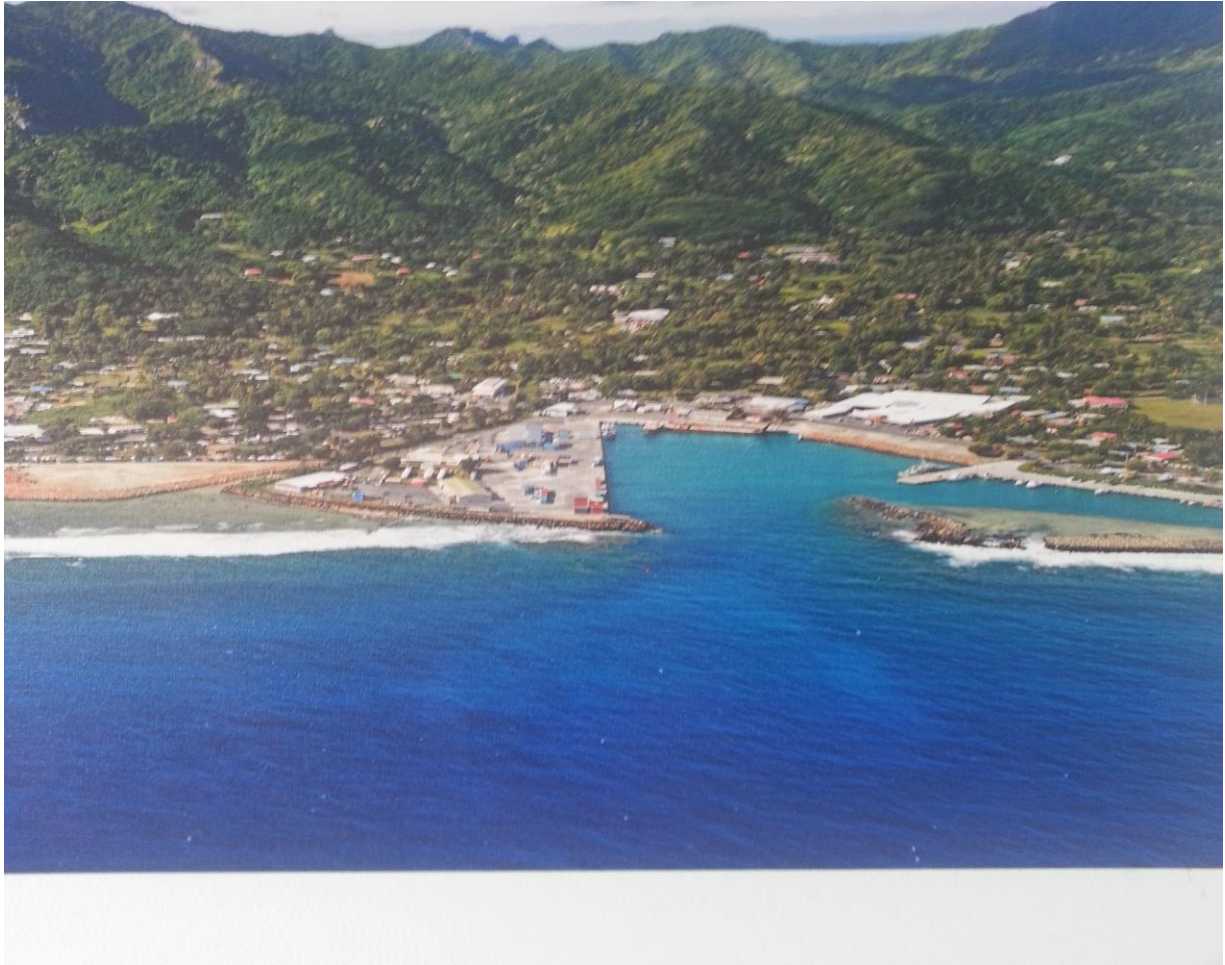


ENVIRONMENTAL IMPACT ASSESSMENT REPORT



**THE PROPOSED CONSTRUCTION AND OPERATION OF A
SUBSEA FUEL PIPELINE AND OFFSHORE MOORING
SYSTEM FOR THE DISCHARGE OF PETROLEUM PRODUCTS
AT RAROTONGA, COOK ISLANDS**

JULY 2016

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PART A: INFORMATION ON EIA PREPARATION

1. Introduction

This document is aligned with the Terms of Reference (TOR) issued by National Environment Services (NES) for guidance and advice in the preparation of Environmental Impact Assessment (EIA) for the Installation of Tanker Moorings and Construction of a Sub-sea Pipeline.

The TOR identifies all issues that need to be addressed by the EIA. Both facilities are for the purpose of conveying petroleum fuels into onshore storage facilities.

Tanker mooring facilities are located offshore at Areatu Tapere, Avarua District. Sub-sea pipeline facilities commences from the offshore moorings and continue towards shore, terminating at Pacific Island Energy (PIE) storage facilities.

2. EIA Objectives

The EIA shall identify all potential environmental, social and economic impacts of the proposed facilities and shall ensure that adverse impacts are either avoided where practicable or mitigated to a reasonable and acceptable state.

The EIA scoping will address the following:

- a) Assess identified impacts and their significance
- b) Recommend mitigating measures
- c) Develop an Environmental Management Plan (EMP)
- d) Develop a Traffic Management Plan, if appropriate
- e) Communicate all relevant information to Stakeholders in an accessible and transparent manner
- f) Describe the consultation process followed with stakeholders, and to record feedback received on issues as raised for dissemination and review

3. Stakeholder Consultation

As part of the EIA process, consultations with stakeholders were carried out in 2014 and 2015 to provide awareness of the proposed projects with the following:

- Cook Islands Investment Corporation
- Cook Islands Ports Authority
- Airport Authority
- Infrastructure Cook Islands
- Ministry of Internal Affairs
- Ministry of Marine Resources
- Te Ipukarea Society
- Rarotonga Fishing Club
- Aquarius Hotel

- Triad Pacific Petroleum
- TOA Petroleum
- Te Aponga Uira
- National Environment Services
- House of Ariki
- Government Cabinet Ministers

Further consultations will be conducted with stakeholders and the public in a forum to provide an overview and update of the proposed facilities, as there has been a considerable time lapse from when the project was first proposed back in 2013. While the nature of the project facilities has not changed, the opportunity is there for stakeholders to raise any new concerns that they may have.

4. EIA Process

The EIA report preparation is guided by the TOR to provide NES with adequate information and data to facilitate the permit approval process

In April 2016 the Project Proponent re-submitted an Environment Significance Declaration (ESD) form to NES in respect of the proposed projects. From this ESD application, NES developed the TOR following their assessment of the initial information provided under the Environment Act 2003.

In accordance with Part 5 Section 36 of the Environment Act 2003, the EIA report shall be made available to the public for review and comment within a 30-day time frame from when EIA is issued.

Public feedback and comments will be directed in writing to NES who will then forward any relevant and pertinent issue to the Project Proponent for a response. NES and REA will review the responses in their overall EIA permit process to arrive at an outcome in regards to the application.

The NSDP 2011-2015 is the second planning phase in our journey of Te Kaveinga Nui towards the achievement of desired 2020 development outcomes and our National Vision:

"To enjoy the highest quality of life consistent with the aspirations of our people, and in harmony with our culture and environment".

The NSDP 2011-2015 integrates the thoughts, ideas, hopes and dreams of a broad cross-section of our society, both in Rarotonga and the Pa Enua.

It is the culmination of many community based consultations, brain storming and focus group sessions, perusing past reports, and numerous public, private and community sector meetings to review our progress on NSDP 2007-2010 and formulate this NSDP.

The project is aligned to the two focus areas in accordance with the National Sustainable Development Plan 2011 – 2015 (NSDP), which are:

Priority Area 1: Economic Development

Goal: A Vibrant Cook Islands Economy

Where ingenuity and connection to our culture and Environment underpins the ability of our people to build business and enterprise to contribute to national growth.

Priority Area 2: Infrastructure

Goal: Infrastructure for Economic Growth and Sustainable Livelihoods

Our investment in infrastructure will maximise economic return, improve livelihoods and build resilience.

In January 2016, the National Sustainable Development Plan (NSDP) 2016 – 2020 was developed. The plan has further defined the national goals from the NSDP 2011 – 2015 into sixteen readily identifiable, sector based development goals. The project is aligned to the following goals.

Goal 2: Expand economic opportunities; improve economic resilience and productive employment to ensure decent work for all.

Goal 5: Build resilient infrastructure and ICT to improve our standard of living.

PART B: ENVIRONMENTAL IMPACT ASSESMENT

EXECUTIVE SUMMARY

The Cook Islands total petroleum fuels usage is currently supplied by Triad Pacific Petroleum, Pacific Islands Energy (PIE) and Toa Petroleum. Current fuel supply is by means of local coastal tankers, (LCT of 3-5,000 tonnes dwt), high seas tankers and iso-tank units (22-24,000 litres capacity).

Due to Avarua port limitations in draft and berthing facilities, the maximum supply tanker is restricted to LCT size capacity. The maximum allowable vessel length within the Avarua Port due to its narrow entrance and turning bay, is 120 metres. The current LCT servicing the Cook Islands Mekong Trans01, is 118 metres in length. The sea conditions have to be near perfect for the LCT to enter the Avarua Port, the prevailing easterly current and winds only increase the risk upon entering.

PIE utilises LCT tanker supply for all it's requirements.

Toa Petroleum utilises LCT tanker, high seas tanker and iso-tanks for it's requirements.

Triad Pacific Petroleum utilises iso-tanks for it's requirements, with the occasional LCT tanker cargo.

PIE has storage locations in Fiji, New Caledonia, Tahiti, Tonga, Vanuatu and Solomon Islands.

PIE has a standing supply agreement with Petrocean for the supply of their petroleum products from Singapore.

Petrocean provides the necessary medium range (MRX) of 30-50,000 tonnes dwt capacity tankers for the transportation of petroleum fuels from Singapore to the selected locations that meet the requirements of draft and berthing facilities for these tankers.

PIE also has supply agreements for third party storages eg American Samoa and Papua New Guinea.

PIE and Petrocean jointly are looking at expanding the capability of MRX tankers to supply into other locations, hence this proposal of developing tanker moorings and sub-sea pipeline for Rarotonga.

These proposed developments will have the following flow-on benefits to the Cook Islands petroleum supply market:

- a) Larger cargo parcels – increased supply efficiency and lower freight costs,
- b) Port safety – tankers will have specific operating area out at offshore moorings and port activities will no longer have restrictions when tanker is in port as with current arrangements. The entering and manoeuvring risks associated with the LCT within the Avarua Port are eliminated,
- c) Total supply – opportunity exists for both Triad Pacific Petroleum and Toa Petroleum to negotiate for direct supply with PIE for all their fuel requirements, hence improving their landed costs,

- d) Supply and Operational Efficiency – bulk supply will remove the current expensive mode of supply in iso-tanks.

This will remove handling and storage issues at the port as well as at depots.

- e) Supply security – in conjunction with these proposed developments, there will be new storage tankage facilities to be constructed, which will not only increase supply efficiency, but will also increase supply security.

Proposed project facilities are:

- 1) Conventional 4-point moorings designed specifically for MRX tanker range that will allow safe berthing under acceptable weather conditions.
- 2) Construction of sub-sea pipeline from moorings to shore. Construction of pipeline connections between sub-sea pipeline and on-shore PIE depot pipeline by means of a manifold. All work will be carried out in accordance with accepted international standards, which incorporate stringent safety features.

Tanker discharge operations in the late 1960's till the early 1980's was possible through the use of a marine pipeline in conjunction with floating hoses.

Mobil Oil installed a pipeline over the reef and the Local Coastal Tanker (LCT) was moored off the reef as it had a shallow draft.

