



**Tauranga City Council**  
Mauao Base Track Remediation Design  
Specification - Revetment and Boardwalk

October 2018

# Table of contents

1.	Project Description .....	1
1.1	Background .....	1
1.2	Contract Parties .....	1
1.3	Purpose of this Specification .....	2
2.	Scope of Works .....	3
3.	General Requirements .....	4
3.1	Australian and New Zealand Standards .....	4
3.2	Precedence & Dimensions of Drawings .....	4
3.3	Electronic Information .....	4
3.4	Interpretation of Documents .....	4
3.5	Omissions .....	5
3.6	Environmental Conditions and Management Plan .....	5
3.7	Contractor's Plant and Methodology.....	5
3.8	Site Access and Traffic Management Plan.....	6
3.9	Site Cleanliness .....	7
3.10	Site Establishment and Temporary Construction Compound .....	8
3.11	Contractor's Facilities.....	9
3.12	Temporary Services during Construction .....	9
3.13	Survey Set Out.....	9
3.14	Protection of the Works.....	10
3.15	Archaeological Site Management .....	10
3.16	Dust Control Measures .....	11
3.17	Inspections .....	11
3.18	Permits and Certificates.....	11
3.19	Site Meetings .....	12
3.20	Progress Photographs .....	12
3.21	Existing Services.....	12
3.22	Restoration and Site Clean Up .....	12
3.23	Testing .....	13
3.24	As Built Survey.....	13
3.25	Practical Completion .....	13
3.26	Final Certificate .....	13
3.27	Plant and Equipment Down-Time.....	14
3.28	Standby Time Due to Inclement Weather Conditions.....	14
3.29	Geotechnical information provided .....	14
3.30	Design of Temporary Works .....	14
3.31	Operation and Maintenance Manual.....	15
4.	Earthworks .....	16

4.1	Scope .....	16
4.2	Relevant Documents.....	16
4.3	Materials .....	16
4.4	Construction .....	17
4.5	Springs and Wells .....	21
4.6	Tolerances .....	21
4.7	Grassing & Planting .....	21
4.8	Earthworks Control .....	22
4.9	Hold Points and Response Times .....	23
5.	Revetment Rock and Backfill .....	24
5.1	Standards & Codes of Practice.....	24
5.2	General .....	24
5.3	Rock.....	24
5.4	Backfill.....	29
5.5	Construction Tolerances .....	30
5.6	Transportation and Stockpiling .....	30
5.7	Protection of Works.....	30
5.8	Setting Out and Control of the Works .....	31
6.	Geotextile .....	32
6.1	Scope .....	32
6.2	Standards.....	32
6.3	Quality Control and Testing of Geotextile .....	32
6.4	Storage and Packaging.....	33
7.	Boardwalk and Foundations.....	34
7.1	Scope .....	34
7.2	Standards and References .....	34
7.3	Material .....	34
7.4	Project Requirements .....	34
7.5	Performance Requirements .....	35
8.	Soil Nailed Slope .....	38
8.1	Preparation of Soil Nailed Slope .....	38
8.2	Flexible Facing & Hydro Seeding .....	41
8.3	Hold Points and Engineer's Approvals .....	42
8.4	Nail Installation Summary Sheet.....	43
9.	Stormwater Drainage .....	44
9.1	Scope .....	44
9.2	Relevant Documents.....	44
9.3	Materials .....	45
9.4	Construction .....	47
10.	Survey and Works Completion.....	51

10.1	General .....	51
10.2	Extent of Survey Work .....	51
10.3	Survey Equipment.....	51
10.4	Survey Detail.....	51
10.5	Pre-Construction Survey.....	52
10.6	Interim Progress Surveys .....	52
10.7	Completion.....	52
10.8	CCTV Inspection.....	53
10.9	Existing Track Remediation .....	53
10.10	Post-Construction Survey .....	53
11.	Quality Assurance .....	54
11.1	General .....	54
11.2	QA Management Representative .....	54
11.3	Quality System Documentation .....	54
11.4	Inspection and Test Plans .....	54
11.5	Identification and Traceability .....	55
11.6	Quality Assurance.....	55
11.7	Non-conformance Reports.....	56
11.8	Default by the Contractor.....	56
11.9	Hold Points and Witness Points.....	56
11.10	Compliance Inspections and Testing.....	57
11.11	Subcontracted Work .....	58
11.12	Design and Construct Separable Portion (Boardwalk and foundations) .....	58
11.13	Quality Records .....	58
11.14	Quality Audits.....	59
11.15	Certifications to Accompany Each Payment Claim .....	59
12.	Final Design Approval .....	60
12.1	The Mauao Trust.....	60
12.2	Nga Poutiriao o Mauao .....	60

## Table index

Table 1:	Surface Level Tolerances.....	21
Table 2	Mass of rock.....	25
Table 3	Nominal diameter of rocks.....	25
Table 4	Testing Rock and Quarry Materials.....	28
Table 5	Backfill grading requirement.....	30

# Appendices

Appendix A – Preliminary Environmental Management Plan

Appendix B – Preliminary Erosion and Sediment Control Management Plan

Appendix C – Archaeological Site Management Plan

Appendix D – Drawings

Appendix E – Planting General Arrangements & Schedule

Appendix F – Geotechnical Assessment

Appendix G – Geotechnical Design Report

Appendix H – Revetment Detailed Design Report

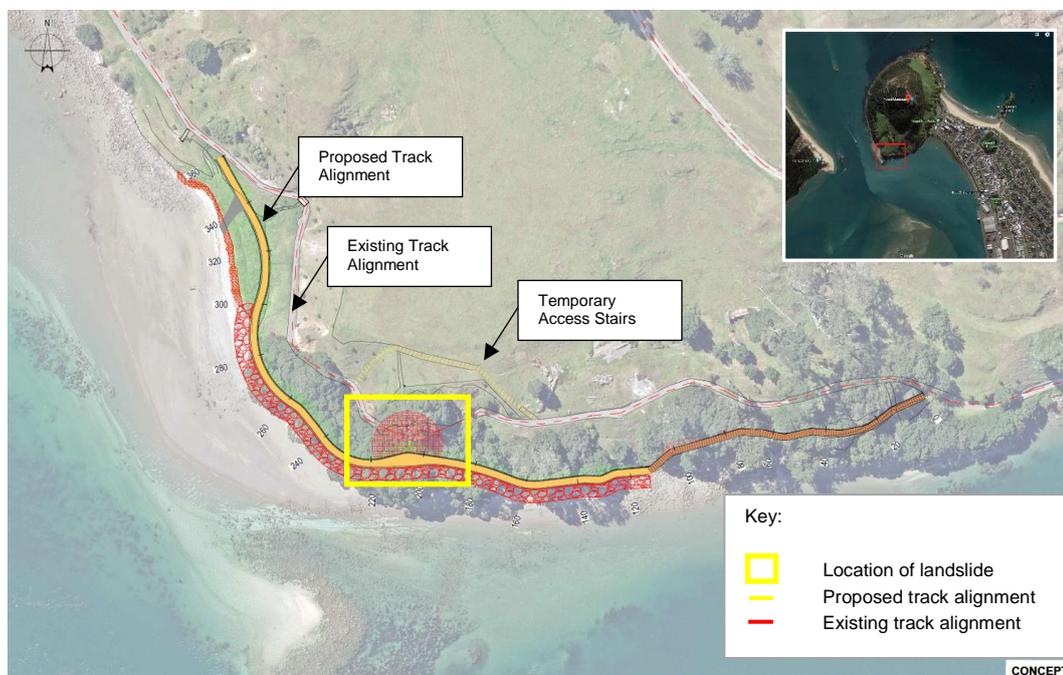
# 1. Project Description

## 1.1 Background

In April 2017 a series of storms occurred in the Tauranga region, resulting in a landslide on the south western corner of Mauao which destabilised the walking track, known as the ‘base track’. A temporary track was installed by Tauranga City Council (TCC), however the route includes many steps and is not practical for community members with limited mobility. A new section of track is required to increase the amenity and access to Mauao for all.

After an options development process to determine the most appropriate alignment of the new section of the track, TCC considered five options. The preferred option selected by TCC consists of a new track at the base of Mauao. To enable the track to be located here, a coastal protection revetment structure is required to elevate the path and protect the base of Mauao from ongoing wave impacts that may cause further erosion and destabilisation of the area.

The location of the old base track and the landslide affected area are presented in Figure 1, where the realigned base track is also shown.



**Figure 1 Location of landslide and proposed new track alignment (Image: Google)**

## 1.2 Contract Parties

This “Specification” is provided to inform the Maoau Base Track Revetment and Boardwalk Construction (“The Works”) for the construction of Maoau Base Track (“The Site”) under a contract (“The Contract”) to be awarded by Tauranga City Council the principal (“The Principal”) to the successful tenderer (“Tenderer”) as the primary Contractor (“The Contractor”). The Principal has appointed RCP as Engineer to the Contract (“the Engineer”) in accordance with NZS3190;2013. Boffa Miskell and GHD (“The Consultant”) will provide technical assistance to the Principal and the Engineer on an as needed basis. The “Engineer’s Representative” is to be advised.

### **1.3 Purpose of this Specification**

This Specification is provided to inform The Works required for the construction of Mauao Base Track Revetment and Boardwalk under a contract to be awarded by The Principal to the successful tenderer.

As outlined in Section 3.5, The Principal does not represent that the information available shows the existing site conditions in its entirety. Consequently, Tenderers shall undertake all necessary investigations and inspections to adequately inform themselves of the required scope of works.

## 2. Scope of Works

The Scope of Works shall include all such other work as necessary for the proper completion of the Works in accordance with the Tender document. The major items of Work include:

- Preparation of Contractor's Management Plans and updates including but not limited to Construction Program, Quality Plan and relevant Inspection and Test Plans, Project SHE Management Plan and relevant Safe Work Method Statements and the Contractor's Environment Management Plan
- Site establishment, including clearing of identified vegetation, installation of fencing and signage as well as completion of site set out surveys
- Design and construction of the boardwalk to the lines and levels specified, including the design and construction of connection of the boardwalk to the revetment structure and screw pile foundations
- Supply and placement of rock, fill material and geotextile meeting the requirements stipulated within this Specification and the drawings
- Earthworks and drainage as per the design drawings
- Construction of the concrete ramp and stairs as per the design drawings.
- Completion of all survey activities associated with the works including setout and as-built compliance surveys
- Site disestablishment and restoration, including completion of As Built Surveys
- All construction works undertaken in accordance with resource consent and Archaeological Authority requirements.

## **3. General Requirements**

### **3.1 Australian and New Zealand Standards**

This specification makes reference to various Australian and New Zealand Standards and established Codes of Practice. The edition of the standard current at the closing date for tenders shall apply, notwithstanding any reference to the contrary.

If, subsequent to the award of the Contract, any Standard is amended, the Engineer may direct the Contractor to comply with such amendments. Standards noted in this specification shall also be adhered to by the Contractor.

Where the regulatory Authority's requirement differs from the Australian and New Zealand Standards, the regulatory Authority's requirement shall prevail.

### **3.2 Precedence & Dimensions of Drawings**

#### **3.2.1 Documentation**

The order of precedence of the contract documents shall be in accordance with "Section 1: Conditions of Contract" of the Tauranga City Council Form of Contract.

#### **3.2.2 Drawings**

Drawings made to larger scale (i.e. 1:100 is larger than 1:1000) and those showing particular parts of the works shall take precedence over Drawings made to smaller scales and those for more general purposes.

Where any discrepancy exists between figure and scaled dimensions, the figured dimensions shall prevail.

Spot levels shall take precedence over contour lines and batter profile lines.

#### **3.2.3 Discrepancies**

All discrepancies shall be immediately notified in writing to The Engineer.

### **3.3 Electronic Information**

Electronic information shall be issued only at the request of the Tenderer or Contractor and will be supplied in CAD format to be used to develop As Built Drawings. When issued, this electronic information is provided on the basis that the hard copy drawings at all times take precedence over the electronic information. The Tenderer / Contractor shall solely be responsible for checking all electronic information provided against the current hard copy drawings and must report any discrepancies in writing to The Engineer.

### **3.4 Interpretation of Documents**

The Tenderer shall make their own interpretation, deductions and conclusions from the information made available and shall accept full responsibility for such interpretations, deductions or conclusions.

The Contractor, or any Subcontractor to them, shall check all relevant dimensions on site before proceeding with the works. Under no circumstances shall dimensions be scaled from the Drawings unless authorised in writing by The Engineer. No claim for additional costs arising from failure to obtain measurements and other information on site will be allowed.

### **3.5 Omissions**

The Principal does not represent that information made available shows completely the existing site conditions. The Principal is not responsible for any interpretations, deductions and conclusions made by the Contractor from the information made available and the Contractor shall accept full responsibility for any such interpretations, deductions and conclusions.

As the information supplied to the Contractor could include errors or omissions or could be ambiguous or misleading, the Contractor shall advise The Engineer of any discrepancies at the earliest possible time.

If the Contractor supplies information to anyone else, including a Contractor or Subcontractor, for any information supplied the Contractor shall indemnify the Principal and The Engineer against any claim by that person arising out of errors or omission or the misleading nature of the advice.

### **3.6 Environmental Conditions and Management Plan**

The site is located within the Coastal Management Area (CMA) of Tauranga City Council and is on the eastern side of the Tauranga Port entrance channel. The Contractor must familiarise themselves with the environmental conditions at the site, giving consideration to potential operational downtime and safety issues.

There are typically 10-20 ships per day to/from the Port which will be passing the site. Contractors working at Mauao would need to make provision for these shipping movements and associated effects such as wake action etc. There will also be a requirement for the Contractor to liaise with the Port Authority and agree any demarcation, navigation lighting, etc requirements for the site.

The Contractor is expected to visit the area, make their own assessment of the appropriateness of their proposed construction plant and methodology given the condition of the proposed work areas and the likely wind and wave conditions and develop an appropriate Environmental Management Plan.

A preliminary Environmental Management Plan has been included in the resource consent application, setting out the key items and matters that need to be included in the Contractor's final Environmental Management Plan (refer to Appendix A). The approval of the final Environmental Management Plan will sit with the Bay of Plenty Regional Council, which will be a condition of the resource consent.

### **3.7 Contractor's Plant and Methodology**

The Contractor is to supply a list of all plant to be used in the works for approval prior to commencement.

The Contractor is to submit a works methodology for each component of the works, taking into account the limitations and implications of a live, operating port. This methodology is to be submitted for approval to the Engineer prior to commencing works on site.

All of the Contractor's plant and equipment, etc., shall be in good and serviceable condition and in ready status to commence the works. Furthermore, it shall be maintained in working condition at all times during the execution of the works.

The Engineer shall have the right to carry out inspections of all equipment prior to its mobilisation. During such inspections, the Contractor shall extend full co-operation and allow access to all dismantled items and parts to be inspected. The survey shall include, but need not be limited to, checking maintenance/services records of equipment. If the survey reveals that

the equipment provided is not in a condition acceptable to The Engineer, the Contractor shall, at no additional cost to The Engineer, carry out the necessary repairs or make replacements.

