

Project Number: 2-9B463.00

Mauao Base Track Reinstatement

Geotechnical Completion Report

24 June 2020



Contact Details

s 7(2)(a) ... Privacy

Document Details:

Date: 24 June 2020
Reference: 2-9B463.00
Status: Final

s 7(2)(a) ... Privacy

s 7(2)(a) ... Privacy



Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
V1	06/04/2020	[Redacted]	[Redacted]		
V2	24/06/2020	s 7(2)(a) ... Privacy	s 7(2)(a) ... Privacy	s 7(2)(a) ... Privacy	Final

Contents

1	Introduction	5
2	Related Reports.....	5
3	Hold Points.....	6
4	Project Roles and Responsibilities.....	6
4.1	Client.....	6
4.2	Contractor.....	6
4.3	Consultant.....	6
4.4	Arborist.....	7
4.5	Cultural Monitors.....	7
5	Construction Summary.....	7
6	Confirmation of Geotechnical Ground Model.....	8
7	Geology.....	8
8	Test Records and Design.....	9
9	Outstanding Items/ Defects.....	10
10	Geotechnical Monitoring and Maintenance.....	10
11	Closure	10

List of Figures

Figure 1 Site Location Plan (Source: TCC Mapi).

Figure 2 Ground Model.

Figure 3 Slip face showing geological units observed in the slip scarp.

Appendices

- A Site Photograph Records.
- B Testing Records.
- C As-Built Information.
- D Inspection Records & Correspondence.

1 Introduction

WSP New Zealand Limited were engaged by Tauranga City Council (TCC) in November 2019 to undertake remedial design to repair a damaged section of the Mauao (Mt Maunganui) base track located on the southern side of Mauao.

WSP were also engaged to undertake the construction monitoring phase of the project. The track was damaged by a landslide following several days of sustained rainfall in April 2017 during the passing of ex-tropical cyclone Debbie.

This document summarises our site visits to observe construction of earthworks and the installation of soil nails and horizontal bored drains for the Mauao base track repair.

Site visits were undertaken from 28 November 2019 to 16 March 2020 to observe critical aspects of construction. This report provides a record of site visits that were undertaken to observe the required hold points during the construction period.

The site of the underslip repair is on the southern side of Mauao approximately 620m south west along the Mauao base track from the Pilot Quay carpark which is located at the north western end of Pilot Bay. The site location is indicated on Figure 1 below.

The slip repair involved widening the existing track where the width was reduced due to the underslip in combination with the installation of soil nails and horizontal bored drains to improve the overall stability of the site.

Figure 1- Site Location Plan (Source: TCC Mapi).



2 Related Reports

The following documents and reports formed the basis of our investigations, design and construction documents for the reinstatement of the Mauao base track.

- Mauao Base Track Repair Options Assessment dated 12 November 2019.
- Mauao Base Track Temporary Works Assessment dated 22 November 2019.
- Mauao Base Track Reinstatement Design Report dated 18 December 2019.
- Mauao Base Track Reinstatement – Project Technical Specification dated 18 December 2019.
- Mauao Base Track Construction Review Letter dated 19 December 2019.
- Mauao Base Track, Crack Observations and Recommendations dated 6 March 2020.

3 Hold Points

The following hold points were covered during our inspections. The hold points were set out in our project geotechnical specification dated 18 November 2018.

- Setting out details,
- Observations of earthworks and inspection of cut batters and fill placement;
- Installation of soil nails;
- Observations of verification and acceptance tests for soil nails;
- Installation of bored drains and subsoil drainage;
- Construction of soil nail slopes.

Site inspection photograph records are summarised in Appendix A.

4 Project Roles and Responsibilities

For this project the roles and responsibilities are summarised below in the following sections.

4.1 Client

The Client for this project was Tauranga City Council (TCC).

TCC also undertook the contract management during construction with technical support provided by WSP.

§ 7(2)(a) ... Privacy was the § 7(2)(a) ... Privacy appointed by TCC.

4.2 Contractor

The lead contractor for this project was Waiotahi Contractors Limited who managed construction on site and carried out all earthworks operations.

§ 7(2)(a) ... Privacy was the lead contractors site supervisor and project manager with support from § 7(2)(a) ... Privacy of Waiotahi.

4.2.1 Subcontractors

The main sub-contractors for this project were Earth Stability Limited and Rock Control Limited. The role of the subcontractors were to drill and install the soil nails and horizontally bored drains using auger and air percussion drilling methods.

4.2.2 Plant List

A simplified list of the main equipment used during construction is given below.

- 3 tonne hydraulic excavator
- 3 tonne compact track loader (skid steer loader).
- 200 kg portable drilling mast.
- High volume air compressor.
- Rope access gear and frame for drilling mast.

4.3 Consultant

Construction monitoring services were provided by WSP New Zealand Limited for key aspects of construction as recommended in the Design Report and Project Technical Specification dated 18 December 2019.

§ 7(2)(a) ... Privacy was the geotechnical lead for this project with technical support from § 7(2)(a) ... Privacy
§ 7(2)(a) ... Privacy also provided support and construction monitoring services on behalf of WSP New

Zealand Limited. s 7(2)(a) ... Privacy assisted with the supplementary geology section provided in this report.

4.4 Arborist

Aboricultural work during construction was undertaken by s 7(2)(a) ... Prifrom Arbor Care Limited.

4.5 Cultural Monitors

The cultural monitors for this project were on site during construction to identify and recover any artefacts that were exposed during excavations.

s 7(2)(a) ... Privacy were appointed as cultural monitors by the Mauao Trustees (Asset Owner).

5 Construction Summary

Construction for the remediation of the Mauao base track slip commenced in late November 2019 with the clearance of vegetation from site and installation of the first row of soil nails above track level. As the soil nailing works progressed, the existing track was widened in stages by cutting into bank above.

Horizontal bored drains were installed above track level where saturated zones were encountered during the drilling of the soil nails. The drain and nail locations are summarised on the asbuilt drawing contained in Appendix C.

Three additional soil nails were also installed above track level. The purpose of the additional nails was to secure the top of the erosion protection mat (MacMat R steel).

The earthworks were completed by early December 2019 and most of soil nails had been installed above the track. By mid-December 2019 the works had been completed up to the end of stage 1, with the installation of a safety fence and the track was open to public for the Christmas period.

The track was then closed to public at the end of January 2020 and stage 2 started. This involved the continued installation of soil nails on the lower slip face, below the first row installed within stage 1.

Voids were encountered in two soil nail auger holes below track level. These voids were then filled with additional grout. Following the drilling of further anchors, it was established that the voids were isolated to these locations.

Cracking in the track was also noted approximately 15m to the west of the slip repair on 25 February 2020 and it was concluded that this was likely due to shrink and swell of clay soils rather than tension cracking which would indicate instability.

The installation of soil nails was complete by the end of February and the final installation of erosion mat was completed by early March 2020, when the track was reopened to the public. A total of 134 soil nails and 8 horizontally bored drains were installed.

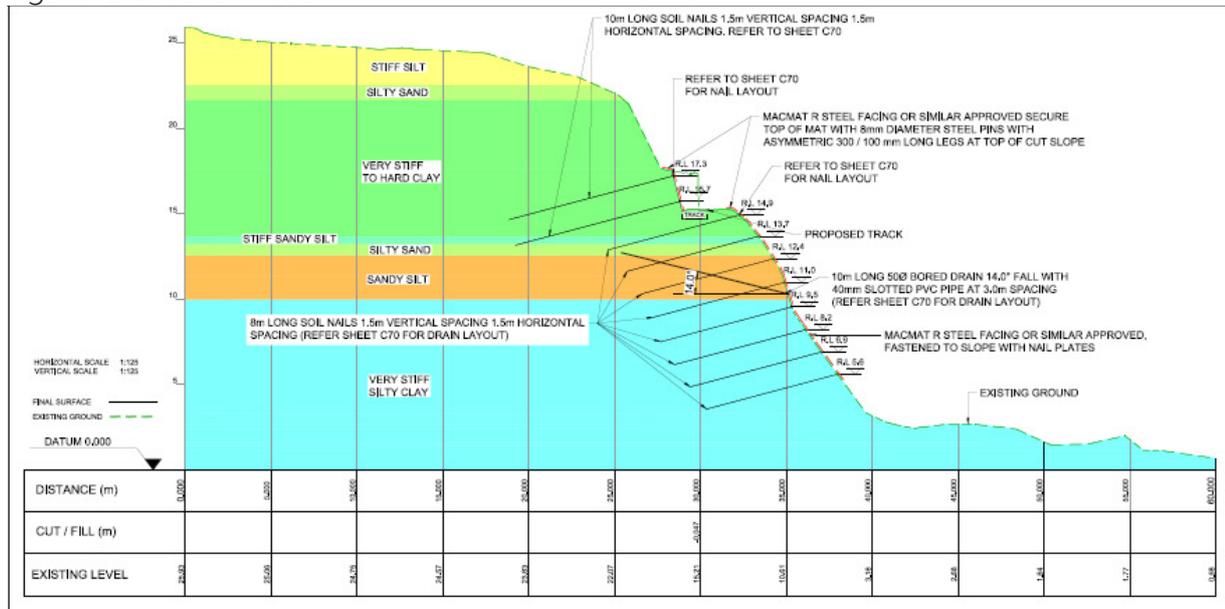
Remaining items such as hydroseeding of the MacMat R and other bare areas is scheduled to be complete in 2020.

Discussions were also held with the arborist as to the stability of the trees at the site. The arborist indicated that the Pohutukawa trees were currently stable from a tree health and structural perspective. WSP provided an opinion that the Pohutukawa tree located at the western extent of the slip on the lower slope may fail under high rain events due to the failure of the slope below the tree. TCC are currently investigating further stabilisation measures in vicinity of this tree.

6 Confirmation of Geotechnical Ground Model

The geotechnical ground model was based on hand augers and field mapping of geologic units on site. Ground conditions observed during construction were generally as described in the design report. Figure 2 from our design report summarises the geotechnical ground model used for the design of the soil nails.