This pipe line was decommissioned when the Avatiu harbour was upgraded to accept LCT Tanker size.

The EIA will address all relevant issues arising from the studies relating to the projects as well as from stakeholder and public submissions.

EIA will also include the following action plans resulting from identified environmental impacts and while all practical efforts will be made to eliminate adverse impacts, mitigation measures will need to be put in place and these are covered in:

- a) Environmental Management Plan (EMP)
- b) Traffic Management Plan (TMP)

Glossary of Terms

API	American Petroleum Institute
ADO	Automotive Diesel Oil
AS	Australian Standard
AS/NZS	Joint Australia / New Zealand Standard
CIIC	Cook Islands Investment Corporation
CIG	Cook Islands Government
EIA	Environment Impact Assessment
EMP	Environmental Management Plan
EMS	Emergency Management System

ESD	Environmental Significance Declaration
ICI	Infrastructure Cook Islands
ISGOTT	International Safety Guide for Oil Tankers & Terminals
ISO	International Organisation for Standardisation
Jet A-1	Aviation Jet Fuel
MoIA	Ministry of Internal Affairs
MoT	Ministry of Transport
NES	National Environment Service
NSDP	National Sustainable Development Plan 2011-2015
NZS	New Zealand Standard
PA	Ports Authority
PIE	Pacific Islands Energy
REA	Rarotonga Environment Authority
TOR	Terms of Reference
ULP	Unleaded Petrol
VAT	Value Added Tax

1. INTRODUCTION

1.1 Proposal Proponent

This EIA is prepared on behalf of the Project Proponent, TOA Petroleum for Petrocean and to document the following:

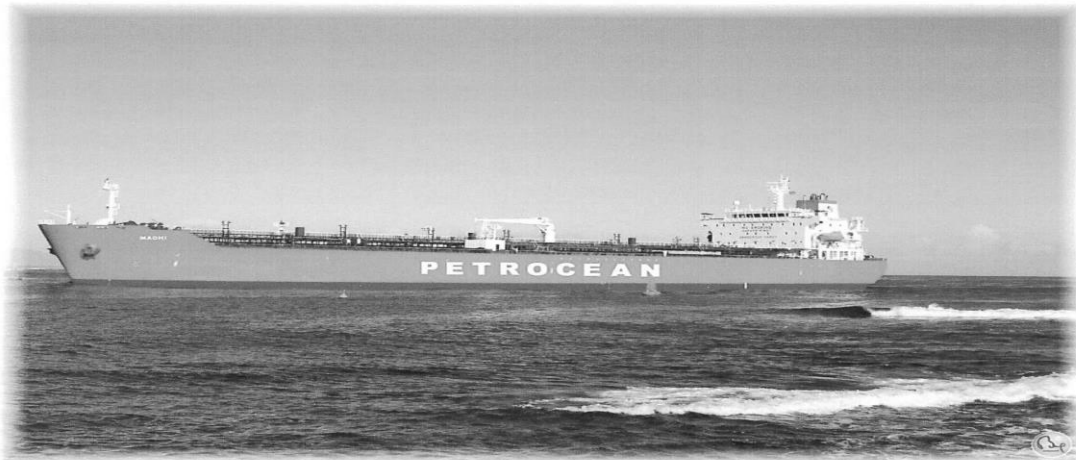
- Project justification,
- Consideration of alternatives and selection of the preferred proposal,
- Environmental impacts arising from the proposed projects and to
- Detail mitigating environmental management measures.

PETROCEAN is owned by "La Parisienne d'Investissement" and " PACER Ltd" (Refer to Appendix II).

Since 2006 the company has focused primarily on delivering fuel products to various ports in the Pacific Region.

PETROCEAN's Management Team are highly qualified individuals that have successfully managed the company thereby achieving sustained growth over the years. Refer to Appendix II & III.

PETROCEAN owns two MR Tankers for the transport of fuel products in the region. These are respectively the MR Tanker "BOUGAINVILLE" at 50,000 TDW (Tonnage Dead Weight) and "MAOHI" at 45,000 TDW –pictured below.



EIA also provides linkage with PIE's objectives to facilitate upgrade of it's current depot storage to achieve supply and operational efficiency.

TOA Petroleum and PIE have been operating in the Cook Islands for many years and are committed to business in the Cook Islands.

PIE was formerly BP (SWP) and owned by Tahiti business entities operating across the Pacific in Fiji, New Caledonia, Vanuatu, American Samoa and Tonga to name but a few island countries.

1.2 Proposal Description

The Project proposal is divided into three key phases that are required to convey petroleum fuels from offshore to onshore.

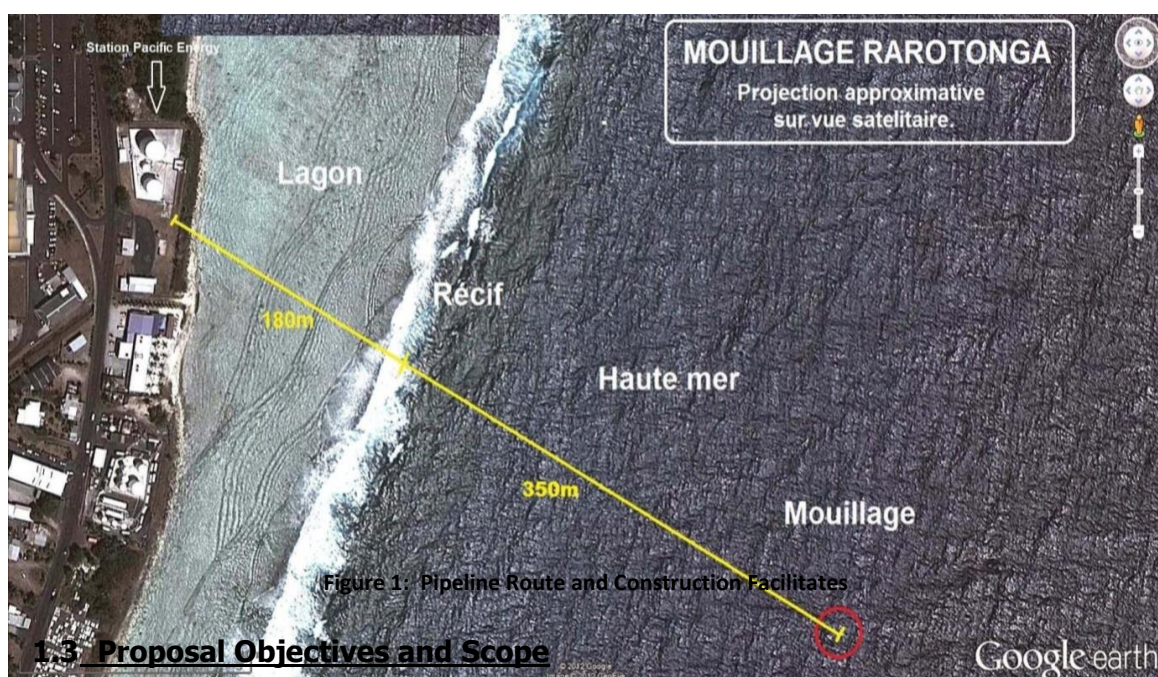
The phases are:

- a) Installation of 4-buoy moorings of international maritime standards to enable safe berthing of tanker
Each mooring buoy will be anchored by chains and anchors specifically designed to take into account marine and climate conditions (normal and seasonal) and the size of tankers that would be using the mooring.
- b) Construction and installation of a sub-sea pipeline from moorings to shore.
Pipeline will be of HDPE material which is resistant to corrosion and of continuous length, hence negating the need for jointing.
Pipeline will be of nominal 200mm diameter and approximately 600 metres long.
Installation will be a combination of trenching and burying in sandy ground conditions and anchoring where ground conditions are rocky.
At the end of the pipeline at the mooring end, there will be a flexible hose string attached, and this will provide the connection between the pipeline and the tanker manifold. Construction and installation of pipeline continuity between the sub-sea pipeline and PIE on shore pipeline.
This portion of pipeline will be crossing the sandy beach area outside PIE's depot and will be buried.

Fig 1 map provides approximate route for the pipeline.

Offshore facilities are within the Avatiu Harbour Port boundaries and will be subjected to Port Authority requirements for safe berthing and operational procedures.

A detailed survey will be undertaken to determine the optimum pipeline route once EIA approvals are granted.



1.3 Proposal Objectives and Scope

Translation of French terms in Fig 1:

- *Mouillage Rarotonga = Mooring Rarotonga*
- *Projection approximative = Approximate projection*
- *sur vue satellitaire = on satellite view*
- *Lagon = Lagoon*
- *Recif = Reef*
- *Haute mer = High sea*
- *Mouillage = Mooring*

Following factors are considered in the wider Scope of the project to minimise possibilities of adverse impacts on the environment:

- a) Pipeline Route - The exact route of the pipeline would be determined during detailed design in consultation with the Port Authority, National Environment Service and Infrastructure Cook Islands and that the selected route shall minimise the impact on marine life during installation and operation, minimise impact of beach erosion and public usage.
- b) Pipeline Protection – Entrenchment and anchorage of pipeline will ensure no impact damages from marine vessels operating in the vicinity, in particular fishing activities. This will also provide protection from sea bed currents and wave movements during rough seas associated with extreme weather such as cyclones.
- c) Hose String Protection – Flexible hose string will remain filled with sea water after each tanker unloading and will be laid on the sea bed, and it's own weight when filled with water will ensure it will remain undisturbed.
- d) Pipeline and Hose Testing – As part of the commissioning process, the completed pipeline will be pressure tested to 2500 kpa and the flexible hose string shall be pressure tested to 1050 kpa.
- e) Create a safe mooring off shore to isolate dangerous fuel vessels from Avatiu Port, and adjacent infrastructures.
- f) Prevent risk of LCT going aground on the reef at Avatiu port, which would have a negative economic and environmental impact.

1.4 Environmental Impact Assessment (EIA) Process**1.4.1 EIA Methodology**

This EIA report is prepared to assist in facilitating the NES permit approval process.

In April 2016 the Project Proponent submitted an Environment Significance Declaration form to NES for the project application as the first step in the process.

NES assessed the proposal in accordance with Part 5 Section 36 of the Environment Act 2003 and concluded that an EIA was required for the project.

NES subsequently issued a TOR to the Project Proponent for guidance in the preparation of the EIA.

In accordance with Part 5 Section 36 of the Environment Act 2003, the Act requires that the EIA report shall be made available to the public for review and comment and provide feedback in writing to NES within the 30-day period from when EIA report is issued.

The EIA details the nature of the proposal, its environmental implications, and the manner in which the proposal will be implemented including any measures which can be taken to mitigate any adverse impacts.

Community consultations and continuous communication between stakeholders ensure issues are addressed, without delay to the project.

1.4.2 EIA Objectives

Objectives are:

- Describe the proposed development
- Investigate and describe the biophysical, social and economic environment concerning the proposed development
- Assess identified adverse impacts and their significance
- Recommend mitigating measures
- Present an appropriate Environmental Management Plan
- Present an appropriate Traffic Management Plan
- Communicate all relevant information to Stakeholders in an accessible and transparent manner
- Describe the consultation process followed and record all comments and suggestions received and all issues raised during the scoping process

EIA reporting contains full details of the proposal from the justification of the project, design plans, to project completion and maintenance throughout the project life span.

An EMP identifies environmental impacts, and identifies actions and mitigation methods to reduce, control or eliminate environmental damage.

1.4.3 Submissions

As noted above, the public can submit comments on the proposal and EIA over the 30-day period, commencing from the date of release. All submissions must be in writing and addressed to the National Environment Service, which will be referred to the developer to address or provide feedback.

Community consultations and continuous communication between stakeholders ensure issues are addressed, without delay to the project.

