

# Application for resource consent or fast-track resource consent

(Or Associated Consent Pursuant to the Resource Management Act 1991 (RMA)) (If applying for a Resource Consent pursuant to Section 87AAC or 88 of the RMA, this form can be used to satisfy the requirements of Schedule 4). Prior to, and during, completion of this application form, please refer to Resource Consent Guidance Notes and Schedule of Fees and Charges — both available on the Council's web page.

## 1. Pre-Lodgement Meeting

Have you met with a council Resource Consent representative to discuss this application prior to lodgement? ☐ Yes ☒ No

## 2. Type of Consent being applied for

(more than one circle can be ticked):

- |   |   |
|---|---|
| <input checked="" type="radio"/> Land Use   | <input type="radio"/> Discharge                           |
| <input type="radio"/> Fast Track Land Use*  | <input type="radio"/> Change of Consent Notice (s.221(3)) |
| <input type="radio"/> Subdivision   | <input type="radio"/> Extension of time (s.125)           |
| <input type="radio"/> Consent under National Environmental Standard<br>(e.g. Assessing and Managing Contaminants in Soil) |   |
| <input type="radio"/> Other (please specify) _____  |   |

\* The fast track is for simple land use consents and is restricted to consents with a controlled activity status.

## 3. Would you like to opt out of the Fast Track Process?

☒ Yes ☐ No

## 4. Consultation

Have you consulted with Iwi/Hapū? ☐ Yes ☒ No

If yes, which groups have you consulted with?

Who else have you consulted with?

For any questions or information regarding iwi/hapū consultation, please contact Te Hono at Far North District Council [tehonosupport@fndc.govt.nz](mailto:tehonosupport@fndc.govt.nz)



## 5. Applicant Details

**Name/s:**

Amanda Marsh

**Email:**

**Phone number:**

**Postal address:**

(or alternative method of service under section 352 of the act)

## 6. Address for Correspondence

*Name and address for service and correspondence (if using an Agent write their details here)*

**Name/s:**

Northland Planning & Development 2020 Ltd

**Email:**

**Phone number:**

**Postal address:**

(or alternative method of service under section 352 of the act)

*\* All correspondence will be sent by email in the first instance. Please advise us if you would prefer an alternative means of communication.*

## 7. Details of Property Owner/s and Occupier/s

*Name and Address of the Owner/Occupiers of the land to which this application relates (where there are multiple owners or occupiers please list on a separate sheet if required)*

**Name/s:**

Amanda Jane Marsh

**Property Address/  
Location:**



## 8. Application Site Details

*Location and/or property street address of the proposed activity:*

**Name/s:**

Amanda Marsh

**Site Address/  
Location:**

**Legal Description:**

**Certificate of title:**

Please remember to attach a copy of your Certificate of Title to the application, along with relevant consent notices and/or easements and encumbrances (search copy must be less than 6 months old)

### Site visit requirements:

Is there a locked gate or security system restricting access by Council staff? ☐ Yes ☒ No

Is there a dog on the property? ☐ Yes ☒ No

Please provide details of any other entry restrictions that Council staff should be aware of, e.g. health and safety, caretaker's details. This is important to avoid a wasted trip and having to re-arrange a second visit.

Please contact applicant to arrange site visit.

## 9. Description of the Proposal:

Please enter a brief description of the proposal here. Please refer to Chapter 4 of the District Plan, and Guidance Notes, for further details of information requirements.

Land use resource consent application to replace two existing retaining walls. RW01 results in a breach of the permitted setback and sunlight standards within the Residential Zone, with the affected boundary adjoining the road reserve. RW01 also encroaches into the road reserve, which a License to Occupy has been lodged concurrently with this application.

If this is an application for a Change or Cancellation of Consent Notice conditions (s.221(3)), please quote relevant existing Resource Consents and Consent Notice identifiers and provide details of the change(s), with reasons for requesting them.

## 10. Would you like to request Public Notification?

☐ Yes ☒ No



### 11. Other Consent required/being applied for under different legislation

(more than one circle can be ticked):

☒ Building Consent

☐ Regional Council Consent (ref # if known)

☐ National Environmental Standard consent

☐ Other (please specify)

### 12. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health:

The site and proposal may be subject to the above NES. In order to determine whether regard needs to be had to the NES please answer the following:

Is the piece of land currently being used or has it historically ever been used for an activity or industry on the Hazardous Industries and Activities List (HAIL) ☐ Yes ☒ No ☐ Don't know

Is the proposed activity an activity covered by the NES? Please tick if any of the following apply to your proposal, as the NESCS may apply as a result. ☒ Yes ☐ No ☐ Don't know

☐ Subdividing land

☐ Disturbing, removing or sampling soil

☒ Changing the use of a piece of land

☐ Removing or replacing a fuel storage system

### 13. Assessment of Environmental Effects:

*Every application for resource consent must be accompanied by an Assessment of Environmental Effects (AEE). This is a requirement of Schedule 4 of the Resource Management Act 1991 and an application can be rejected if an adequate AEE is not provided. The information in an AEE must be specified in sufficient detail to satisfy the purpose for which it is required. Your AEE may include additional information such as Written Approvals from adjoining property owners, or affected parties.*

Your AEE is attached to this application ☒ Yes

### 13. Draft Conditions:

Do you wish to see the draft conditions prior to the release of the resource consent decision? ☒ Yes ☐ No

If yes, do you agree to extend the processing timeframe pursuant to Section 37 of the Resource Management Act by 5 working days? ☒ Yes ☐ No



## 14. Billing Details:

This identifies the person or entity that will be responsible for paying any invoices or receiving any refunds associated with processing this resource consent. Please also refer to Council's Fees and Charges Schedule.

**Name/s:** (please write in full)

AMANDA JANE MARSH

**Email:**

**Phone number:**

**Postal address:**

(or alternative method of service under section 352 of the act)

### Fees Information

An instalment fee for processing this application is payable at the time of lodgement and must accompany your application in order for it to be lodged. Please note that if the instalment fee is insufficient to cover the actual and reasonable costs of work undertaken to process the application you will be required to pay any additional costs. Invoiced amounts are payable by the 20th of the month following invoice date. You may also be required to make additional payments if your application requires notification.

### Declaration concerning Payment of Fees

I/we understand that the Council may charge me/us for all costs actually and reasonably incurred in processing this application. Subject to my/our rights under Sections 357B and 358 of the RMA, to object to any costs, I/we undertake to pay all and future processing costs incurred by the Council. Without limiting the Far North District Council's legal rights if any steps (including the use of debt collection agencies) are necessary to recover unpaid processing costs I/we agree to pay all costs of recovering those processing costs. If this application is made on behalf of a trust (private or family), a society (incorporated or unincorporated) or a company in signing this application I/we are binding the trust, society or company to pay all the above costs and guaranteeing to pay all the above costs in my/our personal capacity.

**Name:** (please write in full)

AMANDA JANE MARSH

**Signature:**

(signature of bill payer)

MANDATORY

## 15. Important Information:

### Note to applicant

You must include all information required by this form. The information must be specified in sufficient detail to satisfy the purpose for which it is required.

You may apply for 2 or more resource consents that are needed for the same activity on the same form. You must pay the charge payable to the consent authority for the resource consent application under the Resource Management Act 1991.

### Fast-track application

Under the fast-track resource consent process, notice of the decision must be given within 10 working days after the date the application was first lodged with the authority, unless the applicant opts out of that process at the time of lodgement. A fast-track application may cease to be a fast-track application under section 87AAC(2) of the RMA.

### Privacy Information:

Once this application is lodged with the Council it becomes public information. Please advise Council if there is sensitive information in the proposal. The information you have provided on this form is required so that your application for consent pursuant to the Resource Management Act 1991 can be processed under that Act. The information will be stored on a public register and held by the Far North District Council. The details of your application may also be made available to the public on the Council's website, [www.fndc.govt.nz](http://www.fndc.govt.nz). These details are collected to inform the general public and community groups about all consents which have been issued through the Far North District Council.



### 15. Important information continued...

#### Declaration

The information I have supplied with this application is true and complete to the best of my knowledge.

**Name:** (please write in full)

AMANDA JANE MARSH

**Signature:**

[Redacted Signature]

#### Checklist (please tick if information is provided)

- ☒ Payment (cheques payable to Far North District Council)
- ☒ A current Certificate of Title (Search Copy not more than 6 months old)
- ☐ Details of your consultation with Iwi and hapū
- ☒ Copies of any listed encumbrances, easements and/or consent notices relevant to the application
- ☒ Applicant / Agent / Property Owner / Bill Payer details provided
- ☒ Location of property and description of proposal
- ☒ Assessment of Environmental Effects
- ☐ Written Approvals / correspondence from consulted parties
- ☒ Reports from technical experts (if required)
- ☒ Copies of other relevant consents associated with this application
- ☒ Location and Site plans (land use) AND/OR
- ☐ Location and Scheme Plan (subdivision)
- ☒ Elevations / Floor plans
- ☒ Topographical / contour plans

Please refer to Chapter 4 of the District Plan for details of the information that must be provided with an application. Please also refer to the RC Checklist available on the Council's website. This contains more helpful hints as to what information needs to be shown on plans.



**Land-Use Consent for**  
**Amanda Marsh**  
**51 School Road, Paihia**

8 August 2025

Attention: Liz Searle and Whitney Peat (Resource Consents – Team Leaders), Far North District Council

Please find attached:

- an application form for a Land-use Resource Consent to construct retaining wall structures within the subject site and adjoining road reserve within the ***Residential Zone***; and
- an Assessment of Environmental Effects of the potential and actual effects of the proposal on the environment.

The application has been assessed as a **Restricted Discretionary Activity** under the Far North Operative District Plan and a **Permitted Activity** under the Proposed District Plan.

If you require further information, please do not hesitate to contact our office.

Regards,



Alex Billot

Resource Planner

Reviewed by:



Rochelle Jacobs

Director/Senior Planner

**NORTHLAND PLANNING & DEVELOPMENT 2020 LIMITED**



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### Attachments:

1. FNDC Application Form
2. Record of Title – LINZ
3. Geotechnical Assessment and Retaining Wall Design – Haigh Workman Ltd
4. License to Occupy Application

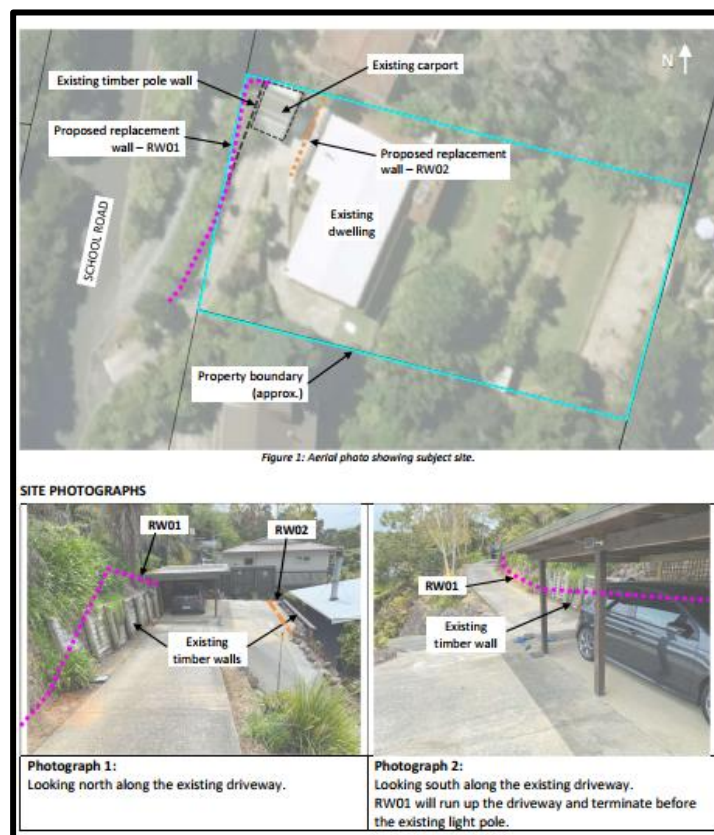




## Assessment of Environment Effects Report

### 1. Description of the Proposed Activity

- 1.1. The Applicant is seeking resource consent to construct two retaining walls at 51 School Road, Paihia. The proposed retaining walls will replace two existing dilapidated retaining walls. RW01 will be located along the western boundary of the site, slightly upslope of the existing timber retaining wall and concrete driveway. This proposed retaining wall will encroach into the road reserve for approximately a 13m length, where it will support an existing unsupported cut bank. A License to Occupy (LTO) Application has been included within **Appendix 4** of this application. It is requested this LTO is processed concurrently with this resource consent application. The Applicant is proposing to widen the concrete driveway and parking/turning area by cutting back the property and supporting the cut with a new timber pole retaining wall. Haigh Workman Ltd (Haigh Workman) have completed a Geotechnical Assessment and Retaining Wall Design Report included within **Appendix 3** which indicates that this retaining wall will support a maximum height of 2.8m.
- 1.2. RW02 will replace the existing timber pole wall supporting the parking/turning area along the western side of the existing dwelling. Based on the Report prepared by Haigh Workman, the proposed retaining wall RW02 will support a maximum height of 2 metres. **Figure 1** below shows the location of the proposed retaining walls.



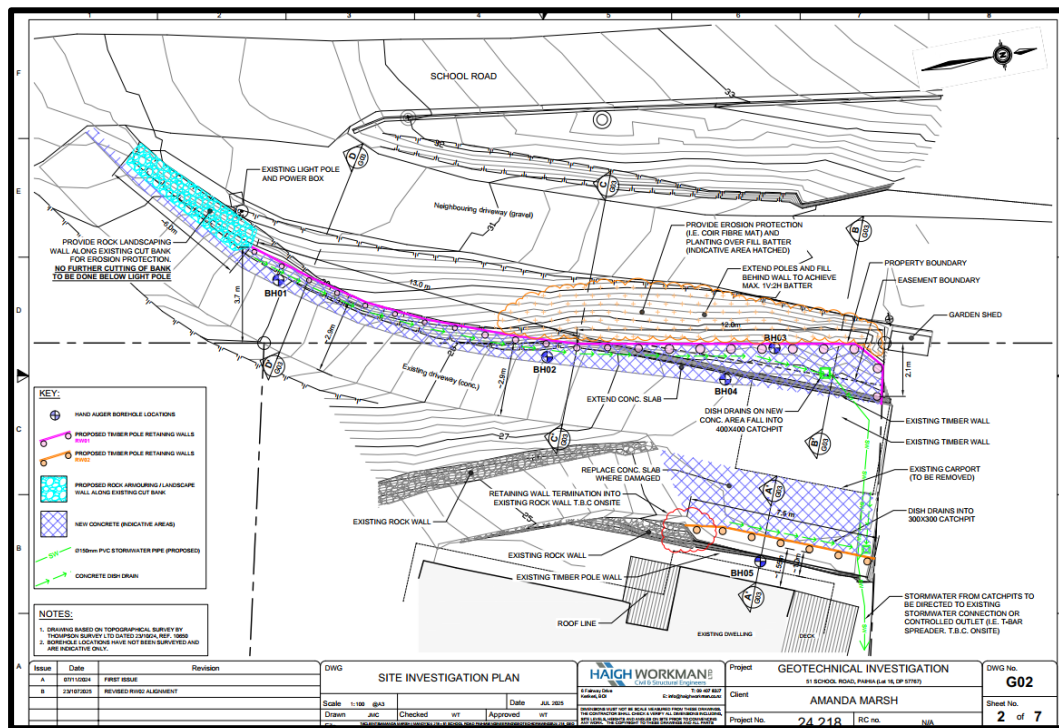
*Figure 1: Site plan and images showing location of existing and proposed retaining walls. Image taken from Haigh Workman Report.*







*Figure 2: Images of the existing retaining wall and proposed location of RW01. Images taken from Haigh Workman Report.*



*Figure 3: Haigh Workman Site Plan showing location of proposed retaining walls RW01 and RW02. Encroachment of RW01 into road reserve detailed.*



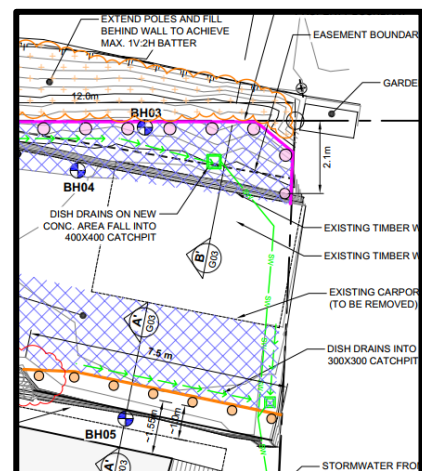




**Figure 4: Image showing location of existing driveway to the site being located within the road reserve, hence the need for the encroachment.**

- 1.3. The proposed retaining wall RW01 results in an infringement of permitted rules 7.6.5.1.5 Sunlight as well as 7.6.5.1.7 Setback from Boundaries, along the boundary which adjoins the road reserve (School Road). A License to Occupy (LTO) has been applied for and is attached within **Appendix 4**. We have been advised by the FNDC Team Leader for Resource Consents, Nick Williamson, that at present, *'Council's roading functions are in the process of being outsourced and it is unclear who holds the relevant delegated authority to issue written approvals on behalf of the Roding Authority. Unfortunately, this means we are currently unable to facilitate the written approval process.'* As such, no written approval has been sought as there is no avenue to seek written approval for an infringement of setback and sunlight to a road boundary.

- 1.4. RW01 returns along the northern boundary of the subject site which adjoins Lot 15 DP57767 for a length of 2.1 metres. Given that this portion of retaining will be less than 10 metres in length and less than 2.7 metres in height, an exemption is applied for this portion of the retaining wall along the boundary of Lot 15 DP57767. RW02 will also encroach into the 1.2 metre setback with Lot 15 DP57767. Given only a portion of the 10 metre exemption was applied for RW01 along this boundary, it is considered that the portion of RW02 which encroaches into the 1.2m setback, can also be provided for as part of the exemption. This will bring the total length of retaining of RW01 and RW02 where an exemption is applied to less than 10 metres in length along this one boundary.



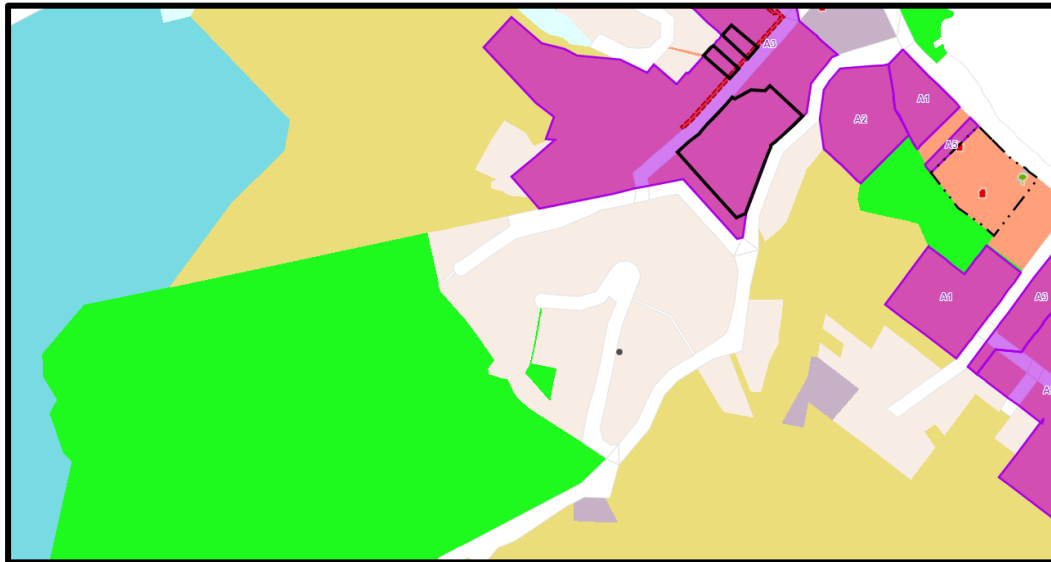
**Figure 5: Enlarged image of site plan showing return of RW01 along boundary of Lot 15 DP57767 and location of RW02 within 1.2m setback of Lot 15 DP57767.**

- 1.5. The proposal has therefore been assessed as a **Restricted Discretionary Activity** under the Operative District Plan (ODP).



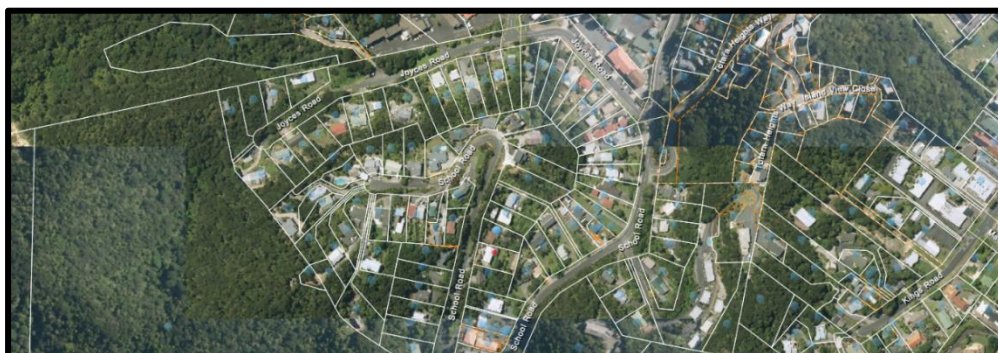
## 2. Site Description

- 2.1. The application site address is 51 School Road, Paihia. The site is zoned Residential under the ODP but is in close proximity to the Paihia central business district to the north, which is zoned as Commercial. The Coastal Living zone borders the Residential zone to the south-east and north-east, with the Conservation zone covering the PNA area to the west/southwest of the site. The site is legally described Lot 16 DP57767. A copy of the record of title is attached at **Appendix 2**.



*Figure 6: FNDC ODP zoning within the immediate area of the site.*

- 2.2. The site currently contains an existing dwelling and carport as per the site plan, which are congregated in the western portion of the site. Access to the site is existing, with an existing concreted driveway leading from the southwestern corner of the site to the northwestern corner, where the existing carport is located. The eastern portion of the site is utilised as open space for the dwelling. The topography of the site is quite steep, which slopes from west to east, hence the need for the proposed retaining wall designs, subject of this application.
- 2.3. The existing built development is connected to existing Council reticulated wastewater, stormwater and water supply services.
- 2.4. The surrounding environment is an established urban residential area. The site is within walking distance of the Paihia town centre, local schools and community facilities.



*Figure 7: Aerial image of the site and surrounding environment.*



### 3. Background

#### Record of Title

- 3.1. The Record of Title is contained within **Appendix 2** of this application. The site is legally described as Lot 2 DP57767, with a land area of 1088m<sup>2</sup>. The site is held within Record of Title NA14C/801 which is dated 23 April 1968. There are no consent notices or easements registered on the title.

#### Site Features

- 3.2. The site is located within the Residential zone under the FNDC ODP and is zoned as General Residential under the Proposed District Plan (PDP).
- 3.3. Under the Regional Policy Statement for Northland (RPSN), the site is shown to be within the Coastal Environment.
- 3.4. The site is not shown to be registered as a HAIL site on the FNDC Maps, nor are there any historical sites registered on the property.
- 3.5. The site is serviced by reticulated wastewater, water and stormwater. Haigh Workman have stated that there are no public pipes shown to be located within the area of the proposed works however there is a water meter at the start of the driveway as well as a light pole. Existing services such as power, chorus and water supply are recommended to be located accurately prior to excavations to ensure no services are disrupted.
- 3.6. Due to the residential nature of the site and surrounding environment, the site is not shown to contain any areas of PNA or reserves, however the site is shown to be within an area where there is kiwi shown to be present.
- 3.7. The site is not shown to be susceptible to natural hazards.
- 3.8. The site is not shown to be within or near a Statutory Acknowledgement Area.



## 4. Weighting of Plans

- 4.1. The site is zoned as General Residential under the Proposed District Plan as well as being within the Coastal Environment Overlay.
- 4.2. The Council notified its' PDP on 27 July 2022. The period for public submissions closed on the 21 October 2022. A summary of submissions was notified on the 4 August 2023. The further submission period closed on the 5 September 2023. It is apparent from the summary of submissions relating to the applicable zone that a large number relate to the application of these provisions. Based on the volume and comprehensive nature of these submissions, the Council has confirmed that no other rules will have legal effect until such time as a decision is made on those provisions.
- 4.3. District Plan hearings on submissions are currently underway and are scheduled to conclude in October 2025. No decision on the PDP has been issued. For this reason, little weight is given to the PDP provisions with the exception of those rules which have immediate legal effect.

## 5. Activity Status of the Proposal

### Operative Far North District Plan (ODP)

- 5.1. The site is zoned urban 'Residential' zone in the ODP. Urban residential activities are enabled in the Residential zone.
- 5.2. An assessment of the relevant District Plan rule standards is set out in Table 1 and Table 2 below:

### Residential Zone Standards

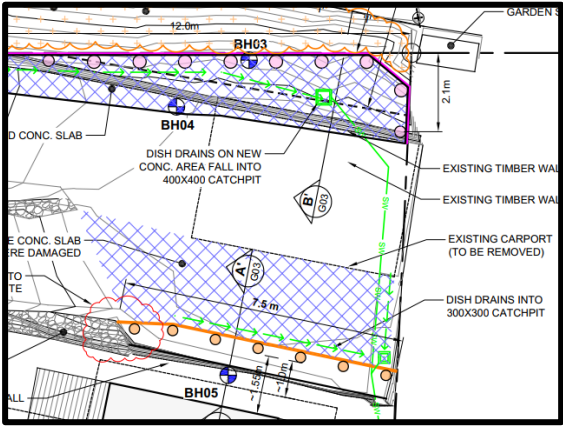
Table 1 - Assessment against the Residential Zone rule standards		
Plan Reference	Rule	Performance of Proposal
7.6.5.1.1	Relocated Buildings	<p>This proposal is for the replacement of two retaining walls. No relocated buildings are proposed.</p> <p><b>Permitted.</b></p>
7.6.5.1.2	Residential Intensity	<p>As above, the proposal is for the replacement of two retaining walls such that the residential intensity for the site will remain unchanged.</p> <p><b>Permitted</b></p>
7.6.5.1.3	Scale of Activities	<p>The proposal does not include any other activities on the site other than for residential purposes.</p>





		<b>Permitted</b>
<b>7.6.5.1.4</b>	<b>Building Height</b>	<p>The maximum height of the retaining walls will be 2.8m which is RW01.</p> <p><b>Permitted</b></p>
<b>7.6.5.1.5</b>	<b>Sunlight</b>	<p>The proposed RW01 will breach the permitted standards for sunlight along the western boundary which adjoins the road reserve. As previously mentioned, there is no avenue at present for obtaining written approval from the roading authority and as such, no written approval has been sought or obtained.</p> <p>The portion of RW01 along the boundary of Lot 15 DP 57767 is expected to be less than 2.7 metres in height and is for a length of 2.1 metres, such that an exemption is applied in this instance. It is not considered that RW02 results in a sunlight infringement.</p> <p>The proposal can comply with the standards for RDA given the maximum height of RW01 is 2.8m and RW02 is 2m.</p> <p><b>Restricted Discretionary Activity</b></p>
<b>7.6.5.1.6</b>	<b>Stormwater Management</b>	<p>The maximum permitted area of impermeable surface on the site is 50% or 544m<sup>2</sup>.</p> <p>The proposal will add an impermeable surface coverage of 21m<sup>2</sup> given the proposed widening of the concrete driveway. The impermeable surface coverage is anticipated to be well within the permitted threshold for the zone.</p> <p><b>Permitted.</b></p>
<b>7.6.5.1.7</b>	<b>Set back from boundaries</b>	<p>The minimum building set back from road boundaries is 3m. The minimum set back from any boundary other than a road boundary is 1.2m, with an exemption applied for a maximum of total length of 10m along any one such boundary, where no setback is required.</p> <p>As shown on Drawing Number G02, RW01 will be located on the western boundary of the site where it adjoins the road reserve for a length of 12 metres, where it then encroaches into the road reserve boundary for a length of 13 metres. As mentioned, written approval is currently unobtainable from the roading authority due to internal factors. The proposal results in a breach of the permitted setback standards along this boundary.</p>



		<p>RW01 is also located on the boundary of the subject site where it adjoins Lot 15 DP 57767 for a length of 2.1 metres. An exemption is applied to this portion of RW01.</p> <p>RW02 also encroaches into the permitted setback distance along the northern boundary where the site adjoins Lot 15 DP 57767. An exemption is applied again, given that the total length where no setback is required will be less than 10m along this one boundary, which includes the 2.1m exemption applied for RW01.</p> <p>The image below shows the 2.1m length of RW01 which will have the exemption applied as well as RW02 (orange retaining wall).</p>  <p><b>Restricted Discretionary Activity</b></p>
7.6.5.1.8	Screening for Neighbours – Non Residential Activities	Not applicable
7.6.5.1.9	Outdoor Activities	Permitted
7.6.5.1.10	Visual Amenity	Not applicable
7.6.5.1.11	Transportation	Refer below
7.6.5.1.12	Site Intensity – Non-Residential Activities	Not applicable
7.6.5.1.13	Hours of operation – Non-residential activities	Not applicable
7.6.5.1.14	Keeping of Animals	Not applicable
7.6.5.1.15	Noise	Able to comply

