is the main berth offered to the large vessels that call at Lautoka. Approximately 150 meters of this berth is constructed as a modern quay facility whilst 140 meters still remain on piles.

Figure 7: Dimensions of the Port of Lautoka. Source FPCL

3.1 Water Levels

Sea level is controlled by many factors, some periodic (like the tides), some brief but violent (like cyclones) which can create storm surge, and some prolonged over periods of years to decades, such as El Niño and the Inter-decadal Pacific Oscillation (IPO). In addition, longer term trends may also be present. The average sea state is smooth, dominated by swell from the Northwest. The annual mean wave height is 0.33m, the annual mean wave direction is 293° and the annual mean wave period is 13.36s.

3.1.1 Predicted tides

The predicted tides Lautoka was used to contextualised tide prediction in the area.

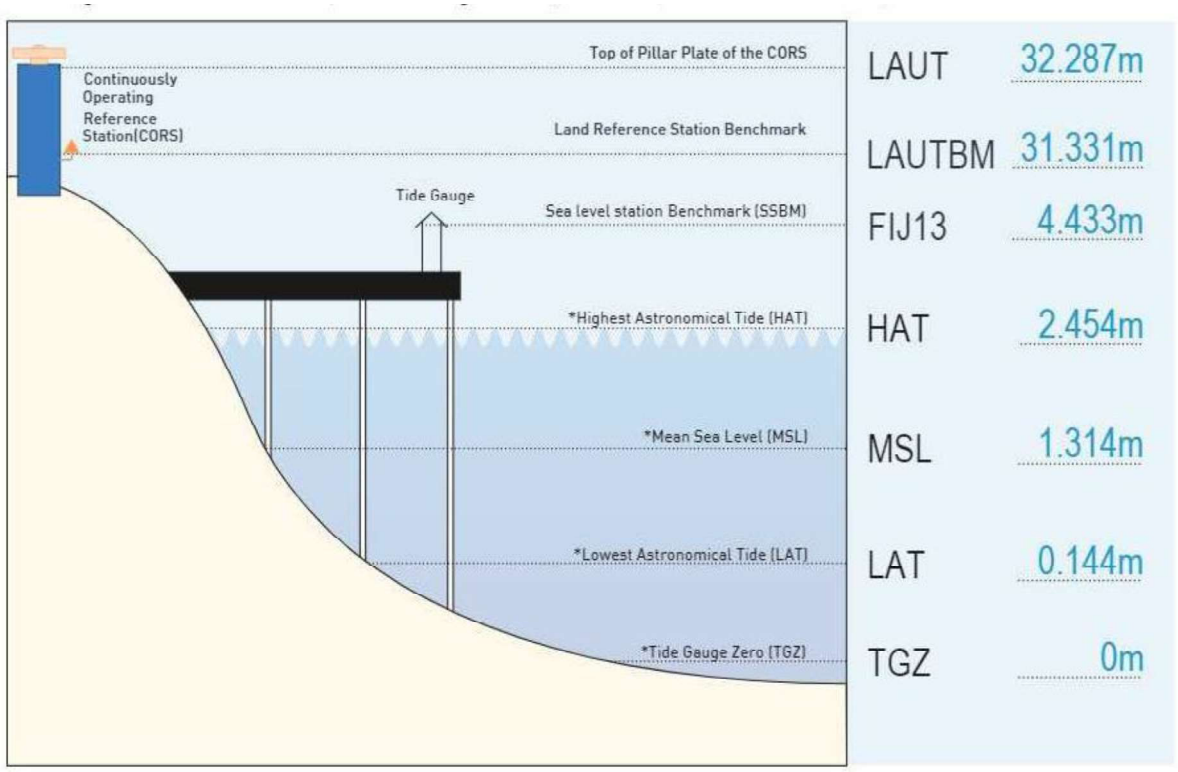


Figure 8: Indicates the key tides profile of the Lautoka Port area.

These results show a difference in Chart Datum, but in terms of Mean Sea Level a consistent range in tide levels occur across the bay. The component of sea level that is predictable due to the influence of the Sun and the Moon and some seasonal effects allow us to calculate the highest predictable level each year.

3.1.2 Storm surges

Cyclones can cause a temporary rise in the level of the sea due to low atmospheric pressure which can cause an increase in water level equivalent to 10 mm for every millibar of pressure drop below standard atmospheric pressure, which is typically 1013 mb. This effect is greatest at the centre of a cyclone. The other factor is wind stress that can cause water to pile up against the coast.

Winds can also cause an increase in sea level with wind piling up water against the coast. Sustained wind stress can increase sea levels a similar order of magnitude as barometric pressure drops. Sustained wind speeds of 70 knots were recorded at with maximum sustained wind speeds of 80 knots recorded for the same cyclone. Winds of this speed could result in another 0.3 to 0.4 m increase in water level, providing a maximum storm surge, exclusive of wave set-up and nearshore processes, of 1.0 m.

3.1.3 Wave set-up

Wave condition is usually defined by the significant wave height, the peak period and the peak direction. The significant wave height is defined as the mean wave height (from trough to crest) of the highest third of the waves and correspond to the wave height that would be reported by an experienced observer. The peak period is the time interval between 2 waves of the dominant waves. The peak direction is the direction the dominant waves are coming from.

The average sea state is smooth, dominated by swell from the Northwest. The annual mean wave height is 0.33m, the annual mean wave direction is 293° and the annual mean wave period is 13.36s.

Wave features	Profile
Mean wave height	0.33m
Mean wave period	13.36s
Mean wave direction [° True North]	293 °
Mean number of wave components	3.72
Mean annual variability [m] (%)	0.02 m (6.9 %)
Mean seasonal variability [m] (%)	0.16 m (48.7 %)

Table 6: Mean wave conditions calculated between 1979 and 2012 for Lautoka.

The waves reaching Lautoka are generally swell produced by the Northern Pacific Ocean storms that propagate across long distances to reach Lautoka. The conditions are usually smooth, almost

never calm and almost never rough. The principal direction, where waves occasionally come from is the North (340°).

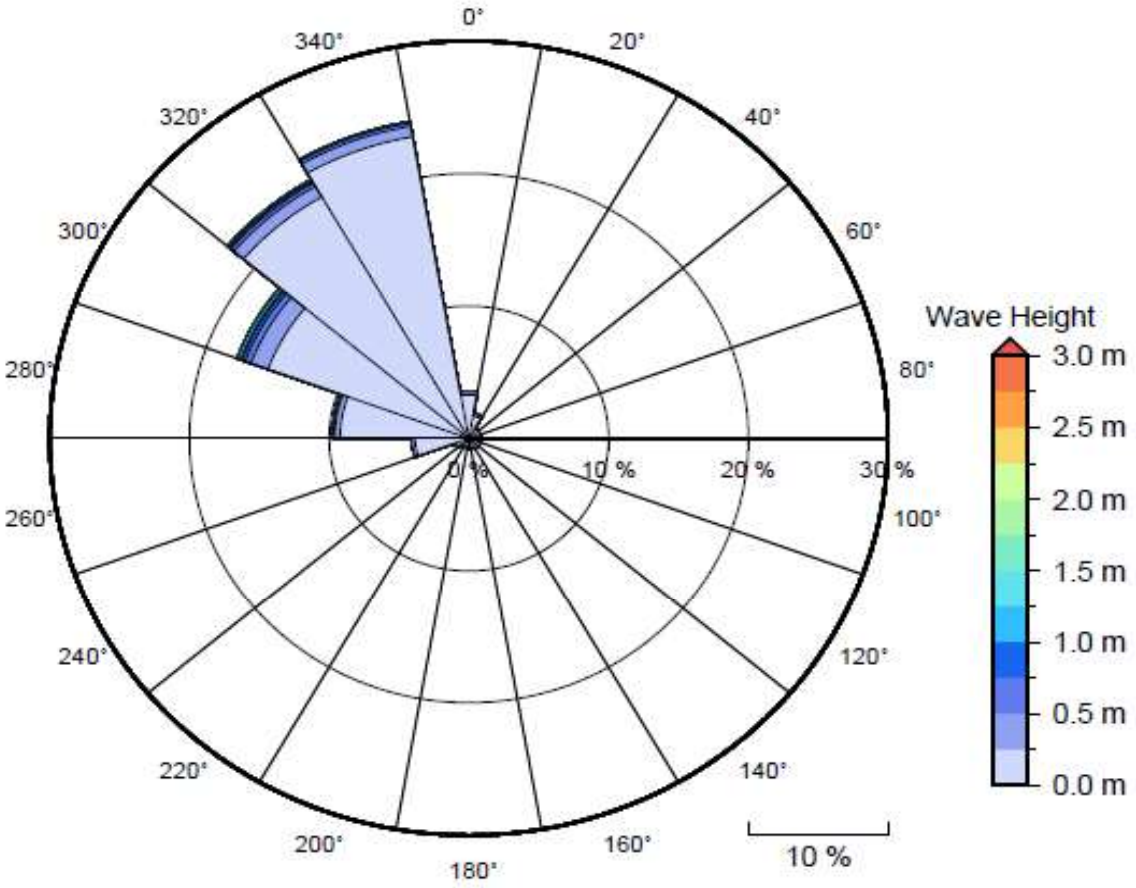


Figure 9: Annual wave rose for Lautoka. Note that direction is where the waves are coming from.

There are different processes that vary sea levels on daily, fortnightly and longer time scales due to tides and interannual variability such as ENSO. During storms, wind and falling pressure elevate sea levels to produce a storm surge while wind-waves breaking at the shore further elevate sea levels due to wave setup and run-up. Elevated coastal sea levels can reduce river drainage and backed up water can worsen upstream flooding.

Under future climate conditions, the TC frequency is projected to either remain the same or decrease slightly. However, the intensity of the most intense TCs is projected to increase. Changes to TC frequency and intensity were incorporated into the statistical model to represent future TC behaviour in Fiji. The changes consisted of a 25% reduction in TC frequency and a 10% increase in the intensity of maximum winds for the most intense cyclones. Projected Sea Level Rise (SLR) has a

significant effect on extreme sea level return intervals: for instance, storm tide heights of approximately 2 metres – currently associated with a 1-in-100-year event – are projected to become more like a 1-in-50-year event (i.e. occur twice as often) by 2055. However, future changes in TC intensity (greater) 7 and frequency (fewer) leads to relatively small changes in future storm tide return intervals for shorter return period events.

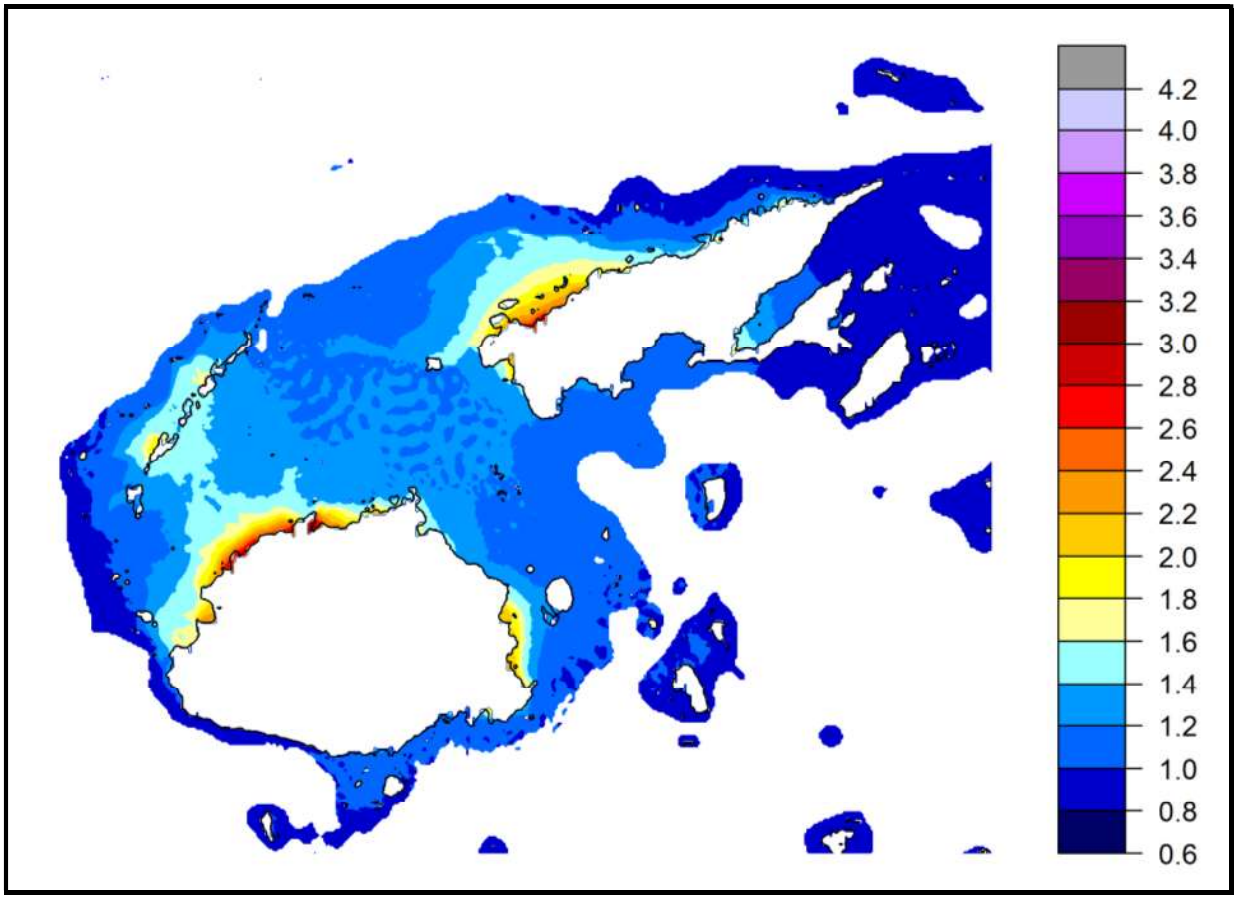


Figure 10: Modelled storm tide heights (m) corresponding with the 1-in-100 year storm tide during baseline (1980-2000) conditions.

For instance, considering SLR only, a 1-in-100-year storm tide is estimated to be 2.4 metres. If, in addition to SLR, projected changes to TCs are included, the storm tide height of a 1-in-100-year event remains similar. However, at longer return periods (i.e. greater than 1-in-200 years), the impact of more intense TCs becomes as important as SLR. For instance, under present climate conditions, a storm tide height of 3 metres is associated with a 1-in-1000-year event. With sea level rise it will become a 1-in-500-year event (i.e. occur twice as often). If increased TC intensity is also considered, it becomes a 1-in -300-year event (i.e. occurs 3 times as often). But generally

speaking, projected SLR is found to make the largest contribution to increased extreme sea level risk, as this increases the height of storm tides at all return intervals.

Location	Scenario	Sea Level Height					
		20 yr.	50 yr.	100 yr.	200 yr.	500 yr.	1000 yr.
Lautoka	Baseline	1.23	1.71	204	2.37	2.76	3.05
	SLR	1.54	2.02	2.35	2.35	3.07	3.36
	SLR + ΔTC	1.34	1.99	2.38	2.77	3.27	3.66

Table 7: Estimates of storm tide heights (excluding effects of waves) for Nadi under baseline conditions; SLR conditions of 0.31 m (the upper uncertainty bound of emission scenario A1B in 2055); and SLR+ΔTC conditions of SLR combined with a 10% increase in TC intensity and 25% decrease in frequency.

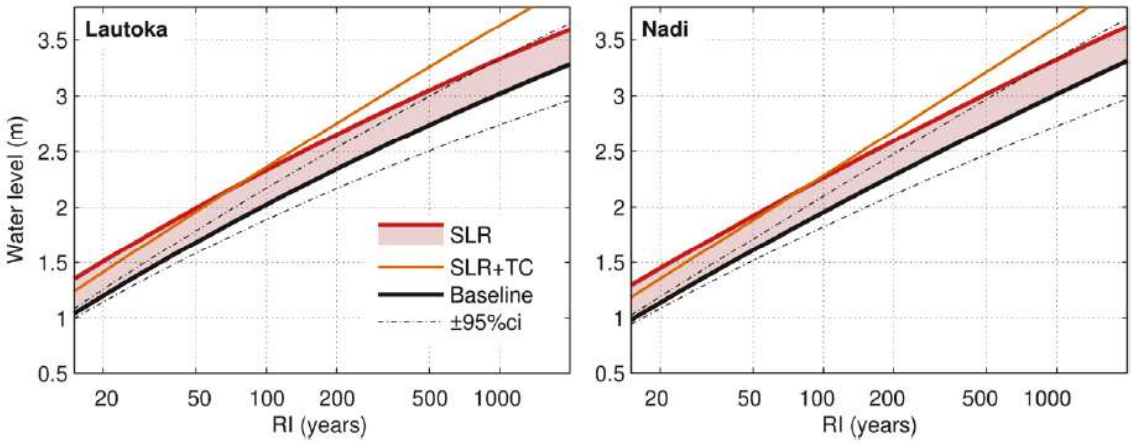


Figure 11: The shaded band represents the range of sea level rise (SLR) scenarios for 2055 added to the baseline (black) return levels, with the dark red line representing the uppermost scenario. The orange line represents return levels from the combination of changes TC frequency and intensity and the uppermost SLR.