1.5 Public Consultation Process

1.5.1 Relevant Legislation and Policy Requirement

To protect the environment and achieve sustainable development, all projects, plans, programmes and policies deemed to have adverse impacts on the environment require an EIA according to the Environment Act 2003.

The following legislations govern the EIA process in Cook Islands, pertaining to the proposed development.

1.5.1.1 Environment Act 2003

The Cook Islands Environment Act provides a broad definition to the term “environment” – Means the ecosystems and the quality of those ecosystems as well as the physical, biological, cultural, spiritual, social and historic processes and resources in those ecosystems; and includes:

- i. Land, water, air, animals, plants and other features of the human habitat; and
- ii. Those natural, physical, cultural, demographic, and social qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes;

The Environment Act also provides the legal framework for the management of any land prior to development.

It establishes the roles and functions of the National Environment Service (NES), which includes the protection and management of the environment and resources, in a sustainable manner among numerous other functions.

Prior to any major activity being conducted on land and water, the proposed activity must be submitted in a report form to NES. The proposed activity will be considered by NES to identify potential impacts to the environment and in particular:

- i) Adverse effects
- ii) Justification for the use or commitment of depleted or non-renewable resources
- iii) Reconciliation of short term usage and long term productivity of the affected resources

If the impacts are significant, then the proposed project/activity will require a full EIA to be conducted and a corresponding EMP developed.

1.5.1.2 Cook Islands National Heritage Trust Act 1999

An act to establish a Cook Islands Natural Heritage Trust with the necessary resources and powers to investigate, identify, research, study, classify, record, issue, preserve and arrange publications, exhibitions, displays and generally educate the public on the science of, and traditional practices and knowledge relating to, the flora and fauna of the Cook Islands.

1.5.1.3 Cook Islands Dangerous Goods Act 1984

An Act to make provision with respect to the packing, marking, handling, carriage, storage, and use of certain flammable, oxidising, and corrosive materials, and certain compressed, liquefied, dissolved, and other gases. The Act requires promoting public safety in the storage and handling of dangerous goods and is referenced to AS 1940:2004 The Storage and Handling of Flammable and Combustible Liquids.

1.5.2 Planning Process and Standards

On 17 September 2013 Cabinet gave consideration to matters in reference to the Petrocean Anchorage and Pipeline as per the Cabinet Minute CM (13) 0307.

Cabinet agreed that a Government "lead agency" be designated to coordinate the proposal from Petrocean for the construction of an offshore anchorage and over the reef sub-sea pipeline for the discharge of petroleum fuel to on-shore storage facilities in Nikao and that the Ports Authority, Te Aponga Uira, Ministry of Internal Affairs, the Cook Islands Investment Corporation and the National Environment Service be consulted on the proposal.

As a result of the Cabinet directive, a fuel committee was formed to oversee the project and consists of:

1. CEO Ports Authority (Chairman)
2. CEO Airport Authority
3. CEO Cook Islands Investment Corporation
4. Secretary for Infrastructure Cook Islands
5. Secretary for Marine Resources
6. National Environment Services Representative
7. Te Aponga Uira Representative

The Project will embrace the following Standards in the development of design and implementation:

1.5.2.1 Contract Management

The construction works will be monitored in accordance with Conditions of Contract for Building and Civil Engineering Construction NZS 3910:2013.

This standard contains essential commercial provisions to address risks on equitable basis.

1.5.2.2 Pipe Specifications

The pipe material is steel of grade Schedule 40, internally lined and externally coated with HDPE that will be corrosion resistant in the marine environment.

The proposed pipeline has enhanced safety and will endure cyclic loading environments that will be experienced offshore.

1.5.2.3 Concrete Specifications

Concrete will be required for construction of mooring anchor blocks as well as for pipeline anchorage. Cement used will be specific for a marine environment.

1.5.2.4 Reinforcement Specifications

Reinforcement shall comply with AS/NZS 4671:2001 Steel Reinforcing Materials.

Detailing will ensure adequate cover is provided to the reinforcement when integrated with the concrete from corrosion.

1.5.2.5 Fuel Handling

Fuel handling shall comply with AS 1940:2004 The Storage and Handling of Flammable and Combustible Liquids.

This Standard provides requirements and recommendations for the design, construction and operation of installations where flammable or combustible liquids are stored and handled.

1.5.2.6 Pipeline

Pipeline construction works shall comply with AS 2885.1:2007 Pipelines – Gas and Liquid Petroleum.

This Standard provides for the design and construction of steel pipelines for the carriage of petroleum fuels.

2. PROPOSAL NEED AND ALTERNATIVES

2.1 Proposal Justification

LCT Fuel tankers delivering petroleum products to the Nikao Fuel Terminals of PIE, Toa Petroleum and Triad are typically of 3-5,000 tonnes displacement.

These tankers berth alongside at Avatiu Harbour and once secured, the shore crew connects flexible hose to tanker and to the existing onshore underground pipeline.

Existing pipeline is steel of 150mm diameter and approximately 2,000 metres in length. Pipeline is denso-wrapped and cathodically protected.

Unloading Operations are:

- (i) Flexible hose string is connected to tanker manifold and the onshore pipeline,
- (ii) The tanker commences pumping fuel, and in so doing displaces the water/product resting in the pipeline into the shore terminal storage tanks,
- (iii) The tanker discharges each product grade into the shore tanks with the change-over to another product being separated by seawater plugs or with another fuel grade and;
- (iv) Upon completion of the tanker discharge operation, the hoses are cleared with sea water and then disconnected.
- (v) The complete pipeline rests in salt water.

Existing arrangements have the following operational limitations and safety risks:

- a) Pipeline is over 40 yrs old and nearing it's life expectancy and will need to be replaced. Corrosion issues internally (resting in salt water) and externally from damages to pipe coating.
- b) Poor discharge rate due to pipeline length and route alignment, restricting it to approximately 100,000 litres per hour. The longer the fuel takes to discharge, increased risk and vulnerability. The offshore mooring would take half the current time to discharge the fuel.
- c) Port/berth restrictions in draft and length cause congestion and safety risks when tanker is in port.
Port entrance is also a limiting factor and high risk for tanker entry and exit.
- d) Higher landed costs due to restriction in cargo parcels affecting unit freight.
- e) Port congestion and adverse weather will incur tanker delays in berthing and lead to demurrage costs.

PIE is looking to improve security and safety of supply and most importantly significantly reduce landed cost of fuel into the Cook Islands.

To achieve these strategic objectives, PIE in consultation with Petrocean agree that both objectives can only be achieved through increasing the cargo parcel sizes.

Proposal for achieving the objectives require:

- 1 Installation of offshore moorings designed for MRX Tankers of 30-50,000 tonnes capacity.

Moorings will remove all restrictive issues currently experienced with LCT tankers using Avatiu port.

Cargo parcel sizes will increase significantly with direct impact on reduced freight and landed costs.

2. Installation of sub-sea pipeline from offshore moorings to shore storage facilities.

With a shorter length (600m vs 2000m) and larger pipe diameter (200 vs 150mm), the unloading rate will increase significantly and make discharge operations more efficient and improve tanker turnaround time.

With new pipeline specifications, the issue of internal and external corrosion is mitigated.

3. For the Cook Islands to fully utilize the significant cost savings from the use of an MRX tanker, extra storage will be constructed.

PIE will construct a new 2,500 tonne storage tank on their existing property to store aviation fuel only.

TOA Petroleum will also construct additional storage to cater for all Petrol and Diesel needs in the Cook Islands.

Important to note that even without the extra storage, fuel cost saving is a reality.

But the potential for significant savings are only realised with additional storage.

The above activities will deliver private sector development and investment in the Cook Islands to the value of around \$10M NZD.

In addition, the potential savings on the cost of fuel into the Cook Islands is estimated at \$4M NZD per annum.

This Proposal also addresses long term future growth for the petroleum market and provides an opportunity for Triad Pacific Petroleum to be supplied either by PIE or other oil companies.

There is also an opportunity for cruise liners to safely moor, as opposed to the current arrangements where vessel is dragging on its anchors.

2.2 Alternatives

In considering alternatives to the Proposal, the following options were reviewed:

a) Do Nothing

Continuing as we are at the moment is not an option as all operational and supply inefficiencies will remain and significantly worsen.

Landed costs will inevitably continue to rise as shore costs increase, leading to higher energy cost and slow economic growth.

Aging pipeline will lead to leakage.

b) Upgrade existing pipeline

Increasing the pipe diameter to 200mm will only reduce time in port for the tanker and will not have any impact on reducing landed costs as cargo parcel sizes remain unchanged.

All supply and operational inefficiencies will remain unchanged.

c) New onshore pipeline

Constructing a new pipeline running onshore from Nikao to Avatiu port will have serious environmental impact issues over its entire length.

Supply and operational issues remain unchanged and there will be no impact on reducing landed costs.

It is clear from the Alternatives considered that the Proposal for offshore moorings and sub-sea pipeline provides the most advantages and benefits and also addresses the supply and operational issues under the existing supply arrangements.

3. PROPOSAL and DEVELOPMENT DESCRIPTION

3.1 Location

Offshore moorings are located at Areatu Tapere, in the Avarua District. Sub-sea pipeline will run from offshore moorings to the shore in front of PIE terminal at Nikao.

3.2 Staging

Implementation of the Proposal projects will be carried out in several phases:

- a) Procurement – this requires a long lead time for anchor chains, ground anchors, buoys, flexible hoses and pipelines.
Due to the specialist nature of the materials, these will be procured by Petrocean offshore and most probably from France.
- b) Survey – require specialist diving companies to conduct detailed survey of the sea bed to determine the optimum route for laying of sub-sea pipeline.
Criteria for route will be based on least disturbance to the sea bed, least damage to the coral reef and keeping route as short as practicable.
- c) Moorings installation – to be undertaken by specialist commercial diving company.
- d) Pipeline installation – this work will be carried out independent of the moorings installation.
- e) Pipeline commissioning – PIE will carry out commissioning and pressure testing of pipeline and flexible hose string. Once test is successful, PIE will carry out connection of pipeline to the terminal tanker discharge manifold.

3.3 Emergency Management

All project installation work will be carried out offshore and on the shore front in front of PIE terminal and will not impact on routine operations.

As part of the procurement process with contractors, they will be required to have their specific emergency procedures dealing with incidents/accidents during the project implementation process.

3.4 Infrastructure Requirement

3.4.1 Transport

As the pipeline route is located offshore, there will be no disruptions to traffic during the construction phase.

During moorings and sub-sea pipeline installation, access will be available to local fishermen operating in the vicinity. Common sense will prevail to ensure fishermen do NOT venture directly onto the work area as project progresses to avoid accidents.

Site access will be adjacent to the fuel terminal and away from the public transport and pedestrian access will not be impeded.

Pipeline materials will require transportation from the port to the site and it will be the responsibility of the successful contractor to communicate with the Police and Ports Authority to ensure traffic flow along the affected route is safely managed through a cordoned zone or using the route at specific times. Pipeline section lengths will be the only issue for transportation.

Like-wise the use of mobile crane for unloading at PIE terminal at Nikao will be necessary.

Mooring chains and anchors will be loaded onto the work barge from the port and taken direct to site.

There will be ample signage and people control present on the beach where pipes are being welded to ensure the safety of the public and to divert them to alternative routes so they can bypass the work sites.

3.4.2 Energy

Project installation equipment and machinery shall be self-supplying through air compressors and welding plants connected to generators stationed on the work barge.

Necessary welding works on shore will be from diesel powered plants and there will be very little reliance on mains electricity.

Post construction/commissioning will not require any power from mains electricity, as all the power for discharge of fuels will be from the tanker.

3.4.3 Water Supply and Storage

Project construction of moorings and pipelines do not require the use of any fresh mains water.

Sea water will be used for high pressure jetting as well as for pressure testing of pipeline and flexible hose string.

Concrete required for anchorage will be from ready-mix batch plants.