The Engineer shall have the right to carry out further surveys and calibrations similar to the above during the performance of the works if any of the Contractor's equipment or systems proves defective and/or is replaced. Calibrations of any equipment or system shall be repeated as per the Contractor's procedures. The Contractor shall prepare such procedures subject to the prior approval of The Engineer. The Contractor shall perform necessary repairs or make replacements on the basis outlined above and as required by The Engineer at no additional cost.

Contractors shall have ready access to a range of tools to effect minor routing repairs (sockets & spanners, pry bars, mallet, shovel, crow bar, spare pins for grabs & buckets). Qualified and experienced operators shall be supplied for the supplied items of machinery for the duration of the works. Relief operators shall be supplied where the regular operator is absent for any reason.

### **3.8 Site Access and Traffic Management Plan**

For the period of the works, the existing base track alignment shall be opened and accessible to the public as much as practical, particularly on weekends and any public holidays. The Contractor shall maintain a secure work site that excludes the public from accessing the work area for the duration of the work when any risks exist.

Due to the limited access to the work area along the existing track network and the limitations of working in the vicinity of significant heritage features, it is anticipated that the majority of heavy material and large equipment will be delivered to the work area by barge to the beach area. The existing track limits the width, weight and height of equipment that can get to the working area. Any damage sustained by equipment accessing the work area shall be repaired immediately by the Contractor at no cost to the Principal, with aims to re-instate safe public access at all times.

It is acknowledged however that it will be necessary for the Contractor to use the existing base track or four-wheel drive track to access the work area with personal or small equipment for the delivery of the contract works. The use of this access needs to be pre-approved by the Principal in one of the following categories:

- a. Personal and small plant and equipment not affecting visitor access or safety

The movement of personal and small plant and equipment that can be carried in and out of the Site is approved to take place while the track remains open. The Contractor shall have signage in place to inform the visitors of any potential hazards during this time and shall take all practicable steps to ensure there is no risk to the public from this activity.

- b. Small plant / equipment or material movements requiring short term closure (up to 30 minutes delay for the public)

On occasion, it will be necessary to move small plant, machinery and materials along the existing track to the work area with an impact on the track of less than 30 minutes.

Because this activity does not allow safe two way traffic at the same time it is necessary to manage the public access during this time. When this is necessary, the Contractor shall temporarily close the track while the transportation is undertaken with signage and designate a marshal at either end informing the public of what is taking place and how long they might have to wait.

- c. Planned one off closures for specific works approved by the Principal

If there is a requirement to close the track for visitor / public safety for a period of more than 30 minutes on any given day, the Contractor shall provide the following:

- Notification of the closure to the Principal's communications team via e-mail at least 1 week in advance, and notification as soon as the closure has been lifted via e-mail
- Effective signage informing the public of the closure dates and times at least 1 week in advance at each end of the base track and also each end of the closed area during the closure
- Effective barriers that prevent public access to the closed area for the duration required
- Staff or security personal at each closure point for the day time duration of the closure during working hours (8am – 5pm)

The Contractor is also required to prepare and submit a Traffic Management Plan before the commencement of construction. The Traffic Management Plan must be approved by the Principal and would benefit from being developed in consultation with the Principal and other relevant stakeholders, detailing site access requirements and communication protocols.

Any use of the Port of Tauranga facilities by the Contractor would need to be negotiated and agreed directly with PoT well in advance of the work. PoT have advised that space for stockpiling material at the Port is limited and the preference would be to load material deliveries directly onto barges.

The Port of Tauranga (PoT) wishes to be kept informed of project development and to have constant communication from the selected Contractor. The Contractor should therefore include details of the proposed communication protocol with the Port of Tauranga to ensure safe barge movements etc in the TMP. They should also include details of the proposed barge loading site and anticipated traffic movements for material deliveries to the barge loading site.

In addition to this, the Contractor shall carry out a risk assessment in consultation with The Engineer to assess if areas near the site need to be closed off.

The Contractor shall provide such signing and undertake temporary works to comply with all safety requirements.

The Contractor shall submit to the Engineer prior to possession of site, their plan for diverting traffic including the location and types of all signs required to control traffic. It is the sole responsibility of the Contractor to provide all standard signs required for traffic control including advisory type signs. The Contractor shall allow for all signing in the tender price.

All signs and method of traffic control shall be generally in accordance with CoPTTM and to the approval of the relevant Statutory Authority.

All damage to existing pavements and improvements shall be made good to the standard of the pre-existing conditions. These works shall comply with the Principal's requirements for works on public lands.

The Contractor shall supply, erect and maintain all necessary signage, barriers and fencing to clearly indicate limits of public access during the works.

### **3.9 Site Cleanliness**

The Contractor shall be responsible for the removal and disposal of all surplus spoil and rubbish and for cleaning up of all areas covered by the contract. All soil, rock and site material must remain on Mauao with the exception of vegetation log wood that will be supplied to local iwi and an allowance for removal and transportation of this log wood should be made within the city limits. Material that needs to be removed from the working area will be transported to one of the two designated disposal areas with Mauao Historic Reserve. The nearest one is adjacent to the reservoir and is accessible with a 6 wheeler tip truck. Note that the volume of storage is limited

and pending the scale of material additional approval may be required specifically by the Engineer.

. Waste minimisation and management measures should be implemented, including:

- Recycling and diverting from landfill demolition materials, wherever practical
- Separately collecting and streaming quantities of waste concrete, bricks, blocks, metals, plasterboard, paper and packaging, glass and plastics, and offering them for recycling where practical

The Contractor shall ensure that no waste from the Site is conveyed to or deposited at any place that cannot lawfully be used as a waste facility for that waste.

The Contractor shall ensure no waste concrete is to be discharged anywhere on the site including during cleaning of plant, equipment and tools.

The Contractor would also employ monitoring techniques and record volumes of waste and methods and locations of disposal as approved by the Engineer. The Contractor shall be responsible for ensuring the site remains clean and tidy during the works to a level acceptable to the Principal's Representative.

### **3.10 Site Establishment and Temporary Construction Compound**

The Contractor shall establish the areas for its site facilities and for storage of materials and equipment in consultation with the Engineer. It is possible to locate a small site office or facility adjacent to the Pilot Bay wharf area provided vehicle turning, public access and parking requirements are not compromised at any time.

There is an alternative location inside the Mount beachside holiday park bollards which would be preferable but further away. Given the distance to the working area it may be necessary to locate a toilet facility closer to the working area.

No temporary building or structure shall be erected outside the establishment or works areas without the Engineer's written approval. Such approval will only be given for a fixed duration and if the Engineer determines that these structures are necessary for the operations being undertaken in their proposed vicinity. The cost of supplying temporary services to the facilities shall be entirely at the Contractor's own cost.

The Contractor shall, within 7 days of acceptance of this Tender, submit, to the Engineer for approval, full details of the proposed layout of their offices, amenities, stores, workshop, etc., within the area of Works, if necessary. Upon receipt of the Engineer's approval for their layout, the Contractor shall mobilise all plant and equipment and shall establish their offices and stores in this area. It is expected that much of the construction plant could be stored within the wharf area.

The proposed location of the temporary construction compound is to be confirmed with The Engineer, prior to mobilisation to site.

The Contractor's work area will be designated using temporary fencing, with a minimum height of 1.8 metres, and signage, and will utilise the existing surfaces where possible. In the event that the existing surface is unable to support the construction traffic i.e the road down to the old jetty, or the remaining sections of track then the contractor shall propose a solution for the Engineers approval. The Contractor shall be responsible for the provision of all temporary services, fencing, sheds and barriers as required for completion of works.

The Contractor shall at all times maintain their establishment area, office, amenities, etc. in a clean and tidy condition.

The Engineer reserves the right to designate additional or alternative working, establishment or storage areas.

### **3.11 Contractor's Facilities**

The Contractor at his own expense shall provide and maintain proper sanitary conveniences for the use of the workmen engaged on the works. Such conveniences shall be kept clean, shall comply with the Principal's requirements and shall be removed at the completion of the works.

All construction plant and associated equipment to be employed on the work shall be in a good working order and in such condition that the Contract can be completed without need for overhaul or repair other than routine maintenance.

In the event of a breakdown which will cause any item of the construction plant to be out of service for a period exceeding one calendar week, the Contractor shall provide a replacement.

### **3.12 Temporary Services during Construction**

#### **3.12.1 General**

The Contractor shall provide or arrange for the provision of temporary service mains, i.e. power, water, etc., within the site of the Works for their own use, where necessary. There is water supply at the end of the road adjacent to the wharf facility.

The Contractor shall meet all costs and be responsible for connection and reticulation of temporary services from the points of connection.

When The Engineer determines that a temporary service is no longer required, the Contractor shall ensure that the service is disconnected and appropriately capped.

#### **3.12.2 Electricity**

The Contractor shall make all necessary arrangements with the relevant supply authority for the supply of all temporary electricity requirements, including all temporary cabling and meter, and shall pay all associated costs and metered charges, if required.

All wiring shall be in accordance with AS/NZS 3000 and the requirements of the supply authority.

#### **3.12.3 Water**

The Contractor shall make all necessary arrangements with the relevant supply authority for the supply of all temporary water requirements, including all temporary piping and meter, and shall pay all associated costs and metered charges, if necessary.

At the completion of the Works, the temporary connection shall be disconnected and removed or abandoned and any existing permanent services made good.

### **3.13 Survey Set Out**

The works shall be set out by The Contractor and constructed in accordance with the alignments, levels, grades and cross sections as shown on the approved drawings or as directed by The Engineer in accordance with this specification.

Approval to proceed shall not constitute acceptance of the accuracy of the work nor relieve the Contractor of their contractual obligations and responsibility for the work.

The Contractor shall be responsible for the establishment of all other temporary reference points. The establishment and checking of reference level survey marks in and around the site

shall be carried out by a licensed surveyor and regularly checked. The Contractor shall supply The Engineer with certified evidence of all such surveys.

Payment for survey set out will be assumed to be included in the relevant schedule item for each activity. Further details around survey works can be found in Chapter 10.

### **3.14 Protection of the Works**

The Contractor shall adopt adequate measures to provide security and protection of the Works and to deter unauthorised people from gaining access to the site.

The Contractor shall be deemed to have allowed for all effects of wind, waves, tides and weather including the following:

- The effect of wave climate and tides
- The effect of wakes from the nearby shipping movement
- The effect of weather on the site
- The effect of wind-blown material from land adjacent to the site
- The effects resulting from erosion and deposition of material, including any necessary backfilling or removal of such material

Without limiting their liability under the Contract, the Contractor shall at their own expense make suitable arrangements to protect the Works, any temporary works, works under construction, construction plant and materials against the effects of weather conditions, wave action, tides and inundation, tug action and shipping movement, wind-blown soil, and shall take all necessary steps, including regular inspection as required, to ensure that no further damage is caused to the revetment.

The Contractor shall provide all temporary drainage required to protect the Works (and any adjoining property) from damage due to collection or flow of rain or stormwater and to prevent ponding of water on excavation works. Any damage resulting from the Contractor's neglect to provide protective drainage shall be rectified by the Contractor at his own expense.

Where extreme weather is forecast or where for some reason, beyond the control of the Contractor, placement of materials must cease, the Contractor shall immediately begin placing sufficient quantity of rock to prevent areas exposed as a result of the construction activities from suffering damage. This clause does not relieve the Contractor of the responsibility of ensuring that the finished structures are to plan and specification. It shall be deemed that the Contractor has allowed, within the rates and prices tendered, for all risks and contingencies associated with the exposure of the construction to storm waves and extreme water levels, and any emergency or rectification works resulting from such a storm.

A preliminary Erosion and Sediment Control Management Plan has been included in the resource consent application (refer to Appendix B). The Contractor shall prepare and implement a detailed Erosion and Sediment Control Plan; the approval of which will sit with the Bay of Plenty Regional Council, which will be a condition of the resource consent.

### **3.15 Archaeological Site Management**

An Archaeological Site Management Plan has been included (refer to Appendix C). All ground disturbance where there is the potential to encounter archaeological features will be subject to prior investigation or monitored at the discretion of the approved archaeologist under the conditions of an archaeological authority granted by Heritage New Zealand. Provision for archaeological investigation prior to commencement of track construction shall be made by the contractor as part of the works which shall include establishment to site and provision of the

required plant and operator as required by the archaeologist. The nature and extent of the investigation will be determined by the conditions of the archaeological authority.

### **3.16 Dust Control Measures**

The Contractor shall be responsible for effectively controlling dust and wind borne material nuisance throughout the period of the works, including after hours, weekends and public holidays.

#### **3.16.1 Dust Management Plan**

The Contractor shall prepare a Dust and Noise Management Plan and submit to the Engineer and Principal for approval, if directed by the Principal, prior to the commencement of work on site. The plan shall include at least the following:

1. Dust and noise control measures in relation to the works programme
2. Operating procedures to prevent the escape of dust and wind borne material from the site
3. Staging of Contractor's dust control works including wind fencing erection and relocation
4. Measures to comply with the Dust Control Guidelines
5. Contact names and telephone numbers for dust or events outside normal working hours
6. Staff education programme for dust and noise control requirements

N.B. the approval of the Dust and Noise Management Plan will sit with the Bay of Plenty Regional Council, which will be a condition of the resource consent.

#### **3.16.2 Adjacent Residents and Properties**

The Principal and Contractor shall issue advisory notices addressed to all adjacent areas providing details of the impending works and the names and contact telephone numbers of the Contractor, as necessary.

### **3.17 Inspections**

The Contractor shall notify The Engineer and the relevant service authority inspector not less than 48 hours prior to an inspection being required for those phases of the work specified in Clause 2 or by the Engineer.

### **3.18 Permits and Certificates**

The Principal will obtain the resource consent, archaeological authority and the building code exemption for the boardwalk, however contractor input will be required around the building code exemption when the DNC design details are known.

The Contractor shall obtain at their own cost all other necessary permits, certificates and other like consents from relevant authorities required to carry out the Works and shall submit copies of all such permits to The Engineer.

Any additional drawings which may be required by such authorities shall be prepared by the Contractor at their own cost and two copies of such drawings shall be supplied to The Engineer at the same time.

Such drawings shall be submitted to the relevant approval and inspecting authorities in ample time to enable them to provide approval prior to work commencing.

The Contractor shall give to the relevant inspecting authorities' reasonable notice in writing (with a copy to The Engineer) of the date and place at which any works will be ready for inspection and testing.

### **3.19 Site Meetings**

Site meetings will occur fortnightly or as advised by the Engineer. The Contractor, or his representative, and The Engineer's Representative shall attend the meeting.

The Contractor shall, if required, arrange for the attendance of Subcontractors and other staff members as may be required.

The purpose of such meetings is to assist in obtaining co-operation between all parties concerned on the project as well as checking progress of the Works, identifying matters requiring action and providing the opportunity for general discussion of the Works.

The Engineer, or their representative, will chair the meeting and provide copies of the minutes of the meeting to the Principal and the Contractor.

### **3.20 Progress Photographs**

During the contract period, the Contractor shall arrange to take weekly photographs of the Works. The photographs shall show progress and all aspects of construction, including Contractor's temporary works and progress achieved underwater.