Figure -2 Ground Model



7 Geology

The following geology interpretation supplements the geology section of our design report. The various stratigraphic units were confirmed during construction.

The geology encountered at the site (Figure 3, borehole logs 1 – 5, Appendix B) comprised a sequence of colluvium and air fall tephra units (above the level of the base track), alluvial deposits of the Matua Subgroup (directly below the base track) and a weakly welded ignimbrite (near the toe of the slope).

The weakly welded ignimbrite encountered at the base of the slope has characteristics similar to the Te Puna Ignimbrite described by Briggs et al. (1996)¹ i.e. a non-welded to partially-welded, buff brown ignimbrite which weathers to a firm clay. It is plausible that Te Puna Ignimbrite could exist at this site given that sections have been described at Matakana Island, Pahoia, and Omokoroa (Briggs et al., 1996).

The materials encountered in HA02 and HA05 are typical of the Matua Subgroup; interbedded, volcanic tephra derived clays, silts and sands (Briggs et al., 1996). The Matua Subgroup encompasses all sediment deposited in fluvial, estuarine and lacustrine regimes between approximately 2 million to 50 thousand years ago (Briggs et al., 1996). Shear vane readings indicate that some of the silts and clays are highly sensitive, meaning that these materials lose a significant amount of strength when the peak strength is overcome. Sensitive materials are typically wet to saturated due to the ability of the unique halloysite clay minerals to bind with pore water (Kluger et al., 2018²).

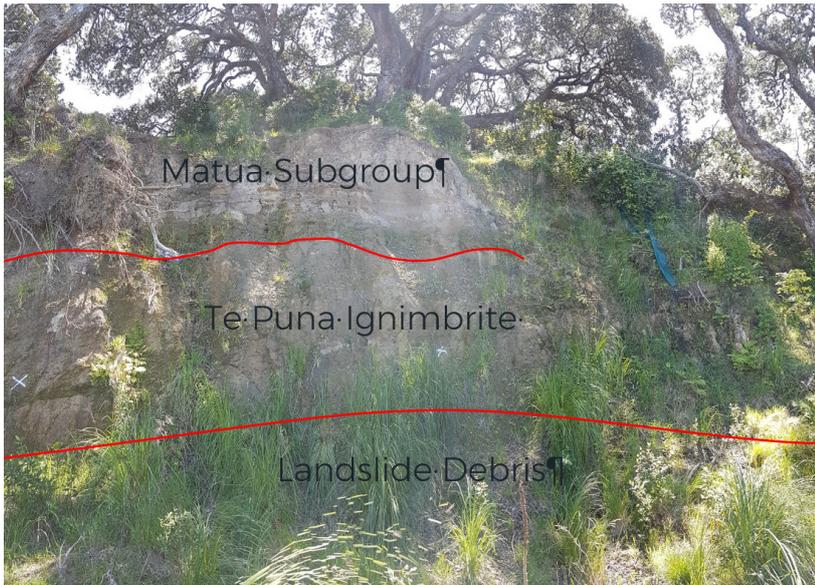
¹ Briggs, R.M., Hall, G.J., Harmsworth, G.R., Hollis, A.G., Houghton, B.F., Hughes, G.R., Morgan, M.D., Whitbread-Edwards, A.R. (1996). Geology of the Tauranga Area. Occasional Report No. 22, Department of Earth Sciences, University of Waikato.

² Kluger, M.O., Moon, V.C., Krieter, S., Lowe, D.J., Churchman, G.J., Hepp, D.A., Seibel, D., Jorat, E., Morz, T. (2016). A new attraction-detachment model for explaining flow sliding in clay-rich tephra. *Geology*, 45(2):131-134.

Ashes interbedded with colluvium were encountered above the Matua Subgroup. The lack of horizontal marker beds make it difficult to place these ashes within the Matua Subgroup or Hamilton Ashes, which typically overlies the Matua Subgroup in the wider Tauranga area. The colluvium encountered at the site is typified by the presence of rhyolite gravel and mottled colours. The thick sequence of colluvium (~3.5m) indicates that slope instability above the site has been an historically active process.

The landslide debris consists of weak, remoulded Matua Subgroup and possibly the Te Puna Ignimbrite.

Figure - 3 Geologic units observed in the slip scarp.



8 Test Records and Design

Soil nail pull-out testing was carried out in accordance with Section 9.4 of FHWA-NHI-14-007, FHWA GEC 007, February 2015. In total, 7 acceptance and 3 verification tests were conducted during the works. Our soil nail design was based on a factored pull-out resistance of 5.3kN per metre.

Based on the testing it was shown that the unfactored pull-out resistance in the Matua Subgroup materials ranged from 5.5 to 21.5kN per metre with the majority of the anchor tests achieving greater than 8.25kN per meter above track level. It was believed that the 5.5kN test was an outlier and may have been due to defects in the soil grout interface.

Verification testing conducted in the Te Puna Ignimbrite below the track achieved 1.0x the factored design load without extension or creep and no failures. All acceptance tests carried out in the Te Puna Ignimbrite returned results of 8.25kN per metre without failure. Just over 5% of all nails were tested which is in accordance with the FHWA standard referenced above.

During construction the design slope model was updated to incorporate the actual pull out resistance achieved in the field. The revised slope stability model (Figure 3) achieved a FoS of 1.36 when incorporating the unfactored pull-out resistance of 8.25kN per metre which is satisfactory.

All test records are contained in Appendix B.

9 Outstanding Items/ Defects

As of June 2020, the following items remained outstanding and still need to be addressed.

- Hydroseeding of the MacMat R and all other bare areas.

10 Geotechnical Monitoring and Maintenance

As recommended in our previous correspondence with TCC and our geotechnical design report WSP recommended the following inspections to monitor the ongoing performance of the site.

- Inspections to determine the condition of site drainage, including culverts, swales and horizontally bored drains.
- Inspection of cut slopes noting for signs of erosion or slippage.
- Topographical survey and inspection of the toe area of the slip repair to monitor coastal erosion.
- General track condition and vegetation establishment.

Since May 2020, WSP has been engaged by TCC to continue to monitor the site and produce regular monitoring reports.

11 Closure

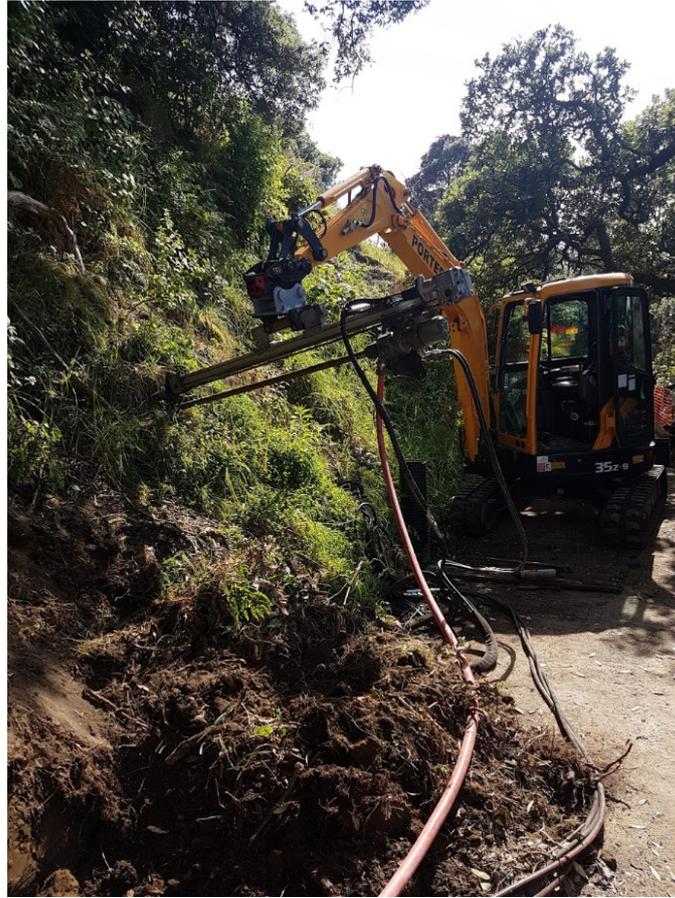
Based on our inspections and testing, we can confirm that the soil nail and track construction meet the criteria outlined in WSP's geotechnical design report reference 2-9B463.00, dated 18 December 2019 except for those items stated in section 9 above.

For further information regarding the contents of this report please contact the author.

Appendix A

Site Photograph Records

Site Inspection Photos



Photograph 1 - 1st test anchor installation prior to track widening.



Photograph 2 - Setting out of soil nails above track level.



Tauranga City Council

Photograph 1 & 2

Project No:

2-9b463.00

Mauao Base Track- Geotechnical Completion Report

Site Inspection Photos



Photograph 3 - Excavations for track widening. Cultural monitor inspecting the excavation.



Photograph 4 - Further track widening and soil nail installation.



Tauranga City Council

Photograph 3 & 4

Project No:

2-9b463.00

Site Inspection Photos



Photograph 5 - Earthworks for track widening advancing.



Photograph 6 - Subgrade preparation.



Tauranga City Council

Photograph 5 & 6

Project No:

2-9b463.00

Mauao Base Track- Geotechnical Completion Report

Site Inspection Photos



Photograph 7 - Soil nail installations, top row above track level.



Photograph 8 - WSP installation of set out pegs for checking track alignment.



Tauranga City Council

Photograph 7 & 8

Project No:

2-9b463.00

Mauao Base Track- Geotechnical Completion Report

Site Inspection Photos



Photograph 9 – Setup for test anchors.



Photograph 10 - Horizontal drain installed above track level.



Tauranga City Council

Photograph 9 & 10

Project No:

2-9b463.00

Mauao Base Track- Geotechnical Completion Report

Site Inspection Photos



Photograph 11 - Installation of Macmat R above track level.



Photograph 12 - Installation of first row of anchors below track level.



Tauranga City Council

Photograph 11 & 12

Project No:

2-9b463.00

Mauao Base Track- Geotechnical Completion Report



Photograph 13 - Installation of safety fence posts.



Photograph 14 - measuring hole depths for posts.



