AGENDA

RĀRANGI TAKE

NOTICE OF AN ORDINARY MEETING OF

COUNCIL

to be held on **Thursday, 29 August 2024** commencing at **1 pm** in the Council Chambers,

36 Weld Street, Hokitika and via Zoom

Chairperson	Her Worship the Mayor
Deputy and Southern Ward Member:	Cr Cassin
Northern Ward Members:	Cr Neale, Cr Burden, Cr Phelps
Hokitika Ward Members:	Cr Baird, Cr Davidson, Cr Gillett
Southern Ward Members:	Cr Manera
Iwi Representatives:	Kw Madgwick, Kw Tumahai



In accordance with clause 25B of Schedule 7 of the Local Government Act 2002, members may attend the meeting by audio or audio-visual link.

Council Vision

By investing in our people, caring for the environment, respecting the Mana Whenua Cultural heritage, and enabling investment, growth, and development we will enrich our district and the people that reside here.

Purpose

The Council is required to give effect to the purpose of local government as prescribed by section 10 of the Local Government Act 2002. That purpose is:

(a) To enable democratic local decision-making and action by, and on behalf of, communities; and

(b) To promote the social, economic, environmental, and cultural well-being of communities in the present and for the future.

1. KARAKIA TĪMATANGA
OPENING KARAKIA

Kia hora te marino ***Kia whakapapa pounamu te moana*** ***Hei hurahai mā tātou*** ***I te rangi nei*** ***Aroha atu, aroha mai*** ***Tātou i a tātou katoa*** ***Hui e! Tāiki e!***	***May peace be widespread*** ***May the sea be like greenstone*** ***A pathway for us all this day*** ***Give love, received love*** ***Let us show respect for each other*** ***Bind us all together!***

2. NGĀ WHAKAPAAHA
APOLOGIES

Deputy Mayor Cassin.

3. WHAKAPUAKITANGA WHAIPĀNGA
DECLARATIONS OF INTEREST

Members need to stand aside from decision-making when a conflict arises between their role as a Member of the Council and any private or other external interest they might have. This note is provided as a reminder to Members to review the matters on the agenda and assess and identify where they may have a pecuniary or other conflict of interest, or where there may be a perception of a conflict of interest.

If a member feels they do have a conflict of interest, they should publicly declare that at the start of the meeting or of the relevant item of business and refrain from participating in the discussion or voting on that item. If a member thinks they may have a conflict of interest, they can seek advice from the Chief Executive or the Group Manager Corporate Services Risk and Assurance (preferably before the meeting). It is noted that while members can seek advice the final decision as to whether a conflict exists rests with the member.

4. NGĀ TAKE WHAWHATI TATA KĀORE I TE RĀRANGI TAKE
URGENT ITEMS NOT ON THE AGENDA

Section 46A of the Local Government Official Information and Meetings Act 1987 states:

(7) An item that is not on the agenda for a meeting may be dealt with at the meeting if –
(a) the local authority by resolution so decides, and
(b) the presiding member explains at the meeting at a time when it is open to the public, -
(i) the reason why the item is not on the agenda; and
(ii) the reason why the discussion of the item cannot be delayed until a subsequent meeting.
(7A) Where an item is not on the agenda for a meeting, -
(a) that item may be discussed at the meeting if –
(i) that item is a minor matter relating to the general business of the local authority; and
(ii) the presiding member explains at the beginning of the meeting, at a time when it is open to the public, that the item will be discussed at the meeting; but
(b) No resolution, decision, or recommendation may be made in respect of that item except to refer that item to a subsequent meeting of the local authority for further discussion.

5. NGĀ MENETI O TE HUI KAUNIHERA
MINUTES OF MEETINGS

Minutes circulated.

- **Ordinary Council Meeting Minutes – 25 July 2024** (Pages 7 – 13)
- **Extraordinary Council Meeting Minutes – 6 August 2024** (Pages 14 – 15)

MINUTES TO BE RECEIVED FROM STANDING COMMITTEES:

- Risk and Assurance Committee Meeting Minutes – 9 May 2024 (Pages 16 – 21)
- Cycling and Walking Subcommittee Meeting Amended Minutes – 15 February 2024 (Pages 22 – 25)

6. ACTION LIST (Pages 26)

Scott Baxendale, Acting Chief Executive

7. NGĀ TĀPAETANGA
PRESENTATIONS

- **Pounamu Pathway**

- **Poutini Puāwai Education and Research Project**
  Laura Neale

8. PŪRONGO KAIMAHI
STAFF REPORTS

- **Projects and Carry Forward to 2024-25** (Pages 27 – 31)
  Lynley Truman, Finance Manager

- **Better Off Funding Update – Tranche One Projects** (Pages 32 – 45)
  Jan Visser, Facilities and Properties Manager

- **Acting Chief Executives Quarterly Report** (Pages 46 – 60)
  Scott Baxendale, Acting Chief Executive

- **Geotech Summary Report - Pakiwaitara Building** (Pages 61 – 136)
  Jan Visser, Facilities and Properties Manager

- **West Coast Wilderness Trail Tōtara Bridge – Options Report** (Pages 137 – 349)
  Erle Bencich, Acting Group Manager District Assets

9. ADMINISTRATIVE RESOLUTION

Council is required to confirm its Seal being affixed to the following documents:

- **Warrant of Appointment – Amendment**

WARRANT OF APPOINTMENT – Amendment to add to the following warrants:	**Litter Control Officers** **Under Section 5 of the Litter Act 1979** (1) Every public authority may from time to time, either alone or jointly with another public authority or other public authorities, appoint any suitable person or persons (whether already employed by an authority or not) to be a Litter Control Officer to

• Wayne Knightbridge - Environmental Health / Regulatory Officer. • Yolanda Knoetze – Alcohol Licencing Inspector. • Clare Lomax – Animal Control Officer. • Lee Buchanan – Health and Safety & Compliance Officer. • Vern Morris – Compliance Team Leader. • Erle Bencich – Acting Group Manager. • Jan Visser – Facilities and Properties Manager. • David Louw – Project Manager, Operations. • Martin Ross – Engineer 3 Waters. • Darcy Lucas – Facilities and Property Coordinator. • Karl Jackson – Transportation Manager. • John Bainbridge – Transportation Officer. • Christy George – Assistant Transportation Engineer.	exercise the powers and duties conferred on the Officer by this Act— (a) within the district or districts of the public authority or public authorities which appointed him and within any other area or place under the control of that authority or those authorities; or (b) if the appointing authority or authorities think fit, within such part or parts of their district or districts or other areas or places under their control as they may specify in his warrant of appointment supplied under subsection (3). (2) Every such appointment shall be on such terms concerning remuneration and other conditions of employment as the appointing authority or authorities may determine. (3) The authority shall supply to every Officer appointed by it a written warrant evidencing the appointment, and the production of that warrant shall be sufficient proof of the appointment. (4) Every Officer shall, on the termination of his appointment, whether by removal from office or by resignation, surrender to the authority employing him his warrant of appointment. **Under Section of the Litter Amendment Act 1990** (1)This subsection substituted section 5(3) of the principal Act. (2)This subsection amended section 5(4) of the principal Act. (3)Every Officer appointed under section 5 of the principal Act who, at the commencement of this section, has in his or her possession an insignia of office issued under the principal Act shall surrender it on demand to the employing authority.

10. KA MATATAPU TE WHAKATAUNGA I TE TŪMATANUI
RESOLUTION TO GO INTO PUBLIC EXCLUDED

(to consider and adopt confidential items)

Resolutions to exclude the public: Section 48, Local Government Official Information and Meetings Act 1987.

The general subject of the matters to be considered while the public are excluded, the reason for passing this resolution in relation to each matter and the specific grounds under Section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of the resolution are as follows:

Item No.	General subject of each matter to be considered	Reason for passing this resolution in relation to each matter	Ground(s) under Section 48(1) for the passing of this resolution
1.	Confidential Minutes – Council Meeting - 27 June 2024	Good reason to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists. Section 48(1)(a)

2.	Confidential Minutes – Extraordinary Council Meeting - 6 August 2024	Good reason to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists. Section 48(1)(a)
3.	Minutes to be received: Confidential Risk and Assurance Committee Meeting - 9 May 2024	Good reason to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists. Section 48(1)(a)
4.	Confidential Risk Report	Good reason to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists. Section 48(1)(a)
5.	Confidential Lower Hokitika Gorge Suspension Bridge 2024-25-03 – Tender Approval	Good reason to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists. Section 48(1)(a)
6.	Confidential Hokitika Racecourse Development Report	Good reason to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists. Section 48(1)(a)

This resolution is made in reliance on sections 48(1)(a) and (d) of the Local Government Official Information and Meetings Act 1987 and the particular interests or interests protected by section 7 of that Act, which would be prejudiced by the holding of the relevant part of the proceedings of the meeting in public are as follows:

Item No.	Interest
1	Protect the privacy of natural persons, including that of deceased natural persons (S. 7(2)(a))
1, 2, 5, 6	Protect information where the making available of the information: (i) would disclose a trade secret; and (ii) would be likely unreasonably to prejudice the commercial position of the person who supplied or who is the subject of the information (S. 7(2)(b))

1	Avoid prejudice to measures that prevent to mitigate material loss to members of the public. (S. 7(2)(e))
1	Maintain the effective conduct of public affairs through: (i) The protection of such members, officers, employees, and persons from improper pressure of harassment (S. 7(2)(f))
1, 4	Maintain legal professional privilege; or (S. 7(2)(g))
1, 4	Enable any local authority holding the information to carry out, without prejudice or disadvantage, commercial activities; or (S. 7(2)(h))
1, 2, 5, 6	Enable any local authority holding the information to carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations) (S. 7(2)(i))
1, 2, 5, 6	Prevent the disclosure of use of official information for improper gain or improper advantage. (S. 7(2)(j))

DATE OF NEXT ORDINARY COUNCIL MEETING – 26 SEPTEMBER 2024
COUNCIL CHAMBERS, 36 WELD STREET, HOKITIKA AND VIA ZOOM

ORDINARY COUNCIL MINUTES

MINUTES OF THE ORDINARY COUNCIL MEETING OF WESTLAND DISTRICT COUNCIL HELD IN THE COUNCIL CHAMBERS, 36 WELD STREET, HOKITIKA AND VIA ZOOM ON THURSDAY, 25 JULY 2024 COMMENCING AT 1 PM

The Council Meeting was live-streamed to the Westland District Council YouTube Channel and presentations are made available on the council website.

Before the Council meeting commenced, Kw Madgwick, Kw Tumahai, Her Worship the Mayor and Acting CE Scott Baxendale signed the Manatu Whakaaetanga Partnership Agreement.

1. KARAKIA TĪMATANGA
OPENING KARAKIA

The opening Karakia was read by Her Worship the Mayor.

2. MEMBERS PRESENT AND APOLOGIES

Chairperson	Her Worship the Mayor
Deputy and Southern Ward Member:	Cr Cassin
Northern Ward Members:	Cr Neale, Cr Burden, Cr Phelps
Hokitika Ward Members:	Cr Baird, Cr Davidson, Cr Gillett
Southern Ward Members:	Cr Manera
Iwi Representatives:	Kw Madgwick, Kw Tumahai

NGĀ WHAKAPAAHA
APOLOGIES

Nil.

STAFF PRESENT

S. Baxendale, Acting Chief Executive; L. Crichton, Group Manager Corporate Services and Risk & Assurance; E. Bencich, Acting Group Manager District Assets; D. Maitland, Executive Assistant; E. Rae, Strategy and Communications Advisor (via Zoom); P. Coleman, Governance Administrator. The following staff were in attendance for part of the meeting: J. Visser, Facilities and Properties Manager; K. Jackson, Transportation Manager; A. Coleman, Building Control Manager; L. Sadlier, Museum Director.

3. WHAKAPUAKITANGA WHAIPĀNGA
DECLARATIONS OF INTEREST

The Interest Register had been circulated with one amendment noted from Deputy Mayor Cassin relating to the Hokitika Cycling Club, committee member.

4. NGĀ TAKE WHAWHATI TATA KĀORE I TE RĀRANGI TAKE
URGENT ITEMS NOT ON THE AGENDA

There were no urgent items of business not on the Council Agenda.

5. NGĀ MENETI O TE HUI KAUNIHERA
MINUTES OF MEETINGS

The Minutes of the previous Meeting were circulated.

- **Ordinary Council Meeting Minutes – 27 June 2024**

  Moved Cr Baird, seconded Cr Gillett and **Resolved** that the Minutes of the Ordinary Council Meeting held on 27 June 2024 be confirmed as a true and correct record of the meeting.

  The Chair **Approved** that their digital signature be added to the confirmed Council Meeting Minutes of 27 June 2024.

6. ACTION LIST

Scott Baxendale, Acting Chief Executive spoke to the Action List and provided the following updates:

- Pakiwaitara Building –
  - The Geotech report for the Pakiwaitara building has been delayed and will be available for the August Council Meeting.
- Lower Swingbridge, Hokitika Gorge
  - There is a presentation today from the Department of Conservation representatives.
- Housing Trust –
  - A meeting has been held with Whare Iraia from Development West Coast regarding the Housing Trust.

Moved Deputy Mayor Cassin, seconded Cr Burden and **Resolved** that the updated Action List be received.