### **3.21 Existing Services**

It shall be the Contractor's responsibility to verify the position of underground and other services before commencing excavation and further, to arrange repair by the responsible servicing authority, at his own cost, all damage caused to these services during the works.

Take every precaution to protect all existing utilities, either above or below ground from damage during construction. Bear all costs resulting from damage to existing utilities.

Do not excavate by machine within 1 m of existing underground services without prior approval from the relevant authority.

Where existing services must be interrupted to enable carrying out of the works such interruption shall be at a time agreed by the Engineer. The Contractor shall organise with the responsible servicing Authority so that the interruption shall be for the minimum practical time. All costs shall be considered to be included in the Contractors price to complete the works.

### **3.22 Restoration and Site Clean Up**

#### **3.22.1 Surface Restoration**

Excavation is to be kept to a minimum in all established areas such as roadways, footpaths and other paved areas. Unless otherwise specified or shown, all damage to existing improvements as a result of construction works shall be made good by the Contractor, to pre-existing conditions.

The cost for reinstatement work shall be deemed to have been included in the tender.

At the direction of the Engineer any deposited material will be deposited on site to the designated stock pile locations.

### **3.22.2 Clean Up**

During the period of the Contract, the Contractor shall clean up the construction site and remove surplus construction material from the site. Any excavated material must not be taken away from Mauao. It will be transported to the nominated stock pile location on site. All logwood that required removal will be delivered to the designated local Marae locations.

At the completion of the Contract the site shall be left clean and tidy with all excess material relocated to the satisfaction of The Engineer. If the Contractor fails to do so, The Engineer will arrange to clean the area at the Contractor's expense.

The Contractor shall return the area handed over to them in a condition equal to the condition in which was given to them. All costs of reinstatement shall be at the Contractor's expense.

The rubbish removed from the site or other areas used by the Contractor must be disposed of lawfully.

### **3.23 Testing**

The Contractor shall be responsible for providing verification that all materials and work comply with the requirements of this specification.

The Contractor shall allow within the tender price for all testing as required by this Specification.

Where the tests fail, the work shall be rectified and retested until the work falls within the specified tolerances to the satisfaction of the Engineer.

The Principal shall pay for additional testing requested by The Engineer unless such tests fail, in which case, such testing shall be at the Contractors expense. All re-tests shall be at the Contractors expense.

### **3.24 As Built Survey**

The Contractor shall provide, at his own expense As Built Survey records to be lodged with The Engineer during the progress of the works as required.

The survey shall be completed by an approved licensed surveyor who will mark up the information in ink on a copy of the plans provided by the Engineer. The Contractor shall also provide a DWG / DXF copy of the As Built data in accordance with the Principal's requirements.

Practical Completion shall not be issued until the As Built drawings have been checked and approved by the Engineer or appropriate governing authority. Further details around survey works can be found in Chapter 10.

### **3.25 Practical Completion**

Practical Completion shall be awarded when:

- All Authority inspections have been successfully completed and clearances are available at no additional cost to the Principal
- All testing has been successfully completed
- All As Built Drawings have been accepted by the Engineer

### **3.26 Final Certificate**

The Final Certificate at the end of the Post Completion Period shall not be issued until:

- The works have been inspected by the Engineer and a defects clearance list provided and accepted

### **3.27 Plant and Equipment Down-Time**

No allowance for payment of down time due to breakdown and maintenance of plant and equipment has been included in this Contract. It is the responsibility of the Contractor during the Tender Period to familiarise himself fully with the site and the likely conditions that will be encountered. The Contractor shall be deemed to have made adequate allowance for down time due to breakdowns, maintenance and the like in the Schedule of Rates and Lump Sum Items.

### **3.28 Standby Time Due to Inclement Weather Conditions**

No allowance for payment of standby time due to weather has been included in this Contract. It is the responsibility of the Contractor during the Tender Period to familiarise himself fully with the site and the likely conditions that will be encountered. The Contractor shall be deemed to have made adequate allowance for delays due to inclement weather in the Schedule of Rates and Lump Sum Items.

### **3.29 Geotechnical information provided**

The geotechnical information provided to the Contractor is not warranted to fully represent the nature of the soil conditions he/she may encounter in executing the Works. The use of the information and the interpretation of it is entirely the Contractor's responsibility, and the Contractor's price shall include for excavation in all materials met with the sole exception of "Hard Rock". The Contractor shall allow in his/her Price for any additional geotechnical investigation he/she considers necessary to confirm ground conditions, determine installation requirements and configuration and design the temporary works.

### **3.30 Design of Temporary Works**

Temporary Works Certificates shall be required for the design of Temporary Works of a non-routine nature including, but not limited to, these parts of the Contract Works;

- a) Temporary works within the location of the revetment where temporary structures to support excavations in loose saturated sand below the water table is required where a safe batter cannot be maintained.
- b) Temporary structures to support excavations over 1.5m deep where a safe batter cannot be maintained.
- c) Temporary works adjacent to or below sea level, drains, streams, and retaining walls. The distance of influence temporary works may have on these features will vary and may be very large especially where dewatering is being undertaken.

Before submission to the Engineer, the Contractor's proposals for all these Temporary Works and erection methods shall have been checked by a Chartered Professional Engineer (CPEng) with the relevant practice area who has proven experience in the design of works of this nature, and who is expressly engaged by the Contractor for the purpose of making such checks.

The Contractor is required to either:

- a) Engage a CPEng geotechnical engineer who is recognised as a Category 1 geo-professional by TCC and employed from an ISO9001 accredited company, or
- b) Engage two CPEng geotechnical engineers from separate firms that are both recognised and have the TCC Category 1 geo-professionals act as the lead geotechnical consultant and peer reviewer.

The Contractor shall engage CPEng engineers with relevant practice areas for other disciplines of temporary works design, for any temporary works that are outside of the expertise and experience of the Category 1 geo-professional.

A form of Producer Statement – C1 Producer Statement (Design) from the TCC IDC shall be provided for each item of temporary works.

Each Temporary Works Certificate shall be signed by the Contractor and the Temporary Works Checker. The Contractor shall submit two copies of the Temporary Works Certificate to the Engineer, with original signatures, along with two copies of all relevant drawings and documents.

Any comment that the Engineer may, or may not, make upon these plans shall in no way relieve the Contractor of any of the Contractor's responsibilities under the Contract Documents.

The Contractor shall not begin construction of any Temporary Works until this procedure is complete.

In addition, the CPEng engineer who checked the Temporary Works on behalf of the Contractor, shall make visits to the Site at sufficiently frequent intervals to be satisfied that the work is being carried out in accordance with the plans as checked and certified by the CPEng engineer, and shall report satisfaction in writing to the Engineer after each such visit.

All Costs associated with this design, its check, and the checking CPEng engineer's Site visits shall be met by the Contractor.

### **3.31 Operation and Maintenance Manual**

The Contractor shall prepare and submit an Operation and Maintenance Manual containing accurate and comprehensive operating and/or maintenance instructions for all installed equipment for the approval of the Engineer.

The manual shall be specifically prepared for this project and shall not contain non-applicable items and information.

As a minimum the manual shall include:

- a) Product datasheets
- b) Detailed maintenance and servicing instructions
- c) Copies of final pre-commissioning and final commissioning check sheets
- d) Proprietary literature included in the manual shall be originals or high quality legible photocopies. The model number or other unique identifier of each component shall be clearly shown on the equipment manufacturer's literature.

# 4. Earthworks

## 4.1 Scope

This section sets out the requirements for the earthworks including imported fill. The Contractor shall comply with the requirements of this section from the Date of Acceptance of Tender.

All work shall be carried out in accordance with specification TNZ F/1, except where amended by this specification, All earthworks shall be constructed to the limits shown on the drawings.

The Contractor shall allow for all conditioning (i.e. wetting, drying), selecting, rehandling and temporary stockpiling necessary to achieve the compaction standards for materials which have been deemed suitable for fill in terms of insitu shear strength.

The Contractor shall manage all earthworks operations within the designated works area. The Contractor shall not dispose of fill or waste materials outside the designated works area without the written approval of the Engineer.

Earthworks operations shall be staged and controlled to avoid excessive bare earth areas.

The Contractor shall carefully manage the earthworks to ensure that the minimum loss of insitu strength occurs in cut areas.

All new earthworks shall be shaped and contoured to visually blend in with adjacent natural landforms. All changes in slope shall be smoothly rounded as a continuous curve.

## 4.2 Relevant Documents

This Specification shall be read in conjunction with the following Standards which are considered to form a part of this Specification. In the event of this Specification being at variance with any provision of the Standards, the requirements of this Specification take precedence over the provision of the Standards. Reference to any Standard shall include all amendments or any Standard in substitution. All Materials and workmanship shall comply with these Standards unless expressly noted otherwise.

- TNZ F/1-Earthworks Construction (latest edition);
- NZS 4402 - Methods Of Testing Soils For Civil Engineering Purposes (latest edition);
- NZS 4431 - Code of Practice for Earth Fill for Residential Development
- Guidelines for Erosion and Sediment Control TP90
- Occupational Safety and Health Code of Practise for Excavation
- Tauranga City Council Track and Walkway Development and Maintenance Manual

## 4.3 Materials

### 4.3.1 Material Classification

#### Revetment Rock Class I-III

The definition of revetment class rock is defined in section 5.3 of this specification

#### Revetment Backfill Class IV-V

The definition of revetment class backfill is defined in section 5.4 of this specification

## **Track Surface Aggregate**

The definition in the Tauranga City Council Track and Walkway Development and Maintenance Manual section 7.4 shall apply.

## **Type R1 Material**

The definitions of type R1 material in TNZ F/1 shall apply.

## **Type R2 Material**

The definitions of type R2 material in TNZ F/1 shall apply.

## **Type W Material**

The definitions of type W material in TNZ F/1 shall apply.

## **Type U Material**

The definitions of type U material in TNZ F/1 shall apply.

## **Topsoil**

Topsoil is defined as the layer of material immediately below the ground surface comprising vegetation, tree roots, other non-decomposed organic matter, turf and humus.

## **Clean Topsoil**

Clean topsoil is defined as the layer of material between the topsoil layer and subsoil layer, comprising topsoil and humus but excluding vegetation, tree roots and other non-decomposed organic matter.

## **Clean Fill**

Clean fill is fill material sourced from off site and complying with the requirements as set out above for the material type for use in the specified locations.

Clean fill material is to comply with the Ministry for the Environment, the Regional or Local Authority which has jurisdiction over the property(ies) involved in the project, definition of Clean Fill.

## **Rubbish**

Rubbish is defined as material e.g. steel, concrete or rubble, plastic, refuse found during cut and fill operations. Rubbish shall be removed offsite.

## **4.4 Construction**

### **4.4.1 Topsoil**

#### **Strip to Stockpile**

The definition of the topsoil and/or the need to separate the topsoil and clean topsoil as defined above and the method of stripping and location of stockpiles to be agreed with the Engineer prior to commencement of work.

The approved areas cleared for earthworks and temporary erosion and sediment control areas shall be stripped of topsoil unless otherwise directed by the Engineer. The Contractor shall establish separate topsoil and mulch stockpiles within the site area. Stockpiles shall not be placed in locations that may endanger the stability of the stockpile or supporting ground. Stockpiles shall be shaped to be free draining and avoid erosion.

Clean topsoil shall be stockpiled separately from other topsoil (as defined above) and clearly identified by fencing to avoid contamination by other material.

### **Uplift from Stockpiles and Respread**

#### **a. Topsoil**

The Contractor shall uplift topsoil from the topsoil stockpiles and spread at a minimum thickness of 100mm (or as directed by the Engineer or otherwise shown on the drawings) on:

- All cut and fill batters 2.5H: 1V and flatter;
- All slopes receiving topsoil shall be textured to provide a key to receive material.

Texturing shall be done by light ripping parallel to the finished ground contour. Priority areas for respreading topsoil are:

- Cut slopes;
- Fill slopes;
- Landscape fill and buttress fill;

#### **b. Clean Topsoil**

The Contractor shall uplift clean topsoil and place or spread, as directed by the Engineer: Clean topsoil shall have a minimum compacted depth of 100mm.

All areas receiving clean topsoil shall be textured to provide a key to receive material.

Texturing shall be done by light ripping parallel to the finished ground contour.

### **4.4.2 Excavation**

The Contractor shall inform and satisfy himself as to the character, quantity and distribution of all material to be excavated. No payment will be made for any excavated material which is used for purposes other than those designated.

Should the Contractor, through negligence or other fault, excavate below or outside the designated lines, he shall replace the excavation with approved materials, in an approved manner and condition, at his own expense. The Principal's Representative shall have complete control over the excavation, moving, placing and deposition of all material and shall determine the suitability of material to be placed within the new landscaped areas.

If it is necessary to interrupt existing surface drainage or under drainage, conduits, services, or similar underground structures, or parts thereof, the Contractor shall be responsible for and shall take all necessary precautions to protect and preserve or to provide temporary services. When such facilities are encountered, the Contractor shall notify the Principal's Representative.

Excavation shall be performed as indicated on the Drawings, and defined in accordance with the as constructed survey, to the lines, grades and levels shown or as directed by the Principal's Representative.

At all times the excavation shall be maintained with adequate falls and drainage to minimise any penetration of water and to allow the ready runoff of water.

The excavation will be performed as documented by the Erosion and Sediment Control planning requirements.

## Cut to Fill

Only minor cut to fill in the location of the Picnic Area is anticipated and will only be superficial landscaping as per the drawings. It is therefore at the discretion of the engineer to the suitability and compaction of this material.

Cut areas shall be excavated to form a uniformly graded surface within the batter limits. The earthworks shall be managed in such a manner that the best material is reserved for the construction of the filling.

The Contractor shall consider all available geotechnical reports (Appendix F&G), investigation and testing results and the like when planning its earthworks. In particular, the varying material types on site. The Contractor needs to assess the degree of selecting, blending, drying and conditioning required, the location and volume of cut available, and haul distances when assessing the best use of the cut material available.

Materials shall be selectively won, for the intended fill type and compacted without undue delay. All cut areas shall be progressively trimmed to meet the final profiles.

The typical cross sections show the design requirements for cut batter slopes and benching. The Engineer may direct modification to the requirements shown on the cross sections at any location on the site to take account of actual conditions present in the excavation.

The Contractor shall take all reasonable care and precautions in regard to weather conditions, haul roads and type of earthmoving equipment to avoid damaging the soils within the cut areas. Where material is workable under favourable weather conditions, the Contractor shall make every effort to take best advantage of these materials during good weather.

## Cut to Waste

Prior to commencement of filling and after topsoil removal, the Contractor shall inspect the existing ground. Should any unsuitable material be present the Contractor shall notify the Engineer of the unsuitable material, who may direct the extent of any undercutting for removal of unsuitable material.

Areas of known undercut are shown on the drawings. The Engineer may instruct additional or reduced areas of undercut as the works progress. The maximum length of open undercut shall not exceed 20m in length and shall not be left un-backfilled at the end of the days work, or when wet weather threatens.