Tauranga City Council

Photograph 13 & 14

Project No:

2-9b463.00

Mauao Base Track- Geotechnical Completion Report



Photograph 15 – Completion of stage 2 of works as per design report.



Photograph 16 – Soil nail installation, lower slope.



Tauranga City Council

Photograph 15 & 16

Project No:

2-9b463.00

Mauao Base Track- Geotechnical Completion Report



Photograph 17, 18 – All soil nails completed and Macmat for lower slope.



Tauranga City Council

Photograph 17 & 18

Project No:

2-9b463.00

Mauao Base Track- Geotechnical Completion Report

Appendix B

Testing Records

Project: Mount Base Track Investigations
 Client: Tauranga City Council
 Contractor:
 Project No.: 2-9B463.00

Location: Mauao
 Coordinates: Not established
 Ref. Grid: n/a
 R.L.: Not established

DEPTH (m)	DESCRIPTION	GRAPHIC LOG	WATER LEVEL	R.L. (m)	DEPTH (m)	SOIL TESTS										SHEAR STRENGTH (kPa)	OTHER TESTS	SAMPLES		
						SCALA PENETROMETER (Blows per mm)														
						0	2	4	6	8	10	12	14	16	18				20	
	Topsoil with trace rootlets and trace pipi shells up to 15mm																			
	SILT, trace sand and rootlets, orange brown	X X X																		80/16
	SILT, minor sand, trace gravel: moist	X X X X																		67/13
1	SILT, some clay: orange brown, moist, moderately plastic	X X X X X			1															113/16
	Silty CLAY, trace sand; orange brown, moist, moderately plastic becoming sandy																			
2	becoming brown, moisture increasing, becoming wet				2															63/16
	Sandy SILT; brown, wet, moderately plastic, trace pyrite flecks	X X X																		80/27
	SAND; brown, wet, fine to medium, loose																			
	Silty SAND, trace fine gravel; brown with orange mottles	X X X																		
3	SILT, some sand: brown with orange and black mottles trace medium ryholite gravel, angular	X X X X			3															
	Clayey SILT, trace sand; brown mottled orange, moist, high plasticity becoming light brown	X X X																		188/87
	CLAY, trace sand; light brown with orange mottles, moist, high plasticity	X X X																		188+
4	becoming wet				4															188+
	CLAY, trace silt; orange brown, moist, high plasticity																			188+
	Silty CLAY; brown, black mottles, wet, high plasticity	X X X																		188+

END OF AUGER AT 5m - Target Depth Reached

Test Methods:
Field Description of Soil and Rock, NZ Geotechnical Soc., 2005

Notes:

Date Tested:

Tested by: s 7(2)

Date Reported:

This report may only be reproduced in full

Approved by

Signed by:

Designation:

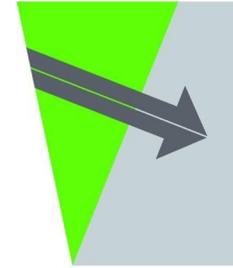
Date: 18/12/2019

Anchor Ref: Generic for site

Job Name: Mauao Base Track

Job Number: 1820

Client: Waiotahi Contractors Ltd



**EARTH
STABILITY**
CIVIL & GEOTECHNICAL ENGINEERING SOLUTIONS

Drilling Log:

Depth: 8.0m (m) Hole Diameter: 150 (mm)
Inclination: 15 (degrees) Drilling Mode: Continuous Flight Auger

Observations: 0 - 0.5m Firm Light Brown Silt
 0.5 - 1.0m Firm Light Brown Silt
 1.0 - 1.5m Light Brown Sandy / Silt
 1.5 - 2.0m Light Brown Sandy / Silt
 2.0 - 2.5m Light Brown Sandy / Silt
 2.5 - 3.0m Light Brown Sandy / Silt
 3.0 - 3.5m Damp Light Brown Silt
 3.5 - 4.0m Damp Light Brown Silt
 4.0 - 4.5m Damp Light Brown Silt
 4.5 - 5.0m Damp Light Brown Silt
 5.0 - 5.5m Wet Light Brown Silt

5.5 - 6.0m Wet Light Brown Silt
6.0 - 6.5m Wet Light Brown Silt
6.5 - 7.0m Wet Light Brown Silt
7.0 - 7.5m Wet Light Brown Silt
7.5 - 8.0m Wet Light Brown Silt
8.0 - 8.5m End hole @ 8.0m
8.5 - 9.0m _____
9.0 - 9.5m _____
9.5 - 10.0m _____
10.0 - 10.5m _____
10.5 - 11.0m _____

Anchor Fabrication Details:

Type: Grade 500 RB25 HD Galvanised
Spacers: PVC Lanterns @ 1.5m c/c

Free Length: 0 * (m)
Bonded Length: 8 (m)

* NB: Designated Test anchors were debonded with a 4.0m section of denso tape wrapped in 3 x layers of PVC tape.

Grouting Log

Cement Type: OPC
Additives: NIL
Grout Plant: Chemgrout

W/C Ratio: 0.45 (18l water + 40kg cement = 30.9l grout)
Grout Volume: 140 litres
Sample taken: YES /-NO

Sample Reference: _____

*****In the event of pre-grouting or secondary grouting being required a new log will be filled out for each occurrence**

Permeability Testing:

Start Time: _____ Total Time: _____ (m)
Stop Time: _____ Water Loss: _____ (m)
Comments: _____

Name: s 7(2)(a) ... Privac

Signature: _____ Date: Feb-20



Job Name: 1820 - Mauao Base Track

Date: 11.02.2020

Anchor No. _____

Verification -
D8

NOTE: LOAD SHOWN BELOW IS 80% OF THE TENSILE BREAKING STRAIN FOR GRADE 500 RB25 BAR

*******THESE LOADS MUST NOT BE EXCEEDED UNDER ANY CIRCUMSTANCES*******

RB25 196kN

LOAD	HOLD TIME	4.48 t	psi	Extension (mm)	
				1	2
Alignment Load	1 minutes				
0.13 Verification test load	10 minutes	0.58	103.2	3.12	50.00
0.25 Verification test load	10 minutes	1.12	198.5	6.78	47.32
0.38 Verification test load	10 minutes	1.70	301.7	12.65	42.21
0.50 Verification test load	10 minutes	2.24	397.0	17.16	31.75
0.63 Verification test load	10 minutes	2.82	500.3	25.97	23.86
0.75 Verification test load (Creep test)	60 minutes	3.36	595.6	35.21	17.67
0.88 Verification test load	10 minutes	3.94	698.8	41.01	8.89
1.00 Verification test load	10 minutes	4.48	794.1	47.96	1.02
Alignment Load	1 minute				

Notes:

60t Jack cross sectional area
= 80.3cm² / stroke of 50mm

Verification test load x 1 Anchor

Cells Marked in yellow require readings to be taken 1,2,4,5, and 10 minutes

DG2 Preset to 50.00mm

	1	2	4	5	10
0.13	3.12	3.12	3.12	3.12	3.12
0.25	6.77	6.77	6.77	6.78	6.78
0.38	12.64	12.64	12.65	12.65	12.65
0.50	17.14	17.15	17.16	17.16	17.16
0.63	25.94	25.94	25.96	25.97	25.97

* No incremental comp readings taken

* No creep was witnessed and compaction matched

Deformation on exposed nail due to differing bands of material and excessive Compaction of lower test frame

*Deflection readings are required during this period as detailed below

Time (minutes)	Dial gauge reading (mm)	
	1	2
1	35.11	20.21
2	35.13	20.21
4	35.13	20.21
5	35.13	19.76
6	35.14	19.51
10	35.17	19.51
20	35.20	19.01
30	35.21	18.31
50	35.21	17.87
60	35.21	17.87

CALCULATING GAUGE PRESSURE REQUIRED

TONNES OF FORCE REQUIRED X 1000
CYLINDER EFFECTIVE AREA (cm²)

= kgf/cm² (gauge pressure)
(Multiply by 14.233 for PSI gauge)

Dial gauge 1 = bar extension 1

Dial gauge 2 = compaction 2

Name: (tester) s 7(2)(a) ... Privacy

Clients Rep: _____

Engineer: _____



Job Name: 1820 - Mauao Base Track

Anchor No. 2b

Date: 3.03.2020

NOTE: LOAD SHOWN BELOW IS 80% OF THE TENSILE BREAKING STRAIN FOR GRADE 500 RB25 BAR

*******THESE LOADS MUST NOT BE EXCEEDED UNDER ANY CIRCUMSTANCES*******

RB25 196kN

LOAD	HOLD TIME	3.36 t	psi	Extension (mm)	
				1	2
Alignment Load	1 minute			0.00	50.00
0.17 Proof test load	UMS	0.57	101.2	3.12	29.57
0.33 Proof test load	UMS	1.11	196.5	6.48	40.72
0.50 Proof test load	UMS	1.68	297.8	8.21	13.17
0.67 Proof test load	UMS	2.25	399.0	8.76	2.59
0.83 Proof test load	UMS	2.79	494.3	10.03	-6.32
1.00 Proof test load (Creep test)	10 minutes	3.36	595.6	11.21	-15.89
Alignment Load	1 minute			0.87	25.32

Notes:

60t Jack cross sectional area
= 80.3cm² / stroke of 50mm

Proof test load x 4 Anchors

Reset due to compaction 45mm
Timber frame bed snapped during test

Test conducted by BH

**Deflection readings are required during this period as detailed below*

Time (minutes)	Dial gauge reading (mm)	
	1	2
1	11.21	15.89
2	11.21	15.90
4	11.21	15.90
5	11.22	15.91
6	11.23	-15.91
10	11.23	-15.91

CALCULATING GAUGE PRESSURE REQUIRED

$$\frac{\text{TONNES OF FORCE REQUIRED X 1000}}{\text{CYLINDER EFFECTIVE AREA (cm}^2\text{)}}$$

$$= \text{kgf/cm}^2 \text{ (gauge pressure)}$$

(Multiply by 14.233 for PSI gauge)

