



INVITATION TO QUOTE
FSM SUBMARINE CABLE PROJECT

TECHNICAL SPECIFICATIONS
BEACH MANHOLE COASTAL EROSION MITIGATION

CONTRACT NO: FSM2

Contents

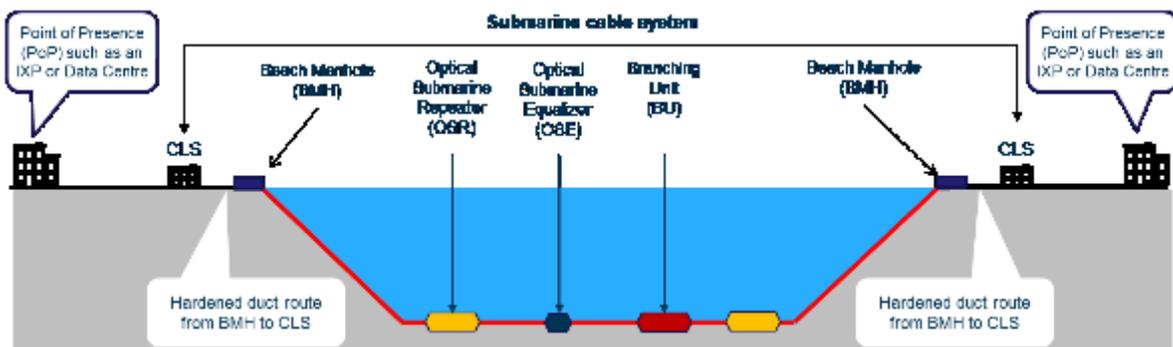
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1. INTRODUCTION

1.1 Purpose

- a) This document describes the technical requirements for Coastal Erosion Mitigation Works required to protect the Beach Manhole (BMH) supporting the landing of the fiber optic submarine cable on Chuuk, Federated States of Micronesia by ensuring the BMH performance over the life of the system
- b) For information-only purposes and at a high level: Submarine cable systems start and end at a Cable Landing Station (CLS) at which connections to terrestrial networks are also provided – Fronthaul and Backhaul. Fronthaul is the hardened terrestrial link from the CLS towards the ocean and BMH. Backhaul refers to the terrestrial link from the CLS towards the telecommunications service operator/s or points of presence. The facilities described in this document refer solely to the BMH and Hardened Duct Route (Fronthaul Duct) from BMH to CLS as depicted below.



1.2 General

- a) The Employer, Federated States of Micronesia ("FSM"), has installed two submarine cable wet plant systems via Seaward Ducts and an installed Beach Manhole (BMH)
 - i. Yap – Guam Cable System (Yap Spur); and
 - ii. Chuuk – Pohnpei Cable System (C-P System).
- b) FSM is now seeking offers for the design and construction of Coastal Erosion Mitigation Works to protect the BMH on Chuuk. These works are to be installed and completed by 30 March 2018.
- c) Appendix 1 (for information purposes) provides details of the Chuuk Landing Point and includes details of the route between the BMH and CLS for the Fronthaul Duct, and As-built drawings for the Beach Manhole and Seaward Ducts.
- d) The successful Civil Contractor will be required to provide the works described within this Technical Specification and within the timeframes indicated above.

2. SCOPE OF WORK

2.1 Contractor's Responsibilities

The Contractor shall be responsible for the following specific aspects plus any other aspects required fulfilling the Scope of Work, not explicitly addressed herein.

- a) Develop and Deliver Planning Drawings that include, but are not limited to, coastal and shore elevations in the vicinity of the Beach Manhole, description of applied works, and complete Bill of Material, for Employer approval;
- b) Support the Employer in liaising with the Property Owner and Community in dealing with any complaints, hearings or information days to manage interaction with the local community;
- c) Obtain all permits, work permits, authorisations and issuing any notifications required to undertake the Work, and ensure that all works comply with national or local civil works regulations,
- d) Identify and mark all existing utilities and property features prior to commencement of operations;
- e) Consistent with the detailed specifications; design, build and construct Coastal Erosion Mitigation Works for the Chuuk Beach Manhole;
- f) Restore the affected areas once installation work is completed;
- e) Manage the work site including:
 - i. controlling site access and traffic to and from the site,
 - ii. recording of all site visits by any legal or government authority,
 - iii. supervising all personnel for the excavation operation including supervision and occupational health and safety requirements,
 - iv. maintaining the work site suitable to the requirements of the job and relevant authorities,
 - v. Establish and Maintain environmental safety protocols for the prevention, containment, restoration, removal, and disposal of work fluids (gasoline, diesel fuel, drilling fluid, etc),
- f) Procure, deliver, receive, and store all materials required for Fronthaul works;
- g) Provide mechanically sound and properly maintained excavation equipment and all associated equipment required for the performance of the Work;
- h) Provide all electrical power and fresh water required for the operation;
- i) Mobilize sufficient spares, reserve equipment and consumables to avoid unnecessary delays;
- j) Mobilise and demobilise equipment and personnel to and from the work sites;
- k) Develop and Deliver an As-Built Report which must include detailed drawings, after completion of operations which includes and updates all the characteristics and data provided in the Planning Drawings.

2.2 **Employer's Responsibilities**

The Employer will:

- a) Secure the rights from the property owner to plan, construct, and install the Coastal Erosion Mitigation Works;
- b) Fulfil any owner / applicant obligations under the permit process which cannot be fulfilled by the Contractor on the Employer's behalf;
- c) Provide a Project Manager point of contact for communication between Employer and Contractor regarding progress, delays, updated schedules, crew changes etc;
- d) Provide a site contact to represent the Employer for any onsite requirements (regular inspection of worksites for progress, safety compliance and meetings with authorities or public).

3. CIVIL WORKS STUDY AND PLANNING

3.1 Planning

3.1.1 Project Schedule

- a) The Contractor shall provide and maintain a Plan of Work (PoW) for the entire operation which shall contain a detailed breakdown of the timing and interdependencies of all aspects of the project Scope of Work and shall be regularly updated to track progress against this schedule.
- b) The Contractor shall provide regular PoW updates to the Employer, and on request, so that all parties are aware of the progress and potential impact of any delays.

3.1.2 Planning Drawings

- a) The Contractor shall develop Planning Drawings for the Coastal Erosion Mitigation Works prior to commencement of civil works. The Planning Drawings shall include, but are not limited to:
 - i. Site Survey including elevations, locations of existing utilities and property characteristics (existing sea walls, piers, boat launch ramps, BMH and Seaward Duct, channels, etc),
 - ii. Detailed description of the planned placement of fabrics, rip rap, stone, boulders, and concrete blocks,
 - iii. Detailed Bill of Material, and
 - iv. Elevations on completion of Works.
- b) Planning Drawings shall be completed and approved by the Employer's Project Engineer prior to commencement of civil works.