### **4.4.3 Placement of Fill**

#### Imported Fill

All imported fill shall comply with 'clean fill' definition as defined by the Ministry for the Environment and Local council.

#### *Granular Fill*

Where directed by the Engineer and as indicated on the drawings, granular fill shall be placed in selected areas.

#### Stability

No fill shall be placed on new foundation areas without prior to inspection and approval from the Engineer. Fill shall be raised in horizontal layers.

## Surface Preparation & Benching

New fill shall not be spread over surfaces which have deteriorated from their specified condition, and where necessary, the old surface shall be scarified and conditioned and recompacted before placing new fill.

Where fill is to be placed against sloping surfaces steeper than 3 (H) : 1 (V), the sloping surface shall be “benched” such that the vertical height of the bench is less than 0.5 m.

## Layer Thickness

The material shall be spread uniformly in layers as stated below and conditioned to an appropriate water content.

Fill shall be compacted in layers of less than 200mm loose thickness.

No Fill shall be placed in any area until the area has been inspected and approved by the Engineer.

These layer and particle thicknesses may be increased for Landscape on approval of the Engineer.

## Batter Faces

Fill batter faces shall be compacted as a separate operation, or alternatively, overfilled and cut back.

## Pond at Base of Spring (Picnic Area)

The fill material and required compaction standard for the area around the scruffy dome is to achieve a permeability of no greater than  $10^{-9}$ , proposed lining material to be approved by the Engineer.

## Fill Operation

The Contractor shall not dispose of fill or waste materials outside the work site boundaries, without the written approval of the Engineer. All soil, rock and site material must remain on Mauao. When the fill operation has ceased in any area for more than 8 hours, then immediately before recommencing the fill operation, the fill surface shall be scarified to a depth of 100mm, conditioned and compacted to achieve the required standard of compaction.

No new fill shall be placed over previously placed fill that:

- has not achieved the required standard of compaction;
- has become contaminated or has deteriorated from the required fill standards.

Erosion damage to fills resulting from surface water flows shall be repaired by trimming to remove all loose and wet material, benching as necessary, backfilling, compacting and trimming to achieve the specified compaction standards and profile. The repair of erosion damage will be at the Contractor's cost. Fill batters shall be overfilled and trimmed at successive lift heights to achieve the design cross section. Cut batters shall be trimmed to the design cross section at successive lift heights immediately after completion of the bulk cut for that section. Fill surfaces shall be maintained at all times to avoid ponding of surface water and shed water in a controlled manner to erosion and sediment control works. Surfaces shall be rolled to seal the exposed surface at the end of each day. The Contractor shall manage all earthworks operations to complete all structural noise bund, buttress and landscape fills within the site boundary. This may require conditioning of materials, rehandling and temporary stockpiling.

#### 4.4.4 Compaction Standards

At any time either prior to or during the course of construction, the Engineer may direct modifications to the following compaction criteria, with the object of ensuring that the compaction criteria for the particular materials and conditions being encountered or likely to be encountered are achieved.

##### Compaction

Compaction of each layer of fill shall be sufficient to obtain the following standards.

##### *Cohesive Fill Areas*

- Shear vane strength shall be at least 100 kPa;
- The air voids shall be no more than 12%.

##### *Cohesionless material such as sand, gravel, silty sand and gravel mixes and hardfill*

- The Contractor shall submit his proposals for compaction for the approval by the Engineer. The backfill shall be placed in layers and compaction to achieve 95% Modified Proctor Compaction.

#### 4.5 Springs and Wells

The Contractor shall drain any springs or preserve any wells in the manner directed by the Engineer on site.

#### 4.6 Tolerances

All earthworks shall be carried out to the lines levels and grades shown on the Drawings. Tolerances shall otherwise be as follows:

**Table 1: Surface Level Tolerances**

Surface Type	Tolerance
Landscaping	0mm to - 20mm
Batters	0mm to +100mm
revetment	As per section 5.5

#### 4.7 Grassing & Planting

##### 4.7.1 Preparation

##### Weed Removal

All areas to be covered in topsoil are to thoroughly cleared of weeds using a combination of mechanical/clearance. The use of glyphosphate herbicide is to be approved by the Engineer.

Where glyphosphate herbicide is to be used all spraying is to be undertaken by a qualified person and in compliance with the weed management plan prepared by the Contractor and approved by the Engineer.

All spraying shall be carried out in compliance with Local council Guidelines.

Care shall be taken to avoid spraying when wind direction is unsuitable, damaging areas adjacent to existing planting, do not spray adjacent to stream and river edges – hand clearance is to be used in these areas.

### **Ground Preparation**

Spread and trim topsoil as described below and gently compact of a depth of a minimum of 100mm. The topsoil is to be worked to a uniform fine tilth, raked and rolled to present a firm, evenly graded surface. Allow for the removal of all stones and rubble over 20mm in diameter from the prepared surface. Cultivate existing grassed areas affected by construction and new-grassed areas, also remove rocks, debris, stones and sticks etc. Where necessary, raise level of area as directed.

Areas to be seeded shall be cultivated by two passes of a rotary hoe or power harrow to achieve a medium even tilth suitable for seeding. Hoeing or harrowing shall not be carried out until the ground has dried out sufficiently to do so without causing compaction.

### **Batter Protection**

The Contractor shall programme the grassing to co-ordinate with earthworks and to be optimal for grass strike and growth.

The Contractor's attention is drawn to the fact that to fulfill his obligations under the erosion and sediment control requirements of this specification, he must seed, mulch or grass all batters as soon as practicable and in a progressive manner as earthworks are completed over various areas of the site in accordance with Contract Specification. The extent of topsoiling, permanent grassing, hydroseeding, mulching and other solutions shall be confirmed by the Engineer on site prior to commencement of those works.

#### **4.7.2 Sowing & Planting**

Sowing and Planting shall be in line with the Planting General Arrangements Plans and Schedule (Appendix E), or in areas as directed by the Engineer.

The Contractor shall supply rates of materials and methodology to Engineer for approval.

#### **4.7.3 Hydroseeding**

Hydroseeding shall be used where shown on the drawings (Appendix D) and in line with the Planting General Arrangements Plans (Appendix E) in the location of the soil nailed slope, or on areas as directed by the Engineer.

The Contractor shall supply rates of materials and methodology to Engineer for approval.

Successful establishment shall be a 95% growth of a satisfactory sward and if necessary oversowing shall be carried out at the Contractors expense.

### **4.8 Earthworks Control**

#### **4.8.1 Drainage and Erosion Control**

All earthworks are to be carried out with full consideration of and in full compliance with the Guidelines for Erosion and Sediment Control TP90.

All earthworks shall be carried out in fully drained conditions with no free water on the working surfaces. Where it is impracticable to maintain excavations of Unsuitable Material deposits in a fully drained condition, the Engineer shall have discretion to relax this requirement to the degree that is necessary. Cut areas shall be sloped and graded adequately so that they do not pond water or allow water to infiltrate, and drains shall be installed or pumping carried out as

necessary on a regular basis to remove water from the areas of operations, or to drain water as soon as it is seen to develop.

Any filling which has been allowed to become too wet or soft shall be removed and dried, or replaced. All fill surfaces shall be rolled off at the end of each day's work to prevent erosion. Prior to commencement of the filling operations the following day, the smooth surface shall be scarified by approved plant to prevent layering of the fill.

#### **4.8.2 Dust Control**

Earthmoving shall be carried out and maintained so that dust is not raised near or blown over the working area and existing buildings. The site shall be kept watered as necessary to meet this requirement until covered by dust-free materials.

#### **4.8.3 Over-excavation**

The Contractor shall direct his operations to avoid excavating beyond specified profiles. Any excavation beyond these profiles carried out without express instruction by the Engineer shall be made good to the direction of the Engineer including requirements for approved drainage measures and compacted fill of equal quality to that designated to cover the excavated profile.

#### **4.8.4 Over-Filling**

The Contractor shall direct his operations to avoid overfilling beyond the specified profiles.

#### **4.8.5 Stockpiling**

The Contractor shall stockpile only in areas approved by the Engineer.

#### **4.8.6 Preservation and Maintenance**

It shall be the Contractors responsibility to ensure that completed and partially completed works including formation, subgrade and cut site materials are not damaged by surface water ingress, over stressing by construction traffic, over compaction, pumping moisture from below or any other mechanism. The Contractor shall at its cost make good any such damage caused.

The Contractor shall control construction traffic to ensure that the fill is not damaged or overloaded in any way. At the end of each day or when rain threatens the surface shall be left smooth, tightly compacted and shaped to avoid ponding.

Should the fill commence to weave or show or indicate signs of stress for any reason, the Contractor shall cease operations on the fill and immediately notify the Engineer.

The Engineer may require the Contractor to halt any filling operation until the interpretation of any monitoring information allows for recommencement.

### **4.9 Hold Points and Response Times**

Notice shall be given to the Engineer for specific points in construction for the purposes of inspection. Requirements are as set out below:

- |    |  |  |
|----|--|--|
| a. | Prior to proof testing of foundation soils     | The Contractor shall give the Engineer a minimum of 48 hours notice  |
| b. | After stripping and prior to placement of fill | The Contractor shall give the Engineer a minimum of 24 hours notice  |
| c. | Prior to construction of buried services       | The Contractor shall give the Engineer a minimum of 24 hours notice. |

# 5. Revetment Rock and Backfill

## 5.1 Standards & Codes of Practice

The following Standards and Codes of Practice are referenced within this Specification. All materials, workmanship and testing shall conform to the requirements of the following Standards and Codes of Practice except as explicitly varied by this Specification:

- AS 4678-2002 Earth Retaining Structures
- AS 4997-2005 Guidelines for the Design of Maritime Structures
- AS/NZS 1170.1-2002 Structural Design Actions
- AS/NZS 2648.1 Underground Marking Tape Part 1: Non-Detectable Tape
- BS 6349 Maritime Structures - Part 7
- CIRIA Rock Manual
- Coastal Engineering Manual, US Army Corps of Engineers;
- Eurocode BS EN 13383-1:2013 Armourstone
- EurOtop - Wave Overtopping of Sea Defences and Related Structures: Assessment Manual

## 5.2 General

It shall be the sole responsibility of the Contractor to adopt construction methods and programming to ensure the stability of the revetment toe and any excavations throughout construction.

Prior to placing quarry material in situ, the Contractor shall submit detailed method statements to the Engineer for approval. These method statements shall detail the Contractors working methods, work sequences, proposed plant, safety measures and contingency plans for inclement weather. This shall include the construction methodology of the revetment below the water level.

The revetment shall be constructed in the location shown and to the levels, widths and slopes indicated on the Drawings

## 5.3 Rock

The rocks required for the revetment construction shall satisfy all of the criteria summarised in Table 2 and Table 3 below, where:

- ELL: Extreme Lower Limit, or 5% passing
- NULL: Nominal Lower Limit, or 10% passing
- NUL: Nominal Upper Limit, or 70% passing
- EUL: Extreme Upper Limit, or 97% passing

A minimum rock density of 2600 kg/m<sup>3</sup> shall be achieved.

**Table 2 Mass of rock**

Rock Class	Type	Mass (Kg)				
		ELL	NLL	M <sub>50</sub>	NUL	EUL
I	Armour – typical	350	650	1300	1850	2850
II	Underlayer	25	70	180	300	500
III	Armour – enlarged	500	870	1700	2350	3600

**Table 3 Nominal diameter of rocks**

Rock Class	Type	Nominal Diameter (m)				
		ELL	NLL	D <sub>n50</sub>	NUL	EUL
I	Armour – typical	0.51	0.63	0.79	0.89	1.03
II	Underlayer	0.21	0.30	0.41	0.49	0.58
III	Armour – enlarged	0.58	0.69	0.87	0.97	1.12

Placing of the rocks shall comply with the following requirements and those noted on the Drawings:

- a. Rock shall be placed to the lines, levels and batters shown on the Drawings. The batter shown on these Drawings shall be adhered to over the full height of the structure
- b. Class I and III rocks shall be placed to achieve a dense, fully interlocked armoured slope so that each rock is securely held in place by its neighbours
- c. Class I and III rocks shall be placed to achieve a minimum ‘three-point support’ and be stable to the lines and levels shown on the Drawings. The surface of the revetment slope shall present an angular uneven face to the harbour. Class I and III rocks shall generally be placed with their long axes normal to the slope
- d. Rocks shall be placed on to the sub-layer(s) from a height no higher than 1 m vertical distance to prevent damage to the geotextile
- e. Smaller pieces of rock shall not be used to fill interstices, or to prop larger rocks in order to achieve the required profile
- f. Carry out placement of all rock in such a way as to minimise the breakdown of individual rocks. The placement method shall also cause minimum disturbance or dislodgement of underlying material

### 5.3.2 Information to be Supplied

At least fourteen (14) days prior to the supply of any imported rock the Contractor shall provide documentation to demonstrate that the imported rock to be supplied complies with the requirements of this Specification. The documentation to be provided shall include but not necessarily be limited to:

- Details of the quarry from which the rock is to be supplied, including identification of the sections of the quarry where rock complies with the requirements of this specification
- A test report from a IANZ registered independent testing authority on the physical and chemical properties of the rock to be supplied. The report shall include the results of a petrographic analysis and laboratory testing of the rock
- A report from an independent and suitably experienced geologist commenting on the suitability of the rock to be supplied for its intended purpose. The geologist shall prepare the report based on an inspection of the rock and the results of the petrographic analysis and laboratory testing undertaken
- A Method Statement outlining how the proposed quarry operations will produce the specified grading’s of rock and quarry materials for the works

- Recorded assessments of any changes anticipated in the geology of the production faces during the works that are likely to affect rock quality, type, block composition or integrity. Where potential changes are anticipated, details of the changing character of the rock shall be provided to The Engineer for approval
- Demonstrable evidence the proposed blasting pattern will minimise the production of latent fractures
- A recorded volume of rock stockpiles to accommodate interruptions to production
- The duration which stockpiled rock will lay in the quarry stockpile and associated details of how the stockpiles will be worked to minimise the time rock will lay in the quarry prior to transport to site
- Evidence of a system for inspection and testing to identify rock which does not comply with the requirements of this specification prior to dispatch from the quarry
- Anticipated incidence of block fracture on site, based either on controlled drop tests or rock breakages during transit
- Details of the Supplier's Quality Assurance System, including details of the proposed quality control procedures to be implemented to ensure that the quality of rock supplied during the Contract complies with this Specification

Should the Contractor wish to vary the source of rock supplied either within the quarry or by changing quarries, the Contractor shall submit additional documentation (as listed above) to demonstrate that the rock from the new source complies with the requirements of this Specification.