UMS = Until Movement Stabilises

Dial gauge 1 = bar extension 1

Dial gauge 2 = compaction 2

QA03c -Testing sheet RB25 Bar

Clients Rep: _____

Engineer: _____



Job Name: 1820 - Mauao Base Track

Anchor No. 4d

Date: 3.03.2020

NOTE: LOAD SHOWN BELOW IS 80% OF THE TENSILE BREAKING STRAIN FOR GRADE 500 RB25 BAR

*******THESE LOADS MUST NOT BE EXCEEDED UNDER ANY CIRCUMSTANCES*******

RB25 196kN

LOAD	HOLD TIME	3.36 t	psi	Extension (mm)	
				1	2
Alignment Load	1 minute			1.25	50.00
0.17 Proof test load	UMS	0.57	101.2	1.65	38.79
0.33 Proof test load	UMS	1.11	196.5	2.11	30.01
0.50 Proof test load	UMS	1.68	297.8	3.27	23.02
0.67 Proof test load	UMS	2.25	399.0	3.56	18.72
0.83 Proof test load	UMS	2.79	494.3	4.23	12.36
1.00 Proof test load (Creep test)	10 minutes	3.36	595.6	5.09	5.73
Alignment Load	1 minute			1.67	43.22

**Deflection readings are required during this period as detailed below*

Time (minutes)	Dial gauge reading (mm)	
	1	2
1	5.09	5.73
2	5.09	5.73
4	5.09	5.73
5	5.10	5.73
6	5.10	5.73
10	5.11	5.73

CALCULATING GAUGE PRESSURE REQUIRED

TONNES OF FORCE REQUIRED X 1000
CYLINDER EFFECTIVE AREA (cm²)

= kgf/cm² (gauge pressure)
 (Multiply by 14.233 for PSI gauge)

Notes:
 60t Jack cross sectional area
 = 80.3cm² / stroke of 50mm

Proof test load x 4 Anchors

Total Compression of face material
 44.27mm

Test conducted by BH

Best test setup anchor on level (ish)
 ground

UMS = Until Movement Stabilises

Dial gauge 1 = bar extension 1

Dial gauge 2 = compaction 2

QA03c -Testing sheet RB25 Bar

Clients Rep: _____

Engineer: _____



Job Name: 1820 - Mauao Base Track

Anchor No. 4e

Date: 3.03.2020

NOTE: LOAD SHOWN BELOW IS 80% OF THE TENSILE BREAKING STRAIN FOR GRADE 500 RB25 BAR

*******THESE LOADS MUST NOT BE EXCEEDED UNDER ANY CIRCUMSTANCES*******

RB25 196kN

LOAD	HOLD TIME	3.36 t	psi	Extension (mm)	
				1	2
Alignment Load	1 minute			1.25	50.00
0.17 Proof test load	UMS	0.57	101.2	1.85	41.50
0.33 Proof test load	UMS	1.11	196.5	5.11	17.82
0.50 Proof test load	UMS	1.68	297.8	6.72	-6.11
0.67 Proof test load	UMS	2.25	399.0	11.32	-19.87
0.83 Proof test load	UMS	2.79	494.3	11.67	-21.31
1.00 Proof test load (Creep test)	10 minutes	3.36	595.6	15.73	-30.75
Alignment Load	1 minute			1.75	-28.32

**Deflection readings are required during this period as detailed below*

Time (minutes)	Dial gauge reading (mm)	
	1	2
1	15.73	-30.75
2	15.73	-30.82
4	15.73	-30.85
5	15.74	-30.85
6	15.74	-30.85
10	15.74	30.85

CALCULATING GAUGE PRESSURE REQUIRED

TONNES OF FORCE REQUIRED X 1000
CYLINDER EFFECTIVE AREA (cm²)

= kgf/cm² (gauge pressure)
 (Multiply by 14.233 for PSI gauge)

Notes:
 60t Jack cross sectional area
 = 80.3cm² / stroke of 50mm

Proof test load x 9 Anchor

Total Compression of face material
 80.75mm

Test conducted by BH

UMS = Until Movement Stabilises

Dial gauge 1 = bar extension 1

Dial gauge 2 = compaction 2

QA03c -Testing sheet RB25 Bar

Clients Rep: _____

Engineer: _____



Job Name: 1820 - Mauao Base Track

Anchor No. 5b

Date: 3.03.2020

NOTE: LOAD SHOWN BELOW IS 80% OF THE TENSILE BREAKING STRAIN FOR GRADE 500 RB25 BAR

*******THESE LOADS MUST NOT BE EXCEEDED UNDER ANY CIRCUMSTANCES*******

RB25 196kN

LOAD	HOLD TIME	3.36 t	psi	Extension (mm)	
				1	2
Alignment Load	1 minute			0.00	50.00
0.17 Proof test load	UMS	0.57	101.2	0.52	46.20
0.33 Proof test load	UMS	1.11	196.5	11.33	26.18
0.50 Proof test load	UMS	1.68	297.8	15.70	9.24
0.67 Proof test load	UMS	2.25	399.0	18.74	-3.27
0.83 Proof test load	UMS	2.79	494.3	19.21	-18.78
1.00 Proof test load (Creep test)	10 minutes	3.36	595.6	20.13	-23.11
Alignment Load	1 minute			1.08	45.21

**Deflection readings are required during this period as detailed below*

Time (minutes)	Dial gauge reading (mm)	
	1	2
1	20.13	-23.11
2	30.13	-23.78
4	20.14	-23.82
5	20.14	-24.01
6	20.14	-24.09
10	20.14	-24.97

CALCULATING GAUGE PRESSURE REQUIRED

TONNES OF FORCE REQUIRED X 1000
CYLINDER EFFECTIVE AREA (cm²)

= kgf/cm² (gauge pressure)
 (Multiply by 14.233 for PSI gauge)

Notes:
 60t Jack cross sectional area
 = 80.3cm² / stroke of 50mm
 Proof test load x 4 Anchors
 Total Compression of face material
 73.11mm
 Test conducted by BH

UMS = Until Movement Stabilises

Dial gauge 1 = bar extension 1

Dial gauge 2 = compaction 2

QA03c -Testing sheet RB25 Bar

Clients Rep: _____

Engineer: _____

6A	3/12/2019	RB25	100.00	10.00	15.00	0.00	10.00	Mud		3/12/2019		80.00	1349
6B	4/12/2019	RB25	100.00	10.00	15.00	0.00	10.00	Mud		5/12/2019		80.00	1059
7A	3/12/2019	RB25	100.00	10.00	15.00	0.00	10.00	Mud		7/12/2019		80.00	1350
7B	4/12/2019	RB25	100.00	10.00	15.00	0.00	10.00	Mud		5/12/2019		80.00	1059
8A	4/12/2019	RB25	100.00	10.00	15.00	0.00	10.00	Mud		5/12/2019		80.00	1059
8B	5/12/2019	RB25	100.00	10.00	15.00	0.00	10.00	Mud		5/12/2019		80.00	1060
9A	5/12/2019	RB25	100.00	10.00	15.00	0.00	10.00	Mud		5/12/2019		80.00	1060
9B	7/12/2019	RB25	100.00	10.00	15.00	0.00	10.00	Mud		7/12/2019		80.00	1061
10A	5/12/2019	RB25	100.00	10.00	15.00	0.00	10.00	Mud		5/12/2019		80.00	1060
10B	7/12/2019	RB25	100.00	10.00	15.00	0.00	10.00	Mud		7/12/2019		80.00	1061
11A	7/12/2019	RB25	100.00	10.00	15.00	0.00	10.00	Mud		7/12/2019		80.00	1061
12A	7/12/2019	RB25	100.00	10.00	15.00	0.00	10.00	Mud		7/12/2019		80.00	1062
Drain 1	29/11/2019	50mm PVC	100.00	10.00	50.00	0.00	4.50	Mud		N/A			1348
						4.50	10.00	Hard Moist Clay					
Drain 2	29/11/2019	50mm PVC	100.00	10.00	70.00	0.00	5.00	Mud		N/A			1348
						5.00	10.00	Hard Moist Clay					

Project: Mount Track

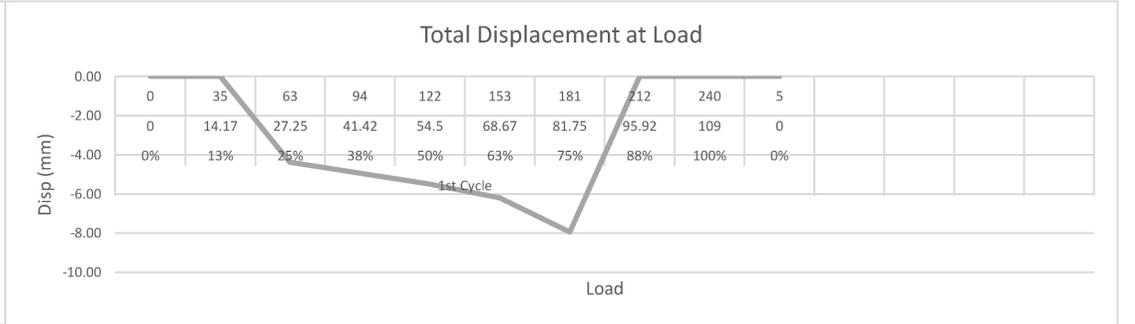
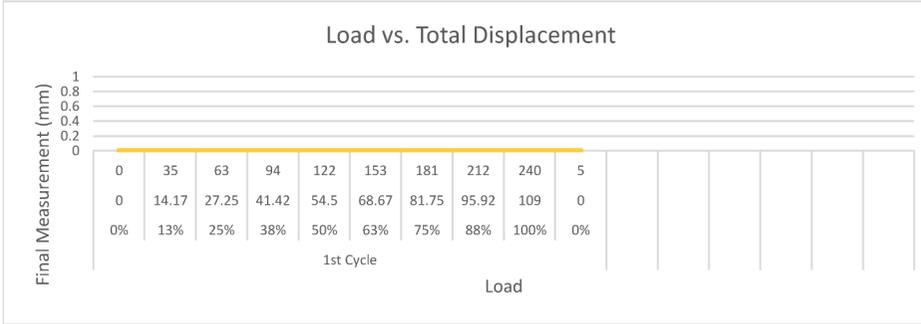
Anchor #	1B
Date	6/12/2019