7. NGĀ TĀPAETANGA
PRESENTATIONS

- **Hokitika Lower Gorge Swing Bridge Project Update**
  Tim Shaw, Acting Operations Manager; Cameron Jones, Senior Works Officer; and Jason Davidson, Regional Based Engineer from the Department of Conservation spoke to the presentation.
  - The Department of Conservation (DOC) have a long history of a shared partnership with Westland District Council (WDC) at the Hokitika Gorge site.
  - A Memorandum of Understanding (MOU) was signed late in 2023, creating a partnership between Council and DOC for the purpose of replacing the original swing bridge at the Hokitika Gorge.
    - WDC have secured funding for the replacement of the Lower Hokitika Gorge Suspension bridge through the Tourism Infrastructure Fund (TIF) with the support of DOC.
    - DOC are responsible for the bridge design, construction monitoring, and project management.
  - The tender is currently out and will close on 15 August, 2024.
  - Construction works should start before Christmas 2024 and are proposed to be completed before February 2025.
  - The suspension bridge design will be very similar to the second suspension bridge at the Hokitika Gorge.

  Moved Cr Neale, seconded Cr Burden and **Resolved** that the presentation from Department of Conservation representatives be received.

- **Road Network and Speed Changes Verbal Update**
  Karl Jackson, Transportation Manager gave a verbal update which included the following:

- Setting of Speed Limits 2024 (the draft Speed Rule) from Central Government has just closed for public consultation.
    - West Coast Councils have sent a combined submission with their concerns on the proposed changes, as has Westland District Council.
- These proposed changes could be costly to the Council if they are to go ahead.
    - Cost-benefit analysis.
    - Proposed changes to school zones.
    - Reversal on recent speed changes.
    - Strengthening of the consultation process.
    - Ministerial speed objective.
    - Change to the classification ranges of speed limits.

Moved Cr Gillett, seconded Cr Baird and **Resolved** that the verbal update from the Transportation Manager be received.

8. PŪRONGO KAIMAHI
STAFF REPORTS

- **Rates Write-offs and Remissions 2023-24**

Lynley Truman, Finance Manager spoke to the amended report which had been circulated to the Mayor and Councillors, and advised the purpose of this report was to request Council approval to write off rates debts deemed uncollectable, and to apply remissions, for the financial year ended 30 June 2024.

The amendments to the report were noted as follows:

3.3 The total has reduced compared to ~~2021-22~~ 2022-23, due to review of the rating information database in the previous year. ~~Special arrangements as per the LGRA and WDC Remissions Policy have increased as they have been reviewed in full and adjusted in this financial year.~~

3.4 The budget for rates write-offs and remissions for financial year ~~2022-23~~ 2023-24 is $200,000 excluding GST. The total write-offs and remissions are $198,668 excluding GST resulting in a variance of -$1,332. This is due to adjustments which were unknown when preparing the Annual Plan budgets.

4.1 Option 1: Approve the write-offs and remissions amounting to ~~$282,037~~ $225,779 including GST.

8.1 Provides for a variance of ~~$45,250~~ -$1,332 against budget.

- The rates remission on Māori reserve land – this is for unoccupied Māori reserve land.
- Any abandoned land will follow the legal process to recover funds from the sale.
- The rates modelling process is reviewed each annual plan and long term plan.

Moved Cr Manera, seconded Cr Phelps and **Resolved** that:

1. The amended report from the Finance Manager be received and noted.
2. Council approves the total proposed rates write-offs and remissions of $225,779 including GST.

- **Cass Square Playground Feedback**

Jan Visser, Facilities and Properties Manager spoke to the item and advised the purpose of this report was to provide feedback on the Cass Square Playground project.

- A thank you book from the children in the Rūma kotuku, Ruru and Tauhou classes from Hokitika Primary School had been circulated.
- The new playground has been very well received and is well used.

Moved Cr Gillett, seconded Cr Baird and **Resolved** that:

1. The report and appendix be received.

Cr Burden left the meeting at 2.20 pm, returning at 2.22 pm.

- **Hokitika Central Business District Christmas Lights**
  Jan Visser, Facilities and Properties Manager spoke to this item and advised the purpose of the report was to provide the Council with the costs involved with the replacement of the current Christmas lights and provide a list of the lights available for selection.

  - This is to lower the cost of maintenance and installation of the Christmas lights each year.
  - There is an operational budget to put up the Christmas lights each year within Council.

  Moved Cr Phelps, seconded Cr Neale that Council does not install any Christmas lights this festive season.

  Voted for the Motion:
  Cr Phelps, Cr Neale, Cr Gillett

  Voted against the Motion:
  Deputy Mayor Cassin, Cr Baird, Cr Davidson, Cr Burden

  The motion was put to the meeting and was lost on a show of hands.

  Moved Cr Manera, seconded Cr Baird and **Resolved by way of Amendment** that:
  1. The report be received.
  2. The request go out to Destination Hokitika and wider Community Groups for interest in funding or fundraising for the Christmas lights, with Council installing the lights each year as per the former agreement, if such funding is successful.

  The amendment became the substantive motion, was put to the meeting, and was carried.

  Cr Phelps, Cr Gillett and Cr Neale recorded their votes against the Motion.

- **Change to Building Levy**
  Ana Coleman, Building Control Manager spoke to this item and advised the purpose of the report was to update the Council on a legislative change effective 1 July 2024.

  Moved Deputy Mayor Cassin, seconded Cr Phelps and **Resolved** that:
  1. The report be received.
  2. Council adopt the amended Fees and Charges for 2024/2025.

- **Ngā Whakatūranga – Hokitika Museum Redevelopment**
  Scott Baxendale, Chief Executive introduced this item and spoke to the background of the Hokitika Museum project.

  Jan Visser, Facilities and Properties Manager spoke to the current project and budget of works.
  Laureen Sadlier, Museum Director spoke to the unbudgeted expenditure for opening the Hokitika Museum with a temporary exhibition prior to the official opening in June 2025.

  - Background and oversight arrangements:
    - At the June Council Meeting, Council adopted to undertake an internal fitout of the Hokitika Museum at a $600,000 budget.
    - The overall Museum project is overseen by a project working group with members including – Acting Chief Executive, Acting Group Manager District Assets, Facilities and Properties Manager, Museum Director and Community Services Manager
    - The Museum displays are the responsibility of the Museum Director.

    - The heritage impact assessment and resource consent are included in the new cost breakdown.
  - The temporary exhibition, Kura Pounamu is to open in December 2024 and close in April 2025, with the official opening of the Museum in June 2025.
  - The exhibition will use the two front galleries which will enable staff to carry on with the displays and set up in the rest of the Museum.
  - Kw Madgwick offered his services to the Hokitika Museum as Māori Researcher.

  Moved Deputy Mayor Cassin, seconded Cr Neale and **Resolved** that:
  1. The report be received.
  2. Council approves the opening of the Hokitika Museum in December 2024 with "Kura Pounamu – Our Treasured Stone", subject to support from local Iwi partners.

  The cost of the Kura Pounamu temporary exhibition is to be covered within the already allocated $600,000 budget for the Hokitika Museum project.

Moved Cr Baird, seconded Cr Burden and **Resolved** that in accordance Clause 4.2 of Council's Adopted Standing Orders, the meeting continue beyond 2 hours at 3.08 pm.

- **Council Headquarters Structural Upgrade**
  Scott Baxendale, Acting Chief Executive spoke to this item and advised the purpose of the report was to seek approval to defer the $8,400,000.00 seismic strengthening project of the Council Headquarters building.

  - This has been a long-standing project on Council's radar.
    - Staff need a safe and healthy working environment.
    - There are issues that must be addressed with the current Council Headquarters building – healthy air flow and mould growth are areas of concern.
    - There will be a future report coming to Council for works that must be done in the interim to make the working environment healthier and safer.
  - There are many equations to be analysed before decisions can be made.
    - The wastewater treatment plant will be an expensive investment (upward of $20M) which will be adding to the cost of rates.
    - There may be other options that have not yet been considered for housing council staff.
  - Rates affordability in our district is an increasing concern that must be looked into.
  - Staff will work to create a timeline of detailed expenses, which will be a totality of impact for capital expenditure which will, in turn, allow future decisions to be made by Council with more clarity and confidence, knowing the impact of such decisions on the rate payer.

  Moved Cr Manera, seconded Deputy Mayor Cassin and **Resolved** that:
  1. The report be received.
  2. Council defers the $8,400,000 Westland District Council Headquarters Structural Upgrade by up to 4 years, in line with the expected determination by Government in the earthquake-prone building review.
  3. A proposal be brought back to the Council for minor building works to address some of the building problems currently being experienced.

Cr Davidson left the meeting at 3.20 pm and did not return for the remainder of the meeting.

9. ADMINISTRATIVE RESOLUTION

Moved Deputy Mayor Cassin, seconded Cr Burden and **Resolved** that Council confirm its Seal being affixed to the following documents:

- **Warrant of Appointment –**

Warrant Of Appointment – COMPLIANCE TEAM LEADER	**STATUTORY APPOINTMENT**
	1. An Authorised Officer pursuant to Section 174 of the Local Government Act 2002
	2. An Enforcement Officer pursuant to Section 177 of the Local Government Act 2002
	3. An Enforcement Officer pursuant to Section 38 of the Resource Management Act 1991
	4. An Enforcement Officer pursuant to Section 229 of the Building Act 2004
	5. Where qualified in terms of the Hazardous Substances and New Organisms (Enforcement Officer Qualifications) Notice 2015, an Enforcement Officer pursuant to Sections 98(1)(a) and 100 of the Hazardous Substances and New Organisms Act 1996
	6. A Dog Control Officer pursuant to Section 11 of the Dog Control Act 1996
	7. A Dog Ranger pursuant to Section 12 of the Dog Control Act 1996
	8. A Deputy Pound keeper pursuant to Section 9 of the Impounding Act 1955
	
	STATUTORY DELEGATIONS AND ENFORCEMENT
	1. Authority pursuant to the Local Government Act 2002 to carry out the functions, powers and duties of an Enforcement Officer.
	2. Authority pursuant to the Resource Management Act 1991 to carry out the functions, powers and duties of an Enforcement Officer.
	3. Authority pursuant to the Building Act 2004 to carry out the functions, powers and duties of an Enforcement Officer.
	4. Authority to carry out and undertake the functions, powers and duties of an Environmental Health Officer pursuant to the Health Act 1956 (excluding those that are required to be undertaken by and Environmental Health Officer appointed pursuant to the Environmental Health Officers Qualifications Regulations 1993)
	5. Authority pursuant to the Hazardous Substances and New Organisms Act 1996 to carry out the functions, powers and duties of an Enforcement Officer where qualified in terms of the Hazardous Substances and New Organisms (Personnel Qualifications) Regulations 2001.
	6. Authority pursuant to the Dog Control Act 1996 to carry out the functions, powers and duties of a Dog Control Officer and Dog Ranger
	7. Authority pursuant to the Impounding Act 1955 to carry out the functions, powers and duties of a deputy Pound Keeper, other than the setting of pound fees conferred by Section 14(1) of the Act
	
	DISCRETIONARY STATUTORY DELEGATIONS
	1. Authority to administer and enforce Westland District Council Bylaws in accordance with the scope of the position.
	2. Authority pursuant to the Local Government Act 2002:
	    a. to enter any land or building other than a dwelling house pursuant to Section 171;
	    b. to enter occupied land or buildings in the event of an emergency pursuant to Section 173.
	3. Authority pursuant to Section 222 of the Building Act 2004
	    a. to carry out inspections
	4. Authority to consider applications and, where the application complies in all respects with the Westland District Council Gambling Venues Policies as the case may be, grant consent for the location and

	operation of Class 4 Gambling Venues in accordance with the Gambling Act 2003. 5. Authority to consider applications and, where the application complies in all respects with the Westland District Council Board Venues Policy as the case may be, grant consent for the location and operation of racing board venues. 6. Authority pursuant to the Dog Control Act 1996: a. To seize and remove a dog pursuant to Section 15 b. To classify a dog as dangerous pursuant to Sections 31 and 33ED; c. To classify a dog as menacing pursuant to sections 33A, 33C and 33ED; d. To require a menacing dog to be neutered pursuant to Section 33EB; e. To exercise the powers and functions of Council pursuant to Sections 32 and 33E; and f. To return a dog to its owner pursuant to Section 70 7. Pursuant to clause 32 of the 7th schedule of the Local Government Act 2002 to act as an informant for the purposes of laying information and issuing summonses under the Summary Proceedings Act 1957. 8. To authorise the undertaking of any prosecution proceedings in the name of Council or by any Council employee for breach of any Act, Regulation, or Westland District Council Bylaw, or Plan 9. This officer is delegated all the functions, powers and duties delegated to those that report to this position
Warrant Of Appointment – PLANNING TEAM LEADER	**To act in the Westland District as:** 1. An Officer pursuant to Section 174 of the Local Government Act 2002; AND 2. An Officer under the Westland District Council Bylaws; AND 3. An Enforcement Officer pursuant to Section 38 of the Resource Management Act 1991, including the power of entry pursuant to Section 332 and Section 333 of the Resource Management Act 1991.

DATE OF NEXT ORDINARY COUNCIL MEETING – 29 AUGUST 2024
COUNCIL CHAMBERS, 36 WELD STREET, HOKITIKA AND VIA ZOOM

MEETING CLOSED AT 3.39 PM

Confirmed by Council at their meeting held on the 29 August 2024.

__________________________ _______________________

Mayor Helen Lash **Date**
Chair

EXTRAORDINARY COUNCIL MINUTES

MINUTES OF THE EXTRAORDINARY COUNCIL MEETING OF WESTLAND DISTRICT COUNCIL HELD IN THE COUNCIL CHAMBERS, 36 WELD STREET, HOKITIKA AND VIA ZOOM ON TUESDAY, 6 AUGUST 2024 COMMENCING AT 3 PM

The Council Meeting was not live streamed.