### **5.3.3 Acceptance of Rock**

Acceptance of imported rock shall satisfy all of the following criteria:

- Individual rocks shall be rough and angular, hard, durable and clean and should be free from cracks, cleavage planes, joints, seams, chemical alteration or weathering and other defects which would result in the breakdown of the rock in the marine environment
- Rock shall be igneous or metamorphic and have a minimum surface saturated dry density of 2,600 kg/m<sup>3</sup>
- The ratio of the maximum dimension of any rock to the minimum dimension, measured at right angles to the maximum dimension shall not exceed the requirement stipulated in Section 5.3.4
- Rock shall have no more than 10% (by volume) olivine material and shall exhibit no zones of secondary alteration such as chloritisation
- Rock shall have a saturated point load strength index ( $I_{s50}$ ) no less than 5.0 MPa
- Rock shall exhibit a maximum Los Angeles abrasion value of 25%
- Rock shall exhibit a maximum sodium sulfate weight loss of 5%
- Rock shall exhibit no signs of stress relief
- Rock is of such character that it will resist disintegration and erosion by the action of air, water (fresh or seawater), wetting and drying, extremes of temperature and impact due to wave action or any other natural or climatic factors

### **5.3.4 Shape of Rock**

Rock shall not contain more than 50% by weight of stone with a length to thickness (L/d) ratio greater than 2. Not more than 5% of the rocks shall have a length to thickness (L/d) ratio greater than 3.

Where the length, L, is defined as the greatest distance between two points on the stone and the thickness, d, as the minimum distance between two enclosing parallel planes through which the stone can just pass. Testing for shape ratio determination shall be undertaken on samples of at least 50 pieces taken at random.

### **5.3.5 Quality Control and Testing of Rock**

Testing shall be carried out by the Contractor regularly throughout the works to monitor the quality and size of rock for compliance with the specified requirements. The minimum frequency of testing is outlined in Table 4.

The Contractor shall report the results to the Engineer within 24 hours. The Engineer may order additional tests or more frequent testing by the Contractor if the quarry is worked inconsistently or the testing demonstrates variability in the character of the rock.

Quality control testing shall be carried out by Contractor at the quarry, prior to transportation to the site, in accordance with the nominated Quality Control Procedures.

Rock that has been delivered to site, but is subsequently identified as failing to meet the acceptance criteria shall be removed from the site immediately and disposed of at the Contractor's expense, unless an alternative use is agreed with the Engineer.

**Table 4 Testing Rock and Quarry Materials**

Characteristic	Standard	Acceptance Criterion	Frequency of Testing
		Reference Design	
Lithological Classification	AS 2758	Igneous or high grade thermal metamorphic rocks.	Selection Phase
Visual Inspection	Evaluation of Shape, Grading, Weathering, Voids, and Integrity by a qualified geologist	Rock should be fresh and adhere to shape and grading requirements of this Specification. Presence of voids less than 5%	Continual and before dispatch to the site
Grading	Sampled tested and reported in accordance with Chapter 3 of The Rock Manual (CIRIA 2007).	Grading's specified within this Specification	Weekly testing or as instructed by the Engineer.
Saturated Surface-Dry Relative Density	Sampled, tested and reported in accordance with NZS 3111: 1986 Test 12	2,600 kg/m <sup>3</sup> minimum	Prior to dispatch to site or as instructed by the Engineer.
Water Absorption	Sampled tested and reported in accordance with NZS 3111: 1986 Test 12	3% Maximum	Prior to dispatch to site or as instructed by the Engineer.
Abrasion Resistance	Los Angeles Abrasion Loss Test in accordance with NZS 4407:2015	25% Maximum	Prior to dispatch to site or as instructed by the Engineer.
Rock Strength	Sampled, tested and reported in accordance with Point Load Strength Index Test in ASTM: D 5731 - 016	5.0 MPa Minimum	Prior to dispatch to site or as instructed by the Engineer.

### **5.3.6 Sample Production Loads**

Two weeks prior to the supply of rock for incorporation in the works, the Contractor shall deliver sample production loads for each class of rock to be supplied under the Contract. Sample production loads shall be set aside both at the site and at the quarry in areas approved by The Engineer for the duration of the Contract. The sample production shall be used as a visual reference throughout the works.

The sample production loads shall be produced using the quarrying techniques proposed for full production. Each sample load shall be fully tested to demonstrate compliance with the requirements specified in Table 4 above.

Inspection and review by The Engineer of the sample loads shall not relieve the Contractor of his obligation to ensure all rock for incorporation in the works are to Specification.

To demonstrate compliance with the specified grading, the Contractor shall provide:

- a. 15 tonnes of Class I and III rock
- b. 10 tonnes of Class II rock
- c. Samples shall comprise of masses approximately equal to the EUL, M<sub>50</sub> and ELL rock sizes for each class of rock as shown in Table 2

Each rock with a weight greater than 1,300 kg shall be weighed and a 'Sum of Girths' measurement (as per definition below) shall be taken. Each rock shall be marked with its measured mass and 'Sum of Girths' measurement and retained at the site for visual reference purposes.

Either visual reference or the 'Sum of Girths' methods may be used as a means of estimating the weight of any individual stones. However, if directed by The Engineer, weighing of Rocks may be ordered to verify and/or calibrate the 'Sum of Girth' estimate of rock weights. In the case such verification identifies a discrepancy between the actual measured weights and estimated weights, the actual measurement of weights shall take precedence over the estimated weights of rocks.

The 'Sum of Girths' measurement is assessed as the sum of two (2) girth measurements taken at right angles to each other. The two (2) girth measurements are to be approximately the minimum and maximum girths but they shall not be measured over major projections or irregularities. All girth measurements shall be taken in a manner as approved or directed by the Engineer.

## **5.4 Backfill**

### **5.4.1 Source and Supply**

Backfill shall be placed to the lines, levels and batters shown on the Drawings.

Backfill with ENM (excavated natural material) or VENM (virgin excavated natural material) classification shall be placed to the lines, levels and batters shown on the Drawings.

The material used for backfill shall be free from organic or other deleterious material, obtained from excavation or imported, and contains no fines smaller than 75 µm. In addition, the backfill material shall be free draining, granular, non-cohesive, and well-graded. The Plasticity Index of the backfill material shall be PI=0.

### **5.4.2 Grading**

The backfill required for the revetment construction shall satisfy all of the criteria summarised in Table 5.

**Table 5 Backfill grading requirement**

Class	Type	Nominal Diameter
IV	Backfill	75 µm ~ 75 mm
V	Backfill	75 mm ~ 120 mm

#### **5.4.3 Quality Control and Testing**

Once placed, the backfill shall be sampled and tested at regular intervals not less than once every placed 500 m<sup>3</sup> or as directed by the Engineer to determine its uniformity/conformity with the source samples. Materials found not conforming to the approved samples shall be removed from the Site and replaced at the contractor's own costs. The frequency of laboratory testing on the backfill material samples shall be as directed by the Engineer, depending on the uniformity of backfill material at source and as delivered to the site by the Contractor.

#### **5.4.4 Compaction**

Compaction shall be by mechanical means for above water where practicable. The Contractor shall submit his proposals for compaction for the approval by the Engineer. Once the top of backfill emerges from water surface, the backfill shall then be placed in layers and compaction to achieve 95% Modified Proctor Compaction shall commence.

### **5.5 Construction Tolerances**

The construction tolerances for the backfill and rock layer shall be as follows:

- Backfill
  - +300 mm of the horizontal position shown on the Drawings
  - +200 mm of the layer thickness shown on the Drawings
- Rock layers
  - +500 mm of the horizontal position shown on the Drawings
  - +500 mm of the layer thickness shown on the Drawings

### **5.6 Transportation and Stockpiling**

#### **5.6.1 Rock Transport**

Rock and quarry materials shall be transported to the site using Contractor-proposed routes for approval by the Engineer, the contractor shall include this detail in the Traffic Management Plan.

Transport of materials will be required to comply with all the requirements of the relevant roading authorities

#### **5.6.2 Stockpiling**

Separate stockpiles shall be made for different grades of rock both at the quarry and at the site. The stockpiles shall be formed so that they do not constitute a hazard; the locations, side slopes and heights and other factors affecting safety shall be as approved by the Engineer. The stockpiles are to be located within the area defined on the General Arrangement Plan as "Indicative Heavy Machinery/Stockpiling Extents" (refer Appendix D).

### **5.7 Protection of Works**

Where extreme weather is forecasted or where for some reason, beyond the control of the Contractor, placement of rock must cease, and the Contractor shall immediately begin placing sufficient quantity of Class I rock onto the work-in-progress section to prevent the exposed

areas from suffering wave damage. A stockpile of Class I rock shall be held on site against such an emergency. This clause does not relieve the Contractor of the responsibility of ensuring that the finished structures are to plan and specification.

It shall be deemed that the Contractor has allowed, within the rates and prices tendered, for all risks and contingencies associated with the exposure of the construction to storm waves and extreme water levels, and any emergency or rectification works resulting from such a storm.

## **5.8 Setting Out and Control of the Works**

### **5.8.1 General**

All survey work for setting out and control of construction shall be undertaken by a registered surveyor. The Contractor shall be responsible for establishing all survey marks necessary for the setting out of the works. Marks shall be placed at ten-metre intervals along the structure to mark the profiles of the revetment.

Before the preparation of any rock placement the Contractor shall:

- Submit to the Engineer for approval details of the survey methods to be adopted to ensure accurate setting out, alignment, level and cross sectional control during construction
- Carry out initial ground and seabed survey lines cross sections at ten-metre intervals, or other closer spacing if required. Any discrepancies between the levels shall be investigated immediately and resolved prior to the commencement of construction

Measurements of cross sections along the length of the structure shall be at ten-metre interval. The cross section locations shall remain the same for each layer placed. The cross sections shall extend at least ten metres outside the extent of the proposed revetment construction.

Results of all surveys shall be presented as both digital and hard copy Drawings. The drawings shall identify the cross section location and the design cross section overlaid by the 'as surveyed' cross sections of the foreshore area.

### **5.8.2 Chainage Markers**

The Contractor shall provide and maintain chainage markers at ten-metre intervals along the revetment. The chainage markers shall coincide with cross sections measured for the control of construction. Where possible, these should remain for reference during potential future maintenance.

### **5.8.3 Notice of Survey**

The Contractor shall give a minimum of 24 hours prior notice to The Engineer and shall provide facilities for his attendance during surveys.

# 6. Geotextile

## 6.1 Scope

Geotextile shall be placed on the slopes of the revetment, after the revetment slope has been prepared and removed of any extruding rock, including the submerged slope. Any length of geotextile laid in a shift would need to have the rock material placed over it prior to the next high tide to avoid potential scouring of the backfill material.

The geotextile used for the work shall be nonwoven fabric. Nonwoven geotextiles must have filaments bonded by needle punching, heat or chemical bonding processes.

The fibres of the geotextile and thread used in joining lengths must consist of long chain synthetic polymers composed of at least 95% by mass of polyolefins or polyesters. The geotextile filaments must be rot-proof, chemically stable and must have low water absorbency. Filaments must resist delamination and maintain their relative dimensional stability in the geotextile.

Geotextiles must be free of any flaws, which may have an adverse effect on the physical and mechanical properties of the geotextile.

Geotextiles must be stabilised against ultraviolet radiation to achieve a retained strength of at least 50% after 500 hours of test exposure, when tested in accordance with AS 3706.11.

Geotextiles may be manufactured under controlled conditions from recycled materials. Geotextiles manufactured from recycled materials must conform to the requirements of this Specification, be identified as such on the Certificate of Compliance, and must be homogeneous with respect to the content of recycled material.

## 6.2 Standards

- AS 2001.2.13 Methods of Test for Textiles – Physical tests – Determination of Mass per Unit Area and Mass per Unit Length of Fabrics
- AS 3706 Geotextile – Methods of Test

## 6.3 Quality Control and Testing of Geotextile

### 6.3.1 General

Carry out control testing on each batch of geotextile delivered to the Site to ensure conformity. Testing must include the mean weight of the geotextile, determined in accordance with AS 3706.1 and AS 2001.2.13.

Geotextiles which has not been verified by site sampling and testing to prove compliance with strength and filtration requirements must not be used in the Works.

### 6.3.2 Frequency of Sampling

Frequency of sampling for the geotextile proposed to be used in the Work shall be as follows:

- a. Batch  $\leq$  10,000 m<sup>2</sup> or part thereof: 1 roll
- b. Each subsequent 20,000 m<sup>2</sup>: 1 roll

Grab and tearing strength of the geotextile shall be tested in a IANZ registered laboratory in accordance with AS 3706.2 and AS 3706.3, respectively. 10 test specimens shall be cut from

the longitudinal direction of the geotextile, and 10 test specimens cut from the transverse direction. Use the characteristic strength in the weaker direction to assess product conformity.

A minimum of 10 additional test specimens shall be cut to determine the CBR Burst Strength and Drop Cone Puncture Resistance to AS 3706.4 and AS 3706.5 respectively.

### **6.3.3 Procedure for Sampling**

A representative sample, covering approximately 15 m<sup>2</sup> of geotextile (e.g. 3 m by 5 m), is cut from each sampled roll but not within 2 m of the start or end of the roll.

The longitudinal direction of the geotextile on each sample shall be clearly marked.

### **6.3.4 Testing**

Only IANZ registered laboratory shall be commissioned to carry out testing of the geotextile sample.

Provide any associated documentation, such as geotextile supplier, geotextile type, batch identification, order represented by sample, sample date, roll directional markings, etc to the testing agency for their information, and show them on or attach them to the test reports.

### **6.3.5 Certificate of Compliance**

Provide a Certificate of Compliance that the geotextile proposed for the Work complies with all the requirements of this specification for its specified usage, together with tests results reported on IANZ endorsed test documents.

The certificate must not be more than twelve months old.

The Engineer may accept Certificates from tests carried out for other projects from the same batch samples. Acceptance is only provided where the Contractor's quality management system ensures that the specified minimum frequency of testing is maintained and also ensures traceability of material to the same batch.

## **6.4 Storage and Packaging**

Protective cover and or a waterproof, opaque UV protective sheeting shall be used to wrap the geotextile when in storage.

Geotextiles must not be stored directly on the ground or in any manner in which they may be affected adversely by heat, dirt or damage.

The method of storage must be in accordance with any other recommendations set by the manufacturer.

The protected geotextile rolls must be clearly labelled showing manufacturer, type of geotextile and batch number identification number.

# 7. Boardwalk and Foundations

## 7.1 Scope

The scope of this section is to define the performance and material requirements for the boardwalk as shown in the Design Drawings, which is to be designed, supplied and constructed by the Contractor using Fibre Reinforced Plastic (FRP) material. This scope also includes design and construction of foundations and connection to the existing base track and proposed revetment structure.

The Contractor shall supply the boardwalk based on manufactures' sections and material properties while meeting the requirements set out in this section. Details of proposed FRP supplier, typical section shapes/sizes/spans etc to be submitted with the Tender.

The boardwalk design shall be undertaken and signed off by suitably qualified engineer(s) as required under relevant New Zealand regulations, The boardwalk shall be designed to the lines and levels supplied in the drawings, due to these levels not achieving the accessibility standards of the building code the contractor shall apply for a building consent exemption on behalf of the Principal.