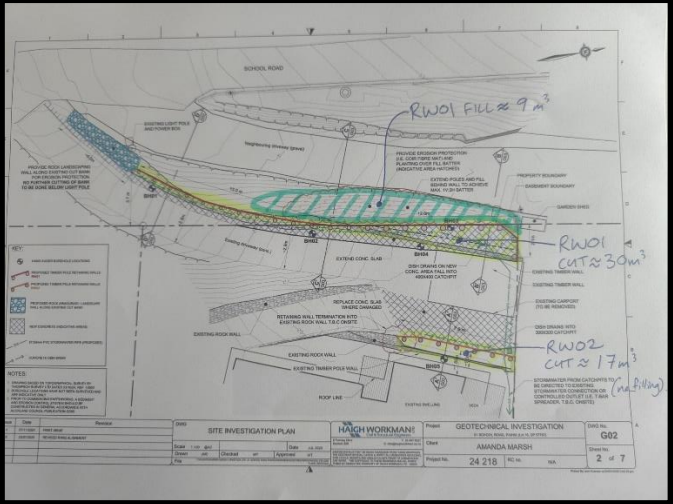




		<b>Permitted</b>
<b>7.6.5.1.16</b>	<b>Helicopter Landing Area</b>	<b>Not applicable</b>
<b>7.6.5.1.17</b>	<b>Building Coverage</b>	<p>The maximum building area permitted on a site is 45% or 489.6m<sup>2</sup>.</p> <p>The proposal will not alter the building coverage for the site.</p> <p><b>Permitted</b></p>

## District Wide Standards

**Table 2 – Assessment against the relevant District Wide rule standards**

Plan Reference	Rule	Performance of Proposal
<b>Chapter 12 – Natural and Physical Resources</b>		
<b>12.1</b>	<b>Landscapes and Natural Features</b>	<b>Not applicable</b>
<b>12.2</b>	<b>Indigenous Flora and Fauna</b>	<b>Not applicable</b>
<b>12.3</b> <b>12.3.6.1.2 (P)</b>	<b>Excavation and/or filling</b>	<p>Excavations will be required as part of this proposal. The excavations associated with RW01 are anticipated to be approximately 9m<sup>3</sup> of fill and 30m<sup>3</sup> of cut with the excavations associated with RW02 anticipated to be approximately 17m<sup>3</sup> of cut with no fill anticipated. This brings the total cut/fill volume to 56m<sup>3</sup> which is well within the permitted threshold for the zone. An image stipulating these volumes is shown below.</p> 



		<p>It is noted that while RW01 will retain a maximum height of 2.8m and RW02 will retain a maximum height of 2m, which exceed the permitted standard of 1.5m. These cut/fill faces will be behind a properly designed and engineered retaining walls for which building consent will be obtained. As such the works do not meet the definition of a cut face and therefore is exempt from this standard.</p> <p><b>Permitted.</b></p>
<b>Sections 12.4 – 12.9 are not applicable to this proposal.</b>		
<b>Chapter 15 - Transportation</b>		
<b>15.1.6A</b>	<b>Traffic Intensity</b>	<p>Single dwelling is exempt. The proposal will not alter the number of dwellings or traffic intensity for the site.</p> <p><b>Permitted</b></p>
<b>15.1.6B</b>	<b>Parking</b>	<p>The proposal will not alter the number of carparking spaces on the site. The proposal will in fact improve access, parking and manoeuvring within the site.</p> <p><b>Permitted</b></p>
<b>15.1.6C</b>	<b>Access</b>	<p>The site is accessed directly from School Road which will remain unchanged as part of this proposal. Access will be improved, with the existing concrete driveway being widened by 500mm.</p> <p><b>Permitted</b></p>

### ODP Activity Status

- 5.3. The proposal results in a breach of the Permitted standards for 7.6.5.1.5 Sunlight and 7.6.5.1.7 Setback from Boundaries, within the Residential Zone along the western boundary of the site which adjoins the road reserve. As mentioned, written approval from the Roading Authority is unable to be applied for and as such cannot be obtained given internal factors within FNDC. An exemption has been applied along the boundary with Lot 15 DP 57767 such that no effects are considered on this allotment. An LTO has been applied for the encroachment of RW01 into the road reserve.
- 5.4. The proposal has been assessed as a **Restricted Discretionary Activity** in accordance with Section 7.6.5.3 of the ODP. An assessment of the relevant sections within Section 7.6.5.3 will be undertaken as part of this application.





## Proposed District Plan (PDP)

- 5.5. The proposal is also subject to the Proposed District Plan process. The proposed site zone is **General Residential** as well as being subject to the Coastal Environment overlay.
- 5.6. An assessment of the proposed activities against the PDP rules that have immediate legal effect, is set out in **Table 3** below:

Table 3 – Assessment against the PDP rule standards that have immediate legal effect		
Chapter	Rule Reference	Compliance of Proposal
<b>Hazardous Substances</b>	<p>The following rules have immediate legal effect:</p> <p>Rule HS-R2 has immediate legal effect but only for a new significant hazardous facility located within a scheduled site and area of significance to Māori, significant natural area or a scheduled heritage resource</p> <p>Rules HS-R5, HS-R6, HS-R9</p>	<p><b>Not applicable.</b></p> <p>The site does not contain any hazardous substances nor are any proposed.</p>
<b>Heritage Area Overlays</b>	<p>All rules have immediate legal effect (HA-R1 to HA-R14)</p> <p>All standards have immediate legal effect (HA-S1 to HA-S3)</p>	<p><b>Not applicable.</b></p> <p>The site is not located within a Heritage Area Overlay.</p>
<b>Historic Heritage</b>	<p>All rules have immediate legal effect (HH-R1 to HH-R10).</p> <p>Schedule 2 has immediate legal effect.</p>	<p><b>Not applicable.</b></p> <p>The site does not contain any areas of Historic Heritage.</p>
<b>Notable Trees</b>	<p>All rules have immediate legal effect (NT-R1 to NT-R9)</p> <p>All standards have legal effect (NT-S1 to NT-S2)</p> <p>Schedule 1 has immediate legal effect</p>	<p><b>Not applicable.</b></p> <p>The site does not contain any notable trees.</p>
<b>Sites and Areas of Significance to Maori</b>	<p>All rules have immediate legal effect (SASM-R1 to SASM-R7)</p> <p>Schedule 3 has immediate legal effect</p>	<p><b>Not applicable.</b></p> <p>The site does not contain any sites or areas of significance to Māori.</p>
<b>Ecosystems and Indigenous Biodiversity</b>	<p>All rules have immediate legal effect (IB-R1 to IB-R5)</p>	<p><b>Not applicable.</b></p> <p>The site does not contain any known ecosystems or indigenous biodiversity to which these rules would apply.</p>
<b>Subdivision</b>	<p>The following rules have immediate legal effect:</p> <p>SUB-R6, SUB-R13, SUB-R14, SUB-R15, SUB-R17</p>	<p><b>Not applicable.</b></p> <p>The proposal is not for subdivision.</p>



<b>Activities on the Surface of Water</b>	All rules have immediate legal effect (ASW-R1 to ASW-R4)	<b>Not applicable.</b>  The proposal does not involve activities on the surface of water.
<b>Earthworks</b>	The following rules have immediate legal effect: EW-R12, EW-R13  The following standards have immediate legal effect: EW-S3, EW-S5	<b>Permitted.</b> All earthworks in all zones are subject to Accidental Discovery Protocol standards EW-S3 and the GD-005 sediment control standards EW-S5.
<b>Signs</b>	The following rules have immediate legal effect: SIGN-R9, SIGN-R10  All standards have immediate legal effect but only for signs on or attached to a scheduled heritage resource or heritage area	<b>Not applicable.</b>
<b>Orongo Bay Zone</b>	Rule OBZ-R14 has partial immediate legal effect because RD-1(5) relates to water	<b>Not applicable.</b>

### PDP Activity Status

5.7. The proposed activities are **Permitted** under the PDP.

### National Environmental Standards

#### National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health 2011

5.8. The site is not identified as a HAIL site on the Council database of HAIL sites. The site has no known history of horticulture or agriculture activities.

#### National Environment Standard for Freshwater Regulations 2020 (NES-F)

5.9. The site does not contain any wetland and would not affect any wetland that is protected by the NES-F.

### Control of Earthworks Bylaw

5.10. As per the assessment above, no District or Regional consents are required for earthworks, and as such an assessment under the control of earthworks bylaw is considered necessary.

5.11. The earthworks required for this application generally meet the exemptions under the definition of excavation being (i) cuts behind retaining walls and definition of fill or filling being (f) filling of building foundation with granular fill under concrete slab foundation or filling with





drainage metal behind retaining wall and (i) fill material behind retaining wall. For completeness the earthworks triggers have been assessed below.

<b>ASSESSMENT OF THE APPLICABLE CONTROL OF EARTHWORKS RULES:</b>		
<b><u>PERFORMANCE STANDARDS</u></b>		
<b>Bylaw Reference</b>	<b>Rule</b>	<b>Performance of Proposal</b>
<b>7.1</b>	<b>(a)</b>	<b>Complies</b>  While some works will be undertaken within 3m of the western and northern site boundaries these works meet the exemptions within the definition of excavation in the bylaw.
	<b>(b)</b>	<b>Complies</b>  Part of RW02 will be located beyond 3 metres from the northern boundary and as such, this clause applies. However, as the works are exempt under, it is considered not applicable.
	<b>(c)</b>	<b>Complies</b>  The site is not located within the Rural Production Zone.
	<b>(d)</b>	<b>Complies</b>  The earthworks area is outside of any resource features.
	<b>(e)</b>	<b>Complies</b>  Stormwater runoff will not adversely impact upon any adjoining properties as per the design from Haigh Workman.

5.12. As per the assessment above, no earthworks permit is required.



## 6. Statutory Assessment under the Resource Management Act (RMA)

### Section 104C of the RMA

- 6.1. Section 104C governs the determination of applications for Restricted Discretionary Activities. When considering an application for resource consent, a consent authority must consider only those matters over which a discretion is restricted in national environmental standards or other regulations, or it has restricted the exercise of its discretion in its plan or proposed plan. The consent authority can grant or refuse the application. If the application is granted, the consent authority may impose conditions under Section 108 only for those matters listed above.

### Section 104(1) of the RMA

- 6.2. The relevant parts of Section 104(1) of the RMA state that when considering an application for resource consent –

*“the consent authority must, subject to Part 2, and section 77M have regard to –*

*(a) any actual and potential effects on the environment of allowing the activity; and*

*(ab) any measure proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment that will or may result from allowing the activity; and*

*(b) any relevant provisions of –*

*i. a national environmental standard:*

*ii. other regulations:*

*iii. a national policy statement:*

*iv. a New Zealand Coastal Policy Statement:*

*v. a regional policy statement or proposed regional policy statement:*

*vi. a plan or proposed plan; and*

*(c) any other matter the consent authority considers relevant and reasonably necessary to determine the application.”*

- 6.3. Actual and potential effects arising from the development as described in 104(1)(a) can be both positive and adverse (as described in Section 3 of the Act). Positive effects arising from this development is the accessibility to the site will be safer than what is currently in existence as well as ensuring that access will remain usable during any weather events, given that the proposed retaining will adequately retain the cut banks alongside the driveway. The proposal will ensure safe and effective access to the site. Adverse effects relate to setback and sunlight infringements on the road reserve given the location of the proposed retaining structure RW01.
- 6.4. Section 104(1)(ab) requires that the consent authority consider ‘any measure proposed or agreed to by the applicant for the purposes of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity’. The proposal is not of a scale or nature that would require specific





offsetting or environmental compensation measures to ensure positive effects on the environment. Potential adverse effects on the environment would be no more than minor given the nature of the consent.

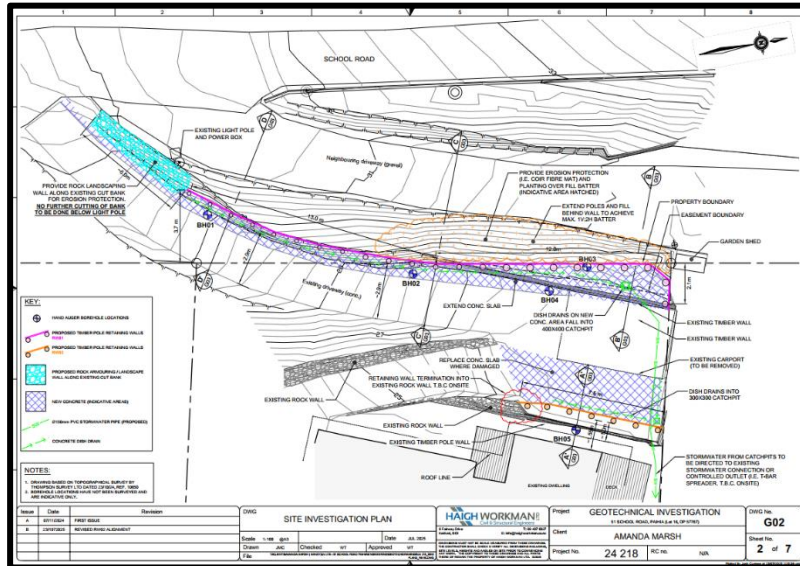
- 6.5. Section 104(1)(b) requires that the consent authority consider the relevant provisions of national environmental standards, regulations, national policy statements, regional policy statements or plans, including proposed plans. There are no national standards, regulations or national policy statements that are directly relevant to the proposed activities and / or that are not adequately managed within the framework hierarchy of the District Plan. An assessment of the relevant statutory documents is provided below.
- 6.6. Section 104(1)(c) states that consideration must be given to 'any other matters that the consent authority considers relevant and reasonable, necessary to determine the application.' There are no other matters relevant to this application.
- 6.7. In accordance with Section 104(6), adequate information is provided to determine this application.

## 7. Section 104(1)(a) - Assessment of Effects on the Environment

- 7.1. The proposal is to be assessed as a Restricted Discretionary Activity under District Plan Rule 7.6.5.3. The Council may approve or refuse an application for a restricted discretionary activity, and it may impose conditions on any consent. In assessing an application for a restricted discretionary activity, the Council will restrict the exercise of its discretion to the specific matters listed for each rule below, or where there is no rule, to the specific matters listed below under the appropriate heading.
- 7.2. Having reviewed the relevant plan provisions and taking into account the matters to be addressed by an assessment of environmental effects as outlined in Clause 7 of Schedule 4 of the Act, the following environmental effects are identified as being relevant to this application. These include matters relating to the construction of the proposed retaining walls, in particular the effects of the sunlight and setback breach given the location of the retaining wall RW01 along the property boundary and encroaching into the road reserve, that require a Restricted Discretionary Activity resource consent. Potential adverse effects arising from other built development activities are within the permitted thresholds of the ODP.
- 7.3. Due to the existing retaining walls being dilapidated, the Applicant is proposing to replace these, to ensure access to the site is not impeded and safeguard access to the site. To support this application, Haigh Workman have completed a Geotechnical Assessment and Retaining Wall Design for the proposal, which has provided recommendations to ensure the retaining walls are properly designed to accommodate for the specific situation. This report is attached within **Appendix 3** of this application. Due to the existing location of the concrete driveway as well as



the cut banks, RW01 is proposed to be located along the western boundary of the site and encroach into the road reserve for approximately 13 metres. Given the location of RW01 and the height, this results in setback and sunlight infringement of the permitted standard for the zone along the site boundary which adjoins the road reserve. Exemptions have been applied for setback and sunlight infringements along the boundary of Lot 15 DP 57767, such that no adverse effects are anticipated on this allotment and therefore it will not be a consideration of this assessment.



*Figure 8: Haigh Workman site plan showing location of proposed retaining structures in relation to site boundaries.*

- 7.4. The topography of the area of works is steep, where the site slopes downhill from the road reserve, to the east. This has resulted in RW01 supporting a height of 2.8 metres and RW02 supporting a height of 2 metres. These cut faces will be retained by properly engineered retaining walls, which building consent will be sought.



*Figure 9: Image of neighbouring driveway, looking down towards the subject site. RW01 will be located within grassed slope.*



*Figure 10: Image showing location of existing and proposed retaining walls.*





- 7.5. An LTO is sought as part of this application process for the encroachment of the proposed retaining wall within the road reserve. The LTO Application which has been lodged concurrently with this resource consent application is attached within **Appendix 4** of this application.
- 7.6. The ODP sets out assessment criteria to be considered when determining an application for Restricted Discretionary Activity for Sunlight and Setback, which are held within Section 7.6.5.3 of the ODP. These are discussed as follows.

#### 7.6.5.3.4 Sunlight

- 7.7. As mentioned above, the proposal creates a sunlight infringement along the boundary of the road reserve for RW01. Given the height of RW01 where it makes a return along the boundary of Lot 15 DP57767, is anticipated to be less than 2 metres (as per Drawing No G07 of Haigh Workman's Plan Set), no sunlight infringement is anticipated albeit an exemption can be applied for this portion if required given the length of the return along the boundary with Lot 15 DP57767 will be 2.1m and a height of less than 2.7m. As such, the only sunlight infringement applicable to this application occurs along the site boundary with the road reserve.
- 7.8. Given the maximum height of RW01 is 2.8m, the proposal is considered to be able to comply with the RDA provisions set out under Rule 7.6.5.3.4.
- 7.9. An assessment of Section 7.6.5.3.4 of the ODP has been undertaken below:

*In assessing an application under this provision the Council will restrict the exercise of its discretion to:*

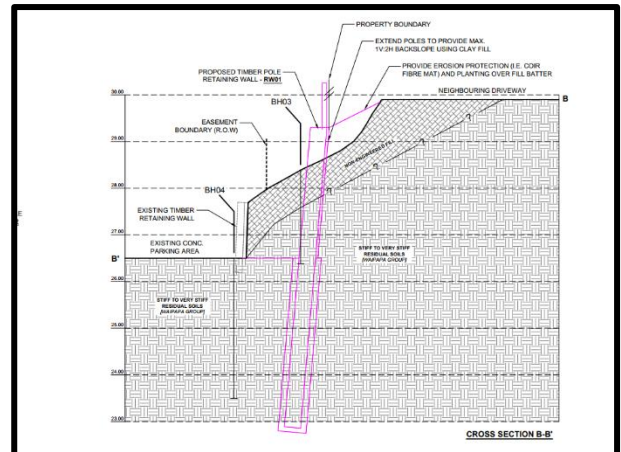
- (a) the extent to which adjacent properties will be adversely affected in terms of visual domination, overshadowing, loss of privacy and loss of access to sunlight and daylight;*
- (b) the location and proximity of adjacent residential units, and the outdoor space used by those units;*
- (c) the ability to mitigate any adverse effects of loss of sunlight.*

- 7.9.1. The subject site is located downslope of the road reserve, as indicated in Figure 11 below. In terms of visual domination, overshadowing, loss of privacy and loss of access to sunlight and daylight, none of these effects are anticipated given the use of this portion of the road reserve and the fact that the retaining wall will be retaining an area of cut bank. As indicated in Figure 11 below, the retaining wall will be located at a lower elevation than the neighbouring driveway which is located within the road reserve. As such no adverse effects are anticipated in terms of (a).

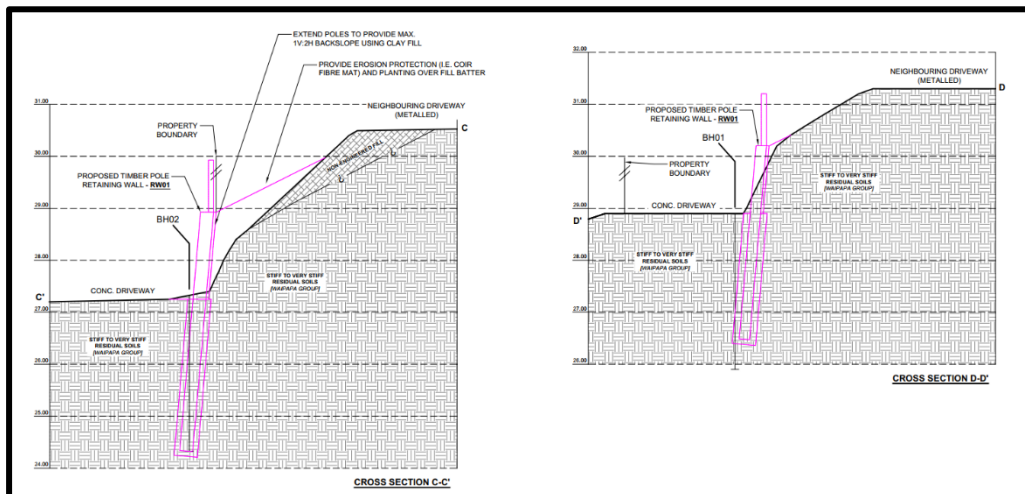




**Figure 11: Image showing location of neighbouring driveway with subject site being located downslope of this. Proposed RW01 will be located within grassed area shown.**



**Figure 12: Cross section B-B from Haigh Workman report showing height of proposed retaining structure and neighbouring drive.**



**Figure 13: Cross section C-C (left) and D-D (right) showing height of retaining structure along this portion and neighbouring drive. Taken from Haigh Workman Report.**

- 7.9.2. The subject portion of retaining wall will does not result in infringement of sunlight to any allotments containing a residential unit or associated outdoor space. The infringement occurs along the boundary with the road reserve such that (b) is not considered applicable to this application.
- 7.9.3. The proposed retaining structure is not considered to result in adverse effects from loss of sunlight given that the retaining structure will be located downslope of the existing road formation and will be installed primarily to support the existing bank to ensure safe and adequate access to the subject site.
- 7.9.4. Overall, it is considered that the proposed retaining structures do not result in any adverse effects in terms of sunlight. The retaining structures are considered necessary to ensure safe access to the site as well as safe use of the existing road corridor, as the retaining structure



will assist in erosion of the cut bank. Given the slope of the bank as well as the existing driveway location, the proposed design is considered necessary to ensure all requirements are met to enable a retaining structure that is fit for purpose.

#### 7.6.5.3.7 Setback from Boundaries

7.10. As mentioned, the setback breach occurs along the western boundary, where the site adjoins the road reserve, as the retaining structure RW01, will be located along this boundary as well as encroach into the road reserve for a length of approximately 13 metres. Where RW01 makes a return along the northern boundary with Lot 15 DP 57767, an exemption has been applied as the length of this portion of retaining will be less than 10m long (2.1m in length). Where RW02 encroaches into the 1.2metre setback with Lot 15 DP 57767, the exemption is also applied as the total length of all structures where an exemption is applied along this boundary will be less than 10m, such that it is considered that the proposal complies with the exemption requirements. As such, only effects on the adjoining road reserve will be considered as part of this application.

7.11. An assessment of Section 7.6.5.3.7 has been undertaken below.

*(a) the extent to which the proposal is in keeping with the existing character and form of the street or road, in particular with the external scale, proportions and buildings on the site and on adjacent sites;*

*(b) the extent to which the building(s) intrudes into the street scene or reduces outlook and privacy of adjacent properties;*

*(c) the extent to which the buildings restrict visibility for vehicle manoeuvring;*

*(d) the ability to mitigate any adverse effects on the surrounding environment, for example by way of street planting;*

*(e) for Lot 1 DP 28017, Lot 1 DP 46656, Lot 1 DP 404507, and Lot 1 DP 181291, Lot 2 DP 103531, Lot 1 DP 103531, Lot 2 DP 58333 and Pt Lot 1 DP 58333 (and any sites created as a result of a subdivision of these lots) and sites having frontage with Kerikeri Road between its intersection with SH10 and Cannon Drive:*

*(i) the scale of the buildings;*

*(ii) the extent of setback from Kerikeri Road and Cobham Road;*

*(iii) the visual appearance of the site from the Kerikeri Road and Cobham Road frontage;*

*(iv) the extent to which the building(s) are in harmony with landscape plantings and shelter belts;*

*(f) the extent to which the buildings and their use will impact on the public use and enjoyment of adjoining esplanade reserves and strips and adjacent coastal marine areas.*

7.11.1. In terms of (a) The proposed retaining structure is considered consistent with the existing character and form of the road, given the topography of this area and the fact that





allotments east of this portion of School Road are located downslope of the road reserve. The proposed retaining structure is considered consistent with the surrounding environment, and the proposed design is necessary given the external factors which determine the required height.

- 7.11.2. As mentioned, the retaining structure is not considered to intrude into the street scene or reduce outlook or privacy of adjacent properties. The proposal is for a retaining structure, not a dwelling and effects are considered to be less than minor. Therefore, the proposal is not considered to create adverse effects in terms of (b).



*Figure 14: Image showing location of School Road, neighbouring driveway and the subject portion of proposed retaining wall which will be located within the road reserve.*

- 7.11.3. The proposed retaining structure will enhance vehicle manoeuvring and visibility as it will enable the existing driveway to be widened whilst providing a safer approach than what is currently in existence.
- 7.11.4. In terms of (d), the proposal is not considered to create adverse effects. The proposal is for a retaining structure which will be located along the western boundary of the site as well as encroach into the road reserve. The location and design of the retaining structure is necessary given the location of the existing driveway and the slope of this portion of the site and the road reserve. No additional mitigation measures such as planting are considered necessary and may undermine the integrity of the retaining structure.
- 7.11.5. (e) and (f) are not considered applicable to this proposal.
- 7.11.6. The proposed retaining structure is located as such given the external factors which have determined the required location for the retaining structure. No adverse effects are anticipated given the retaining structure has been properly designed by a qualified person. An LTO has been sought for the encroachment of the retaining structure into the road reserve.

## **8. Section 104(1)(b) – Relevant provisions of any statutory planning document**

8.1. In accordance with Section 104(1)(b) of the Act, the following documents are relevant to this application.

### **National Environmental Standards (Section 104(1)(b)(i) & 2**

8.2. There are no National Environmental Standards that are relevant to the consideration of the proposed activity.

### **National Policy Statements (section 104(1)(b)(iii))**

8.3. There are currently 8 National Policy Statements in place. These are as follows:

- National Policy Statement on Urban Development
- National Policy Statement for Freshwater Management
- National Policy Statement for Renewable Electricity Generation
- National Policy Statement on Electricity Transmission
- New Zealand Coastal Policy Statement
- National Policy Standard for Highly Productive Land.
- National Policy Statement for Indigenous Biodiversity
- National Policy Statement for Greenhouse Gas Emissions from Industrial Process Heat.

8.4. The site is located within the Coastal Environment under the RPSN and therefore the NZCPS is considered applicable to this proposal. No other NPS are considered applicable.

### **New Zealand Coastal Policy Statement (NZCPS)**

8.5. The New Zealand Coastal Policy Statement 2010 is considered to be relevant to the application as the application site is located within the coastal environment under the NRC Regional Policy Statement.

8.6. The subject site is not known to contain any areas of outstanding landscape or features. It is considered the proposal will not adversely affect the natural aspects within the coastal environment nor will the proposal create any adverse effects on the natural character and amenity values within the area.

#### Objectives

8.7. The proposal is considered to achieve the objectives of the NZCPS as the proposal does not adversely impact on the integrity, form, functioning or resilience of the coastal environment. The proposal is not considered to affect the natural landscapes and character of the coastal environment. The application is not known to create any cultural issues as the proposal will result replacement of existing retaining structures which are required to ensure safe access to the site. The subject site is not known to contain any archaeological sites. The proposal is considered to result in positive economic effects by providing employment through the construction process, while creating less than minor effects on the residential/coastal character of the locality.



### Policies

- 8.8. The proposal is also considered to achieve the policies of the NZCPS. The character of the existing built environment will be maintained as the site and surrounding environment is residential in nature, meaning that the area is intensively developed. The natural character of the surrounding environment is considered to remain unaffected due to the nature of the proposal.
- 8.9. Overall, the proposed activity is considered to be consistent with the objectives and policies of the NZCPS as the proposal is in keeping with the existing development in the surrounding area.

### **Regional Policy Statement for Northland 2016 and Regional Plan for Northland (February 2024)**

- 8.10. The Regional Policy Statement for Northland (RPS) and the Regional Plan for Northland are the governing regional statutory documents for Northland that includes the application site. The small-scale nature of the proposed land use activity is such that it can be adequately assessed under the provisions of the ODP provisions. The nature and volume of the proposal that would be generated by the proposed activity is not of a regional scale that would be captured by regional rules.
- 8.11. It is considered the proposal would not be contrary to any Regional Policy Statement objective or policy and would not be subject to any Regional Plan rule.

### **Far North Operative District Plan 2009**

- 8.12. The relevant objectives and policies of the Plan are those related to the Urban Environment, and its' Residential Zone. As assessed above, it is considered that the proposed activity that infringes the permitted standards would generate no more than minor adverse effects on the receiving environment, including the adjacent sites. The proposal would be consistent with the character of the surrounding area. The proposal would not be contrary to the objectives and policies of the ODP, as commented on in the paragraphs below.