3.1. 4 Wind

In Lautoka the prevailing wind is dominated by South Easterly trade winds. with a mean wind speed of 3.66ms−1 (7.11knts) from 106°.The figure below shows the wind rose for Lautoka and Figure 12 shows the monthly mean wind speed and direction. Note that the results presented here use the nautical convention: directions shown are the directions the wind is blowing from.

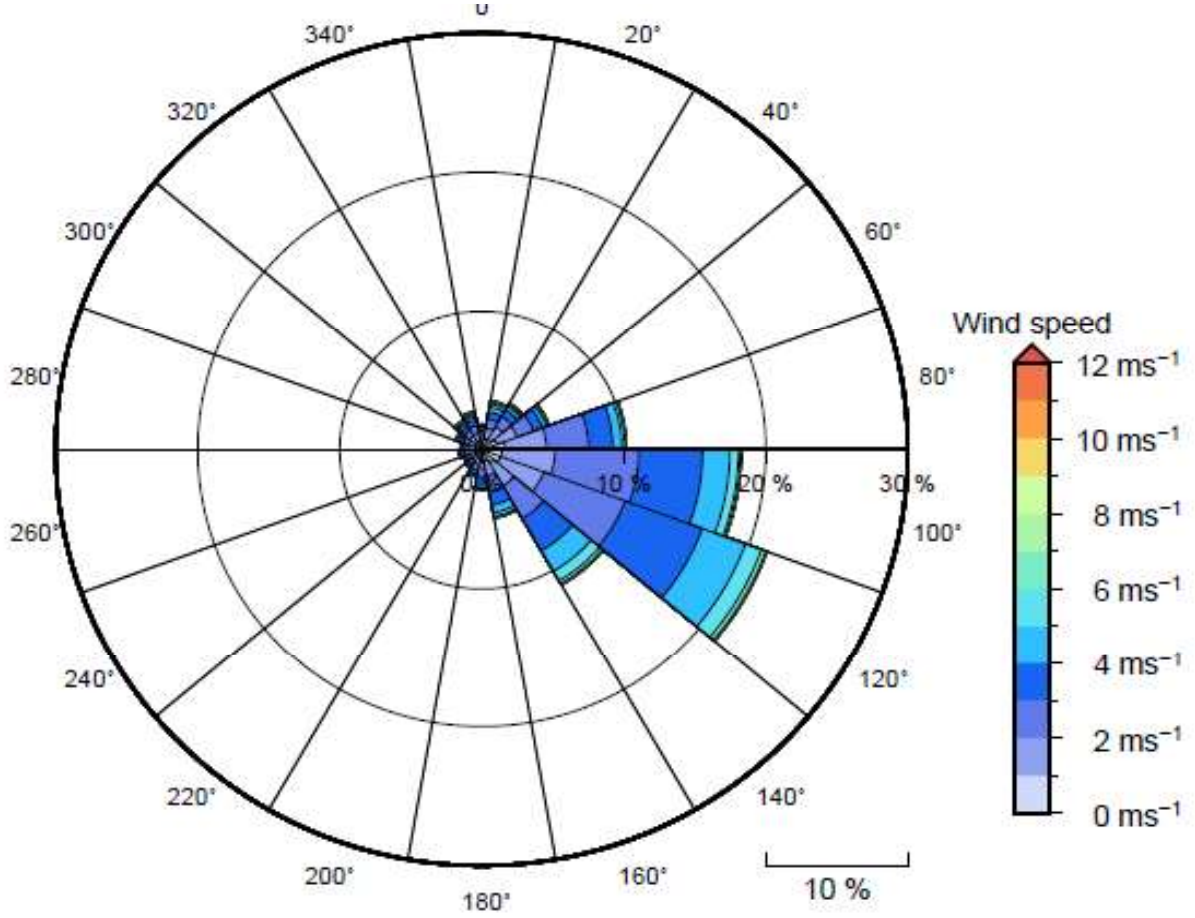


Figure 12: Annual wind rose for Lautoka. Note that directions are where the wind is coming from.

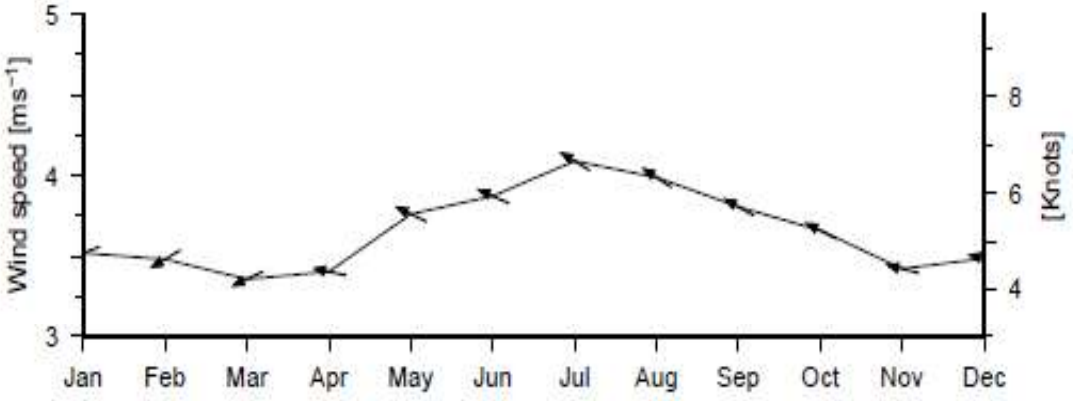


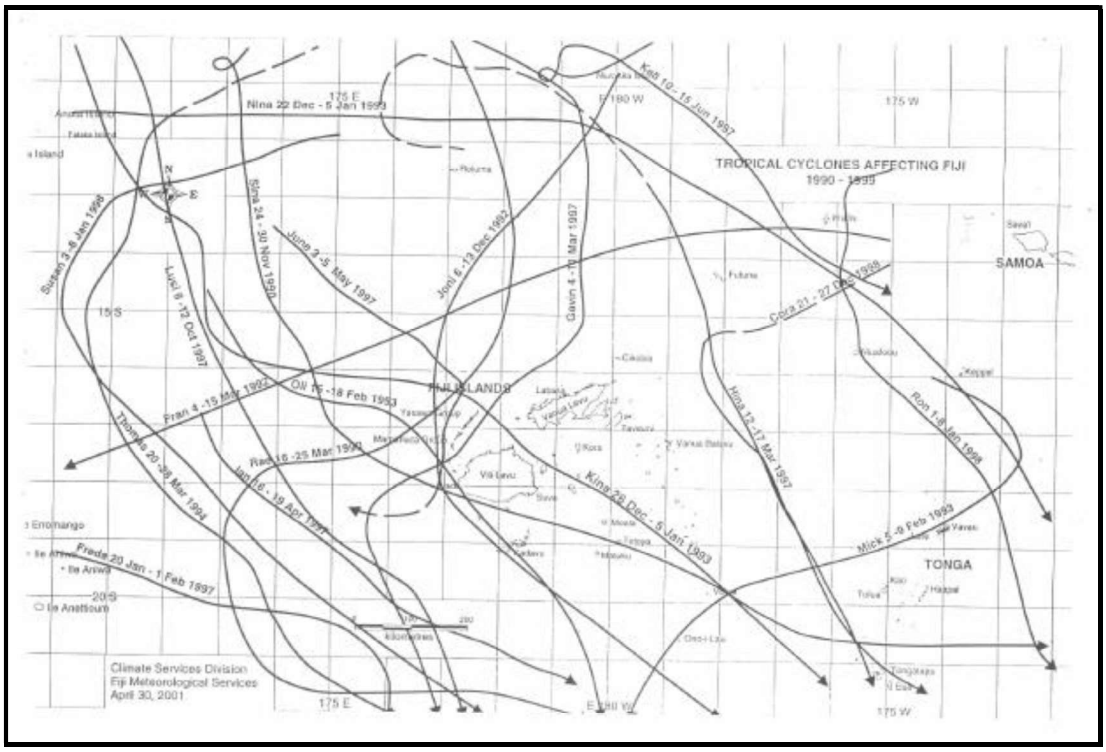
Figure 13: Monthly wind speed (Black line) and wind direction (arrows).

3.1.5 Currents

The currents are driven westward by the trade winds at speeds of 0.19 m/s to 0.32 m/s while immediately outside the reef the currents are tidally driven eastward on flood and westward on ebb at a maximum of 0.1 m/s (Penn, 1983).

3.1.6 Cyclone

About 10-15 cyclones per decade directly affect Fiji with an average of two to four, causing severe damage. The cyclone frequencies dates from 1998 to 2003 give a more recent clear indication that climatic conditions are quite constant but have been subject to some unpredictability in the last few years.



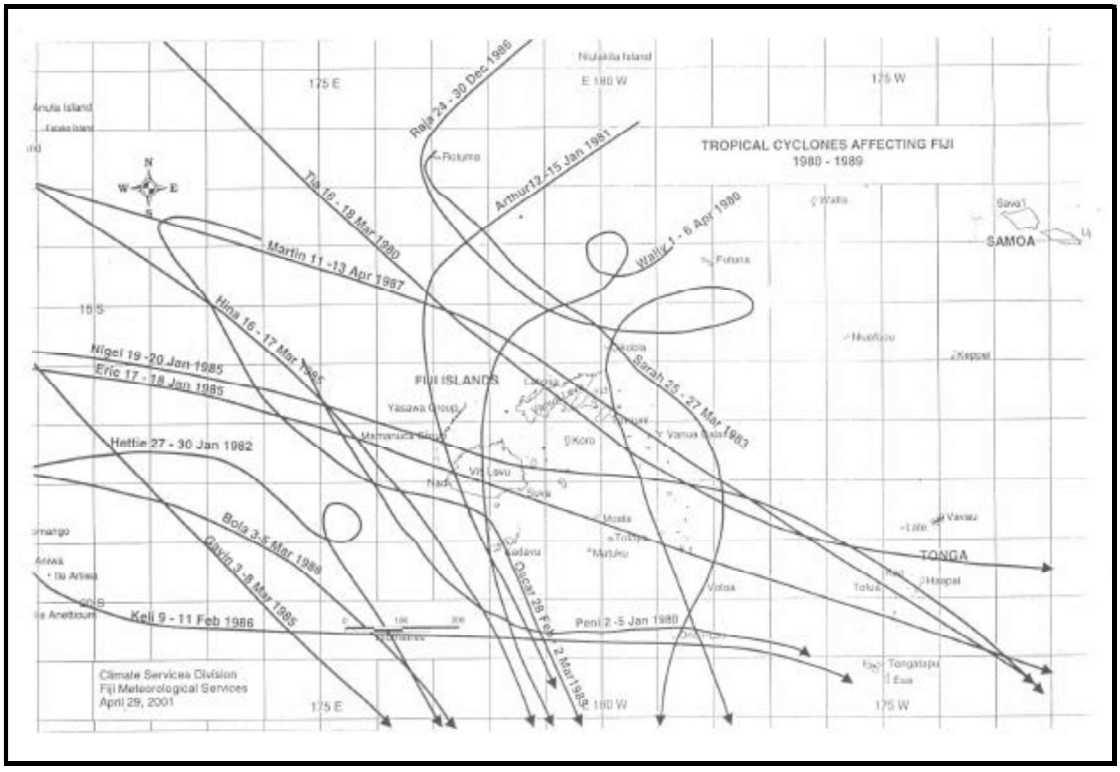


Figure 14 Pathways for tropical cyclones passing through Fiji, 1980 - 2003

3.1.7 Assessment of the Vulnerability of the Project Site to Cyclone Frequencies and Intensity, Flooding and Other Climatic Extreme Events

The project site even though is located in a very protected Lautoka Harbour that shielded it coasts from the Southeast Trade Winds and associated Wind-driven waves, it is actually lying on a low lying coastal area. Many studies have been carried out to ascertain the vulnerability of Lautoka Harbour against the impact of severe flooding and inundation caused by cyclones, and sea level rise. Carter, (1990b) carried out the evaluation of the effects of sea-level rise on storm surge elevations in Lautoka Harbour. In another study Nunn (1994) carried out the estimation of the effects of sea level rise on water levels at the Lautoka port facilities In 1996 to 1998, Solomon and Kruger (1996) were further engaged by the Department of Environment to carry out the vulnerability assessment of Lautoka Peninsular as a baseline information for the first Climate Change National Communications to the United Nations Framework Convention on Climate Change (UNFCCC). This study used a simplistic, one-dimensional spreadsheets model for storm surge.

Using different water-level estimates, maps have been produced which show the location of overtopping based on the surveyed elevations. The overtopping estimates are simply based on rise of still water level and do not include the effects of waves, splash and run-up. The study conducted a 5-year return period with four (4) different future scenarios for sea level rise of 0.25m, 0.5m, and 1.0m shows the following results:

- The downtown area and the present fort facilities are relatively well protected while the outlying areas are much more exposed.
- In another methodology of using GIS mapping and survey works, they found out that existing shoreline protection systems, particularly the damaged ones, using the same heights and the 5year return period (AR1) as mentioned in bullet point one (1) above. Results have identified that these zones are also vulnerable to the impact of sea level rise.
- Both of the results do not take the result of waves overtopping on coastal areas.

Observations that are more recent were carried out in 2009 to 2010, shows the highest rates changes refer to the EL-Nino Southern Oscillation (ENSO) events. When comparing datasets in 1997 and 1998, which represents only the redistribution of water masses[2] and do not take into the account the variables such as thermal effects from expansion/contraction of the supper elevation of the ocean surface[3]. This study was published by Mörner in 2017 titled the Fiji Tide-Gauge Stations.

When it comes to the sea level changes, one has to take into consideration that there are complex variables that impact sea level changes, the meteorological variables in this study do not refer only to the impact of global warming and warming up of the Earth's ocean surface temperature per say, prudency in science has to accommodate other variable factors like planetary movements, and tectonic plate movements of the earth's geomorphological structure. A comparison was taken from the two tidal gauge stations of Lautoka and Lautoka, both stations record a 3-part sequel, though there is a marked difference between time and amplitude the main shape is so similar that it points to a common factor, which can be termed as a cyclical changes in sea level. The cyclical changes are induced by the following events:

[2] Mörner, N.-A. (1995) Earth Rotation, Ocean Circulation and Paleoclimate. GeoJournal, 37, 419-430 (https://doi.org/10.1007/BF00806932

[3] Mörner, N.-A. (2011) Setting the Frames of Expected Future Sea Level Changes by Exploring Past Geological Sea Level
Records In: Easterbrook, Ed., Evidence-Based Climate Science, Chapter 6, Elsevier, Amsterdam, 185-196

- It is seen that planetary movements affects the cyclical changes between a thirty (30) to sixty (60) year's period[4].
- Another factor relates to tectonic plates movements such as the influence from crustal subsidence and site-specific effect of compaction[5]. In figure 15 refers to a complex tide-gauge record for Lautoka for the 25-year assessment.

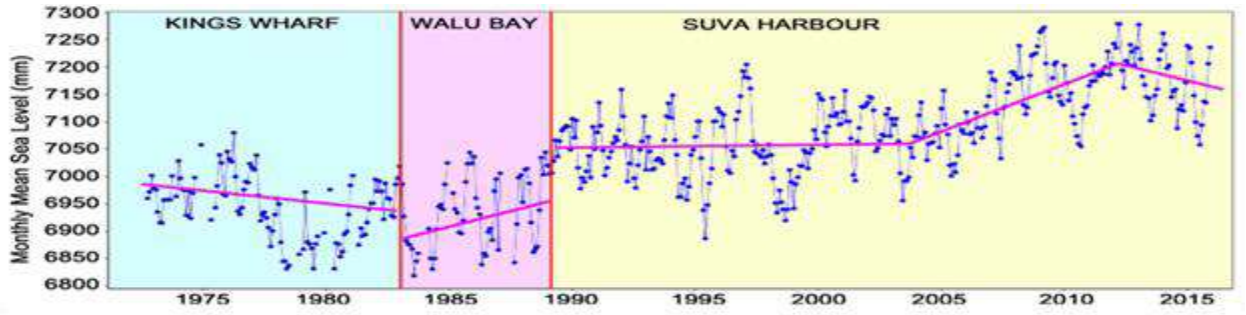


Figure 15 Shows 25-year tide gauge readings for Lautoka Harbour, showing the Queens Wharf, Walu Bay and Lautoka Harbour

Apart from flooding and cyclones, it was observed that in 1953 a magnitude of 6.8 and in 2009, a much larger magnitude of 7.1 on the richer scale was recorded that is associated with tectonic plate movements in the region[6]. Figure 16: Shows the comparison between Lautoka and Lautoka Gauge Stations showing the impacts of planetary movements and tectonic plate movements in the region.