s 7(2)(a) - Privacy	30t
DTL (Kn)	109

Stressing Length

	Loading			Reading Increments												Final (mm)	Total Disp (mm)	Total Movement at Load (mm)
	Applied Test Load		Gauge Value	LHS (mm)														
	%	kN	Bar	Intial	1min	2min	4min	5min	6min	10min	20min	30min	50min	60min				
1st Cycle	0%	0	0													0.00	0.00	0.00
	13%	14.17	35													0.00	0.00	0.00
	25%	27.25	63	4.38	4.38											0.00	0.00	-4.38
	38%	41.42	94	4.93	4.93											0.00	0.00	-4.93
	50%	54.5	122	5.49	5.49											0.00	0.00	-5.49
	63%	68.67	153	6.20	6.20											0.00	0.00	-6.20
	75%	81.75	181	7.94	7.94	7.94	7.94	7.94	8.14	8.14						0.00	0.00	-7.94
	88%	95.92	212													0.00	0.00	0.00
	100%	109	240													0.00	0.00	0.00
	0%	0	5													0.00	0.00	0.00

s 7(2)(a) - Privacy pumped to maintain pressure hence 0.2mm creep



Project: Mount Track

Anchor #	2A
Date	6/12/2019

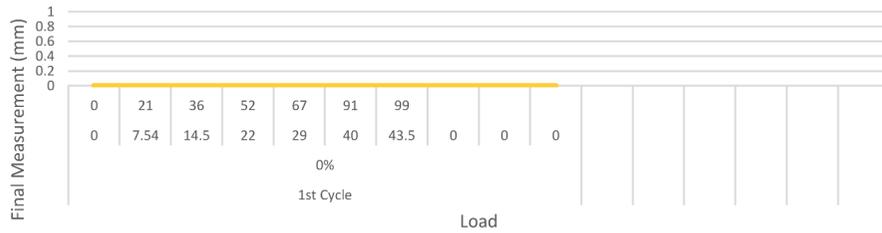
DTL (Kn)	30t
DTL (Kn)	109

Stressing Length

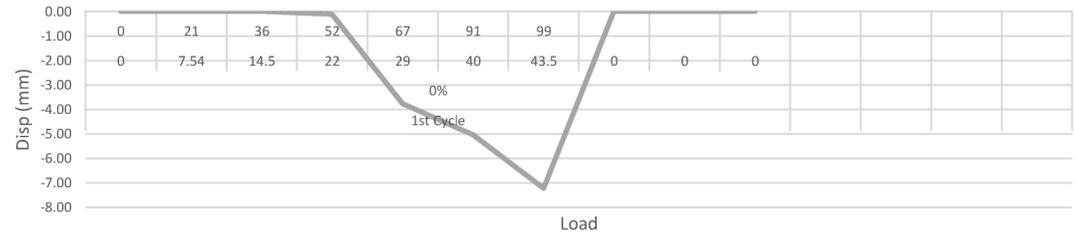
	Loading			Reading Increments												Final (mm)	Total Disp (mm)	Total Movement at Load (mm)
	Applied Test Load		Gauge Value	LHS (mm)														
	%	kN	Bar	Intial	1min	2min	4min	5min	6min	10min	20min	30min	50min	60min				
1st Cycle	0%	0	0													0.00	0.00	0.00
		7.54	21	0.00	0.00											0.00	0.00	0.00
		14.5	36	0.00	0.00											0.00	0.00	0.00
		22	52	0.11	0.11											0.00	0.00	-0.11
		29	67	3.76	3.76											0.00	0.00	-3.76
		40	91	5.04	5.04											0.00	0.00	-5.04
		43.5	99	7.22	7.22	7.22	7.22	7.22	7.22	7.22	7.22					0.00	0.00	-7.22
		0														0.00	0.00	0.00
		0														0.00	0.00	0.00
		0														0.00	0.00	0.00

Loads changed on site as per instruction - new loads on spreadsheet

Load vs. Total Displacement



Total Displacement at Load



Project: Mount Track

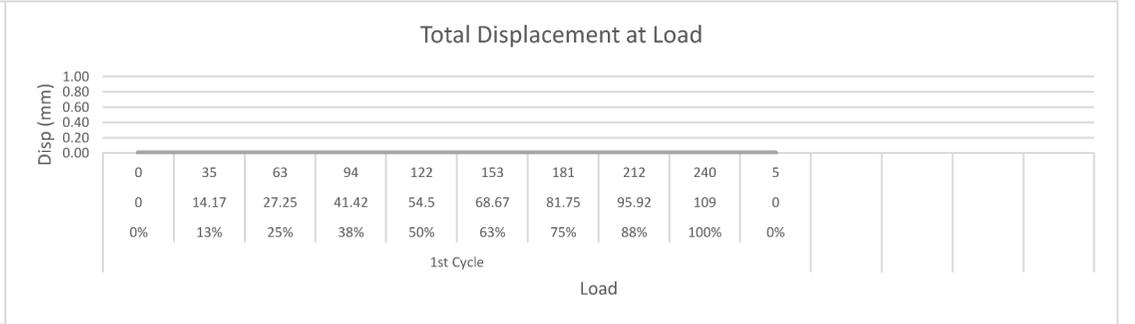
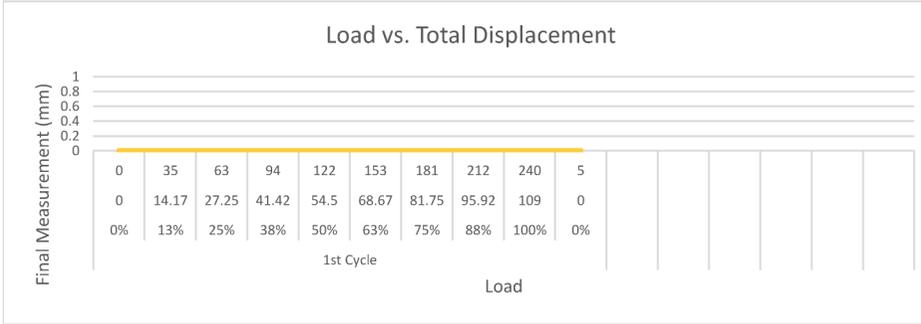
Anchor #	4B
Date	6/12/2019

DTL (Kn)	30t
DTL (Kn)	109

Stressing Length

	Loading			Reading Increments												Final (mm)	Total Disp (mm)	Total Movement at Load (mm)
	Applied Test Load		Gauge Value	LHS (mm)														
	%	kN	Bar	Intial	1min	2min	4min	5min	6min	10min	20min	30min	50min	60min				
1st Cycle	0%	0	0													0.00	0.00	0.00
	13%	14.17	35													0.00	0.00	0.00
	25%	27.25	63													0.00	0.00	0.00
	38%	41.42	94													0.00	0.00	0.00
	50%	54.5	122													0.00	0.00	0.00
	63%	68.67	153													0.00	0.00	0.00
	75%	81.75	181													0.00	0.00	0.00
	88%	95.92	212													0.00	0.00	0.00
	100%	109	240													0.00	0.00	0.00
	0%	0	5													0.00	0.00	0.00

Failed at 55KN - when preloading bar



Project: Mount Track

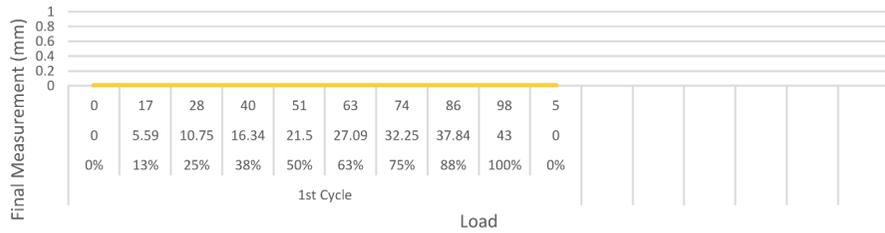
Anchor #	Bottom Slope Test Anch	s 7(2)(a) - Privacy	30t
Date	9/12/2019	DTL (Kn)	43

Stressing Length

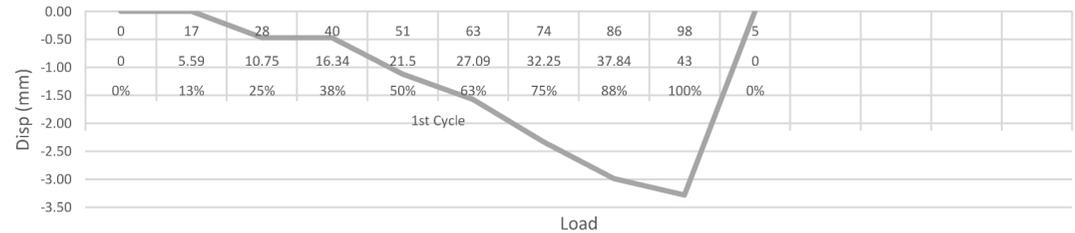
	Loading			Reading Increments												Final (mm)	Total Disp (mm)	Total Movement at Load (mm)
	Applied Test Load	Gauge Value	Bar	LHS (mm)														
				Intial	1min	2min	4min	5min	6min	10min	20min	30min	50min	60min				
%	kN	Bar																
1st Cycle	0%	0	0	0.00												0.00	0.00	0.00
	13%	5.59	17	0.00	0.00											0.00	0.00	0.00
	25%	10.75	28	0.47	0.47											0.00	0.00	-0.47
	38%	16.34	40	0.47	0.47											0.00	0.00	-0.47
	50%	21.5	51	1.12	1.12											0.00	0.00	-1.12
	63%	27.09	63	1.57	1.57											0.00	0.00	-1.57
	75%	32.25	74	2.33	2.39	2.39	2.40	2.40	2.40	2.40	2.41	2.41				0.00	0.00	-2.33
	88%	37.84	86	2.99												0.00	0.00	-2.99
	100%	43	98	3.28												0.00	0.00	-3.28
	0%	0	5													0.00	0.00	0.00