The only fresh mains water required will be for normal drinking and washing by contractor workers, and this will be made available at the PIE terminal where facilities are located.

3.4.4 Storm Water Drainage

Not Applicable

3.4.5 Sewerage

Contractor employees will use existing facilities at PIE terminal as well as facilities on work tug boat and barge when working offshore.

3.5 Waste Management

3.5.1 Character and Quantities of Waste Materials

In the installation of moorings, there will be no waste generated as the anchors and chains will be hydraulically jetted into the sea bed and buried.

Pipeline construction will generate waste from welding consumables and pipe off-cuts. These wastes will be of insignificant quantities and will be collected into a skip at work site.

Pipeline installation will not generate waste.

3.5.2 Solid Waste Disposal

All waste generated and collected in skips at work site will be disposed off at approved rubbish dump/land fill area.

Off cut steel piping waste shall be recycled with waste recycler on the island.

4 ENVIRONMENTAL VALUES AND MANAGEMENT OF IMPACTS

4.1 Land

4.1.1 Environmental Values

4.1.1.1 Soils

The geological structure of the island is of volcanic interior, and fringing reef. The lagoon, created between the volcanic body and the reef, is formed by marine organisms.

Soils of the coastal margin extend from the seaward boundary of the interior uplands to the lagoon beach and include the physiographic units, with associated soils; Estuarine margins (Koromiri soils), beach ridge (Muri soils), poorly drained depressions and flood plains (Vaikai soils), moderately well drained soils (Ngatangia soils), younger flood plains (Ava, Takuvaine and Rutaki soils), older flood plains (Matavera soils), terraces (Pouara and Nikao soils) and fans (Tikioki and Arorangi soils).

At the project construction site areas, it will be sandy beach at onshore end and sandy ground and coral reef at pipeline route.

4.1.1.2 Land use characteristics

The on-shore end of the proposed Moorings and Pipeline project is currently the PIE fuel storage terminal.

Neighbours on either side of the terminal are the Cemetery and the Islander Hotel.

To the front of the terminal is the main ring road and beyond is the international airport.

To the rear of the terminal is the ocean with rocky/sandy beach.

In the same area and locality of Nikao where the terminal is situated are the fuel depots for Toa Petroleum and Triad Pacific Petroleum.

4.1.1.3 Landscape

Where pipeline emerges from the offshore on route to the terminal, it will be crossing the sandy beach, and most of its length will be buried to provide aesthetic appearance and blending with the environment.

4.1.2 Potential Impacts and Mitigation Measures

4.1.2.1 Land use suitability

Proposed tanker moorings and sub-sea pipeline will have no impact on the current land use of the area.

Pipeline crossing the beach will be clearly sign-posted for beach users to be aware.

Beach area in front of the terminal is not used frequently for swimming or leisure.

4.1.2.2 Land contamination

Construction activities on shore may cause disturbance of surface soil from storage of pipeline material and movement of machinery. Project material storage will be in PIE compound. Every precaution will be taken from causing damage to the ground by ensuring adequate packing to keep pipeline material off the ground.

4.1.2.3 Soil erosion

No soil erosion from the implementation of the projects.

4.2 Climate

The Cook Islands weather is typically tropical. Summer is from December to March, and is hot and very with a high rainfall and greater risk of tropical storms and cyclones. Winter is from June to September, and is generally much cooler and drier. In Rarotonga the summer rainy season temperature averages 29° C, and the mornings are often bright and sunny followed by late afternoon downpours.

November to March is classified as the cyclone season. Heat accumulates over the Pacific Ocean during this season leading to weather depression. Climate changes over the years have seen a reduction in rainfall during the summer season that directly impacts on some areas of the Cook Islands experiencing drought.

All mooring off tanker activities are subject to acceptable weather conditions.

4.3 Water Resources

4.3.1 Environmental Values

Rarotonga is a volcanic island and all streams generally fall from a central high point and radiate out around the island. The catchments are very steep and rock bound and more moderate in the lower channels and densely forested with a high runoff coefficient. The streams rise and fall rapidly and at times can initiate small landslides with debris, entering into the water systems.

Tests have been conducted at the water intakes, (outside the intake stream) as well as downstream from the network, and within the network below the intake.

The results show high total coliform, faecal coliform and E-coli counts. Total coliform ranged from a high of 4,423 at Avatiu to a low of 2,702 at Takuvaive with the other intakes falling within the band. Faecal coliform ranged from 384 at Matavera to 81 at Tupapa, with E-coli within a range of 276 at Avatiu and 56 at Tupapa.

Tests of the water within the network showed similar high total coliform (2,306 to 1,397), faecal coliform (388 to 21), and E-coli (237 to 70).

Contamination of the water supplies in Rarotonga consistently does not meet the WHO recommended standards for presence of dangerous bacteria.

4.3.2 Potential Impacts and Mitigation Measures

The construction and operation of the project will have minimal to no impact on the fresh water supply in Rarotonga.

The project has the potential to impact sea water quality and hydrology in the immediate vicinity of the pipeline and moorings when jetting operations are carried out to embed mooring anchors as well as the pipeline into seabed trench.

High pressure jetting will stir up seabed and render surrounding areas in a cloud of silt and sand, but these will settle out pretty quickly and will have little impact on marine life.

4.4 Air

4.4.1 Environmental Values

The air quality around the proposed project moorings and pipeline is of strong sea breeze and clear with no pollution

4.4.2 Potential Impacts and Mitigation Measures

Given the nature of the construction works offshore, the only impact on the air environment will be from the normal tug and barge operation, and these will be of little effect due to the strong sea breeze.

Work on shore will not generate dust and only fumes from welding will be present but are unlikely to be of any significance to the surrounding neighbours and environment.

4.5 Waste

4.5.1 Environmental Values

The design and nature of the projects are such that there will be very little waste generation, as materials will be procured to exact requirements. Mooring chains, anchors, buoys are design specific. Flexible hoses are made to order.

4.5.2 Potential Impacts and Mitigation Measures

Construction waste will be generated from material packaging and these will be disposed off at a registered waste disposal facility.

Other waste such as welding rod ends, offcut piping sections will be disposed off at metal recycler on the island.
Site collection will be by skips.

4.6 Noise and Vibration

4.6.1 Environmental Values

Noise pollution already exists near the site in the form of vehicles travelling on the main road and aircrafts landing and departing Rarotonga from the international airport

4.6.2 Potential Impacts and Mitigation Measures

It is anticipated that the noise resulting from construction vehicles and machinery may impact on the permanent staff working at the site.

The background noise in the vicinity of the pipeline route varies, but is influenced by the operation of welding plants at the foreshore where pipe sections are assembled ready to be towed out to sea.

Installation of subsea pipelines out at sea will be muted as all works will be carried out mostly below the surface and will only happen in daylight hours.

Working hours on shore will be restricted to 0800 hrs – 1800 hrs on Mondays to Saturdays and there will be no work on Sundays.

4.7 Nature Conservation

4.7.1 Environmental Values

The only impact area by the project is in the marine environment on the sea bed and on the reef where pipeline route is determined. Pipeline will follow natural contours and narrow reef passage without damaging corals.
There is no impact on the shore where pipeline traverses.

4.7.2 Terrestrial Flora and Fauna

There are no sensitive or important vegetation in the areas of the proposed project.

Flora on the construction site may be impacted on due to the removal of vegetation for the pipeline from the shore to the PIE Terminal, but this will be kept to the minimum.

The disturbances created during the decommissioning phase will likely lead to a loss of floral species within the working area.

However, due to the site being surrounded by large areas of natural vegetation as well as the fact that no sensitive species are present on site, it is anticipated that the loss of flora within the working area will not

result in a disruption to the ecological functioning of the site and surroundings.

Due to the loss of species diversity within the working area, it is recommended that the disturbed areas be rehabilitated with indigenous species as far as possible and that a weed eradication program is implemented to curb the spread of weedy species following decommissioning. It is anticipated that the impact on loss of flora (natural vegetation) will be of low significance.

4.7.3 Aquatic Biology

Seaweeds or algae are marine plants that form the basis of a complex food web involving all the organisms living within a coral reef ecosystem. Seaweeds are eaten by fish, molluscs and crustaceans, which in turn are eaten by other usually larger animals.

Seaweeds convert sunlight and dissolved nutrients into energy rich organic compounds that other organisms can eat. They also produce oxygen that all animals need to breathe and provide shelter and protection for many organisms.

Invertebrates

Trochus and clams are two of the important economic and food invertebrates. Trochus are harvested in Aitutaki for export to Europe where they are made into buttons and other ornaments. Clams are considered a delicacy in many island communities. Neither of these species are located in the vicinity of the proposed project

Corals

Coral reefs are composed of millions of tiny (one millimetre or so) soft bodied animals that are closely related to jellyfish and sea anemones. Unlike those animals however coral polyps produce a hard skeleton of calcium carbonate. Soft corals have tiny limestone crystal structures (spicules) embedded in their tissues. The polyps feed on small usually microscopic animals called zooplankton that float in the water column. The small stinging tentacles of the polyps are used to spear zooplankton.

Corals also get a large amount of their nutrients from tiny plants (algae called zooxanthellae) that live within the tissue of the polyp. The algae use the coral's waste products, which in addition to sunlight enables them to photosynthesise vital nutrients, which are then leaked into the surrounding tissues of the coral polyp. The relationship is beneficial to both the coral polyp and the algae. Because coral polyps rely on these small plants that need sunlight for photosynthesis, most corals grow in shallow and clear water.

Hard corals are largely responsible for building reefs when they die their skeleton remains. Coral reefs in the Pacific are the result of millions of years of growth with additional material from calcareous seaweed and shells that are found on reefs.

Echinoderms

Echinoderms include all sea cucumbers, sea stars, brittle stars, feather stars and sea urchins. All echinoderms have tube feet with suction cups that hydraulically expand and contract, giving the animals the ability to move about. Echinoderms feed on microscopic organisms that live in the sand or on dead coral.

Sea cucumbers are important to the marine environment because they scavenge on the reef and turnover the sand on the lagoon floor preventing the build-up of decaying organic matter that would otherwise be locked up under layers of sediment.

There are eleven species of rori in the Cook Islands. The most common species are the rori-matie (green sea cucumber), the rori-puakatoro (red surf fish) and the rori-toto (sandy sea cucumber)

Examples of sea urchins in the Cook Islands are atuke, kina and vana. These animals have spines that move in many directions. The spines serve as a defensive weapon. On the underside of the urchin, the spines are used along with the tube feet for movement. The mouth is also underneath and most sea urchins feed on algae small molluscs and other invertebrates.

Basic Information on the Marine Resources of the Cook Islands Produced by the Ministry of Marine Resources Government of the Cook Islands and the Information Section Marine Resources Division Secretariat of the Pacific Community (SPC)

A Brief Overview of the Marine Environment for Each Individual Island: Rarotonga

“..... There are three main land divisions on Rarotonga called vaka. The largest one to the south and southeast is Takitumu, which includes the villages of Titikaveka, Muri and Ngatangia. Te-Au-O- Tonga district lies to the northern side of the island and is centered on the villages of Avatiu and Avarua. The third district is that of Puaikura in the Arorangi area. These three areas are further divided into tapere. A chief (Mataiapo or Rangatira) manages each subdivision. The fringing reef defines the lagoon, which is broad and sandy to the south, and narrow and rocky on the north and east. Compared to those of the atolls, the lagoon surrounding Rarotonga is quite small, covering eight square kilometres. In most areas the lagoon is relatively shallow. The marine environment of Rarotonga has been affected by human activities in several areas. Coral is smothered by eroded soil and other material (e.g. pesticides, plastic containers) washed into the lagoon; man-made structures alter the lagoon environment by affecting current flows; and heavy fishing of most of the edible resources may have caused the noticeable decline of many marine animals. However, most areas still have healthy coral and support large numbers of fish and shellfish.....