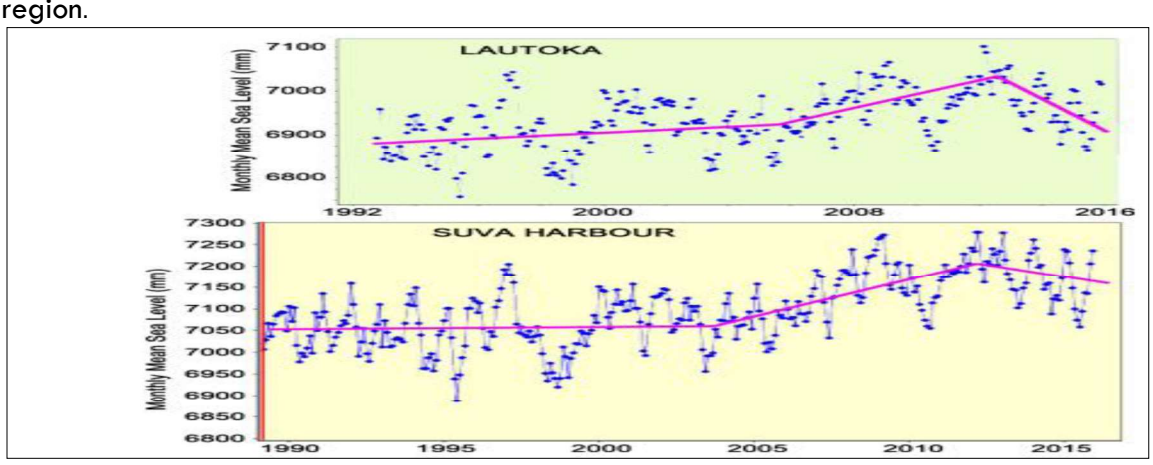


Figure 16: Shows a 25yrs tidal reading between Lautoka and Lautoka gauge.

[4] Mörner, N.-A. (2015) Multiple Planetary Influence on the Earth. In: Mörner, N.-A.,Ed., Planetary Influence on the Sun and the Earth, and a Modern Book-Burning,Chapter 4, Nova Science Publishers, New York, 39-49.

[5] Mörner, N.-A. and Matlack Klein, P. (2017) Sea Level Changes in the Yasawa Islands, Fiji.

[6] Anon. Accessed 10th January. http:/www.mrd.gov.fj/gfiji/geology/educate/equakes.html, https://www.sott.net/article196463-7-1-Earthquake-Occurs-Between-Fijis-Main-Islands

During the tidal assessments, the wind directions were a northerly and the sea was very calm, the waves experienced were mostly ripple waves, these are caused by the boat movements in the Lautoka Harbour. See pictures of the project site taken during the assessment study.

3.1.8 Water Quality Physical and Environmental Parameters

Standards methods for water quality assessment were used. The Horiba millimeter was used to measure multiple parameters *in-situ*: pH, water temperature, salinity, electrical conductivity, turbidity, dissolved oxygen and total dissolved solids (TDS). Water samples were collected from the sites, and analysed in the laboratory, using standard methods (APHA, 1998) for suspended solids (TSS); organic pollution (BOD); heavy metal (lead); and micro-biological status (total and Faecal coliform).

The physical environmental parameters were taken using the Horiba portable meter.

Parameters	Site/Sample		
	1	2	3
Temp (°C)	30.19	30.19	30.36
pH (0-14)	3.98	3.04	6.61
Conductivity (mS/m)	49.3	48.9	48.3
Turbidity (NTU)	0.0	0.1	0.3
Dissolved Oxygen DO (mg/L)	6.4	7.8	3.23
Total Dissolved Solid TDS (mg/l)	31.1	28.9	31.4
Total Suspended Solids (mg/L)	306.6	319.2	331.6
Biological Oxygen Demand (mg/L)	1.20	1.41	0.80
Oil & Grease (mg/L)	48.2	199.0	24.2
GPS Coordinates (around of close to)	17°36'21.48"S 177°26'13.13"E	17°36'13.42"S 177°26'14.96"E	17°36'5.87"S 177°26'23.99"E

Table 8: Results of the water parameter test carried out at the site.

Results for the water quality sampling undertaken is tabulated in full in Appendix 6 and described below.

i. Temperature - the three sites temperature was relatively uniform around 30 degrees Celsius during both the outgoing and incoming tides. These were all within the recommended temperature for marine water, which is 20 to 30 degrees Celsius, for Fiji.

ii. Dissolved oxygen - ranged from 6.4 to 7.4 mg/L. These levels are all above the recommended level of 6 mg/L for coastal waters to support marine life. This indicates good

circulation within the harbour. High dissolved oxygen levels are required to support aquatic life, which require oxygen for respiration.

iii. pH - the pH ranged for site 1 and 2 was very acidic with pH readings below 4 while site 3 recorded pH of 6.61. The pH for site 1 and 2 is below the range for marine environment.

iv. Total Dissolved Solids- site recoded a reading of 31.1mg/L, site 2 recorded 28.9 mg/K and site 3 recoded 31.4 mg/L. The reading is within acceptable limits for such environment.

v. Total suspended solids (TSS) - which is also related to clarity as it measures the amount of suspended matter in the water was slightly high which is >70 mg/L). This value is high which suggest high degree of suspended solid with the water column. Total suspended solids are a measure of how clear the water is which is important for survival of marine organisms. Increased silt may clog feeding and respiratory structures of sedentary and mobile marine.

vi. Oil and grease - was detected at the three sites, site 2 recorded the highest reading of 199.0 mg/L. with site 1 recording a reading of 48.2 mg/L and site 3 24.2 mg/L.

Studies by Ghani et al 2020 did an analysis of heavy metal accumulation in fishes from the coast of Lautoka. The study shows that the concentrations of the accumulated heavy metals such as cadmium, lead, copper, mercury, zinc, and chromium have been determined in the muscles, gills and liver of the fish species of *Clupea pallasii, Macolor niger* and *Pristipomoides filamentosus* collected from the waters of the South Pacific Ocean around Lautoka in Fiji. Overall, the contents of heavy metals were below the permissible limits, except for chromium that is slightly higher than the limit set by Food and Agriculture Organization of the United Nations and World Health Organization regulations, respectively.

3.2 Biological Environment

3.2.1 Study area

The biological environment of the main *Lautoka* Port comprises the main marine areas of the outer *Lautoka* harbor extending to the key areas to be dredged were surveyed.

Methodology/targeted areas& constraints

1. Surveys of the fisheries resources to determine their presence and relative abundance were mainly by 'desktop' research.

2. Catch per Unit effort (CPUE)-netting survey where gillnets will be deployed at the vicinity of the three proposed sites with catch and effort recorded to be analyzed. The nets will be deployed for a maximum of 3-5 hours during high tide.
3. Interviewing locals fishing in the *Lautoka* port areas including the sea wall areas, and the '*i qoliqoli*' areas of the *Lautoka* port areas.

The main constraints to be taken into account is the sea traffic to and from the three wharfs may hinder the deployments of gillnets and affect the movement of fish in the harbor.

Picture 3: Team Conduct Fisheries survey around the port facility at Lautoka.

3.2.2 Baseline Inventory of Aquatic Fauna and Flora with Emphasis on Endemic, Rare or Endangered Species of Conservation Significance as Relevant.

Upon field assessment, certain fish species were easily observed on the water surfaces and the locals fishing along the coastline caught some species.

The common coastal and estuarine fishes observed were the crescent grunter, *Therapon jarbua* (*qitawa*), the small trevally, *kaikai* , saqa, ki and the common mullet, *Mugilidae (kananace*).

Picture 4: LHS-Crescent grunter C-Trevally RHS-Mullet

Picture 5: ***Large mullet*** ***small mullet caught at night*** ***Red snapper Lutjanus bohar.***

Barnacles *(Cirripediaare*) are easily observed on the wharfs partly submerged concrete posts with the common mobile crustacean, the *Grapsus albolineatus (saravali*) moving among them.

Picture 6: Barnacles on princess wharf and RHS, the common crustaceans

3.2.3 Benthic communities

Just like the Suva harbor, the benthic communities at the project site were relatively low with only low species below 4 species identified within the Lautoka Wharf area.

3.2.2 Ecological Sensitive Habitats and Significant Natural Sites (As Relevant) That May Occur On or Around the Site and How They Will Be Affected By the Proposed Development

Given that the Port of Lautoka sits adjacent the FSC Sugar Mill in Lautoka and other important industries, the *Lautoka* harbor has been subject to various environmental impacts for a very long time from discharge and other factors.

The main sensitive ecological areas to be impacted by the proposed maintenance dredging works include:

- Mangrove area and the fringing reef around Vio island which located about 200 meters west from the Lautoka main wharf; and
- Mangrove and the fringing reef system of Bekana Island located about 950 meters northwest from the Lautoka Wharf

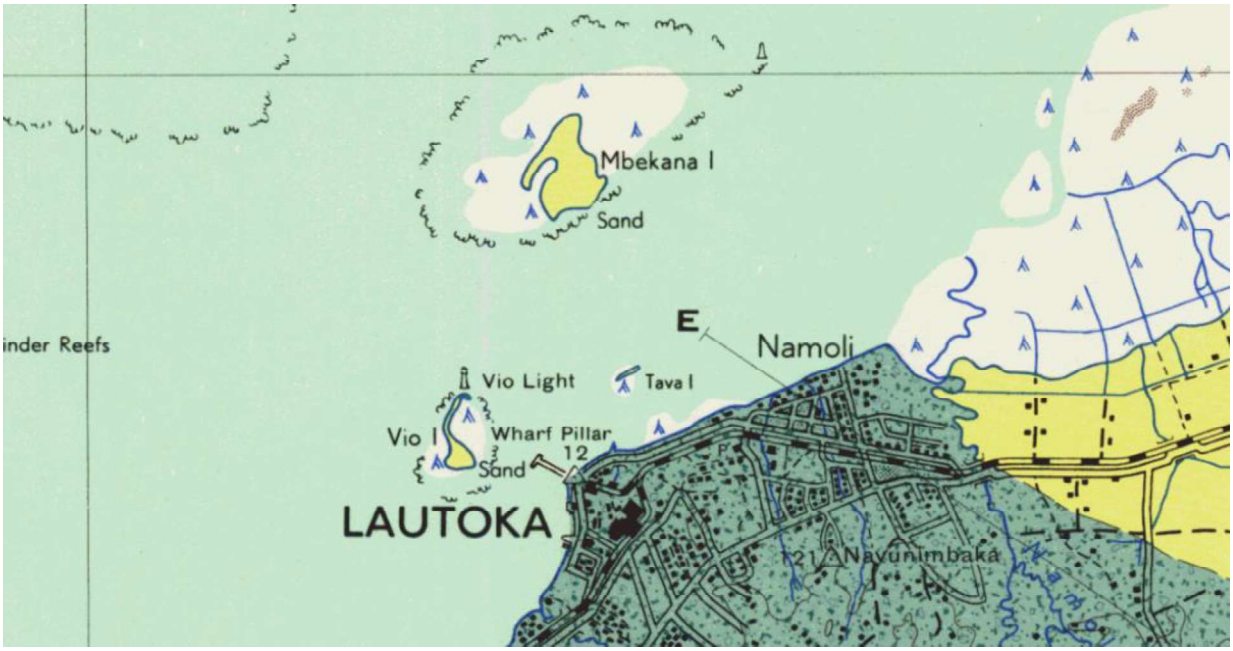


Figure 17: Map of Indicating the location of Vio and Bekana Island.

3.3 Maintenance Dredging Consultation

A consultative discussion was held at the Department of Environment Lautoka office Board room on the 1st of April 2024 with attendance from George Vulakoro(MSAF), Mithun Prasad (Lautoka City Council - Health), Daniel Chand (Lautoka City Council -Building), Roko Naiqama Balecina (Provincial Office),Mr Inosi Nabuka (Fiji Ports), Mr Joeli Sauqaqa (Mata-ni-Tikina Vitogo), and Mr Iferemi Waqasese (Ministry of Health).

Outcome of the discussion

- Mr. Mittun asked about the monitoring once the dredging begins, the concern being what it will be compared to. Mr. Finau responded that FYES will be collecting water samples and conducting baseline readings including oil and grease later the team will analyse heavy metals by which monitoring readings will be compared to;

- Mr. Mittun wanted to see the zoning laid out in the Bathymetric Survey. Mr. Finau responded that he will send all the selected stakeholders a copy of the PowerPoint presentation, which had a copy of the Survey Map with the zoning clearly marked;

- Follow up question was if the dredging was likely to affect the small island besides the wharf, to which Mr. Finau responded, saying that yes it was likely that the plumes would have some effect on the island, especially with the currents and the changing wind directions;

- It was clarified to Mr. Daniel upon questioning the proposed dump area of the dredged material, that it was just being pushed from the high mound areas of the shallow parts to the deeper ends;

- Current depths to the required depths being targeted after dredging asked Mr. Daniel. Some places were at -7m while the required depths needed to be around -10.5m according to Mr. Inosi of FPCL.

- A point of concern was raised too that the dredging works should also consider the physical structure of the wharf, that it is not compromised;

- Were the Ministry of Lands consulted in this process too was raised by Mr. Mittun. Fiji Ports Management Act covers the legal custodian of the Port Boundary, which runs from the mouth of the Momi Reef to the Port of Lautoka birthing area itself. Legally the Fiji Ports Corporation are the gazette custodians and have full responsibility;

- In the case of the waiver and compensation issues, the Fiji Ports Management Act dictates that the national interest takes precedence over the traditional i Qoliqoli owners' rights. A sensitive issue but the balance needs to be struck;

- Mr. Vulakoro asked if MSAF could be alerted ahead of the scheduled dredging with the coordinates so that they could put out a marine notice to vessels that utilize the Port due to the risks involved. Concern was noted. He was in approval of the methodology proposed by the Fiji Ports because of the time factor in cartage of dredging material from the wharf, that it could impede on the operations at the Port especially during peak traffic period with supply ships coming in and out;

- Mr. Finau responded to Mr. Daniels question on the timeline, that Fiji Ports was hoping to finish all the dredging within three months.

4.0 POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS WITH MITIGATION MEASURES

This section of the Environment Impact Assessment report will identify current operational issues that require particular management and necessary actions.

The major areas of potential environmental impacts that have been identified during the GEMP study on the proposed dredge include the following:

i. Disturbances of existing biological ecosystems/ habitats during work period

ii. Potential risks to fish health associated with the resuspension of contaminated sediments. Stirring and mixing heavy toxic chemicals with the water column, which have settled at the bottom of the sea during maintenance dredging phase. This may lead to potential contamination of marine flora and fauna.

iii. Wide spread of high turbidity water (plumes) within the Lautoka Harbor

iv. Control of seaport traffic during maintenance dredging hours Maintaining the stability of the piers of the main *Port of Lautoka* structure

v. Monitoring of toxic chemicals during the maintenance dredging works.

vi. Environmental spill & waste management (loose oil/fuel, on site wastes)

vii. Socio-economic impacts (values ,sea traffic, noise, loss of resources)

4.1 Loss Of, Damage to and Alteration of Any Aquatic Habitats and Species As A Result Of the Dredging Works

Past studies have deduced that the variations in the macrobenthic community were mainly controlled by sediment texture, depth, and dissolved oxygen. The dominant soft sediments dwellers include are the Polychaeta. Deposit-feeding Polychaeta's, and deposit dominated shallow depths and filter feeders such as crustaceans and molluscs dominated deeper depths.

The impact of dredging directly disturbs the benthic habitats and soft sediment dwellers, which are an important part of the harbor lagoon food chain. Even though the movement of large ships and vessels continually disturbs the bottom sediments in the proposed area, the proposed dredging excavation will cause the release of more bottom sediments into the water columns. The presence of

the traces of heavy metals (including cadmium, lead, chromium, copper and zinc) indicates the toxic nature of the bottom sediment along the sediment beds along the main *Lautoka* harbor. Larger fish may also be affected by the consumption of these traces of metals leading to possible fish poisoning.

Dispersion and suspension of sediments from dredging works on the upper columns of the sea may cloud and suffocate the pelagic micro producers (zoo/phytoplankton).

In addition, oil spillage in the sea may also occur, adding to further degradation of the existing seawater of the enclosed harbor areas.

On a positive note, dredging activities may remove settled silts, clear metal scraps at the bottom of the harbor with deeper channels allowing bigger fish to find feeding grounds in the area. Having identified the above items, an EMP is needed. The EMP establishes what an organization needs to do in order to manage itself to meet its environmental, economic and social goals during the operational stages.