▲ Took anchor to failure which was 190 bar

Load vs. Total Displacement



Total Displacement at Load



Project: Mount Track

Anchor #	TEST 1 - SAC
Date	2/12/2019

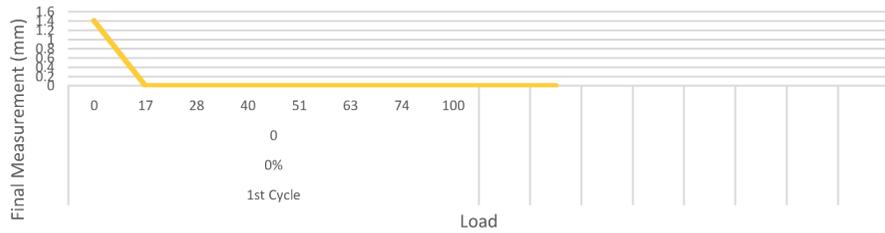
DTL (Kn)	30t
	109

Stressing Length

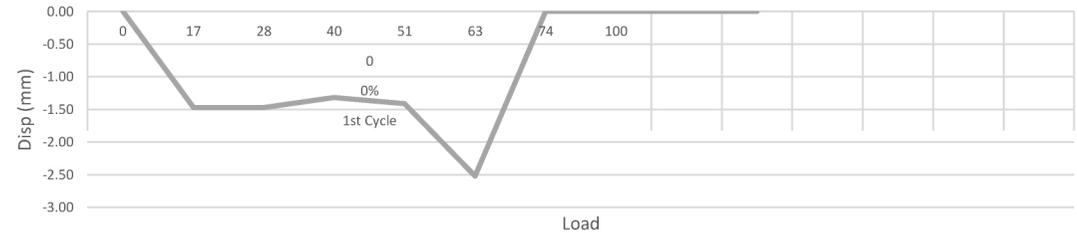
	Loading			Reading Increments												Final (mm)	Total Disp (mm)	Total Movement at Load (mm)
	Applied Test Load		Gauge Value	LHS (mm)														
	%	kN	Bar	Intial	1min	2min	4min	5min	6min	10min	20min	30min	50min	60min				
1st Cycle	0%	0	0	1.41												1.41	0.00	0.00
			17	1.47	1.47											0.00	1.41	-1.47
			28	1.47	1.47											0.00	1.41	-1.47
			40	1.32	1.32											0.00	1.41	-1.32
			51	1.41	1.41											0.00	1.41	-1.41
			63	2.52	2.52											0.00	1.41	-2.52
			74													0.00	1.41	0.00
			100													0.00	1.41	0.00
																0.00	1.41	0.00
																0.00	1.41	0.00

Loads given on site.

Load vs. Total Displacement



Total Displacement at Load



**GROUT DENSITY & COMPRESSION
TEST REPORT**



Project : Mount Base Track Investigations
 Location : Mount Maunganui
 Client : WSP Tauranga
 Contractor : Unknown
 Sampled by : Unknown
 Date sampled : 28 November 2019
 Sampling method : Unknown
 Sample description : Grout Cubes
 Sample condition : Dry (as received)

Project No : 29B463.00/00002
 Lab Ref No : TG3716
 Client Ref No : --

Test Results			
Lab reference :	TG3716-1	TG3716-2	TG3716-3
Client reference :	1	2	3
Age at test (days) :	4	4	4
Cube average width (mm) :	51.0	50.9	51.0
Cube average height (mm) :	54.2	54.4	53.6
Cube end area (m ²) :	0.0026	0.0026	0.0026
Density (kg/m ³) :	1920	1920	1930
Ends capped :	2	2	2
Maximum load (kN) :	64	64	62
Compressive strength (MPa) :	24.6	24.6	23.8
Ave. Compressive strength (MPa) :	24.3		
Date tested :	2/12/19	2/12/19	2/12/19
Test Method :		Notes	
Test Method : BS EN 12390-3 : 2009, Part 3		This report may only be reproduced in full.	

Date reported : 2 December 2019

s 7(2)(a) ... Privacy

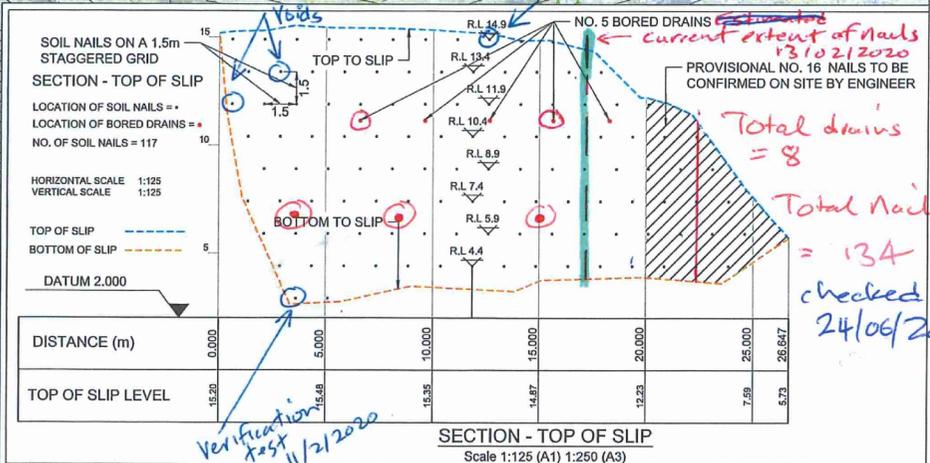
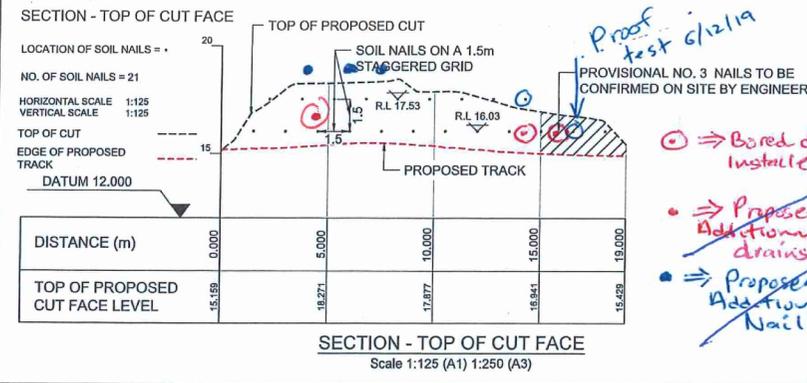
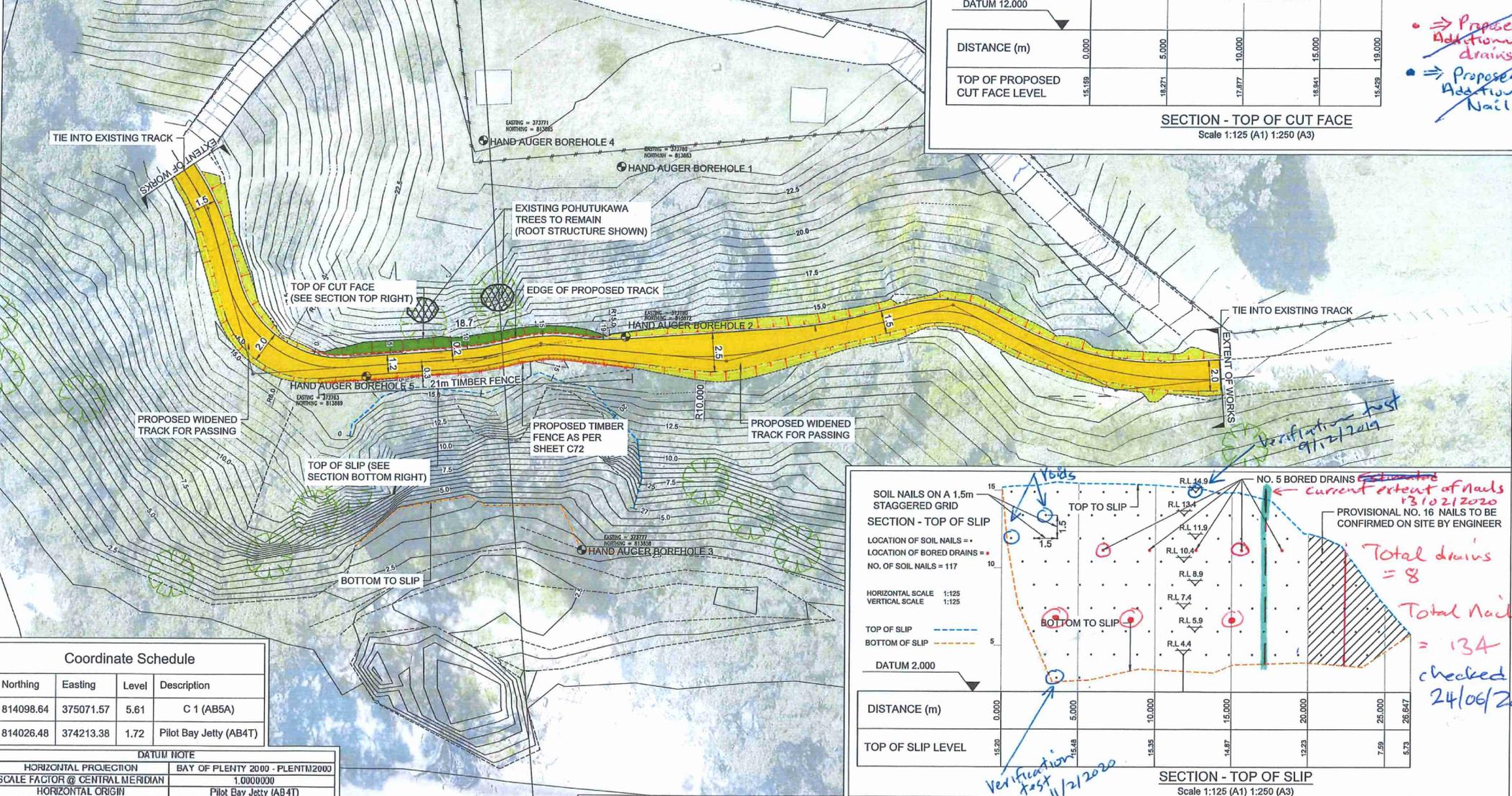
Date : 2 December 2019

Appendix C

As-Built Information

LEGEND

	PROPOSED TRACK.
	PROPOSED EARTHWORKS - AREA OF CUT
	PROPOSED EARTHWORKS - AREA OF FILL
	EXISTING POHUTUKAWA TREES TRUNK.