“...The Cook Islands Natural Heritage Project has identified around 1,000 reef invertebrate species in Rarotonga. Some of the harvested invertebrates include pa’ua (giant clams), ariri (turban snail), rori (sea cucumbers), vana, avake and atuke (sea urchins). It has been estimated that 70% of residents over 15 years of age search the reef for food or go fishing at least once within the year. A number of aquatic species have been introduced to Rarotonga including, trochus, tilapia and fresh water prawns (*Macrobrachium rosenbergii*). Populations of tilapia are abundant in freshwater streams and are occasionally consumed. Trochus are well established on the reef-flats and lagoon. There has been a considerable amount of

impact from the introduction of modern fishing gear and methods and also from increases in demand for seafood. Monofilament gill nets and SCUBA spear fishing are examples of very efficient modern techniques. Stocks of invertebrates such as giant clams, kuku (mussels) are reported to have declined. Reasons for the decline are not certain, but are thought to be due to high fishing pressure coupled with land runoff. Several Acts have been passed to protect the Cook Islands marine environment. These include the 'Ministry of Marine Resources Act 1984' the 'Marine Resources Act 1989' (and amendments 1990, 1991), the 'Rarotonga Environment Act 1994-95' and the 'Prevention of Marine Pollution Act 1998'. In Rarotonga, ra'ui (traditional community based management systems) have recently being implemented to safeguard marine resources from further decline and for communal use....."

4.7.4 Potential Impacts and Mitigation Measures

Route selection for the pipeline will minimise physical impact on the coral and marine life on the sea bed. The pipeline diameter of nominal 200mm provides a very small area on the sea bed and insignificant to impact life on the sea bed.

Jetting operations where necessary creates a temporary cloud of sand mixed with water which will settle out very quickly and will not pose any threats to marine life on sea bed nor to the fish.

Post construction, the pipeline where exposed will act as a fish aggregation mechanism.

4.8 Cultural Heritage

4.8.1 Environmental Values

There are no direct cultural heritage impacts along the pipeline route nor at the tanker moorings and with the old Mobil sea pipeline in Avatiu.

4.8.2 Potential Impacts and Mitigation Measures

Areas and places of cultural significance around the project site have been identified:

- Returned Services Association
- Public Cemetery

The construction works will be carried out at a distance from these sites. Project information will be shared with relevant custodians to inform them of the work to be carried and that there would be no direct impact to these sites.

4.9 Social

4.9.1 Environmental Values

The island of Rarotonga is the main and most populated island, with a population of 13,097 (census 2011), out of the country's total population of 17,791. Rarotonga houses the centre of Government, Government Ministries and is the commercial hub of the nation. Entry and departure to the other islands is through Rarotonga via the international airport in Nikao and main port at Avatiu.

Tourism, offshore banking, marine resources and agriculture are the largest industries in the Cook Islands. Tourism in particular has experienced unprecedented growth over the last few years, with over 130,000 visitors per annum and continues to grow.

The project work sites will have very little impact on the surrounding airport, businesses and recreational activities.

The majority of the work will be carried out offshore.

4.9.2 Potential Impacts and Mitigation Measures

Significant noise from welding plants and machinery when work reaches the shore for connection to PIE terminal, and may impact on nearby premises. Work will be carried out during the day to minimise noise impact, and will blend in with normal road traffic and aircraft movement noise.

Very little dust will be generated from planned works.

The beach front in front of PIE terminal where pipeline comes ashore is not being used for any significant recreational activities.

Project will have very little impact on Rarotonga utility services.

4.10 Health and Safety

4.10.1 Environmental Values

During construction, machineries and equipment will be used on site. This increases the possibility of injuries and the responsible contractor must ensure that all employees are briefed about the potential risks of injuries on site. The contractor is further advised to ensure that adequate emergency facilities including first aid kits are available on site.

All Health and Safety standards should be in accordance with AS/NZS 4804:2001 Occupational Health and Safety Management Systems and relevant local Regulations.

4.10.2 Potential Impacts and Mitigation Measures

Equipment, machinery and materials stored and operated on site shall be secured in a fenced compound and safe guarded by security personnel at all times.

4.11 Economy

4.11.1 Environmental Values

The Proposal provides an opportunity to change the economy of the Cook Islands in several ways:

- a) Unloading of petroleum fuel is removed from the congested Avarua port to an open environment offshore moorings. This will remove the associated hazards and safety risks in handling fuels for all port users.
- b) Discontinuation in the use of existing 2000m long pipeline that is approaching it's end of useful life and will become an environmental and public safety risk.
- c) Cost efficiencies specific to landed cost of fuels will have a direct and immediate impact to all fuel consumers, particularly the aviation industry. Economic growth in the Tourism industry with reduced travel and production costs.
- d) Removing existing supply and operation inefficiencies.
- e) Consolidating the total petroleum supply into Cook Islands to achieve economy of scale and reduce fuel prices.
- f) Opportunity for the existing three (3) fuel suppliers to utilise new facilities and pipeline to achieve safety targets in operations, storage and handling
- g) Enhances environment protection within Avarua port confines.

4.11.2 Potential Impacts and Mitigation Measures

Tanker moorings offshore will be designed for large size medium tankers up to 50,000 tonnes dead-weight, which will have the capacity to supply all three (3) fuel operators in the Cook Islands.

Cargo parcels will increase significantly to 3-5,000 tonnes compared to the existing 1,200 tonnes. Annual visits will be halved for MR's from 5-6 in comparison to LCT's at 9-10.

This provides supply efficiency that will directly impact on significant reduction in landed costs.

Consolidating bulk fuel supply will negate the use of supply through iso-tanks which are very expensive and inefficient through operational handling and storage and will improve port congestion of container storage and handling.

A shorter and larger diameter pipeline will improve pumping capacity discharge and makes operations on shore more efficient. The discharge rate would be at about 500 – 800 cubic metres per hour, compared to the current 100 cubic metres per hour.

The sub-sea pipeline being constructed is of special piping material with enhanced environment protection provides a safer operation compared to the existing underground pipeline that runs parallel with the main road.

Having a dedicated tanker mooring provides the Port with more capacity for other shipping and removes the environmental and safety risk associated with tanker operations in port.

A petroleum fuel spill in the port will be confined and poses a safety risk. A petroleum fuel spill at tanker moorings will be exposed to the wind, tide and sun which will ensure fuel is rapidly dissipated and make the environment safer and cleaner.

Under current arrangements, the Lead on marine petroleum fuel and oil spill is the national body that coordinates response with Ports, Oil companies, NES and other Govt departments. Oil companies have limited spill equipment that can deal with minor spills from leaks during hose connection failures.

Oil tankers carry oil spill dispersants and in some cases booms that can be rapidly deployed to contain petroleum fuel spills from hose connection failures. In conjunction with shore company response, spills can be contained or dispersed should petroleum fuel spill threaten to come ashore. First response is always to shut down the source of petroleum fuel leak and then monitor the spill's projected path.

Tanker operations will be identical to existing operations.

Flexible hose string is retrieved from the sea bed and connected to tanker manifold.

Fuel is pumped from tanker displacing sea water resting in the pipeline into shore slops tanks until fuel is detected and then diverted to the appropriate storage tank.

At the end of fuel transfer, the pipeline and hoses are cleared of remaining fuel by sea water. Pipeline is then allowed to rest in clean sea water

Shore slops tanks and product tanks are then allowed to settle before draining away water into Separators.

Offshore moorings provide an opportunity for cruise liners to safely anchor when calling into Rarotonga. This will prevent vessel from dragging it's anchors and damaging the marine environment.

As well, other larger vessels will be able to use moorings when awaiting entry into the port in a safe environment.

Project provides stimulation of the economy through flow-on effect of lower fuel prices (eg electricity tariff, tourism travel, inter island shipping) creation of employment during the construction phases, increased investment in

onshore storage tankage to cater for larger cargo parcels and supply security in the event of tanker delays, supply disruption through adverse weather conditions and for future growth.

Project investment will be just under US\$2.0 M dollars

High level cost savings on cargo freight is US\$120.00 per tonne (current freight cost average US\$200.00 per tonne vs MRX freight rate of US\$80.00) and for the total Cook Islands petroleum fuels of 24,000 tonnes per annum, then the potential cost savings on freight is US\$2.8 M per tonne.

There will be other potential cost savings that will flow on from the completion of project.

Final and detailed cost savings will be determined once go ahead is given for the project, as engineering design and procurement costs can only be finalised with project going forward.

4.12 Hazards and Risk

4.12.1 Environmental Values

Hazards and risks from constructional activities will come from material handling, machinery and equipment movements and work processes. Contractor employees and the public shall be protected from these constructional activity hazards.

There are no fresh waterways to be affected by construction activities. Marine environment shall be safe guarded from contamination resulting from constructional activities.

4.12.2 Potential Impacts and Mitigation Measures

Work site on the beach area will be barricaded during construction activities to warn the public and ensure they take diversion routes that are sign posted. This diversion shall be applicable only during construction activity.

Employees will follow contractor PPE and safety policies during construction. Work processes shall be followed to ensure there is no contamination of the environment.

Adequate safety and warning signage's shall be posted around the work sites as a daily reminder to all contractor employees, visitors and the public.

4.13 Erosion Control

4.13.1 Environmental Values

The only land use affected by the project is during embedding of pipeline on the beach rising towards PIE terminal boundary.

No beach material will be removed from site.

4.13.2 Potential Impacts and Mitigation Measures

The clearing of vegetation, as well as the exposing of soil during the on shore pipeline works may lead to erosion of these surfaces due to rain and wind.

It is anticipated that this impact will be of minimal significance.

4.14 Storage and Handling of Dangerous Substances

4.14.1 Environmental Values

Dangerous Goods Regulation in the Cook Islands govern procedures on storage and handling to ensure substances stored on site for use during construction will not pose any safety risk nor environmental hazard.

4.14.2 Potential Impacts and Mitigation Measures

Safety is of primary importance in the fuel industry and PIE maintains a high standard of safety and adheres closely to its safety policies as well as its operational procedures to ensure compliance with DG Regulations.

There will be no chemicals stored on site, and all petroleum based substances and fuels will be safely stored in PIE terminal storage.

5. **ENVIRONMENTAL MANAGEMENT PLAN (EMP)**

Objectives of the EMP are to detail the protection of environmental values that will be impacted by the Project during construction and during operations.