4.2 Potential Impacts and Management Measures

The EMP is the lead environmental management document that defines the procedures for achieving the objectives set out in the Environmental Policy and identified environmental performance targets for the project. The EMP outlines the approach to environmental management throughout the maintenance dredging phases with the primary aim of reducing any adverse impacts from extraction of sand deposits on local sensitive receivers.

The EMP is site specific plan developed to ensure that all works comply with the environmental conditions of approval for the project and that the environmental risks are properly managed. In addition, the EMP will provide sustainable environmental guidelines and monitoring procedures during the operations process.

The table below outlines the summary of the mitigate/management measures for the potential impacts that will occur during the proposed work period.

Potential Impacts	Suggested Mitigation measures
Disturbances of existing Marine biological ecosystems during maintenance dredging work	• Dredging should be confined to the proposed area to ensure minimum impact to the benthic communities. • Dredging to operate at a slow speed and undertake visual monitoring for mobile marine fauna.
Stirring and mixing of heavy toxic chemicals with the water column	• Avoid unwarranted disturbance of benthic area. • Public Notice to arears in close proximity to the Lautoka Wharf including the Lautoka Fisherman market.
Control of seaport traffic during maintenance dredging hours	• FPCL will coordinate with inbound ships and dredging contractors. • Notice to be provided to outboard fishing boat and hotel mariners (Tavewa Sea Buses)
Environmental spill & waste management (loose oil/fuel, on site wastes)	• Dredgers are equipped with emergency spill clean-up kits. • Regular maintenance of vessels/machines • Strict monitoring during work by supervisors
Decrease in water quality. (during maintenance dredging works)	• Proper spill kits and spill procedures in place • Dredging to be confined to the proposed area. • It is preferred that dredging work be conducted at low tide.
Socio-economic impacts (values, traffic, noise, loss of resources, recreation use)	• Complaint center to be used for any concerns. • Signage and notice to place on within the proposed site. • Ongoing communications with all relevant stakeholders • Compensation for disturbances to *proposed* areas.
Maintaining the stability of the piers of the main wharf structure	• Contractor to ensure that dredging works do not undermine the structural integrity of the wharf. • Contractor with the relevant stakeholders to monitor dredging activity close to the wharf structure
Loss of, damage to and alteration of any aquatic habitats and species as a result of the dredging works	• Timing of works (tide and season) • Containment of all dredging areas and immediate areas • Minimization of oil spill and solid wastes dumping into the sea water • Ongoing sea water and sediment tests

Table 9: Gives an outline of the potential impacts from the sand activities with its mitigation measures.

The minimum environmental management standards must be achieved by *the FPCL* and the workers throughout the extraction are briefly outlined in tables' 10 -15.

The table below identifies the mitigation measures for the maintainers of the biological environmental conditions of the surrounding of the proposed sand extraction site.

Issue	Key Principle/Mitigation Standard	Minimum Mitigation Measures
• Loss of habitats form learning of access to extraction site	• Benthic communities to be preserved	• Minimal disturbance to habitats
• Loss of endanger	• A reserved area on site to be allocated	• minimum disturbances during extraction
• Generation of suspended solids from maintenance dredging work	• Minimise generation or stirring on benthic sediments	• maintain dredging work on proposed area. • Conduct dredging work during low tide.
• Introduction of invasive species	• Transported materials to be screened for invasive species	• machinery should be cleaned prior to working & leaving site
• Efficiency of control measures over	• Control measures should continue to work appropriately throughout the	• Control measures to be inspected and maintained in efficient operating conditions

Table 10: Highlights issues relate to disturbance of benthic communities.

The table below identifies the mitigation measures for issues related to runoff of suspended sediment.

Issue	**Key Principle/Mitigation Standard**	**Minimum Mitigation Measures**
• Runoff of suspend ed sediments from dumped barge	• Stockpiling on the barge should not give rise to storm water containing suspended solids	• No direct discharge of sediment laden water within the Lautoka Harbour • Minimise dumping of excess water with sediment into the barge
• Dust generation	• Dust must not cause a hazard or nuisance	• Barge to transport the dredged material to the dumped site once it has reached maximum capacity

Table 11 : Gives the minimum mitigation management steps for any stockpiling if required during the maintenance dredging activity.

The table below identifies the mitigation measures for pollution risk associated with the storage and use of fuels.

Issue	Key Principle/Mitigation Standard	Minimum Mitigation Measures
• Pollution risk associated with the storage and use of fuels for machines, equipment's and backup generators	• No oil, lubricants, fuel or containers should be drained or dumped to sea.	• Keep an update list of all/amounts of fuels stored on site. • Storage in accordance with regulations
	• Accidental spills to be minimised and procedures put in place to clean up the environmental damage	• Keep the material safety data sheet of all hazardous materials. • Bunding to capture 100% of fuel must be placed around storage areas. • Spill kits and emergency procedures to be used and workers trained. • No deliberate discharge of oil, diesel or any hazardous materials to surrounding soil or water way

Table 12: Gives mitigation factors for issues associated with usage of fuels.

The table below gives steps that need to be followed if there is an archeological or cultural finding during the sand extraction activity.

Issue	Key Principle/Mitigation Standard	Minimum Mitigation Measures
• Finding and disturbance of previously unknown sites	• No sites shall be disturbed once identified	• *Notify LOU and Museum* of any uncovered site. No work to be undertaken at that site until a resolution is reached between the concerned parties

Table 13: Outlines the mitigation measures for an archeological or cultural finding during maintenance dredging activity.

The table below gives the mitigation measures for any issue related to significant noise, dust, sediment and other related issues generated from sand extraction related activities.

Issue	Key Principle/Mitigation Standard	Minimum Mitigation Measures
• Noise of machinery associated with all extraction and carting activities	• Minimal noise impacts	• Working hours are in accordance with the conditions of the consents and stakeholders' requirements. • Equipment's kept in good condition. • Noise suppression equipment's used. • Site workers and nearby areas not exposed to excessive noise. • use of complaints registers and • Procedures to address issues as they arise.
• Dust generation from maintenance dredging, and carting	• Dust must not cause a hazard. • or nuisance to nearby areas	• water sprays are used to control dust. • raw materials load on trucks covered before leaving extraction sites.
• Increase traffic associated with carting of dredged materials to the dumped site	• No significant increased risk to • Inbound ships and mall local fishing boats	• awareness on sea traffic activities on access use of complaints register & procedures to address issues arising especially areas close to the facilities used by other seafarers
• Pollution risk activities • occurring on sites	• Develop appropriate storage, • transport and use practice	• Procedure in place for disposal process of each of the following (packaging materials, chemicals, redundant parts, oil and grease from machinery etc. • Solid waste disposal taken off site. • Keep list of all contaminants
• Monitoring	• Monitoring shall be done • to address the concerns • of the stakeholders, and local communities	• Complaints record of all issues raised by concerned parties in response to all the extraction and work activities. The record including the responses by the on-site workers shall be kept.

Table 14: Gives the mitigation measures related to noise pollution.

The table outlines mitigation measures related to health and safety related issues.

Issue	Key Principle/Mitigation Standard	Minimum Mitigation Measures
• Health and Safety risks from all operational activities (traffic, heavy machinery operating)	• Health and safety risks to nearby residents are minimised	• Refer to the sections above discussing impacts from traffic hazards and operational activities
	• All residents to be informed of all potential hazards to health and • safety	
	• Communities have the expectations that the issues will be addressed and resolved by negotiation	

Table 15: Highlights mitigation measures for health and safety.

5.0 ENVIRONMENT MANAGEMENT PLAN

5.1 Purpose of the EMP

The purpose of this EMP is to ensure that appropriate environmental practices are followed during operation of the maintenance dredging phase. Those objectives are:

i. To implement and maintain effective environmental management systems;

ii. To ensure adequate management, monitoring and mitigation regimes are in place to protect the surrounding environment;

iii. To provide details of environmental protection infrastructure or controls and discuss their operation and reporting procedures; and

iv. To ensure compliance with relevant legislation, regulatory requirements and any other undertakings given by FPCL

5.2 Scope

This EMP details the environmental management requirements to be followed during the maintenance dredging phase from the following consents granted under the GEMP process of the Environment Management Act 2005.

This EMP includes:

- the requirements for environmental management during the planning, implementation, evaluation and review of maintenance dredging activities
- the responsibilities for implementing this EMP.
- environmental controls and limits to ensure that program objectives and targets are achieved.
- an overview of the environmental inspection and audit requirements, environmental monitoring and contingency plans and associated management actions

It is estimated that approximately 18, 658 m^3 of materials will be dredged in this 1st phase and the area will be re-surveyed on annual basis to determine the volumes that will be dredged in the future maintenance dredging works.

Zone	Elevation (Lat m)	Area (m^2)	Volume (m^3)
A	-13	7,660	12,300
B	-7	2,350	6,200
C	-7	5,120	13,500
D	-13	40,210	78,500
E	-13	8,170	14,470
Total		**63,510**	**124,970**

Table 16: Provides the estimated volumes that are to be dredged from the three proposed sites. Source FPCL

The expected volume of sediments to be dredged is shown in Table 16; the dredged volumes will vary depending on survey results, rates of sedimentation and the availability of dredging equipment. Dredging activities may occur concurrently in these project areas. All sediments dredged from area are deemed to be contaminated unless demonstrated otherwise. Therefore, all the dredged materials will be dumped at the designated dumpsite. FPCL through its contractor will adopt a 24 hrs dredging regime which will work around the shipping schedules.

Days	Start time	Finish Time	Comments
Monday - Sunday	7am	7pm	Day Shift
	7pm	7am	Night Shift

Table 17: Maintenance dredging operating hours.

5.3 Health and Safety Procedure

The proposal for the extraction of raw materials and refurbishment works will be carried out through strict guidelines put in place by *FPCL*. FPCL, through the company's act and Occupational Health & Safety (OHS) Acts and Regulations under the Ministry of Labour & Employment are responsible for the health and safety of all employees and workers during the entire work periods.

FPCL through ifs contractor to ensure that the following safety PPE' are readily available and accessible for workers safety and risk management:

- Fire extinguisher
- Safety Boots and helmets for workers
- First aid kit in site office
- Evacuation map

- Overalls and gloves
- Communication devises (walkie/talkie)

The OHS regulation for the operation is recommended to be put in place and ensure the following:

a) Safety of Buildings & Working Environment

b) Safety of Machines and Plants

c) Emergency Evacuation Plans and Procedures during fire & natural disasters

d) Proper operation manual and Spill Kits procedures

e) Safety Kits and Firefighting Equipment's

In the event of an incident or natural disaster, which may result in serious health, safety and environmental damage, emergency response or contingency actions will be implemented as soon as possible to limit the extent of environmental damage. As part of the Management Strategy, emergency responses must be incorporated into spill response complying with the requirements under the Occupational Health & Safety Act (OHS).

The employment of a site Hazard Board in the main operation areas (extraction & crushing) as part of the OHS policy is therefore highly recommended. An illustration of a site hazard board is shown in the table below.

SITE HAZARD BOARD				
HAZARDS	HARM	E/M	DESCRIPTION	RESPONSIBILITY
e.g. Excavator	Injury		Wear safety equipment's while operating	Operator/Floor boy

Table 18: Outline a proposed site hazard board.

The main objectives and targets for the above are to provide an immediate and effective response to incidents that present a risk to workers and visitors or public health and safety minimise environmental harm/damage. The implementation strategies for Emergency Responses are outline in table below:

TASKS/ACTIONS	PERFORMANCE	MONITORING	REPORTING
Maintain fire fighting	Fire safety certificate	Monthly Fire service	Annual Report
Train/Drill all workers in emergency preparedness and response in OHS	Induction /training for Dredge staff/workers	Drill/Training throughout\ operation phase	Monthly-Project manager

Table 19: Implementation strategies for emergency responses.

Other relevant stakeholders may impose further conditions to safeguard public rights (including safety and health) and public access ways through the license area.

FPCL is to work closely with the relevant authority such MSAF, the health office and the Ministry of Labor in this regard.

5.2 Record Keeping and Reporting

A record book of operation should always be kept on site at all times – This sheet has to be submitted to relevant authorities and DOE to monitor maintenance dredging activities.

A logbook for the site shall be prepared and should be kept in the site office. The purpose of the logbook is to provide the following information:

- Details of operations such dredge works and number of dumping trips.
- The volume of dredged and spread to the deeper areas.

The form shall be filled daily, signed by the Foreman, countersigned by the Operation Manager, and endorsed by the Management Team.

5.3 Training Requirements – Brief Plan

Prior to commencement of the work on the site, the consultants shall be assigned to train the contractor on the conditions given by the relevant authority in relation to the maintenance dredging activities. Special considerations shall provide training on the developer's obligations to the Environment Management Plan. This shall be a short-term measure and for long-term operations, the developer can consider the long-term training and shall engaged tertiary institutions like the Fiji National University, University of Fiji or the University of the South Pacific. Overseas engagement of special Environment specialists can also be considered.

All training records shall be well kept at the premises of the developer, for record keeping and auditing purposes. A brief plan for the training requirements concerning the proposed sand extraction is outlined in the table below.

Scope/Area	Description
Management and Operation	*All those responsible for the management and operation of the EMP should be adequately trained for their responsibilities.*
Monitoring of the maintenance dredging area and marine environmental parameters	*Qualified personnel shall carry out marine habitat monitoring and technical experts who can be sub-contracted should the contractors lack proper skills.*
Interpretations of results	*Various agencies and private GEMP companies exist in Fiji, which can successfully carry out the work. These include private environment consulting firms, Institute of Applied Science (IAS) and Fiji National University (FNU).*
Emergency procedure and risk management	*All staff and workers involved in the handling of any potentially hazardous materials must be trained in spill management and emergency procedure.*
Review (Department of Environment)	*All monitoring reports shall be made available to the DOE on request. DOE will carry out auditing of results and duplicate monitoring at any time to ensure compliance with the EMP as stipulated under the Environment Management Act (EMA, 2005) and any approvals issued.*

Table 20: Capacity development and training of workers.

5.4 Complaints Procedure

A complaints book must be present at the project office site at all times, to record any form of complaints from the nearby communities. Any concerns raised need to be recorded in the complaints logbook and forwarded to management to resolve accordingly.

On site there shall be a proper complaint logbook designed, kept and updated by the developer specifically for this proposed extraction project. The logbook records must record all types of complaints regarding this project and it is advisable that the Site Engineer collate all information and group it as recommended. The degree of the nature of complaints shall be examined well and an appropriate response time shall be considered to that effect. It will also be appropriate to ascertain the context of the complainant whether it be internal or external. A clear guide is shown below.

Heading	Reported by	Recipient of report
Minor incident or near miss- no injuries or environment damage	Staff-verbal, immediately	Site Manager-records on file
Minor incident-failure of performance measure in EMP, can easily be remedied, little damage	Staff-verbal, immediately	Site Manager Monthly report to Manager Operations

Moderate incident-failure of performance measure in EMP, breach of GEMP approval Can easily be remedied, some damage	Site Manager-written report on demand by *Developer* agents	*Developers'* representative
Major incident-one off or consistent failure of performance measure in EMP, breach of GEMP approval or EMA, 2005 Not easily remedied, significant environmental damage	Staff-verbal, immediately	Site Managers-records on file
	Site Manager-verbal, followed by written report	Manager, Operations
	Manager Operations-verbal, followed by written report	DOE

Table 21: Schedules of External Reporting.

Table 21 sets out the lines of communications for relevant stakeholders, government stakeholders and other individuals in relations to complaints or enquiries during the sand extraction progress.

Stakeholders	Main Interest	Means of Contact	Key Contact
Fishing Boat owners, private pilot boat operators and Shipping companies	Impact on seaport traffic or Oil Spill	Complaints and enquires to main contractor, extraction company and representative.	Lautoka Port Harbour Master, MSAF & MOE
General Public	General Interest and concerns	Media updates- press release , Complains/ enquiries	MD/*Administrator*
Government and relevant stakeholders	Environmental and socio economic issues.	Consultation Committee *Environmental Consultant*	MSAF, Ministry of Fisheries , GEMP Consultants

Table 22: Communication Matrix

5.5 Update Procedure Document

All documents pertaining to the proposed extraction work shall be updated according to the conditions stipulated in the GEMP and the issuance of extraction license.

5.6 Emergency Procedure and Reporting

Staff on site shall be trained in simple emergency procedures on site. The purpose for this is to familiarize them with the site and to customize the training. Essential considerations on safety will address issues such as:

- Determination of emergency situation.
- What to do?
- Whom to report to.
- Risk assessment and incident reporting.
- Job safety analysis.
- Common assembly area.