Coordinate Schedule

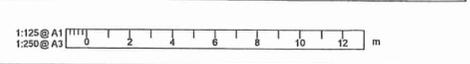
Northing	Easting	Level	Description
814098.64	375071.57	5.61	C 1 (AB5A)
814026.48	374213.38	1.72	Pilot Bay Jetty (AB4T)

DATUM NOTE

HORIZONTAL PROJECTION	BAY OF PLENTY 2000 - PLINTM2003
SCALE FACTOR @ CENTRAL MERIDIAN	1.0000000
HORIZONTAL ORIGIN	Pilot Bay Jetty (AB4T)
VERTICAL DATUM	MOTURKI 1953
VERTICAL ORIGIN	Pilot Bay Jetty (AB4T)

COMMENTS:

THIS WORK INCLUDES DATA WHICH IS LICENSED BY LAND INFORMATION NEW ZEALAND (LINZ) FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.



Revision	Amendment	Approved	Revision Date
1	ISSUED FOR CONSTRUCTION	D.D.	2019-11-22



wsp

Tauranga Office
#617 578 2089

PO Box 646
Tauranga 3140
New Zealand

Discussed: s 7(2)(a) ... Privacy

Approved: [Signature]

Date: 2019-11-22

Project: s 7(2)(a)

Scale: 1:125 (A1) 1:250 (A3)

FOR CONSTRUCTION

Project: TAURANGA CITY COUNCIL MAUAO BASE TRACK REINSTATEMENT MOUNT MAUNGANUI, TAURANGA

Sheet: SLIP LAYOUT PLAN SHEET 1 OF 1

Project No.: 2-9B463.00

Sheet No.: C70

Revision: 1

Appendix D

Inspection Records & Correspondence

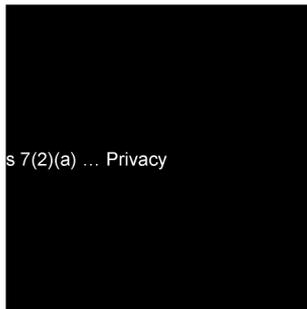
From: s 7(2)(a) ... Privacy
Sent: Monday, 2 December 2019 4:28 PM
To: s 7(2)(a) ... Privacy
Cc:
Subject: Mauao Site Visit 021219

Hi s 7(2)(a) , just a summary from today.

- We carried out a verification test to 1.0x the design load and was holding so good result.
- The horizontally bored drains are functioning well, however there was some saturation of the track over the weekend. Since my visit I instructed Waiotahi to flume the drains to the closest existing culvert to prevent further saturation. They will then dig out the wet material tomorrow and replace with dry material borrowed from the bank.
- Hopefully the guys will have the rest of the anchors up to the tree installed by the end of today.
- If the anchors have been installed successfully today we will be scratching further past the tree (Chainage 30 mark).
- I have arranged to have our surveyor there tomorrow to confirm design heights and track width are adequate.

Thanks will see you tomorrow at 7.30am.

Regards



s 7(2)(a) ... Privacy

WSP
Gartshore House
Level 3 116 Cameron Rd
Tauranga 3110
New Zealand

wsp.com/nz

s 7(2)(a) ... Privacy

From: s 7(2)(a) ... Privacy
Sent: Tuesday, 3 December 2019 5:51 PM
To: s 7(2)(a) ... Privacy
Cc: s 7(2)(a) ... Privacy
Subject: Mauao Base Track Site Visit 031219

Hi s 7(2)(a) ...

Today we managed to cut the track through achieving an average width of 3m from the slip face. Anchor works are continuing today / tomorrow. I will give you an update tomorrow of how many installed to date. Tomorrow I am meeting our surveyor on site at 9am to check levels and width and also set out fence/ hand rail. Drains are working well and the guys should have some half round pipe installed to prevent saturation of the track at the toe of the cut batter.

Regards,

s 7(2)(a) ... Privacy

WSP
Gartshore House
Level 3 116 Cameron Rd
Tauranga 3110
New Zealand

wsp.com/nz

s 7(2)(a) ... Privacy

From: s 7(2)(a) ... Privacy
Sent: Wednesday, 4 December 2019 6:13 PM
To: s 7(2)(a) ... Privacy
Cc:
Subject: Mauao Base Track Update 041219
Attachments: 041219.jpg; 041219 - 2.jpg

Hi s 7(2)(a) . just a quick update.

- We have now drilled and grouted 16 anchors to 10m depth with another 7 remaining on the top slope which should hopefully be completed tomorrow to finish the top section. We also are proposing to install some shorter lengths approx. 5x 1.5m long bars to secure the top of the Mac Mat where it would be difficult to pin.
- Today we checked the track width and set out the hand rail which looks satisfactory. We also checked fill heights.
- A subsoil drain will be installed tomorrow which will comprise a roughly 300mm x 300mm trench lined with geotextile cloth with a 110mm diameter draincoil backfilled with drainage 40 metal to drain the bank water table. We will extend this across the full width of the cut. I have also recommended we install a half round pipe dish channel as a permanent feature to control water coming from horizontally bored drains.
- We will try get some performance testing of the anchors above the track and a proof test below the track this week.

Regards

s 7(2)(a) ... Privacy

WSP
Gartshore House
Level 3 116 Cameron Rd
Tauranga 3110
New Zealand

wsp.com/nz

s 7(2)(a) ... Privacy

From: s 7(2)(a) ... Privacy
Sent: Thursday, 5 December 2019 3:49 PM
To: s 7(2)(a) ... Privacy
Cc: s 7(2)(a) ... Privacy
Subject: RE: Mauao 5 Dec

Hi s 7(2)(a) ... It appears the water seeps were accumulating overnight with no way to get into the culvert. We now have a subsoil drain installed on site which appears to be controlling the seepage effectively and the saturated material has now been scraped off.

With regards to the anchors, these should be completed today and the guys will be testing two anchors tomorrow. With the loads confirmed the guys can use for anchorage if required or they may anchor to the large tree.

Regards,

s 7(2)(a) ... Privacy

WSP
Gartshore House
Level 3 116 Cameron Rd
Tauranga 3110
New Zealand

wsp.com/nz

From: s 7(2)(f)(ii)
Sent: Thursday, 5 December 2019 3:00 PM
To: s 7(2)(a) ... Privacy
Cc: s 7(2)(a) ... Privacy
Subject: Fwd: Mauao 5 Dec

s 7(2)(a) ... Pr

Any issue with the water as per photos attached

s 7(2)(f)(ii)

Begin forwarded message:

From: s 7(2)(f)(ii)
Date: 5 December 2019 at 10:28:34 AM NZDT
To: s 7(2)(f)(ii)
Subject: Mauao 5 Dec

s 7(2)(a) ... Privacy

From: s 7(2)(a) ... Privacy
Sent: Monday, 9 December 2019 1:39 PM
To: s 7(2)(f)(ii)
Cc: s 7(2)(a) ... Privacy
Subject: Mauao Base Track 091219
Attachments: 20191209131810592.pdf; 1.jpg; 2.jpg

Hi s 7(2)(a) ... as discussed and following my site visit on Friday 6. We carried out a proof test on 3 anchors close to chainage 37.5. The first anchor tested passed the proof test / creep test however the anchor immediately next to it failed. This area is noticeably wet and is where the horizontal drains are located. Following the failure we then tested the anchor next to it which passed. I therefore recommended that we install an additional anchor to a depth of 15m in this region.

I also recommend we place an additional drain at track level chainage 37.5 (this is the third drain we previously discussed as we have only installed 2/3 drains to date.) I also recommend that we install at least 2 bored drains to 10m in the slip face below the track in addition to the first row of anchors prior to Christmas as this will be important to for stability of the slope. I have attached a plan indicating where the drains should be installed these are highlighted in green. Once we receive the test results from the test anchor below the track later today we can confirm the anchor length for the lower slope. Any questions, please don't hesitate to contact me.

s 7(2)(a) ... Privacy

WSP
Gartshore House
Level 3 116 Cameron Rd
Tauranga 3110
New Zealand

wsp.com/nz

From: s 7(2)(a) ... Privacy
Sent: Thursday, 13 February 2020 11:59 AM
To: s 7(2)(a) ... Privacy
Subject: Mauao Base track Inspection 12/02/2020
Attachments: 20200213114355475.pdf

Hi s 7(2)(a) ...

Just letting you know I popped out to site yesterday as requested. Regarding the voids, we will just fill these with additional grout. Earth Stability have established that the void is isolated to two anchors only and are within the length of the anchor so should form a good grout bulb. See plan attached. I have annotated some as-built information including where I think we will need additional anchors (blue dots at the top of sheet) and drains (red dots). Also of interest is highlighted dashed line where I believe the current extent of nails finishes leaving approx. 3m before we even get to the provisional area so might be some savings but better to have a look on site as discussed to confirm. Would like to optimise position of anchors to provide best resilience within the budget.

Regards,

s 7(2)(a) ... Privacy

WSP
Gartshore House
Level 3 116 Cameron Rd
Tauranga 3110
New Zealand

wsp.com/nz



From: s 7(2)(a) ... Privacy
Sent: Thursday, 13 February 2020 11:59 AM
To: s 7(2)(f)(ii)
Subject: Mauao Base track Inspection 12/02/2020
Attachments: 20200213114355475.pdf

Hi s 7(2)(f)(ii)

Just letting you know I popped out to site yesterday as requested. Regarding the voids, we will just fill these with additional grout. Earth Stability have established that the void is isolated to two anchors only and are within the length of the anchor so should form a good grout bulb. See plan attached. I have annotated some as-built information including where I think we will need additional anchors (blue dots at the top of sheet) and drains (red dots). Also of interest is highlighted dashed line where I believe the current extent of nails finishes leaving approx. 3m before we even get to the provisional area so might be some savings but better to have a look on site as discussed to confirm. Would like to optimise position of anchors to provide best resilience within the budget.