1. MEMBERS PRESENT AND APOLOGIES

Chairperson	Her Worship the Mayor
Deputy and Southern Ward Member:	Cr Cassin
Northern Ward Members:	Cr Neale, Cr Burden
Hokitika Ward Members:	Cr Davidson, Cr Gillett (via zoom)
Southern Ward Members:	Cr Manera
Iwi Representatives:	Kw Madgwick

NGĀ WHAKAPAAHA
APOLOGIES

Cr Baird, Kw Tumahai.

ABSENT

Cr Phelps.

Moved Cr Burden, seconded Cr Neale and **Resolved** that the apologies from Cr Baird and, Kw Tumahai be received and accepted.

STAFF PRESENT
S. Baxendale, Acting Chief Executive; L. Crichton, Group Manager Corporate Services and Risk Assurance; E. Bencich, Acting Group Manager District Assets; D. Maitland; Executive Assistant; P. Coleman, Governance Administrator; J. Visser, Facilities and Properties Manager.

2. WHAKAPUAKITANGA WHAIPĀNGA
DECLARATIONS OF INTEREST

The Interest Register had been circulated. There were no changes to the Interest Register noted.

3. KA MATATAPU TE WHAKATAUNGA I TE TŪMATANUI
RESOLUTION TO GO INTO PUBLIC EXCLUDED

(to consider and adopt confidential items)

Moved Cr Davidson, seconded Cr Neale and **Resolved** that Council confirm that the public were excluded from the meeting in accordance with Section 48, Local Government Official Information and Meetings Act 1987 at 3.04pm.

Resolutions to exclude the public: Section 48, Local Government Official Information and Meetings Act 1987.

The general subject of the matters to be considered while the public are excluded, the reason for passing this resolution in relation to each matter and the specific grounds under Section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of the resolution are as follows:

Item No.	General subject of each matter to be considered	Reason for passing this resolution in relation to each matter	Ground(s) under Section 48(1) for the passing of this resolution
1.	Confidential Tender Report – Enabling Infrastructure Project Hokitika Racecourse Development (Contract No. 43040) Tender Approval	Good reason to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists. Section 48(1)(a)

This resolution is made in reliance on sections 48(1)(a) and (d) of the Local Government Official Information and Meetings Act 1987 and the particular interests or interests protected by section 7 of that Act, which would be prejudiced by the holding of the relevant part of the proceedings of the meeting in public are as follows:

Item No.	Interest
1.	Protect information where the making available of the information: (i) Would disclose a trade secret; or (ii) Would be likely unreasonably to prejudice the commercial position of the person who supplied or who is the subject of the information. (s. 7(2)(b))
1.	Enable any local authority holding the information to carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations). (s. 7(2)(i))
1.	Prevent the disclosure or use of official information for improper gain or improper advantage. (s. 7(d)(j))

Moved Cr Burden, seconded Cr Manera and **Resolved** that the business conducted in the 'Public Excluded Section' be confirmed and accordingly, the meeting went back to the open part of the meeting at 3.40 pm.

DATE OF NEXT ORDINARY COUNCIL MEETING – 29 AUGUST 2024
COUNCIL CHAMBERS, 36 WELD STREET, HOKITIKA AND VIA ZOOM

MEETING CLOSED AT 3.40 PM

Confirmed by:

____

Her Worship the Mayor **Date:**
Chair

RISK AND ASSURANCE COMMITTEE MEETING MINUTES

MINUTES OF THE RISK AND ASSURANCE COMMITTEE MEETING OF WESTLAND DISTRICT COUNCIL HELD IN THE COUNCIL CHAMBERS, 36 WELD STREET, HOKITIKA AND VIA ZOOM ON THURSDAY 9TH MAY 2024 COMMENCING AT 1.00 PM

The Committee Meeting was live streamed to the Westland District Council YouTube Channel and presentations are made available on the council website.

1. MEMBERS PRESENT AND APOLOGIES

Chairperson:	Rachael Dean
Members:	
Her Worship the Mayor	Cr Baird
Cr Neale (via zoom)	

NGĀ WHAKAPAAHA
APOLOGIES

Cr Phelps

Moved Her Worship the Mayor, seconded Cr Baird and **Resolved** that the apology from Cr Phelps be received and accepted.

ABSENT

Kw Madgwick & Kw Tumahai

STAFF PRESENT
S.R. Bastion, Chief Executive; T. Cook, Regulatory Services Manager; L. Crichton, Group Manager: Corporate Services & Risk Assurance; S. Baxendale, Group Manager District Assets; D. Maitland; Executive Assistant, E. Rae, Strategy and Communications Advisor (via Zoom); P. Coleman, Governance Administrator.

2. WHAKAPUAKITANGA WHAIPĀNGA DECLARATIONS OF INTEREST

The Interest Register had been circulated.
There were no changes to the Interest Register noted.

3. NGĀ TAKE WHAWHATI TATA KĀORE I TE RĀRANGI TAKE URGENT ITEMS NOT ON THE AGENDA

There were no urgent items of business not on the Agenda.

4. NGĀ MENETI O TE HUI KAUNIHERA MINUTES OF MEETINGS

The Minutes of the previous meeting had been previously circulated.

- **Risk and Assurance Committee Meeting Minutes – February 8th 2024**

  Moved Cr Baird seconded Cr Neale and **Resolved** that the Minutes of the Risk and Assurance Committee Meeting held on the 8th of February 2024 be confirmed as a true and correct record of the meeting.

  The Chair **Approved** that their digital signature be added to the confirmed Risk and Assurance Committee Meeting Minutes of the 8th of February 2024.

5. ACTION LIST

Lesley Crichton, Group Manager Corporate Services and Risk Assurance spoke to the Action List and provided the following updates:

- Evaluation of the performance of the committee – Rachael Dean
  - A workshop should be held in August.
  - Rachael will distribute the questionnaire at the end of May to be filled out by 30 June at the latest.
  - This will then be summarised and returned 2 weeks before the August meeting.

Moved Chair Rachael Deal, seconded Cr Baird and **Resolved** that the updated Action List be received and the Sensitive Expenditure Policy be removed from the Action List.

6. NGĀ TĀPAETANGA PRESENTATIONS

Nil

7. PŪRONGO KAIMAHI STAFF REPORTS

- **Workplan**

  Lesley Crichton, Group Manager Corporate Services and Risk Assurance spoke to the workplan.

  Insurance will be updated on the workplan to include the Chief Executive of Destination Westland and Rachael Dean.

  Moved Chair Rachael Dean, seconded Her Worship the Mayor and **Resolved** that:

  1. The Workplan be received.

- **Review of Revised Human Resources (HR) Policies**

  Simon Bastion, Chief Executive spoke to this item and advised the purpose of this report is to present revised policies for the Risk and Assurance Committee (R&A) to receive:

  1. Volunteer Policy updated
  2. Flexible Work Policy updated
  3. Staff Code of Conduct updated

  - The Staff Code of Conduct policy has been reworded with a positive focus. This has been approved by staff before going to the exec team.
  - Volunteer policy –

- 2.1 Westland District Council Obligations – extend to add "and any form of harassment".
- 2.2 Volunteer Obligations – amend to say – "Take reasonable care of safety", removing the words "their own".

Moved Chair Rachael Dean, seconded Cr Baird and **Resolved** that:

1. The report be received.
2. The following policies be received by the Risk and Assurance Committee:
   - 2.1. Volunteer Policy.
   - 2.2. Flexible Work Policy.
   - 2.3. Staff Code of Conduct.

- **Quarterly Report – Q3 – 1 January – 31 March 2024**

Lynley Truman, Finance Manager and Emma Rae, Strategy and Communications Advisor spoke to this item and advised the purpose of this report is to inform the Committee of Council's financial and service delivery performance for the nine months ended 31 March 2024 (Q3) and answered questions from the Committee.

It was noted that the additional sampling costs related to Water are a mandatory requirement from Government that came in through Water regulations and are the reason for a significant proportion of the proposed rate increase.

Matters discussed by the Committee included

- Interest rate risk.
- Rates affordability.
- Debt affordability benchmark.
- Water, additional sampling costs.
- Consent fees.
- Debtors.

Cr Baird left the meeting at 1.25 pm, returning at 1.26 pm.

Moved Chair Rachael Dean, seconded Cr Baird and **Resolved** that:

1. The report be received.
2. The Committee receive the Quarterly Report - Q3 - January – March 2024.

- **Artificial Intelligence (A.I) Policy**

Richard Morris, Information Manager spoke to this item and advised the purpose of this report is to provide a summary and synopsis of the recently adopted Artificial Intelligence (A.I) Policy.

- The Information Technology department used ideas from the Association of Local Government Information Management (ALGIM) template policy to create this policy.
- New Zealand is currently ahead of the curve with developing AI policies.
- This policy is meant to temper the advance of technology with some common sense.
- Attempting to keep one step ahead of emerging threats.

Moved Chair Rachael Dean, seconded Cr Neale and **Resolved** that:

1. The report be received.
2. The Committee endorse the Artificial Intelligence (AI) Policy as published.

- **Information Management Update**
  Richard Morris, Information Manager spoke to this item and advised the purpose of this report is to update the committee on the work of the Westland District Council (WDC) Information Management team.

  - Technology is moving ahead very quickly at the moment.

  Moved Cr Mayor seconded Cr Baird and **Resolved** that:
  1. The report be received.
  2. Any feedback, suggestions, or recommendations for the working group be provided at the committee's earliest convenience.
  3. The committee recommend the continued commitment to the work of the Information Management team.

- **Sensitive Expenditure Policy**
  Lesley Crichton, Group Manager Corporate Services and Risk Assurance spoke to this item and advised the purpose of this report is to review the addition of the Office of the Auditor General (OAG) principles in the Sensitive Expenditure Policy as requested by the Risk and Assurance meeting 9 November 2023.

  Moved Cr Baird, seconded Cr Neale and **Resolved** that:
  1. The report be received.
  2. The updated Sensitive Expenditure Policy including Office of the Auditor General principles be received.

8. KA MATATAPU TE WHAKATAUNGA I TE TŪMATANUI RESOLUTION TO GO INTO PUBLIC EXCLUDED

(to consider and adopt confidential items)

Moved Chair Rachael Dean, seconded Her Worship the Mayor and **Resolved** that the Risk and Assurance Committee confirm that the public were excluded from the meeting in accordance with Section 48, Local Government Official Information and Meetings Act 1987 at 1.48 pm.

The general subject of the matters to be considered while the public are excluded, the reason for passing this resolution in relation to each matter and the specific grounds under Section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of the resolution are as follows:

Item No.	General subject of each matter to be considered	Reason for passing this resolution in relation to each matter	Ground(s) under Section 48(1) for the passing of this resolution
1.	Confidential Minutes – February 8th 2024	Good reasons to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists. Section 48(1)(a)
2.	EY Westland District Council Audit Plan	Good reasons to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure

			of information for which good reason for withholding exists. Section 48(1)(a)
3.	Information Technology Report and Updates	Good reasons to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists. Section 48(1)(a)
4.	Risk Report	Good reasons to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists. Section 48(1)(a)
5.	Quarterly Report on Whistleblower Service at 31 March 2024	Good reasons to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists. Section 48(1)(a)
6.	Privacy Breach Report	Good reasons to withhold exist under Section 7	That the public conduct of the relevant part of the proceedings of the meeting would be likely to result in the disclosure of information for which good reason for withholding exists. Section 48(1)(a)

This resolution is made in reliance on sections 48(1)(a) and (d) of the Local Government Official Information and Meetings Act 1987 and the particular interests or interests protected by section 7 of that Act, which would be prejudiced by the holding of the relevant part of the proceedings of the meeting in public are as follows:

Item No.	Interest
1, 4, 6	Protect the privacy of natural persons, including that of deceased natural persons. (s. 7(2)(a))
1, 4	Protect information where the making available of the information: (i) would disclose a trade secret; and (ii) would be likely unreasonably to prejudice the commercial position of the person who supplied or who is the subject of the information. (s. 7(2)(b))
3	Avoid prejudice to measures that prevent to mitigate material loss to members of the public. (s. 7(2)(e))
1, 2, 5	Maintain the effective conduct of public affairs through: (i) The protection of such members, officers, employees, and persons from improper pressure of harassment (s. 7(2)(f))

1, 4, 5	Maintain legal professional privilege. (s. 7(2)(g))
1, 3, 4, 5	Enable any local authority holding the information to carry out, without prejudice or disadvantage, commercial activities. (s. 7(2)(h))
1, 4	Enable any local authority holding the information to carry on, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations). (s. 7(2)(i))
2, 3	Prevent the disclosure or use of official information for improper gain or improper advantage. (s. 7(2)(j))

Moved Chair Rachael Dean, seconded Cr Baird and **Resolved** that the business conducted in the 'Public Excluded Section' be confirmed and accordingly, the meeting went back to the open part of the meeting at 3.25 pm

DATE OF NEXT RISK AND ASSURANCE COMMITTEE MEETING
8TH AUGUST 2024
COUNCIL CHAMBERS, 36 WELD STREET, HOKITIKA AND VIA ZOOM

MEETING CLOSED AT 3.25 PM

Confirmed by the Risk and Assurance Committee at their meeting on **8TH AUGUST 2024.**

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Rachael Dean **Date: 8 August 2024**
Chair

CYCLING & WALKING SUBCOMMITTEE MINUTES

MINUTES OF THE CYCLING AND WALKING SUBCOMMITTEE MEETING OF WESTLAND DISTRICT COUNCIL HELD IN THE COUNCIL CHAMBERS, 36 WELD STREET, HOKITIKA AND VIA ZOOM ON THURSDAY 15TH FEBRUARY 2024 COMMENCING AT 3PM

The Subcommittee Meeting was live-streamed to the Westland District Council Youtube Channel and presentations are made available on the Council Website.