Environmental issues raised in EIA report are tabulated below:

Environmental Issues	Details	Risk Rating	Mitigation
Community Relations & Amenity	Excessive noise, dust and traffic congestion.	Medium	Inform the local communities of the type of operation and provide contact details of any concern. Adhere to Contract specifications on times of operation. Public will be advised on the proposed working hours for the construction works.
Air Quality	N/A		
Noise	Annoyance and disturbance.	Low	Maintain all equipment in good working order. Maintain normal working hours of 0800 – 1800 No Sunday work
Flora Disruption	N/A		
Soil Erosion	N/A.		
Construction Waste Generation	Welding consumables and pipe offcuts	Low	Use industrial skips for collection of waste Disposal at approved dump and use recyclers
Surface and Groundwater Pollution	N/A		
Soil Contamination	N/A		.
Hazardous Materials	Handling of hazardous materials, fuels and chemicals can result in fire, loss and health hygiene.	Low	Proper storage and handling procedures
Safety and Security	Earth moving equipment and machineries used on the construction site	Medium	Site compound to be securely fenced and patrolled by security after hours Safety and warning signs to be displayed
Visual Impact	Eye sore to the public	Low	Most of the work is done offshore
Cultural Heritage	N/A		The construction works do not impact on any known cultural/heritage sites

Environmental issues being considered at the planning, design and construction phases are addressed below:

PLANNING		IMPLEMENTATION	
Environmental Issues	Compliance & Best Practice Requirements	Procedures	Responsible party
Air Quality	N/A		
Noise	<ul style="list-style-type: none"> All machinery exhaust mufflers and reversing alarms in good working conditions, engine servicing Compliance with approved working hours 	<ul style="list-style-type: none"> Daily and weekly check of all machineries Time restrictions - Sunday: no construction works 	Project Manager Contractor
Traffic Management	<ul style="list-style-type: none"> Supervise delivery of plants & heavy machineries on site to minimise damages, accidents & losses. Manage parking & servicing yard safely away from community access 	<ul style="list-style-type: none"> Ensure dump trucks & machineries use designated access routes Trucks and machinery hazard lights and warnings are in good order for night works Advise the local community of any unusual activity that might affect access to their properties 	Contractor
Dust	N/A	<ul style="list-style-type: none"> Work carried out on beach and offshore 	Contractor
Community Liaison	Keep community aware and fully informed of proposed works and any activity that would impact amenity (e.g. tree cutting)	<ul style="list-style-type: none"> Keep a register of all property owners closely related to the work site Advanced consultation with the local communities and prior warning on actual construction dates Develop a traffic user methods and road repairs format for temporary road accessibility 	Project Manager Contractor

Complaints	Complaints are to be logged and corrective actions taken promptly and documented	<ul style="list-style-type: none"> Record all details of issues and complaints (person, date, time and nature of the complaint) Promptly carry out corrective action 	Project Manager Contractor
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Noise

PLANNING		IMPLEMENTATION	
Environmental Issues	Compliance & Best Practice Requirements	Work Instructions	Responsibility
Noise emission from site activities	Development consent and Conditions of Contract and specification	<ul style="list-style-type: none"> Time restrictions No Sunday work Document complaints and corrective action taken 	Project Manager Contractor

Construction Waste Generation

PLANNING		IMPLEMENTATION	
Environmental Issues	Compliance & Best Practice Requirements	Work Instructions	Responsibility
Construction waste	Development of consent and Conditions of Contract and specifications	<ul style="list-style-type: none"> Industrial skips for collection of waste 	Project Manager Contractor
		<ul style="list-style-type: none"> Waste to be dumped at approved sites or recycled 	

Hazardous Material

PLANNING		IMPLEMENTATION	
Environmental Issues	Compliance & Best Practice Requirements	Work Instructions	Responsibility
On-site storage of fuel for machinery	Requirements of the D G Regulations	<ul style="list-style-type: none"> Avoid smoking or use of open flame near fuel containers Fuel containers to be securely closed at all times Clean up any fuel leaks drips during refuelling of machinery 	Contractor

Safety and Security

PLANNING		IMPLEMENTATION	
Environmental Issues	Compliance & Best Practice Requirements	Work Instructions	Responsibility
Earthmoving equipment movement and operation	Best practice in OHS	<ul style="list-style-type: none"> Ensure that adequate emergency facilities, including first aid kits, are available on site 	Contractor
Equipment to be housed and secure from criminal activities		<ul style="list-style-type: none"> Site to be fully fenced off from the public Employ security personnel 	Contractor

Visual Impact

PLANNING		IMPLEMENTATION	
Environmental Issues	Compliance & Best Practice Requirements	Work Instructions	Responsibility
Eye sore of construction site	Not applicable	<ul style="list-style-type: none"> Visual impacts could be limited through keeping the site clean and orderly at all times 	Contractor

Environmental Issues arising from the Commissioning Process and post construction Operations

	Environmental Issues	Impacts	Risk Rating	Mitigation
	Fire and Explosion	Fire during the unloading of fuels that may have an impact on surrounding premises and human life.	Low	<i>Tanker will have it's own fire protection system that can extinguish fires on deck. Terminal procedures will ensure risks are eliminated during unloading</i>
	Product Spillage	Spillages on site can cause adverse effects to human life and to the environment.	Low	<i>Identify, isolate and contain spilled product and activate emergency spill procedures</i>
	Cyclones	Cyclones can cause destruction which will have adverse effects to human life and to the environment.	Low	<i>Subsea pipeline and hoses will be resting on water on sea bed and will not be duly affected.</i>

				<i>Moorings will not be used from when cyclone warning is issued.</i>
	Ground Water Contamination	Toxicity and pollution can cause marine pollution from drainage outlets and contaminate water unfit for ordinary use.	Low	<i>Ensure that all drainage from operating areas are separated from normal surface water runoff and oil water ends up in the separator system for treatment and collection for recycling.</i>
	Health and Safety	Exposures can lead to dermatitis, inhalation can cause dizziness and ingestion can cause burning sensation	Low	<i>Proper training of employees is required and in accordance with operating procedures</i>
	Waste generation	Oil spills can cause pollution to the area	Low	<i>Oily materials used in maintenance and spill clean-up shall be stored in leak proof containers and disposed of appropriately.</i>
	Pipeline sabotage	Sabotage of the pipeline as the location is away from busy areas, not suitable for fishing or swimming.	Low	<i>Inspection of all pipelines during the week before each tanker discharge operation.</i>
	<i>Pipeline leakage</i>	<i>Product leakage during discharge.</i>	<i>Low</i>	<i>Pipeline and subsea hoses will be inspected and pressure tested regularly as per SOP.</i>

Following successful commissioning of mooring facilities and sub-sea pipeline, PIE will assume total responsibility for continual monitoring and implementation of the EMP to ensure all environmental issues as identified in the EIA are managed satisfactorily.

PIE will develop specific operating procedures (SOP) for the tanker moorings and sub-sea pipeline and their interface with the terminal operations. Specific EMP ongoing plans will address:

- a) Regular inspection and pressure testing of flexible hoses and pipeline. Mooring chains and anchors will also be inspected for wear and possible displacement from original bedded positions.
- b) Develop safe mooring criteria and restrictions in use during adverse weather and climatic conditions.
- c) Monitoring of the EMP and reporting of non-compliant issues that arise for corrective action to be taken and documented
- d) Provide training to employees in the management of the EMP and processes

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PONIA, B., K. RAUMEA, N. ROI., N. MAKIKIRITI & T. TURUA. (1999). *Inshore Invertebrate Resource Assessment of Rarotonga Island. October 1998. MMR Miscellaneous Report: 99/16*.

7. APPENDICES

a. TOR for this EIA

[Made available as a separate document]

b. Contacts

Rairi Designs
C/o Daryl Rairi
PO Box 3024
Avarua, Rarotonga
COOK ISLANDS
Ph: (682) 20 398 Mb: (682) 55 064
Email: daramide@oyster.net.ck

Reviewer and Engineering Sign off:

Envirocare & Engineering Consult Ltd
C/o Tu'ulemaaga Fereti Filipe
32 Flinders Rd
Christchurch
New Zealand
Ph: +64 273578251 or +685 772 8989
Email: feretifilipe13@gmail.com

The approved and signed project permit must be issued to:

Toa Petroleum
C/o Edward Herman
Nikao
Rarotonga
Ph: (682) 27 001 Fax: (682) 28001 Mob (682) 55455
Email: manager@toapetroleum.co.ck

c. Specialist Studies

A feasibility study report was carried out by Captain Bernard Baudry, Marine Consultant back in June 2014.

The purpose of the study was to determine the practicality and suitability of the offshore sites for placing of moorings and subsequent subsea pipeline at the designated locations within the Port boundaries.

[Made available as a separate document]

d. Consultation Reports

FUEL COMMITTEE

No	Questions	Response
1	We question whether there is adequate bulk fuel storage on Rarotonga to justify the economics of direct MR shipping. Considering the size of the ships proposed (45,000 and 50,000 metrics tonnes), even a 50% discharge roughly equates to the total annual fuel volume of Cook Islands. Will this project include building new bulk fuel storage tanks on shore? How will the suppliers deal with the increased risk of fuel going off-spec if left sitting in storage tanks for too long a period?	Rarotonga has total volume storage of 5000 metric tonnes, with current annual fuel volumes revised at 24,000 metric tonnes. In conjunction with the project, there will be additional storage to be built, and this can only happen if the MR tanker project is approved. Jet fuel has a shelf life of 6 months and then will need to be recertified. Given the frequency of MR tanker voyage for Tahiti, Rarotonga will be supplied on 2-3 months cycle, so there is no danger of fuel products going off-spec from prolonged storage.
2	Will all the current fuel importers be using the MR? If not, there is a potential for some suppliers to be driven out of business and perhaps seek recourse from the government.	The proposal offers an opportunity for consolidation of fuel supply through various supply agreement options that each of the companies can enter into. It is an opportunity for the fuel companies to be more efficient and reduce costs.
3	The Toa minimum payment issue will be with Cook Islands for the next few years. How will this new arrangement impact on that?	TOA Petroleum agreement with Govt will be finished before the Project is fully implemented and therefore become irrelevant
4	How will this project impact on fuel supplies for the outer islands? Is there potential for MR economics to be passed on to Aitutaki and the outer islands?	Price of fuel is dependent on the fuel price tribunal through the Ministry of Internal Affairs. Any savings made to the distributors in Rarotonga will have a flow on beneficial effect to outer island consumers.
5	What do Petrocean want in return for their investment? For how long?	The investment is for supply and PIE will continue to utilise Petrocean as it provides the least cost option.
6	Is there potential for Cook Islands to evolve into a monopoly supply situation?	Each distributor has economic freedom to source from the many possible suppliers in the region including Matson, PDL, Mobil, Total, PESWP and other suppliers. If anything, importers will have more choice and will be in a favourable position to take advantage of competitive pricing. Importers can still ship via tank-tainers or smaller tankers as and if they choose, there is no monopoly on delivery of fuel to the Cook Islands.

7	Assuming that there will be economic benefits to the MR project, what mechanism is in place to ensure that the bulk of those savings will be passed on to the Cook island people and businesses?	The MR delivery option will provide the lowest landed cost compared with the other delivery supply options existing. Fuel pricing is managed by the Tribunal
8	The sketchy plan that we have seen mentions that the new anchorage may be suitable for cruise ships? Is this a real possibility? What would be the economic impact on the Cook Islands if this happened?	The mooring facility is available to be used by the cruise liners if they wish, however that is a decision each liner will make in consultation with the Port Authority. The mooring itself presents a real opportunity to increase cruise ship visits. The internationally recognised mooring displayed on marine charts offers cruise liners safe anchorage and encourages stopover.

TRIAD PACIFIC PETROLEUM

No	Questions	Response
1	Why can't we use our existing two pipelines we have?	PIE's land pipeline is 40 years old and is almost at the end of its useful life. However, the pipeline will remain as a contingency measure. TRIAD's pipeline has not seen use since 2012 when it was built. The proposed marine pipeline by Petrocean offers significant economic delivery over current deliveries which logically cannot be ignored.
2	Extra storage capacity, if there is no storage capacity then there is no use of using and MR Tanker, the storage capacity in the terminal is 500,000 litres, I have 300,000 litres stored now	Logically the way to take advantage of bulk fuel delivery is to match it with sufficient storage balanced by demand. To this extent PIE has a proposal before the Airport Authority for the construction of a 3.8 million litre Jet fuel tank. This tank is expected to meet current and future demands at least for the next 20 years. There is significant savings in costs for the supply of fuel from the MR Tanker.
3	Triad has a current contract with Te Aponga Uira which we need to supply fuel regularly to keep up with the demand. Waiting 45 days for the MR Tanker we will not be able to keep up with the demand, we must maintain our reserves.	Triad does NOT supply TAU and only provides hosting on behalf of PIE TAU requires more storage for supply security and this is where Triad will need to invest in or PIE will look to other sources for storage and hosting.