### **Urban Environment – Objectives**

*7.3.1 To ensure that urban activities do not cause adverse environmental effects on the natural and physical resources of the District.*

*7.3.2 To enable the continuing use of buildings and infrastructure in urban areas, particularly where these are under-utilised.*

*7.3.3 To avoid, remedy or mitigate the adverse effects of activities on the amenity values of existing urban environments.*

*7.3.4 To enable urban activities to establish in areas where their potential effects will not adversely affect the character and amenity of those areas.*





*7.3.5 To achieve the development of community services as an integral and complementary component of urban development.*

*7.3.6 To ensure that sufficient water storage is available to meet the needs of the community all year round.*

- 8.13. As detailed within this assessment and supporting documents, the proposal is not considered to create any adverse effects on the environment. The proposal will replace existing retaining structures which are required for safe access to the site. The proposal will result in continued use of buildings within the site as access will not be compromised. Amenity values will be maintained. The proposal will not undermine the character and amenity of the area. The proposal does not involve community services. Water supply to the site will remain unchanged.

### **Urban Environment – Policies**

*7.4.1 That amenity values of existing and newly developed areas be maintained or enhanced.*

*7.4.2 That the permissible level of effects created or received in residential areas reflects those appropriate for residential activities.*

*7.4.3 That adverse effects on publicly-provided facilities and services be avoided or remedied by new development, through the provision of additional services.*

*7.4.4 That stormwater systems for urban development be designed to minimise adverse effects on the environment.*

*7.4.5 That new urban development avoid:*

*(a) adversely affecting the natural character of the coastal environment, lakes, rivers, wetlands or their margins;*

*(b) adversely affecting areas of significant indigenous vegetation or significant habitats of indigenous fauna;*

*(c) adversely affecting outstanding natural features, landscapes and heritage resources;*

*(d) adversely affecting the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga;*

*(e) areas where natural hazards could adversely affect the physical resources of urban development or pose risk to people's health and safety;*

*(f) areas containing finite resources which can reasonably be expected to be valuable for future generations, where urban development would adversely affect their availability;*

*(g) adversely affecting the safety and efficiency of the roading network;*

*(h) the loss or permanent removal of highly productive and versatile soils from primary production due to subdivision and development for urban purposes.*

*7.4.6 That the natural and historic heritage of urban settlements in the District be protected (refer to Chapter 12).*



*7.4.7 That urban areas with distinctive characteristics be managed to maintain and enhance the level of amenity derived from those characteristics.*

*7.4.8 That infrastructure for urban areas be designed and operated in a way which:*

*(a) avoids remedies or mitigates adverse effects on the environment;*

*(b) provides adequately for the reasonably foreseeable needs of future generations;  
and*

*(c) safeguards the life-supporting capacity of air, water, soil and ecosystems.*

*7.4.9 That the need for community services in urban areas is recognised and provided for.*

- 8.14. Amenity values are considered to be maintained and enhanced as the proposal will result in replacement of retaining structures necessary to access the site. The proposal is not considered to create any adverse effects. Stormwater design has been incorporated into the design of the retaining walls. The proposal is not considered to fall under new urban development given the proposal is to replace existing retaining structures. The site is not located within a heritage area. Amenity will be maintained. The proposal does not require additional infrastructure. No community services are proposed.

### **Residential Zone - Objectives**

*7.6.3.1 To achieve the development of new residential areas at similar densities to those prevailing at present.*

*7.6.3.2 To enable development of a wide range of activities within residential areas where the effects are compatible with the effects of residential activity.*

*7.6.3.3 To protect the special amenity values of residential sites on the urban fringe, specifically Lot 1 DP 28017, Lot 1 DP 46656, Lot 1 DP 404507, Lot 1 DP 181291, Lot 2 DP 103531, Lot 1 DP 103531, Lot 2 DP 58333, Pt Lot 1 DP 58333 (and any sites created as a result of a subdivision of these lots), and those having frontage to Kerikeri Road between its intersection with SH10 and Cannon Drive.*

- 8.15. The proposed activity will not change the density of the site.
- 8.16. Resource consent is required for the infringement of setback and sunlight of a retaining structure on the road reserve which is necessary to enable safe access to the site. Due to the existing development and topography of the site, these departures have occurred although the proposal has been determined to be compatible with the effects of residential activity.
- 8.17. The site does not contain any significant indigenous vegetation or habitats of indigenous fauna. The site is not within any outstanding landscapes nor does it contain any outstanding natural features. The proposal would not adversely affect water quality in the area or soil conservation.



## Residential Zone - Policies

*7.6.4.1 That the Residential Zone be applied to those parts of the District that are currently predominantly residential in form and character.*

*7.6.4.2 That the Residential Zone be applied to areas which are currently residential but where there is scope for new residential development.*

*7.6.4.3 That the Residential Zone be applied to areas where expansion would be sustainable in terms of its effects on the environment.*

*7.6.4.4 That the Residential Zone provide for a range of housing types and forms of accommodation.*

*7.6.4.5 That non-residential activities only be allowed to establish within residential areas where they will not detract from the existing residential environment.*

*7.6.4.6 That activities with net effects that exceed those of a typical single residential unit, be required to avoid, remedy or mitigate those effects with respect to the ecological and amenity values and general peaceful enjoyment of adjacent residential activities.*

*7.6.4.7 That residential activities have sufficient land associated with each household unit to provide for outdoor space, planting, parking and manoeuvring.*

*7.6.4.8 That the portion of a site or of a development that is covered in buildings and other impermeable surfaces be limited so as to provide open space around buildings to enable planting, and to reduce adverse hydrological, ecological and amenity effects.*

*7.6.4.9 That sites have adequate access to sunlight and daylight.*

*7.6.4.10 That provision be made to ensure a reasonable level of privacy for inhabitants of buildings on a site.*

*7.6.4.11 That the built form of development allowed on residential sites on the urban fringe, specifically Lot 1 DP 28017, Lot 1 DP 46656, Lot 1 DP 404507, Lot 1 DP 181291, Lot 2 DP 103531, Lot 1 DP 103531, Lot 2 DP 58333, Pt Lot 1 DP 58333 (and any sites created as a result of a subdivision of these lots), and those with frontage to Kerikeri Road between its intersection with SH10 and Cannon Drive remains small in scale, set back from the road, relatively inconspicuous and in harmony with landscape plantings and shelter belts.*

- 8.18. As stated above, the proposed activity consists of replacement of retaining structures necessary to access the site. The proposal will not increase the number of residential dwellings on the site. No non-residential activities are proposed. Effects have been mitigated to a less than minor degree such that amenity values and general peaceful enjoyment of adjacent residential activities will remain unaffected. Outdoor space, planting, parking and manoeuvring will remain unchanged or be improved as a result of the proposal. Access to sunlight and daylight are considered adequate for the site. The proposal does create a sunlight infringement along the road reserve boundary, however effects are considered to be less than minor as discussed earlier in this report. Privacy will be adequately provided for.





## Proposed Far North District Plan 2022

8.19. The application site is proposed to be zoned 'General Residential' and is within the Coastal Environment overlay. Based on the proposed rules that have current legal effect, the proposed residential activity is a permitted activity. For completeness, a brief assessment of the area-specific zone objectives and policies is provided below.

### **General Residential Zone - objectives**

GRZ-01	<p><i>GRZ-01 The General Residential zone provides a variety of densities, housing types and lot sizes that respond to:</i></p> <ul style="list-style-type: none"> <li><i>a. housing needs and demand;</i></li> <li><i>b. the adequacy and capacity of available or programmed <u>development infrastructure</u>;</i></li> <li><i>c. the amenity and character of the receiving residential <u>environment</u>; and</i></li> <li><i>d. <u>historic heritage</u>.</i></li> </ul>
GRZ-02	<i>The General Residential zone consolidates urban residential development around available or programmed development infrastructure to improve the function and resilience of the receiving residential environment while reducing urban sprawl.</i>
GRZ-03	<i>Non-residential activities contribute to the well-being of the community while complementing the scale, character and amenity of the General Residential zone.</i>
GRZ-04	<i>Land use and subdivision in the General Residential zone is supported where there is adequacy and capacity of available or programmed development infrastructure.</i>
GRZ-05	<i>Land use and subdivision in the General Residential zone provides communities with functional and high amenity living environments.</i>
GRZ-06	<i>Residential communities are resilient to change in climate and are responsive to changes in sustainable development techniques.</i>



**General Residential Zone - policies**

GRZ-01	<p>Enable land use and <u>subdivision</u> in the General Residential zone where:</p> <ul style="list-style-type: none"> <li>a. there is adequacy and capacity of available or programmed <u>development infrastructure</u> to support it; and</li> <li>b. it is consistent with the scale, character and amenity anticipated in the residential <u>environment</u>.</li> </ul>
GRZ-02	<p>Require all <u>subdivision</u> in the General Residential zone to provide the following reticulated services to the <u>boundary</u> of each <u>lot</u>:</p> <ul style="list-style-type: none"> <li>a. telecommunications:               <ul style="list-style-type: none"> <li>i. fibre where it is available; or</li> <li>ii. copper where fibre is not available;</li> </ul> </li> <li>b. local electricity distribution network; and</li> <li>c. <u>wastewater</u>, potable water and <u>stormwater</u> where they are available.</li> </ul>
GRZ-03	<p>Enable <u>multi-unit developments</u> within the General Residential zone, including terraced housing and apartments, where there is adequacy and capacity of available or programmed <u>development infrastructure</u>.</p>
GRZ-04	<p>Enable non-residential activities that:</p> <ul style="list-style-type: none"> <li>a. do not detract from the vitality and viability of the Mixed Use zone;</li> <li>b. support the social and economic well-being of the community;</li> <li>c. are of a residential scale; and</li> <li>d. are consistent with the scale, character and amenity of the General Residential zone.</li> </ul>
GRZ-05	<p>Provide for <u>retirement villages</u> where they:</p> <ul style="list-style-type: none"> <li>a. compliment the character and <u>amenity values</u> of the surrounding area;</li> <li>b. contribute to the diverse needs of the community;</li> <li>c. do not adversely affect <u>road</u> safety or the efficiency of the transport network; and</li> <li>d. can be serviced by adequate <u>development infrastructure</u>.</li> </ul>
GRZ-06	<p>Encourage and support the use of on-site <u>water</u> storage to enable sustainable and efficient use of <u>water</u> resources.</p>
GRZ-07	<p>Encourage energy efficient design and the use of small-scale <u>renewable electricity generation</u> in the construction of residential development.</p>
GRZ-08	<p>Manage land use and <u>subdivision</u> to address the <u>effects</u> of the activity requiring resource consent, including (but not limited to) consideration of the following matters where relevant to the application:</p> <ul style="list-style-type: none"> <li>a. consistency with the scale, design, amenity and character of the residential <u>environment</u>;</li> </ul>



	<ul style="list-style-type: none"> <li>b. <i>the location, scale and design of <u>buildings</u> or <u>structures</u>, potential for shadowing and visual dominance;</i></li> <li>c. <i>for <u>residential activities</u>:</i> <ul style="list-style-type: none"> <li>i. <i>provision for <u>outdoor living space</u>;</i></li> <li>ii. <i>privacy for adjoining <u>sites</u>;</i></li> <li>iii. <i>access to sunlight;</i></li> </ul> </li> <li>d. <i>for non-residential activities:</i> <ul style="list-style-type: none"> <li>i. <i>scale and compatibility with <u>residential activities</u></i></li> <li>ii. <i>hours of operation</i></li> </ul> </li> <li>e. <i>at zone interfaces, any <u>setbacks</u>, <u>fencing</u>, <u>screening</u> or <u>landscaping</u> required to address potential conflicts;</i></li> <li>f. <i>the adequacy and capacity of available or programmed <u>development infrastructure</u> to accommodate the proposed activity, including:</i> <ul style="list-style-type: none"> <li>i. <i>opportunities for low impact design principles</i></li> <li>ii. <i>ability of the <u>site</u> to address <u>stormwater</u> and <u>soakage</u>;</i></li> </ul> </li> <li>g. <i>managing <u>natural hazards</u>; and</i></li> <li>h. <i>any historical, spiritual, or cultural association held by <u>tangata whenua</u>, with regard to the matters set out in Policy TW-P6</i></li> </ul>
--	--

8.20. The proposed activity is consistent with the intent of the General Residential zone, which is for urban residential development. The proposal will see methods implemented to ensure that the construction of the retaining wall structures do not have adverse effects on the surrounding environment and will ensure safe access to the subject site whilst not comprising access to other allotments. The proposal will not affect the amenity of the site or surrounding environment.



## 9. Notification Assessment – Sections 95A to 95G of the RMA

### Public Notification Assessment

- 9.1. Section 95A requires a council to follow specific steps to determine whether to publicly notify an application. The following is an assessment of the application against these steps:

#### Step 1 Mandatory public notification in certain circumstances

*An application must be publicly notified if, under section 95A(3), it meets any of the following criteria:*

- (a) the applicant has requested that the application be publicly notified;*
- (b) public notification is required under section 95C;*
- (c) the application is made jointly with an application to exchange recreation reserve land under section 15AA of the Reserves Act 1977.*

- 9.2. Public notification of the application is not required or requested. The application is not made jointly with an application to exchange reserve land. Step 1 does not apply. Step 2 is considered.

#### Step 2: Public Notification precluded in certain circumstances.

*(4) Determine whether the application meets either of the criteria set out in subsection (5) and, —*

- (a) if the answer is yes, go to step 4 (step 3 does not apply); and*
- (b) if the answer is no, go to step 3.*

*(5) The criteria for step 2 are as follows:*

- (a) the application is for a resource consent for 1 or more activities, and each activity is subject to a rule or national environmental standard that precludes public notification;*
- (b) the application is for a resource consent for 1 or more of the following, but no other, activities:*
  - (i) a controlled activity;*
  - (ii) [Repealed]*
  - (iii) a restricted discretionary, discretionary, or non-complying activity, but only if the activity is a boundary activity.*
  - (iv) [Repealed]*

*(6) [Repealed]*

- 9.3. Public Notification is not precluded as the proposal is a Restricted Discretionary Activity and includes more than one boundary activity. Step 3 is considered.

#### Step 3: Public Notification required in certain circumstances

- 9.4. The proposal is not subject to a rule or NES requiring public notification and the proposal does not have effects that will be more than minor. Public Notification is not required. Step 4 is considered.



**Step 4: Public notification in special circumstances**

- 9.5. Section 95A(9) states that a council must publicly notify an application for resource consent if it considers that 'special circumstances' exist.
- 9.6. There are no special circumstances that would warrant public notification of the application. The proposal is for replacement of retaining walls to ensure safe access to the site. All potential adverse effects can be avoided or mitigated to the extent that they will be no more than minor.

**Public Notification Summary**

- 9.7. It is considered that the public notification of the application is not required.

**Limited Notification Assessment**

- 9.8. If the application is not publicly notified, a consent authority must follow the steps of section 95B to determine whether to give limited notification of an application.

**Step 1: Certain affected groups and affected persons must be notified**

- (2) Determine whether there are any—*
- (a) affected protected customary rights groups; or*
  - (b) affected customary marine title groups (in the case of an application for a resource consent for an accommodated activity).*
- (3) Determine—*
- (a) whether the proposed activity is on or adjacent to, or may affect, land that is the subject of a statutory acknowledgement made in accordance with an Act specified in Schedule 11; and*
  - (b) whether the person to whom the statutory acknowledgement is made is an affected person under section 95E.*
- (4) Notify the application to each affected group identified under subsection (2) and each affected person identified under subsection (3).*

- 9.9. There are no protected customary rights groups or customary marine title groups or statutory acknowledgement areas that are relevant to this application. Step 1 does not apply and Step 2 must be considered.

**Step 2: Limited notification precluded in certain circumstances**

- (5) Determine whether the application meets either of the criteria set out in subsection (6) and,—*
- (a) if the answer is yes, go to step 4 (step 3 does not apply); and*
  - (b) if the answer is no, go to step 3.*
- (6) The criteria for step 2 are as follows:*
- (a) the application is for a resource consent for 1 or more activities, and each activity is subject to a rule or national environmental standard that precludes limited notification:*



*(b) the application is for a controlled activity (but no other activities) that requires a resource consent under a district plan (other than a subdivision of land).*

9.10. There is no rule in the plan or national environmental standard that precludes notification. The application is not for a controlled activity. Step 2 does not apply. Step 3 is considered.

### **Step 3: Certain other affected persons must be notified**

*(7) In the case of a boundary activity, determine in accordance with section 95E whether an owner of an allotment with an infringed boundary is an affected person.*

*(8) In the case of any other activity, determine whether a person is an affected person in accordance with section 95E.*

*(9) Notify each affected person identified under subsections (7) and (8) of the application.*

9.11. The proposal does include boundary activities which are setback and sunlight infringements along the boundary with the road reserve. As previously discussed, written approval from the FNDC Roding Department has not been sought as there is no avenue for obtaining written approval at this current time. A LTO has been applied for concurrently with this resource consent application for the encroachment of the proposed retaining wall into the road reserve. As detailed within this report, given the existing topography and development of accessways in this area, the proposal is not considered to create any effects that would be more than minor. The retaining wall structures have been designed to accommodate the existing driveway and cut banks such that no alternatives are proposed.

9.12. The potential adverse effects on any persons are less than minor. Step 3 does not apply. Step 4 is considered.

### **Step 4: Further notification in special circumstances**

*(10) whether special circumstances exist in relation to the application that warrant notification of the application to any other persons not already determined to be eligible for limited notification under this section (excluding persons assessed under section 95E as not being affected persons),*

9.13. The proposal is for replacement of retaining walls. There are no special circumstances that would apply.

### **Limited Notification Assessment Summary**

9.14. For the reasons set out above, it is concluded that Steps 1, 2 & 4 do not apply, and that this application can be processed on a non-notified basis. Based on the detail provided within this report, there are no adverse effects considered to be created on the road reserve, and no other allotments are considered to be affected by the proposal. As there is no avenue for obtaining written approval from the FNDC Roding Department, this has not been sought, and a detailed assessment has been provided determining effects of the proposal on the road reserve will be less than minor.





## 10. RMA Part 2 Assessment

- 10.1. The application is subject to Part 2 of the RMA contained in Sections 5 to 8 inclusive.
- 10.2. The proposed activity will achieve the sustainable management purpose of the RMA expressed in Section 5 and enable social and economic wellbeing of the Applicant. Future sustainable use of natural and physical resources and the life-supporting capacity of air, water, soil and eco-systems will not be affected. Adverse effects on the environment can be avoided and/or mitigated.
- 10.3. The scale of the proposed activity is such that Section 6 of Matters of National Importance are not relevant. The activity would not affect the natural character the coastal environment, wetlands, lakes or rivers, any outstanding natural features or landscapes, any significant indigenous vegetation or habitats. The relationship of Māori and their culture and traditions would not be affected. The activity would not affect any historic heritage, area with identified customary rights and would not affect any natural hazard risk.
- 10.4. Section 7 matters are not affected by the proposed activity. The amenity and quality of the Residential zone will be maintained in accordance with Section 7(c) and (f).
- 10.5. Section 8 relates to the principles of the Treaty of Waitangi. The proposed activity would not be contrary to the principles of the Treaty of Waitangi.

## 11. Conclusion

- 11.1. The Applicant seeks resource consent to replace existing retaining walls alongside the access to the site. Restricted Discretionary resource consent is required for a departure of the Setback and Sunlight rules in the Residential Zone.
- 11.2. This AEE concludes that any adverse effects arising from the proposed retaining structures will be no more than minor. Given the existing topography and location of access to the site and adjoining allotments, the proposed location and design of the retaining structures are considered necessary to ensure no erosion of the existing cut bank as well as ensuring safe and accessible access to the site.
- 11.3. The proposed activity would not be contrary to any relevant statutory policy statement or operative or proposed plan objectives or policies.
- 11.4. The proposed activity will enable the social and economic wellbeing of the Applicant.
- 11.5. The Applicant requests that the application be granted on a non-notified basis.



## 12. Limitations

- 12.1. This report has been commissioned solely for the benefit of our client, in relation to the project as described above, and to the limits of our engagement, with the exception that the Far North District Council or Northland Regional Council may rely on it to the extent of its appropriateness, conditions and limitations, when issuing their subject consent.
- 12.2. Copyright of Intellectual Property remains with Northland Planning and Development 2020 Limited, and this report may NOT be used by any other entity, or for any other proposals, without our written consent. Therefore, no liability is accepted by this firm or any of its directors, servants or agents, in respect of any information contained within this report.
- 12.3. Where other parties may wish to rely on it, whether for the same or different proposals, this permission may be extended, subject to our satisfactory review of their interpretation of the report.
- 12.4. Although this report may be submitted to a local authority in connection with an application for a consent, permission, approval, or pursuant to any other requirement of law, this disclaimer shall still apply and require all other parties to use due diligence where necessary.





**RECORD OF TITLE**  
**UNDER LAND TRANSFER ACT 2017**  
**FREEHOLD**  
**Search Copy**



  
R.W. Muir  
Registrar-General  
of Land

**Identifier** **NA14C/801**  
**Land Registration District** **North Auckland**  
**Date Issued** 23 April 1968

**Prior References**  
NA2025/98

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**Estate** Fee Simple  
**Area** 1088 square metres more or less  
**Legal Description** Lot 16 Deposited Plan 57767  
**Registered Owners**  
Amanda Jane Marsh

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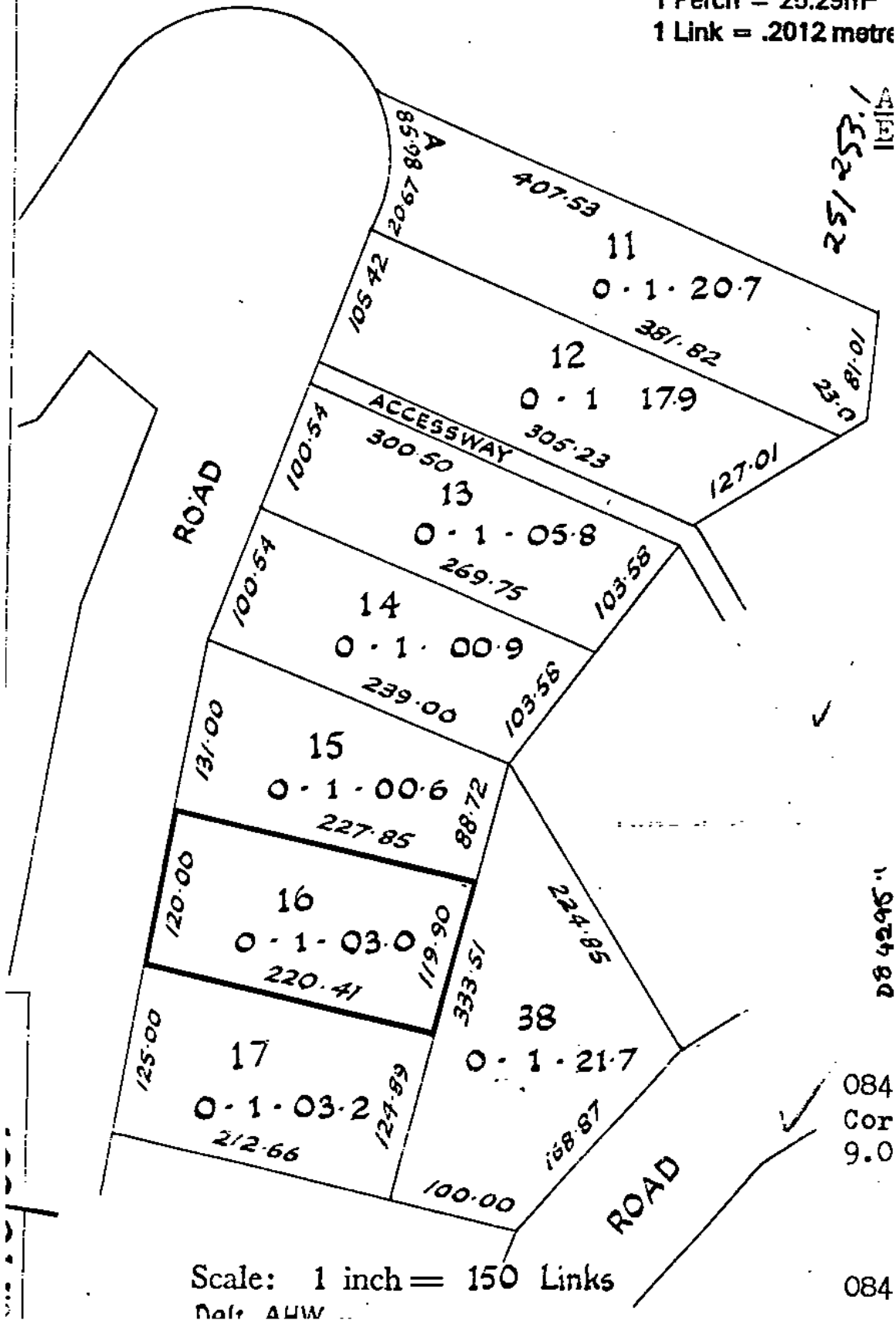
**Interests**  
8868802.2 Mortgage to Bank of New Zealand - 30.9.2011 at 9:49 am

## Conversion Factors:

1 Acre = 4046m<sup>2</sup>1 Perch = 25.29m<sup>2</sup>

1 Link = .2012 metre

## IV KAWAKAWA S.D.







# Licence to Occupy a Portion of Road

Local Government Act 1974

## APPLICATION FORM

Where structures (encroachment) have been or are to be erected on or within the legal road (formed or unformed), Council consent must be sought. In these cases, the Council considers whether to issue a Licence to Occupy to formalise the legal placement of structures on legal road. If issued, the structure can remain at Councils pleasure subject to the terms and conditions of the licence issued and the maintenance and cost of its occupancy is the responsibility of the licence holder.

These licences attach to a person (structure owner/typically the adjacent land owner) and are not transferable. If ownership changes hands, a new owner must make a new application in their name in order to formalise the structure/encroachment. In some cases, Public Liability Insurance may be required by the licence holder, as outlined in the terms and conditions of the licence.

The applicant must supply the Council with details of the extent of the structure/encroachment and plans showing the position and measurements in relation to the legal road boundaries. Please provide all information required in order for your application to be considered. Your application will not be accepted for assessment until council has received all information. Please note that an application can take some time to be processed and an issue of a licence is not guaranteed.

**Please complete this form and return it along with supporting documents to:**

*Property Legalisation Team*

*Far North District Council*

**or post to:** Private Bag 752, Kaikohe 0440

**or scan and email the form to:** [propertylegalisation@fndc.govt.nz](mailto:propertylegalisation@fndc.govt.nz)

**Further enquiries can also be made by:**

Calling **0800 920 029** or via our website at [www.fndc.govt.nz](http://www.fndc.govt.nz)

## APPLICANT CONTACT DETAILS

Your Name: Amanda Marsh

Date: 5.08.2025

Applicant signature:

Your Address:

51 SCHOOL ROAD, PAIHIA, 0200

Home Phone:

Mobile:

0274255 788

Email: [amandamarsh000@gmail.com](mailto:amandamarsh000@gmail.com)

## INFORMATION REQUIRED

**Address or location of the encroachment:**

51 School Road, Paihia

**Describe the nature of the encroachment and its purpose:**

Proposal to construct a retaining wall along the existing concrete driveway which will replace an existing timber retaining wall as well as retain an existing unsupported cut bank. Approximately 13 metres of the retaining wall will extend into the road reserve (School Road). The proposed retaining wall will introduce support for the currently unsupported existing cut bank and will provide mitigation for erosion of the bank.

**Please provide the reasons the encroachment cannot occur within your own land boundaries:**

Given the location of the existing drive and cut bank, the retaining wall is proposed in this location as it will ensure that the cut bank is adequately supported as well as enable safe and usable access and parking within the subject site.

**Is public access affected by the encroachment?**

No. Access will remain as is given that this portion of the road reserve is utilised as access to the site.

**Does this application refer to a proposed or existing encroachment?**

Proposed encroachment of proposed retaining wall.

**Does the encroachment have an existing Licence to Occupy?**

**YES / NO**

**Is this application made in conjunction with any other applications e.g: Building Consent or Resource Consent? Please list:**

Building Consent  
Resource Consent for breach of permitted setback and sunlight standards along road reserve boundary.

**Any other relevant information to support your application:**

Geotechnical Assessment and Retaining Wall Design prepared by Haigh Workman Ltd.

**NOTE:** An occupation plan **must** be submitted with this application.

24 July 2025

Amanda Marsh

**RE: GEOTECHNICAL ASSESSMENT AND RETAINING WALL DESIGN AT 51 SCHOOL ROAD, PAIHIA**

**INTRODUCTION**

Haigh Workman Ltd (Haigh Workman) has been commissioned by Amanda Marsh (the client) to undertake a geotechnical investigation and carry out retaining wall design to replace two existing timber pole walls. The purpose of the investigation was to assess subsoil conditions and design the replacement timber pole retaining walls.

The scope of this report encompasses the geotechnical suitability in the context of the proposed development as defined in the Short Form Agreement dated 9<sup>th</sup> October 2024.

**PROPOSED DEVELOPMENT**

The subject site comprises an existing dwelling with a concrete driveway running down into the property from the south-western corner. The driveway cut is unsupported along the first 20 m with a height of 1.0 to 1.4 m. The cut is supported by a timber pole wall (up to 1.5 m depth) toward the northern end, adjacent to the existing carport. There is another dilapidated timber pole wall supporting fill (up to 1.9 m depth) for the parking / turning area along the western side of the existing dwelling. There are also some grouted rock walls along the driveway running around the southern side of the dwelling.