1. MEMBERS PRESENT AND APOLOGIES

Chairperson	Cr Davidson	
Members	Her Worship the Mayor	
	Cr Baird	Cr Neale
	Kw Madgwick	Kw Tumahai
	Cr J. O'Connor, Grey District Council	O. Kilgour, Department of Conservation
	L. Anderson, Westland Mountain Bike Club (via Zoom)	I. Perkins, Herenga ā Nuku Aotearoa; The Outdoor Access Commission

NGĀ WHAKAPAAHA
APOLOGIES

J. Wood, West Coast Wilderness Trail; T. Brownlee, Manawa Energy; J. Gurden, West Coast Wilderness Trail; Cr Gillett.

Moved Cr Baird, seconded Cr Neale and **Resolved** that the apologies from J. Wood, T. Brownlee and J. Gurden be received and accepted.

STAFF PRESENT
S.R. Bastion, Chief Executive; S. Baxendale, Group Manager District Assets; T. Cook, Group Manager: Regulatory and Community Services; L. Crichton, Group Manager Corporate Services, Risk and Assurance; D. Maitland, Executive Assistant; E. Rae, Strategy and Communications Advisor (via Zoom); P Coleman, Governance Administrator.

2. WHAKAPUAKITANGA WHAIPĀNGA
DECLARATIONS OF INTEREST

The Interest Register had been circulated to the Committee.
There were no changes to the Interest Register noted.

3. NGĀ TAKE WHAWHATI TATA KĀORE I TE RĀRANGI TAKE
URGENT ITEMS NOT ON THE AGENDA

There were no urgent items of business not on the Agenda.

4. NGĀ MENETI O TE HUI KAUNIHERA
MINUTES OF MEETINGS

The Minutes of the previous meeting were included in the Subcommittee Agenda.

- **Cycling and Walking Subcommittee Meeting Minutes – 16th November 2023**
  It was noted that the Minutes of the 16 November 2023 needed an amendment made to the attendees of the meeting. The minutes stated that Cr Burden was in attendance which was incorrect, this should have stated that Cr Baird was in attendance. The minutes have been amended accordingly.

  Moved Cr Baird, seconded, O. Kilgour and **Resolved** that the Amended Minutes of the Cycling and Walking Subcommittee Meeting held on the 16th November 2023 be confirmed as a true and correct record of the meeting.

  The Chair **Approved** that their digital signature be added to the confirmed Cycling and Walking Subcommittee Meeting Minutes of 16th November 2023.

5. ACTION LIST

Scott Baxendale, Group Manager District Assets, spoke to the Action List and provided the following updates:

- Mahinapua Historic Bridge – Highway Crossing.
  - No further progress.
- West Coast Wilderness Trail exiting onto stated highway 6.
  - No further progress.
- Pine Tree Road Connection
  - No funding for this project.
  - Inger Perkins has spoken to many local businesses and has initial support, will work further on this in regard to finding funding to get this project done. Will keep the committee updated on any progress.
- Track Realignment behind the Hokitika Racecourse.
  - Funding for this was denied.
  - Recommend this item be removed from the Action List.

  Moved Her Worship the Mayor, seconded Cr Baird and **Resolved** that the updated Action List be received and the item relating to the track realignment behind the Hokitika Racecourse be removed.

6. NGĀ TĀPAETANGA
PRESENTATIONS

Nil

7. WRITTEN REPORTS

- **Economic and Performance Report, West Coast Wilderness Trail Trust Update**
  Jackie Gurden, Trail Manager, West Coast Wilderness Trail, was unable to attend the meeting.
  Simon Bastion, Chief Executive spoke to this item.

  - A family event is being planned for the very near future on part of the West Coast Wilderness Trail.

- Charging stations are not required to be added to the Trail.
- West Coast Wilderness Trail is performing above the average for trails in New Zealand.
- The trail has a direct return of $15 million per year.
- Kumara and Ross townships have benefited from the trail as visitor numbers have increased with great accessibility.

  Moved Cr Davidson, seconded Cr Baird and **Resolved** that Jackie Gurden be invited to a Council meeting to report on the economic impacts of the West Coast Wilderness Trail.

  Moved Cr Baird, seconded Cr Neale and **Resolved** that the Economic and Performance report, West Coast Wilderness Trail Trust update from Jackie Gurden, Trail Manager, West Coast Wilderness Trail be received.

- **Grey District Council**

  Cr Jack O'Connor, Grey District Council, provided the following update:

  - Congratulated Department of Conservation on opening their Pike 29 Memorial Trail on 16 February 2024.
  - The new trail will potentially enable visitors to make return visits to the Coast.
  - Lake Brunner Scenic Trail from Moana is pushing forward to Bain Bay. There are potential future plans to carry this track towards Kumara. The scenic trail is currently a shared biking and walking track, has great visuals, and is very flat. This is a local asset, not a council asset.
  - Blackball school flow track, a great community effort in building the cycling network.
  - Tu Manawa Active Aotearoa funding is open for applications from February 12th – March 1st for – Play, Active Recreation and Sports projects. This funding is available to Councils.
  - Cobden Aromahana Sanctuary and Recreation Area. This extension will link to the flood wall. This will not extend the official route of the cycle trail, but it will link in. Funding for this will be under the Grey District Council.
  - Vandalism of trails is an ongoing issue.

  Moved I. Perkins, seconded Cr Neale and **Resolved** that the Grey District Council report from Cr Jack O'Connor, Grey District Council be received.

- **Manawa Energy**

  Tim Brownlee, Generation Site Leader West Coast, Manawa Energy Limited, was unable to attend the meeting. 'Scott Baxendale read out Mr Brownlees report for the subcommittee.

  Moved Cr O'Connor, seconded I Perkins and **Resolved** that the Manawa Energy report from Tim Brownlee, Generation Site Leader West Coast, Manawa Energy Ltd be received.

- **Department of Conservation**

  Owen Kilgour, Operations Manager, Department of Conservation, spoke to this item as follows:

  - The Department of Conservation has been working closely with NZ Police regarding the vandalism that has been happening around the West Coast.
  - Westland has seen a very busy summer season for visitors to the District.
  - Hans Bay at Lake Kaniere has been at full capacity and beyond most of the summer period.
  - Hokitika Gorge has been very busy, in discussions with Council on managing the traffic and parking. The engineering survey has been completed for the swing bridge. The project is running as scheduled, next is the design phase.
  - Wadeson Island Stage Two work is finished. Working with Development West Coast looking for commercial sponsors to help maintain Wadeson Island in the future.
  - Mahinapua bridge work will be mainly around the piles if there is any work to be done.

- Estimate Hokitika Gorge project will be finished for Summer 2025.

  Moved Cr Baird, seconded I. Perkins and **Resolved** that the Department of Conservation Report from Owen Kilgour, Operations Manager, Department Of Conservation be received.

- **Herenga ā Nuku Aotearoa – The Outdoor Access Commission**
  Inger Perkins, Herenga ā Nuku Aotearoa; The Outdoor Access Commission, provided the following verbal update:

  - Pine Tree Road Connection. There is value in that connection but as noted in the Action list there is no funding. [1]A couple of local businesses have pledged their initial support, will work further on this in regard to finding funding to get this project done. Will keep the committee updated on any progress.
  - Work has begun on the two new gates that will allow access over the unformed legal road at Ruatapu.

  Moved Cr Baird, seconded Cr Neale and **Resolved** that the Verbal Report from the Inger Perkins, Herenga Ā Nuku Aotearoa, The Outdoor Access Commission be received.

- **Westland Mountain Bike Club**
  Liam Anderson, Club President, Westland Mountain Bike Club, joined the meeting via Zoom. Items discussed included:

  - The Westland Mountain Bike Club have started the biggest track project to date at Blue Spur Forest linking Reg Cox Drive with the main track area of the forest. Currently halfway through digging the track, this will be almost 1.5km when it is finished.
  - A track will be formed over the unformed legal road which will need to be fenced as it is currently land that is being grazed.
  - Bikers will be encouraged to park their vehicles on the main road, and this may have to be made more usable if numbers increase.

  Moved I. Perkins, seconded Cr Neale and **Resolved** that the Westland Mountain Bike Club from Liam Anderson, Club President, Westland Mountain Bike Club be received.

DATE OF NEXT CYCLING AND WALKING SUBCOMMITTEE MEETING [2]WEDNESDAY, 21 AUGUST 2024 COUNCIL CHAMBERS, 36 WELD STREET, HOKITIKA AND VIA ZOOM

MEETING CLOSED AT 3.43PM

Confirmed by:

____

Cr Paul Davidson **Date:**
Chair

[1] Amended at the Cycling and Walking Subcommittee Meeting of 21 August 2024. Corrected.
[2] Amended at the Cycling and Walking Subcommittee Meeting of 21 August 2024. Updated date for the next meeting.

22.02.24 – COUNCIL MEETING ACTION LIST

Item No.	Date of Meeting	COMPLETED IN PROGRESS OVERDUE	Item	Action	Completion Date/Target Date	Officer	Status
1	26.08.21		Pakiwaitara Building, 41 Weld Street Hokitika Council Headquarters, 36 Weld Street, Hokitika	Business case and scope of work to be brought to Council after the structural elements of the work have been identified, costed and timelines finalized.	June 24	CE	Pakiwaitara will be put forward for Sale as part of the LTP, will be kept wind and watertight in the meantime. Council HQ has a report to Council at this July meeting. Pakiwaitara - Report to this August Council meeting. Council HQ – No further update.
2	30.05.24		Hokitika Gorge Bridge	Replacement of the original swing bridge at the Hokitika Gorge.		CE	DOC will be presenting at the July meeting of Council regarding progress on the Hokitika Lower Gorge Swingbridge. DOC gave a detailed update at the July Council meeting.
3	27.06.24		Community Housing Trust	Available Council land to contribute to the Community Housing Trust		CE	Council requested at the May Council meeting for a report from Staff regarding Council land that may be able to be contributed to the Community Housing Trust. A meeting with Whare Iraia from Development West Coast was held regarding this. Whare will come back to Council in the future regarding this.

Report to Council

DATE: **29 August 2024**

TO: Mayor and Councillors

FROM: Finance Manager

PROJECTS AND CARRY FORWARDS TO 2024-25

1. Summary

1.1. The purpose of this report is to seek Council approval for the carry forward of funding of projects and operating costs and revenues that were scheduled from previous financial years but were not completed by 30 June 2024.

1.2. This issue arises because Council is accountable for the application of its revenues and other funding sources to service levels and infrastructure in accordance with its Enhanced Annual Plan 2024-25.

1.3. Council seeks to meet its obligations under the Local Government Act 2002 and the achievement of the District Vision adopted by the Council in June 2024, which are set out in the Enhance Annual Plan 2024-25. Refer page 2 of the agenda.

1.4. This report concludes by recommending that Council approves the carry forward of funds for the project costs itemised in **Appendix 1** and operational costs of $104,000 for audit fees for the deferred Long Term Plan, and approve the future allocation of funds for specific purposes.

2. Background

2.1. The reason the report has come before the Council is due to the Council approving its annual budget based on planned levels of service and capital works for the financial year.

2.2. It is common that certain undertakings will be partially complete, committed but not started or deferred as at the end of the financial year.

2.3. These items will appear as favourable variances in the financial year 2023-24 in which their funding was recognised as revenue, or where debt was planned to be drawn.

2.4. Council has an obligation to deliver on its commitments, but where projects and expenditure are carried forward, they will be reported as adverse variances against the budget for the financial year in which they are completed.

2.5. Typically, the types of items carried forward are:
    2.5.1. Capital projects partially completed.
    2.5.2. Projects funded by third parties.
    2.5.3. Long-term operational projects.
    2.5.4. Activities whose frequency is less than annual but for which funding is phased evenly over more than one financial year.

3. Current Situation

3.1. The Council is expecting to report a favourable variance in its external debt position for the year ended 30 June 2024, after eliminating debt held on behalf of and on-charged to Council Controlled Organisations. This in part relates to the non-completion of the items proposed for carry forward attached as **Appendix 1**.

3.2. Any variances against Council's operating budget will be addressed in the Annual Report for the year ending 30 June 2024. However, the funds proposed for future allocation will be included in these variances.

3.3. The amounts proposed to be carried forward are estimated by deducting expenditure to date from the original budget and adjusted by any known variations as advised by activity managers.

3.4. Where projects have been cancelled or superseded in the budget for 2023-24, they have been excluded from the carry forward schedule.

3.5. The proposed carry forward schedule has been drafted after consideration of these commitments alongside those included in the Enhanced Annual Plan 2024-25.

3.6. Progress on completion of these items will be communicated through Council's monthly financial reports.

4. Options

4.1. Option 1: Approve the carry forward of funds for the projects in Appendix 1 and operational costs of $104,000 for audit fees for the deferred Long Term Plan to the financial year 2024-25, and the future allocation of funds for specific purposes.

4.2. Option 2: Approve amended schedule, adding or deleting items.

4.3. Option 3: Reject all carry forwards.

5. Risk Analysis

5.1. Risk has been considered and the following risks have been identified, reputational risk because of uncompleted projects carried forward for unrealistic commitments. Financial risk has also been considered where Council has already funded expenditure that has a rates element which if the project does not continue may require repayment of rates to ratepayers, there is also the risk of having to repay external funding.

6. Health and Safety

6.1. Health and Safety has been considered and there is potential for staff to become overwhelmed with the volume of commitments being undertaken. Council management have acknowledged this and will manage the wellbeing of staff.