4. PERMITTING

- a) The Contractor is responsible for identifying and obtaining all necessary permits, pre-consultation, permissions, wayleaves and other approvals required to design and construct the required facilities in accordance with these technical requirements.
- b) A detailed breakdown of individual permit applications and their associated timeframe and interdependency shall be included in the Contractor's Plan of Work.
- c) The Contractor shall nominate a representative to manage the permit application process and serve as a point of contact with the Employer on permit related matters.
- d) The Contractor shall participate in regular co-ordination meetings (typically by teleconference) with the Employer to keep the Employer informed regarding the permit application status and to seek any inputs required from the Employer in respect of the permit applications.
- e) Where permits, permissions and wayleaves have an associated cost (one off cost or annual recurring charges) these must be approved by the Employer before any formal agreement is implemented.
- f) Costs incurred in the obtaining of permits, permissions and wayleaves will only be reimbursed on provision to the Employer of formal agreements detailing the costs.
- g) The Employer is responsible for obtaining Permits, Easements and /or Written Permissions Permission from private property owners prior to commencement of any work by the Contractor on the property.

5. SPECIFICATIONS

5.1 Coastal Mitigation Erosion Works

The Coastal Mitigation Erosion Works is designed to protect the Chuuk – Pohnpei Cable System Beach Manhole located on the Mori Property in Weno Chuuk. The Employer has solicited and obtained an assessment of coastal erosion of the site and conceptual design options.

5.1.1 General Requirements

- a) The exact Coastal Erosion Mitigation Works Plan / design shall be selected in consultation with the Employer and approved by the Employer.
- b) Refer to the following figures for clarification of the Specifications for the Coast Erosion Mitigation Works:

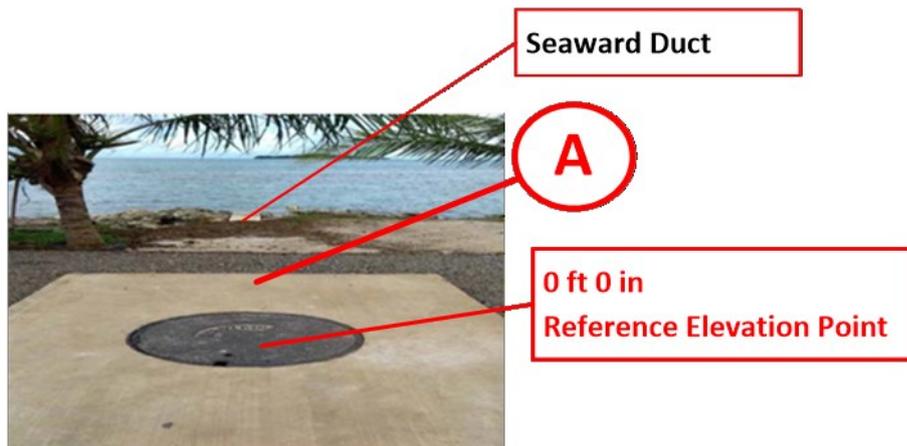


Figure 5-1: Beach Manhole and Seaward Duct Facing Lagoon with Reference Point A and Zero Elevation Point Denoted.

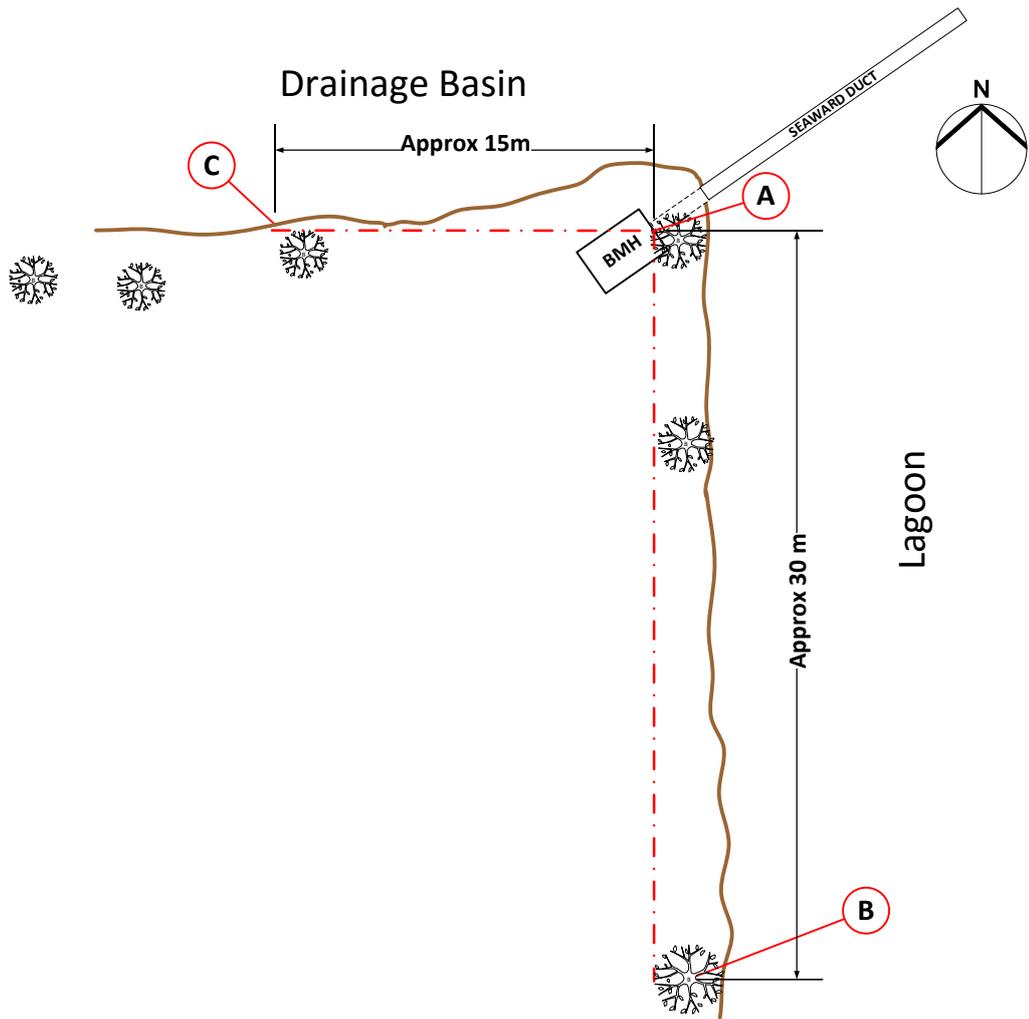


Figure 5-2: Plan View of Site and Spans for Coastal Erosion Mitigation Works

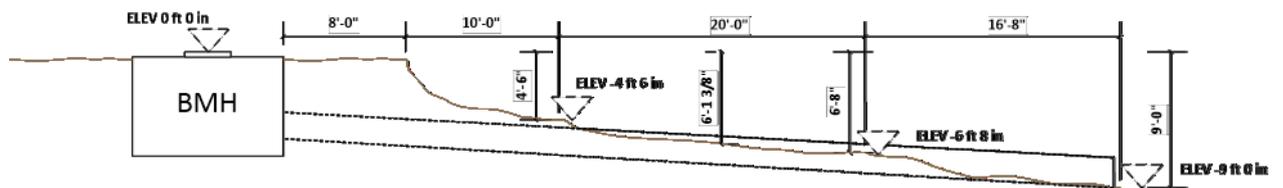


Figure 5-3: Elevation View of BMH and Seaward Duct
(Bottom Elevations are Approximate)

5.1.2 Span of Works

5.1.2.1 **Southeast Shore Protection Span**

The Coastal Erosion Mitigation Works shall provide coastal erosion mitigation along the shoreline from **Point A**, located at the centerline of the Seaward Edge of the Beach Manhole to

Point B, 30m ± 2m south along the southeast shorefront. The termination point is denoted by a leaning coconut tree as photographed in 3rd Quarter 2017 as shown below.