All external reports are to be submitted to external agencies through the key contact identified in the communications matrix, table 22above. Table 23 below outlines the schedule of reporting in times of emergency or incidents.

Types of Report	Frequency of Submission	Responsible Team Member	Submit to :
EMP	Prior to operations	Manager Operations	DOE
Updates (including alterations management/monitoring procedures	As required	Manager Operations	FPCL DOE
Incident Reports	Within 24 hours incident	Site Manager	Manager Operations DOE
Habitat monitoring reports	After completion of exercise	Manager Operations	DOE

Table 23: Schedules of Reporting

5.7 Environment Management Strategy

This component of the EMP outlines mitigation strategies for the protection of specific environmental values that may be affected by maintenance dredging and disposal of dredged sediment.

The extent to which the environmental risks identified in the previous section led to tangible or observable environmental impacts will depend on the duration of impacting process, the extent of the area effected, the intensity of impacting process, and the resilience of the natural environment to the impacting process. Individual management strategies (controls and contingency measures) have been prepared for:

- Sediment characteristics;
- marine flora and fauna;
- water quality;

- waste management;
- spill response and emergency procedures; and
- air and noise.

5.7.1 Roles and Responsibility

The following parties have responsibilities under this EMP:

FPCL	Principal and Superintendent
Contractor	Dredging Contractor
FPCL consultant	Consultant employed by FPCL to carry out environmental monitoring.
ESS	Environmental Site Supervisor

Management strategies may be revised and updated based on experience. It is intended that specific work instructions be prepared for staff and contractors as the details of dredging methods and conditions of approval for each project are finalised. The following management measures will be implemented to minimise these impacts.

5.7.2 Sediment Characteristics

Objective

To ensure material proposed to be dredged and placed at the offshore disposal site. There is risk vessel maintenance or pollution from visiting vessels could result in further contamination of harbour sediments.

Action	Responsibility
FPCL undertakes annual seabed monitoring surveys to assess the volume of siltation in the Port of Lautoka area in order to plan for dredging campaigns. When siltation rates reach a level that require dredging a consultant may be commissioned to develop a Sediment Sampling Analysis Plan (SAP) for the extent of the proposed maintenance dredging area. To investigate sediment characteristics, contaminants and ASS	FPCL
FPCL will forward a copy of the SAP to relevant approving authority	FPCL
Subject to concurrence from relevant authority on the content of the SAP sediment sampling will be undertaken and a report drafted on sediment characteristics.	FPCL's consultant

Table 24: Sediment Characteristics Assessment Strategies.

Performance indicators

Mitigating strategies will be developed to manage risks associated with the disposal option chosen.

Monitoring and reporting

A final sediment sampling report shall be provided to relevant authority prior to the commencement of dredging works.

Corrective action/contingency plan

In situations where the performance criteria cannot be met alternative disposal options must be utilised.

5.7.3 Marine Flora and Fauna

Objectives

To minimise direct and indirect disturbance to marine flora and fauna other than within the immediate works areas.

To ensure turbid plumes from the works and re-suspension of material from the disposal site do not significantly impact the long-term ecological values and integrity of the adjacent sensitive marine ecological areas.

Environmental Risk

The primarily sandy material dredged from Port of Lautoka is sourced from the adjacent coastal system. The environmental risks of these works are broken down into the following.

1) Direct impacts on marine fauna from the dredging and disposal works;
2) Direct impacts at the dredge and disposal areas due to substrate removal and smothering;
3) The potential for short-term impacts of plume transport from dredging and disposal activities on sensitive receptors; and
4) The potential for medium-term impacts associated with the re-distribution of dredged sediment from the disposal site on sensitive areas (offshore site).

The plumes created by dredging and offshore disposal should be contained within 300m of the approved works area. The impact of plumes will be much localised.

Marine Fauna and Flora Management Strategies Taxa and Operation	Risk	Likelihood of Risk	Justification	Risk Mitigation Strategy	Responsibility
General				Maintain the extent of the turbidity plumes close to the dredging and disposal areas to minimise impacts on marine fauna habitat.	FPCL & Contractor
				Visually observe for large marine fauna	Contractor
				If the death of a listed species is suspected to have occurred in or near the works area, adopt	Contractor
				Inspect dredge hull for marine pests prior to travelling to site if vessels outside Fiji are to be used.	FPCL & Contractor
Dredging	Interaction between marine fauna and dredge head	Very Low	Interaction with ecological importance species at commencement of works	Stop dredging if organism with ecological importance sighted within 50 m of dredge area	Contractor

Table 25: Marine Flora and Fauna Risk Mitigation Strategy.

Taxa and Operation	Risk	Likelihood of Risk	Justification	Risk Mitigation Strategy	Responsibility
Dredging	Noise associated impacts	Very Low	Noise associated with dredging activities is typically constant rather than intermittent. Noise generated by dredging is likely to be at low frequency due to the nature of the seabed and dredging equipment.	None	Contractor
Dredge under steam to / from spoil ground	Separation of pod / younger animals	Very Low	Fish are highly mobile and are commonly observed bow riding marine vessels	None	Contractor
Dumping of dredge spoil	Physical injury of Fish during disposal of dredge spoil	Very Low	Fish are highly mobile and are likely to move away during spoil disposal	Delay spoil disposal if Fish are in the area. Fish can be driven away from area by mechanical noise	Contractor
Dredging / spoil disposal	Reduction in food availability	Very Low	Fish stocks are mobile and although they may move from the immediate works area, they are expected to return upon cessation of works.	None	Contractor
Dredging / spoil disposal	Changes to water quality	Very Low	Turbidity-associated changes to water quality with dredging / disposal activities are likely to have little impact on marine flora and fauna populations. Increased turbidity may lead to increased predation on fish	None	Contractor

Table 26: Risk Mitigation Strategy.

Performance indicators

- Physical disturbance to the substrate does not extend beyond the footprint of the dredging area shown on permit applications.
- Physical disturbance (smothering) at the disposal site. Placement will occur to contain all dredge material within the disposal site extents and in addition to this, a specific dump area has been allocated for this dredging campaign to minimise smothering of any seagrass within the disposal site area based on seagrass mapping.
- Physical disturbance at the reclamation area is in accordance with Environmental Approvals
- No marine fauna incidents.

Monitoring and reporting

- All sightings of rare, endangered and threatened animals, which could possibly have been impacted by the works, will be recorded and reported to the relevant authority.
- Pre and post Hydrographic surveys to be undertaken to confirm dredging area and extent of changes at disposal site and surrounding areas.
- This report shall be provided to relevant authority.

Corrective action/contingency plan

- All incidents involving flora or fauna are to be reported to the relevant authority.
- Dredging outside of approved areas is a breach of approval conditions and shall be reported to the relevant authorities and remediation works shall be undertaken to the satisfaction of approval agencies.
- Disposal of material outside the designated disposal site is a breach of approval conditions and shall be reported to the relevant authorities and remediation works shall be undertaken to the satisfaction of approval agencies.

5.7.4 Water Quality

Objective

To provide protection to the biological integrity of waterways adjacent to the work site

Environmental Risk

The environmental risks to water quality for this project include;

1) Dredging works generate a plume that may impact on adjacent seagrass meadows and offshore coral communities.
2) Tail water release from the barge, may generate a plume that may impact on adjacent seagrass meadows and offshore coral communities.

5.7.5 Offshore Dredge Material Placement Site

Because of the nature of the dredge material, relatively rapid settlement to the seafloor is expected. For this reason, the impact of material is low. Although unlikely, a spill of dredged material in transit to the disposal site is a potential risk.

5.7.6 Waste Management

Objective

To minimise the production of waste and ensure waste that is produced is stored and disposed of lawfully.

Environmental Risk

The contractors are required to manage waste in accordance with EMA 2005 and Maritime Transport Act 2013 and for this reason; environmental risk associated with waste management is low.

Action	Responsibility
On vessels, allocate areas for solid and liquid waste storage. Waste will not be stored outside these areas. Any waste fuels, oils or other chemicals shall be collected in separate drums and transported to an approved facility for disposal	Contractor
If wastes listed as 'trackable wastes' are handled or transferred, documentation in accordance with EMA 2005 and Maritime Transport Act 2013	Contractor

Waste will be removed from vessels and disposed of at an approved facility.	Contractor
Housekeeping procedures, including spillage control, will be implemented to minimise the generation of waste.	Contractor
All waste awaiting disposal will be stored appropriately	Contractor

Table 27: Waste Management Strategies.

Traffic Management

FPCL will be coordinating and working in close collaboration with FPTL in relation to managing the ship traffic during dredging works and during the dumping phase.

Performance indicators

- Appropriate waste receptacles are on board.
- All waste is disposed of lawfully.

Monitoring and reporting

A record/manifest will be maintained for general and regulated waste disposal. The manifest shall record the type of waste, and the point and date of disposal.

Corrective action/contingency plan

Failure to meet the performance criteria shall be recorded as a non-conformance incident.

5.7.7 Spill Response and Emergency Procedures

Objective

- To minimise the risk of spills or unplanned situations that might cause environmental harm.
- To ensure that contingency measures are in place and implemented in the event of such spills or unplanned situations.

Environmental Risk

The contractor is required to confirm Emergency Response Procedures, via training prior to the commencement of works and for this reason environmental risk associated with spill response and emergency procedures is low.

The Contractors vessels shall be equipped with suitable spill kits and will be operated in accordance with the Maritime Safety Authority of Fiji Oil Pollution Emergency Plan.

Action	Responsibility
– All refuelling is to be done by licensed fuel suppliers in accordance with their Standard Operating Procedure & MSAF requirement	– Contractor
– Refuelling will take place at wharves suited to tanker access. In the event that it is necessary for the contractor to refuel vessels or plant in the works area operations will be in accordance with industry standards.	– Contractor
– Provide a Dumping Plan, prior to the commencement of any works.	– Contractor
– Maintain an Emergency Contact List with an up-to-date copy retained	– Contractor
– Minimise the stored volumes of fuel, lubricants and oil in discrete containers on board vessels. When required they will be stored in a secure area and any spills will be cleaned immediately. Any visible or reasonably suspected fuel, lubricant or hydraulic fluid loss will be treated as an 'incident'.	– Contractor
– Vessel crew are to regularly check equipment for evidence of leaks and fitness of hydraulic hoses and seals and conduct maintenance or repairs as necessary to prevent drips, leaks or likely equipment failures. Inspections of the dredge, pipeline and the booster pump(s) are to be undertaken daily to meet this requirement	– Contractor
– The pipeline offshore outlet point is to be inspected a minimum of once a week and directly after any storm event. During this inspection, the outlet will be moved if required to ensure the dredge material is spread evenly across the designated area. The GPS position of the dumping point shall be recorded	– Contractor
– For minor spills, provide spill kit including; bilge socks, heavy duty absorbent polypropylene pads, floating booms and blowback refuelling collars on vessels for use in the event a substance is spilled either on deck or to waters to handle a spill of up to 160 litres.	– Contractor
– For major spills, undertake actions as specified in the MSAF approved Shipboard Oil Pollution Emergency Plan	– Contractor
– A register of Materials Safety Data Sheets (MSDS) relating to all hazardous substances on board, will be maintained	– Contractor
– Daily Visual Monitoring of the reclamation walls are to be undertaken and any concerns to be reported to FPCL and Council to instigate management actions.	– Contractor

Table 28: Spill Response and Emergency Procedure Management Strategies.

Performance indicators

- Documented procedures for emergency response are available and up to date.
- All vessels carry response equipment appropriate to the level of risk. The kits are restocked and accessible.
- Staff have been trained in the use of the kits and in emergency response.
- Contractor is Standard Operating Procedures for Refuelling available and implemented.
- No spills—if any spills do occur, they are effectively contained and cleaned up. Incident reports accurately describe any spills and response actions.
- A register of MSDS for each chemical used on site is available.

Monitoring and reporting

The contractor will undertake audits, which include:

- ensuring that emergency response plans and equipment and materials are available, working an unobstructed
- ensuring firefighting equipment has been serviced when required.
- updating the emergency response contacts list when required.
- hazardous materials are appropriately stored.
- MSDS are appropriate to the material stored.
- Daily visual inspections of the reclamation are undertaken.

If emergency response procedures are initiated, or any spills of hazardous materials occur, the action will be regarded as an incident and reported to relevant authority.

Equipment that uses fuel, lubricants, and/or hydraulic fluid, will be inspected during scheduled maintenance for the condition of hoses, valves, seals and reservoirs.

Storage areas, containers, transfer hoses and valves for fuel/lubricants/hydraulic fluids will be inspected during maintenance.

Corrective action/contingency plan

- Failure to meet the performance criteria shall be recorded as a non-conformance incident.
- In the event of a spill, the spill source will be immediately isolated, stopped and contained.
- In the unlikely event a structural failure of the reclamation area occurs placement works are to immediately cease, immediate actions are to be taken to minimise impacts outside the approved the works and the incident is to be reported to FPCL, MSAF and the DOE, so that remediate actions can b instigated.

5.7.8 Noise and Air Quality

Objectives

- To minimise the impact of dredging and disposal of dredged material on noise-sensitive receptor
- To minimise the impacts of the proposed dredging works on air quality.

Environmental Risk

Low provided management strategies be followed.

Action	Responsibility
Conduct all works during hours agreed by relevant authority prior to start of dredging project	Contractor
Notify all nearby businesses and residences of the work hours and give a point of contact for any questions or problems.	FPCL
Equipment will be maintained and operated to ensure that unnecessary noise or air emissions will be prevented.	Contractor
In the event that a complaint is received, the relevant details will be recorded on the Complaints/Query Report Form -	Contractor
All vessels are to be suitably maintained and fit for the work to be undertaken.	Contractor

Odours or airborne contaminants, which are noxious, offensive, or otherwise unreasonably disruptive to public amenity or safety, must not be released to any nuisance sensitive place or commercial place.	Contractor

Table 29: Noise and Air Quality Management Strategies.

Performance indicators

- All nearby businesses are notified prior to commencement of the works.
- Response to all complaints about noise or air quality issues initiated within 24 hours of receipt.
- Machinery is operating in a fit-for-purpose manner.
- No odours or airborne contaminants released.

Monitoring and reporting

All complaints will be recorded on the Complaints/Query Report Form and referred to FPCL.

Corrective action/contingency plan

Failure to meet the performance indicators shall be recorded as a non-conformance and will be dealt with in accordance with the conditions and recommendations.

- All complaints received will be investigated immediately, taking note of prevailing wind conditions and noting any evidence that relates to the complaint.
- Defective vessels are to be repaired prior to continuing work.
- Changes to hours of work or dredging procedures should be considered if practical and potentially beneficial.

5.7.9 Environmental Management Plan Procedures

This component of the EMP establishes the procedures for implementation of the environmental management plan.

Procedure/Action	Responsibility
Amend/revise EMP document when required, sign off and supply a copy to any contractors to whom it is relevant and publish	FPCL
Ensure satisfaction with the EMP and all conditions contained in all permits (attachment F) that relate to the works.	Contractor
Oversee dredging and ensure compliance with the monitoring program	FPCL
Conduct hydrographic surveys as needed	Fiji Navy

Table 30: Responsibility and Implementation.

Procedure/Action	Responsibility
All project staff will heed any lawful direction by the Environmental Site Supervisor	Contractor/ FPCL
Any actions required under the GEMP/EMP procedures shall be duly documented.	Contractor/ FPCL
Copies of dredge logs (including plume sketch), dredge and placement locations, wind conditions and a summary of dredging progress shall be provided to the DOE on request	Contractor
Copies of the field notes from the water quality monitoring will be provided to the DOE on request	FPCL
A final report following completion of the works will be forwarded to DOE, MASF and other relevant authority	Contractor/FPCL

Table 31: Communication and Reporting.

Procedure/Action	Responsibility
Primary control of EMP document	FPCL
Ensure the EMP and associated specific project instructions are readily accessible to personnel carrying out activities associated with dredging.	Contractor
Ensure records are maintained with respect to, non-conformance and incidents, environmental training, complaints and results of any audits	Contractor
Plant maintenance records are kept and used to program repairs and vessel/plant maintenance as required	Contractor

Table 32: Documentation and Record Keeping

Procedure/Action	Responsibility
Ensure all personnel performing activities related to environmental management of dredging are trained, qualified and competent	Contractor
Ensure all personnel performing activities are aware of their responsibilities under the EMP.	Contractor
Ensure all personal performing activities have PPE and are trained in spill response and emergency procedure management strategies	Contractor

Table 33: Environmental Awareness Training.

Procedure/Action	Responsibility
Main point of contact for complaints, provide a contact number to Contractor to refer complaints.	FPCL
Ensure complaints are forwarded to TMR representative	Contractor
Upon receipt of a complaint, all relevant details will be obtained and documented on the Complaints/Queries Report Form (Appendix E)	Contractor/FPCL
All complaints responded to within 24 hours	Contractor/FPCL

Table 34: Complaint Handling Procedures.