7. Significance and Engagement

7.1. The level of significance has been assessed as being low significance insofar as it relates to existing circumstances that have been reported throughout the financial year.

7.2. No public consultation is considered necessary as all items were consulted on through the previous long-term plan or annual plans, with some items that are funded through external funding that were not consulted on, however these have been reported on through the normal channels throughout the year.

8. Assessment of Options (including Financial Considerations)

8.1. Option 1 – will generate adverse operating variances and additional debt requirements in the financial year, 2024-25. However, these are merely the inversion of favourable variances in 2023-24 and are therefore essentially timing differences. Option 1 is financially prudent because it ensures that Council's revenues and funding sources are applied to their intended purposes. It would also meet community expectations as Council will deliver on its commitments undertaken in the Enhanced Annual Plan 2024-25.

8.2. Option 2 – would invoke some departures from the Enhanced Annual Plan 2024-25 and may cause some adverse community reaction. This may be appropriate if Council determines that alternative applications of these funds are more prudent or of higher priority, or that the requirements have substantially changed.

8.3. The financial implications of Option 2 would not be known until the extent of the changes that Council suggest are known, but there are likely to be some implications.

8.4. The financial implications of this option could be significant if external funding has to be repaid and rates adjustments made.

9. Preferred Option(s) and Reasons

9.1. The preferred option is Option 1 – approve the carry forward of funds for the project costs itemised in **Appendix 1** and operational costs of $104,000 for audit fees for the deferred Long Term Plan to the financial year 2024-25, and the future allocation of funds for specific purposes.

9.2. The reason that Option 1 has been identified as the preferred option is that this will demonstrate Council's resolve to deliver on its commitments and will ensure that revenues and other sources of funds are applied to their intended purposes.

10. Recommendation(s)

10.1. That the report be received.

10.2. That Council approve the carry forward of funds for the projects itemised in Appendix 1 and operational costs of $104,000 for audit fees for the deferred Long Term Plan to the financial year 2024-25.

10.3. That Council approve the future allocation of funds for specific purposes.

Lynley Truman
Finance Manager

Appendix 1: Additional Capital Expenditure Budget carried forwards request

Appendix 1			2024/2025							
Additional Capital Expenditure Budget carried forwards request			**FIS Expenditure (incl. c/fwds)**				**FUNDING**			
	C/Fwd from 2023/24	Expected c/fwd already included in AP	Renewal	Growth	LOS	Total 2024/2025	Grant	Reserve	Loan	Total 2024/2025
PLANNING & REGULATORY										
Emergency										
Civil Defence - Alternate water supply					58,500	**58,500**			58,500	**58,500**
Civil Defence - EMAT Cache					32,000	**32,000**			32,000	**32,000**
Civil Defence Generators					36,742	**36,742**			36,742	**36,742**
Emergency communications					28,281	**28,281**			28,281	**28,281**
Emergency equipment container					31,416	**31,416**			31,416	**31,416**
Emergency Total			**0**	**0**	**186,939**	**186,939**			**186,939**	**186,939**
PLANNING & REGULATORY TOTAL		**0**	**0**	**0**	**186,939**	**186,939**	**0**	**0**	**186,939**	**186,939**
LEADERSHIP										
HQ										
Council HQ Earthquake strengthening & refurbishment	**41,097**				321,097	**321,097**			321,097	**321,097**
Furniture Renewals			5,353			**5,353**		5,353		**5,353**
HQ Total	**41,097**		**5,353**	**0**	**321,097**	**326,450**	0	5,353	321,097	**326,450**
IT										
Aerial photography		40,000	40,000			**40,000**		40,000		**40,000**
IT equipment Renewals	**(1,839)**	11,720	59,881			**59,881**		59,881		**59,881**
IT Offsite Replication		40,960			40,960	**40,960**			40,960	**40,960**
Teleconferencing Equipment			10,000			**10,000**		10,000		**10,000**
IT Total	**(1,839)**	**92,680**	**109,881**	**0**	**40,960**	**150,841**	0	109,881	40,960	**150,841**
MV										
Replacement of vehicles			100,000			**100,000**		100,000		**100,000**
MV Total			**100,000**	**0**	**0**	**100,000**	0	100,000	0	**100,000**
LEADERSHIP TOTAL	**39,258**	**92,680**	**215,234**	**0**	**362,057**	**577,291**	**0**	**215,234**	**362,057**	**577,291**
COMMUNITY SERVICES										
Halls										
Bandroom, painting of gutters, replacement of windows & reroofing										
Carnegie - Museum fitout (includes Museum Packaging proj tsfr 2025 $2,869)			602,869			**602,869**		2,869	600,000	**602,869**
Drummond Hall minor works (Museum Building)			75,000			**75,000**		75,000		**75,000**
Hokitika Heritage Park Infrastructure	**14,648**		14,648			**14,648**		14,648		**14,648**
Halls Total	**14,648**		**692,517**	**0**	**0**	**692,517**	0	92,517	600,000	**692,517**
Township										
Franz Josef Urban Revitalisation Plan	**168,452**				168,452	**168,452**		168,452		**168,452**
Hokitika revitalisation plan					25,000	**25,000**			25,000	**25,000**
Hokitika Rubbish Bins	**1,024**		22,528			**22,528**		22,528		**22,528**
Cass Square & Franz Josef Community Bins (50% funding received)	**16,920**				16,920	**16,920**		16,920		**16,920**
Lighting and banners					30,000	**30,000**			30,000	**30,000**
Township Total	**186,396**		**22,528**	**0**	**240,372**	**262,900**	0	207,900	55,000	**262,900**
COMMUNITY TOTAL	**201,043**	**0**	**715,045**	**0**	**240,372**	**955,416**	**0**	**300,416**	**655,000**	**955,416**
FACILITIES & LEISURE SERVICES										
Cemeteries										
Ross Berm Development				15,000		**15,000**			15,000	**15,000**
Hokitika Cemetery - Develop Berms	**5,797**				5,797	**5,797**			5,797	**5,797**
Hokitika Cemetery - Reseal Roads			30,000			**30,000**			30,000	**30,000**
Hokitika Cemetery upgrade & expansion	**29,779**		28,339	12,146		**40,485**			40,485	**40,485**
Stafford Cemetery Infrastructure Improvements	**6,847**				6,847	**6,847**			6,847	**6,847**
Cemeteries Total	**42,423**		**58,339**	**27,146**	**12,644**	**98,129**	0	0	98,129	**98,129**
Conveniences										
Beach Front Public Toilets upgrade			12,500			**12,500**		12,500		**12,500**
Otira Public Toilets	**226,160**			226,160		**226,160**			226,160	**226,160**
Tancred Front Public Toilets upgrade			47,500			**47,500**		47,500		**47,500**
Conveniences Total	**226,160**		**60,000**	**226,160**	**0**	**286,160**	0	60,000	226,160	**286,160**
Land & Buildings										
Hari Hari House			29,169			**29,169**		29,169		**29,169**
Racecourse Development	**(43,585)**	1,557,947			1,514,362	**1,514,362**	1,514,362			**1,514,362**
Land & Buildings Total	**(43,585)**	**1,557,947**	**29,169**	**0**	**1,514,362**	**1,543,531**	1,514,362	29,169	0	**1,543,531**
Library										
Book replacements			65,126			**65,126**		65,126		**65,126**
Library redecoration and improvements			48,000			**48,000**		48,000		**48,000**
Library Total			**113,126**	**0**	**0**	**113,126**	0	113,126	0	**113,126**
Parks & Reserves										
Cass Square - new developments					50,000	**50,000**			50,000	**50,000**
Haast playground equipment upgrade/replacement	**3,072**		2,150		922	**3,072**		3,072		**3,072**
Heritage area lighting and banners	**29,588**				29,588	**29,588**			29,588	**29,588**
Kumara playground equipment upgrade/replacement	**3,072**		17,150		922	**18,072**		18,072		**18,072**
Ross Community Pole Shed & Land	**82,908**			82,908		**82,908**			82,908	**82,908**
Whataroa playground equipment	**1,536**		1,075		461	**1,536**		1,536		**1,536**
Parks Total	**120,176**		**20,375**	**82,908**	**81,893**	**185,176**	0	22,680	162,496	**185,176**
Pools										
Hokitika Pool - Heating, roofing and shorsheld flooring	**29,105**				629,105	**629,105**			629,105	**629,105**
Ross swimming pool			6,144			**6,144**		6,144		**6,144**
Pools Total	**29,105**		**6,144**	**0**	**629,105**	**635,249**	0	6,144	629,105	**635,249**
WCWT										
Minor infrastructure & safety enhancements	**128,807**				128,807	**128,807**			128,807	**128,807**
Totara Bridge Stage 2 & 3	**549,139**				549,139	**549,139**			549,139	**549,139**
WCWT Total	**677,946**	**0**	**0**	**0**	**677,946**	**677,946**	0	0	677,946	**677,946**
FACILITIES & LEISURE SERVICES TOTAL	**1,052,226**	**1,557,947**	**287,153**	**336,214**	**2,915,950**	**3,539,318**	**1,514,362**	**231,119**	**1,793,837**	**3,539,318**

Additional Capital Expenditure Budget carried forwards request cont.			FIS Expenditure (incl. c/fwds)				FUNDING			
	C/Fwd from 2023/24	Expected c/fwd already included in AP	Renewal	Growth	LOS	Total 2024/2025	Grant	Reserve	Loan	Total 2024/2025
LAND TRANSPORT										
211 Unsealed Road Metalling			212,400			**212,400**	135,936	76,464		**212,400**
212 Sealed Road Resurfacing			1,547,908			**1,547,908**	990,661	557,247		**1,547,908**
213 Drainage Renewals			250,445			**250,445**	160,285	90,160		**250,445**
214 Sealed Road Pavement Rehabilitation			200,000			**200,000**	128,000	72,000		**200,000**
215 Structures Component Replacements			1,750,000			**1,750,000**	1,120,000	630,000		**1,750,000**
222 Traffic Services Renewals			165,221			**165,221**	105,741	59,480		**165,221**
Footpath renewals - All Footpaths			100,000			**100,000**	64,000	36,000		**100,000**
Local Road Improvements - Low cost / Low risk improvements			700,000			**700,000**	448,000	252,000		**700,000**
213 SPR Drainage renewals			200,000			**200,000**	200,000			**200,000**
214 SPR Sealed road pavement rehabilitation			600,000			**600,000**	600,000			**600,000**
216 SPR Bridge & Structure Renewals			1,500,000			**1,500,000**	1,500,000			**1,500,000**
222 SPR Traffic services renewals			15,000			**15,000**	15,000			**15,000**
SPR Local Road Improvements - Low cost / Low risk improvements			2,000,000			**2,000,000**	2,000,000			**2,000,000**
Transport Total		**0**	**9,240,974**	**0**	**0**	**9,240,974**	**7,467,623**	**1,773,351**	**0**	**9,240,974**
SOLID WASTE										
Butlers Intermediate Capping & equipment	**80,051**		110,051			**110,051**			110,051	**110,051**
Butlers New Cell/Franz Josef Waste Management	**83,042**				83,042	**83,042**	83,042			**83,042**
Emissions Trading - Carbon Credits			280,000			**280,000**			280,000	**280,000**
Haast Landfill Capping			30,000			**30,000**			30,000	**30,000**
Haast Transfer Station Development	**100,000**				100,000	**100,000**			100,000	**100,000**
Hari Hari Landfill Protection			20,000			**20,000**			20,000	**20,000**
Hokitika - Refuse General Upgrade			10,000			**10,000**		10,000		**10,000**
Misc Plant & Equipment for Waste Minimisation	**(16,530)**	97,798			134,798	**134,798**			134,798	**134,798**
Solid Waste Total	**246,563**	**97,798**	**450,051**	**0**	**317,840**	**767,891**	**83,042**	**10,000**	**674,848**	**767,891**
STORMWATER										
Hokitika Pump Station Component Upgrade			130,000		130,000	**260,000**		130,000	130,000	**260,000**
Livingstone St Pump Upgrade/Hokitika sw retic with pump upgrade			500,000		500,000	**1,000,000**		500,000	500,000	**1,000,000**
Stormwater Mains replacement Hokitika	**42,340**		42,340			**42,340**		42,340		**42,340**
Catchment Management					85,000	**85,000**			85,000	**85,000**
New Service Requests					5,000	**5,000**			5,000	**5,000**
Stormwater Total	**42,340**	**0**	**672,340**	**0**	**720,000**	**1,392,340**	**0**	**672,340**	**720,000**	**1,392,340**
WASTE WATER										
Fox Glacier WWTP upgrade	**23,375**				23,375	**23,375**			23,375	**23,375**
Fox Glacier WWTP Components replacement			17,500			**17,500**		17,500		**17,500**
Franz I & I follow up programme from 2022					50,000	**50,000**			50,000	**50,000**
Franz Josef WWTP Components replacement			17,500			**17,500**		17,500		**17,500**
Haast WWTP Components replacement			17,500			**17,500**		17,500		**17,500**
Hokitika I & I follow programme from 2022					50,000	**50,000**			50,000	**50,000**
Hokitika Upgrade Pump Stations - Pumps and Components			350,000			**350,000**		350,000		**350,000**
Hokitika Wastewater Mains Replacement	**79,858**		197,858			**197,858**	197,858			**197,858**
Hokitika WWTP Components replacement			17,500			**17,500**		17,500		**17,500**
Hokitika WWTP Treatment and Disposal	**724,385**				3,724,385	**3,724,385**			3,724,385	**3,724,385**
Franz Josef Security Camera's at WWTP					20,000	**20,000**			20,000	**20,000**
Sewell St Pump Station New Generator					60,000	**60,000**			60,000	**60,000**
New Service Requests					10,000	**10,000**			10,000	**10,000**
Wastewater total	**827,618**	**0**	**617,858**	**0**	**3,937,760**	**4,555,618**	**197,858**	**420,000**	**3,937,760**	**4,555,618**
WATER SUPPLY										
Arahura monitoring equipment installations	**56,833**				56,833	**56,833**		56,833		**56,833**
Arahura Security fencing and cameras					25,000	**25,000**			25,000	**25,000**
Arahura Water Treatment Plant upgrade	**17,238**				17,238	**17,238**			17,238	**17,238**
Fox Security fencing and cameras					25,000	**25,000**			25,000	**25,000**
Franz Josef monitoring equipment installations		26,503			26,503	**26,503**		26,503		**26,503**
Franz Josef Water Meters Replacement			110,000			**110,000**		110,000		**110,000**
Franz Josef Watermains/Points Replacement			72,000		168,000	**240,000**		72,000	168,000	**240,000**
Franz Security fencing and cameras					25,000	**25,000**			25,000	**25,000**
Haast monitoring equipment installations		49,501			49,501	**49,501**		49,501		**49,501**
Hari Hari Security fencing and cameras					25,000	**25,000**			25,000	**25,000**
Hari Hari monitoring equipment installations		61,331			61,331	**61,331**		61,331		**61,331**
Hokitika - Investigate Options for Brickfield Reservoirs	**54,256**		54,256			**54,256**		54,256		**54,256**
Hokitika - Extension and updrade of various Rider Mains	**142,628**		142,628			**142,628**		142,628		**142,628**
Hokitika - Town Belt North to West Drive - Upgrade Line				800,000		**800,000**			800,000	**800,000**
Hokitika Security cameras (At Blue Spur)					25,000	**25,000**			25,000	**25,000**
Hokitika Water Meters Replacement			70,500			**70,500**		70,500		**70,500**
Kumara Existing Reservoirs Replacement			342,000			**342,000**		342,000		**342,000**
Kumara Security fencing and cameras					25,000	**25,000**			25,000	**25,000**
Kumara Seismic Valves		27,315			83,035	**83,035**			83,035	**83,035**
Kumara monitoring equipment installations	**5,580**	55,067			60,647	**60,647**		60,647		**60,647**
Ross Security fencing and cameras					25,000	**25,000**			25,000	**25,000**
Whataroa monitoring equipment installations	**26,539**				26,539	**26,539**		26,539		**26,539**
Whataroa Security cameras					25,000	**25,000**			25,000	**25,000**
Water Total	**303,074**	**219,717**	**842,384**	**800,000**	**873,627**	**2,516,011**	**0**	**1,123,738**	**1,392,273**	**2,516,011**
Better Off Funding Projects										
All Better Off Funded projects (including Community assets)	**622,585**				**622,585**	**622,585**	**622,585**			**622,585**
Better Off Funded Projects Total	**622,585**	**0**	**0**	**0**	**622,585**	**622,585**	**622,585**	**0**	**0**	**622,585**
TOTAL ALL PROJECTS	**3,334,706**	**1,968,142**	**13,041,039**	**1,136,214**	**10,177,129**	**24,354,382**	**9,885,470**	**4,746,199**	**9,722,714**	**24,354,382**