Based on discussions with our client the proposal is to widen the driveway and parking / turning area by cutting back to the property boundary and supporting the cut with a new timber pole retaining wall (denoted RW01). The retaining wall on the eastern side of the parking / turning area will also be replaced with a new timber pole wall.

This report includes the design of timber pole retaining walls supporting a maximum height of 2.8 m for RW01 and maximum 2.0 m for RW02.



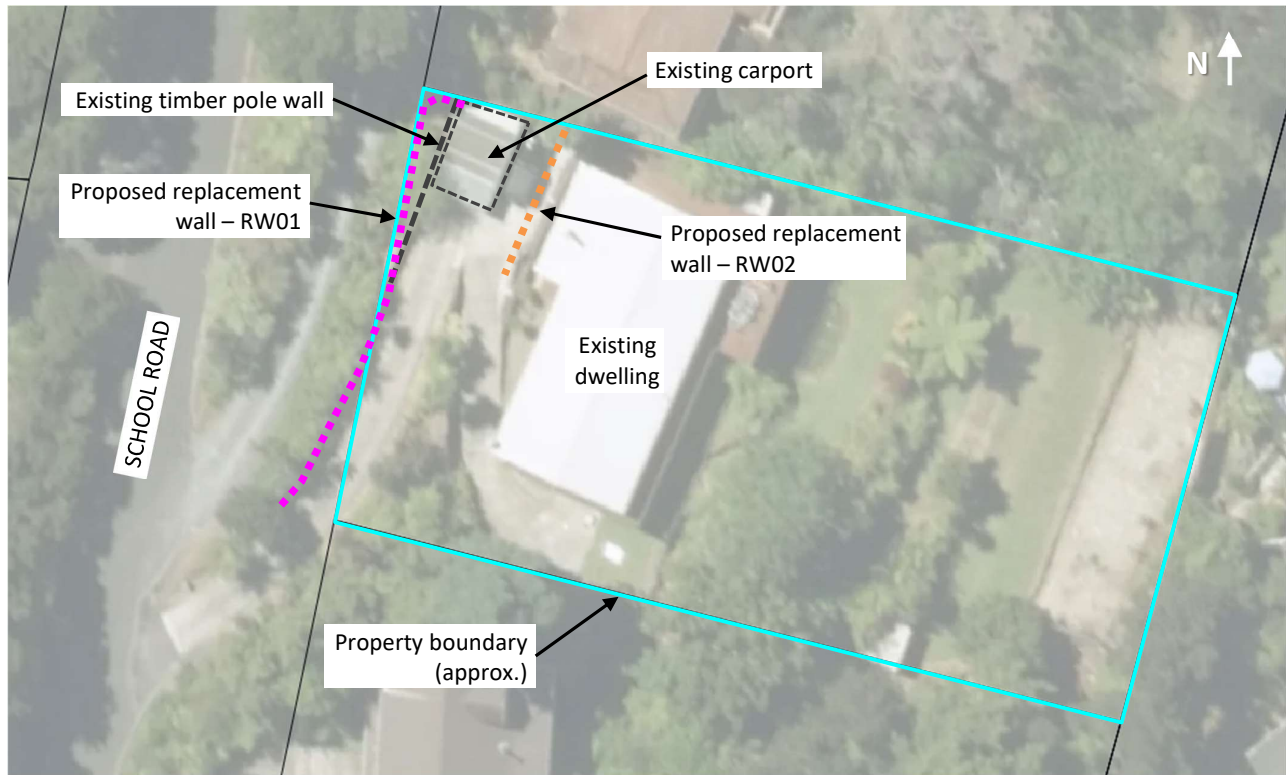
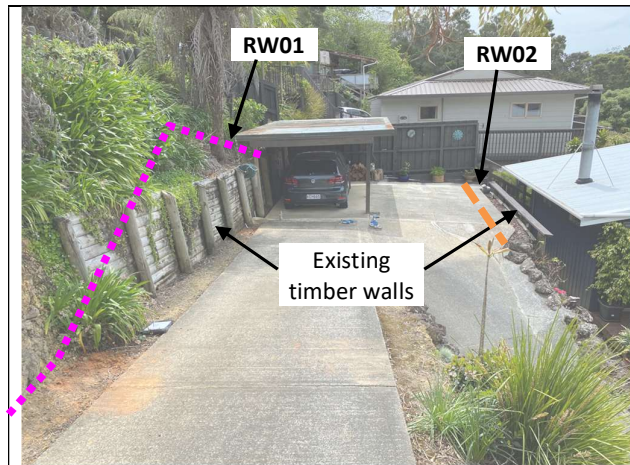
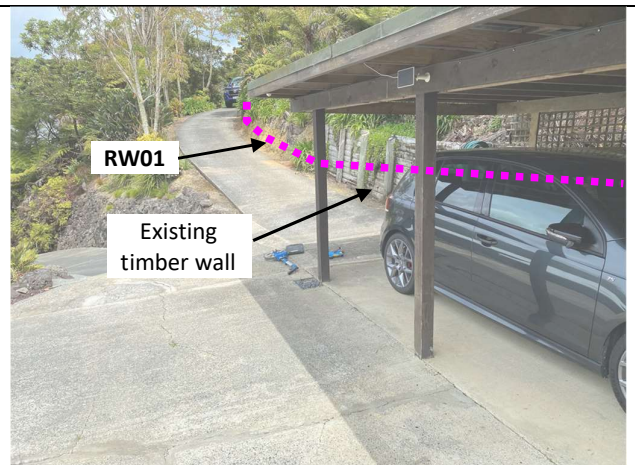


Figure 1: Aerial photo showing subject site.

#### SITE PHOTOGRAPHS



**Photograph 1:**  
Looking north along the existing driveway.



**Photograph 2:**  
Looking south along the existing driveway.  
RW01 will run up the driveway and terminate before the existing light pole.





**Photograph 3:**  
Existing wall along northern side of house to be replaced with RW02.



**Photograph 4:**  
Looking north along the neighbouring driveway above RW01.

## GEOLOGY

The Institute of Geological & Nuclear Sciences, Map 2, 1:250,000 Scale, 2009: "Geology of the Whangarei Area" shows the subject site to be underlain by Waipapa Group (TJw). The soils of the Waipapa Group comprise massive to thin bedded, lithic volcanoclastic sandstone and argillite of Permian to Jurassic age.

## GROUND CONDITIONS

Three hand auger boreholes were drilled along the retaining wall alignments to assess the underlying subsoils conditions. Detailed descriptions of the subsoils encountered are given on the attached borehole logs however, a summary of the ground conditions is given in the table below:

**Table 1: Summary of Borehole Results**

Borehole Number	Non-certified Fill (mbgl)	Residual Soils (mbgl)	Groundwater Observations
BH01	0.0 to 0.2	0.2 to >3.0	Groundwater not Encountered. Moist throughout.
BH02	NE	0.0 to >3.0	
BH03	0.0 to 0.8	0.8 to >2.0	
BH04	0.0 to 0.2	0.2 to >3.0	
BH05	NE	0.0 to >3.0	

*Note: Depths measured from existing ground level.  
NE = Not Encountered*

Groundwater was not encountered in any of the boreholes. The investigation was carried out following a dry season and may be higher during wetter winter conditions.

## DESIGN METHODOLOGY

Design has been undertaken using retaining wall analysis software WALLAP, version 6.06 using moment equilibrium methods and the subgrade reaction model. A factor of safety of 1.5 is recommended for stability for static conditions, e.g., toe-kickout and overturning, and soil/shaft interface factors adopt B1/VM4 values for a timber pole.

Failure modes assessed during the design phase include:

- Kick-out.
- Yielding of structural elements.

For structural design of earth retaining structures, the design horizontal ground acceleration to be used in computing seismic inertia forces is as follows (New Zealand Bridge Manual – SP/M/022):

$$C_a g = C_h(T_0) Z R_u g$$

- $C_h(T_0) = 1.33$  (Class C)
  - $Z = 0.06$  (Paihia/Russell)
  - $R_u = 1.0$  (Importance Level 2, 50-year design life – APE 1/500)
- $C_o g = 0.08$

Geotechnical design parameters presented in Table 3 below have been adopted in design. The design criteria for the timber pole retaining walls given in Table 2.

**Table 2: Design Criteria**

Wall I.D.	Maximum Retained Height (m)	Surcharge (kPa)	Backslope (degrees)
<b>RW01</b>	2.8 m	10 <i>(driveway removed from wall)</i>	30°*
<b>RW02</b>	0.7 m	10	N/A

\*Designed for 30° which is the natural back slope in places. Maximum fill batter above wall should be limited to 1V:2H (i.e. 26°).

**Table 3: Geotechnical Design Parameters**

Soil Unit	Bulk Unit Weight, $\gamma$ (kN/m <sup>3</sup> )	Effective Cohesion, $c'$ (kPa)	Effective Friction Angle, $\phi'$ (degrees)	Young's Modulus, E (MPa)
<b>Retained Fill</b>	17	3*	26	10
<b>Retained Residual</b>	18	5*	30	25
<b>Stiff to Very Stiff Residual Soils</b>	18	5	30	25

\*Cohesion is ignored over the upper 1.5 m below the top of the wall.

## DESIGN SUMMARY

A summary of the design is presented in Table 4. Design calculations and detailed drawings are attached.

**Table 4: Retaining Wall Design Summary**

Wall Properties	RW01			RW02
Maximum Height (H)	1.5 m	2.0 m	2.8 m	2.0 m
Pole Spacing (c/c)	1.2 m	1.2 m	1.2 m	1.2 m
Pole type	200 mm SED (High Density)	250 mm SED (High Density)	350 mm SED (High Density)	275 mm SED (High Density)
Embedment Length (L)	2.7 m	3.4 m	4.2	3.4 m
Total Pile Length (H + L)	4.2 m	5.4 m	7.0 m	5.4 m
Encasement (B)	450 mm bored pile, encased in 20 MPa concrete	450 mm bored pile, encased in 20 MPa concrete	600 mm bored pile, encased in 20 MPa concrete	500 mm bored pile, encased in 20 MPa concrete
Timber lagging rails	150 x 50 timber, H5 treated. Double rails below 0.6 m and triple below 2.55 m the top of wall. (refer Detail 1, sheet G05)			150 x 50 timber, H5 treated. Double rails below 0.75 m

Seepage drainage must be installed behind the wall, with the drainage pipe outlet directed downslope away from the building. Refer to drawings in Appendix A attached for full details and specifications.

The backslope above RW01 at the northern extent of the wall is steep and the design allows for extending the poles above existing ground level to enable filling the backslope at a safer gradient. Material excavated for RW01 can be used to fill behind the wall and provide a maximum batter slope of 1V:2H (i.e. 26°), refer to cross section B-B, sheet G03.

All fill batters and disturbed areas behind RW01 should be covered with coconut matting and planted for erosion protection.

## STORMWATER

The existing driveway will be widened by approximately 500 mm the majority of RW01, extending to 1.5m at the north-western corner. A concrete dish drain is recommended along the toe of the wall to collect surface water and direct into a catchpit.

Also, the concrete parking area above RW02 currently drains into the back of the existing timber wall. A concrete nib can be provided along the top of the wall to direct surface water into a catchpit.

Surface water runoff from these catchpits should be conveyed in sealed pipes to the existing stormwater system OR to a controlled outlet (i.e. T-Bar spreader) if a connection is not available. Refer to drawing G02 for details.

## EROSION AND SEDIMENT CONTROL

Prior to commencing earthworks, a sediment control system needs to be constructed to ensure the Territorial and Regional Authority requirements are met. Typical details can be found in the Auckland Council publication GD05.

## EXISTING SERVICES

Far North Maps does not show any public pipes in the area of the proposed retaining walls, however there is a water meter shown near the start of the driveway. Existing services (power, chorus, water supply) are expected to run between School Road and the existing dwelling therefore all services must be accurately located prior to carrying out any excavations.

### LICENSE TO OCCUPY ROAD CORRIDOR

Approximately 13.0 m of RW01 extends into the road corridor (School Road). The existing cut bank is currently unsupported along this length of wall and RW01 is proposed to mitigate erosion of the bank and widen the driveway. A license to occupy (LTO) will need to be applied for in conjunction with the Building and Resource Consent applications.

### EXISTING RIGHT OF WAY

There is an existing Right of Way easement (Easement A shown below) in the north-western corner of the property in favour of Lots 13, 14 and 15 DP 57767 to the north. The proposed retaining wall is to extend over this easement however the formed driveway for Lots 13, 14 and 15 has been constructed well outside this easement.

It is recommended that legal permission be sought with the affected parties for the construction of RW01 over this easement.

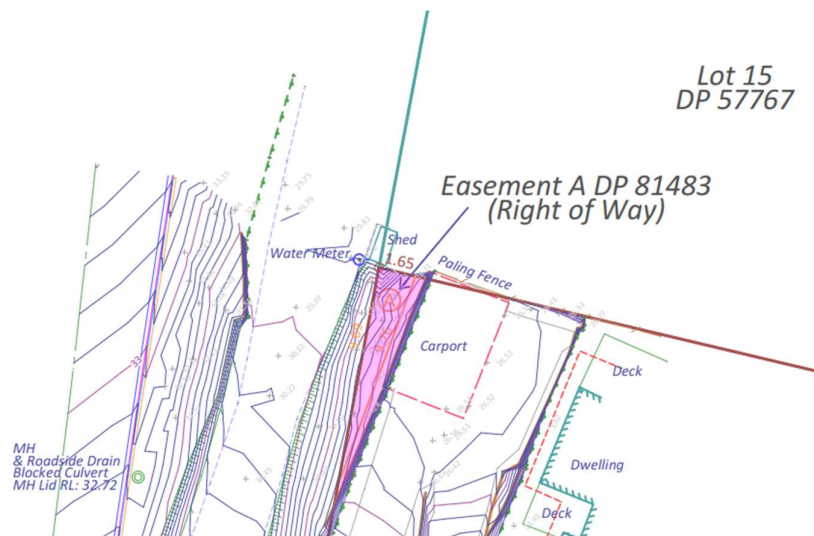


Figure 2: Right of Way Easement

### SAFETY IN DESIGN

A safety in design register has been prepared and should be updated during construction when required.

Table 5: Safety in design risk register

Issue	Risk	Proposed mitigation measure
Excavations	Collapse of material and potential to strike people	All earthworks to be staged where possible and cuts to remain open for the smallest possible duration. No one to work immediately adjacent to the cut or during poor weather conditions.
Open auger holes	Falling from height	No holes to remain open overnight. No one allowed to walk around the construction site, other than those who understand site hazards. Holes should be backfilled with concrete as soon as possible.
Lifting timber poles and putting into ground	Falling from height (heavy)	Lifting gear (straps and chains) to be in good condition and certified if required.
Groundwater	If encountered, groundwater will make constructability difficult	We expect holes to remain free of groundwater in the short term.



#### LIMITATIONS

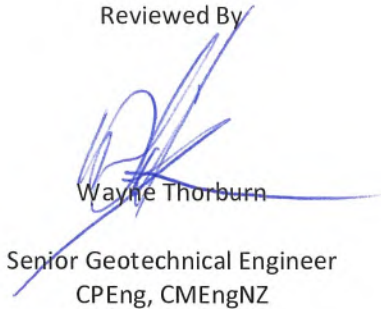
This letter report has been prepared for the use of Amanda Marsh with respect to the particular brief outlined to us. This letter report is to be used by our Client and their Consultants only. The information and opinions contained within this report shall not be used in other context for any other purpose without prior review and agreement by Haigh Workman Ltd.

Prepared By



Geotechnical Engineer  
MEngNZ

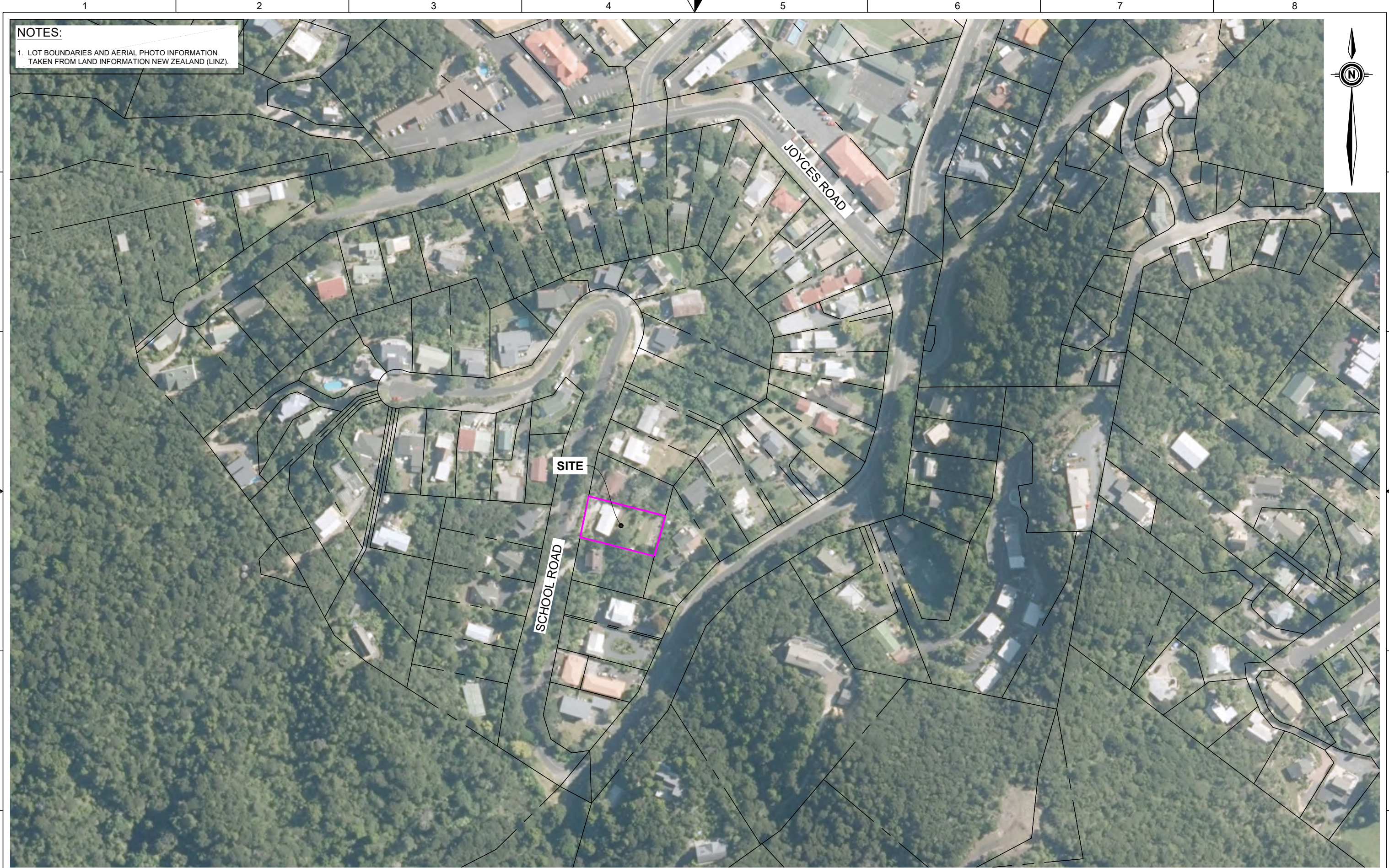
Reviewed By



Senior Geotechnical Engineer  
CPEng, CMEngNZ

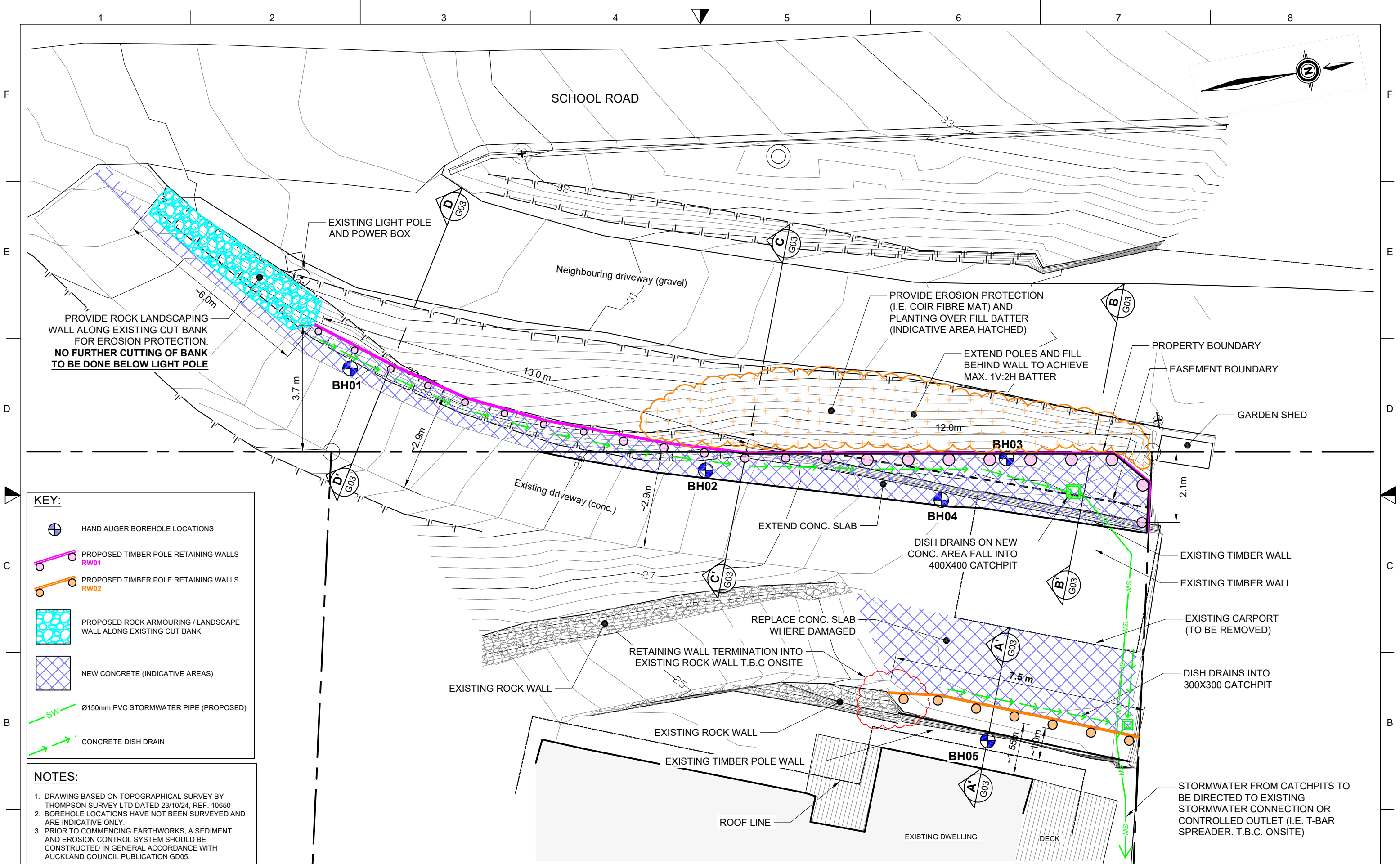
## **APPENDIX A – Drawings**





Issue			Revision			DWG			Project			DWG No.		
A			07/11/2024			FIRST ISSUE			GEOTECHNICAL INVESTIGATION			G01		
B			23/07/2025			REVISED RW02 ALIGNMENT			51 SCHOOL ROAD, PAIHIA (Lot 16, DP 57767)					
									Client			AMANDA MARSH		
									Project No.			24 218		
									RC no.			N/A		
												Sheet No.		
												1 of 7		





Issue			Revision			DWG			Project			DWG No.		
A			07/11/2024			FIRST ISSUE			GEOTECHNICAL INVESTIGATION			G02		
B			23/07/2025			REVISED RW02 ALIGNMENT			51 SCHOOL ROAD, PAIHIA (Lot 16, DP 57767)					
									Client			AMANDA MARSH		
									Project No.			24 218		
									RC no.			N/A		
												Sheet No.		
												2 of 7		



NOTES:

1. THIS DRAWING IS BASED ON TOPO SURVEY CONTOURS AND IS APPROXIMATE ONLY.
2. THE GROUND MODEL HAS BEEN INFERRED FROM THE BOREHOLE DATA. INFERENCES ABOUT THE SOILS CONDITIONS BETWEEN TEST LOCATIONS HAVE BEEN MADE BUT CANNOT BE GUARANTEED.
3. DRAWING NOT TO BE USED FOR CONSTRUCTION PURPOSES.

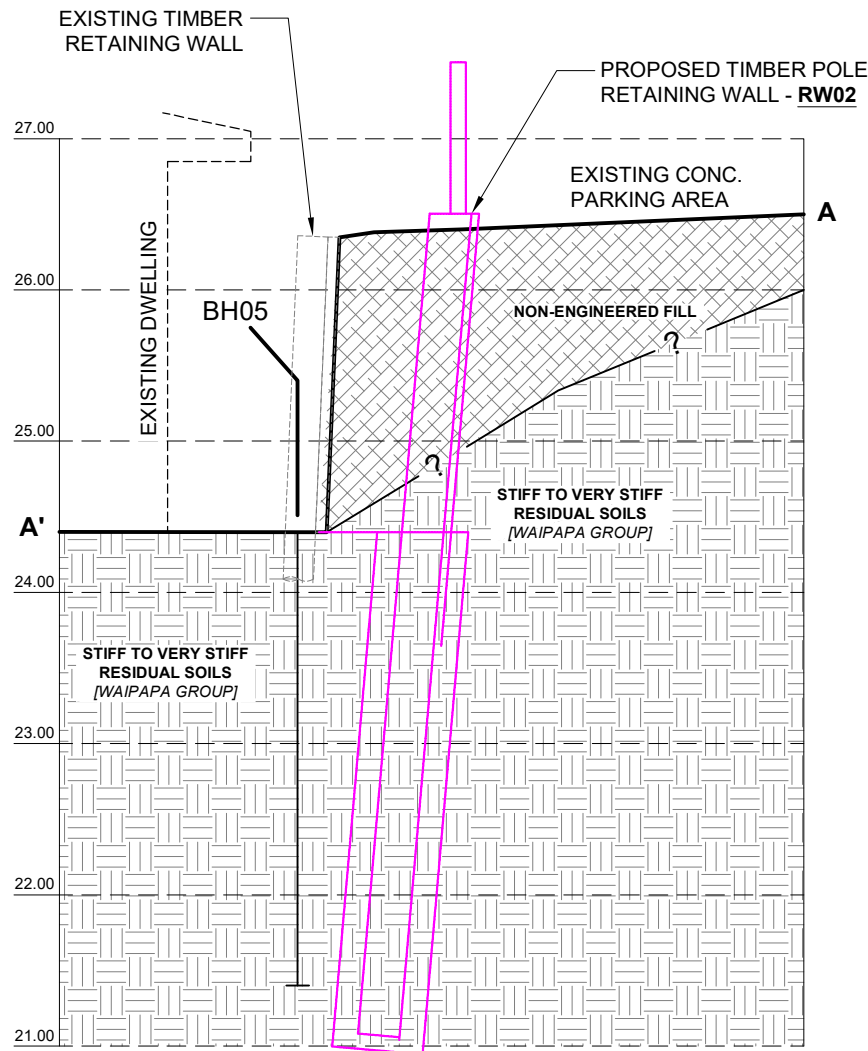
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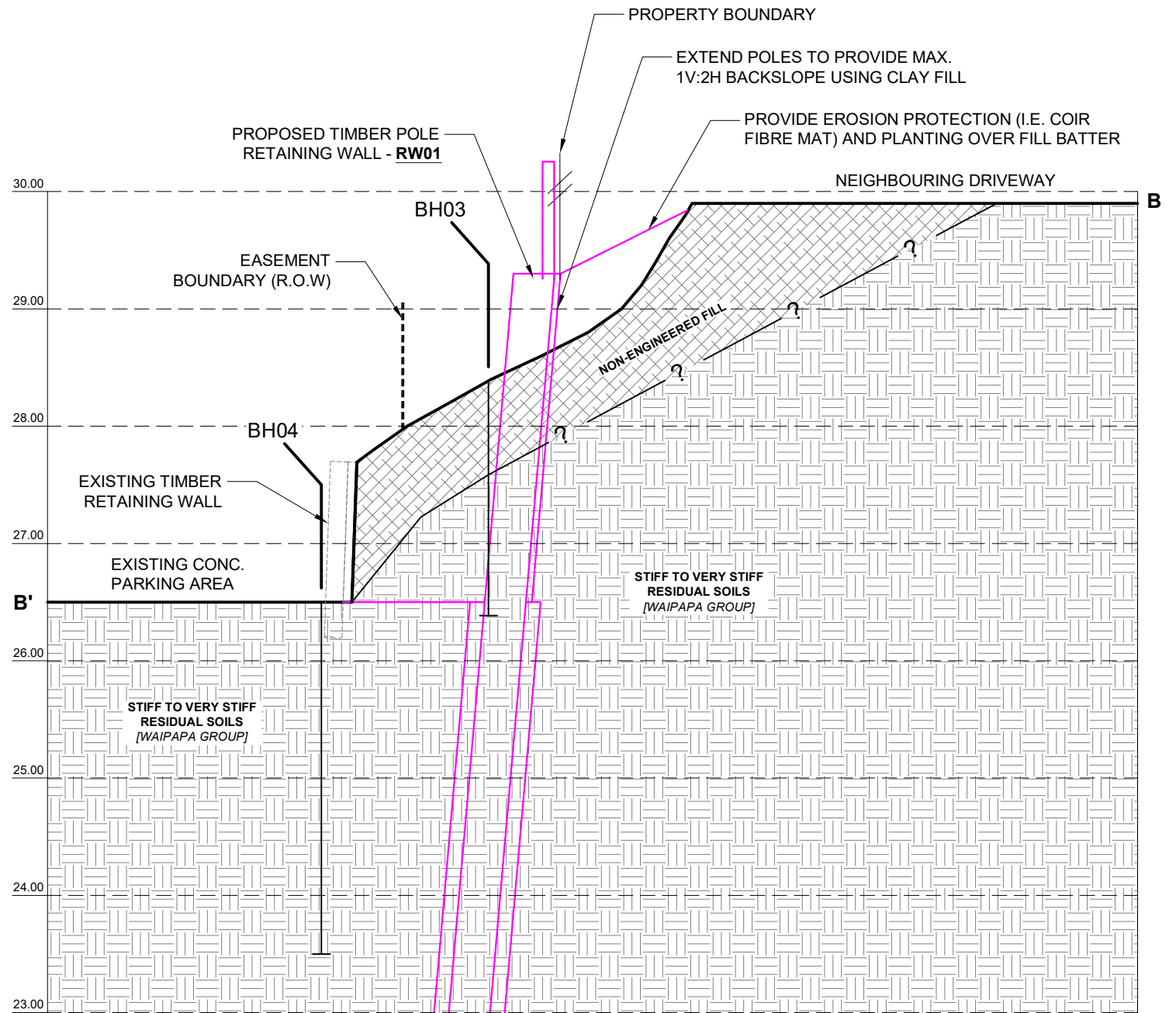
NON-ENGINEERED FILL