## 7.2 Standards and References

The design and construction of the FRP boardwalk shall comply with the specifications in the following standards and references:

- AS/NZS 1170 Structural Design Actions
- AS/NZ 2156 Walking Tracks
- Tauranga City Council – Track and Walkway Development and Maintenance Manual
- Eurocomp Structural Design of Polymer Composites - Design Guide and Handbook

## 7.3 Material

Unless otherwise noted or approved, the elements for use in this boardwalk shall be designed and manufactured using ECR glass and vinyl ester resin (i.e. fibre reinforced plastic) conforming to ISO 9002 standard.

## 7.4 Project Requirements

The Contractor shall ensure the FRP material supplied for the Project satisfies the following requirements:

- Material must not environmentally degrade over the design life of the Project
- Materials must be inert such that they do not interact with the ecosystem
- Materials should not encourage growth of flora including moulds and fungi
- Materials should, as far as reasonable practicable, be resistant to pest and fauna attack
- Colour of the material to be approved by the Engineer and Principal
- Systems and components must be capable of being transported, as discussed in Section 3.8
- All connections/fixings to be stainless steel or otherwise approved by the Engineer

- Clearance between the base of the boardwalk and the ground should be a minimum of 200mm.

The Contractor's manufacturer/supplier shall have the engineering capability to develop the design to suit their product. In addition, the Contractor's manufacturer/supplier shall implement rigorous quality control and testing processes to deliver against the performance criteria.

Approvals to proceed shall be obtained from The Engineer prior to the Contractor commencing the below activities:

- Procurement/fabrication
- Delivery
- Installation

The programme shall clearly state the timeframes for the design and construct portion of the works including product supply lead times. The Engineers/Principals design review/approval period of 10 working days shall be allowed for in the programme.

## **7.5 Performance Requirements**

This section outlines the requirements of any submissions made by the Contractor's chosen supplier(s). The design drawings specify the grades, levels, location, alignment and dimensions of the proposed boardwalk. These parameters are fixed and any variation proposed by the contractor's design will require written approval from The Engineer.

### **7.5.1 Design Life**

The boardwalk material is to have a minimum design life of 50 years, The contractor shall describe the maintenance requirements of the boardwalk solution they propose. All components of the boardwalk shall achieve the durability to survive the design life under conditions in the coastal environment. An operations and Maintenance Manual is to be provided to The Engineer for the Boardwalk. A warranty shall be supplied to the Principal in the form of Schedule 13 of the conditions of contract.

### **7.5.2 Boardwalk Classification**

The boardwalk shall achieve the requirements as Class 1 Primary Path per TCC TC1/14 (SNZ HB 8630:2004) Reserves Walkways Maintenance – Track and Walkway Development and Maintenance Manual.

The loadings on the boardwalk shall be taken from the requirements of AS/NZ 2156 Walking Tracks as a Class 1 track.

### **7.5.3 Structural Loading and Deflections**

All loads, load combinations and deflection limits shall comply with relevant Australian and New Zealand standards. The Contractor shall submit a design that meets the criteria below.

#### **Live loads**

Live loads shall be in accordance with AS/NZS 1170.1 and AS/NZ 2156, extract below. These loads are requirements of a Class 1 walking track in AS/NZS 2156.1.

- Uniformly Distributed Load: 5.0 kPa
- Point Load per span: 4.5 kN

Design wind speed shall be calculated in accordance with AS/NZS 1170.2.

## Load Combination

Load combinations nominated in the AS/NZ 1170 shall be adopted and are listed below.

- Strength Combination: 1.5\*Live load + 1.2\*Dead load
- Deflection Combination: 1\*Live load + 1\*Dead load

## Deflection Limits

Deflection shall be limited to span length/250 under the deflection loading combination.

### 7.5.4 Boardwalk Layout

The proposed layout of the boardwalk is shown in the Design Drawings. These specify the grades, levels, location, alignment and dimensions of the proposed boardwalk. These parameters are fixed and any variation proposed by the contractors design will require written approval from The Engineer

The boardwalks deck shall have an overall width of 2.5 m with a clear walking width minimum of 2 m.

### 7.5.5 Boardwalk Grade

The ramped sections of the boardwalk shall comply with the TCC TC1/14 Reserves Walkways Maintenance – Track and Walkway Development and Maintenance Manual, and shall have a maximum grade of 1 in 8 (12.5%) and a preferred grade of 1 in 12 (8%).

### 7.5.6 Piles

The Contractor shall design and construct the foundations using screw piles for supporting the boardwalk. Screw piles shall follow the Practise Note 28 Screw Piles: Guidelines for Design, Construction & Installation as outlined by Engineering New Zealand.

Pile locations shall fall within the current footprint of the boardwalk, and shall consider and avoid important features such as streams of cultural significance, shell mounds, boulders close to the shoreline , tree roots etc while meeting the criteria set out in this Clause. The Contractor shall be responsible for determining the required embedment depths for the proposed piles using the conditions and soil parameters specified in the Geotechnical Design Reports (Appendix F&G). The material for the screw piles shall be provided to the Principal for approval prior to construction.

### 7.5.7 Headstocks and Joists

FRP material shall also be used for the headstocks and joists.

The Contractor shall nominate their preferred sections and spans for both the headstocks. joists and posts at the time of tender, ensuring the design complies with the deflection requirements outlined in Section 7.5.3 and spans features of importance outlined in Section 6.5.6.

### 7.5.8 Decking

Decking of the boardwalk shall be constructed from FRP mini mesh or equivalent with acceptable wear and slip resistance treatment to meet the site environment and design life requirement, and meet the prior approval of the Consultant.

### 7.5.9 Balustrade and Handrails

Balustrade and handrails shall be design and constructed in accordance with the New Zealand Building Code and be located on both sides of the boardwalk for its entirety.

### **7.5.10 Connection Details**

The contractor shall design the connection details for the boardwalk with the revetment and the existing track and submit to The Engineer for approval prior to works starting.

# 8. Soil Nailed Slope

## 8.1 Preparation of Soil Nailed Slope

### 8.1.1 Preliminary

Refer to the Preliminary and General Clauses of the Specifications and to the Conditions of Contract, which are equally binding on all Trades. This section of the Specification shall be read in conjunction with all other sections.

### 8.1.2 Scope

This Specification covers the trimming of the existing face, the disposal of all unwanted material from within the area of work, and the supply and installation of nails, flexible facing reinforcing and drainage provisions as defined on the Drawings.

The Contractor shall supply all plant, temporary works, scaffolding, materials, labour and supervision necessary to complete the work in accordance with the contract documents.

### 8.1.3 Soil conditions

The Contractor shall satisfy itself as to the nature of the slip or batter face area prior to submitting a tender. Where subsurface information obtained by the Engineer is made available, it is done so without guarantee as to its accuracy or completeness. Tenderers shall make their own deductions as to the nature and condition of the material to be dressed and drilled and advise the Engineer if in their opinion the material is likely to be significantly different to that indicated by the Engineer's information provided.

### 8.1.4 Disposal

Unless otherwise specified, any excavated material must not be taken away from Mauao. It will be transported to the nominated disposal location on site. All logwood that required removal will be delivered to the designated local Marae locations.

### 8.1.5 Scaffolding

The Contractor shall arrange sufficient secure scaffolding to be erected at the site of the works by an approved certificated company.

Before commencing erection of the scaffold the Contractor shall obtain all necessary permits and signed certifications. The scaffolding shall be erected to maintain pedestrian access either through the scaffold or around the scaffold, where such continuous access is required.

### 8.1.6 Nails

Unless otherwise specified all soil nails shall be Reidbar nails complying with the following:

- Pre-galvanised Reid bars of diameter specified.
- Bars shall have a minimum certificated tensile strength of 500 MPa.
- The end of the nail to be tied into the flexible facing shall be provided with a flat plate as detailed. Hooks are not acceptable in Reid bars.

### 8.1.7 Damage to galvanising:

Any area of nail bar on which the galvanising has been damaged shall be replaced unless approved for use by the Engineer. As a minimum, when approved for use, any galvanising

damage shall be made good with an approved zinc rich primer paint followed by a high build epoxy top coat.

#### **8.1.8 Drilling of holes for nails**

Holes for nails shall be drilled at the centres, inclinations lengths and diameter as given on the Drawings. The selection of mechanical equipment to drill the nail holes shall be made by the Contractor considering the confinement of the site and temporary scaffolding which will be required. Any deviation in nail hole alignment shall not exceed 1 in 20.

The driller shall maintain a drilling log for each nail recording the following:

- Nail meterage
- Date and time of the start and finish of drilling
- Depth, diameter and inclination of hole
- Length of bar installed
- Flushing medium
- Method of drilling hole
- Water losses from hole
- Water seeps from hole
- Depth at which water encountered if known
- Ground conditions encountered and ease of drilling
- Nominal and actual volume of grout placed
- Length of casing used (if any)
- Problems such as caving that occurred during drilling

If during or after drilling the Engineer considers the soil exposed is sufficiently different to that assumed during design, he may instruct the Contractor to lengthen holes (and nail) or to drill additional holes. When so instructed the Contractor shall undertake the work as a variation at rates or amounts scheduled or to be agreed before undertaking the work.

On completion of drilling, each hole shall be cleaned with compressed air passed through a tube which can be inserted to the bottom of the hole.

The Engineer may instruct the Contractor to fill the holes with water and then to expel the water with compressed air. For water flushing the Contractor shall make provision to protect any adjoining buildings, cars or at risk assets from mud and debris expelled from the nail holes.

Any motorised plant, including compressors etc, shall be muffled to ensure that the noise level of such plant is within the decibel range permitted by the Territorial Authority.

#### **8.1.9 Grouting**

Cement used for grouting nails shall comply with NZS3122. Grout shall consist of Ordinary Portland Cement and water. Sand or other materials shall not be used unless approved by the Engineer.

Water for grouting shall comply with NZS3122. Admixtures shall comply with NZS3113 and shall not be used without the Engineer's permission.

The water cement ratio of the grout shall not exceed 0.38. The minimum 28 day strength of the grout shall be 40MPa. The use of approved plasticisers will be permitted.

The grout shall not be subject to bleeding in excess of 0.5% by volume three hours after mixing or 1% maximum when measured at 20 degrees Celsius in a covered glass or metal cylinder of 100mm internal diameter and a grout depth of approximately 100mm.

Grouting shall take place immediately after installation of each nail to minimise the risk of hole collapse or restriction.

#### **8.1.10 Alternative grouts**

Because epoxy based grouts reduce the durability of galvanised nail bars, they will not be considered as an acceptable solution unless access difficulties make the provision of cement grout impractical. If the Contractor wishes to use epoxy (or other non cement based) grouts, they shall note this fact in the tender and provide details of the proposed product and reasons why cement grout is not useable at the site or parts of the site.

The use of non cement based grout will require the written approval of the Engineer which will only be given if he/she agrees with the contractors assessment that delivery of cement based grout is impractical.

## **8.2 Flexible Facing & Hydro Seeding**

### **8.2.1 General**

The flexible facing should be constructed as per the construction drawings. No irregular slope face should be present as the slope face should have been trimmed and shaped prior to these works. Any product specified in the construction drawings may be switched with a similar product if written approval given by the design engineer.

### **8.2.2 Erosion protection mat (MACMAT-R)**

Mat shall be laid and fixed onto sloping ground in accordance with the manufacturers recommended procedures and in compliance with the following requirements:

- The mats shall be nailed at the top, toe and sides of the slope as per the drawings. The mat must be laid tight and secured across the face by permanent soil nails.
- The mats shall be rolled out from top down the slope surfaces. Sufficient hot-dip galvanized pins at a maximum spacing of 1 m centre to centre shall be provided to ensure the mats are in complete and total contact with the ground at every place.
- Lapping between mats shall be at least 500mm and shall be formed with the upslope mat over the downslope mat

### **8.2.3 Hydro seeding**

The sequence of hydro seeding and laying of mat shall be in accordance with the manufacturer's recommended sequence which is;

1. ProGanics sprayed onto cut slope (to manufactures specification)
2. Flexterra HP-FGM applied over ProGanics (to manufactures specification)
3. MacMat-R Placed over top of ProGanics and Flexterra

Hydroseeding shall be carried out by approved specialist contractor and prior approval from the engineer shall be obtained for the constituents and proportions of the spay mixture.

Samples and method statement of laying of the erosion control mat and hydro seeding shall be submitted to the engineer for approval.

After spraying, the hydro seed slope shall be watered to encourage germination and growth of the grass, particularly during dry weather.

### 8.3 Hold Points and Engineer's Approvals

#### 8.3.1 Hold Points for Contractor's advice to Engineer

In order to allow the PS1 signatory to issue a Producer Statement No.4, the following schedule of inspections will be necessary:

Inspection Number	Inspection Required	Inspection By	Records to be Supplied or Taken
1	Extent of vegetation cleared and slope grading	Designer's Representative	Photographic record + Site Visit Record Sheet
2	Nail hole locations to be agreed by the Engineer's representative	Designer's Representative	Photographic record + Site Visit Record Sheet
3	Nail hole depths. Designer's representative to witness 5% of nails achieving design depth	Designer's Representative	Photographic record + Draft nail load test sheets. Finalised nail acceptance test results to be supplied by Contractor to designer.
4	Final finished surface of flexible facing to be inspected	Designer's Representative	Photographic record + Site Visit Record Sheet

The Contractor shall also hold any other works for inspection by the Engineer as instructed from time to time.

## 8.4 Nail Installation Summary Sheet

### 8.4.1 Acceptable Format

The following is an acceptable form for use by the Contractor in providing as built information to the Engineer for nail and post holes. Alternative formats are acceptable subject to the Engineer's approval that they cover the necessary as-built information required.

Nail name/location/reduced level	
Date and time of the start and finish of drilling	
Depth, diameter and inclination of hole	
Length of bar installed	
Flushing medium	
Method of drilling hole	
Water losses from hole	
Water seeps from hole	
Ground conditions encountered and ease of drilling	
Nominal and actual volume of grout placed	
Length of casing used (if any)	
Problems such as caving that occurred during drilling	

# 9. Stormwater Drainage

## 9.1 Scope

This specification includes the following:

- d. The bedding, laying, jointing of stormwater pipework and the construction of stormwater structures.
- e. Capping and filling of any existing stormwater systems required as part of the contract.
- f. Supply of all materials, tools, plant, labour and supervision necessary of the whole work in accordance with the Contract Specification.

## 9.2 Relevant Documents

Unless specified in the Special Requirements this specification shall be read in conjunction with the following:

### External Documents

- Tauranga City Council Infrastructure Development Code
- Tauranga City Council Track and Walkway Development and Maintenance Manual
- Relevant Utility Service Provider Specifications
- Relevant Manufacturer's Specifications and Recommendations
- NZ Building Code and Approved Documents (latest editions)
- NZTA F3 – Culvert Pipe Construction (latest edition)
- NZ/BS 2494 - Specification for Elastomeric Seals for Joints in Pipework and Pipelines (latest edition)
- NZS 3101 – Concrete Structures Standard
- NZS 3103 - Specification for Sands for Mortars and Plasters (latest edition)
- NZS 3104 – Specification for Concrete Production
- NZS 3107 - Specification for Precast Concrete Drainage and Pressure Pipes (latest edition)
- NZS 3109 – Concrete Construction
- NZS 3114 – Concrete Surface Finishes
- NZS 3302 - Specification for Ceramic Pipes, Fittings, and Joints.
- NZS 4402 – Methods of Testing Soils for Civil Engineering Purposes
- NZS 4442 - Steel
- NZS 4452 - Code of Practice for the Construction of Underground Pipe Sewers and Drains (latest edition)
- NZS 7643 - Code of Practice for the Installation of Unplasticised PVC Pipe Systems (latest edition)
- AS/NZS 1254 – Unplasticised PVC sewer and drainpipe and fittings (latest edition)
- AS/NZS 1657 – Fixed platforms, walkways, stairways and ladders. Design, construction and installation.