During the Annual Plan process estimates are made of the projects likely to be completed. The estimated carry over already approved throught this plan was $1,968,142. The additional carry forward request is for $3,334,706. There is minimal impact on funding as these are mainly timing issues. There may be some funding mechanism variations where expected grant funding varies from planned, or where additional grant funding is received.

Report to Council

DATE: 29 August 2024

TO: Mayor and Councillors

FROM: Facilities and Properties Manager

BETTER OFF FUNDING UPDATE- TRANCHE ONE PROJECTS

1. Summary

1.1. The purpose of this report is to provide an update to Council on the status of the Three Waters Reform, Better Off Funding - Tranche One projects. This will be the final update. A final report will be presented to Council at November Council meeting.

1.2. This issue arises from the requirement to update Councillors on progress on all Better Off Funded projects.

1.3. Council seeks to meet its obligations under the Local Government Act 2002 and the achievement of the District Vision adopted by the Council in June 2024, which are set out in the Enhanced Annual Plan 2024/2025. Refer to page 2 of the agenda.

1.4. This report concludes by recommending that Council receive this report.

2. Background

2.1. The reason this report has come before the Council is due to Westland District Council (WDC) being successful in receiving Tranche One of the Three Waters Reform, Better Off Funding Grant. This grant has a total value of $2.79 million and has been allocated to 49 different community projects. Council's vision for Tranche One of the Better Off Grant was to distribute the funding across the district, delivering a wide benefit and making a positive difference to communities.

2.2. WDC received access to the official Department of Internal Affairs, Better Off Funding portal in April 2023. Since then, $2,080,630.00 has been claimed, with a further $709,370.00 remaining to be claimed.

2.3. Individual community funding agreements were written and sent to all community groups. A reporting template was required to be completed and returned monthly to Council. The reporting template ensures transparent communication between community groups and Council regarding the Better Off-funded projects. These reports also allow Council to have information available for reporting to the Department of Internal Affairs through the Better Off Funding portal.

3. Current Situation

3.1. The current funding grant situation is detailed in the below tables, these are separated by portfolio and project.

Community Funding

Project	Budget	Spent to Date	Open P/O	Project Update	Photos/Plans
Bruce Bay Hall Improvements	$40,020.00	$40,017.41	$0.00	Project finished. Work completed includes sanding the wooden floors and coating them in polyurethane. New vinyl flooring was installed in the kitchen and new windows were installed throughout the hall.	
Fox Glacier Arboretum	$44,000.00	$43,275.11	$0.00	Project finished. The official opening for the Arboretum was on May 4th. This community event was a great success. The garden is a fantastic asset to the town.	

Harihari Civil Defence Plan	$45,944.00	$18,771.01	$23,000.00	Initial project completed in 2023. Two water tanks were purchased for the community to install. Bulk dry food supplies were purchased for the community civil defence group. In May 2024 the project scope was increased to include purchasing a new generator for the town hall. A purchase order has been raised and the generator is expected to be installed in the coming months.	
Lake Kaniere Civil Defence	$43,633.00	$38,275.50	$0.00	Project finished. Stopp Digging installed the screws in April and both shipping containers were delivered to site in May.	
Lions Club Lazar Park Hall	~~$103,628.00~~ $47,000.00	$47,000.00	$0.00	Project cancelled. Costs spent to date remain a cost to the project. The remaining funding was reallocated in May 2023.	

West Coast RDA, Arena Surface	$57,234.00	$56,235.55	$0.00	Project finished. Fibre bales arrived on site at the end of November. Henry Adams Contracting installed a compacted river gravel pad for the new surface to be installed on. A new sprinkler system has been purchased.	
West Coast RDA, Arena Electrical Works	$35,733.00	$35,504.33	$0.00	Project finished. Electrical works funded through Better Off Funding have been completed. A new pump has been purchased and will be installed in the coming months.	
Kumara Gentle Annie Track Extension	$29,115.00	$29,074.54	$0.00	Project finished. The Better Off Portion of the Gentle Annie Track and Scouts pass track has been completed. The Kumara Junction Community Inc. expects the official track opening to be this summer.	
Kumara Hall Resilience Container	$39,964.00	$20,741.00	$0.00	Stopp Digging installed the screws in April and the shipping container was delivered to site in June. The remaining budget is being used to fit out the civil defence container.	

Otira Civil Defence Hub	$14,593.00	$7,506.52	$0.00	Stopp digging has installed the screws. The shipping container is expected to be delivered to site in August.	
Ross Civil Defence Hub	$23,300.00	$23,195.33	$0.00	Project finished. The water tanks and generator have been installed.	
Whataroa Civil Defence Infrastructure	$78,882.00	$59,806.11	$5,250.00	A CAT DE50EO generator has been purchased and delivered to site as well as two shipping containers. Aotea has done the initial electrical work for the generator. The remaining works include building a shed for the generator to be installed inside. The project is on track to be completed by September.	
Total	**$500,000.00**	**$419,402.41**	**$28,250.00**		

Township Development

Project	Budget	Spent to Date	Open P/O	Project Update	Photos/Plans
Hokitika Swimming Pool	$690,000.00 (BOF Contribution)	$690,000.00 (BOF Contribution)	$0.00	Project finished. Council adopted to reallocate the entire Township Development fund to the Hokitika Swimming Pool. All works funded by the Better Off funds have been completed. These works include the new pool liner and the new pump/filtration room.	
Total	**$690,000.00**	**$690,000.00**	**$0.00**		

Community Resilience

Project	Budget	Spent to Date	Open P/O	Project Update	Photos/Plans
Civil Defence communication supplies for Welfare sites in Westland	$200,000.00	$199,340.67	$0.00	Project finished. All satellite communication kit equipment and 19 community Starlink internet kits have been delivered to each welfare centre. Due to greater-than-expected cost savings, the original project scope has been increased. Nelspecs has been contracted to supply and install new Tait base radios at all welfare centres. Some centres that require a roof-mounted aerial have also had these installed.	
Total	**$200,000.00**	**$199,340.67**	**$0.00**		

Culture and Heritage

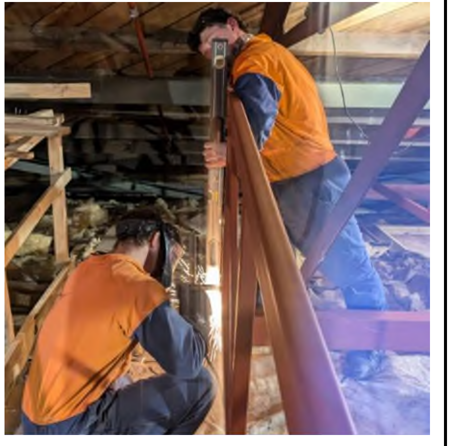
Project	Budget	Spent to Date	Open P/O	Project Update	Photos/Plans
Westland Anniversary – 150 years Celebration	$200,000.00	$200,000.00	$0.00	Project finished. Some works completed to date include the 150 Years of Connection branding, supporting the Otira Tunnel 100-year commemorations, designing a website, 2023/2024 Hokitika brochure design and the 100 years of aviation weekend. The project also included developing a new website for the Westland Industrial Heritage Park. The group is currently working on developing a Heritage App for Westland.	 
Hokitika Regent Theatre Upgrade	$36,000.00	$29,436.61	$4,814.19	The Hokitika Regent Theatre exterior building lighting, interpretation panels and main auditorium LED lighting and display project is progressing well. It is on track to be completed by September.	

Hokitika Town Clock	$15,000.00	$4,298.23	$12,601.00	A seismic report has been completed on the Hokitika Town Clock. The report has indicated that the building (clock) is earthquake prone and has an NBS rating range of 0-20%. Remaining Better Off funding will be spent on minor maintenance works. The clock will be required to be earthquake strengthened in the future.	
Carnegie Fit-out	$50,000.00 (BOF Contribution)	$50,000.00 (BOF Contribution)	$0.00	Project finished. Funding was reallocated to Carnegie Fit-out to help offset ratepayer contribution to the overall Carnegie Fit-out project.	
Westland Industrial Heritage Park	$199,000.00	$194,085.31	$0.00	Shed one is complete. Shed two is currently being built and is expected to be finished by September.	
Total	**$500,000.00**	**$477,820.15**	**$17,415.19**		

Community Halls

Project	Budget	Spent to Date	Open P/O	Project Update	Photos/Plans
Carnegie Strengthening Project	$260,000.00 (BOF Contribution)	$260,000.00 (BOF Contribution)	$0.00	Project finished. Funding was reallocated to Carnegie Strengthening project to help offset ratepayer contribution to the overall project.	
Fox Glacier Hall	$10,186.00	$10,146.13	$0.00	Project finished. Grant Gibb Construction installed a new disability carpark at the front entrance to the Fox Glacier Hall.	
Franz Josef Hall	$149,432.00	$35,877.59	$90,760.76	A seismic assessment was completed. Alongside a geotech and structural design report. Due to the location of the hall and the level of work required works completed to the hall with the remaining Better Off funding will be to reduce the sinking and help level out some of the sections of floor.	
Haast Hall	$55,309.00	$28,038.31	$19,023.00	Seismic assessment complete. An engineering design is underway. Once this is received back	

				council will complete what works can be completed with the remaining budget.	
Harihari Hall	~~$11,697.00~~ $544.00	$543.62	$0.00	Community had already completed the work. Project not required. Project cancelled.	
Civil Defence Welfare	$41,879.00	$19,251.93	$1,533.37	Project rescoped. Working with the Okarito community to install a civil defence container on road reserve. Stop Digging has installed the screws onsite. The container will be installed in August.	
Ross Swimming Pool	$40,000.00	$40,000.00 (BOF Contribution)	$0.00	Project finished. Structural steelworks have been completed at the swimming pool. Due to greater than expected cost savings, the original project scope was increased further. New hand dryers were installed in the bathrooms.	
Grey Power Hall	$34,500.00	$34,065.71	$0.00	Project finished. New windows have been installed.	

Hokitika Regent Theatre	$88,580.00	$56,984.63	$20,961.96	The Hokitika Regent Theatre exterior building restoration/maintenance project is progressing well. It is on track to be completed by September.	
Kokatahi Hall	$46,334.00	$20,527.27	$1,646.00	Seismic assessment complete. Waiting for the Seismic report to be completed. Electrical upgrades have been completed to the switchboard on site. Council to work with community on how remaining funding for the hall would like to be spent.	
Kowhitirangi Hall	$8,230.00	$8,227.92 (Under budget)	$0.00	Project finished. Matt Fairmaid installed replacement windows in the hall. Better Off Funding covered the small shortfall left from a lotteries grant.	
Okuru Hall	$51,860.00	$37,183.73	$17,297.00	Seismic assessment complete. Waiting for the Seismic report to be completed. Once received council will be able to scope the project.	