4	Renewable energy projects are currently being implemented in the Cook Islands, fuel consumption will decrease.	Indeed renewable energy is increasing in the Pacific. Never the less fuel will still continue throughout the region such as transport and aviation use. For example, within the Cook Islands, the transport sector requirement constitutes 80% of total fuel demand. Renewable energy in this sector is still a work in progress for the future.
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TOA PETROLEUM

No	Questions	Response
1	TOA Petroleum supports your proposal, there are benefits for TOA Petroleum and to the people of the Cook Islands	Noted
2	Who owns the fuel?	Each supplier will own the fuel depending on the supply agreement entered into with PIE
3	What is the time line of the project?	Petrocean is ready to commence with full engineering plans and procurement process once EIA is approved
4	We would like to be advised on the price of the fuel such as a formula based on MOPs. Also costs for the Usage of the proposed pipeline	PIE will send a pricing template to you, which will indicate all the cost parameters based on MOPs Singapore.

Telpukarea Society

No	Questions	Response
1	How is the seawater discharged into the pipeline?	The MR Tanker pumps the seawater into the pipeline to PIE's interface tank at its terminal.
		Sea water eventually discharged via a separator to separate the hydrocarbons from the seawater. The lagoon is periodically tested for hydrocarbon levels by an independent organisation. At present the lagoon is pristine clear.
2	What type of fuel will be on the tanker ?	White products including diesel of low sulphur, petrol and jet fuel.

3	How do Triad get their fuel?	The Petrocean proposal is ideal for the 3 local distributors especially because all three distributors (Triad, PIE & TOA) are currently connected by a common fuel pipeline. With the proposed new pipeline, all the companies will be connected.
4	What happens during cyclonic conditions?	The proposed pipeline is protected from cyclones as it is resting on the sea bed, anchored and filled with sea water.
5	What happens if the pipeline is damaged ?	Since sea water is in the pipeline there is no impact to the environment, should there be a leak.
6	What about the fishermen?	The mooring systems acts like a Fish Aggregation Device (FAD) which fishermen can take advantage of. So not only will it attract bait fish but pelagic species as well. The Mooring will be fitted with lights and fluorescent labelling to make it visible both day and night. It also provides safety platforms in the event local fishermen are stranded or suffer difficulties.
7	Will the proposed buoys be prone to damage ?	No, as the buoys are made of steel or composite material
8	What about the fuel discharge operations in New Caledonia?	Two separate studies were carried out for New Caledonia before finalising the proposal. They have advanced this proposal within 6months compared to the Cook Islands which thus far has been 3 years. Seabed conditions were different to Rarotonga's proposal which was more difficult. Rarotonga's seabed is perfect for this proposal. There are similar operations in Apia, Samoa and Vuda Point in Fiji.
9	The pipeline materials?	The pipeline materials are specialised materials that prevent corrosion from sea water and more durable.
10	A report was prepared by the University of New South Wales on Coastal Adaptation Needs for Extreme Events and Climate Change, Avarua, Rarotonga, Cook Islands	<i>NOTE: The report was reviewed along with the Climate Risk Assessment for Ports and Connected Infrastructure also prepared by the University of New South Wales, relevant information was Incorporated into this EIA report.</i>

Rarotonga Fishing Association

No	Questions	Response
1	What are the depths for anchorage?	Mooring draft will be in the vicinity of minimum 15.0m
2	How many tonnes is the MR Tanker	50,000 tonnes deadweight
3	When the MR Tanker comes in for discharge, how long does it stay?	On average 24 hours
4	What type of pipe will be used?	Special material that is non corrosive from sea water and durable with high pressure capacity
5	What is the size of the pipeline	200mm diameter
6	How is the pipeline anchored?	At sandy areas, pipeline will be buried and at areas where ground is hard and at coral reef areas, pipe saddle anchors will be used and route alignment will try to minimise impact on coral reef.
7	What happens when the pipeline is not in use?	The pipeline rests in salt water and blanked off at ends.

Airport Authority

No	Questions	Response
1	If this tanker proposal will not involve aviation fuel, and the discharge pipeline will not pass on airport land then we have no issue	The tanker proposal involves delivery of aviation fuel as well as other products from sea to PIE's terminal and to other distributors.
2	We will make our position known when we see all environmental concerns are catered for in the event of a spill in the lagoon or on airport land. Further more assurance is needed that this would translate to lower fuel prices to the airlines	All environmental issues and the management of the issues will be described in the Environmental Management Plan. The proposal guarantees cheaper fuel for the Cook Islands compared to the existing arrangement for fuel delivery to Rarotonga

Submission from the UI-ARIKI and KOUTU NUI of the Cook Islands following meeting and discussions held with PIE and Toa Petroleum representatives.



ARE ARIKI E TE ARONGA MANA O TE KUKI AIRANI
ORAMA: "E Taiki-rapa-tu, ka rama i te marae nui o taku ui-tupuna"

Teripōni: (682) 26508
Kaumaiti: # 54084
Karāka: # 54080
Imere: uiariki@oyster.net.ck

Opati o te Ui Ariki e te Aronga Mana,
Atupare Marae,
Arorangi,
P.O. 764,
Rarotonga
KUKI AIRANI
24/4/15

Mr Mark Vaikai,
Country Manager – Cook Islands,
Pacific Energy SWP Limited,
COOK ISLANDS

cc:
Okirua Apera
C/- Transam Cook Islands,
Rarotonga, Cook Islands

Brett Porter,
Director,
Toa Petroleum,
RAROTONGA

Dear Vaikai,

Kia Orana i te aroa tumatātini o to tatou Atu.

Re: **Petrocean Fuel Project Proposal**

Allow me at the outset on behalf of the Ui-Ariki & Koutu Nui of the Cook Islands to thank you and your team for giving us the Executive members of the House of Ariki and Koutu Nui the courtesy to view and listen to your endeavour in pursuing for an alternative to import fuel into our country.

Based on the documentation, the dialogue and the illustrative presentation by your team, as well as the public reactions, the House of Ariki & Koutu Nui submits:

THAT:

1. The project has socio-economic merits that will permeate and impact the various levels of our society;
2. At the outset, your traditional leaders, our people and the wider community have reservations about the potential environmental impacts of the project, and in particular were;
 - i. The container-ship accidentally being wrecked on our reef;
 - ii. Oil spills and toxic substances polluting our environment;
 - iii. The operations of this project harming marine life-forms, the reef and land-based biodiversities.

AND THAT:

1. We your traditional leaders, being customary guardians of our islands and ocean,

2. Having properly been clarified by your team with the historical data on past and present day similar operations in the Pacific, the different phases of the operations, the safety and precautionary mechanisms involved prior, during and following any transfer of fuel operations, and the types and quality standards of the materials to be used during the restricted constructions relating to the project;
3. Knowing that the concerns raised above have been addressed by Petrocean to the best of their financial abilities and to world standards, understanding that anything man-made cannot be guaranteed to perfection in the face of nature's elements;
4. We your traditional leaders know that our people and country, particularly our people in the Pa Enua have continued to suffer badly for too long in every form and manner from all fossil-fuel related activities in trying to improve our wellbeing;
5. The well-being of our people being a part of the customary and statutory responsibility of your House of Ariki & Koutu Nui;
6. In continuing to share the concerns of our people -

HEREBY PROVIDE THAT:

1. We offer the support of the House of Ariki and Koutu Nui to Petrocean Limited to proceed with this project at their earliest;
2. And further recommends to the appropriate authorities to consider granting Petrocean the right to proceed with this project;
3. The basis of this support are as follows:
 - a. Petrocean to maintain the prescribed international monitoring and safety standards throughout the term of their operations;
 - b. Petrocean to furnish regularly a hard copy of their safety standard operations report to the House of Ariki & Koutu Nui, preferably annually;
 - c. That Petrocean Limited agree to finance a privately contracted person or company of the House of Ariki & Koutu Nui's choice, to undertake specified marine and land related survey around and at the immediate area of this project - at the commencement of the constructions and every 3 years thereafter.

The Findings of this survey will be made available by the House of Ariki & Koutu Nui to Petrocean and the appropriate Government authorities and stakeholders.

I wish you all the best,

Thank you,

Tou Travel Ariki,
KAUMAITI NUI (President)

Cabinet minute in respect of proposed project



GOVERNMENT OF THE COOK ISLANDS
OFFICE OF THE CABINET SERVICES
GOVERNMENT BUILDING
RAROTONGA, COOK ISLANDS

MEMORANDUM

DATE: 17 September 2013

TO: Secretary, Ministry of Internal Affairs
Director, National Environment Service
Chief Executive Officer, Cook Islands Investment Corporation
Chief Executive Officer, Ports Authority
Chief Executive Officer, Te Aponga Uira
Public Service Commissioner, Office of the Public Service Commission
Chief of Staff, Office of the Prime Minister
Solicitor General, Crown Law Office
Financial Secretary, Ministry of Finance and Economic Management

SUBJECT: PETROCEAN ANCHORAGE AND PIPELINE

At a meeting held on Tuesday, 17th September 2013, Cabinet gave consideration to matters relevant to your Ministry in reference to the above-mentioned subject.

CM (13) 0307

Paper dated 10 September 2013

Submitted by the Hon. Mark Brown, Minister of Finance

Agreed

1. that a Government "lead agency" be designated to coordinate the proposal from Petrocean for the construction of an offshore anchorage and over-the-reef undersea pipeline for the discharge of fuel to the Pacific Energy storage facility in Nikao.
2. that the Ports Authority, Aponga Uira, Ministry of Internal Affairs and Cook Islands Investment Corporation and the National Environment Service be consulted on the proposal.

Aukino Tairea
ACTING SECRETARY TO CABINET

e. Project Technical Information



Conventional Buoy Mooring (CBM) systems, sometimes referred to as Multiple Buoy Mooring (MBM) systems, are in use for the transfer of products such as crude, refined oils and LPG between tankers and shore facilities all over the world.

A CBM system provides a safe and attractive solution to tanker offloading requirements in shallow water, offering a more reliable, efficient and cost effective alternative to jetty or wharf systems. (Moreover, offshore terminals give a far greater scope and flexibility for location).

CBM systems are ideally suited to shallow water applications up to some 30m depth in benign environmental conditions and conditions with a dominant directional character.

The CBM system allows the tankers to safely maintain position for the period required to offload their products.

Typically, 3 or 4 mooring buoys are used for station keeping of the tanker.

When berthed, the tanker remains on location without using its own anchors. On the tanker side, the ships mooring ropes are connected on either side to the bow and the stern and on the buoy side to the quick release hooks on the buoy.

After mooring the tanker to the buoys, picking up a submerged hose string and connecting this hose to its mid-ship manifold, the offloading operation may start.

The other end of the hose string is connected to a Pipeline End Manifold (PLEM), which in turn is fixed to a subsea pipeline, transferring the product to any installation located onshore.

On completion of the unloading operation, the hose string is laid down on the seabed, ready for being picked up again when the next tanker arrives.

Mooring System

The mooring system comprises Mooring Buoys and Mooring Legs, where the buoys are generally moored to the seabed with chain legs and high holding power anchors or piles, depending on soil characteristics.

A typical CBM includes 3 or 4 buoys and each buoy has a mooring assembly through the centre of the unit, terminating in a mooring eye on the bottom and pad-eyes on top for the fitting of quick release hooks.

Pipeline End Manifold

Located on the seabed, the Pipeline End Manifold (PLEM) serves to connect the subsea hose string to the submarine pipeline(s).

By means of valves on the PLEM, the hose string can be isolated and the pipeline closed off.

Offloading Hose String

The hose string provides the interface between the mid-ship loading manifold on the berthed tanker and the PLEM. Its total length depends on the possible excursions of the moored tanker, which in turn are determined by the water depth and the environmental conditions expected during loading / offloading activities.

When the system is not in use, the hose string is laid down on the seabed away from the influence of the waves.

The end of the hose is provided with a pick-up line and a marker buoy.