STIFF TO VERY STIFF RESIDUAL SOILS  
[WAIPAPA GROUP]



CROSS SECTION A-A'



CROSS SECTION B-B'

Issue	Date	Revision
A	07/11/2024	FIRST ISSUE
B	23/10/2025	REVISED RW02 ALIGNMENT

DWG		CROSS SECTION A-A' & B-B'	
Scale 1: 50 @A3			Date JUL 2025
Drawn JMC		Checked WT	Approved WT
File		T:\CLIENTS\AMANDA MARSH ( MANDY)\24 218 - 51 SCHOOL ROAD PAIHIA\ENGINEERING\GEOTECH\DRAWINGS\24 218_GEO PLANS_REV.DWG	

**HAIGH WORKMAN**  
Civil & Structural Engineers

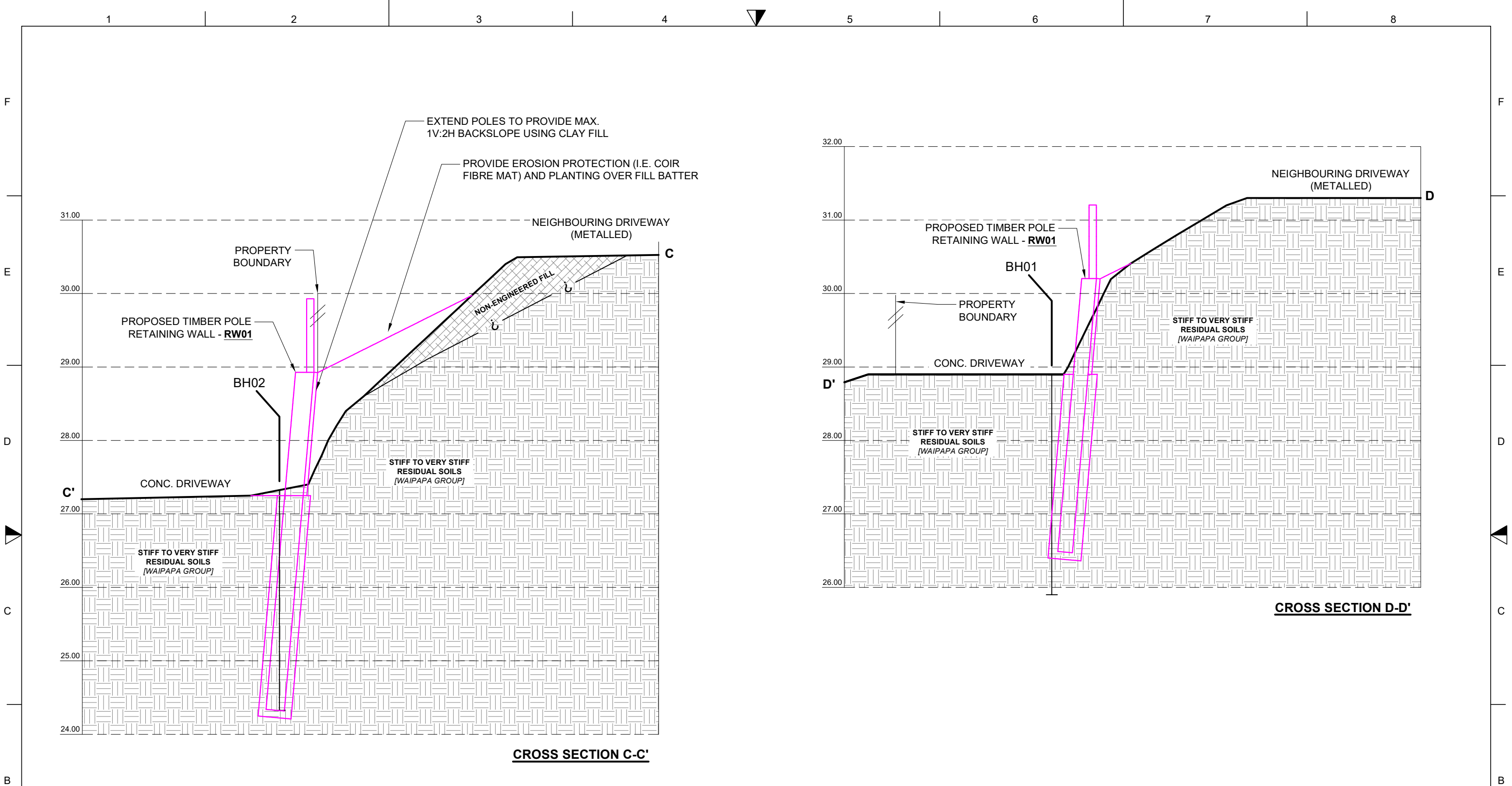
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Project	GEOTECHNICAL INVESTIGATION	
	51 SCHOOL ROAD, PAIHIA (Lot 16, DP 57767)	
Client	AMANDA MARSH	
Project No.	24 218	RC no. N/A

DWG No.	<b>G03</b>
Sheet No.	
	<b>3 of 7</b>



NOTES:

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- DRAWING NOT TO BE USED FOR CONSTRUCTION PURPOSES.

KEY:



NON-ENGINEERED FILL



STIFF TO VERY STIFF RESIDUAL SOILS  
[WAIPAPA GROUP]

Issue	Date	Revision
A	07/11/2024	FIRST ISSUE
B	23/07/2025	REVISED RW02 ALIGNMENT

DWG CROSS SECTION C-C' & D-D'			
Scale	1:50 @A3	Date	JUL 2025
Drawn	JMC	Checked	WT
Approved	WT		
File	T:\CLIENTS\AMANDA MARSH (MANDY)\24 218 - 51 SCHOOL ROAD PAIHIA\ENGINEERING\GEOTECH\DRAWINGS\24 218_GEO PLANS_REV\DWG		

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Kerikeri, BOI

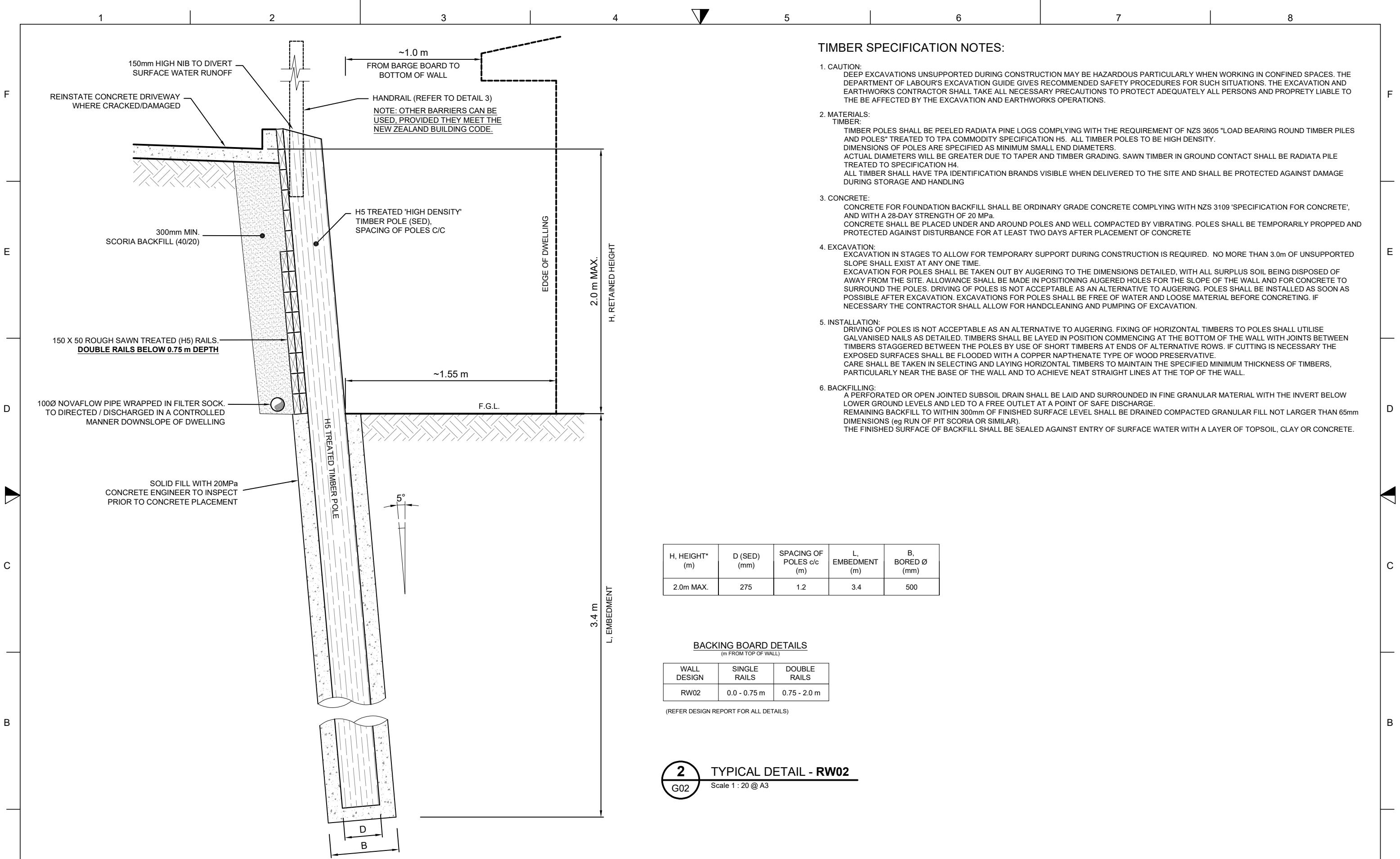
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Project	GEOTECHNICAL INVESTIGATION 51 SCHOOL ROAD, PAIHIA (Lot 16, DP 57767)	
Client	AMANDA MARSH	
Project No.	24 218	RC no. N/A

DWG No.	<b>G04</b>
Sheet No.	<b>4</b> of <b>7</b>





TIMBER SPECIFICATION NOTES:

- CAUTION:  
DEEP EXCAVATIONS UNSUPPORTED DURING CONSTRUCTION MAY BE HAZARDOUS PARTICULARLY WHEN WORKING IN CONFINED SPACES. THE DEPARTMENT OF LABOUR'S EXCAVATION GUIDE GIVES RECOMMENDED SAFETY PROCEDURES FOR SUCH SITUATIONS. THE EXCAVATION AND EARTHWORKS CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT ADEQUATELY ALL PERSONS AND PROPERTY LIABLE TO THE BE AFFECTED BY THE EXCAVATION AND EARTHWORKS OPERATIONS.
- TIMBER:  
TIMBER POLES SHALL BE PEELED RADIATA PINE LOGS COMPLYING WITH THE REQUIREMENT OF NZS 3605 "LOAD BEARING ROUND TIMBER PILES AND POLES" TREATED TO TPA COMMODITY SPECIFICATION H5. ALL TIMBER POLES TO BE HIGH DENSITY. DIMENSIONS OF POLES ARE SPECIFIED AS MINIMUM SMALL END DIAMETERS. ACTUAL DIAMETERS WILL BE GREATER DUE TO TAPER AND TIMBER GRADING. SAWN TIMBER IN GROUND CONTACT SHALL BE RADIATA PILE TREATED TO SPECIFICATION H4. ALL TIMBER SHALL HAVE TPA IDENTIFICATION BRANDS VISIBLE WHEN DELIVERED TO THE SITE AND SHALL BE PROTECTED AGAINST DAMAGE DURING STORAGE AND HANDLING
- CONCRETE:  
CONCRETE FOR FOUNDATION BACKFILL SHALL BE ORDINARY GRADE CONCRETE COMPLYING WITH NZS 3109 'SPECIFICATION FOR CONCRETE', AND WITH A 28-DAY STRENGTH OF 20 MPa. CONCRETE SHALL BE PLACED UNDER AND AROUND POLES AND WELL COMPACTED BY VIBRATING. POLES SHALL BE TEMPORARILY PROPPED AND PROTECTED AGAINST DISTURBANCE FOR AT LEAST TWO DAYS AFTER PLACEMENT OF CONCRETE
- EXCAVATION:  
EXCAVATION IN STAGES TO ALLOW FOR TEMPORARY SUPPORT DURING CONSTRUCTION IS REQUIRED. NO MORE THAN 3.0m OF UNSUPPORTED SLOPE SHALL EXIST AT ANY ONE TIME. EXCAVATION FOR POLES SHALL BE TAKEN OUT BY AUGERING TO THE DIMENSIONS DETAILED, WITH ALL SURPLUS SOIL BEING DISPOSED OF AWAY FROM THE SITE. ALLOWANCE SHALL BE MADE IN POSITIONING AUGERED HOLES FOR THE SLOPE OF THE WALL AND FOR CONCRETE TO SURROUND THE POLES. DRIVING OF POLES IS NOT ACCEPTABLE AS AN ALTERNATIVE TO AUGERING. POLES SHALL BE INSTALLED AS SOON AS POSSIBLE AFTER EXCAVATION. EXCAVATIONS FOR POLES SHALL BE FREE OF WATER AND LOOSE MATERIAL BEFORE CONCRETING. IF NECESSARY THE CONTRACTOR SHALL ALLOW FOR HANDCLEANING AND PUMPING OF EXCAVATION.
- INSTALLATION:  
DRIVING OF POLES IS NOT ACCEPTABLE AS AN ALTERNATIVE TO AUGERING. FIXING OF HORIZONTAL TIMBERS TO POLES SHALL UTILISE GALVANISED NAILS AS DETAILED. TIMBERS SHALL BE LAYED IN POSITION COMMENCING AT THE BOTTOM OF THE WALL WITH JOINTS BETWEEN TIMBERS STAGGERED BETWEEN THE POLES BY USE OF SHORT TIMBERS AT ENDS OF ALTERNATIVE ROWS. IF CUTTING IS NECESSARY THE EXPOSED SURFACES SHALL BE FLOODED WITH A COPPER NAPHTHENATE TYPE OF WOOD PRESERVATIVE. CARE SHALL BE TAKEN IN SELECTING AND LAYING HORIZONTAL TIMBERS TO MAINTAIN THE SPECIFIED MINIMUM THICKNESS OF TIMBERS, PARTICULARLY NEAR THE BASE OF THE WALL AND TO ACHIEVE NEAT STRAIGHT LINES AT THE TOP OF THE WALL.
- BACKFILLING:  
A PERFORATED OR OPEN JOINTED SUBSOIL DRAIN SHALL BE LAID AND SURROUNDED IN FINE GRANULAR MATERIAL WITH THE INVERT BELOW LOWER GROUND LEVELS AND LED TO A FREE OUTLET AT A POINT OF SAFE DISCHARGE. REMAINING BACKFILL TO WITHIN 300mm OF FINISHED SURFACE LEVEL SHALL BE DRAINED COMPACTED GRANULAR FILL NOT LARGER THAN 65mm DIMENSIONS (eg RUN OF PIT SCORIA OR SIMILAR). THE FINISHED SURFACE OF BACKFILL SHALL BE SEALED AGAINST ENTRY OF SURFACE WATER WITH A LAYER OF TOPSOIL, CLAY OR CONCRETE.


H, HEIGHT* (m)	D (SED) (mm)	SPACING OF POLES c/c (m)	L, EMBEDMENT (m)	B, BORED Ø (mm)
2.0m MAX.	275	1.2	3.4	500

BACKING BOARD DETAILS  
(m FROM TOP OF WALL)

WALL DESIGN	SINGLE RAILS	DOUBLE RAILS
RW02	0.0 - 0.75 m	0.75 - 2.0 m

(REFER DESIGN REPORT FOR ALL DETAILS)

2 TYPICAL DETAIL - RW02  
G02 Scale 1 : 20 @ A3

A	Issue	Date	Revision	DWG TYPICAL RETAINING WALL DETAILS RW02						Project PROPOSED RETAINING WALLS 51 SCHOOL ROAD, PAIHIA		DWG No. G06	A	
	A	7/11/2024	FIRST ISSUE					6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz		Client AMANDA MARSH				
	B	23/07/2025	REVISED RW02 ALIGNMENT											
				Scale 1: 25 @A3		Date JUL 2025						Sheet No.		
				Drawn JMC		Checked WT		Approved WT		DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND ANGLES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT TO THESE DRAWINGS AND ALL PARTS THERE OF REMAIN THE PROPERTY OF HAIGH WORKMAN LTD. ©2020		Project No. 24 218 RC no. N/A		
				File T:\CLIENTS\AMANDA MARSH ( MANDY)\24 218 - 51 SCHOOL ROAD PAIHIA\ENGINEERING\GEOTECH\DRAWINGS\24 218_RW DETAILS_REV8.DWG								6 of 7		

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## **APPENDIX B – Investigation Logs**

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6 Fairway Drive  
Kerikeri, 0230  
New Zealand



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Fax 09 407 8378  
[www.haighworkman.co.nz](http://www.haighworkman.co.nz)  
[info@haighworkman.co.nz](mailto:info@haighworkman.co.nz)

## Borehole Log - BH01

Hole Location: Refer to Site Plan

JOB No. 24 218

CLIENT: Amanda Marsh SITE: 51 School Road, Paihia (Lot 16 Deposited Plan 57767)  
Date Started: 16/10/2024 DRILLING METHOD: Hand Auger LOGGED BY: JP  
Date Completed: 16/10/2024 HOLE DIAMETER (mm) 50mm CHECKED BY: WT

Soil Description Based on NZGS Logging Guidelines 2005	Depth (m)	Geology	Graphic Log	Water Level	Sensitivity	Vane Shear and Remoulded Vane Shear Strengths (kPa)	Scala Penetrometer (blows/100mm)
<b>SILT</b> , some gravel, brown and grey brown, Stiff, dry to moist, non-plastic. [FILL]	0.0	FILL					0 4 8 12 16 20
<b>Clayey SILT</b> ; pinkish red streaked orange and white. Very stiff, moist, moderate plasticity. [WAIPAPA GROUP]							
<b>SILT</b> ; some clay, light pinkish red streaked orange and white, speckled black. Very stiff, moist, low plasticity.	0.5	WAIPAPA GROUP			7	29 186	
At 1.0m: Becoming reddish orange and pink mottle orange, black and white	1.0					201	
<b>SILT</b> ; some clay, and gravel, reddish orange mottled black and orange. Very stiff, moist, low plasticity. Trace weakly cemented clasts.	2.5						
At 2.8m: Becoming light reddish orange mottled pinkish red, speckled black							
End of Hole at 3.0m (Target Depth)	3.0						
	3.5						
	4.0						
	4.5						

### LEGEND

TOPSOIL CLAY SILT SAND GRAVEL FILL

Note: UTP = Unable To Penetrate.

Scala penetrometer testing not undertaken.

Hand Held Shear Vane S/N: DR2220. Groundwater not encountered.

Corrected shear vane reading  
Remoulded shear vane reading  
Scala Penetrometer

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## Borehole Log - BH02

Hole Location: Refer to Site Plan

JOB No. 24 218

CLIENT: Amanda Marsh  
Date Started: 16/10/2024  
Date Completed: 16/10/2024  
SITE: 51 School Road, Paihia (Lot 16 Deposited Plan 57767)  
DRILLING METHOD: Hand Auger  
HOLE DIAMETER (mm): 50mm  
LOGGED BY: JMC  
CHECKED BY: WT

Soil Description Based on NZGS Logging Guidelines 2005	Depth (m)	Geology	Graphic Log	Water Level	Sensitivity	Vane Shear and Remoulded Vane Shear Strengths (kPa)	Scala Penetrometer (blows/100mm)
<b>Silty CLAY</b> ; reddish brown mottled light grey. Hard, moist, moderate plasticity. <i>[WAIPAPA GROUP]</i>	0.0	WAIPAPA GROUP		Groundwater Not Encountered.			0 4 8 12 16 20
	0.5					224	
<b>Clayey SILT</b> ; reddish brown mottled light yellow brown. Hard, moist, low plasticity.	1.0					224	
<b>SILT</b> ; minor clay, reddish and orange brown mottled light yellow brown, occasional black streaks. Hard, moist.	1.5					224	
	2.0					UTP	
	2.5					UTP	
<b>End of Hole at 3.0m (Target Depth)</b>	3.0					UTP	
	3.5						
	4.0						
	4.5						

### LEGEND

TOPSOIL CLAY SILT SAND GRAVEL FILL

Note: UTP = Unable To Penetrate.

Scala penetrometer testing not undertaken.

Hand Held Shear Vane S/N: DR1617. Groundwater not encountered.

Corrected shear vane reading  
Remoulded shear vane reading  
Scala Penetrometer



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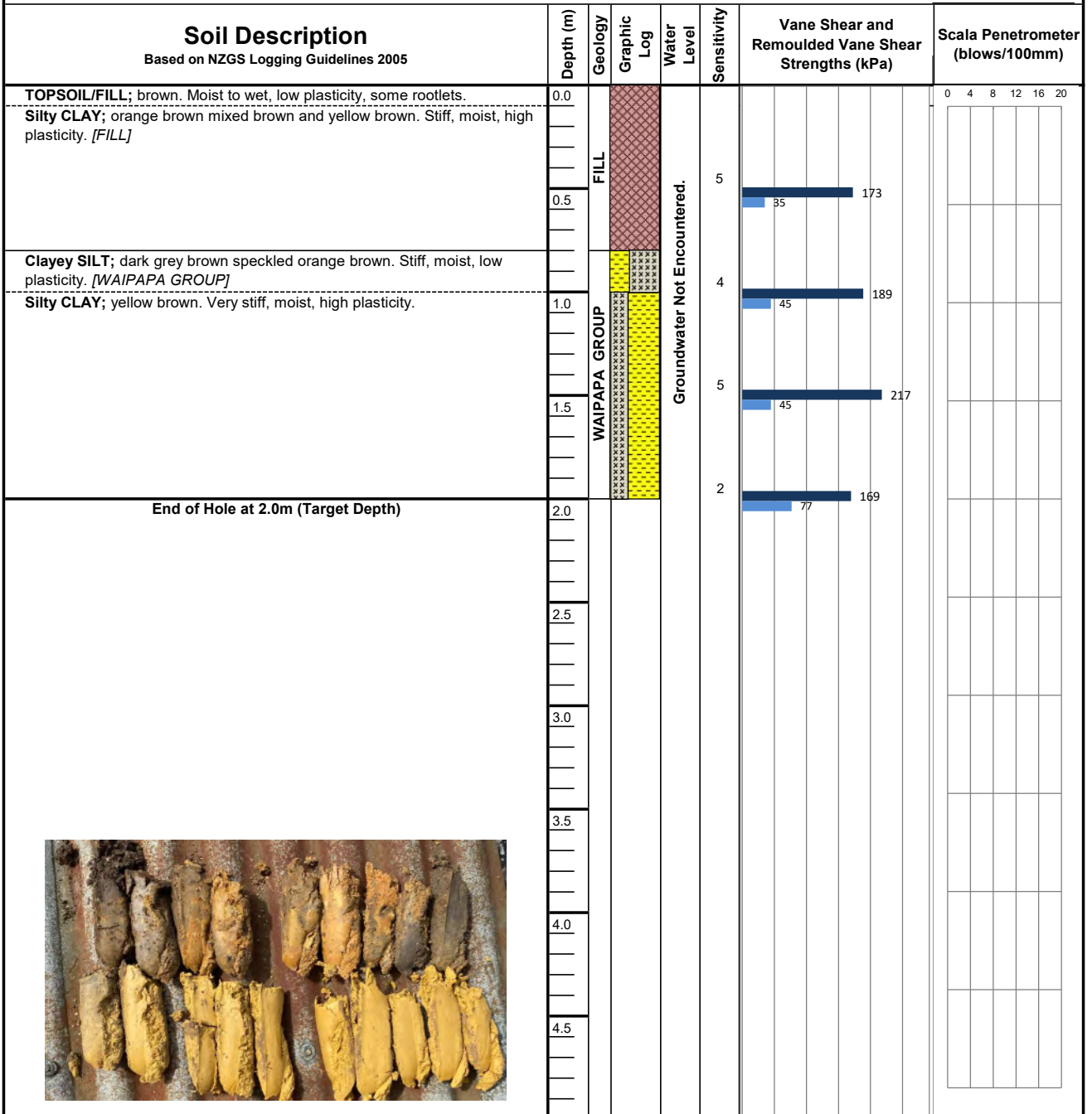
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[info@haighworkman.co.nz](mailto:info@haighworkman.co.nz)

## Borehole Log - BH03

Hole Location: Refer to Site Plan

**JOB No. 24 218**

**CLIENT:** Amanda Marsh  
**Date Started:** 16/10/2024  
**Date Completed:** 16/10/2024  
**SITE:** 51 School Road, Paihia (Lot 16 Deposited Plan 57767)  
**DRILLING METHOD:** Hand Auger  
**HOLE DIAMETER (mm):** 50mm  
**LOGGED BY:** JMC  
**CHECKED BY:** WT



### LEGEND

**TOPSOIL**
**CLAY**
**SILT**
**SAND**
**GRAVEL**
**FILL**

**Note:** UTP = Unable To Penetrate.

Scala penetrometer testing not undertaken.

Hand Held Shear Vane S/N: DR1617. Groundwater not encountered.

Corrected shear vane reading  
 Remoulded shear vane reading  
 Scala Penetrometer

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Kerikeri, 0230  
New Zealand



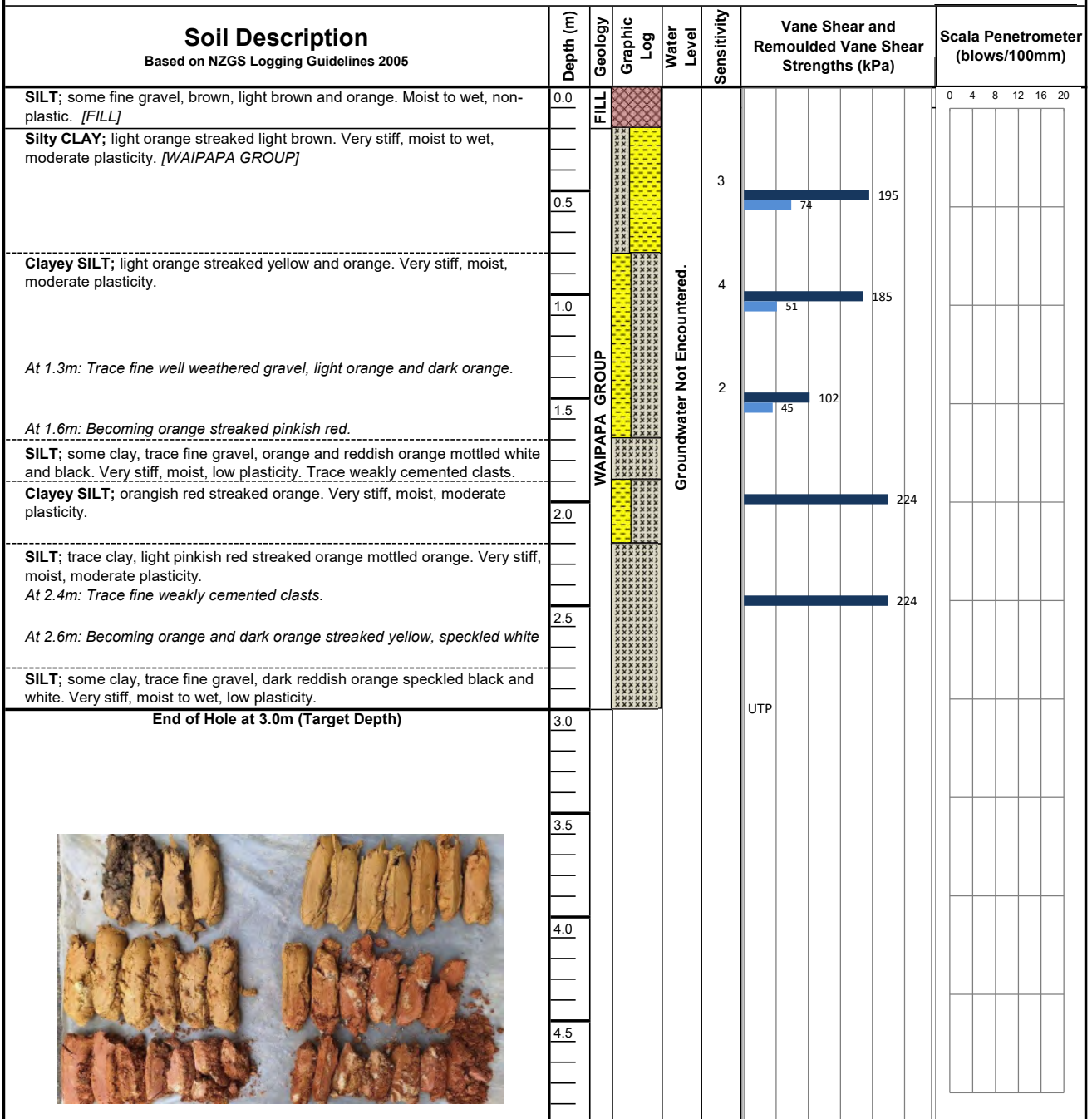
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[info@haighworkman.co.nz](mailto:info@haighworkman.co.nz)

## Borehole Log - BH04

Hole Location: Refer to Site Plan

JOB No. 24 218

CLIENT: Amanda Marsh SITE: 51 School Road, Paihia (Lot 16 Deposited Plan 57767)  
Date Started: 16/10/2024 DRILLING METHOD: Hand Auger LOGGED BY: JP  
Date Completed: 16/10/2024 HOLE DIAMETER (mm) 50mm CHECKED BY: WT



### LEGEND

TOPSOIL
 CLAY
 SILT
 SAND
 GRAVEL
 FILL

Note: UTP = Unable To Penetrate.