Figure 5-4: Approximate 30m Point of Shore Line Southeast of BMH

5.1.2.1 Southwest Shore Protection Span

The Coastal Erosion Mitigation Works shall provide coastal erosion mitigation along the shoreline from **Point A**, located at the Centerline of the Seaward Edge of the Beach Manhole To **Point C**, 15m ± 2m south along the southwest shorefront. The termination point is just beyond the coconut tree shown in the figure below with the large tire next to it.



Figure 5-5: Approximate 15m Point of Shore Line Northwest of BMH

5.1.3 Works Construction Materials

The Coastal Erosion Mitigation Works shall be constructed using local materials to the extent possible, including, but not limited to:

- a) High Strength Concrete Blocks reclaimed from Chuuk Airport renovations. Each of the blocks having approximate dimensions of 1.6m x 1.6m x 0.36m (5.25ft x 5.25ft x 1.2ft). Blocks shall be Employer provided, but Contractor shall be responsible for transport from storage location to site.
- b) Locally quarried rock fill of rough diameter 0.25m (10in) and weight of 25kg (55lbs).
Note: Quarry is located approximately 0.25km from work site.
- c) Sources for quarried rock used as fill or aggregate shall be procured from a licensed quarry, and shall not be from any unauthorized foreshore or beach material.
- d) Except as specified above, Contractor shall be responsible for the supply of all materials and consumables required for the completion of the Work.
- e) The Contractor shall include details / specification sheets in its proposal for the specific materials it proposes to use for this application. Such materials and any changes thereto shall be subject to Employer approval.

5.1.4 Site Preparation

The Contractor shall remove all rubbish and assorted waste materials including tires from the shore so that a clear beach profile is available for installation of the works.

Rubbish and assorted waste materials including tires which are removed from the shore profiles shall be disposed of **at a licensed or permitted landfill or recycling facility.**

5.1.5 Profile of Works

The Coastal Erosion Mitigation Works shall be constructed with a general profile of three sections as depicted in the figure below.

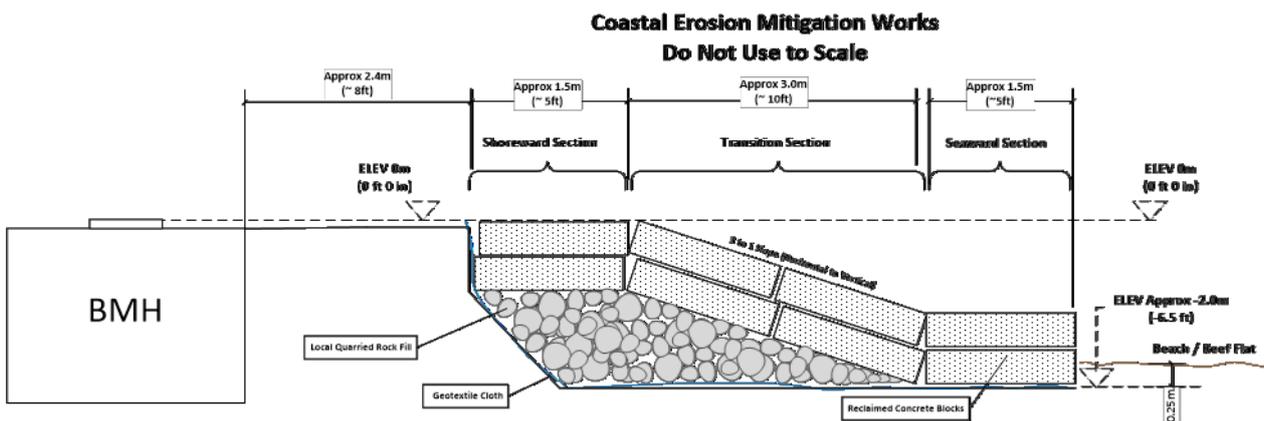


Figure 5-6: Profile View of Coastal Erosion Mitigation Works

5.1.5.1 Shoreward Section:

The Shoreward Section of the Works is that section closest to the existing shoreline.

The Shoreward Section of the Works shall consist of two stacked layers of Reclaimed Concrete Blocks partially inset into the existing coastal bluff and partially laid on local rock fill.

The Shoreward Section of Works shall have:

- a) A width (Shore to Sea) of approximately 1.6m, integrated into the existing shoreline by approximately 0.5m.
- b) A finished height of 0m + 0.1m, -0m (0ft + 4in, - 0 in).
- c) A constructed depth of approximately 0.5m to 1m.

5.1.5.2 **Transition Section:**

The Transition Section of the Works is that section of Works sloping down toward the finished elevation.

The Transition Section of the Works shall consist of two stacked layers and two adjacent rows of Reclaimed Concrete Blocks sloping downshore at a 3 to 1 pitch (3 horizontal / 1 vertical) and laid on a bed of local rock fill.

The Transition Section of Works shall have:

- a) A bottom elevation of 2m (6.6 ft), which is anticipated to be just below the Beach/ Reef Flat elevation.
- b) Rock fill placed to provide appropriate slope 3 to 1) for Reclaimed Concrete Blocks.

5.1.5.3 **Seaward Section:**

The Seaward Section of the Works is that section farthest from the existing shoreline.

The Seaward Section of the Works shall consist of two stacked layers of Reclaimed Concrete Blocks, with the lower layer partially inset into the existing Beach / Reef Flat by approximately 0.25m (10 in).

5.1.6 Soil Fine Containment

A geotextile filter cloth shall be place below the rock and concrete slab works on the shoreline at and to the Southeast of the Beach Manhole to prevent the migration and loss of soil fines from the bluff.

No geotextile filter cloth shall be used below the local rock placed on shoreline Northwest of the Beach Manhole.

5.1.7 Interlacing Reclaimed Concrete Blocks

To the extent possible, Reclaimed Concrete Blocks shall be set in an interlacing pattern (alternating seams of block) as shown in the Plan view below:

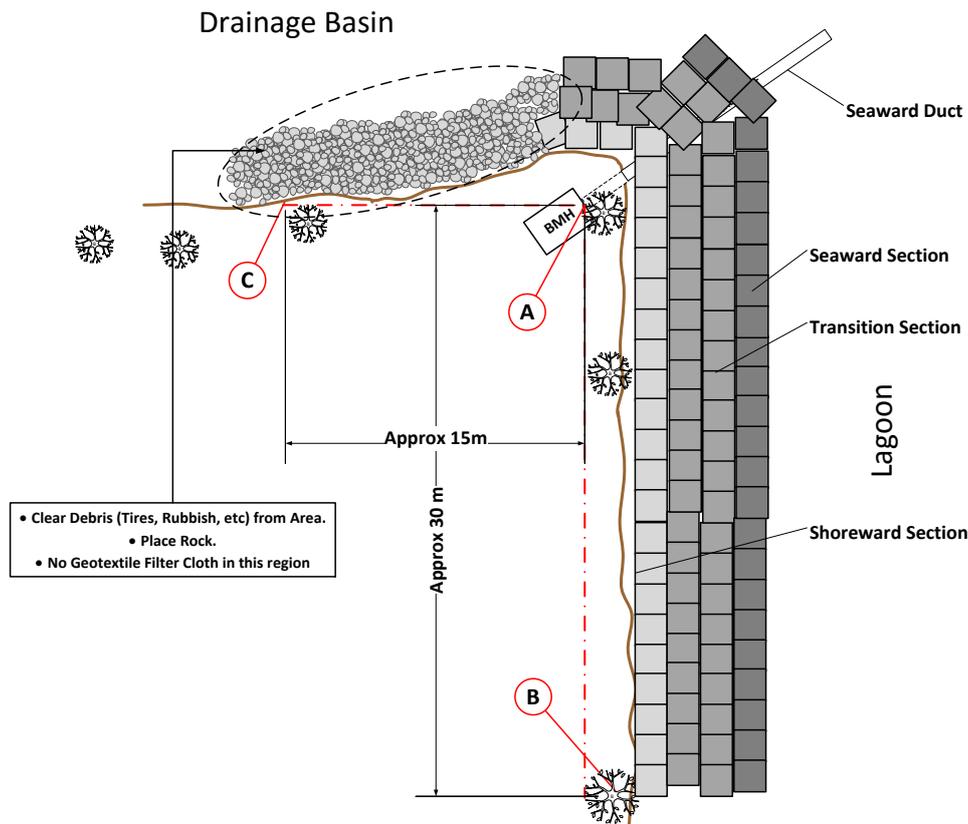


Figure 5-7: Interlacing of Concrete Blocks and Placement of Local Rock

5.1.8 Fill of Interstices

All open volumes and interstices shall be fill with rock fill.

5.1.9 Work Near Seaward Duct

Contractor shall take special care when excavating, placing rock fill, or placing reclaimed concrete blocks in the vicinity and / or on top of the Seaward Duct.

Contractor is solely responsible for any damage to the Seaward Duct, or cable ducts, and optical cable contained therein.

5.1.10 Reinstatement

- a) Reinstatement of all ground disturbed by the works shall be to "as good as or better" condition at completion of works in that area and in accordance with the relevant government agencies.
- b) Turf reinstatement will be of the same grade and will include maintenance (watering and fertilising) for 6 weeks.

6. PROJECT MANAGEMENT

6.1 General

The Contractor shall:

1. Appoint a Project Manager, who will be the principal point of contact for all matters pertaining to the duct route installation;
2. Appoint a Site Superintendent, who will direct activities on the site and ensure that all documentation and record keeping is kept up to date.
3. Advise the Employer of any planned change of key personnel in advance of the change. If the replacement has not been previously nominated as an alternative, a CV must be provided with the change notification and shall be subject to Employer approval. (The Employer reserves the right to reject any key personnel who lack experience and knowledge in the applicable field of operation; any such rejection shall not be unreasonable.)

The Employer will nominate

1. A Project Manager who will act as a point of contact for the Contractor for reporting, scheduling and contractual matters;
2. A Works Inspector who will visit the site on a regular basis to monitor activity and the standard of workmanship, housekeeping and record- keeping. All reasonable requests made by the Works Inspector on behalf of the Employer must be addressed by the Contractor in a timely manner.

6.2 Subcontractors

The Contractor shall provide a list of proposed subcontractors to the Employer.

Details of the equipment or services provided by the subcontractors are to be included in the submission in sufficient detail for their suitability to be assessed. This will include current copies of any relevant certification, registration, insurances and training certificates.

The Employer reserves the right to reject any subcontractor who lacks experience and knowledge in these fields of operation; any such rejection shall not be unreasonable.

7. QUALITY MANAGEMENT

The Contractor shall:

1. Prepare a site specific Quality Plan and submit this to the Employer for approval prior to mobilisation to site. This document will describe each phase of the project, the objectives of the phase and the criteria that will be used to demonstrate satisfactory completion of that phase. It will refer to the procedures contained in the Quality Manual that are appropriate to each phase in order to demonstrate how the requirements for quality will be fulfilled.
2. Keep a copy of the Quality Manual and site-specific Quality Plan containing all the procedures relevant to the planned operations on site for review at any time.
3. Develop and maintain a Register of documentation relevant to the project that currently exists or will be produced during the course of the project. It is recognised that this Register may be updated from time to time; a copy of the updated Register must be provided to the Employer at the time of issue.
4. Execute all work in accordance with the Contractor's project Quality Plan and Quality Manual.

8. ENVIRONMENT, HEALTH AND SAFETY

8.1 Environment Management Plan

1. Prior to commencement of work, the Contractor shall carry out a site-specific assessment to identify the potential environmental risks.
 - (i) Prepare an Environmental Management Plan which describes the controls that the Contractor will put in place to manage the risks. This Plan will outline the training requirements for each on-site position and a record will be kept on the site of the environmental training undertaken by each of the staff.
 - (ii) Demonstrate that suitable controls are in place to avoid site contamination, spillage of pollutants, disposal of waste, damage to foliage, injury to animal and marine life and generation of nuisance dust, noise and odours.
2. All of Contractor's site staff shall be aware of what to do in case of an environmental incident, i.e. what actions to take, who to notify, what records must be kept.
3. The Contractor shall have in place a schedule of regular environmental site inspections that include housekeeping, silt screens, leakage of drilling fluid and checking of waste disposal documentation and certificates.

8.2 Health and Safety Plan

The Contractor shall prepare and implement a detailed Health and Safety Plan to protect staff and visitors from risk of injury or damage to health. This will meet the requirements of best commercial practice shall include the following:

1. Trained Environmental, Health, and Safety Officer

The Contractor shall have a trained Environmental, Health, and Safety Officer on their project team.

2. Training of Personnel

The Contractor shall provide evidence that all staff have received adequate training to ensure their own safety and the safety of others in the workplace. This evidence would normally be in the form of training documentation and appropriate training certificates for each staff member

3. Designated First Aider and Alternative

There shall be clear indication on site of the designated First Aid attendant and their alternative, and both shall be trained as to what to do in the case of an emergency.

4. Site Inductions

All members of the Contractor's staff and all visitors to site shall undergo a site induction that has particular reference to on-site safety and environmental management. A record of all inductions must be kept in a register on site.

5. Workplace Inspections

The Contractor shall implement workplace inspections on a regular basis to ensure that the workplace remains safe and any new risks are identified. Records shall be made of each inspection and these shall be retained on site. Evidence should be available that demonstrates the timely implementation of any remedial action required.

6. Safety Equipment

The Contractor shall ensure that all staff are supplied with, and utilise appropriate safety equipment for use on the site. Visitors to the site shall also be provided with suitable personal protection equipment. Sanitisation of this equipment and/or the use of suitable controls must be in place on site.

7. Traffic Control into and out of Worksite

The Contractor shall ensure that all traffic entering and leaving the worksite is controlled to ensure that staff and the public are not placed at risk.

8. Signage for Traffic / Pedestrian Management

The Contractor shall ensure that appropriate signage is displayed on site and in the vicinity of the worksite to assist with the safe management of staff, visitors and the general public. Signage must be fit for purpose.

9. Crowd Control

The project will be taking place in a very public location. It must be recognised that at times it shall be necessary to control crowds of onlookers, particularly during mobilisation when all planned safety measures are not yet in place. It is the Contractor's responsibility to ensure that sufficient staffs are available to manage the public in these circumstances.

10. Emergencies

The Contractor shall develop processes and procedures associated with emergency situations identified by the risk analysis. These shall be clearly defined in the Risk Management Plan and evident in the training documentation and training certificates. It must also be covered in the Site Induction Training.

9. ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

9.1 Compliance with the Environment and Social Management Plan

An Environment and Social Management Plan has been developed for use on this project (See Appendix 3 for the Environmental and Social Impact Monitoring Table.) The Contractor shall review the project ESMP and ensure that the project and works are in compliance with this document.

9.2 Contractor's Environment and Social Management Plan

The Contractor shall develop its own a derivative Environment and Social Management Plan that is in compliance with the Project ESMP for Employer review and approval prior to construction works.

9.3 Grievance Redress Mechanism

The Contractor shall be aware of the Grievance Redress Mechanism as developed and presented by the Safeguards Monitor, and shall ensure compliance with this process.

10. SITE SECURITY

The Contractor shall be fully responsible for site security from the time the Contractor first occupies the site to the time when the work is complete and the Contractor completes all reinstatement and fully clears the site. This shall include:

1. Site Fencing

Adequate fencing (as required) shall be provided around the work site and especially any open pits, to ensure the safety of the public and the security of the equipment on site.

2. Access Control

Appropriate controls shall be implemented to ensure that only authorised persons enter the site and that entry to and exit from the site is always controlled.

3. Security of Site if Unattended

Adequate provision shall be made to ensure the security of the site when unattended, and to protect against theft of materials and / or equipment

4. Signage

Adequate signage must be installed to inform the public of the nature of the work and the risks of site entry.

11. DOCUMENTATION

The Contractor shall be responsible for producing and maintaining the following documentation pertaining to the project:

1. Daily Log of Activities

A log of all activities on site shall be maintained in sufficient detail to provide a clear understanding of all events that take place.

2. Log of Persons on Site

This log shall record the name of person on site, time of entry and exit, a contact phone number and whether they are staff, visitors or local authorities.

3. Log of Site Inductions

A record shall be kept on site of all persons who have participated in the Site Inductions. The record shall include their full name, date and time of induction, contact number and organisation (if appropriate).

4. Materials Management Records

(i) Materials Used

A record shall be kept of all materials brought to or removed from the site. This record should include references to any documents of relevance such as materials certificates, test certificates, Material Safety Data Sheets, results of concrete slump tests.

(ii) Waste Disposal:

Records shall be kept of any material disposed of, together with a description of the material, quantity disposed, and certificates of disposal, weighbridge tickets etc.

5. Records of Inspections by Authorities or Local Interest Groups.

Any visit by local authorities shall be recorded; the record should include the name and position of the visitor, contact phone number, purpose of visit and any matters arising from the visit.

12. EQUIPMENT

1. The Contractor shall include the following information in its proposal in sufficient detail to enable the suitability of the equipment to be assessed:
 - (i) Details of all equipment planned to be used on the project
 - (ii) Currency of certifications, specifications, age and standard of maintenance
 - (iii) Details of any sub-contracted equipment
2. The Employer will the right to inspect the Contractor's equipment prior to commencement of work and reserves the reasonable right of rejection or request to make good for sub-standard equipment.

13. REPORTING

13.1 Weekly Report

The Contractor shall submit to the Employer, a weekly report, commencing from the day of mobilisation and ceasing on completion of demobilisation and final acceptance of the Work by the Employer. The content of the report will include the following:

1. Time and date of the report.
2. Time period covered by the report.
3. Summary of the work performed during the preceding 7 days.
4. Summary of the planned work for the following week.
5. Time spent on effective work during each 24-hour period and the cumulative total.
6. Weather downtime and cumulative total.
7. Summary of plant installed and performance.
8. Any other pertinent information about the operation and progress.

13.2 Incident Reports

The Employer shall be advised immediately of any serious incident affecting personnel, equipment or which could significantly affect the ability of the Contractor to complete the Work on time.

The Contractor shall be required to provide a written report of all serious incidents.

13.3 Construction Reports

On completion of the Work the Contractor shall prepare a detailed Land Cable Duct Route (LCDR) Construction Report. This Report will include separate sections under the following headings; the precise content of each section shall be discussed and agreed between the Contractor and the Employer following contract award:

1. Contents page
2. Executive Summary
3. Introduction
4. Summary Map to be drawn at a suitable scale to allow whole system to be viewed on one sheet of paper.
5. Detail maps to be drawn to such scale as to allow all necessary details for section of work can be clearly read on A4 page.
6. Summary Construction Report
7. Full and complete diary of events detailing all events from initial mobilisation to final demobilisation
8. Full engineering drawings of the installation.

Two draft copies of the Coastal Erosion Mitigation Works Construction Report shall be provided to the Employer within 14 days of completion of the operation and four (4) copies of the final version within 14 days of receipt of the Employer's approval or comments.

To the extent possible all documentation should also be provided in electronic format using a common application such as the MS Office Suite, Adobe Formats, or .dwg file.

13.4 Safeguard Reporting

The Contractor shall provide information regarding Safeguards in their standard reports.

The Employer shall be advised immediately of any incident involving safeguards.

14. ACCEPTANCE CRITERIA

Acceptance of the Work by the Employer shall be based on the following criteria:

1. All the objectives, activities and conditions described in this document shall have been met. Any concessions to the objectives, activities and conditions will require a written request from the Contractor and agreement in writing from the Employer.
2. The Employer's Works Inspector shall be advised when it is considered that each operation has been successfully completed. This information will be passed to the Employer's Project Manager for approval.
3. The site shall be returned to the equivalent condition that existed prior to the mobilisation. Formal acceptance of the reinstatement must be obtained from the local authorities.
4. Acceptance procedures will be as stated in the terms and conditions.

End Document

15. ABBREVIATIONS

BMH	Beach Manhole
CLS	Cable Landing Station
LCDR	Land Cable Duct Route
MHWL	MHWL: Mean High Water Level

APPENDICES

APPENDIX 1: CHUUK LANDING POINT AND AS-BUILT BEACH MANHOLE INFORMATION

The Chuuk – Pohnpei Cable System was installed in the Chuuk Lagoon, through the NE Channel, and landed at the previously constructed Beach Manhole and Seaward Ducts as approximately shown in the figure below.



**Figure Appendix 1.1: Aerial View of the Landing Point and Fronthaul Route
(Taken Prior to BMH and Seaward Duct Construction and Subsea Cable Installation)**