Ross Hall	$85,300.00	$1,381.08	$75,799.36	Cladding samples were taken, and the test results came back positive for asbestos. Issacs Construction was contracted to complete the work. They are expected to be finished onsite in August.	
Waitaha Hall	$16,201.00	$12,252.45	$4,426.00	Water tanks installed. Small jobs around the hall are still to be completed.	
Whataroa Hall	$12,000.00	$11,761.11	$0.00	Project finished. Aotea Electrical installed two new heat pumps in the hall.	
Total	**$900,000.00**	**$576,241.48**	**$231,447.45**		

3.2. The current Three Waters Reform, Better Off Funding Tranche One financial position is summarised by the portfolio below.

Portfolio	Funding Allocation	Funding Spent or Committed	Claimed through DIA/BOF portal
Community Funding	$500,000.00	$419,402.41	$347,567.00
Township Development	$690,000.00	$690,000.00	$690,000.00
Community Resilience	$200,000.00	$199,340.67	$200,000.00
Culture and Heritage	$500,000.00	$477,820.15	$407,939.00
Community Halls	$900,000.00	$576,241.48	$435,124.00
Total:	**$2,790,000.00**	**$2,362,804.71**	**$2,080,630.00**

4. Options

4.1. Option 1: That Council receives the report.

4.2. Option 2: That Council does not receive the report.

5. Risk Analysis

5.1. Risk has been considered and no risks have been identified.

6. Health and Safety

6.1. Health and Safety has been considered and no items have been identified.

7. Significance and Engagement

7.1. The level of significance has been assessed as being of low significance and administrative in nature.

8. Assessment of Options (including Financial Considerations)

8.1. Option 1 – Council receives the report.
8.1.1. There are no financial implications to this option.
8.1.2. Staff have provided a progress report as required by elected members.

8.2. Option 2 – Council do not receive the report.
8.2.1. There are no financial implications to this option.

9. Preferred Option(s) and Reasons

9.1. The preferred option is Option 1, Council receives the report.

9.2. The reason that Option 1 has been identified as the preferred option is that staff have provided an in-depth progress report update on the Three Waters Reform, Better Off Funding Tranche One projects as requested by elected members

10. Recommendation(s)

10.1. That the report be received.

Jan Visser
Facilities and Properties Manager

Report to Council

DATE: 29 August 2024

TO: Mayor and Councillors

FROM: Acting Chief Executive

ACTING CHIEF EXECUTIVE'S QUARTERLY REPORT (10 May to 10 August 2024)

1. Summary

1.1. The purpose of this report is to provide an update on all aspects of what is happening in the Westland District and update Council on any matters of significance and priority.

1.2. Council seeks to meet its obligations under the Local Government Act 2002 and the achievement of the District Vision adopted by the Council in June 2024, which are set out in the Enhanced Annual Plan 2024/2025. Refer page 2 of the agenda.

1.3. This report concludes by recommending that Council receive the Acting Chief Executive's Quarterly Report dated 29 August 2024.

2. Background

2.1. The reason the report has come before the Council is due to the need to keep Council informed of any matters of significance and priority.

3. Regulatory and Planning

1.1. **<u>Building Department</u>**

The Territory Authority has undertaken the following work:

Building Warrant of Fitness – on site Audits	39
Received and check Building Warrant of Fitness	60
Compliance Schedules issued	2
Compliance Schedule amendments issued	8
Investigations of Unconsented Work from complaints	2
Notices for Earthquake Prone Building issued	4
Removal of Earthquake Prone Building notice	1
Notices to Fix for Breaches of the Building Act issued	4

Certificates of Public Use granted	4

There are changes and new initiatives from the government being introduced, out for public consultation and proposed changes to the Building Act and Code.

Remote building inspections using new software is currently being considered. Lack of connectivity throughout the district and the cost of the software have been two factors limiting the ability to undertake a full remote inspection previously. There will be restrictions as to what type of inspection could be undertaken and for what buildings it would apply to and who it would apply to.
The building department will be reviewing this going forward.

Council is waiting for the completion of legislative changes relating to Earthquake Prone Buildings. If enacted this may result in extensions to the completion dates for building owners having to undertaken seismic improvements to their properties. This will generate additional work for the department in making necessary administrative updates to records.

The submissions for "making it easy to build granny flats less than 60m2" has now closed. The building department will await the outcome of that before any changes are made, in the meantime the current rules still apply.

1.2. **Building Consents**

- 76 Building Consents were granted in this quarter and 93.4% within the 20 statutory days and 5 exceeded the timeframe. As a comparison for the same period last financial year, the building department granted 62 consents and 95.2% within time.
- 37 Code Compliance Certificates were issued - 100% within the 20 statutory day timeframe.
- 266 inspections were undertaken.

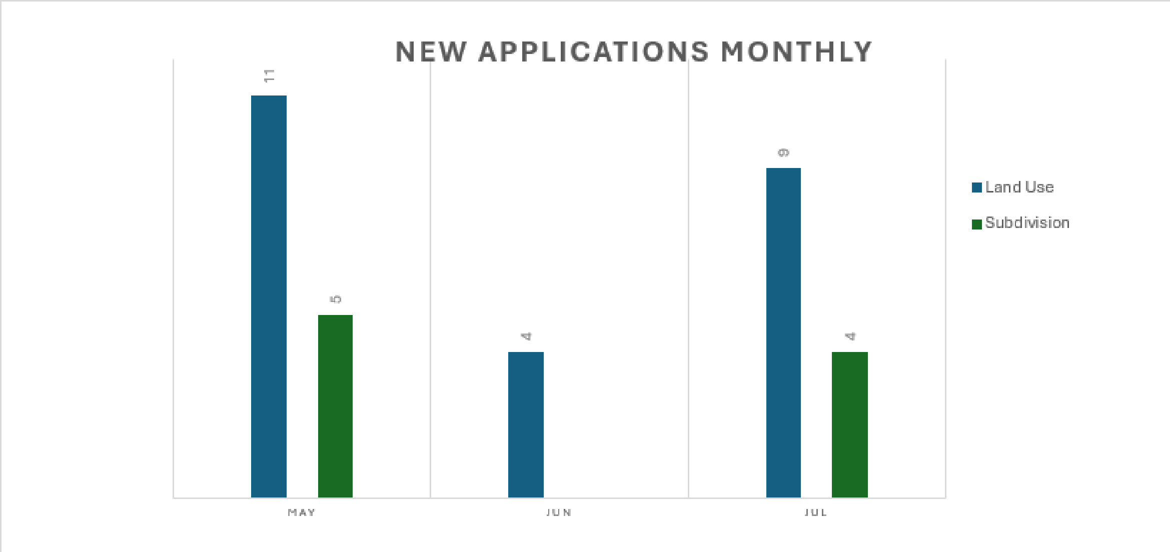
1.3. **Planning Department**

A focus for the Planning Department over the last quarter has included file preparation to enable migration to the Laserfiche system. This included reviewing all consenting files held from 1991 and ensuring that the physical files were also held electronically. The bulk of this work has been completed, and the next stage of this preparation work will continue to progress in the next quarter. Additionally, cross functional discussions are underway to assist with the migration process to ensure this is effectively undertaken to avoid any disruption to "business as usual" tasks.

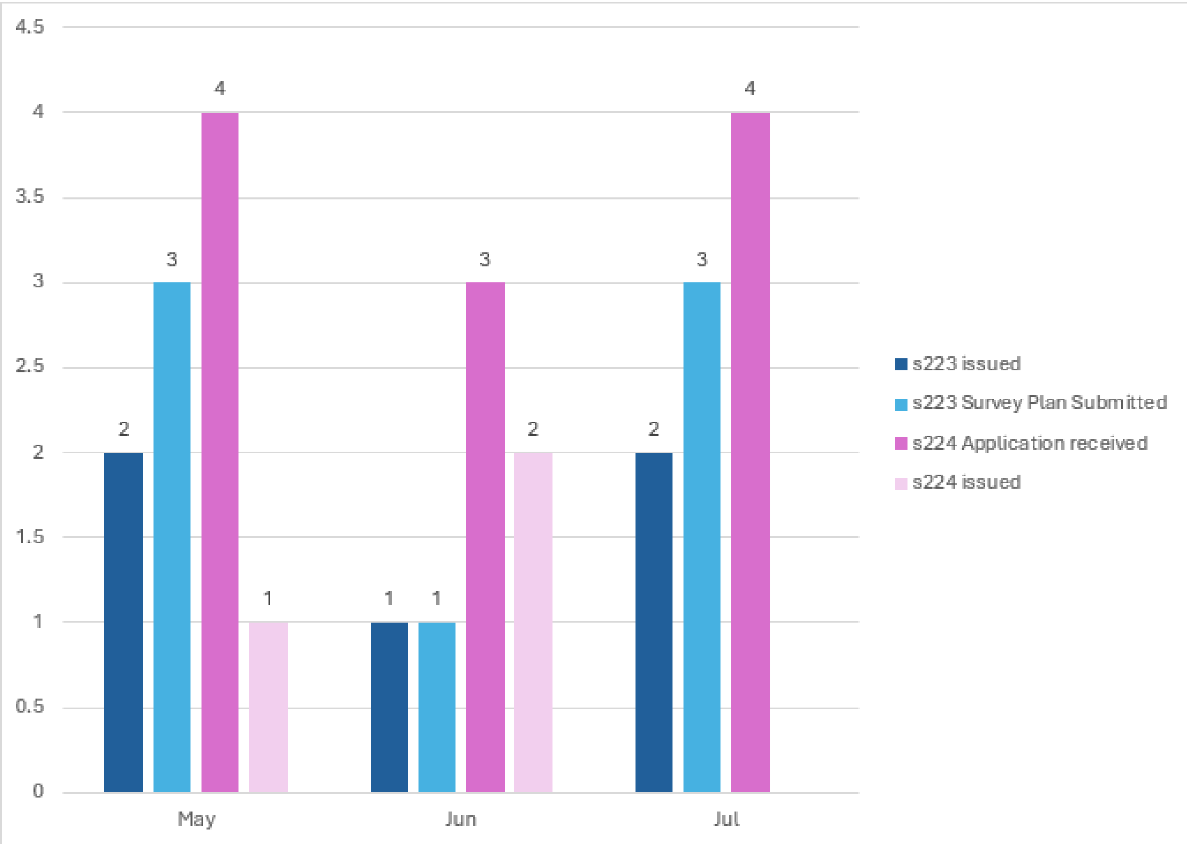
The Te Tai o Poutini Plan hearings continue and are expected to conclude in November 2024.
In preparation for the next phase of this process, a West Coast Special Interest Planning Forum has been established. This leadership group consists of members from each West Coast District, with a focus on achieving a consistent approach on implementation of the Proposed Plan post decisions. The initial stages of the forum are underway with process sharing across the districts.

1.4. **Resource Consents**

During the last quarter, the Planning Department received 33 new applications for resource consent. These applications comprised of the following:



In addition to new applications for resource consent, the Planning Department also received and certified the following s 223 (survey plan) & s 224 (conditions met) requests:



The Planning Department granted 44 resource consents, all under Delegated Authority. Of these, 10 were subdivision applications and 34 for land use related activities. 100% of these being issued within statutory timeframes.

2. Community Services

2.1. <u>Westland District Library</u>

Library Spaces – providing safe, inclusive, and welcoming spaces for learning, social and recreational purposes that support individual and community wellbeing and resilience.

The library is a multi-use hub and part of the district's social infrastructure. This quarter's footfall has returned to 'winter' levels (10547) and is similar to Q1 (10599), as measured by the door counter. There is less difference between the winter off peak and summer peak season footfall now than there was pre-pandemic, reflecting changes in use of the library by tourists.

Programmes and Events – aiding literacy, learning, social cohesion, and active citizenship.
The regular literacy, social programmes and outreach run by the library are well attended and have continued to offer learning and social opportunities to children and adults. The library held 81 events this quarter with 588 people attending. This is slightly lower than expected with many patrons cancelling due to winter illnesses.

Collections – supporting literacy, providing access to culture, information, and life-long learning.
The total issues (physical and digital items) are slightly higher for the last two quarters compared to previous quarters this year (Q1 17,621, Q2 17,408, compared to Q3 18,452, Q4 17,993). The total issues for the year (71,474) are slightly higher than the previous year (69,733) but not yet at pre-pandemic levels (78,553). Patrons can suggest titles to be purchased and the library has purchased over 100 of the requested titles (80%). The Inter-loan system provides another way for patrons to access titles not in the collection and 109 requests (87%) have been filled.

Digital inclusion - providing equitable access to the internet, equipment, and skills to access it.
The library provides access to APNK ICT equipment and ultrafast broadband, supporting digital equity in the community. Use of the APNK computers and Wi-Fi has decreased this quarter, with 35,679 minutes of computer use and 2636 minutes of Wi-Fi use compared to 36,783 and 3,693 in Q3. This is likely to be the decrease in tourist use of computers and Wi-Fi in the winter months. Book-A-Librarian service continues to support library patrons with the use of their devices. The partnership with the Digital Inclusion Alliance Aotearoa and Spark enables the library to offer Skinny Jump subsidised modems to eligible households in Westland, 32 have been issued this year.

Volunteers – supporting the delivery of library services.
There are 33 volunteers contributing over 22 hours per week to support the delivery of library services in the main library and across the district.