Scala penetrometer testing not undertaken.

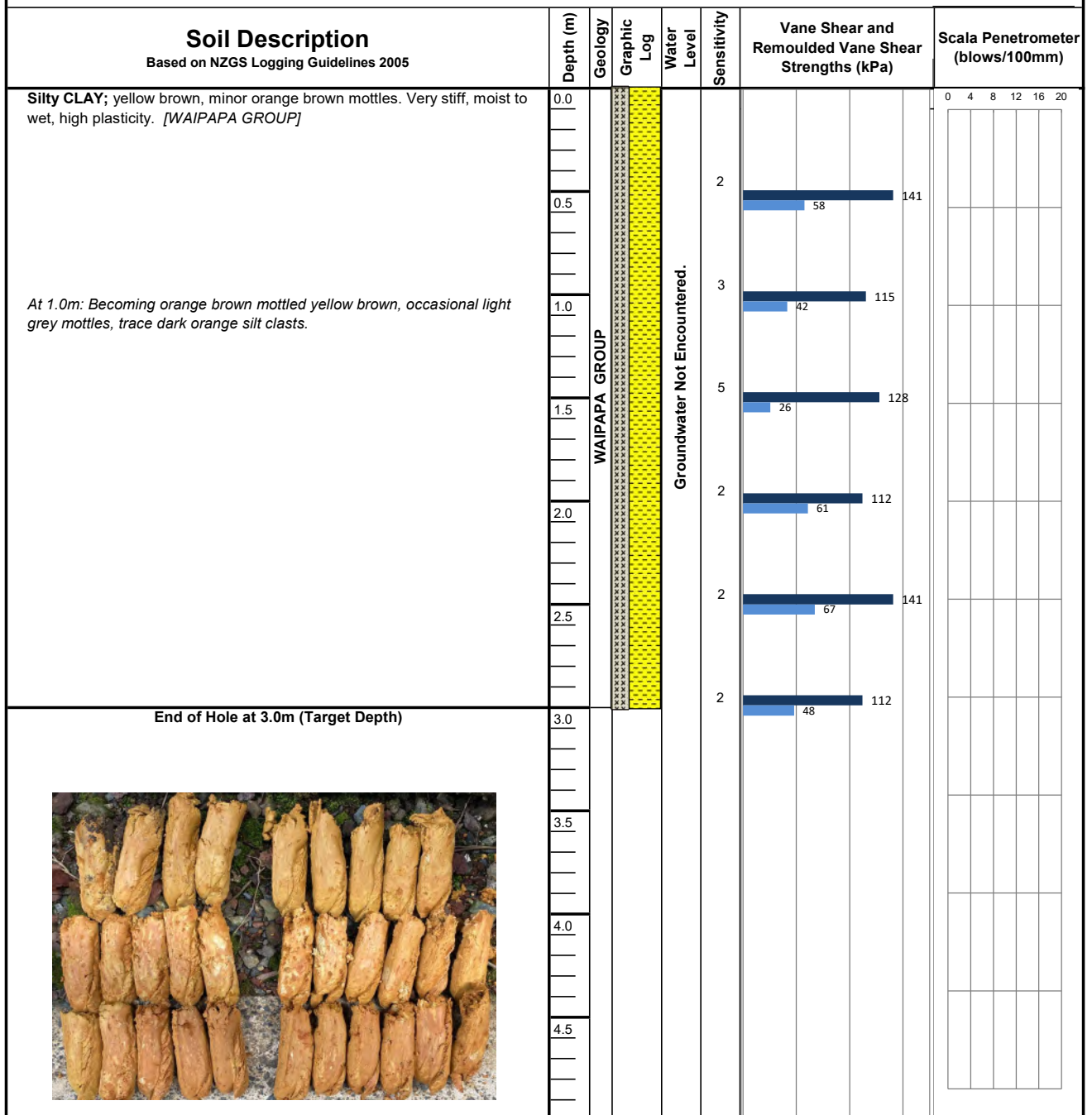
Hand Held Shear Vane S/N: DR2220. Groundwater not encountered.

Corrected shear vane reading  
 Remoulded shear vane reading  
 Scala Penetrometer

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**JOB No. 24 218**

LOGGED BY: JMC  
CHECKED BY: WT



## LEGEND



**Note:** UTP = Unable To Penetrate.

Scala penetrometer testing not undertaken.

Hand Held Shear Vane S/N: DR1617. Groundwater not encountered.

Corrected shear vane reading

Remoulded shear vane reading

Scala Penetrometer

## **APPENDIX C – Design Calculations**



Material Properties for Timber Pole

E =	8.70 GPa	(Young Modulus)	[MGS8, NZS3603 Amendement 4, Table 2.3]
	8.70E+06 kPa		
ρ =	450 kg/m <sup>3</sup>	(Density)	
S =	1.2 m c/c	(Spacing between piles)	0.200 m ϕ
A =	0.031 m <sup>2</sup>	(Sectional Area)	
I =	7.85398E-05 m <sup>4</sup>	(Area Moment of Inertia)	
		per pile	
EA =	2.278E+05 kN/m	= [kN/m <sup>2</sup> ][m <sup>2</sup> ]/[m]	
EI =	569.41 kNm <sup>2</sup> /m	= [kN/m <sup>2</sup> ][m <sup>4</sup> ]/[m]	
w =	0.116 kN/m/m	= [kg/m <sup>3</sup> ][m/s <sup>2</sup> ][m <sup>2</sup> ]/[m]	
I	6.545E-05 m <sup>4</sup> /m	per unit length of wall	
EI	5.6941E-04 kNm <sup>2</sup> /m	= [kN/m <sup>2</sup> ][m <sup>4</sup> ]/[m]	
		per unit length of wall	

Static Loading Check

	(m)	(kNm/m) BM	(kN/m) SF	c/c (m)		
Max Height	1.5	6	7.8	1.2		
Load factor =		1.5				
DESIGN						
(kNm)	(kN)			pole size (mm)	Embedment	Total length (m)
BM	SF	fos	disp (mm)		(m)	
10.8	14.04	1.62	24	200	2.7	4.2
pole design (maximum)						
(kNm)	(kN)					
BM	SF					
12	34					
OK	OK					

Seismic Loading Check

	(m)	(kNm/m) BM	(kN/m) SF	c/c (m)		
Max Height	1.5	8.3	10	1.2		
Load factor =		1				
DESIGN						
(kNm)	(kN)			pole size (mm)	Embedment	Total length (m)
BM	SF	fos	disp (mm)		(m)	
9.96	12	1.27	38	200	2.7	4.2
pole design (maximum)						
(kNm)	(kN)					
BM	SF					
26	78	<-For short term loading (k1 = 1.0)				
OK	OK					

<-For short term loading (k1 = 1.0)

Material Properties for Timber Pole

E =	8.70 GPa	(Young Modulus)	[MGS8, NZS3603 Amendement 4, Table 2.3]
	8.70E+06 kPa		
ρ =	450 kg/m <sup>3</sup>	(Density)	
S =	1.2 m c/c	(Spacing between piles)	0.250 m ϕ
A =	0.049 m <sup>2</sup>	(Sectional Area)	
I =	1.91748E-04 m <sup>4</sup>	(Area Moment of Inertia)	
		per pile	
EA =	3.559E+05 kN/m	= [kN/m <sup>2</sup> ][m <sup>2</sup> ]/[m]	
EI =	1390.17 kNm <sup>2</sup> /m	= [kN/m <sup>2</sup> ][m <sup>4</sup> ]/[m]	
w =	0.181 kN/m/m	= [kg/m <sup>3</sup> ][m/s <sup>2</sup> ][m <sup>2</sup> ]/[m]	
I	1.598E-04 m <sup>4</sup> /m	per unit length of wall	
EI	1.3902E-03 kNm <sup>2</sup> /m	= [kN/m <sup>2</sup> ][m <sup>4</sup> ]/[m]	
		per unit length of wall	

Static Loading Check

	(m)	(kNm/m)	(kN/m)			
		BM	SF	c/c (m)		
Max Height	2	11.7	11.2	1.2		
Load factor =		1.5				
DESIGN						
(kNm)	(kN)			pole size (mm)	Embedment	Total length (m)
BM	SF	fos	disp (mm)		(m)	
21.06	20.16	1.65	32	250	3.4	5.4
pole design (maximum)						
(kNm)	(kN)					
BM	SF					
24	54					
OK	OK					

Seismic Loading Check

	(m)	(kNm/m)		(kN/m)				
		BM		SF		c/c (m)		
Max Height	2	18.7		15.9		1.2		
Load factor =		1						
DESIGN								
(kNm)	(kN)				pole size (mm)	Embedment	Total length (m)	
BM	SF	fos		disp (mm)		(m)		
22.44	19.08	1.33		61	250	3.4	5.4	
pole design (maximum)								
(kNm)	(kN)							
BM	SF							
49	118	<-For short term loading (k1 = 1.0)						
OK	OK							

<-For short term loading (k1 = 1.0)

Material Properties for Timber Pole

E =	8.70 GPa	(Young Modulus) [MGS8, NZS3603 Amendement 4, Table 2.3]	
	8.70E+06 kPa		
ρ =	450 kg/m <sup>3</sup>	(Density)	
S =	1.2 m c/c	(Spacing between piles)	0.350 m ϕ
A =	0.096 m <sup>2</sup>	(Sectional Area)	
I =	7.36618E-04 m <sup>4</sup>	(Area Moment of Inertia)	
		per pile	
EA =	6.975E+05 kN/m = [kN/m <sup>2</sup> ][m <sup>2</sup> ]/[m]		
EI =	5340.48 kNm <sup>2</sup> /m = [kN/m <sup>2</sup> ][m <sup>4</sup> ]/[m]		
w =	0.354 kN/m/m = [kg/m <sup>3</sup> ][m/s <sup>2</sup> ][m <sup>2</sup> ]/[m]		
I	6.138E-04 m <sup>4</sup> /m	per unit length of wall	
EI	5.3405E-03 kNm <sup>2</sup> /m = [kN/m <sup>2</sup> ][m <sup>4</sup> ]/[m]	per unit length of wall	

Static Loading Check

	(m)	(kNm/m)		(kN/m)			
		BM		SF		c/c (m)	
Max Height		2.8		29.8		18.8	1.2
Load factor =				1.5			
DESIGN							
(kNm)	(kN)				pole size (mm)	Embedment	Total length (m)
BM	SF		fos	disp (mm)		(m)	
53.64		33.84		1.65	40	350	4.2
							7
pole design (maximum)							
(kNm)	(kN)						
BM	SF						
		66		106			
OK	OK						

Seismic Loading Check

	(m)	(kNm/m)		(kN/m)			
		BM		SF		c/c (m)	
Max Height	2.8	47.4		27.6		1.2	
Load factor =		1					
DESIGN							
(kNm)	(kN)				pole size (mm)	Embedment	Total length (m)
BM	SF	fos		disp (mm)		(m)	
56.88	33.12	1.38		75	350	4.2	7
pole design (maximum)							
(kNm)	(kN)						
BM	SF						
133	221	<-For short term loading (k1 = 1.0)					
OK	OK						

<-For short term loading (k1 = 1.0)

Material Properties for Timber Pole

E =	8.70 GPa	(Young Modulus)	[MGS8, NZS3603 Amendment 4, Table 2.3]
	8.70E+06 kPa		
ρ =	450 kg/m <sup>3</sup>	(Density)	
S =	1.2 m c/c	(Spacing between piles)	0.275 m ϕ
A =	0.059 m <sup>2</sup>	(Sectional Area)	
I =	2.80738E-04 m <sup>4</sup>	(Area Moment of Inertia)	
		per pile	
EA =	4.306E+05 kN/m	= [kN/m <sup>2</sup> ][m <sup>2</sup> ]/[m]	
EI =	2035.35 kNm <sup>2</sup> /m	= [kN/m <sup>2</sup> ][m <sup>4</sup> ]/[m]	
w =	0.219 kN/m/m	= [kg/m <sup>3</sup> ][m/s <sup>2</sup> ][m <sup>2</sup> ]/[m]	
I	2.339E-04 m <sup>4</sup> /m	per unit length of wall	
EI	2.0353E-03 kNm <sup>2</sup> /m	= [kN/m <sup>2</sup> ][m <sup>4</sup> ]/[m] per unit length of wall	



Static Loading Check

	(m)	(kNm/m)	(kN/m)			
		BM	SF	c/c (m)		
Max Height	2	14.5	13.4	1.2		
	(2.0m out of ground)					
Load factor =		1.5				
DESIGN						
(kNm)	(kN)			pole size (mm)	Embedment	Total length (m)
BM	SF	fos	disp (mm)		(m)	
26.1	24.12	1.69	28	275	3.4	5.4
pole design (maximum)						
(kNm)	(kN)					
BM	SF					
	32	65				
OK	OK					

Seismic Loading Check

	(m)	(kNm/m) BM	(kN/m) SF	c/c (m)		
Max Height	2	21.6	17.6	1.2		
Load factor =		1				
DESIGN						
(kNm)	(kN)			pole size (mm)	Embedment	Total length (m)
BM	SF	fos	disp (mm)		(m)	
25.92	21.12	1.44	49	275	3.4	5.4
pole design (maximum)						
(kNm)	(kN)					
BM	SF					
65	141					
<-For short term loading (k1 = 1.0)						
OK	OK					

Impact Loading Check (300mm stick up, 20kN load)

	(m)	(kNm/m)	(kN/m)			
		BM	SF	c/c (m)		
Max Height	2	53.8	44.1	1.2		
Load factor =		1				
DESIGN						
(kNm)	(kN)			pole size (mm)	Embedment	Total length (m)
BM	SF	fos	disp (mm)		(m)	
64.56	52.92	1.9	n/a	275	3.4	5.4
pole design (maximum)						
(kNm)	(kN)					
BM	SF					
65	141					
<-For short term loading (k1 = 1.0)						
OK	OK					



Project 51 School Rd, Paihia  
Client Amanda Marsh  
Job No 24 218  
Date 19/11/2024  
Calculated by: J. Curreen  
Reviewed by: W. Thorburn  
Comments RW01

Factored load on the plank at the base of the wall =	17.33	kPa	From Wallap
<b>Structural Design of Lagging to NZS 3603:1993</b>			2.8 Height (m) 11.6 kPa 1.5 Load factor 3 Rails Required
<b>Timber Lagging: Structural actions</b>			
Lagging width b =	50	50	2.55 Height (m) 10.4 kPa
Lagging depth d =	150	150	2 Rails Required
For a maximum soil pressure of 17.325 kPa. The UDL on lagging "d" =			
lagging "d" =	2.60	kN/m	
Lagging Span "L" =	1.2	m	
Maximum factored moment $M^* = 1/8 dL^2$	0.468	kNm	0.6 Height (m) 4.73 kPa
Under Flexure, calculate the minimum lagging depth for moment capacity			1 Rails Required

Bending Stress,  $f_b =$  11.7 MPa  
Shear Stress,  $f_s =$  2.4 MPa  
No of parallel support elements, n = 3  
Strength Reduction Factor,  $\phi =$  0.8  
Duration Factor,  $k_1 =$  0.6  
Parallel Support Factor,  $k_4 =$  1.00  
Grid System Factor,  $k_5 =$  1.00

Rails	Height
Single	0 to 0.6
Double	0.6 - 2.55
Triple	2.55 - 2.8

Section modulus of lagging,  $Z = bd^2/6 =$  187500 mm<sup>3</sup>  
 $\phi M_n = \phi k_1 k_4 k_5 f_b Z =$  1.053 kNm  
Percentage of lagging moment capacity utilised 44%

**Lagging OK for Moment Capacity!**  
**Check for Shear Capacity**

For 150 x 50 lagging. Shear surface area = 5000.0 mm<sup>2</sup>  
 $\phi V_n = \phi k_1 k_4 k_5 f_s A_s =$  5.760 kN  
Compare with  $V^* =$  1.949 kN  
Percentage of Shear capacity utilised 34%

**Lagging OK for Shear Capacity!**

Use 150 x (3)50 lagging, spanning continuously across a minimum of 2 pole spacings

**Project** 51 School Rd, Paihia  
**Client** Amanda Marsh  
**Job No** 24 218  
**Date** 19/11/2024  
**Calculated by:** J. Curreen  
**Reviewed by:** W. Thorburn  
**Comments** RW02

Factored load on the plank at the base of the wall =	15.50	kPa	From Wallap
<b>Structural Design of Lagging to NZS 3603:1993</b>			2 Height (m)
<b>Timber Lagging: Structural actions</b>			10.3 kPa
Lagging width b =	50	50	1.5 Load factor
Lagging depth d =	150	150	2 Rails Required
For a maximum soil pressure of 15.495 kPa. The UDL on lagging "d" =	2.32	kN/m	0.75 Height (m)
Lagging Span "L" =	1.2	m	5.1 kPa
Maximum factored moment $M^* = 1/8 dL^2$	0.418	kNm	1 Rails Required

Under Flexure, calculate the minimum lagging depth for moment capacity

Bending Stress,  $f_b = 11.7$  MPa  
Shear Stress,  $f_s = 2.4$  MPa  
No of parallel support elements,  $n = 2$   
Strength Reduction Factor,  $\phi = 0.8$   
Duration Factor,  $k_1 = 0.6$   
Parallel Support Factor,  $k_4 = 1.00$   
Grid System Factor,  $k_5 = 1.00$

Rails	Height
Single	0 to 0.75
Double	0.75 - 2.0

Section modulus of lagging,  $Z = bd^2/6 = 125000$  mm<sup>3</sup>  
 $\phi M_n = \phi k_1 k_4 k_5 f_b Z = 0.702$  kNm  
Percentage of lagging moment capacity utilised 60%

**Lagging OK for Moment Capacity!**

**Check for Shear Capacity**

For 150 x 50 lagging. Shear surface area = 5000.0 mm<sup>2</sup>

$\phi V_n = \phi k_1 k_4 k_5 f_s A_s = 5.760$  kN  
Compare with  $V^* = 1.743$  kN

$V^* = 0.625 vL$

Percentage of Shear capacity utilised 30%

**Lagging OK for Shear Capacity!**

Use 150 x (2)50 lagging, spanning continuously across a minimum of 2 pole spacings

CONSTRUCTION STAGES	
Construction stage no.	Stage description
1	Excavate to elevation -2.80 on RIGHT side
2	Apply surcharge no.1 at elevation 0.00
3	Apply surcharge no.2 at elevation 0.00
4	Apply surcharge no.3 at elevation 0.00

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.50

## FACTORS OF SAFETY and ANALYSIS OPTIONS

```

Stability analysis:
Method of analysis - Strength Factor method
Factor on soil strength for calculating wall depth = 1.50

Parameters for undrained strata:
Minimum equivalent fluid density      = 5.00 kN/m3
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
Method - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 0 m

```

Boundary conditions:  
Length of wall (normal to plane of analysis) = 1000.00 m  
Width of excavation/fill on Left side of wall = 20.00 m  
Width of excavation/fill on Right side of wall = 20.00 m

Distance to rigid boundary on Left side = 20.00 m  
Distance to rigid boundary on Right side = 20.00 m

## OUTPUT OPTIONS

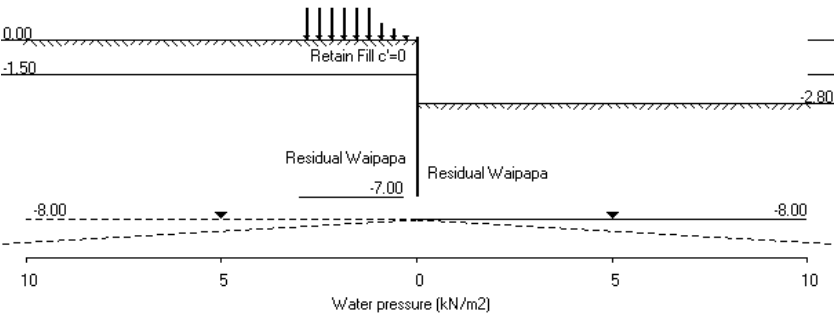
Stage no.	Stage description	Displacement Bending mom. Shear force	Output options Active, Passive pressures	Graph. output
1	Excav. to elev. -2.80 on RIGHT side	Yes	Yes	Yes
2	Apply surcharge no.1 at elev. 0.00	Yes	Yes	Yes
3	Apply surcharge no.2 at elev. 0.00	Yes	Yes	Yes
4	Apply surcharge no.3 at elev. 0.00	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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Note: L = Left side, R = Right side  
A ramp surcharge is defined by two values:  
N = at edge near to wall, F = at edge far from wall

Units: kN,m

Stage No.4 Apply surcharge no.3 at elev. 0.00



Units: kN,m

Stage No. 4 Apply surcharge no.3 at elevation 0.00

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**  
Factor of safety on soil strength

Stage No.	Ground level Act.	Pass.	Prop Elev.	FoS for toe elev. = -7.00		Toe elev. for FoS = 1.500		Direction of failure
				Factor of Safety	Moment of equilb. at elev.	Toe elev.	Wall Penetration	
4	0.00	-2.80	Cant.	1.651	-6.51	-6.42	3.62	L to R

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**  
Analysis options

Soldier Pile width = 0.35m; spacing = 1.20m  
Passive mobilisation factor = 3.000  
Subgrade reaction model - Boussinesq Influence coefficients  
Soil deformations are elastic until the active or passive limit is reached

Length of wall perpendicular to section = 1000.00m  
Rigid boundaries: Left side 20.00m from wall  
Right side 20.00m from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop Forces kN/m
1	0.00	0.00	0.040	1.19E-02	0.0	0.0	
2	-0.40	3.16	0.035	1.19E-02	0.6	0.1	
3	-0.80	6.30	0.030	1.18E-02	2.5	0.7	
4	-1.15	9.00	0.026	1.18E-02	5.2	2.0	
5	-1.50	11.63	0.022	1.15E-02	8.8	4.4	
		3.62	0.022	1.15E-02	8.8	4.4	
6	-1.75	5.23	0.019	1.13E-02	9.9	6.8	
7	-2.00	6.80	0.016	1.09E-02	11.4	9.4	
8	-2.40	9.23	0.012	1.00E-02	14.6	14.6	
9	-2.80	11.55	0.008	8.71E-03	18.8	21.2	
		-11.76	0.008	8.71E-03	18.8	21.2	
10	-3.20	-34.28	0.005	6.88E-03	9.6	27.7	
11	-3.60	-44.91	0.003	4.73E-03	-6.3	29.8	
12	-4.00	-11.19	0.001	2.72E-03	-17.5	23.7	
13	-4.40	6.38	0.001	1.25E-03	-18.4	15.8	
14	-4.80	12.51	0.000	3.27E-04	-14.7	8.9	
15	-5.20	12.57	0.000	-1.57E-04	-9.7	4.0	
16	-5.60	9.96	0.000	-3.52E-04	-5.1	1.2	
17	-6.00	6.50	0.001	-3.93E-04	-1.9	-0.1	
18	-6.40	3.02	0.001	-3.78E-04	0.0	-0.3	
19	-6.70	0.18	0.001	-3.65E-04	0.5	-0.2	
20	-7.00	-3.69	0.001	-3.60E-04	0.0	-0.0	

Node no.	Y coord	Effective stresses					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press.	Vertic -al	Active limit	Passive limit	Earth pressure		
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2616
2	-0.40	0.00	9.34	3.16	29.40	3.16	3.16a	2616
3	-0.80	0.00	18.62	6.30	58.61	6.30	6.30a	2616
4	-1.15	0.00	26.60	9.00	83.75	9.00	9.00a	2616



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(continued)

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Stage No.4    Apply surcharge no.3 at elevation 0.00

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Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method  
Factor of safety on soil strength

LEFT side								
Effective stresses						Total	Coeff. of	
Node	Y	Water	Vertic	Active	Passive	Earth	earth	subgrade
no.	coord	press.	-al	limit	limit	pressure	pressure	reaction
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
5	-1.50	0.00	34.39	11.63	108.26	11.63	11.63a	2616
		0.00	34.39	3.62	158.60	3.62	3.62a	6540
6	-1.75	0.00	40.04	5.23	180.57	5.23	5.23a	6540
7	-2.00	0.00	45.55	6.80	201.97	6.80	6.80a	6540
8	-2.40	0.00	54.06	9.23	235.04	9.23	9.23a	6540
9	-2.80	0.00	62.21	11.55	266.72	11.55	11.55a	6540
		0.00	62.21	11.55	233.38	11.55	11.55a	6540
10	-3.20	0.00	70.05	13.79	260.03	13.79	13.79a	6540
11	-3.60	0.00	77.62	15.95	285.78	16.06	16.06	6540
12	-4.00	0.00	84.98	18.05	310.78	30.09	30.09	6540
13	-4.40	0.00	92.16	20.09	335.44	39.11	39.11	6540
14	-4.80	0.00	99.20	22.10	359.64	44.86	44.86	6540
15	-5.20	0.00	106.14	24.08	383.49	48.56	48.56	6540
16	-5.60	0.00	113.00	26.04	407.09	51.23	51.23	6540
17	-6.00	0.00	119.81	27.98	430.50	53.55	53.55	6540
18	-6.40	0.00	126.59	29.91	453.79	55.83	55.83	6540
19	-6.70	0.00	131.65	31.36	471.20	57.43	57.43	6540
20	-7.00	0.00	136.71	32.80	488.58	58.61	58.61	6540

		FoS for toe		Toe elev. for			
		elev. = -7.00		FoS = 1.500			
Stage	Ground level	Prop	Factor	Moment	Toe	Wall	Direction
No.	Act.	Pass.	Elev.	of	elev.	Penetr	of
				Safety	at elev.	-ation	failure
1	0.00	-2.80	Cant.	1.903	-6.48	-5.70	2.90
2	0.00	-2.80	Cant.	1.748	-6.47	-6.12	3.32
3	0.00	-2.80	Cant.	1.680	-6.50	-6.31	3.51
4	0.00	-2.80	Cant.	1.651	-6.51	-6.42	3.62
							L to R

RIGHT side								
Effective stresses						Total	Coeff. of	
Node	Y	Water	Vertic	Active	Passive	Earth	earth	subgrade
no.	coord	press.	-al	limit	limit	pressure	pressure	reaction
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	-0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	-0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	-1.15	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	-1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	-2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	-2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	23.31	23.31	23.31p	14009
10	-3.20	0.00	7.20	0.00	48.07	48.07	48.07p	14009
11	-3.60	0.00	14.40	0.00	72.82	60.97	60.97	14009
12	-4.00	0.00	21.60	0.00	97.57	41.28	41.28	14009
13	-4.40	0.00	28.81	2.03	122.33	32.73	32.73	14009
14	-4.80	0.00	36.02	4.08	147.09	32.35	32.35	14009
15	-5.20	0.00	43.24	6.14	171.87	35.99	35.99	14009
16	-5.60	0.00	50.46	8.20	196.66	41.28	41.28	14009
17	-6.00	0.00	57.68	10.26	221.48	47.05	47.05	14009
18	-6.40	0.00	64.92	12.32	246.31	52.81	52.81	14009
19	-6.70	0.00	70.35	13.87	264.96	57.26	57.26	14009
20	-7.00	0.00	75.78	15.42	283.62	62.30	62.30	14009