- AS/NZS 1260 - PVC Pipes and Fittings for Drain, Waste, and Vent Applications (latest edition)
- AS/NZS 1462 – Method of test for PVC Pipes and Fittings (latest edition)
- AS/NZS 1477 - PVC pipes and fittings for pressure applications (latest edition)
- AS/NZS 2566 – Plastic Pipelaying Design
- AS/NZS 3725 – Loads on Buried Concrete Pipes (latest edition)
- AS/NZS 4058 – Precast Concrete Pipes (Pressure and Non-pressure)
- AS/NZS 4586 – Slip Resistance Classification of New Pedestrian Surface Materials
- AS/NZS 4765 – Modified PVC (PVC-M) pipes for pressure applications (latest edition)
- AS 1646 – Electromeric seals for water works purposes (latest edition)
- BS 65 - Vitrified Clay Pipe (latest edition)
- BS EN 124 – Gully Tops and Manhole Tops for Vehicular and Pedestrian Areas
- BS EN 295 - Vitrified Clay Pipe (latest edition)
- OSH Code of Practice for Excavation (latest edition)
- Construction Regulation “Guarding of Waterholes” (latest edition)
- Construction Guidelines Precast Concrete (latest edition)

### **9.3 Materials**

Bedding, haunch, overlay and backfill material for stormwater pipes shall be in accordance with AS/NZS 3725.

#### **9.3.1 Bedding**

All bedding material shall be approved by the Engineer. Unless otherwise stated the following shall be used:

##### **Granular**

Bedding type shall be selected based on the following categories:

- Approved GAP 20 well-graded material as specified for pipes.

#### **9.3.2 Pipes and Fittings**

All pipes shall have factory made spigot and socket flexible type.

Pipes shall be manufactured as one of the following as shown in the Contract Drawings:

- Precast reinforced concrete

All pipes and fittings shall comply with one of the following standards or such other standard as the Engineer approves:

##### **Precast Concrete**

Precast concrete pipes shall comply with NZS 3107 (latest edition) or AS/NZS 4058 and will be marine grade pipes including prefabricated concrete pipe bends. Pipe class shall be as per the Contract Drawings.

## Other Materials

Any other materials shall be as stated on the Contract Drawings.

### 9.3.3 Joints

Rubber ring joints shall be of a type suitable for the pipe used and shall comply with NZS 2494:1990 specification for elastomeric seals for joints in pipework and pipelines.

### 9.3.4 Manholes

#### Precast Manholes

Marine grade precast manholes are to be used unless specified otherwise on the contract drawings. They shall consist of centrifugally spun 1050 mm internal diameter or larger diameter as described in the drawings and specification for concrete pipes to AS/NZS 4058 standard with surface finishes to NZS 3114 requirements.

They shall have holes cast in the side for step irons and, if possible, holes for pipe connections. Cast-in-place step-irons may only be used upon written approval of the Engineer.

All manholes are to be water tight by use of elastomeric sealing.

#### Step-irons

The step-irons shall be hot-dipped galvanised or 316 Stainless Steel. The step irons shall be bolted into the manhole wall and the outer end of the holes then filled with epoxy mortar flush with the outside of the manhole.

#### Manhole Bases

Unless specified otherwise on the contract drawings, all manhole bases shall be precast concrete.

##### a. Precast Concrete Bases

Precast bases shall be factory made flanged and constructed to AS/NZS 3109 and AS/NZS 3101 with cover to reinforcement to meet marine applications specified in AS/NZS 4058. The diameter of the base shall be a minimum of 300 mm greater than the external diameter of the manhole.

#### Joining of Sections

Stormwater Manholes – Epoxy Mortar and BM100 or SM 9020 sealing strip shall be used for joining sections of pre-cast stormwater manholes as shown on the Standard TCC drawing T501.

#### Bedding

All drainage structures either precast or in-situ shall have compacted bedding as follows, unless otherwise stated:

- a. The minimum 150 mm compacted depth of GAP20
- b. The bedding shall be under the base of the drainage structure and extend 100 mm beyond the perimeter of the outer wall.
- c. Site concrete - 50 mm minimum depth raked out over the entire area plus 100 mm past the perimeter.

### **Curved Channels**

Curved channels in the floor of the manhole are to be formed and rendered with the cement mortar and finished with a steel tool and neat cement. Render all benching with cement mortar and finish as above. Every precaution shall be taken to ensure that no debris, dirt or other material enters the system.

### **Scruffy Dome Lid**

Low profile scruffy dome shall comply with AM-5.4.3.6 of the Tauranga City Council Infrastructure Development Code. Hot dipped galvanised steel bars to be powder coated Bokara Grey by Resene.

### **9.3.5 Catchpits**

Unless otherwise stated all catchpits shall be precast reinforced concrete as per NZS 3109, AS/NZS 3101 and as per contract drawings standard detail.

### **Catchpit Grate and Frame**

Hygrade Ductile iron Hydro stormwater grates and frames as shown on the contract drawings.

### **Catchpit Leads**

Catchpit leads shall be constructed using 225 mm RCRRJ pipes as per the contract drawings.

### **Other Drainage Structures**

Unless otherwise stated the other drainage structures shall be constructed of reinforced concrete in accordance with NZS 3109, NZS 3124, Concrete Specification and the concrete shall have a minimum crushing strength of 17.5 MPa at 28 days.

## **9.4 Construction**

Unless otherwise specified all construction shall comply with NZS 4452, AS/NZS 3725, and AS/NZS 1260.

All reticulation works, including laying of new lines and reinstatement of existing systems are to be carried out by, or under the supervision of, a registered drain layer to current trade certificate practices.

### **9.4.1 Excavation of Trench**

On completion of excavation, and prior to pipe bedding being placed, or a structure being constructed, the Engineer shall inspect the trench base and assess if it is suitable for pipe laying or construction to proceed.

If so directed by the Engineer, the Contractor shall excavate and dispose of an agreed depth of unsuitable material and backfill with GAP20 base course, compacted in layers of 150 mm loose depth. In addition, the Engineer may direct that sand, or a geotextile cloth, be placed prior to placing and compacting GAP20. Where any material has become wet due to insufficient drainage or other negligent operation of the Contractor, and would not otherwise have had to be excavated, the excavation and backfilling shall be carried out at the Contractor's expense.

### **9.4.2 Pipe Bedding**

All bedding shall be placed and compacted to ensure the pipe is evenly supported over the entire length.

Irrespective of the material of bedding used, the bedding adjacent to the pipe joints shall be recessed as necessary to ensure that the whole of the barrel length of the pipe makes uniform contact with the prepared bedding.

#### **Granular**

Refer to the contract drawings for bedding dimensions.

### **9.4.3 Laying and Jointing Pipes**

#### **Concrete Pipes**

Concrete pipes shall be installed to NZS/AS 3725 Pipes shall be laid with sockets pointing uphill.

Pipe jointing shall be carried out in such a manner that the finished joints are watertight and present a smooth invert surface.

The internal barrel, spigot and socket of pipes shall be clean before jointing.

Any obstructions or irregularities shall be removed before a further length is laid.

Every facility shall be provided for the Engineer to check grades, alignment and the finish of joints as the work proceeds.

Notwithstanding this requirement, it shall be the Contractor's sole responsibility to ensure that the gradients, levels and alignment of the work as constructed shall conform exactly to the requirements of the plans and specification, except where modified by the Engineer.

Rubber rings for flexible joints shall be free of dust, grease or dirt.

### **9.4.4 Anchor Blocks**

Unless stated otherwise, anchor blocks shall be installed at the pipe joints for drainage lines exceeding 15% in grade in accordance with TCC IDC.

The anchor blocks are to be constructed in accordance with T552 of the TCC IDC

The anchor block shall be constructed on the socket and shall not extend over the pipe joint.

### **9.4.5 Drainage Structures**

Manholes, inspection chambers or other drainage structures shall be constructed in accordance with TCC IDC standard drawings.

#### **Bedding**

All drainage structures either precast or in-situ shall have compacted bedding as follows, unless otherwise stated:

- a. The minimum 150 mm compacted depth of GAP20
- b. The bedding shall be under the base of the drainage structure and extend 100 mm beyond the perimeter of the outer wall.
- c. Site concrete - 50 mm minimum depth raked out over the entire area plus 100 mm past the perimeter.

#### **Manholes**

The excavation of manholes shall be a minimum of 300mm beyond the outer face of the manhole walls. Where rock is encountered, the manhole base shall be roughly levelled off and a levelling course applied prior to placing the manhole.

Any visible infiltration leakage through the manhole walls shall be remedied to the approval of the Engineer.

a. **Concrete Bases**

If on the contract drawings the base is specified as insitu not precast, the following procedure is required:

Place 150 mm high concrete blocks or bricks and place precast manhole riser section in correct location. Place 300 mm thick concrete (17.5 MPa) in the base extending 150 mm minimum beyond the outer wall of the manhole riser. (Note this shall form the base of the manhole and is not to be used for benching).

b. **Step Irons**

Where manhole depths exceed 1.2 m, step irons shall be placed at 300 mm centres commencing 600 mm below the cover.

Precast sections shall be placed and aligned to provide vertical sides and vertical alignment of the step irons over the benching. All joints shall be mortared as per Concrete Works Specification. The access hole in the lid shall be placed over the step-irons.

c. **Pipe Connections**

Where pipe connections have not been formed in the casting, the wall of the manhole shall be broken out to a maximum of external diameter plus 75 mm of the pipe. This area shall be carefully broken out making sure that the rest of the manhole is not damaged. The pipe shall be laid in the wall to the invert level shown on the plan and mortared neatly flush to the inside of the manhole. The precast manhole wall structure shall maintain its structural integrity.

Compacted GAP 20 approved by the Engineer shall be under all pipe connections which do not enter the manhole at invert level. This shall extend to a minimum of (unless otherwise stated):

- i) 600 mm back from the outside wall of the manhole
- ii) From below the bedding of the pipe to the bedding of the manhole

Pipes entering manholes shall be flush with the internal wall of the manhole and on the outside be secured by a 150 mm fillet around the circumference of the pipe with 17.5 MPa concrete mortar.

Pipes shall be provided with a flexible joint within 600 mm of the manhole wall.

d. **Curved Channels**

Curved channels in the floor of the manhole are to be formed and rendered with the cement mortar and finished with a steel tool and neat cement. Render all benching with cement mortar and finish as above. Every precaution shall be taken to ensure that no debris, dirt or other material enters the system.

### Catchpits

The type of catchpit shall be a standard 450 x 450 x 900 Catchpit with Hygrade Hydro Grate Class D

a. **Location**

The location and alignment of the catchpit shall be confirmed with regard to the position of the proposed stormwater swale drain.

b. **Pipe Connections**

All pipes to be finished flush with the inside wall of the catchpit unless otherwise stated. The wall of the catchpit shall be broken out to a maximum external diameter of the catchpit lead plus 75 mm. The catchpit lead shall be epoxy mortared flush to the inside wall of the catchpit.

Note - All pipes entering the catchpit shall be secured by a 150 mm fillet around the circumference of the pipe with 25 MPa concrete

Pipes shall be provided with a flexible joint within 600 mm of the catchpit wall.

#### **9.4.6 Backfilling and Reinstatement**

In accordance with TCC IDC requirements.

#### **9.4.7 Tolerances**

##### **Horizontal Tolerance**

- a. Manholes and other drainage structures shall be within 150 mm of the position indicated on the plan unless otherwise directed by the Engineer.
- b. Pipelines shall be within 100 mm of the position indicated on the plan unless otherwise directed by the Engineer.
- c. Pipelines shall not extend into the internal wall of drainage structures more than 10 mm for pipes not entering at invert level
- d. For the pipeline entering and exiting the manhole at invert level the maximum tolerances are as follows:
  - i) Diameter less than 675 mm=50 mm maximum from internal manhole wall

##### **Vertical Tolerance**

- a. Manhole cover levels shall be within 15 mm to adjacent surface for grass surfaces and 5 mm for concrete and seal surfaces.
- b. Catchpit shall be within 30 mm of the cesspit frame in the correct location.
- c. Manhole invert levels are to be within 15 mm of the design level.
- d. Pipelines are to be laid to grade such that no pipe shall be more than 10 mm out of grade and adjoining pipes shall not vary in error by more than 5 mm from the adjacent pipe.

##### **Cover**

Unless otherwise stated, the minimum cover (from finished surface to top of pipe) depth is 600mm

#### **9.4.8 Inspection**

Commencement of stages shall not proceed until after Engineer's inspections and approval of the previous stage. Engineer's inspections are as follows:

- Approval of all materials prior to procurement
- Completed pipelines, drainage structures, anchor blocks prior to backfilling
- Inspection of finished lid levels.

# 10. Survey and Works Completion

## 10.1 General

All survey work shall be carried out by, or under the supervision of, an appropriately qualified and experienced surveyor (to be engaged by the Contractor). The surveyor shall be responsible in conjunction with the Contractor for the collection and processing of the survey data and the provision of all survey equipment required to complete this activity.

The Contractor shall provide all labour, materials and other assistance that The Engineer may require at any time to check the setting out of the work or to make progress measurements.

The method of survey shall be in accordance with this section.

## 10.2 Extent of Survey Work

The extent of survey work required for the Works shall comprise:

- Set out of all construction works in accordance with the Drawings
- Interim progress surveys as the progression of revetment construction and boardwalk installation
  - After preparation of existing foreshore and excavation of the toe
  - After laying down geotextile
  - After placing underlayer
  - After placing armour layer
  - After placing toe
  - Every three spans of the boardwalk installation
- Compliance surveys to confirm that the works have been constructed in accordance with the Drawings
- Post-construction survey of all areas which may be affected by the Contractor's component of the works

The horizontal positioning of the construction works shall be related to the Bay of Plenty circuit coordinate system. Details of the origin of coordinates and azimuth are provided on the Drawings.

All level information for construction works shall be reduced to Maturiki Chart Datum.

## 10.3 Survey Equipment

All survey equipment utilised on the Works shall be calibrated and maintained in accordance with the requirements of the instruments' technical specification, survey regulations and standard survey practices.

## 10.4 Survey Detail

Compliance surveys are required to confirm that the Work have been constructed in accordance with the Drawings.

The profile of the existing slope in the vicinity of the proposed track shall be captured by the compliance surveys and presented clearly on As-Built Drawings.