Procedure/Action	Responsibility
In the event of an environmental incident, take immediate action to secure safe conditions and prevent further environmental harm, and then immediately notify FPCL, the Harbour Master, MSAF and the DOE of the type and extent of the incident	Contractor
In the event of an environmental incident details of the incident shall be recorded on the Environmental Incident/Non-conformance Report Form	Contractor
Notify relevant authorities' representatives of the incident within 24 hours of the incident	FPCL
Cases of non-conformance with the EMP will be recorded on the Environmental Incident/Non-conformance Report form and reported to DOE within 24 hours of the incident	Contractor

Table 35: Incident and Non-Conformance Reporting.

5.8 Contingency & Vulnerability Of The Project To Natural Hazards

5.8.1 Fuel Spill

The dredging operation has the potential to result in environmental contamination in the event of a spill or leak (contamination of soil, groundwater or surface water).

Mitigation measures to minimize the potential for spills or leaks include the following:

- FPCL to have continuous secondary containment monitoring;
- FPCL must have corrosion protection, secondary containment, containment sumps and overfill protection;
- Product transfer areas must be designed to contain spills;
- Fuel transfer must be supervised at all times to facilitate immediate shut off of flow if necessary;
- Emergency Response Plan must be in place to deal with potential leaks or spills;
- A visual inspection of the facility should be conducted on a weekly basis to ensure there are no leaks or equipment failures for pumps, gauges, and spill containment.
- An approved leak detection procedure should be implemented and records should be completed and maintained. Records should include maintenance and repairs, weekly visual inspection and inspection.
- An environmental emergency response plan must be prepared, maintained and updated.

5.8.2Vulnerability of Project to Cyclones and Storm Surges

The worst case scenarios for cyclones are expected to occur at least 1 in every 20 years return period of a design water for Fiji and South Pacific, but in it is expected that cyclones occur in every two years, which positions this risk in the "almost certain" category if veered from the northwest direction toward the east. Damaging cyclone winds and associated floods would in particular expose all constructions to a high level of risk. Hence, installations and buildings need to meet construction code requirements. For the surrounding environment, other appropriate risk reduction measures for cyclone proofing need to be put in place e.g. burying of electric and telecom cables, trimming of overhanging branches and topdressing maintenance on coconut trees, etc.

It is the management's responsibility to specifically demarcate the region according to its high to extreme cyclone risk level, as this will threaten transportation in the area. These include developing a cyclone response plan for the whole area and the designation of safe areas and evacuation centers. The reason being is when cyclone paths become sporadic, they are always unpredictable.

5.8.3 Vulnerability of the Project Vulnerability of Project to Tsunamis, Earthquake and Liquefaction

The islands of the Fiji archipelago form part of the Fiji Platform that lies within a complex transform zone delimited by the New Hebrides Arc-Trench to the west and the Tonga Arc to the east. The arc systems are driven by convergence of the Indo-Australian and Pacific Plates shown in Figure below.

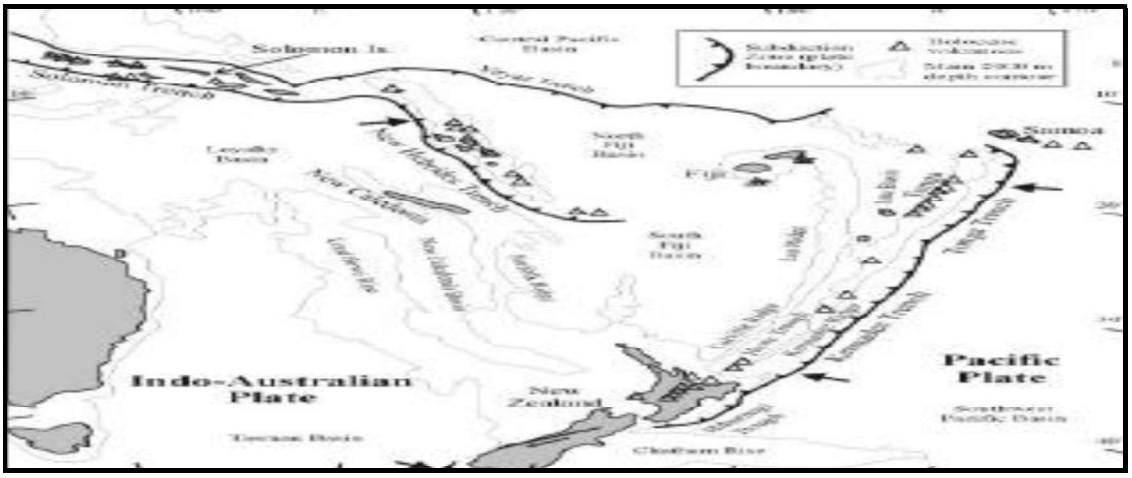


Figure 18: The arc systems are driven by convergence of the Indo-Australian and Pacific Plates shown above.

Tsunamis are induced by seismic activities (MRD, 2010). The 1952 Lautoka earthquake event triggered the worst tsunami recorded in Fiji. It had wave heights of 1.8 m to 4.5 m above MSL (Tariq). Tariq also mentions that for worst case scenario the ingress of tsunami inland is not more than 400m. The area is not a risk to any Tsunami.

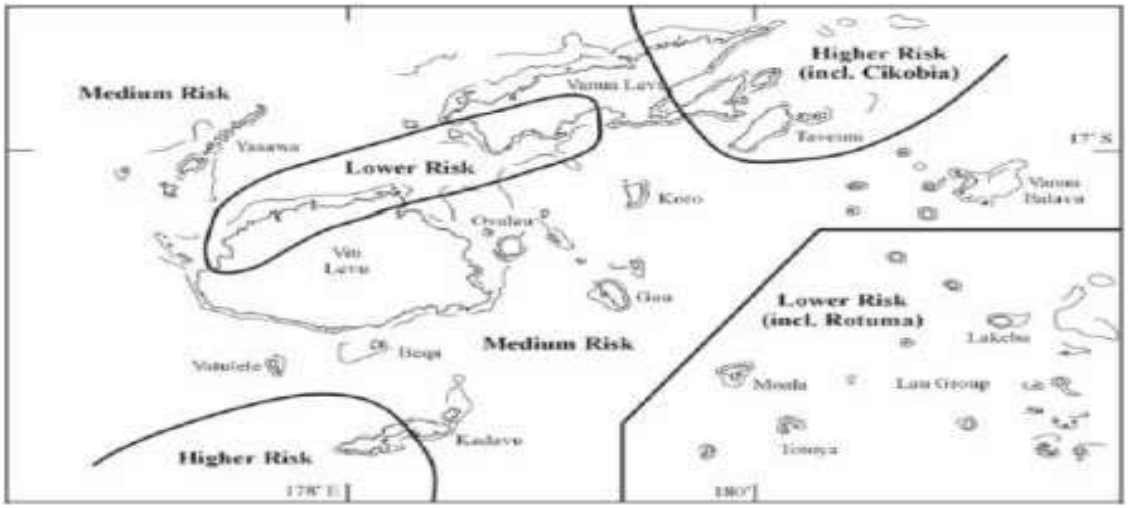


Figure 19: Highlighting the seismic risk categories of the Fiji Areas

The Port of Lautoka providence falls in the Low risk zone in terms of risk o seismic activities. However, the Fiji lies close to the rime of fire and is prone to earthquakes and tsunamis.

5.8.4 Social Vulnerability

The area is well guarded by ports security officers that ensure that people without proper clearance do not trespass into the Port of Lautoka area.

5.9 Monitoring

The purpose of the Operation Monitoring is to monitor the adequacy of the Operation Environmental Management Plan (EMP) during the operational stage, assess any environmental impacts and to implement appropriate mitigation measures. The plan addresses all relevant requirements identified in the EMP Report.

FPCL through implementation of this EMP will operate the scheme with due regard for protecting the natural (biophysical) and socio-economic environment. *FPCL* is required to:

Comply with the relevant environmental legislation as stipulated under the Environmental

Management Act, (EMA, 2005) and GEMP Regulations (2007).

- Fulfill all commitments in the EMP.
- Promote environmental awareness and understanding among employees and contractors through:
  - ✓ Regular training and awareness
  - ✓ Assignment of roles under this EMP
  - ✓ Linking performance indicators of responsibilities to overall performance
- Foster a shared sense of responsibility for environmental performance among all project participants.
- Monitor environmental performance and implement continuous improvement to meet the requirements of the EMP.
- Continue to liaise with stakeholders involved in the project including the DOE & MSAF

5.9.1 Format and Function of the Monitoring Plan

Monitoring should occur throughout the operational and (where appropriate) decommissioning of all phases of proposal components. This is to ensure that management commitments and licensing agreements are kept and to enable ameliorative measures are taken if unexpected impacts are detected and to facilitate best practice environment management. Monitoring programs and management feedback systems should be part of the overall environment management system in place for the duration of the project proposal/operations.

5.9.2 Roles and Responsibilities Relevant Parties

This section describes the organizational structures and responsibilities of individuals involved with the implementation of the EMP throughout the work stages.

Party/Position	Responsibilities/Tasks
FPCL	• Implementation, monitoring and compliance of the EMP • Reviewing the performance of the EMP and adjustments to improve efficiency and application for the improving the environmental management of site activities. • Reporting to DOE • Compliance of operational activities with the GEMP/EMP guidelines and approval conditions
Habitat Sampling Sub-Contractor	• Implementation of all monitoring programs set out in the EMP. • Reporting to *FPCL*

Table 36: Outlines the responsibilities of relevant parties for the monitoring works.

5.9.3 Environmental Risks

The major environmental risks during the operational stages include the following:

- Habitat disturbances around the proposed dredging areas
- Sedimentation of waterways and declining water quality (plumes)
- Stirring and mixing of harmful substance with the water column during the maintenance dredging phase
- Socio-Economic impacts to stakeholders within 1km boundary
- Solid & liquid wastes management

5.9.4 Environmental Monitoring Sites

The monitoring of the biological, sediments and the environmental parameters should be carried out within the designated area. The work (monitoring and analysis) may be sub-contract out to a third party including environmental consultants and local institutions such as IAS of USP, FNU, etc.

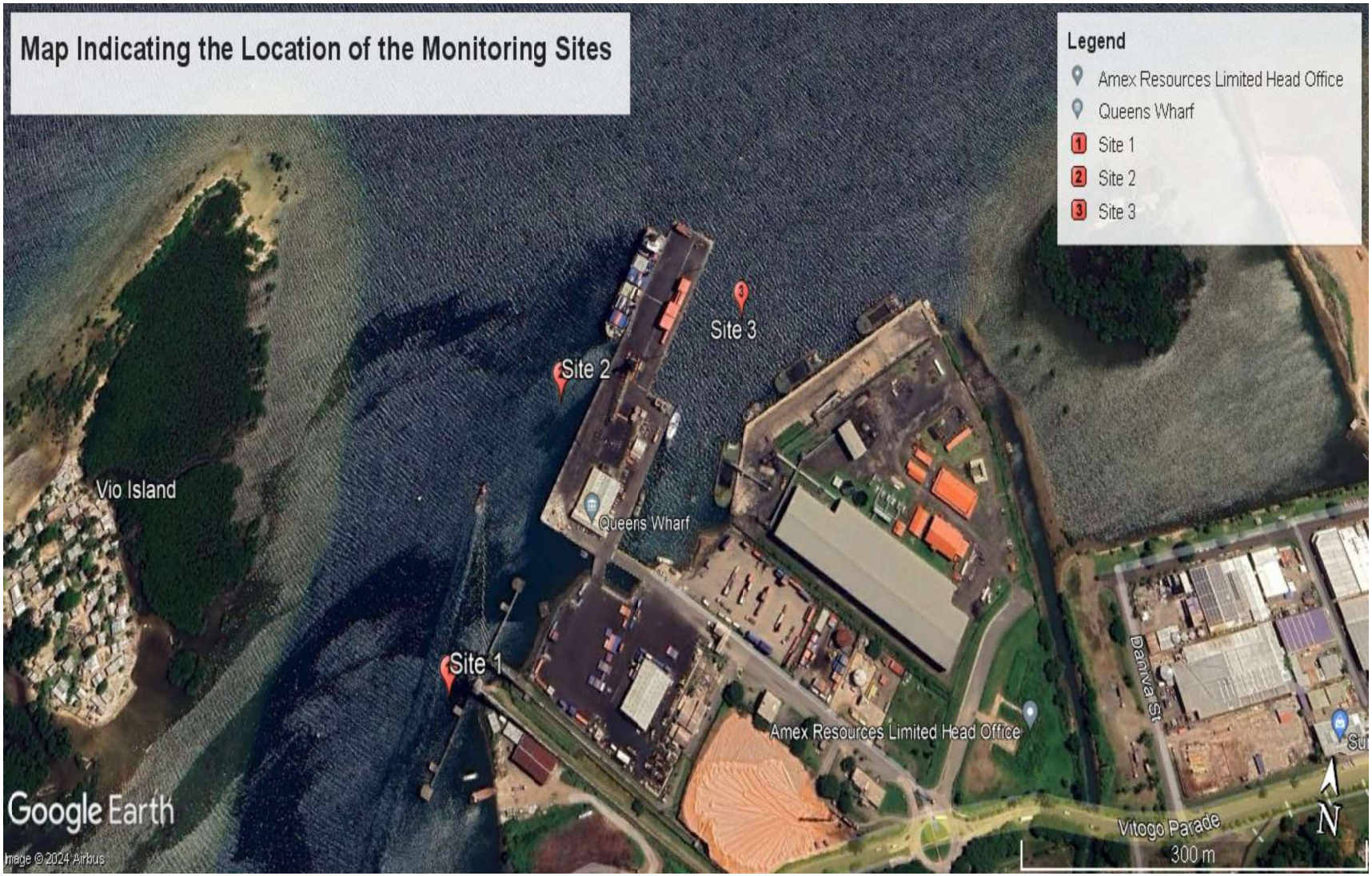


Figure 20: The Figure above indicates the location of monitoring sites for both sediments and water quality. Source FYES

6.0 ENVIRONMENTAL BOND

The environment bond required under Regulations 32 of the Environment Management (GEMP Process) Regulations 2007 is a rehabilitation bond. The purpose of the environment bond is a security against development activities to ensure that the Department of Environment can undertake rehabilitation of any phase of the development, if the developer breaches any obligations under the approval conditions and cannot undertake works to re-instate the environment and its surroundings to its former state.

The bond required under Section 32 of the EIA Regulations 2007 can take many forms, which are financial, guarantee, indemnity or insurance. The environmental bond deposited in the Environment trust fund is usually refunded at the end of the development phase, if the development is completed successfully. The bond shall be determined by the Department of Environment and to advise the developer on what is the best practice to satisfy the statutory obligation at National interest.

It is recommended that FPCL is to pay the sum of $44,075.00 to the DOE as an Environment Bond for the proposed maintenance dredging project along the Port of Lautoka. The environmental bond is calculated based taking into account the estimated cost for the; (i) restoration improvement or remediation work on the construction site; (ii) costing on the area that will need rehabilitated; and (iii) lastly the 2% miscellaneous to cover for any other unforeseen related issues that may arise during the construction phase such as the cost of restoration, compensation or preventative or other action.

Item Description	Activities	Rate	Total FD $
Restoration, Improvement, or remediation	- Identification of area of interest, problems & mitigation measure - Development of Action Plan & Implementation strategy	NA	1,950.00
	- Deployment of Equipment's & material - Execution of task 63,510	Total area of 15 acres x $875.00/acre	13,125.00

Oil Spill	- Deployment of Oil Spill Equipment's - Removal of hydrocarbon from site - Safe disposal of hydrocarbon		5,000.00
Miscellaneous	- Cover for other unforeseen circumstances/issues that may arise during the maintenance dredging works		24,000.00
Total Environmental Bond			**$44,075.00**

Table 37: Calculation of the Environmental Bond.

The Enviromental Bond will be refunded to FPCL after the construction phase once the DOE is content with all rehabilitation work is fully completed and incompliance with the conditions prior to the operation phase.

7.0 SUMMARY AND CONCLUSION

The approval of proposed maintenance dredging work is a project of significance for FPCL in ensuring the smooth and safe operation at the Port of Lautoka. This project will ensure that operations at the Port of Lautoka are conducted in a safe environment and maximize the potential of the Port facility and services.

Currently the proposed maintenance dredging site comprises marine flora and fauna that are able to tolerate the conditions of the marine environment. The marine ecological conservation issues of the proposed development have been well addressed in the report.

FPCL has made a strong commitment to sound environmental management from planning through extraction of gravel. The environmental objectives of the *FPCL* will be maintained and the assessment and mitigation measures documented in this EMP put into practice will be assured through the monitoring phase. To this end, it is recommended that the project receive approval for the maintenance dredging subject to the recommendations for the *FPCL*:

Maintenance Dredging Design Considerations: In the design and operation of the maintenance dredging works, consideration should be given to minimise unnecessary disturbance of the benthic sediments.