The hose string is picked-up by a small support vessel that also assists the tanker with mooring to the buoys. CBM's can be operated with up to 3 or 4 separate product lines.

The pipeline diameter would be of 200mm pipe steel core, polyethylene inner liner, polyethylene outer shield, UV resistant and able to withstand rough terrain.

As noted above, a map illustrating the proposed pipeline corridor is given in **Figure 1**.

The exact route of the pipeline would be determined during detailed design in consultation with the Port Authority and Infrastructure Cook Islands using the following criteria:

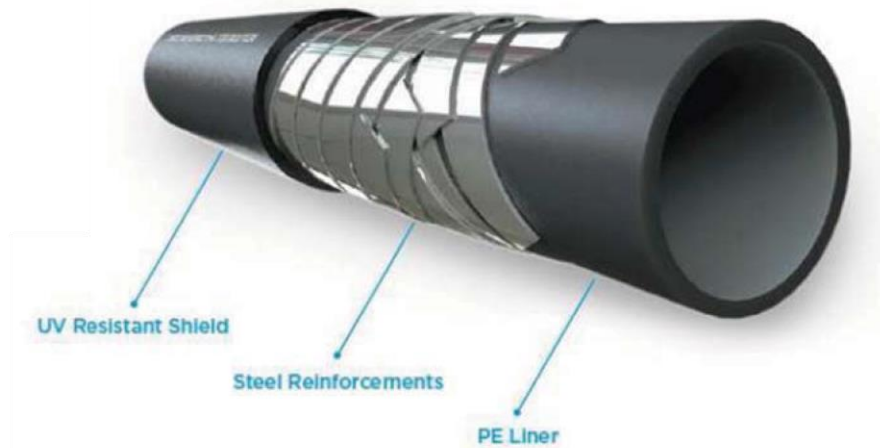
Offshore construction will use tug work boat and dumb barge as platform for assembly of pipeline and for laying.

Welding plants will be required for joining of pipeline sections and installation at the shore end with the terminal existing pipeline networks.

Pipeline Details

Flexible Steel Pipeline's unique characteristics make it the best and most versatile choice for a variety of environments and applications.

Flexible Steel Pipelines out performs traditional steel line pipe and other pipes through cost effective measures and proven reliability.



With unmatched structural integrity, Flexible steel Pipeline continues to perform up to original design specifications and does not need to be re-rated over time. Durable by design, it is the only flexible pipe that can be laid directly in rough terrain without affecting reliability. It is the clear choice when failure is not an option

DURABILITY

- Steel core provides durability
- Polyethylene inner liner allows for superior flowrates
- Polyethylene outer shield is UV resistant and able to withstand rough terrain
- Enhanced safety - no bruising or degradation
- Stands up to cyclic loading environments
- Will not weaken when wet
- The only onshore flexible pipe with API17J certification

INSTALLATION

- Fast, easy and inexpensive to install with minimal disruption to land, saving on average 50% versus steel pipe installations
- Can be laid directly in rough terrain without needing any special handling or bedding materials
- Superior tension capabilities enable longer pulls, even in difficult terrain
- Steel reinforced core provides electrical continuity, eliminating the need for tracer wires and lowering costs

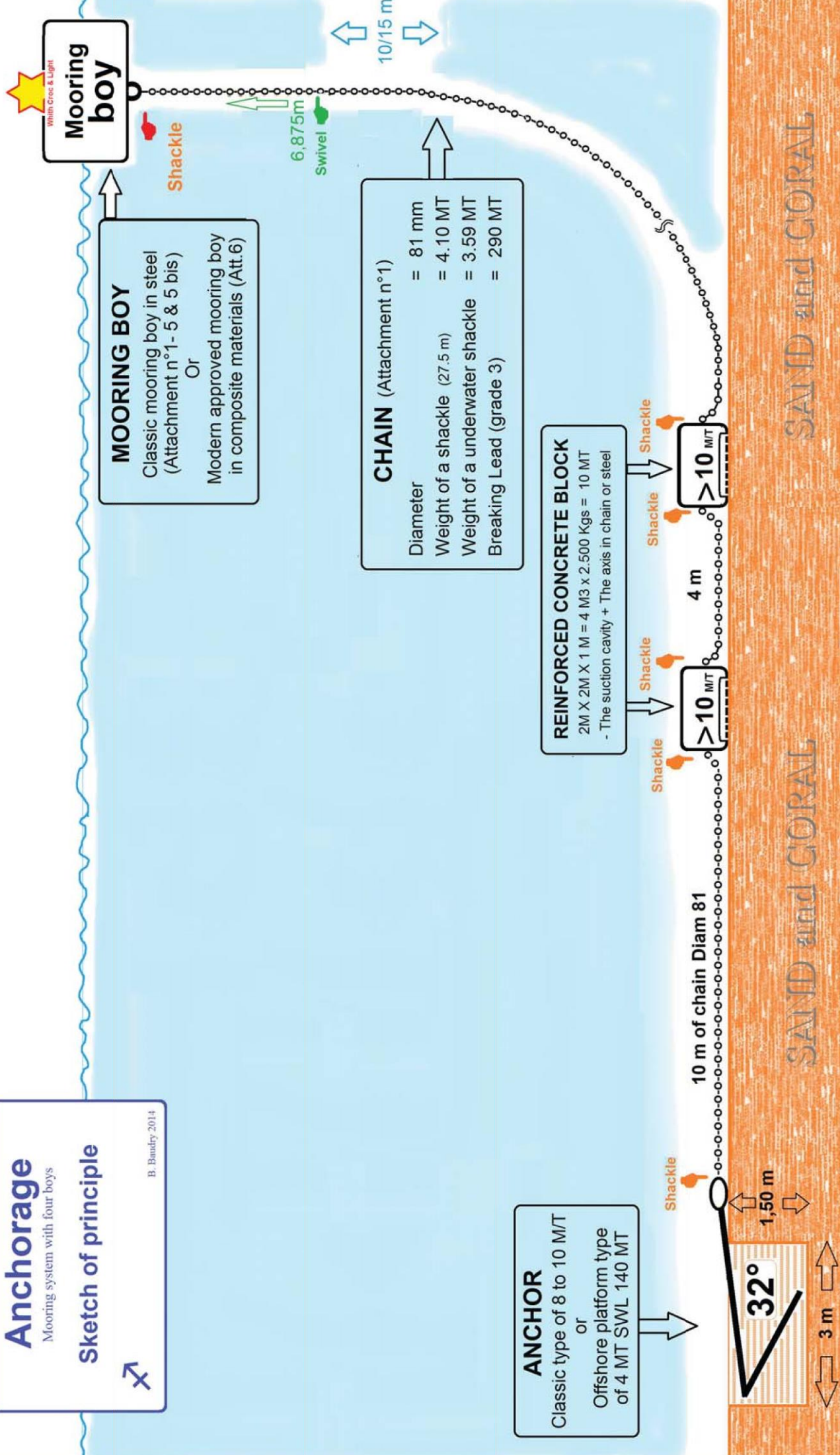
Anchorage

Mooring system with four boys

Sketch of principle



B. Baudry 2014



Mooring boy
Whin Cree & Light

Shackle

6,875m
Swivel

CHAIN (Attachment n°1)

Diameter = 81 mm
Weight of a shackle (27.5 m) = 4.10 MT
Weight of a underwater shackle = 3.59 MT
Breaking Lead (grade 3) = 290 MT

REINFORCED CONCRETE BLOCK

2M X 2M X 1 M = 4 M3 x 2.500 Kgs = 10 MT
- The suction cavity + The axis in chain or steel

10 m of chain Diam 81

32°

1,50 m

3 m

SAND and CORAL

SAND and CORAL

Shackle

Shackle

Shackle

Shackle

Shackle

Shackle

4 m

>10 MT

>10 MT

>10 MT

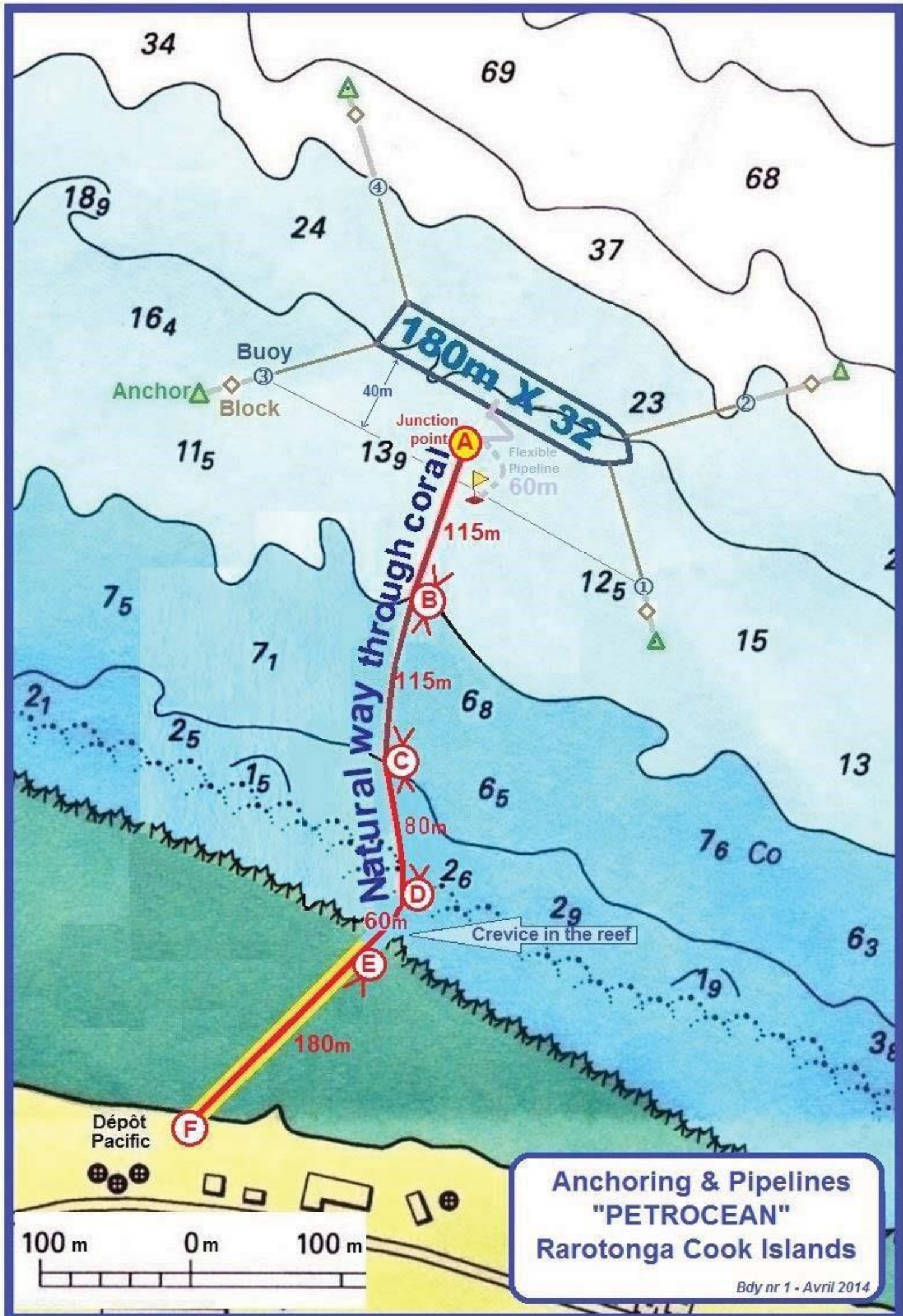
10/15 m



Above are Mooring information

Below shows approx site location for placement of moorings and pipeline.

Final route and positioning will be determined in a full site survey when EIA is approved.



**Anchoring & Pipelines
"PETROCEAN"
Rarotonga Cook Islands**

Bdy nr 1 - Avril 2014