The compliance surveys shall capture sections of the revetment at five-metre intervals. Each section shall capture the following information:

- Edge of existing track
- Any furniture on the track within five metres of the edge
- Crest and toe of existing revetment
- Intermediate points along the revetment slope

The extent of the survey shall be adequate to capture the entire revetment, seabed adjacent to the revetment toe, and the revetment crest. In addition, the survey shall provide tie lines between sections that run along the crest and toe on the structure.

For purposes of verification, the Engineer may from time to time undertake compliance check surveys at any location or any cross-section. Any non-compliance detected by such surveys shall be remedied by the Contractor at no cost to the Principal.

At the request of the Engineer, the Contractor shall supply, free of charge, any digital depth/height/coordinate and other survey information and associated documentation held by the Contractor for the purpose of verification or computation by the Engineer. Information shall be supplied within five working days of the request and shall be in a digital format as requested by the Engineer.

### **10.5 Pre-Construction Survey**

The Contractor shall undertake a survey prior to the commencement of the works for all areas which may be affected by Contractor's construction activities. The extent of pre-construction survey shall be replicated prior to Completion. The purpose of this survey is to confirm the "Pre" and "Post" construction condition of these areas.

The survey shall confirm the location and condition of the existing revetment, base track, stormwater pipelines and outlets, services, other infrastructure and foreshore vegetation.

The pre-construction survey shall be completed by the Contractor in the company of the Engineer.

The pre-construction survey shall comprise a comprehensive photographic record and/or video record, including comments, of the existing condition of the above features. The Contractor shall compile this record into an electronic files as well as bound report and two copies to the Engineer.

### **10.6 Interim Progress Surveys**

The Contractor shall undertake interim progress surveys following placement of each layer in the revetment design and during installation of the boardwalk. The purpose of these surveys is to confirm the construction work has been undertaken to the design and the required tolerance as well as being a measure for payment purposes.

The surveys shall confirm the extent, elevation, and interim points of each layer. Surveys shall be submitted to the Engineer for review. Correcting any non-conformance identified in the surveys shall be the Contractor's responsibility and to the Contractor's cost. The Work shall not progress further until the non-conformance has been corrected.

### **10.7 Completion**

Upon completion of the works but prior to Completion Certificate being issued, the areas of the site shall be cleared of all surplus materials, spoil, plant, site sheds, notice boards, fencing, temporary signage, and temporary office.

The Contractor shall be responsible for the relocation of any surplus spoil from excavations to the designated disposal location onsite, no excavated material shall be taken from Mauao. All logwood that require removal will be delivered to the designated local Marae locations. The contractor shall removal and disposal of all rubbish and all areas covered by the Contract shall be left clean and tidy on completion of the Contract.

Any areas utilised by the Contractor for execution of this contract shall be fully restored to not less than the pre-construction condition including the temporary access roads.

### **10.8 CCTV Inspection**

Upon completion of the works all pipes are to be inspected for defects using CCTV. Copies of the CCTV video and log sheets are to be provided to the Engineer. Any defects identified by the CCTV inspection shall be rectified to the acceptance of the Engineer at no cost to the Principal.

### **10.9 Existing Track Remediation**

Once the revetment and boardwalk has been completed and on the approval of the Principal and the Engineer the contractor shall complete surface scraping and topsoiling of the existing section of track between the track closure points marked on the drawings.

### **10.10 Post-Construction Survey**

Following the completion of the Works, and prior to the award of Practical Completion, a post-construction survey shall be completed by the Contractor in the company of the Engineer to ensure that the site has been restored to a condition at least equivalent to that captured on the pre-construction survey.

# 11. Quality Assurance

## 11.1 General

The Contractor shall control the quality of the work and shall fully implement a quality management system under this Contract in accordance with the requirements of the current *AS/NZS ISO 9001:2008*.

## 11.2 QA Management Representative

The Contractor shall be required to nominate a suitably qualified Quality Assurance Representative (QAR) who is at a management level with appropriate authority to effectively control the complete quality assurance process. For construction works, the QAR shall be site based.

## 11.3 Quality System Documentation

The Contractor shall submit to the Engineer a copy of the following documents within 14 days of the award of the Contract:

- Corporate Quality Manual (for review and return to the Contractor)
- Electronic copies of the Project Quality Plan in Microsoft Word or pdf format

The Contractor shall also provide the Engineer with access to inspect Corporate Quality Procedures applicable to this Contract.

The Project Quality Plan shall follow the guidelines of *AS/NZS ISO 9004.5: 1998*.

The Project Quality Plan shall cover all quality system elements required by the appropriate Quality Systems Standard as specified, that are applicable to this Contract.

As a minimum, the Project Quality Plan shall contain the following information:

- A Project Organisation Chart or list of nominated Project Personnel showing their positions, lines of communication and details of the responsibilities of the positions
- Inspection and Test Plans (ITP) for the various phases during design, manufacture, construction and commissioning, as applicable to the project, to be submitted at least 14 days prior to commencement of relevant activity
- A copy of the IANZ Terms of Registration for the Contractor's Compliance Testing Laboratory (Internal or Sub-Contract)
- Project specific operating procedures or descriptions outlining as a minimum, details of activities, who is responsible for implementation/verification, identification of relevant Quality Records and distribution of such records, to be submitted at least 7 days prior to commencement of respective activities
- A Register of all intended Quality Records to be used on the project

## 11.4 Inspection and Test Plans

The Inspection and Test Plans (ITP) shall contain at least the following information for each significant activity identified in the relevant process:

- Description of activity
- Specification requirements/reference

- Person responsible for activity (title)
- Hold Points and Witness Points
- Activity checklists
- Inspection and test type
- Tolerances or other acceptance criteria
- Identification of relevant procedure and quality records
- Test/inspection frequency
- Work item or work lot identification

Where considered necessary the Engineer may request the Contractor to insert additional Hold Points or Witness Points. Provisions shall be made for the Contractor and the Engineer to sign off at these points.

### **11.5 Identification and Traceability**

All work under this Contract including construction and commissioning, shall be subdivided into distinct work lots or work items.

Work lots or work items shall be chosen by the Contractor, consistent with any specified requirements, but shall be subject to approval by the Engineer.

Each work lot or work item shall be assigned a unique identification number.

The Contractor shall maintain a register of all allocated work lot or work item numbers.

This register shall contain as a minimum, the following information:

- Brief description of the work lot or work item
- Location reference (3 dimensional where applicable)
- Lot or item status (conforming or non-conforming)

The Contractor shall ensure that traceability is maintained throughout all documented records under this Contract.

All test results where applicable under this Contract shall be positively identified with their respective work lot or work item number.

### **11.6 Quality Assurance**

Quality Assurance documentation shall be forwarded to the Engineer for each designated work lot or work item, within 72 hours of completion of the work lot or work item.

Quality Assurance documentation shall include a verification statement certifying that the relevant work lots or work items have been inspected and/or tested in accordance with the Contractor's Inspection and Test Plan(s) applicable to this Contract and that they comply with the specified requirements of the Contract Documents.

Quality Assurance documentation shall include the following documents:

- All relevant signed off Inspection and Test Plans and associated Checklists
- IANZ certified compliance test results (where applicable)
  - \*Note: In cases where test results are not available within this period (e.g. 28 day concrete strengths), the Contractor shall submit preliminary results or previous analytical data of the same mix type which statistically indicates a high probability of conformance. Submission of such information does not absolve the Contractor from his responsibilities under this

Contract should actual results subsequently identify non-conformance of the work lot or work item

- Survey and measurement compliance data i.e. as built information (where applicable)

### **11.7 Non-conformance Reports**

The Contractor shall submit a Non-conformance Report to the Engineer within 24 hours of detecting nonconforming work.

The Contractor's Non-conformance Report shall clearly detail but not be limited to the following items:

- The nature and extent of the non-conformance
- The work lot or work item number it relates to including the precise boundaries of the nonconforming work
- Any relevant information, data, test results and/or measurements (as applicable)
- The corrective and preventive actions the Contractor proposes to take
- The time frame within which the non-conformance will be rectified

The method of isolating/identifying nonconforming work, applying and releasing hold points, etc., shall be clearly stated in the Project Quality Plan.

The proposed corrective action shall be subject to approval by the Engineer.

### **11.8 Default by the Contractor**

Failure by the Contractor to submit either a Conformance Report or a Non-conformance Report within the nominated time frame may constitute a substantial breach of the Contract and may, at the Engineer's discretion, be subject **to a stop work order**.

As a result of such action by the Engineer, and in addition to the Contractor's responsibility to rectify the nonconforming work, the Contractor shall be responsible for its own costs for any time delays due to such breach of Contract.

### **11.9 Hold Points and Witness Points**

A 'Witness Point' shall mean a point in the construction or verification process at which an activity is to be observed by the Engineer. 48 hours' notice is required to be given by the Contractor for a witness point.

A 'Hold Point' shall mean a point in the construction or verification process beyond which the work may not proceed without the authorisation of the Engineer. 48 hours' notice is required to be given by the Contractor for a hold point, except for hold points to be carried out at Manufacturer's premises, which require 5 days' notice, or where specified as longer elsewhere in this Specification.

Witness Points shall apply to verify compliance of the constructed works with the approved design drawings.

Hold Points shall apply prior to commencement of designated **work lots** or **work items**.

Hold and Witness points are to be scheduled for normal working hours of the Principal's personnel. If personnel are required at other times, then the Principal may require the Contractor to pay for the overtime costs of the personnel.

The Engineer may, without penalty, convert hold points to witness points on a temporary or permanent basis.

To obtain authorisation to proceed, the Contractor shall ensure the following:

- That all work lots or work items affected by the lot or item in question are conforming
- That all Conformance Reports for all work lots or work items affected by the lot or item in question have been submitted at least 24 hours prior to the time the Contractor intends to proceed with the lot or item in question, thus ensuring that defective works are not built-in

The minimum required hold points are detailed below. Additional hold points are at the discretion of the Engineer or as noted throughout the Specification.

The hold points and witness points shall include the following:-

a. PRE-CONSTRUCTION

- Contractor's Environmental Management Plan hold point
- Contractors' Erosion and Sediment Plan hold point
- Quality Plan hold point
- Project Site Specific Safety Plan including Safe Work Method Statements for each work item hold point
- Construction Program hold point
- Nomination of subcontractors/suppliers hold point
- Other approvals identified in the Contractor's EMP hold point
- Boardwalk and foundations design and shop drawings hold point
- Concrete box culvert ramp construction methodology hold point

b. CONSTRUCTION

- Survey Setout witness point
- Quarry assessment of proposed materials hold point
- Inspection of sample loads hold point
- Placement of Class IV backfill at revetment depression witness point
- Interim survey to the prepared existing revetment surface witness point
- Placement of Class II rocks witness point
- Interim survey to the placed Class II layers witness point
- Placement of Class I and III rocks witness point
- Installation of boardwalk witness point
- Installation of the box culvert ramp witness point
- Submission of As Built surveys hold point

c. COMPLETION

- Completion inspection hold point

## **11.10 Compliance Inspections and Testing**

All compliance inspections and tests shall be based on work lots or work items unless otherwise specified in the contract documents. The costs for all such inspections and tests shall be borne by the Contractor and included in the tender price submitted.

All compliance testing shall be carried out by a IANZ registered laboratory certified for the tests specified in this Contract.

The Contractor shall advise the Engineer of the work lot or work item number and the location within the lot or item, prior to any testing of the lot or item.

The Contractor shall submit a Non-conformance Report and the proposed corrective action for any nonconforming test result.

For compliance inspections, the Contractor shall nominate responsible persons, who are not directly involved in performing the work.

The frequency of compliance testing shall be in accordance with the minimum requirements of the Contract Documents, or this Specification

The Contractor shall submit to the Engineer any preliminary results on compliance tests carried out for each work lot or work item within 24 hours of completion of tests.

### **11.11 Subcontracted Work**

The Contractor shall ensure that subcontracted works and procured supplies are subject to appropriate quality assurance standards, when incorporated into the works in order to comply with the requirements of this Contract.

If requested by the Engineer, the Contractor shall provide evidence of appropriate quality assurance for subcontracted work or procured items incorporated into the works under this Contract. This shall include verification by the Contractor.

### **11.12 Design and Construct Separable Portion (Boardwalk and foundations)**

The Contractor's manufacturer/supplier shall have the engineering capability to develop the design to suit their product. In addition, the Contractor's manufacturer/supplier shall implement rigorous quality control and testing processes to deliver against the performance criteria.

Approvals to proceed shall be obtained from The Principal prior to The Contractor commencing the below activities:

- Procurement/fabrication
- Delivery
- Installation

### **11.13 Quality Records**

The Contractor's quality system shall include sufficient quality records to provide objective evidence that the requirements of the Contract are met. This shall include Design Consultants, Subcontractors and Suppliers records relevant to this Contract.

The Contractor shall, when requested by the Engineer, provide access to all quality records relevant to the Contractor's quality system under this Contract.

Within 28 days of the Date of Completion, the Contractor shall forward a complete clean copy of at least the following records to the Engineer (in accordance with the TCC infrastructure Development Code requirements). Previously submitted documents may be selected as appropriate.

- All Test Results, analyses, reports, measurements, appropriate supply documents and observations
- Records shall be maintained by the Contractor for a minimum period of six years from the Date of Completion or in accordance with the Contractor's statutory requirements if the latter exceeds the minimum period required for this Contract

- Records for equipment and parts subject to inspection and approval by the relevant regulatory authority shall be made available on site at the time of arrival of all relevant items at site, or after inspections have been carried out on site (if applicable)

#### **11.14 Quality Audits**

The Contractor shall submit an audit schedule to the Engineer at the time of submission of the Contractor's Quality System documentation. This shall include internal audits and audits on Suppliers and Subcontractors, and submit all audit records including objective evidence for any necessary follow up corrective actions attached to close out corrective action reports.

#### **11.15 Certifications to Accompany Each Payment Claim**

Each Payment Claim shall be accompanied by a Conformance Report from the Contractor in respect of the works completed to the date of the claim and the subject of the claim, certifying that the works as constructed are in full accordance with the Contract requirements.

## **12. Final Design Approval**

Due to the resource consent application process being undertaken in parallel with the detailed design process, there is a possibility that final design drawings and specifications will be modified from those included with this Technical Specification. Final design approval sits with the following parties.

### **12.1 The Mauao Trust**

The Mauao Trust are the landowner of Mauao, and may request changes to design to meet cultural values.

### **12.2 Nga Poutiriao o Mauao**

Nga Poutiriao o Mauao are the joint administration board for the Mauao Historic Reserve, made up of tangata whenua representatives and Elected Members of the Tauranga City Council. Nga Poutiriao o Mauao representatives form part of the Consultant's design team, who will confirm final design in conjunction with the Mauao Trust, and inform the Contractor of any design modifications above and beyond that included with this Technical Specification.



# Appendices

# **Appendix A** – Preliminary Environmental Management Plan

# **Appendix B** – Preliminary Erosion and Sediment Control Management Plan

# **Appendix C** – Archaeological Site Management Plan

## **Appendix D** – Drawings

# **Appendix E** – Planting General Arrangements & Schedule

## **Appendix F** – Geotechnical Assessment

# **Appendix G** – Geotechnical Design Report

# **Appendix H** – Revetment Detailed Design Report

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