Maintenance Dredging Activities: *FPCL* shall ensure that the maintenance dredging related activities do not restrict access to other uses especially for the mariners such as local fisherman, hoteliers and Yasawa Islanders that uses the Lautoka Fish market Wharf.

Environmental Management Programme: *FPCL* will be required to follow the operation environmental management plans (EMPs).

Monitoring: *FPCL* shall undertake regular monitoring of ambient, noise control and dust emission, water quality, the marine ecosystem and other parameters. Provide the monitoring results and analysis to the relevant authorities on a regular basis.

High Risk area: FPCL to clearly highlight the high-risk areas especially on the north and south side of the proposed maintenance dredging area.

It is highly recommended that following recommendations to be employed at each proposed site to ensure that there is minimum impact to the surrounding biological, physical and social environment.

Recommendations	Justification
• FPCL to ensure that the maintenance dredging areas are clearly demarcated. • Port Master to monitor and coordinate seaport traffic and coordinator with the dredging contractor. • Maintenance dredging work should follow the EMP and conditions provided by relevant authorities. • Dredged materials should only be dumped at the location that has been designated by MSAF. • Business communities close to the dredging areas fishing for outboard owners to be informed on the dredging plan. • Fishing within close proximity to the dredging areas especially local fisherman, hoteliers and Yasawa Islanders that uses the Lautoka Fish market Wharf.	• Minimise unnecessary breaches or incidents with other seaport users. • Ensure smooth coordination of seaport traffic. • Minimise water pollution downstream. • Ensure full compliance with the conditions of approval and EMP. • Minimise or eliminate social conflict. • Minimise the impact of bioaccumulation or bio magnification poisoning as a result of consuming contaminated fish or another marine organism

Table 38: Summary recommendation

7.1 Site Preparation

1. All maintenance dredging activities should ensure that sedimentation be kept to a minimum considering the close proximity to the creek.
2. Untreated runoff should not discharge directly into the water bodies.
3. Oil spill kit should be kept in an area that can be easily deployed in case of an oil spill.
4. Solid waste is to be managed as per the condition of the waste permit issued by the DOE.

7.2 Maintenance Dredging Operation

The initial phase of the development will require careful management by FPCL of a range of potentially impacting activities such as waters plumes, water pollution, sea traffic, and proper waste management. The contractor is to carefully follow the EMP and other conditions that accompany the approval.

5. The development will generate a significant increase in TSS with the water column. It is recommended that:

i. Signs and appropriate safety features to be erected to indicate maintenance dredging high risk areas.

ii. Dredging activities and cartage is to be restricted to be confined to areas requested and approved by relevant authorities.

iii. Safety procedures and processes should be in place prior to the commencement of maintenance dredging works.

iv. FPCL to secure waste permits from the DOE as required under the Environment Management (Waste Disposal & Recycling) Regulations 2007.

v. Dredge materials to be disposed only on the approved dumping sites. A designated compliance officer from MSAF will accompany the contractor to ensure that the dredged materials are dumped at the approved location.

7.3 Social Effects

6. The social impacts of the development and FPCL's relationship with the local business and community will need to be carefully managed to maximize the positive social effects that will result from the development. It is recommended that FPCL:

i. Protects staff and public safety through adequate signage and security at all work sites, adequate health care facilities and training at maintenance dredging site, providing workers with personal protection equipment and ensuring that there are safe and clean facilities including sanitation and drinking water easily accessible for all workers.

ii. FPCL to have in place a proper complain procedure and process in place for both workers and community members who want to voice their complaints or concerns.

7.4 Environment Management and Monitoring Plan

The Environment Management Plan (EMP) covers all activities related to the maintenance dredging works. DOE will be responsible for the monitoring, reviewing and approving the plan. Therefore, it is recommended that:

7. FPCL closely follows the recommendation of the GEMP/EMP and conditions that accompany approvals. No work should be undertaken until the relevant authority approves the GEMP/EMP.
8. FPCL to submit monitoring report to DOE, MSAF and other relevant authorities.
9. FPCL and the contractor to regularly conduct monitoring of seawater quality.

8.0 REFERENCE

ADB. Fiji Ports Development Project. Completion Report. https://www.adb.org/sites/default/files/project-document/67702/32525-fij-pcr.pdf

Anon.1995. Exploration Opportunies in Fiji. Geology & Mineralisation. Information Sheet. MRD

Anon. Accessed 10th January. http:/www.mrd.gov.fj/gfiji/geology/educate/equakes.html, https://www.sott.net/article196463-7-1-Earthquake-Occurs-Between-Fijis-Main-Islands

Anon. 2016. https://dlca.logcluster.org/display/public/DLCA/2.1.+Fiji+Port+Assessment

ANZECC 1992. Australian Water Quality Guidelines for Fresh and Marine Waters. Australian and New Zealand Environment and Conservation Council.

Collar, N.J., Crosby, M.J. & Stattersfield, A.J. 1994. Birds to Watch 2: The World List of Threatened Birds. Cambridge, UK. BirdLife International (Conservation Series No. 4).

Cooper, C., J. Fletcher, D.Gilbert and Wanhill, S. 1993. Tourism. Principles and Practice. Pitman Publishing, UK

Fiji MET. (2015). Fiji Climate Summary January 2015. Nadi: Fiji Meteorological Service

Fiji Meteorological Service 2012. Monthly climate data for Nadi from January 2010 to June 2012.

Fiji's Environmental Management Act 2005. Government of Fiji

G. G. Shorten.1990. Structural geology of Lautoka Peninsula and Harbour and its implications for the Neogene tectonics of Fiji New Zealand Journal of Geology and Geophysics, Vo.33

Ghani, S, S & Aman, D. 2020. Analysis Of Heavy Metal Accumulation In Fishes From The Coast Of Lautoka, Fiji. Chemistry Journal of Moldova

Gob, F., et al. (2005). "River dredging, channel dynamics and bedload transport in an incised meandering river (the River Semois, Belgium)." River Research and Applications **21**(7): 791-804.

Komar, P. D, The Coast of Hawkes Bay: Process & Erosion Problems.2007. Hawke's bay regional Council.

Lata, S. and P. Nunn (2012). "Misperceptions of climate-change risk as barriers to climate-change adaptation: a case study from the Ba Delta, Fiji." Climatic Change **110**(1-2): 169-186.

M. Maata. & S. Singh. 2008. Heavy metal pollution in Lautoka harbour sediments, Fiji. Environmental Chemistry Letters

Macfarlane, M. and Mitchell, P. 2005. Environmental and Social Impacts of River Mining. University of Warwick.

Marco Gatti.2011. Performance Evaluation Report for Fiji Ports Development Project (Loan 1902). ADB Evaluation Approach

Mataki, M., et al. (2006). "Implementing climate change adaptation in the pacific islands: adapting to present climate variability and extreme weather events in Navua (Fiji)." Assessments of Impacts and Adaptations to Climate Change (AIACC), Florida, USA.

Mörner, N.-A. (1995) Earth Rotation, Ocean Circulation and Paleoclimate. GeoJournal, 37, 419-430

(https://doi.org/10.1007/BF0080693

Mörner, N.-A. (2011) Setting the Frames of Expected Future Sea Level Changes by Exploring Past Geological Sea Level Records In: Easterbrook, Ed., Evidence-Based Climate Science, Chapter 6, Elsevier, Amsterdam, 185-196

Mörner, N.-A. (2015) Multiple Planetary Influence on the Earth. In: Mörner, N.-A., Ed., Planetary Influence on the Sun and the Earth, and a Modern Book-Burning, Chapter 4, Nova Science Publishers, New York, 39-49.

Mörner, N.-A. and Matlack Klein, P. (2017) Sea Level Changes in the Yasawa Islands, Fiji.

Passified, M. 2016. Operation Environment Management Plan, Curllewin Dredge.

Penn, N. (1981). The environmental consequences and management of coral sand dredging from seagrass beds in the Lautoka region, Fiji Islands. Bulletin of Marine Science, ROSENSTIEL SCH MAR ATMOS SCI 4600 RICKENBACKER CAUSEWAY, MIAMI, FL 33149.

R.R. Thaman, Teddy Fong and Asakaia Balawa. 2009. Biodiversity and Ethnobiodiversity of Finfishes of Vanua Navakavu Viti Levu, Fiji Islands. CRISP Technical Report.

Rodda, P. Outline of the Geology of Viti Levu. 1967. N.Z Geol. Geophys:10:1260-1273

Shirley W. C. Mohammed and Simon E. Coppard. 2008. Ecology and distribution of soft-sediment benthic communities off Viti Levu (Fiji). Marine Ecology Progress Series. Vol. 371: 91–107, 2008

Steadman, D. W., & Franklin, J. (December 2010). Forest Plant and Bird Communities in the Namosi Group, Fiji. PLoS ONE, 1-15.

9.0 APPENDICES

Appendix 1: Determination Letter

DEPARTMENT OF ENVIRONMENT

Levels 1 & 2, Bali Tower, 318 Toorak Road
P. O. Box 2109
Government Buildings, Suva, Fiji

TELEPHONE NO: (679) 3311-699 Email: info@govnet.gov.fj

Applicant: The Chief Executive Officer
Fiji Ports Corporation Pte Limited
PO Box 780
Suva

Proposed Development: Port of Lautoka Maintenance Dredging
Proposal Number: EIA-W/57/2024

RE: DETERMINATION OF ENVIRONMENT IMPACT ASSESSMENT (EIA) SCREENING APPLICATION

The Department of Environment (Department) acknowledges receipt of your EIA Screening Application dated April 08, 2024 for the proposed Port of Lautoka Maintenance Dredging works. The application was screened in accordance with the process specified under Part 2, Regulation 6 of the Environment Management (EIA Process) Regulations 2007 and the determination is as follows.

1. The Fiji Ports Corporation Pte Limited (FPCL) is required to submit a detailed **Maintenance Dredging Environmental Management Plan** (MDEMP) report for the proposed Port of Lautoka Maintenance Dredging works. The MDEMP must include the project overview and outline, key outcomes of the report, site features, scope of works for each stages, access and working hours, dredging methodology, proposed disposal method, stockpile area (if relevant), contingencies and provide mitigative measures on erosion and sediment control, dredging works, fuel & oil handling and storage, particulate matter (dust), noise, site rehabilitation, stormwater and waste management (solid & liquid).

2. The report should describe in detail a baseline inventory of marine fauna and flora with emphasis on endemic, rare or endangered species of conservation significance (as relevant), sensitive ecologically habitats and significant natural sites (as relevant) that may occur on or around the site and how they will be affected by the proposed maintenance dredging and further identify any potential for marine protected areas in close proximity, impacts and mitigation measures. A baseline water quality test must be submitted to the Department measuring the following parameters such as pH, temperature, BOD, turbidity, TSS and TDS. The GPS coordinates of the sampling points and the interpreted water quality results must be appended to the MDEMP report.

3. The report shall describe in respect of the proposal the environmental protection measures that will be put in place by the proponent, including an environmental monitoring and surveillance program of action. The MDEMP must include results/ outcomes of the consultation with neighbouring facilities, Maritime Safety Authority of Fiji, Lautoka City Council and relevant stakeholders. Mitigation measures to address issues raised in the consultation must be included in the MDEMP.

4. The report must also include an environmental bond against the cost of restoration, improvement or remediation work on any area caused by the project, compensation for loss or damage to property or income or preventative or remedial action necessitated by the environment or resource management impacts of a development activity or undertaking under regulation 32(2) (b) of the Environment Management (EIA Process) Regulations 2007.

5. FPCL must hold a valid Waste Disposal Permit from the Department of Environment for the site before any works begin.
6. FPCL must establish an effective Grievance Redress Mechanism. The Grievance Redress Mechanism is to resolve complaints as quickly as possible.
7. FPCL must carry out a Bathymetric survey and GPS coordinates of the area of the proposed dredging site must be appended to the MDEMP report.
8. FPCL must ensure that a registered EIA consultant with the Department of Environment prepares the MDEMP report. The EIA consultant must be within the correct areas of expertise for the preparation of the MDEMP report.

FPCL must submit two (2) hard copies of the report and one electronic copy in PDF format.

Should you disagree with the decision made by the EIA Administrator on the determination, you may appeal to the Permanent Secretary for the Ministry of Environment and Climate Change.

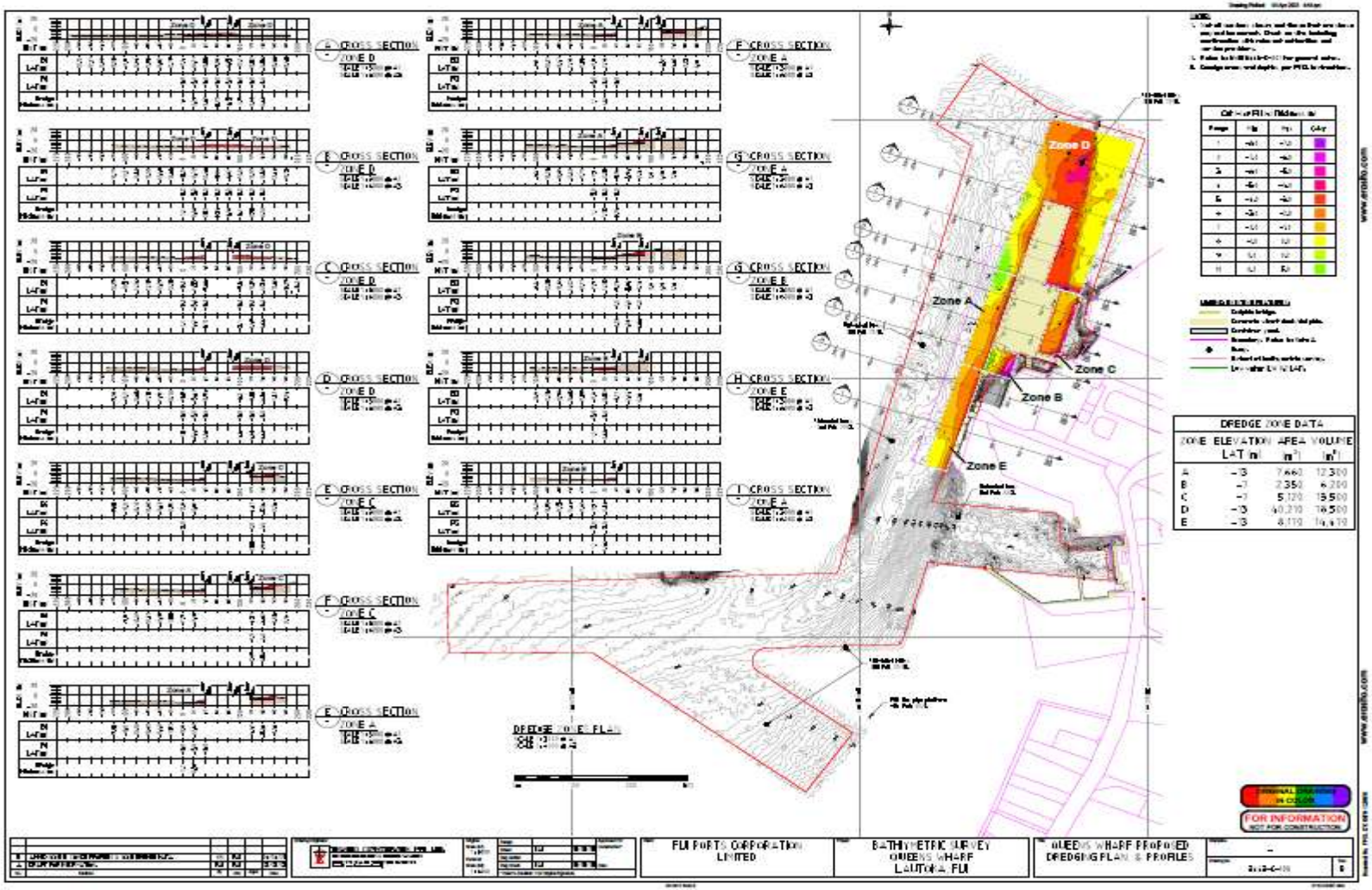
For any clarification, please contact Ms. Mere Bainimarama on phone +679 3311699 or on email mere.bainimarama@govnet.gov.fj

Vilikdonu Qionibaravi (Ms.)
EIA Administrator (Project)