2. AS-BUILT DRAWINGS - CHUUK

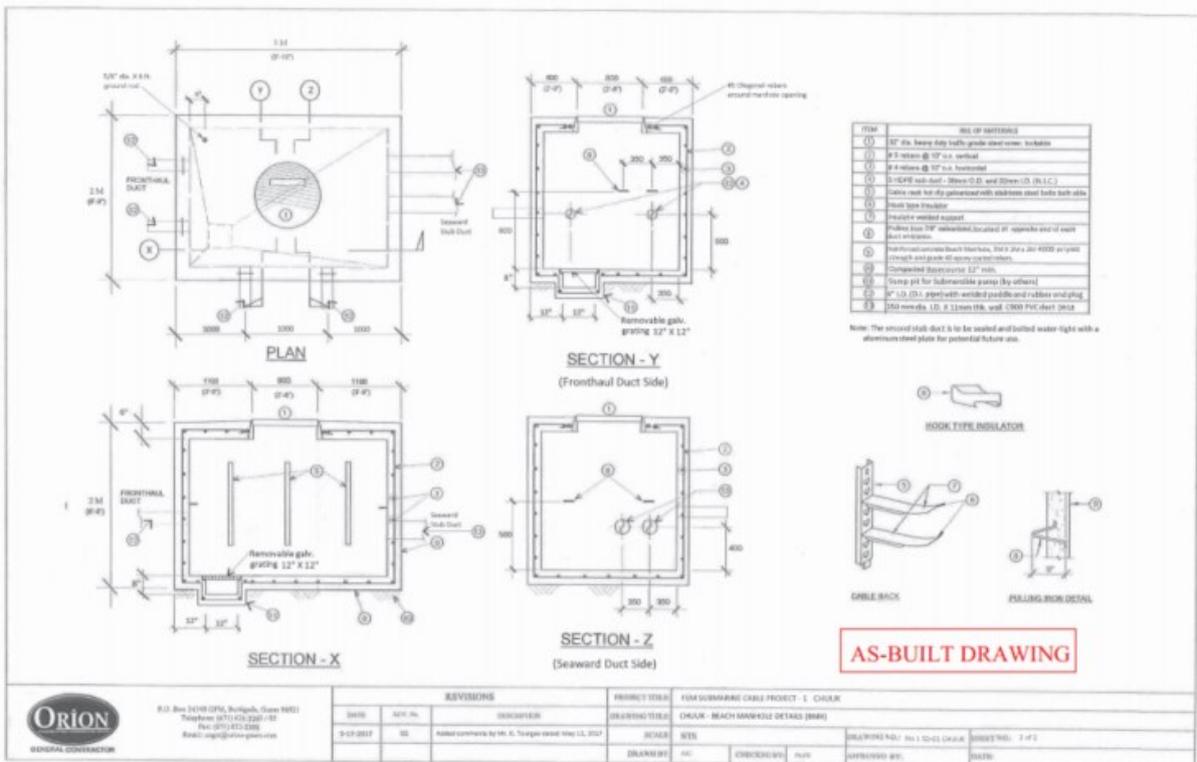
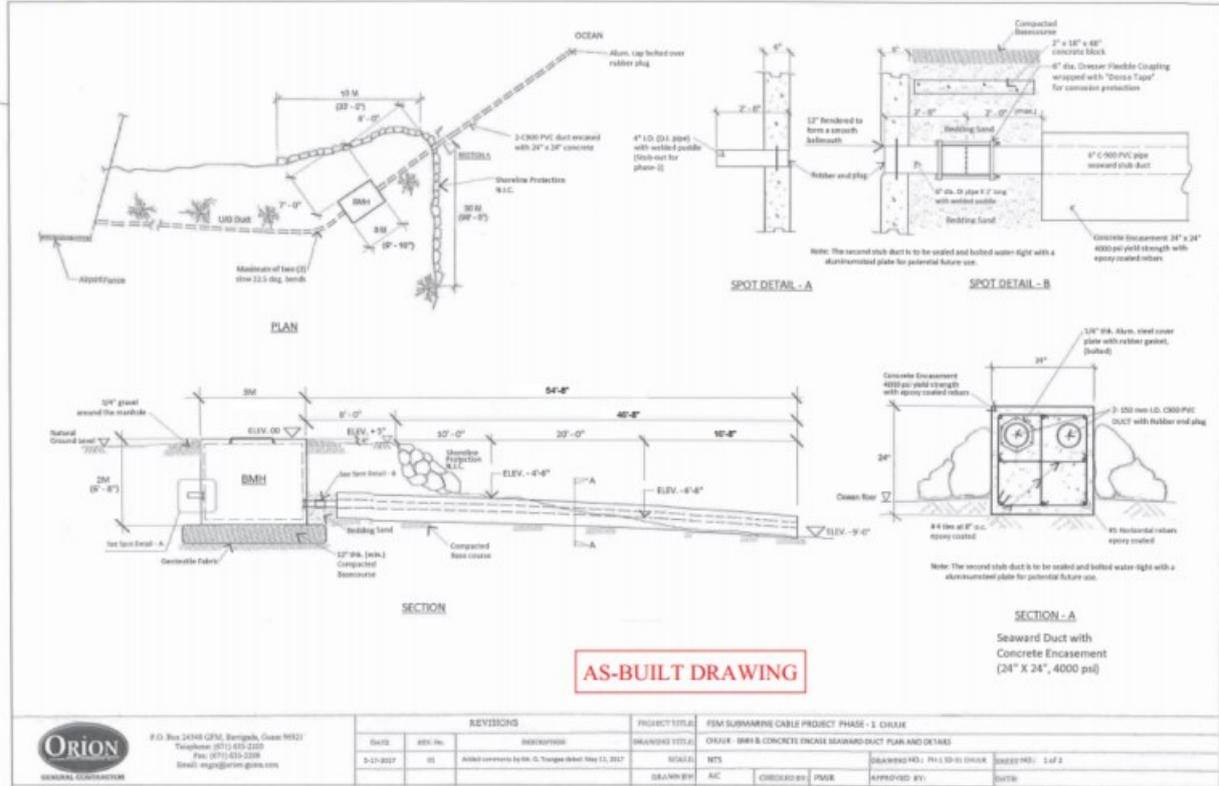


Figure Appendix 1.2: As-Built Beach Manhole and Seaward Duct Drawings



Figure Appendix 1.3: Completed Beach Manhole and Seaward Duct



Figure Appendix 1.4: Aerial View of Fronthaul Route from BMH, Onto Airport Property, Road Crossing, and Entry in FSMTC Facility



Figure Appendix 1.5: Aerial View of Fronthaul Route transiting onto Airport Property

APPENDIX 2: CONTACT NAMES AND DETAILS

a) Local FSMTC Contact:

Mr. Mino Mori (FSMTC Chuuk Station Manager)
FSMTC Chuuk Facility
Mobile: TBD4
Email: mino.mori@fsmtc.fm

b) FSM Cable Project Coordinator:

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APPENDIX 3: ENVIRONMENTAL AND SOCIAL IMPACT MONITORING TABLE

Project Period and Environmental Parameters	Project Impact	Mitigation Measures	Details of Monitoring Action to be Undertaken	When/ Frequency/ Duration	Output to be Provided	Who Implements	Who Supervises
1. PRE-CONSTRUCTION PERIOD							
Physical Environment							
1.1 Air Quality	Green House Gas released from all vessels involved in cable contract	In contract specs, require all ships used, to submit emission certification re PM, SO2 and NOx. The results will need to meet emission standards for such vessels, based on the USEPA standards (http://www.epa.gov/otaq/marine.htm CFR-40 set of codes). A smoke density test will also be performed by the technical monitor, using the Canadian Department of Transport Smoke Chart set out in the schedule of the regulations (https://www.dieselnet.com/standards/ca/marine.php). For vessels with diesel engines a stack smoke density less than No. 1 is normally required with the exception that a smoke density of No. 2 for an aggregate of not more than 4 minutes in any 30-minute period is allowed.	Confirm contract specification and compliance certification	During preconstruction period	Written and signed DD inspection note-to file	DTCI / OAE	Project Coordinator
1.2 Substrate	Use of foreign materials for filling cable trench, causing unknown pollution.	Specify in cable-laying contractor's specification that: 1. All backfill will have to be only locally sourced or seabed material. 2. Only inert/stable materials are to be used in cable laying and anchoring. Be aware of unexploded WWII munitions.	Confirm contract specification and bidder response	During preconstruction period	Written and signed DD inspection note-to file	DTCI / OAE	Project Coordinator
1.3 UXO	Failure to complete an unexploded ordinance sweep of the cable route as it enters the coastal waters could lead to explosions and loss of life	Conduct a UXO survey of the cable alignment as it passes the barrier reef cut and all the way to the landing site, prior to any cable placement activity.	Obtain record of UXU sweep completed	During preconstruction period	Written and signed DD inspection note-to file	DTCI / OAE	Project Coordinator
1.4 Hydrothermal Vents	1. Physical damage to vents by cable or cable-laying equipment. 2. Smothering by disturbing area sediments.	1. In construction contract specifications (prepared by Project Coordinator) require survey team to identify a cable route that maintains a minimum clearance of 200 m from active hydrothermal vents (if known), and specify this route in the cable-laying specification.	Confirm that appropriate specification contained bid documentation	During preconstruction period	Written and signed DD inspection note-to file	DTCI / OAE	Project Coordinator
1.5 Sea mounts.	Physical damage to habitat and possible fishery usage.	During preparation of contract specifications, Project Coordinator will include a minimum clearance of 2 Km from the base of seamounts, for any cable alignment and that this specification will be rigorously adhered to by the contractor (both the oceanographic survey and cable-laying operators)	Confirm adequate presentation in bid documentation	When bid documents are being prepared	DD note to file	DTCI / OAE	Project Coordinator
Ecological Environment							
1.6 Conservation Areas (MPA)	Disturbance of marine organisms and habitats in CA.	1. Define in contract specifications, via GPS and survey markers, a cable route that provides ≥ 75m distance from CA boundaries, and requires all survey and cable laying vessels to maintain this distance at all times.	Confirm contract specification in place as indicated in ESMP	During preconstruction period	Written and signed DD inspection note-to file	DTCI / OAE	Project Coordinator

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Project Period and Environmental Parameters	Project Impact	Mitigation Measures	Details of Monitoring Action to be Undertaken	When/ Frequency/ Duration	Output to be Provided	Who Implements	Who Supervises
1.7 Coastal and deep ocean habitats	Accidental discharge of pollutants from vessel and from vessel grounding.	<ol style="list-style-type: none"> Require bidders to provide specifications of the fuel and lubricant management equipment and storage on survey and cable laying vessels used and certify that the installations in in compliance with national regulations and-or MARPOL specifications for fuel management Maintain a contingency plan to 	Confirm that appropriate specification contained bid documentation	During preconstruction period	Written and signed DD inspection note-to file	DTCI / OAE	Project Coordinator
1.8 Coral Communities	Failure to plan route around coral communities	Via contract specifications instruct cable survey team to survey cable alignment around all coral reefs, avoiding all coral outcrops, and following defined shipping channels, where applicable.	Confirm that appropriate specification contained bid documentation	During preconstruction period	Written and signed DD inspection note-to file	DTCI / OAE	Project Coordinator
1.9 Sea grass	Damage sea grass communities due to cable placement.	Define in contract specifications that the cable's placement must be confined narrow a path (less than 0.4m wide an 0.75m deep), keeping in mind that the cable will be between 3 and 6cm in diameter.	Confirm that appropriate specification contained bid documentation	During preconstruction period	Written and signed DD inspection note-to file	DTCI / OAE	Project Coordinator
1.10 Species potentially at risk	<ol style="list-style-type: none"> Ocean sonar survey affecting cetaceans. Entanglement in cable by deep diving cetaceans such as the sperm whale. 	<p>Contract specifications to include reference to best practices for operating vessels in proximity to marine mammals as included in Env. Code of good Practice document, prepared as part of this assignment. These instructions include:</p> <ol style="list-style-type: none"> Survey timing outside whale presence/migration season, namely between May and October. Post a watch for whales and suspend activities when whales are within 1 Km of vessel. 	Confirm inclusion in contract specifications	When specifications are being written	Record to file	DTCI / OAE	Project Coordinator

Project Period and Environmental Parameters	Project Impact	Mitigation Measures	Details of Monitoring Action to be Undertaken	When/ Frequency/ Duration	Output to be Provided	Who Implements	Who Supervises
Socio-Economic Environment							
1.11 Coastal Resource Users – subsistence and artisanal fisheries	1. Damage to ecosystem integrity and fishery productivity through loss or damage to local fishing grounds.	Using the data on design limits found in the IEE, prepare contract specs. defining trenching/cable laying activities to be limited to a narrow corridor and trenching to be followed by immediate burial.	Confirm that contract specification is properly written and includes specs.	When specifications are being written	Record to file	DTCI / OAE	Project Coordinator
1.12 ESM P implementation monitor	Lack of an experienced technician will likely lead to delayed or failed implementation of ESMP items, e.g. no clauses in the bid docs.	Asa first task of the project Coordinator or lead of the State PMUs, an ESMP monitor will be retained for a 2 year period, to help implement and record the delivery of the ESMP	Confirm that the technician is on staff since the start of the project	At start of the detailed design stage	Note to file	DTCI / OAE	Project Coordinator
1.13 Community Information	Misconceptions regarding the project raising people's fears regarding project footprint and potential damages to marine food supply.	Conduct of series of government and non-government consultations e.g. prior to commencement of civil works, during construction and after project completion.				DTCI / OAE	Project Coordinator
1.14. Community Grievances	Minor concerns/issues developing community resentments due to unaddressed project related concerns.	Establishment of grievance redress mechanism prior to commencement of civil works.	Confirm that requirements for a grievance redress mechanism is in Contract specs. and that it is in the IEE	During detailed design stage	A note to file	DTCI / OAE	Project Coordinator
2. CONSTRUCTION PERIOD							
Physical Environment							
2.1 Air Quality	Emissions from survey and cable placement vessels	Zero tolerance and immediate repair required—as specified in Contract specifications; namely stack emissions and stack smoke tests as defined in IEE and at web sited defined in IEE . Vessel fined and shut down within 5 days of notice	Collect emission testing results from contractor	Prior to start of work	Record to file	DTCI / OAE	Project Coordinator

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Project Period and Environmental Parameters	Project Impact	Mitigation Measures	Details of Monitoring Action to be Undertaken	When/ Frequency/ Duration	Output to be Provided	Who Implements	Who Supervises
2.2 Substrate	Introduction of foreign substances reacting with environment or introduced medium for introduced organisms.	Contractor to insure that: 1. All backfill use only original material as per cable laying specifications. 2. Use only inert/stable materials in cable laying and anchoring as per cable laying	Inspect backfilling operation to insure no foreign material used and substrate replaced quickly	During this work—in nearshore waters	DD note	DTCI / OAE	Project Coordinator
2.3 Hydrothermal Vents	Physical damage to vents.	As per contract specifications, lay cable along surveyed alignment which has identified any hydrothermal vents and maintains a minimum clearance of 200 m from active hydrothermal vents to protect the site(s).	If hydrothermal vents detected during initial ocean, survey, periodically check on cable location to be sure it is placed in compliance with the limits defined.	When the detailed design is completed and the cable placement is to take place	Compliance checklist—signed	DTCI / OAE	Project Coordinator
2.4 Sea mounts	Physical damage to habitat and possible fishery usage.	As defined in the contract specifications, lay cable along designated survey route, which maintains a minimum clearance of 2 Km from the base of seamounts	If seamounts are identified by local fishers, during the detailed design work, the monitor will check on cable location to be sure it is placed in compliance with the limits defined.	When the detailed design is completed and the cable placement is to take place	Compliance checklist—signed	DTCI / OAE	Project Coordinator
Ecological Environment							
2.5 Marine Coastal Conservation Areas	Disturbance of marine organisms and habitats in CA.	According to contract specs., the contractor(s) will ensure that they: 1. Lay cable along surveyed route providing for a safe distance (≥ 75m) from CA s as per cable laying specifications 2. Keep all survey and support vessels at safe distances	Inspect cable laying operation in coastal waters and confirm minimum distance from CAs is maintained	As soon as work takes place inside the barrier reef—inside the passage into nearshore waters	Record of inspection and findings—written and photos	DTCI / OAE	Project Coordinator
2.6 Coastal and Deep Ocean Habitats	Accidental discharge of pollutants from vessel.	Adhere to contract specifications and national laws, containing all fuel, lubricants and transmission	Inspect both survey and cable laying vessel of	At start of work and for all vessels used	Written compliance checklist	DTCI / OAE	Project Coordinator