Regards,

s 7(2)(a) ... Privacy

WSP
Gartshore House
Level 3 116 Cameron Rd
Tauranga 3110
New Zealand

wsp.com/nz



From: § 7(2)(a) ... Privacy
Sent: Friday, 13 December 2019 4:35 PM
To: § 7(2)(f)(ii)
Cc:
Subject: Mauao Base Track

Hi § 7(2)(f)(ii)

Just an update.

- I checked the set out for fence which looked good confirming >325mm in front of post. We have achieved nominal 2.0m width.
- Mac Mar R looking tidy with edges folded etc.
- First row of anchors installed with the exception of 1.
- Coconut mat is now installed over half the face below the track.

Outstanding items:

I have recommended an additional drain above the track which has not been installed.

An additional anchor will need to be drilled at the top row in place of the sacrificial test anchor.

These will now have to be installed in the new year.

I have not observed the "caps" for the lower anchors as they will arrive Monday. I understand that Waiotahi are proposing to use a 25mm nut which I would like to check.

I will likely poke my head in next week prior to opening to check completed earthworks.

Have a good weekend

Cheers

s 7(2)(a) ... Privacy

From: s 7(2)(a) ... Privacy
Sent: Friday, 29 November 2019 4:03 PM
To: s 7(2)(f)(ii)
Cc: s 7(2)(f)(ii)
Subject: RE: Mauao Works (programme/progress)
Attachments: 20191129_121259.jpg; 20191129_121309.jpg; 20191129_121246.jpg

Hi s 7(2)(a) ... , further to our phone conversation just a quick summary of operations.

- Waiotahi have advanced/ widened the excavation to approx. chainage 30 or about half way.
- Arborist happy with root anchorage and there was minimal root removal required close to tree.
- Waiotahi have drilled 1x test anchor to 4m and two production anchors to 10m.
- Waiotahi have drilled 2x production anchor holes but left un-grouted in case we need to increase the hole diameters.
- Before I left the guys were in the process of drilling two horizontally bored drains so should be complete.
- I will be on site first thing on Monday to observe the anchor testing. Based on the testing we will confirm the bond strength and if satisfactory we will continue installing anchors as per current specifications.
- If unsatisfactory we may need to adjust the anchor length and / or diameter if required.
- Our lab will be testing the grout samples also on Monday to confirm strength of grout.
- I will keep you updated as the works progress next week.
- I have attached some photos from today.

Have a good weekend.

cheers

s 7(2)(a) ... Privacy

WSP
Gartshore House
Level 3 116 Cameron Rd
Tauranga 3110
New Zealand

wsp.com/nz

From: s 7(2)(f)(ii)
Sent: Friday, 29 November 2019 7:56 AM

To: s 7(2)(a) ... Privacy
s 7(2)(a) ...

s 7(2)(f)(ii)
s 7(2)(a) ... Privacy

Subject: Mauao Works (programme/progress)

Kia Ora Gents,

Hope everyone is well.

It is great to see that we have commence construction on such an important and cultural sensitive project.

From: s 7(2)(a) ... Privacy
Sent: Wednesday, 18 December 2019 11:03 AM
To: s 7(2)(f)(ii)
Cc: s 7(2)(a) ... Privacy
Subject: Mauao Site Visit 181219

H s 7(2)(f)(ii)

Following my site visit this morning I just have a few observations. I have discussed these with s 7(2)(f)(ii) while on site.

- Anchors below track need to be tightened with a large spanner to align the base plate to the face and ensure it is snug against the face. There appeared to be at least one anchor nut that was loose towards the Matakana side.
- Further to my email regarding the track width, with the fence now installed the narrowest section is 1.7m wide which may be a bit tight for the surf quad bike. At this section the fence is the closest allowable distance to the slip so to widen would require some more cutting into the toe of the bank and relaying Macmat. I would suggest we revisit this in the new year?
- The slot for the subsoil drain that is picked up by the culvert needs to be deepened to ensure the drain coil/metal has enough fall to flow into the culvert inlet.
- The lower anchor nuts have been covered with Macmat so do not require caps.
- Everything else looking pretty tidy.

Please let me know if you have any questions.

Regards,



From: s 7(2)(a) ... Privacy
Sent: Tuesday, 28 January 2020 11:12 AM
To: s 7(2)(f)(ii)
Cc: s 7(2)(a) ... Privacy
Subject: RE: Mauao Monitoring
Attachments: Base Track Test Results

Hi s 7(2)(f)(ii) thanks for the heads up, I saw something on the TCC Facebook page about the works recommencing over the weekend which made me wonder when the start date was so thanks for that.

Regarding the soil nails, I still have not received the formal (typed) test records for the Verification and Proof tests of the soil nails or construction records as below. I requested this from Waiotahi last year but still have not received so I was wondering if you could also follow this up with them. See also email requesting these items on 12/12/19. I have photos of the field sheets but that is about all. I have also sniped out our construction records requirements from the geotechnical specification below.

5 Construction Records

The contractor shall keep construction records for every nail and bored drain constructed. The construction records shall contain the following information as a minimum:

- Nail/drain number, location, and dimensions
- A drilling record showing date and time of drilling, the drilling method, the type of materials encountered and the location at which the materials were encountered, water loss/seepage during drilling, problems during drilling.
- Nominal and actual volumes of grout placed.
- Soil nail test records.

Regarding the maintenance inspection routine I would suggest the following below:

Track inspection requirements

- Inspect all drains, i.e. culverts and bored horizontal drains to ensure they are functioning. Check for signs of blockage or sediment build up especially the existing culvert. Also ensure that the flume (green sock) is firmly attached to the culvert. Regarding the bored drains, similarly check for blockage or sediment build up. If these drains become completely blocked then they may require re-drilling or flushing. In addition the water tables leading to the culverts should be inspected for signs of blockage by detritus or signs of scour.
- The cut bank above the track should be visually inspected for signs of instability or slippage, the large tree should also be inspected for signs of instability and health. I think these inspections will be more critical after heavy rain events and storms but should also be inspected periodically.
- In addition to the above, the condition of the toe should also be inspected. There is a small wave cut bank at the base which is about 0.4m high (see images below where the red crosshair is on the 3D image below). This needs to be inspected for signs of regression and erosion as does the toe of the slope. I think the best way to do this would be to survey 6 monthly or after storms. It could also be done by tape and visual but would not be as good as would be hard to know if you were measuring the same points each time. We can provide this service if you require?
- In addition, the establishment of vegetation on the face should be monitored as this will enhance the erosion protection capability of the erosion mat.



Monitoring frequency

As per our options report we suggested the following frequency for monitoring.

- 0 to 2 months following construction – weekly monitoring suggested.
- 2 to 4 months following construction – fortnightly inspections.
- 4 to 12 months – monthly inspections.
- After a 12 month period consider reducing to ongoing regular inspections every 2 months.
- Inspection required after each major rain or seismic event.

Further to the above I think monitoring in good / fine weather conditions once every 2 months would be sufficient but during winter or wet periods once a month for the first year to establish the performance of the site (particularly erosion of the toe or slippage outside the nailed areas). I also think an inspection should be carried out after each major rain or seismic event. I assume TCC have a maintenance inspection programme for the rest of the track?

Also can you confirm if you would like us to monitor this site post construction or were you thinking this would be managed by TCC?

In relation to your email regarding asset life, for the purpose of the register the durability of the materials/ soil nails have been designed for 50years.

That said the slopes above and below the soil nails are susceptible to erosion slippage and these may impact / reduce the overall design life due to slippage or erosion, this is why the inspections are important as issues are identified in advance and mitigation implemented to preserve the slope.

In addition, the stability of the trees/ slope above the track could affect / damage the track if they failed this is outlined in our design report on sections 6.8 and 6.9.

I hope this answers your questions, please come back to me if you need more detail or further clarification.

Regards



WSP
Gartshore House
Level 3 116 Cameron Rd
Tauranga 3110
New Zealand

<http://www.wsp.com/nz>

-----Original Message-----

From: s 7(2)(f)(ii)

Sent: Tuesday, 28 January 2020 7:36 AM

To: s 7(2)(a) ... Privacy

Cc: s 7(2)(f)(ii)

Subject: RE: Mauao Monitoring

Hi [redacted]

Just a heads up that Waiotahi will be re-establishing onsite today and the drilling will recommence tomorrow.

FYI - Rock Control will no longer be doing the nails, Earth Stability are now the subby.

I will endeavour to duck out to site later today to catchup with the team.

On another note, I have had a lot of interest from the Asset Owner re the inspection routine once we complete the works. Can you please provide more detail re this? What is the inspection/maintenance routine post construction.

Cheers,

-----Original Message-----

From [redacted] s 7(2)(a) ... Privacy

Sent: Thursday, 9 January 2020 12:23 PM

To: [redacted] s 7(2)(f)(ii)

[redacted] s 7(2)(a) ... Privacy

Subject: RE: Mauao Monitoring

Happy new year [redacted] s 7(2)(a) ... hope you had a good break.

I am back on board now. Our staff visited the site several times over the break and all is as expected.

We did note that the flow from a horizontal drain had slowed which is probably due to the dry conditions we have been experiencing.

So nothing to report at this stage. I will try to get out there before the stage 3 works are carried out after Auckland anniversary weekend and provide you with an update.

Feel free to call me if you have any questions.

Regards,

[redacted] s 7(2)(a) ... Privacy

WSP
Gartshore House
Level 3 116 Cameron Rd
Tauranga 3110
New Zealand

<http://www.wsp.com/nz>

-----Original Message-----

From [redacted] s 7(2)(f)(ii)

Sent: Wednesday, 8 January 2020 6:44 PM

To: [redacted] s 7(2)(a) ... Privacy

Subject: Mauao Monitoring

wsp

wsp.com/nz