Note:        13.79 a    Soil pressure at active limit  
              48.07 p    Soil pressure at passive limit

Summary of results (continued)

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options  
Soldier Pile width = 0.35m; spacing = 1.20m  
Passive mobilisation factor = 3.000  
Subgrade reaction model - Boussinesq Influence coefficients  
Soil deformations are elastic until the active or passive limit is reached

Length of wall perpendicular to section = 1000.00m  
Rigid boundaries: Left side 20.00m from wall  
Right side 20.00m from wall

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum	minimum	maximum	minimum	maximum	minimum
		m	m	kN.m/m	kN.m/m	kN/m	kN/m
1	0.00	0.040	0.000	0.0	0.0	0.0	0.0
2	-0.40	0.035	0.000	0.1	0.0	0.6	0.0
3	-0.80	0.030	0.000	0.7	0.0	2.5	0.0
4	-1.15	0.026	0.000	2.0	0.0	5.2	0.0
5	-1.50	0.022	0.000	4.4	0.0	8.8	0.0
6	-1.75	0.019	0.000	6.8	0.0	9.9	0.0
7	-2.00	0.016	0.000	9.4	0.0	11.4	0.0
8	-2.40	0.012	0.000	14.6	0.0	14.6	0.0
9	-2.80	0.008	0.000	21.2	0.0	18.8	0.0
10	-3.20	0.005	0.000	27.7	0.0	9.6	0.0
11	-3.60	0.003	0.000	29.8	0.0	0.0	-8.8
12	-4.00	0.001	0.000	23.7	0.0	0.0	-17.5
13	-4.40	0.001	0.000	15.8	0.0	0.0	-18.4
14	-4.80	0.000	0.000	8.9	0.0	0.0	-14.7
15	-5.20	0.000	0.000	4.0	0.0	0.0	-9.7
16	-5.60	0.000	0.000	1.2	0.0	0.0	-5.1
17	-6.00	0.001	0.000	0.0	-0.3	0.0	-1.9
18	-6.40	0.001	0.000	0.0	-0.3	0.4	0.0
19	-6.70	0.001	0.000	0.0	-0.2	0.5	0.0
20	-7.00	0.001	0.000	0.0	-0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum	elev.	minimum	elev.	maximum	elev.	minimum	elev.
	kN.m/m		kN.m/m		kN/m		kN/m	
1	18.0	-3.20	-0.3	-6.00	12.2	-2.80	-11.9	-4.00
2	25.4	-3.60	-0.3	-6.40	16.4	-2.80	-15.9	-4.00
3	28.3	-3.60	-0.3	-6.40	18.0	-2.80	-17.6	-4.40
4	29.8	-3.60	-0.3	-6.40	18.8	-2.80	-18.4	-4.40

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.022	0.00	0.000	0.00	Excav. to elev. -2.80 on RIGHT side
2	0.034	0.00	0.000	0.00	Apply surcharge no.1 at elev. 0.00
3	0.038	0.00	0.000	0.00	Apply surcharge no.2 at elev. 0.00
4	0.040	0.00	0.000	0.00	Apply surcharge no.3 at elev. 0.00

CONSTRUCTION STAGES	
Construction stage no.	Stage description
1	Excavate to elevation -2.80 on RIGHT side
2	Apply surcharge no.1 at elevation 0.00
3	Apply surcharge no.2 at elevation 0.00
4	Apply seismic loading: 0.0800g horizontal Line of action of quasi-static seismic force = 0.333 Seismic loading model: Quasi-static loading

Units: kN, m

Stratum no.	Elevation of top of stratum	Soil types	
		Left side	Right side
1	0.00	1 Retain Fill c'=0	1 Retain Fill c'=0
2	-1.50	3 Residual Waipapa	3 Residual Waipapa

-- Soil type --	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy )	At rest coeff. Ko (dKo/dy)	Consol state. limit NC/OC ( Nu )	Active limit ( Kac )	Passive limit ( Kpc )	Cohesion kN/m2 ( dc/dy )
1 Retain Fill c'=0	17.00	10000	0.500	NC (0.250)	0.338 (1.357)	3.148 (4.404)	0.0d
2 Not defined							
3 Residual Waipapa	18.00	25000	0.500	OC (0.250)	0.285 (1.238)	3.886 (4.998)	5.000d

--- parameters for Ka ---				--- parameters for Kp ---			
Soil      Wall      Back-				Soil      Wall      Back-			
----- Soil type -----	friction	adhesion	fill	friction	adhesion	fill	
No. Description	angle	coeff.	angle	angle	coeff.	angle	
1 Retain Fill c'=0	26.00	0.640	0.00	26.00	0.312	0.00	
2 Not defined							
3 Residual Waipapa	30.00	0.631	0.00	30.00	0.305	0.00	

Density of water = 10.00 kN/m3	Left side	Right side
Initial water table elevation	-8.00	-8.00
Automatic water pressure balancing at toe of wall : No		

```

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.35 m
Soldier Pile spacing = 1.20 m
Passive mobilisation factor = 3.00
Elevation of toe of wall = -7.00
Maximum finite element length = 0.40 m
Youngs modulus of wall E = 8.7000E+06 kN/m2
Moment of inertia of wall I = 6.1385E-04 m4/m run
= 7.3662E-04 m4 per pile
E.I = 5340.5 kN.m2/m run
Yield Moment of wall = Not defined

```

Surcharge		Distance	Length	Width	Surcharge (kN/m <sup>2</sup> )		Surcharge	Part	Short Q	
no.	Elev.	from wall	parallel to wall	perpend. to wall	Near edge	Far edge	Cat.	Soil type	fact.	reduc. fact.
1	0.00	0.00(L)	15.00	2.00	0.00	20.00	QGL	--	--	1.00
2	0.00	2.00(L)	15.00	3.00	20.00	=	QGL	--	--	0.94
3	0.00	2.00(L)	15.00	3.00	10.00	=	QGL	--	--	0.94

Note: L = Left side, R = Right side  
 A ramp surcharge is defined by two values:  
 N = at edge near to wall, F = at edge far from wall  
 Surcharge types: QGL Surcharge at or below GL  
 SOL (n) Soil fill (n = soil type)  
 TOP Surcharge on top of soil fill

Construction stage no.	Stage description
1	Excavate to elevation -2.80 on RIGHT side
2	Apply surcharge no.1 at elevation 0.00
3	Apply surcharge no.2 at elevation 0.00
4	Apply seismic loading: 0.0800g horizontal Line of action of quasi-static seismic force = 0.333 Seismic loading model: Quasi-static loading

```
Stability analysis:
Method of analysis - Strength Factor method
Factor on soil strength for calculating wall depth = 1.00
Active limit pressures by Wedge Analysis (Seismic Stages only)
Passive limit pressures by Wedge Analysis (Seismic Stages only)
```

Parameters for undrained strata:

Minimum equivalent fluid density	=	5.00 kN/m3
Maximum depth of water filled tension crack	=	0.00 m

Bending moment and displacement calculation:  
Method - Subgrade reaction model using Influence Coefficients  
Open Tension Crack analysis? - No  
Non-linear Modulus Parameter (I) = 0 m

Boundary conditions:  
Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation/fill on Left side of wall = 20.00 m  
Width of excavation/fill on Right side of wall = 20.00 m

Distance to rigid boundary on Left side = 20.00 m  
Distance to rigid boundary on Right side = 20.00 m

Stage no.	Stage description	Displacement Bending mom. Shear force	Output options Active, Passive pressures	Graph. output
1	Excav. to elev. -2.80 on RIGHT side	Yes	Yes	Yes
2	Apply surcharge no.1 at elev. 0.00	Yes	Yes	Yes
3	Apply surcharge no.2 at elev. 0.00	Yes	Yes	Yes
4	Quasi-static Seismic load: 0.080g(H)	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

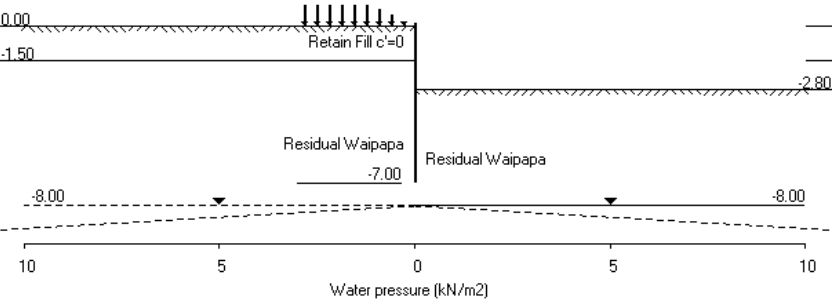
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HAIGH WORKMAN LTD  
Program: WALLAP Version 6.09 Revision A59.B77.R60  
Data filename/Run ID: RW01\_2-8m\_seismic  
RW01\_2.8m\_seismic  
51 School Road, Paihia

Sheet No.  
Job No. 24 218  
Made by : JMC  
Date:12-11-2024  
Checked :

Units: kN,m

Stage No.4 Quasi-static Seismic load: 0.080g(H)



HAIGH WORKMAN LTD  
Program: WALLAP Version 6.09 Revision A59.B77.R60  
Data filename/Run ID: RW01\_2-8m\_seismic  
RW01\_2.8m\_seismic  
51 School Road, Paihia

Sheet No.  
Job No. 24 218  
Made by : JMC  
Date:12-11-2024  
Checked :

Units: kN,m

Stage No. 4 Apply seismic loading:  
0.0800g horizontal  
Line of action of quasi-static seismic force = 0.333  
Seismic loading model: Quasi-static loading

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**

Factor of safety on soil strength  
Active limit pressures by Wedge Analysis (Seismic Stages only)  
Passive limit pressures by Wedge Analysis (Seismic Stages only)

Stage No.	Ground level Act.	Pass.	Prop Elev.	FoS for toe elev. = -7.00		Toe elev. for FoS = 1.000		Direction of failure
				Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetration	
4	0.00	-2.80	Cant.	1.388	-6.50	-5.08	2.28	L to R

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**

Analysis options  
Soldier Pile width = 0.35m; spacing = 1.20m  
Passive mobilisation factor = 3.000  
Subgrade reaction model - Boussinesq Influence coefficients  
Soil deformations are elastic until the active or passive limit is reached  
Active and Passive limit pressures by [Wedge Analysis](#) (Seismic Stages only)  
[Short Surcharge](#) No.2 is treated as an equivalent infinitely long surcharge with reduced magnitude

Length of wall perpendicular to section = 1000.00m  
Rigid boundaries: Left side 20.00m from wall  
Right side 20.00m from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m
1	0.00	0.00	0.075	2.11E-02	0.0	0.0	
2	-0.40	4.06	0.066	2.11E-02	0.8	0.1	
3	-0.80	8.81	0.058	2.11E-02	3.4	0.9	
4	-1.15	13.51	0.050	2.10E-02	7.3	2.7	
5	-1.50	17.33	0.043	2.07E-02	12.7	6.2	
		6.26	0.043	2.07E-02	12.7	6.2	
6	-1.75	9.09	0.038	2.03E-02	14.6	9.6	
7	-2.00	10.99	0.033	1.98E-02	17.1	13.5	
8	-2.40	13.02	0.025	1.85E-02	21.9	21.3	
9	-2.80	15.34	0.018	1.65E-02	27.6	31.2	
		-9.65	0.018	1.65E-02	27.6	31.2	
10	-3.20	-30.71	0.012	1.38E-02	19.5	41.4	
11	-3.60	-48.71	0.007	1.05E-02	3.6	47.4	
12	-4.00	-47.72	0.004	7.06E-03	-15.7	45.0	
13	-4.40	-10.90	0.001	4.06E-03	-27.4	35.1	
14	-4.80	12.54	0.000	1.88E-03	-27.0	23.2	
15	-5.20	18.12	-0.000	5.10E-04	-20.9	13.4	
16	-5.60	17.49	-0.000	-2.34E-04	-13.8	6.5	
17	-6.00	13.85	-0.000	-5.66E-04	-7.5	2.4	
18	-6.40	9.16	0.000	-6.73E-04	-2.9	0.5	
19	-6.70	5.14	0.000	-6.86E-04	-0.8	0.0	
20	-7.00	0.04	0.001	-6.86E-04	0.0	-0.0	



(continued)

Stage No.4    Apply seismic loading:  
                 0.0800g horizontal  
                 Line of action of quasi-static seismic force = 0.333  
                 Seismic loading model: Quasi-static loading

(continued)

Stage No.4    Apply seismic loading:  
                 0.0800g horizontal  
                 Line of action of quasi-static seismic force = 0.333  
                 Seismic loading model: Quasi-static loading

Note:            23.86 a    Soil pressure at active limit  
                 69.33 p    Soil pressure at passive limit  
                            t    Wedge analysis at this node in Turbo Mode

LEFT side								
Effective stresses							Total	Coeff. of
Node	Y	Water	Vertic	Active	Passive	Earth	earth	subgrade
no.	coord	press.	-al	limit	limit	pressure	pressure	reaction
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2607
2	-0.40	0.00	9.31	4.06 t	40.05	4.06	4.06a	2607
3	-0.80	0.00	18.41	8.81 t	83.39	8.81	8.81a	2607
4	-1.15	0.00	26.08	13.51	120.66	13.51	13.51a	2607
5	-1.50	0.00	33.46	17.33 t	154.77	17.33	17.33a	2607
		0.00	33.46	6.26	196.84	6.26	6.26a	6517
6	-1.75	0.00	38.79	9.09	223.15	9.09	9.09a	6517
7	-2.00	0.00	43.98	10.99 t	244.82	10.99	10.99a	6517
8	-2.40	0.00	52.02	13.02 t	248.90	13.02	13.02a	6517
9	-2.80	0.00	59.77	15.34 t	241.15	15.34	15.34a	6517
		0.00	59.77	15.34	211.00	15.34	15.34a	6517
10	-3.20	0.00	67.29	18.20 t	229.87	18.20	18.20a	6517
11	-3.60	0.00	74.62	20.62 t	252.84	20.62	20.62a	6517
12	-4.00	0.00	81.81	23.86 t	272.47	23.86	23.86a	6517
13	-4.40	0.00	88.89	26.07 t	293.67	32.77	32.77	6517
14	-4.80	0.00	95.88	28.22 t	322.71	44.12	44.12	6517
15	-5.20	0.00	102.81	31.82 t	349.10	50.70	50.70	6648
16	-5.60	0.00	109.70	36.34 t	373.08	54.35	54.35	6648
17	-6.00	0.00	116.56	37.78 t	398.21	56.56	56.56	6648
18	-6.40	0.00	123.40	38.19 t	424.40	58.22	58.22	6648
19	-6.70	0.00	128.52	40.44	444.34	59.22	59.22	6648
20	-7.00	0.00	133.65	42.38 t	461.31	59.77	59.77	6648

RIGHT side								
Effective stresses							Total	Coeff. of
Node	Y	Water	Vertic	Active	Passive	Earth	earth	subgrade
no.	coord	press.	-al	limit	limit	pressure	pressure	reaction
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	-0.40	0.00	0.00	0.00 t	0.00	0.00	0.00	0.0
3	-0.80	0.00	0.00	0.00 t	0.00	0.00	0.00	0.0
4	-1.15	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	-1.50	0.00	0.00	0.00 t	0.00	0.00	0.00	0.0
6	-1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	-2.00	0.00	0.00	0.00 t	0.00	0.00	0.00	0.0
8	-2.40	0.00	0.00	0.00 t	0.00	0.00	0.00	0.0
9	-2.80	0.00	0.00	0.00 t	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	24.99	24.99p	13606
10	-3.20	0.00	7.20	0.00 t	48.92	48.92	48.92p	13606
11	-3.60	0.00	14.40	0.00 t	69.33	69.33	69.33p	13606
12	-4.00	0.00	21.60	0.00 t	92.27	71.58	71.58	13606
13	-4.40	0.00	28.81	0.00 t	116.42	43.67	43.67	13606
14	-4.80	0.00	36.02	0.49 t	138.87	31.58	31.58	13606
15	-5.20	0.00	43.24	3.46 t	161.44	32.57	32.57	6648
16	-5.60	0.00	50.46	7.22 t	185.51	36.86	36.86	6648
17	-6.00	0.00	57.68	8.84 t	211.99	42.71	42.71	6648
18	-6.40	0.00	64.92	10.47 t	235.26	49.06	49.06	6648
19	-6.70	0.00	70.35	11.76	248.81	54.08	54.08	6648
20	-7.00	0.00	75.78	13.08 t	266.31	59.72	59.72	6648

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method  
Factor of safety on soil strength  
Active limit pressures by Wedge Analysis (Seismic Stages only)  
Passive limit pressures by Wedge Analysis (Seismic Stages only)

Stage No.	Ground level Act. Pass.		Prop Elev.	FoS for toe elev. = -7.00		Toe elev. for FoS = 1.000		Direction of failure
				Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetration	
1	0.00	-2.80	Cant.	1.902	-6.48	-4.21	1.41	L to R
2	0.00	-2.80	Cant.	1.747	-6.47	-4.43	1.63	L to R
3	0.00	-2.80	Cant.	1.681	-6.50	-4.51	1.71	L to R
4	0.00	-2.80	Cant.	1.388	-6.50	-5.08	2.28	L to R

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options  
Soldier Pile width = 0.35m; spacing = 1.20m  
Passive mobilisation factor = 3.000  
Subgrade reaction model - Boussinesq Influence coefficients  
Soil deformations are elastic until the active or passive limit is reached  
Active and Passive limit pressures by [Wedge Analysis](#) (Seismic Stages only)  
[Short Surcharge](#) No.2 is treated as an equivalent infinitely long surcharge with reduced magnitude

Length of wall perpendicular to section = 1000.00m  
Rigid boundaries: Left side 20.00m from wall  
Right side 20.00m from wall

Bending moment, shear force and displacement envelopes								
Node no.	Y coord	Displacement		Bending moment		Shear force		
		maximum	minimum	maximum	minimum	maximum	minimum	
		m	m	kN.m/m	kN.m/m	kN/m	kN/m	
1	0.00	0.075	0.000	0.0	0.0	0.0	0.0	
2	-0.40	0.066	0.000	0.1	0.0	0.8	0.0	
3	-0.80	0.058	0.000	0.9	0.0	3.4	0.0	
4	-1.15	0.050	0.000	2.7	0.0	7.3	0.0	
5	-1.50	0.043	0.000	6.2	0.0	12.7	0.0	
6	-1.75	0.038	0.000	9.6	0.0	14.6	0.0	
7	-2.00	0.033	0.000	13.5	0.0	17.1	0.0	
8	-2.40	0.025	0.000	21.3	0.0	21.9	0.0	
9	-2.80	0.018	0.000	31.2	0.0	27.6	0.0	
10	-3.20	0.012	0.000	41.4	0.0	19.5	0.0	
11	-3.60	0.007	0.000	47.4	0.0	3.6	-8.8	
12	-4.00	0.004	0.000	45.0	0.0	0.0	-17.0	
13	-4.40	0.001	0.000	35.1	0.0	0.0	-27.4	
14	-4.80	0.000	0.000	23.2	0.0	0.0	-27.0	
15	-5.20	0.000	-0.000	13.4	0.0	0.0	-20.9	
16	-5.60	0.000	-0.000	6.5	0.0	0.0	-13.8	
17	-6.00	0.001	-0.000	2.4	-0.3	0.0	-7.5	
18	-6.40	0.001	0.000	0.5	-0.3	0.4	-2.9	
19	-6.70	0.001	0.000	0.0	-0.2	0.5	-0.8	
20	-7.00	0.001	0.000	0.0	-0.0	0.0	0.0	

Maximum and minimum bending moment and shear force at each stage								
Stage no.	Bending moment				Shear force			
	maximum	elev.	minimum	elev.	maximum	elev.	minimum	elev.
	kN.m/m		kN.m/m		kN/m		kN/m	
1	18.0	-3.20	-0.3	-6.00	12.2	-2.80	-11.9	-4.00
2	25.4	-3.60	-0.3	-6.40	16.4	-2.80	-15.9	-4.00
3	28.3	-3.60	-0.3	-6.40	18.0	-2.80	-17.6	-4.40
4	47.4	-3.60	-0.0	-7.00	27.6	-2.80	-27.4	-4.40

Maximum and minimum displacement at each stage					
Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.022	0.00	0.000	0.00	Excav. to elev. -2.80 on RIGHT side
2	0.034	0.00	0.000	0.00	Apply surcharge no.1 at elev. 0.00
3	0.038	0.00	0.000	0.00	Apply surcharge no.2 at elev. 0.00
4	0.075	0.00	-0.000	-5.60	Quasi-static Seismic load: 0.080g(H)

CONSTRUCTION STAGES	
Construction stage no.	Stage description
1	Excavate to elevation -2.00 on RIGHT side
2	Apply surcharge no.1 at elevation 0.00
3	Apply surcharge no.2 at elevation 0.00

## FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Stability analysis:  
Method of analysis - Strength Factor method  
Factor on soil strength for calculating wall depth = 1.50

Parameters for undrained strata:

Minimum equivalent fluid density	=	5.00 kN/m3
Maximum depth of water filled tension crack	=	0.00 m

Bending moment and displacement calculation:  
 Method - Subgrade reaction model using Influence Coefficients  
 Open Tension Crack analysis? - No  
 Non-linear Modulus Parameter (I) = 0 m

Boundary conditions:  
Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation/fill on Left side of wall = 20.00 m  
Width of excavation/fill on Right side of wall = 20.00 m

Distance to rigid boundary on Left side = 20.00 m  
Distance to rigid boundary on Right side = 20.00 m

Stage no.	Stage description	Displacement	Active	Graph.
		Bending mom.	Passive	output
		Shear force	pressures	
1	Excav. to elev. -2.00 on RIGHT side	Yes	Yes	Yes
2	Apply surcharge no.1 at elev. 0.00	No	No	No
3	Apply surcharge no.2 at elev. 0.00	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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```