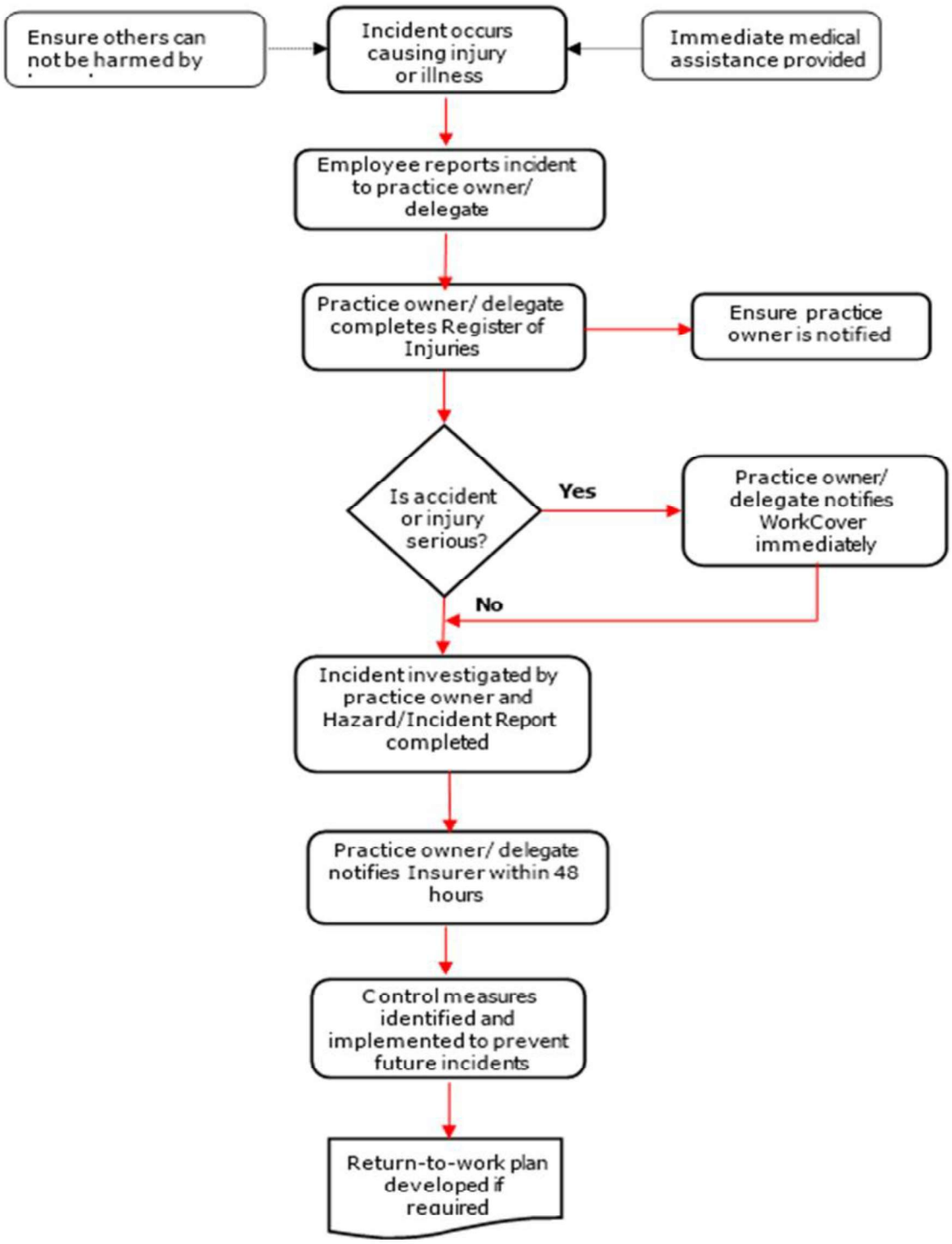
Date: 15/04/24

Cc: Acting Director of Environment
File Copy

Appendix 2: Map of the Proposed Project



Appendix 3: Incidents and Reporting



Appendix 4: Incident Response Plan

	Bodily Injury (ies) Fatality (ies)	**Environment consequences / Pollution**	**Natural Event**	**Reporting**
Minor	Dangerous occurrence (dangerous situation, unsafe acts, anomalies), Near miss First aid	Minor spill or release of pollutant. Minor loss of stormwater exceeding standards. Petroleum Spill < 200 L Without environmental consequence.		Internal Reports and monthly reports to regulatory authorities
Moderate	Injury without lost time, Medical treatment, Restricted work	Moderate spill or release of pollutant. Sediment-laden stormwater is above standard but below recorded background levels. Without environmental consequence. Petroleum Spill between 200L and 1 m^3. Quickly contained with existing kit.	Risk of floods, cyclone, tsunamis announced by Fiji Meteorology Service; Earthquake with no direct consequences for Contractor staff or premises	

Serious	Lost time accident	Serious pollution incident. Release of significant sediment-laden stormwater exceeding standard Petroleum Spill between 1 and 50 m^3	Any meteorological or natural event experienced and with direct serious / major consequences for Contractor staff or premises.	**INCIDENT** To be reported immediately to relevant authorities
Major	Permanent disability or fatality occurring	Major pollution external to the site. Evacuation of persons. Petroleum pollution of dredging area. Spill exceeding 50 $m^{3.}$		

Appendix 5: Minutes of the Stakeholders Consultation Meeting

Finau Yaubula Environmental Service (Fiji)
Community Consultation

Date: 01/05/2024
Time: 1430hrs
Venue: Department of Environment Office, Lautoka
Convenor: Mr. Ilaitia Finau
Developer/ Proponent: Fiji Ports Corporation Limited
Subject Area of Project/ Business: Lautoka Wharf as per map appendage
Land Owning Unit: Traditional Qoliqoli owners are the Tikina o Namoli. Subject area is covered under the Fiji Ports Management Act of which the Fiji Ports Corporation Limited is the custodian.
Auxiliary Information: The Lautoka Wharf is managed by the proponent and carries out a routine maintenance programme by which dredging is an activity that happens every 2years or earlier if necessary. The proponent has engaged Finau Yaubula Environmental Services as the consultant to carry out the Environmental Impact Assessment that has been required by the Director for Environment.
Those Present: George Vulakoro(MSAF), Mitthun Prasad(City Council - Health), Daniel Chand (City Council -Building), Naiqama Balecina (Provincial Office), Inosi Nabuka (Fiji Ports), Joeli Sauqaqa (Mata-ni-Tikina Vitogo), Iferemi Waqasese (Ministry of Health), Ilaitia Finau, Eremasi Lovodua (FYES).

Apologies: Mr Pillay President Lautoka Chambers of Commerce
Agenda: Routine maintenance dredging programme EIA for the Port of Lautoka by Fiji Ports Corporation Limited.

After a short welcome and self-introduction by the different stakeholders, Mr. Finau proceeded to outline the purpose for the briefing consultation.
INTRODUCTION:
Although it is not a requirement by law, Mr. Finau thought it best to visit the traditional i Qoliqoli owners head, the Taukei Vidilo, and seek his blessing in the works that would be carried out that have national implications. The reef entrance at Momi and the Wharf area was legally under the Fiji Government and there was therefore no legal obligation for consent nor compensation payment owed to the traditional i Qoliqoli owners. This was the first time that the Department of Environment required an EIA for the Suva Port and an EMP for the Lautoka Port prior to the dredging works being carried out but was a step in the right direction considering implications of such activities. Additionally, this needed to be considered on the backdrop of the economic significance of both major ports of entry, of which Lautoka was one,

and that they were responsible for up to 95% of all trade in and out of Fiji. The urgency was that the depth of the birthing area was becoming an issue for vessels birthing at the wharf and needed to be addressed with haste.

BACKGROUND:

- The Suva Port maintenance dredging programme required a full EIA done. However, for the Lautoka Port routine maintenance dredging, the Director only required an EMP with some EIA requirements also embedded into it due to the depth issue urgency;
- Director Environment will make a decision regarding the development after considering the EMP submitted;
- Although it is not a necessity that consultation be carried out for an EMP, this was part of the hybrid requirement by the Director Environment, specifically that the City Council, MSAF and Lautoka Chamber of Commerce be consulted. Mr. Pillay of the Lautoka Chamber of Commerce was contacted also about this consultation but he was engaged, but correspondence through email is being pursued;
- To fulfil the requirement as per Director of Environment through the determination letter, FYES moved forward with consultations, to engaging the key stakeholders, and getting feedback from them, including the Mata-ni-Tikina o Vitogo;
- Indicators from observations of the Bathymetric assessment are not encouraging – the Port urgently needs dredging. Director Environment has therefore directed that a lesser form of assessment be done, cutting the time factor considerably. FYES has been asked to expedite the process. A third party will carry out the actual dredging, not the Fiji Ports.

DREDGING:

- Dredging works options by suction dredger will need a proposed area to dump the dredge materials. This will mean disposing a distance away, which can be an expensive exercise;
- The most cost effective approach that is being proposed is spreading the mound from the shallow areas to the deeper areas using an excavator. Any form of development will have an impact upon the surrounding environment and an issue of concern is the plumes of sediments from the disturbance of the seabed. EMP will cover operational activities taking into account the time of dredging;
- Key biodiversity areas were being mapped out to see the types of impacts. Mangrove areas can take the impact, however of concern are the live corals;
- An issue that was being discouraged was to bring the dredge materials to the village for their use. This is because of the strong possibility that heavy metals would be present due to the constant discharge from the industrial area close by;

- Total wharf area has been divided into 5 parts and labelled A – E on the Bathymetric Survey Map;
- Total estimated volume to be removed is 124,970m³ that will span an area of 63,510m²;
- The proposed removal is by pushing the excess sedimentary deposits from the shallow subject areas to the deeper areas;
- Dredging being a temporary solution to the current problem of the Port, the frequency of maintenance dredging will depend on the rate of accumulation of sediments, sediment deposition and sediment transport;
- Regular monitoring will be carried out by FYES during and after the dredging activity;

Q&A & COMMENTS:

- Mr. Mittun asked about the monitoring once the dredging begins, the concern being what it will be compared to. Mr. Finau responded that FYES will be collecting water samples and conducting baseline readings including heavy metals by which monitoring readings will be compared to;
- Mr. Mittun wanted to see the zoning laid out in the Bathymetric Survey. Mr. Finau responded that he will send all the selected stakeholders a copy of the PowerPoint presentation, which had a copy of the Survey Map with the zoning clearly marked;
- Follow up question was if the dredging was likely to affect the small island besides the wharf, to which Mr. Finau responded, saying that yes it was likely that the plumes would have some effect on the island, especially with the currents and the changing wind directions;
- It was clarified to Mr. Daniel upon questioning the proposed dump area of the dredged material, that it was just being pushed from the high mound areas of the shallow parts to the deeper ends;
- Current depths to the required depths being targeted after dredging asked Mr. Daniel. Some places were at -7m while the required depths needed to be around -10.5m according to Mr. Inosi of Fiji Ports.
- A point of concern was raised too that the dredging works should also consider the physical structure of the wharf, that it is not compromised;
- Were the Ministry of Lands consulted in this process too was raised by Mr. Mittun. Fiji Ports Management Act covers the legal custodian of the Port Boundary, which runs from the mouth of the Momi Reef to the Port of Lautoka birthing area itself. Legally the Fiji Ports Corporation are the gazetted custodians and have full responsibility;
- In the case of the waiver and compensation issues, the Fiji Ports Management Act dictates that the national interest takes precedence over the traditional i qoliqoli owners' rights. A sensitive issue but the balance needs to be struck;

- Mr. Vulakoro asked if MSAF could be alerted ahead of the scheduled dredging with the coordinates so that they could put out a marine notice to vessels that utilize the Port due to the risks involved. Concern was noted. He was in approval of the methodology proposed by the Fiji Ports because of the time factor in cartage of dredging material from the wharf, that it could impede on the operations at the Port especially during peak traffic period with supply ships coming in and out;
- Mr. Finau responded to Mr. Daniels question on the timeline, that Fiji Ports was hoping to finish all the dredging within three months.

There being no other questions or comments, Mr. Finau thanked all the stakeholders present for their time taken to attend and participate in the consultation process, adding that the initial report will be ready by Friday, 03rd of May, subject to the availability of test results from the Laboratory, and would be made available to the stakeholders that were interested. The consultation meeting concluded at 1515hrs.

Appendix 6: Water Analysis Results (WAF LAB)

water authority fiji
Clean Water for a Better Life.

National Water Quality Laboratory Report

Ratu Dovi Road Nasinu, Fiji Islands GPO Box 1272, Suva, Fiji Islands
Telephone (679) 3345677 or 577 (Vodafone & Inkk) users.
Email: contact@waf.com.fj Website:www.waterauthority.com.fj

Certificate of Analysis: Chemical and Biological Analysis
Sample: Environment (NGO)

Lab Reference No : NWQL/1405/23-24	**Date Generated: 09 May 2024**
Sample From: Finau Yaubula Environmental Services	Address : G. P. O. Box 17719, Suva
Sample Type : Grab	Sample time : 1030hrs
Sampled By : Ilaitia Finau	Sample date : 02/05/2024
Sample Received : 02 May 2024	Weather Condition : Fine
Date Analysis Started : 03 May 2024	Cust Reference No : -

SL. No	DETERMINANDS	Units	APHA Method Code	SAMPLE LOCATION			General Standards
				1	2	3	
1	*Total Suspended Solids	mg/L	2540D	306.6	319.2	331.6	-
2	*Biochemical Oxygen Demand	mg/L	5210B	1.20	1.41	0.80	-
3	*Oil & Grease	mg/L	5520D	48.2	199.0	24.2	-

Sampling Points

1 Lautoka Wharf - Site 1
2 Lautoka Wharf - Site 2
3 Lautoka Wharf - Site 3

Remarks:

†All results apply to samples as received by Laboratory. Avg means Average < means Less than, > means Greater than, N/A means Not Applicable

* These tests are outside the laboratory's scope of accreditation.

Checked By:Sher Singh
Position: Supervisor NWQL
Signature :

Authorised By: Kirti Chandra
Position: Manager Water Quality [KTP]
Signature :

End of Test Report.

No : NWQL/ 265/18-19
This test report shall not be reproduced except in full.

Page 1 of 1

Appendix 7: Dredge Log Checklist

Daily Checks	
Site compound check – waste collection areas clean? Spill containment, ok?	
Check equipment for leaks including hoses, valves, seals & reservoirs.	
Vessel checks for leaks	
Wind conditions	
Sea state	
Visual inspection – Port Navigation is not restricted.	
From vessel – check with binoculars for marine species near dredge or disposal area. Record any sightings.	
Pipeline check	
Disposal area check	
Once Dredging: Sediment plume – estimate plume length. Less than 300m from dredge? (If more, or close, notify Site Supervisor.)	
Check for excessive noise	
Check for air pollution (after starting up exhaust smoke)	

Appendix 8: Emergency Spill Response Procedures

All spills must be reported to the Site Supervisor.

Reporting requirements are set out in Appendix E of this EMP.

Spill Kits are located on the Dredge, fuel barge and at the site compound.

Each Kit contains the following items stored in the dedicated 240L wheelie bin;

- 6 off 3m long connecting floating absorbent booms.
- 50 off Oil sorbent pads
- 2 pair of Gloves
- 2 off 20m rolls of poly rope.
- 6 off disposal bags

A quick response is critical to prevent environmental damage.

1. Stop the source of the spill.

2. Contain and restrict the spread of the spill.

Deploy booms to surround the spill, the booms are absorbent, however if the spill is too large to be absorbed by the booms use sorbent pads to recover the remaining oil within the contained area.

Be aware of the effects of wind, waves and current on dispersal of the spill.

Extra care should be taken when working from boats.

Once initial control is established, or if immediate assistance is required, all spills are to be promptly notified to the Site Supervisor who will notify the DEHP and Project Superintendent as required.

The best method of spill management is prevention. All staff need to be vigilant and careful when refuelling and servicing machinery and equipment.

Appendix 9: Waste Manifest

Date of Disposal	Type of Waste	General/Regulated waste?	Disposal destination

Appendix 10: Training and Induction Record

Date	Name (and organisation if not Contractor)	Type of Training (Induction / Emergency Response / Spill Response / Environmental Awareness

All operators are to have the following training as a minimum:

- Environmental Awareness including record-keeping and incident reporting;
- Emergency Response including Spill Response and Fire on Board Vessel;
- Project induction

All visitors and contractors are to have induction training.

Appendix 11: Complaint Record Sheet

COMPLAINT RECORD SHEET		
Date of Complaint	Name of Complaint	
Complainants Address		Phone Number
Nature of Complaint (circle appropriate) Dust Noise Vehicle speed Others	Date of Occurrence: Time of Occurrence: Duration: Severity: Low/Medium/Severe	
Impacts, observation, comments		

Appendix 12: Operations Action Report

OPERATORS ACTION REPORT	
Complaint lodged/received. Date: Time:	Complaint lodged by (Name):
Complainants verified by Manager (tick appropriately)	Comments on verification:
Report on investigation/cause of offence	
Action Taken:	
Date and Time complaint informed	How complainant informed:
Date of completion of complaint management procedure	Signature (Manager)