Project Period and Environmental Parameters	Project Impact	Mitigation Measures	Details of Monitoring Action to be Undertaken	When/ Frequency/ Duration	Output to be Provided	Who Implements	Who Supervises
		fluids in double walled tanks on vessels and if in drums, store below deck, as specified in contract specifications. 2. Maintain a contingency plan to address spills and storm events.	contractor and confirm compliance				
2.7 Coral Communities	Destruction of coral communities	1. Contractor(s) to adhere to ≥75m avoidance rule and lay cable along surveyed route, as per cable-laying specification, thus avoiding coral reefs and outcrops. 2. Contractor to received map from State Marine Resources agency, showing coral areas on route from passage to landing.	Inspect cable laying operations in vicinity of coral formations and confirm compliance	1. When work is going on in vicinity of coral areas 2. defined during the detailed design	Written compliance report (can be bullet format, with photos. Confirm that contractor has coral community location map	DTCI / OAE	Project Coordinator
2.8 Sea grass	Destruction of sea grass communities.	As defined in contract specs: 1. restrict cable footprint to as narrow a path as possible (0.4m wide by 0.75m deep), when burying across a seagrass meadow, and fill trench immediately. 2. if possible, avoid crossing	Inspect cable laying operations in seagrass area, and confirm compliance	When work is going on in and around Seagrass meadows	Compliance checklist—signed	DTCI / OAE	Project Coordinator
2.9 Species of Special Interest - Cetaceans	Entanglement in cable risk for deep diving cetaceans	Control cable tension so that laid cable conforms to undulations of seabed as per cable laying specification and-or provide anchors if needed.	Discussion with person in charge of cable placement to confirm understanding re cetacean sensitivity	At start of survey and start of cable placement	DD note to file	DTCI / OAE	Project Coordinator
Socio-Economic Environment							
2.10 Coastal Resource Users, Coastal Resource Users, subsistence and artisanal fisheries	Damage to local nearshore fishing grounds or introduce greater changes of gear entanglement	As per the contract specifications, confine trenching activities to as narrow a corridor as possible and restore site when finished and confine trenching/laying activities to as short a period as possible 3. Request Fisheries authorities to advise local fishers of cable laying	1. Examine trenching activity in nearshore waters and establish compliance with work area limits defined in ESMP. 2. Interview fishers	When trenching going on in nearshore waters	DD note to file	DTCI / OAE	Project Coordinator

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Project Period and Environmental Parameters	Project Impact	Mitigation Measures	Details of Monitoring Action to be Undertaken	When/ Frequency/ Duration	Output to be Provided	Who Implements	Who Supervises
		activities, dates, and avoidance measures. 4. Consider placing warning markers along cable line in shallow (<10 m) waters.	to determine if contractor met to advise re cable laying activity 3. Locate cable markers or other means				
2.11 Coastal Resource Users-- Game fishers	1. Displacement of activities during cable laying. 2. Entanglement of fishing gear. 3. Damage to ecosystem integrity and fishery productivity.	1. Project Coordinator to ensure a shipping notice is issued, warning of cable laying, dates, and safe clearance for other activities. 2. Request Port Authorities & Marine Resources Authority to advise local operators of cable laying activities, location (planned corridor survey) and avoidance measures. 3. Confine laying activities to as short a period as possible, preferably outside any fishing seasons defined	Shipping notice(s) issued.	When work is under taken.	1. Shipping notice(s) cited and for content recorded verification	DTCI / OAE	Project Coordinator
2.12 Coastal shipping – commercial shipping and ports	1. Physical injury of cable by shipping. 2. Disruption to shipping during cable laying.	1. Ensure a shipping notice is issued, warning of cable-laying, dates, and safe clearance for other activities. 2. Request Port Authorities to advise local shipping of laying activities and avoidance measures. 3. Contractors to provide written statement to Project Coordinator that marine navigation lights and other	Shipping (local and international) notice(s) issued. Appropriate markers and signage employed	When work is under taken.	1. Shipping notice(s) cited and for content recorded	DTCI / OAE	Project Coordinator

Project Period and Environmental Parameters	Project Impact	Mitigation Measures	Details of Monitoring Action to be Undertaken	When/ Frequency/ Duration	Output to be Provided	Who Implements	Who Supervises
2.13 Land Use	Straying of agreed to cable alignment into communal resource area. Community perception of cable encroachment to 'no-go' marine protected areas.	Conduct a series of consultations with government, private sector and non-government organizations including women and youth on progress of work and cable alignment. These consultations have the objective of informing all interested people on the work and general alignment location and methods to be used.	Obtain review and file record/notes/minutes of consultations completed	Within 5 days of landuse issue consultation taking place	Copy of record of meeting completed	Contractor	Project Coordinator
2.14 Access	Temporary loss of access to fishing grounds for local communities during laying of undersea cable.	Provision of electronic and print notices to local communities/ fishermen of construction schedule and contact person in case of inquiries.	Inspect material distributed and confirm timely distribution	At start of construction where access restrictions could arise	Copy of material distributed	Contractor	Project Coordinator
2.15 Environmental Completion Reporting	Contractor fails to prepare a summary report defining the mitigation & monitoring actions completed & what needs to be continued during the Operating period.	Prepare a completion report and deliver to the Engineer.	Review completion report and file compliance checklist	Once when the report is submitted by contractor(s)	Compliance checklist	DTCI / OAE	Project Coordinator
2.16 Contractor Awareness Raising	A contractor with little understanding of EMPs or safeguard matters initiates the work and causes damage, impacts and complaints	Conduct a 1 day contractor ESMP implementation briefing reviewing the mitigative, monitoring and reporting requirements	Review briefing material and attendance record	Once after the briefing session takes place	Review report	DTCI / OAE	Project Coordinator
3.0 OPERATING PERIOD							
Physical and Ecological Environment							
3.1 Mitigation measures completion Report	No report and no record of actions implemented during the construction period	Prepare completion report	Confirm that completion report is available and provided by the contractor	At the end of the construction period, extending 1 month into the operating period	DD note	DTCI / OAE	Project Coordinator
3.2 Oceanic habitat –	Physical impact on cable of vent water.	New vents can appear in proximity to the cable and re-routing of cable	Undertake periodic check in vicinity of	After any significant volcanic activity	DD note	DTCI / OAE	Project Coordinator