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.28 m
Soldier Pile spacing = 1.20 m
Passive mobilisation factor = 3.00
Elevation of toe of wall = -5.40
Maximum finite element length = 0.30 m
Youngs modulus of wall E = 8.7000E+06 kN/m2
Moment of inertia of wall I = 2.3395E-04 m4/m run
                             = 2.8074E-04 m4 per pile
                             E.I = 2035.4 kN.m2/m run
Yield Moment of wall = Not defined

```

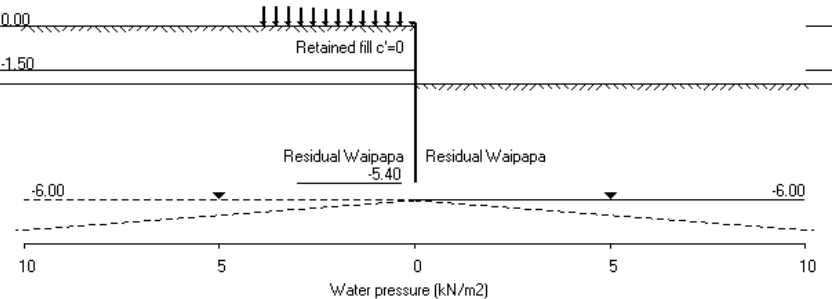
Surcharge		Distance	Length	Width	Surcharge (kN/m <sup>2</sup> )		Surcharge	Part	Short Q
no.	Elev.	from wall	parallel to wall	perpend. to wall	Near edge	Far edge	Cat.	Soil type	fact. reduc.
1	0.00	0.30 (L)	8.00	5.00	10.00	=	--	--	--
2	0.00	0.00 (L)	8.00	5.30	0.00	4.70	--	--	--

A ramp surcharge is defined by two values:

N = at edge near to wall, F = at edge far from wall

Units: kN,m

Stage No.3 Apply surcharge no.2 at elev. 0.00



Units: kN,m

Stage No. 3 Apply surcharge no.2 at elevation 0.00

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**  
Factor of safety on soil strength

Stage No.	Ground level Act.	Pass.	Prop Elev.	FoS for toe elev. = -5.40		Toe elev. for FoS = 1.500		Direction of failure
				Factor of Safety	Moment of equilb. at elev.	Toe elev.	Wall Penetration	
3	0.00	-2.00	Cant.	1.695	-4.95	-4.86	2.86	L to R

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**  
Analysis options

Soldier Pile width = 0.28m; spacing = 1.20m  
Passive mobilisation factor = 3.000  
Subgrade reaction model - Boussinesq Influence coefficients  
Soil deformations are elastic until the active or passive limit is reached

Length of wall perpendicular to section = 1000.00m  
Rigid boundaries: Left side 20.00m from wall  
Right side 20.00m from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m
1	0.00	0.00	0.028	1.14E-02	0.0	0.0	
2	-0.30	2.40	0.025	1.14E-02	0.4	0.0	
3	-0.60	5.08	0.021	1.14E-02	1.5	0.3	
4	-0.90	7.36	0.018	1.13E-02	3.3	1.0	
5	-1.20	9.42	0.015	1.10E-02	5.9	2.4	
6	-1.50	11.35	0.011	1.05E-02	9.0	4.6	
		7.28	0.011	1.05E-02	9.0	4.6	
7	-1.75	8.82	0.009	9.87E-03	11.0	7.1	
8	-2.00	10.33	0.006	8.81E-03	13.4	10.1	
		-13.09	0.006	8.81E-03	13.4	10.1	
9	-2.20	-21.98	0.005	7.70E-03	9.9	12.5	
10	-2.40	-30.88	0.003	6.40E-03	4.6	14.0	
11	-2.70	-36.15	0.002	4.30E-03	-5.5	14.5	
12	-3.00	-7.57	0.001	2.40E-03	-12.0	11.2	
13	-3.30	6.71	0.000	1.04E-03	-12.1	7.3	
14	-3.60	11.45	0.000	2.22E-04	-9.4	3.9	
15	-3.90	11.02	0.000	-1.86E-04	-6.1	1.6	
16	-4.20	8.49	0.000	-3.26E-04	-3.1	0.3	
17	-4.50	5.52	0.000	-3.28E-04	-1.0	-0.3	
18	-4.80	2.68	0.000	-2.84E-04	0.2	-0.3	
19	-5.10	-0.41	0.000	-2.50E-04	0.5	-0.1	
20	-5.40	-3.25	0.001	-2.39E-04	-0.0	-0.0	

Node no.	Y coord	Effective stresses					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press.	Vertic -al	Active limit	Passive limit	Earth pressure		
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3341
2	-0.30	0.00	7.08	2.40	22.30	2.40	2.40a	3341
3	-0.60	0.00	15.02	5.08	47.28	5.08	5.08a	3341
4	-0.90	0.00	21.78	7.36	68.56	7.36	7.36a	3341



Run ID: RW02\_2m\_static | Sheet No.  
RW02\_2m\_static | Date:12-11-2024  
51 School Road, Pahiia | Checked :  
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(continued)

Stage No.3 Apply surcharge no.2 at elevation 0.00

LEFT side								
Effective stresses						Total	Coeff. of	
Node	Y	Water	Vertic	Active	Passive	Earth	earth	subgrade
no.	coord	press.	-al	limit	limit	pressure	pressure	reaction
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
5	-1.20	0.00	27.86	9.42	87.69	9.42	9.42a	3341
6	-1.50	0.00	33.56	11.35	105.64	11.35	11.35a	3341
		0.00	33.56	7.28	118.86	7.28	7.28a	3341
7	-1.75	0.00	38.13	8.82	133.24	8.82	8.82a	3341
8	-2.00	0.00	42.57	10.33	147.24	10.33	10.33a	3341
		0.00	42.57	5.95	130.91	5.95	5.95a	8353
9	-2.20	0.00	46.27	7.00	140.77	7.00	7.00a	8353
10	-2.40	0.00	49.91	8.04	150.50	8.04	8.04a	8353
11	-2.70	0.00	55.29	9.58	164.88	10.83	10.83	8353
12	-3.00	0.00	60.60	11.09	179.06	22.22	22.22	8353
13	-3.30	0.00	65.85	12.59	193.24	29.26	29.26	8353
14	-3.60	0.00	71.06	14.08	207.63	33.58	33.58	8353
15	-3.90	0.00	76.23	15.55	221.94	36.28	36.28	16656
16	-4.20	0.00	81.38	17.02	236.18	38.10	38.10	14620
17	-4.50	0.00	86.52	18.48	250.37	39.67	39.67	14620
18	-4.80	0.00	91.64	19.95	264.54	41.25	41.25	14620
19	-5.10	0.00	96.76	21.41	278.70	42.64	42.64	14620
20	-5.40	0.00	101.88	22.87	292.86	44.12	44.12	14620

RIGHT side								
Effective stresses						Total	Coeff. of	
Node	Y	Water	Vertic	Active	Passive	Earth	earth	subgrade
no.	coord	press.	-al	limit	limit	pressure	pressure	reaction
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	-0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	-0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	-1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	-1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	-1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	-2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	19.04	19.04	19.04p	17900
9	-2.20	0.00	3.60	0.00	28.99	28.99	28.99p	17900
10	-2.40	0.00	7.20	0.00	38.93	38.93	38.93p	17900
11	-2.70	0.00	12.60	0.00	53.83	46.97	46.97	17900
12	-3.00	0.00	18.00	0.00	68.74	29.79	29.79	17900
13	-3.30	0.00	23.40	0.48	83.63	22.56	22.56	17900
14	-3.60	0.00	28.81	2.03	98.53	22.12	22.12	17900
15	-3.90	0.00	34.21	3.57	113.43	25.26	25.26	35455
16	-4.20	0.00	39.62	5.11	128.33	29.61	29.61	14620
17	-4.50	0.00	45.03	6.65	143.24	34.15	34.15	14620
18	-4.80	0.00	50.44	8.20	158.15	38.56	38.56	14620
19	-5.10	0.00	55.85	9.74	173.07	43.04	43.04	14620
20	-5.40	0.00	61.27	11.28	187.99	47.37	47.37	14620

Note: 8.04 a Soil pressure at active limit  
38.93 p Soil pressure at passive limit

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Data filename/Run ID: RW02\_2m\_static |  
RW02\_2m\_static | Date:12-11-2024  
51 School Road, Pahiia | Checked :  
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Units: kN,m

#### Summary of results

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**  
Factor of safety on soil strength

			FoS for toe		Toe elev. for			
			elev. = -5.40		FoS = 1.500			
<u>Stage</u>	<u>Ground level</u>	<u>Prop</u>	<u>Factor</u>	<u>Moment</u>	<u>Toe</u>	<u>Wall</u>	<u>Direction</u>	
<u>No.</u>	<u>Act.</u>	<u>Pass.</u>	<u>Elev.</u>	<u>of</u>	<u>elev.</u>	<u>Penetr</u>	<u>of</u>	
				<u>Safety</u>	<u>at elev.</u>	<u>-ation</u>	<u>failure</u>	
1	0.00	-2.00	Cant.	1.963	-4.94	-4.34	2.34	L to R
2	0.00	-2.00	Cant.	1.715	-4.94	-4.81	2.81	L to R
3	0.00	-2.00	Cant.	1.695	-4.95	-4.86	2.86	L to R

Run ID. RW02_2m_static	Sheet No.
RW02_2m_static	Date:12-11-2024
51 School Road, Paihia	Checked :

Units: kN,m

Right side 20.00m from wall

Node no.	y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	0.00	0.028	0.000	0.0	0.0	0.0	0.0
2	-0.30	0.025	0.000	0.0	0.0	0.4	0.0
3	-0.60	0.021	0.000	0.3	0.0	1.5	0.0
4	-0.90	0.018	0.000	1.0	0.0	3.3	0.0
5	-1.20	0.015	0.000	2.4	0.0	5.9	0.0
6	-1.50	0.011	0.000	4.6	0.0	9.0	0.0
7	-1.75	0.009	0.000	7.1	0.0	11.0	0.0
8	-2.00	0.006	0.000	10.1	0.0	13.4	0.0
9	-2.20	0.005	0.000	12.5	0.0	9.9	0.0
10	-2.40	0.003	0.000	14.0	0.0	4.6	0.0
11	-2.70	0.002	0.000	14.5	0.0	0.0	-6.6
12	-3.00	0.001	0.000	11.2	0.0	0.0	-12.0
13	-3.30	0.000	0.000	7.3	0.0	0.0	-12.1
14	-3.60	0.000	0.000	3.9	0.0	0.0	-9.4
15	-3.90	0.000	0.000	1.6	0.0	0.0	-6.1
16	-4.20	0.000	0.000	0.3	-0.1	0.0	-3.1
17	-4.50	0.000	0.000	0.0	-0.3	0.0	-1.0
18	-4.80	0.000	0.000	0.0	-0.3	0.3	0.0
19	-5.10	0.000	0.000	0.0	-0.1	0.5	0.0
20	-5.40	0.001	0.000	0.0	-0.0	0.0	-0.0

Stage	Bending moment				Shear force			
no.	<u>maximum</u>	<u>elev.</u>	<u>minimum</u>	<u>elev.</u>	<u>maximum</u>	<u>elev.</u>	<u>minimum</u>	<u>elev.</u>
	kN.m/m		kN.m/m		kN/m		kN/m	
1	9.4	-2.40	-0.3	-4.50	9.5	-2.00	-8.3	-3.00
2	13.9	-2.70	-0.3	-4.80	13.0	-2.00	-11.7	-3.00
3	14.5	-2.70	-0.3	-4.80	13.4	-2.00	-12.1	-3.30

Stage no.	<u>maximum</u> m	<u>Displacement elev.</u>	<u>minimum</u> m	<u>elev.</u>	<u>Stage description</u>
1	0.016	0.00	0.000	0.00	Excav. to elev. -2.00 on RIGHT side
2	0.027	0.00	0.000	0.00	Apply surcharge no.1 at elev. 0.00
3	0.028	0.00	0.000	0.00	Apply surcharge no.2 at elev. 0.00

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RW02\_2m\_seismic | Date:12-11-2024  
51 School Road, Paihia | Checked :  
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Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types -----			
		Left side		Right side	
1	0.00	1 Retained fill c'=0		1 Retained fill c'=0	
2	-1.50	2 Retained fill		2 Retained fill	
3	-2.00	3 Residual Waipapa		3 Residual Waipapa	

SOIL PROPERTIES

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy )	Ko (dKo/dy)	NC/OC ( Nu )	Ka ( Kac )	Kp ( Kpc )	kN/m2 ( dc/dy )
1 Retained fill c'=0	17.00	10000	0.500	(0.250)	(1.357)	( 4.404)	0.0d
2 Retained fill	17.00	10000	0.500	(0.250)	(1.357)	( 4.404)	3.000d
3 Residual Waipapa	18.00	25000	0.500	OC (0.250)	0.285 (1.238)	3.886 ( 4.998)	5.000d

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---				--- parameters for Kp ---			
Soil		Wall	Back-	Soil		Wall	Back-
----- Soil type -----	friction	adhesion	fill	friction	adhesion	fill	
No. Description	angle	coeff.	angle	angle	coeff.	angle	
1 Retained fill c'=0	26.00	0.640	0.00	26.00	0.312	0.00	
2 Retained fill	26.00	0.640	0.00	26.00	0.312	0.00	
3 Residual Waipapa	30.00	0.631	0.00	30.00	0.305	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3  
  
Initial water table elevation      Left side      Right side  
   -6.00              -6.00  
  
Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall  
Soldier Pile width = 0.28 m  
Soldier Pile spacing = 1.20 m  
Passive mobilisation factor = 3.00  
Elevation of toe of wall = -5.40  
Maximum finite element length = 0.30 m  
Youngs modulus of wall E = 8.7000E+06 kN/m2  
Moment of inertia of wall I = 2.3395E-04 m4/m run  
                                 = 2.8074E-04 m4 per pile  
                                 E.I = 2035.4 kN.m2/m run  
Yield Moment of wall = Not defined

SURCHARGE LOADS

no.	Surcharge Elev.	Distance from wall	Length parallel to wall	Width perpnd. to wall	Surcharge (kN/m2) Near edge	Surcharge Far edge	Part Soil type	Short Q reduc. fact.
1	0.00	0.30(L)	8.00	5.00	10.00	=	QGL --	0.90
2	0.00	0.00(L)	8.00	5.30	0.00	4.70	QGL --	0.92

Note: L = Left side, R = Right side  
A ramp surcharge is defined by two values:  
N = at edge near to wall, F = at edge far from wall  
Surcharge types: QGL Surcharge at or below GL  
                     SOL (n) Soil fill (n = soil type)  
                     TOP Surcharge on top of soil fill

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Excavate to elevation -2.00 on RIGHT side
2	Apply surcharge no.1 at elevation 0.00
3	Apply surcharge no.2 at elevation 0.00
4	Apply seismic loading: 0.0800g horizontal Line of action of quasi-static seismic force = 0.333 Seismic loading model: Quasi-static loading

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:  
Method of analysis - Strength Factor method  
Factor on soil strength for calculating wall depth = 1.00  
Active limit pressures by Wedge Analysis (Seismic Stages only)  
Passive limit pressures by Wedge Analysis (Seismic Stages only)

Parameters for undrained strata:  
Minimum equivalent fluid density = 5.00 kN/m3  
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:  
Method - Subgrade reaction model using Influence Coefficients  
Open Tension Crack analysis? - No  
Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:  
Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation/fill on Left side of wall = 20.00 m  
Width of excavation/fill on Right side of wall = 20.00 m

Distance to rigid boundary on Left side = 20.00 m  
Distance to rigid boundary on Right side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Excav. to elev. -2.00 on RIGHT side	Yes	Yes	Yes
2	Apply surcharge no.1 at elev. 0.00	No	No	No
3	Apply surcharge no.2 at elev. 0.00	Yes	Yes	Yes
4	Quasi-static Seismic load: 0.080g(H)	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

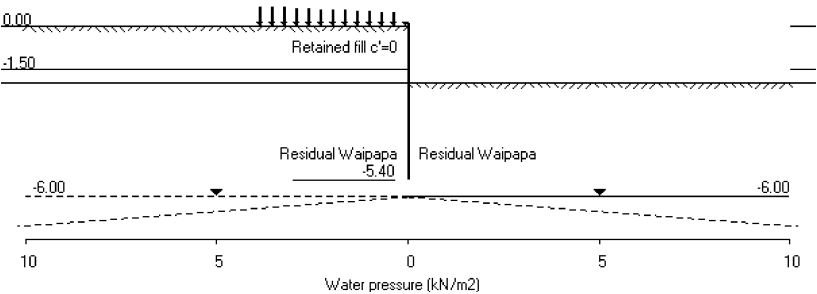
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51 School Road, Paihia

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Checked :

Units: kN,m

Stage No.4 Quasi-static Seismic load: 0.080g(H)



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Data filename/Run ID: RW02\_2m\_seismic  
RW02\_2m\_seismic  
51 School Road, Paihia

Sheet No.  
Job No. 24 218  
Made by : JMC  
Date:12-11-2024  
Checked :

Units: kN,m

Stage No. 4 Apply seismic loading:  
0.0800g horizontal  
Line of action of quasi-static seismic force = 0.333  
Seismic loading model: Quasi-static loading

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**

Factor of safety on soil strength  
Active limit pressures by Wedge Analysis (Seismic Stages only)  
Passive limit pressures by Wedge Analysis (Seismic Stages only)

Stage No.	Ground level Act.	Pass.	Prop Elev.	FoS for toe elev. = -5.40		Toe elev. for FoS = 1.000		Direction of failure
				Factor of Safety	Moment of equilb. at elev.	Toe elev.	Wall Penetr -ation	
4	0.00	-2.00	Cant.	1.444	-4.97	-3.85	1.85	L to R

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**

Analysis options  
Soldier Pile width = 0.28m; spacing = 1.20m  
Passive mobilisation factor = 3.000  
Subgrade reaction model - Boussinesq Influence coefficients  
Soil deformations are elastic until the active or passive limit is reached  
Active and Passive limit pressures by [Wedge Analysis](#) (Seismic Stages only)  
[Short Surcharges](#) No.1, 2 are treated as equivalent infinitely long surcharges with reduced magnitude

Length of wall perpendicular to section = 1000.00m  
Rigid boundaries: Left side 20.00m from wall  
Right side 20.00m from wall

Node no.	Y coord	Nett pressure kN/m²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Prop forces kN/m
1	0.00	0.00	0.049	1.89E-02	0.0	0.0	
2	-0.30	5.39	0.043	1.89E-02	0.8	0.1	
3	-0.60	6.97	0.037	1.88E-02	2.7	0.6	
4	-0.90	9.20	0.032	1.87E-02	5.1	1.7	
5	-1.20	11.43	0.026	1.83E-02	8.2	3.7	
6	-1.50	13.56	0.021	1.75E-02	11.9	6.7	
		9.39	0.021	1.75E-02	11.9	6.7	
7	-1.75	11.39	0.017	1.65E-02	14.5	10.0	
8	-2.00	13.33	0.013	1.50E-02	17.6	14.0	
		-12.08	0.013	1.50E-02	17.6	14.0	
9	-2.20	-21.15	0.010	1.35E-02	14.3	17.2	
10	-2.40	-28.11	0.007	1.17E-02	9.4	19.7	
11	-2.70	-38.75	0.004	8.65E-03	-0.7	21.6	
12	-3.00	-34.21	0.002	5.61E-03	-11.6	19.6	
13	-3.30	-3.72	0.001	3.08E-03	-17.3	14.7	
14	-3.60	12.08	0.000	1.30E-03	-16.0	9.4	
15	-3.90	15.50	-0.000	2.38E-04	-11.9	5.1	
16	-4.20	14.05	-0.000	-3.01E-04	-7.5	2.2	
17	-4.50	10.60	-0.000	-5.10E-04	-3.8	0.6	
18	-4.80	6.53	0.000	-5.53E-04	-1.2	-0.0	
19	-5.10	1.95	0.000	-5.42E-04	0.1	-0.1	
20	-5.40	-2.43	0.000	-5.34E-04	-0.0	-0.0	



Run ID: RW02\_2m\_seismic | Sheet No.  
RW02\_2m\_seismic | Date:12-11-2024  
51 School Road, Paihia | Checked :

(continued)

Stage No.4 Apply seismic loading:  
0.0800g horizontal  
Line of action of quasi-static seismic force = 0.333  
Seismic loading model: Quasi-static loading

LEFT side								
Effective stresses								
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Coeff. of subgrade reaction
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3268
2	-0.30	0.00	7.08	5.39 t	36.15	5.39	5.39a	3268
3	-0.60	0.00	15.02	6.97 t	70.82	6.97	6.97a	3268
4	-0.90	0.00	21.78	9.20 t	82.59	9.20	9.20a	3268
5	-1.20	0.00	27.86	11.43 t	103.16	11.43	11.43a	3268
6	-1.50	0.00	33.56	13.56 t	121.67	13.56	13.56a	3268
7	-1.75	0.00	33.56	9.39	133.60	9.39	9.39a	3268
8	-2.00	0.00	38.13	11.39	149.77	11.39	11.39a	3268
9	-2.20	0.00	42.57	13.33 t	165.51	13.33	13.33a	3268
10	-2.40	0.00	42.57	8.80	142.72	8.80	8.80a	8170
11	-2.70	0.00	46.27	10.36	153.46	10.36	10.36a	8170
12	-3.00	0.00	49.91	11.15 t	165.44	11.15	11.15a	8170
13	-3.30	0.00	55.29	12.97 t	164.23	12.97	12.97a	8170
14	-3.60	0.00	60.60	15.39 t	171.06	15.39	15.39a	8170
15	-3.90	0.00	65.85	17.40 t	190.07	25.80	25.80	8170
16	-4.20	0.00	71.06	19.25 t	196.12	33.89	33.89	8776
17	-4.50	0.00	76.23	20.39 t	211.72	38.52	38.52	8776
18	-4.80	0.00	81.38	22.07 t	225.46	40.88	40.88	8776
19	-5.10	0.00	86.52	24.57 t	238.12	42.21	42.21	8776
20	-5.40	0.00	91.64	26.44 t	254.14	43.17	43.17	8776

RIGHT side								
Effective stresses								
Node no.	Y coord	Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Coeff. of subgrade reaction
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	-0.30	0.00	0.00	0.00 t	0.00	0.00	0.00	0.0
3	-0.60	0.00	0.00	0.00 t	0.00	0.00	0.00	0.0
4	-0.90	0.00	0.00	0.00 t	0.00	0.00	0.00	0.0
5	-1.20	0.00	0.00	0.00 t	0.00	0.00	0.00	0.0
6	-1.50	0.00	0.00	0.00 t	0.00	0.00	0.00	0.0
7	-1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	-2.00	0.00	0.00	0.00 t	0.00	0.00	0.00	0.0
9	-2.20	0.00	0.00	0.00	20.88	20.88	20.88p	16421
10	-2.40	0.00	3.60	0.00	31.51	31.51	31.51p	16421
11	-2.70	0.00	7.20	0.00 t	39.25	39.25	39.25p	16421
12	-3.00	0.00	12.60	0.00 t	51.72	51.72	51.72p	16421
13	-3.30	0.00	18.00	0.00 t	66.34	49.59	49.59	16421
14	-3.60	0.00	23.40	0.00 t	80.19	29.52	29.52	16421
15	-3.90	0.00	28.81	0.00 t	93.63	21.81	21.81	8776
16	-4.20	0.00	34.21	0.00 t	108.36	23.02	23.02	8776
17	-4.50	0.00	39.62	1.63 t	123.73	26.83	26.83	8776
18	-4.80	0.00	45.03	4.91 t	137.04	31.61	31.61	8776
19	-5.10	0.00	50.44	7.11 t	149.72	36.64	36.64	8776
20	-5.40	0.00	55.85	8.61 t	163.67	41.86	41.86	8776

Run ID: RW02\_2m\_seismic | Sheet No.  
RW02\_2m\_seismic | Date:12-11-2024  
51 School Road, Paihia | Checked :

(continued)

Stage No.4 Apply seismic loading:  
0.0800g horizontal  
Line of action of quasi-static seismic force = 0.333  
Seismic loading model: Quasi-static loading

Note: 15.39 a Soil pressure at active limit  
51.72 p Soil pressure at passive limit  
t Wedge analysis at this node in Turbo Mode

HAIGH WORKMAN LTD | Sheet No.  
Program: WALLAP Version 6.09 Revision A59.B77.R60 | Job No. 24 218  
Licensed from GEOSOLVE | Made by : JMC  
Data filename/Run ID: RW02\_2m\_seismic |  
RW02\_2m\_seismic | Date:12-11-2024  
51 School Road, Paihia | Checked :  
-----

Units: kN,m

**Summary of results**

**STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method**

Factor of safety on soil strength  
Active limit pressures by Wedge Analysis (Seismic Stages only)  
Passive limit pressures by Wedge Analysis (Seismic Stages only)

Stage No.	Ground level		Prop Elev.	FoS for toe elev. = -5.40		Toe elev. for FoS = 1.000		Direction of failure
	Act.	Pass.		Factor of Safety at elev.	Moment of equilib.	Toe elev.	Wall Penetr- -ation	
1	0.00	-2.00	Cant.	1.963	-4.94	-3.24	1.24	L to R
2	0.00	-2.00	Cant.	1.715	-4.94	-3.48	1.48	L to R
3	0.00	-2.00	Cant.	1.694	-4.94	-3.51	1.51	L to R
4	0.00	-2.00	Cant.	1.444	-4.97	-3.85	1.85	L to R

HAIGH WORKMAN LTD | Sheet No.  
Program: WALLAP Version 6.09 Revision A59.B77.R60 | Job No. 24 218  
Licensed from GEOSOLVE | Made by : JMC  
Data filename/Run ID: RW02\_2m\_seismic |  
RW02\_2m\_seismic | Date:12-11-2024  
51 School Road, Paihia | Checked :  
-----

Units: kN,m

**Summary of results**

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall**

**Analysis options**  
Soldier Pile width = 0.28m; spacing = 1.20m  
Passive mobilisation factor = 3.000  
Subgrade reaction model - Boussinesq Influence coefficients  
Soil deformations are elastic until the active or passive limit is reached  
Active and Passive limit pressures by Wedge Analysis (Seismic Stages only)  
Short Surcharges No.1, 2 are treated as equivalent  
infinitely long surcharges with reduced magnitude

Length of wall perpendicular to section = 1000.00m  
Rigid boundaries: Left side 20.00m from wall  
Right side 20.00m from wall

**Bending moment, shear force and displacement envelopes**

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum	minimum	maximum	minimum	maximum	minimum
		m	m	kN.m/m	kN.m/m	kN/m	kN/m
1	0.00	0.049	0.000	0.0	0.0	0.0	0.0
2	-0.30	0.043	0.000	0.1	0.0	0.8	0.0
3	-0.60	0.037	0.000	0.6	0.0	2.7	0.0
4	-0.90	0.032	0.000	1.7	0.0	5.1	0.0
5	-1.20	0.026	0.000	3.7	0.0	8.2	0.0
6	-1.50	0.021	0.000	6.7	0.0	11.9	0.0
7	-1.75	0.017	0.000	10.0	0.0	14.5	0.0
8	-2.00	0.013	0.000	14.0	0.0	17.6	0.0
9	-2.20	0.010	0.000	17.2	0.0	14.3	0.0
10	-2.40	0.007	0.000	19.7	0.0	9.4	0.0
11	-2.70	0.004	0.000	21.6	0.0	0.0	-6.6
12	-3.00	0.002	0.000	19.6	0.0	0.0	-12.0
13	-3.30	0.001	0.000	14.7	0.0	0.0	-17.3
14	-3.60	0.000	0.000	9.4	0.0	0.0	-16.0
15	-3.90	0.000	-0.000	5.1	0.0	0.0	-11.9
16	-4.20	0.000	-0.000	2.2	-0.1	0.0	-7.5
17	-4.50	0.000	-0.000	0.6	-0.3	0.0	-3.8
18	-4.80	0.000	0.000	0.0	-0.3	0.3	-1.2
19	-5.10	0.000	0.000	0.0	-0.1	0.5	0.0
20	-5.40	0.001	0.000	0.0	-0.0	0.0	-0.0

**Maximum and minimum bending moment and shear force at each stage**

Stage no.	Bending moment				Shear force			
	maximum	elev.	minimum	elev.	maximum	elev.	minimum	elev.
	kN.m/m		kN.m/m		kN/m		kN/m	
1	9.4	-2.40	-0.3	-4.50	9.5	-2.00	-8.3	-3.00
2	13.9	-2.70	-0.3	-4.80	13.0	-2.00	-11.7	-3.00
3	14.5	-2.70	-0.3	-4.80	13.4	-2.00	-12.1	-3.30
4	21.6	-2.70	-0.1	-5.10	17.6	-2.00	-17.3	-3.30

**Maximum and minimum displacement at each stage**

Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.016	0.00	0.000	0.00	Excav. to elev. -2.00 on RIGHT side
2	0.027	0.00	0.000	0.00	Apply surcharge no.1 at elev. 0.00
3	0.028	0.00	0.000	0.00	Apply surcharge no.2 at elev. 0.00
4	0.049	0.00	-0.000	-3.90	Quasi-static Seismic load: 0.080g(H)

## **APPENDIX D – PS1 (Design)**

# PRODUCER STATEMENT – PS1 DESIGN



association of  
consulting and  
engineering



<b>Building Code Clause(s):</b>	B1,	Job number: 24 218
<b>ISSUED BY:</b> <i>(Engineering Design Firm)</i>	Haigh Workman Limited	
<b>TO:</b> <i>(Client)</i>	Amanda Marsh	
<b>TO BE SUPPLIED TO:</b> <i>(Building Consent Authority)</i>	Far North District Council	
<b>IN RESPECT OF:</b> <i>(Description of building work)</i>	Timber Pole Retaining Walls	
<b>AT:</b> <i>(Address)</i>	51 School Road, Paihia, Far North District 0200	
<b>LEGAL DESCRIPTION</b>	Lot 16, DP 57767	

We have been engaged by Amanda Marsh to provide:

SED Retaining Walls,

in respect of the requirements of the Clause(s) of the Building Code specified above for part only, as specified in the attached Schedule, of the proposed building work.

In this document SED means “Specific Engineering Design”.

The design carried out by Haigh Workman Limited has been prepared in accordance with:

- ✓ compliance documents issued by the Ministry of Business, Innovation & Employment (Verification method /acceptable solution): VM1/VM4
- ✓ alternative solutions as per the attached Schedule.

The proposed building work covered by this producer statement is described in the drawings specified in the attached Schedule, together with the specification, and other documents set out in the attached Schedule.

On behalf of Haigh Workman Limited, and subject to:

- all proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that:

- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached Schedule, will comply with the relevant provisions of the Building Code specified above; and that
- the persons who have undertaken the design have the necessary competence to do so.

I recommend the CM2 level of construction monitoring.

Job Number: 24 218  
Job Address: 51 School Road, Paihia, Far North District 0200  
Compilation Date and Time: 23 July 2025 at 14:46 pm

PS1 - DESIGN – JANUARY 2024 (REV 01)

PAGE 1 OF 7

I, Wayne Thorburn, am:

- CPEng number 1006534
- and hold the following qualifications: BEngTech (Civil), GDipEng

Haigh Workman Limited holds a current policy of Professional Indemnity Insurance no less than \$200,000.

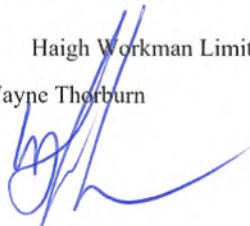
✓

Haigh Workman Limited is a member of ACE New Zealand.

**SIGNED BY:**

Wayne Thorburn

(Signature):



Date:

23/7/2025

**ON BEHALF OF:**

Haigh Workman Limited

*Note: This statement has been prepared solely for Far North District Council and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to Haigh Workman Limited only. As a condition of reliance on this statement, Far North District Council accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to Far North District Council in relation to this building work, whether in tort or otherwise, is limited to the sum of \$200,000.*

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.



## **SCHEDULE TO PSI**

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

- Construction Monitoring Schedule, Structural Maintenance Schedule, B2 Letter in Lieu - Design
- Engineering Drawing Set: G01 to G07, Ref. 24 218, dated July 2025
- Geotechnical Report: Haigh Workman Retaining Wall Design, Ref. 24 218, dated July 2025

### **Limited Scope of Engagement**

We have been engaged by Amanda Marsh to provide services in respect of the requirements of the Clause(s) of the Building Code specified above for the following parts of the proposed building work:

SED Retaining Walls,

### **Alternative Solution**

The design carried out by Haigh Workman Limited has been prepared in accordance with:

MBIE - Module 6

## GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on either the [ACE New Zealand](#) or [Engineering New Zealand](#) websites.

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

**PS1 DESIGN:** Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

**PS2 DESIGN REVIEW:** Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

**PS3 CONSTRUCTION:** Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011/2

**PS4 CONSTRUCTION REVIEW:** Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

### Competence of Engineering Professional

This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.

The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

### Professional Indemnity Insurance

As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

### Professional Services during Construction Phase

There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1-CM5 for engineers<sup>3</sup>).

The BCA is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

### Requirement to provide Producer Statement PS4

BCAs should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued. No design professional should be expected to provide a producer statement unless such a requirement forms part of Haigh Workman Limited's engagement.

### Refer Also:

- 1 Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
- 2 NZIA Standard Conditions of Contract SCC 2011
- 3 Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
- 4 PN01 Guidelines on Producer Statements

[www.acenz.org.nz](http://www.acenz.org.nz)

[www.engineeringnz.org](http://www.engineeringnz.org)

## SCHEDULE OF MONITORING FOR

Address: 51 School Road, Paihia, Far North District 0200

Job number: 24 218

We propose that at least the following site monitoring is undertaken to Engineering New Zealand/ACENZ CM2:

No.	Item of monitoring	Timeframe	To be monitored by
1.	Timber piles	Once holes are at the specified depth and clear of loose soil, pre-concrete pour	Engineer
2.	Retaining wall back boards (walling planks)	Before placing drainage material, while additional planks can practicably be added	Engineer

### Notes:

- The above items of monitoring are the minimum required to enable Haigh Workman Limited to issue a PS4 – Producer Statement Construction Review for the specific engineering design items.
- The above items of monitoring do not cover work constructed in accordance with NZS 3604:2011, for which monitoring is to be undertaken by the Building Consent Authority.
- The Contractor/Builder is to provide Haigh Workman Limited at least 24 hours' notice of the requirement for monitoring. The above timeframes are indicative, the Engineer and Contractor are to agree the timing of monitoring prior to work commencing on site.
- A copy of this monitoring schedule is to be held on site during the works, and the Contractor/Builder is to provide reasonable and safe access to enable works to be monitored according to the schedule.
- The above schedule does not necessarily represent the actual number of monitorings to be undertaken. The number of monitorings will depend on the construction method, sequence of the works and whether or not unforeseen conditions or difficulties are encountered on site.



## TIMBER POLE RETAINING WALLS AT 51 SCHOOL ROAD, PAIHIA, FAR NORTH DISTRICT 0200

This schedule of ongoing inspection and maintenance of structural elements shall be included with the Operations and Maintenance manuals and provided to the Owner/Body Corporate and building managers.

Inspection/maintenance timeframe and item	
(a) Half-yearly	Not applicable.
(b) 5 yearly	Not applicable.
(c) 10 yearly	<ul style="list-style-type: none"> <li>Check exposed timber fixings for corrosion, repair as required.</li> </ul>
(d) 25 yearly	<ul style="list-style-type: none"> <li>Inspect all exposed, external timber. Repair as required.</li> </ul>
(e) Following fit-out or alterations	Not applicable.
(f) Following seismic shaking > SLS1 event	<ul style="list-style-type: none"> <li>Inspections and repair as per sections above</li> </ul>

## LETTER IN LIEU – DESIGN



To the Building Official,  
Far North District Council  
Timber Pole Retaining Walls at 51 School Road, Paihia, Far North District 0200

### COMPLIANCE WITH BUILDING CODE CLAUSE B2 – DURABILITY

The purpose of this letter is to demonstrate how compliance with Clause B2 (Durability) of the Building Code will be achieved for the above project. We can confirm that for specifically designed structural elements that are included within our design documentation:

Material	Means of Compliance	Details
Structural timber	B2/AS1	Timber treatment has been selected in accordance with Table 1A of B2/AS1

Yours faithfully,

A handwritten signature in blue ink, appearing to read 'Wayne Thorburn', written over a horizontal line.

Wayne Thorburn  
For and on behalf of  
Haigh Workman Limited