2.2. **Hokitika Museum**

Carnegie Building
This week marked the start of Stage II, the services fitout in the Museum building, beginning with electrical work for lighting and other installations. Following this, work will proceed with flooring and painting. Work continues within budget.

Museum Reopening – Stage III.

Plans for the Museum reopening (first week of December) are underway. A contract with Te Papa to secure the traveling exhibition – Kura Pounamu - will be signed by end of August. The Kura Pounamu exhibition provides a great opportunity to "soft launch" the new museum, with a promotion to residents.

Museum Redevelopment and Permanent Exhibitions – Stage IIII
The exhibitions and concept are in development, with core themes identified and stakeholder involvement. A schematic has been produced as a base for the stories and displays. We plan to share

these exhibition concepts at the September Council meeting. Visitor experience and spatial planning is happening alongside AV and interactive scope.

Collection Management
Significant progress has been made in improving the storage of the Museum's collection. New museum shelving has been installed providing a safer environment for the long-term preservation of the collection. Additionally, a large collection of New Zealand Gazettes, the official newspaper of record for the New Zealand Government, has been identified for deaccessioning and disposal, as these periodicals are already held by the Alexander Turnbull Library and the Wellington Law School.

Research Enquiries and Photo Orders
The team responded to 16 research enquiries and processed 3 photo orders in both digital and print formats, attracting minor income.

An Interesting Enquiry: Agatha Christie Documentary – August 2024
The Hokitika Museum was recently contacted by Two Rivers Media, a UK-based production company, regarding their upcoming documentary *Travels with Agatha Christie*. The inquiry was referred by historian Felicity Barnes from the University of Auckland. The series will air on BritBox, More4, and internationally.

In 1922, Agatha Christie embarked on a world tour as part of The British Empire Exhibition Mission, visiting South Africa, Australia, New Zealand, Hawaii, and Canada. Actor David Suchet, known for his role as Poirot, will retrace her steps, exploring the historical context of the 1920s and the evolving identities of the Dominions. Museum staff have provided low-resolution 1922 images, advised on film sources, and recommended filming locations and interviewees.

Public and Education Programmes
At the end of August staff will be taking 75 Westland High School students on a walking tour of the township to learn about local events, experiences, and the significance of the downtown area of Hokitika.

2.3. **<u>Hokitika isite</u>**

Footfall Q2 (April – June):

2021-2022	2022-2023	2023-2024
4740	6179	8798

Booking Turnover Q2 (April – June):

2021-2022	2022-2023	2023-2024
$8,645.20	$10,546.58	$16,080.86

Retail Turnover Q2 (April – June):

2021-2022	2022-2023	2023-2024
$2,661.00	$4,877.56	$6,023.49

Steady increases on SQLY (Same Quarter Last Year) results. Tourism has continued to increase across the country post Covid, resulting in increased bookings and retail sales. Strong targets for itinerary bookings are being achieved. The isite earns a commission on all bookings and retail turnover.

Initiatives for Q3

- Increased retail shelving/space to showcase products.
- Ensuring all operator agreements are changed from Destination Westland Ltd to Westland District Council (this is a large volume of work for all teams).

- Identifying market gaps to capture both local and visitor markets – both for bookings and retail.

2.4. **Hokitika Centennial Swimming Pool**

Hokitika Pool proudly supported 'The Big Swim' through the month of July and became a partner pool for participants to swim while clocking up the km's, raising money and awareness for the Coast Guard. July 28th saw two lanes being used for participants to swim from 9am until 5pm surpassing their personal targets.

The Swimming Pool continues to have ongoing regular lane swimmers daily and has received good feedback on increased pool temperature. Traci Booth-Ross's Aqua Zumba classes are run three times a week with a good following. Senior Fit classes have resumed and take place once a week, these are popular with older pool users.

The earlier plumbing issue in the toilets has now been resolved. In term three Swim School recommences. Pam and Reilly Enstrom have built a strong following, this gives the lifeguards plenty to watch as there are children of all swimming capabilities during swim school times.

Swimming Pool staff are currently receiving training on the new Till system which will enable improved reporting.

2.5. **Community Development and Assistance**

The Welcoming Communities initiative has been running at Westland District Council for 12 months. This is a fully MBIE funded initiative focused on equipping new arrivals and the community with programmes, networks and events to ensure the newcomer's relocation is successful. Emphasis is placed on enhancing, rather than duplicating, existing community led events and programmes, and generates economic and regional reputational benefits.

The Welcoming Communities Coordinator has resigned, and the Community Development Advisor is currently on leave. The new Community Services Manager has been accessing ways to ensure there is no loss of service across community development and funding.

2.6. **Mayors Taskforce for Jobs**

The Westland MTFJ team had a particularly busy EOFY and a strong start to the new financial year, supporting five employment opportunities in July. Outcome targets for the 2024/25 Financial Year are set at 30.

Key highlights this quarter include awarding two scholarships through the Outward-Bound programme, bringing the total number of scholarships offered to seven, and celebrating the first Limited Services Volunteer graduation. The Westland team also continued its collaboration with Development West Coast by hosting an employer information evening for South Westland businesses, helping them prepare for the upcoming tourism season. Additionally, in partnership with Inspiring Stories NZ, the team supported four local youth in attending the Festival for the Future.

The MTFJ/WestREAP driver licensing programme continues to address significant barriers for at-risk and NEET youth. Meanwhile, the Coordinator and Youth Facilitator have been refining the SkillED Employment programme to better meet participants' evolving needs. Despite facing tighter funding this year, the Westland MTFJ team remains committed to offering employment programmes, supporting rangatahi in securing employment, and providing pastoral care services to those employed.

Since its inception in 2020, the Westland Mayors Taskforce for Jobs, funded by the Ministry of Social Development, has invested over $2 million directly into the Westland District and supported more than 300 local employment opportunities.

2.7. **Animal Control**

- 8 dogs have been impounded, one recidivist offender.
- 4 impounded dogs were for stock attacks (3 of these were euthanised).
- 8 infringements issued.
- 1 dog received a menacing dog classification.
- 22 afterhours call outs.
- 36 dog related service requests.
- Threatening behaviour experienced by Dog Control staff was referred to the Police.
- The dog registration period commenced.
- Actions have been taken to identify dog owners allowing their dogs to defecate in the CBD and not cleaning it up.
- Discussions with the new Team Leader about dog control signage and bylaws.
- Several anti-barking collars were provided/loaned to residents as required.
- New dog control van arrived.

Detail	**Number**
Dogs Impounded	8
Dogs Euthanised (at owner's request)	3
Dogs Classed as Menacing	1
After Hours Call Outs	22
Service Requests	36
Infringements Issued	8
Renewed registration	60%

2.8. **Environmental Health and Liquor Licencing**

During the last year, the compliance team have been undertaking a restructuring of workloads, this work is ongoing.

Food verifications are required under the Food Act 2014 and the Food Regulations 2015. The frequency of these verification visits can range. In general, about 95% of verification visits result in revisits to the premises to ensure compliance with the Food Act.

All liquor licence applications for either new licences or renewal of licence are subject to a visit prior to the completed application being sent to agencies for their response.
In addition, the compliance team completes random monitoring visits to licensed premises to check compliance with liquor licensing laws.

The numbers below are for the 3 months of May, June and July.

Verification Visits	23
Verification Revisits	22
Liquor Inspections	16
Managers Certificates Issued	35

On Licences Issued	6
Off Licences Issued	5
Temporary Authorities Issued	1
Total Food Premises	106 (9 of which are not verified by Council)
Total Licenced Premises	58 (36 On, 19 Off, 3 Club)

3. Human Resources

3.1. <u>Human Resources</u>

New Starters
Since 1 February 2024, 31 new staff members have joined Council. 13 of these have come from Destination Westland Limited.

Leavers
Since 1 February 2024, 10 staff members have left Council.

Current Vacancies
Council is currently recruiting for three permanent, full-time roles.

- Group Manager, Regulatory and Compliance
- Building Control Officer – Reference checking
- Planner – Interviewing

Training
<u>Provided:</u>

- Civil Defence inductions for new starters.

<u>Upcoming:</u>

- D4H Introduction: two 3-hour sessions on 23 August 2024. Maximum 20 people per session.
- CIMS 4: two-day course on 21 and 22 October 2024. Priority for this course will be given to employees that take on manager roles in the CIMS function roles during a Civil Defence event.

Well-being initiatives
Well-being initiatives for the remainder of 2024 are currently being worked on by the well-being/Hauroa sub-committee and will be finalised at the next meeting on 3 September 2024. It has been agreed by the Sub-committee that the following activities will go ahead:

- Daffodil day 30 August 2024
- Gumboot Friday 1 November 2024
- Movember 1 November 2024.

3.2. <u>Health and Safety</u>

- Incidents:

<u>Incident</u>	<u>Date</u>	<u>Explanation</u>
Abusive behaviour toward animal control	03.08.2024	Cameras are being worn and are beginning to have a positive effect.

- Initiatives:

- Over the past month staff have been working to get Council's major contractor details updated and moved into the Laserfiche program. This work is ongoing.
- The building fire plan is in its finishing stages prior to being sent away for approval.
- St John ran a defib and CPR course on the 9 August free for staff to attend who wished to update their skills.

4. Corporate Services

4.1. **Strategy and Communications**

- The Strategy and Communications advisor (SCA) lead the Enhanced Annual Plan 2024-25 project to a successful conclusion as the plan was adopted within the statutory deadline.
- The SCA is now leading the Annual Plan project and ensuring that staff are on track to complete within the deadlines.

4.2. **Finance**

- Finance completed the Enhanced Annual Plan 2024-25 within the statutory deadlines and have now moved on to completing the Annual Report at 30 June 2024. Currently staff are finalising the accounts and making adjustments where necessary. Revaluations have taken place for Infrastructure assets and Buildings which takes finance quite some time to account for.
- Audit of the Annual Report is slowly taking place with information requests starting to come through from EY before the final audit kicks off fully in September. Staff are currently on time to complete the audit and have sign off by the statutory deadline of 31 October 2024.
- At the same time, Finance have been incorporating the Swimming Pool and isite into Council accounts after the Council decision to transfer the management of these activities back to Council.

4.3. **Information Technology**

- All the servers are now running on the new server hardware. The old servers will now be repurposed for static storage and in the case of the most recent of the old server hardware, will be repurposed for resilience. The resilience server is to be utilised as a failover in the event of failure of the new servers.
- Wifi connectivity throughout the Council building has now been upgraded. All departments now have high speed wifi coverage – wifi is now faster than a hard-wired connection. The wifi is now 3 bands instead of 2, is more reliable and resilient, allows more simultaneous connections and less interference from other wifi. It also means Council will have less reliance on the hard-wired network.

4.4. **Information Management**

- This quarter has seen some technical challenges in document management. Migrating documents for long term storage has involved changing file formats and locking file dates to ensure file integrity. There are over 100,000 documents being reviewed and converted, removing duplicates as they are found.
- Physical files that are to be kept forever have been relocated to secure storage at Iron Mountain in Christchurch. These can easily be retrieved on demand as required.
- Digitisation of forms and processes continue. All Civil Defence records containing information from historical events have been migrated to the eDRMS (Electronic Document and Records Management System).
- It is hoped that making this historical information more readily available to staff in an event will assist with decision making during future events.

- Health & Safety related documents have also been migrated to the eDRMS with the new H&S advisor making considerable progress in managing this important function. Further work is planned for the digitisation of forms for this area.
- The IM (Information Management) team has worked with the HR (Human Resources) Advisor in utilising the eDRMS system to manage both Historical and Current HR records. Work has begun applying Retention & Disposal rules to both electronic files and historical physical files to ensure documents are managed appropriately.
- All LIMS (Land Information Memorandums) have been processed within timeframes.
- Online applications continue to increase, with electronic forms being utilised multiple times a day triggering fully digital processes.

Laserfiche | Search | Saved Searches | Search Filters

Westland-District-Council › Civil Defence › Events › **Severe weather - 10/04/2024** 10 entries

Name	CD Event Date	CD Event Name	CD Function
Log - Welfare - logbook - 10/04/2024	10/04/2024	Severe weather 10/04/2024	Welfare
Log - Response manager - logbook - 10/04/2024	10/04/2024	Severe weather 10/04/2024	Response Manager
Log - Planning - logbook - 10/04/2024	10/04/2024	Severe weather 10/04/2024	Planning
Log - Operations - logbook - 10/04/2024	10/04/2024	Severe weather 10/04/2024	Operations
Log - Logistics logbook - 10/04/2024	10/04/2024	Severe weather 10/04/2024	Logistics
Log - Intelligence - logbook part 2 - 10/04/2024	10/04/2024	Severe weather 10/04/2024	Intelligence
Log - Intelligence - logbook - 10/04/2024	10/04/2024	Severe weather 10/04/2024	Intelligence
Log - Controller - logbook - 10/04/2024	10/04/2024	Severe weather 10/04/2024	Controller
Log - Controller - emergency logbook - 10/04/2024	10/04/2024	Severe weather 10/04/2024	Controller

5. Water, Wastewater and Stormwater

5.1. Local Water Done Well

- Tonkin and Taylor have been engaged to assist all three West Coast Councils (cost share) to provide robust evidence base for Councillors to be in a position to:
  - Make decisions on how to structure the delivery of 3-waters services.
  - This will contrast the status quo with a single Council CCO and one or more jointly owned CCOs.
- Key activities for the preliminary analysis covered by this offer will comprise of:

- High level comment on potential approaches - status quo, individual CCO, joint CCO, hybrid (e.g. joint services contract).
- Cost impacts (analysis suitable to guide discussions within each Council and between three Councils).
- Implementation considerations for the options identified.
- Updating the risk framework (threats and opportunities) developing during the stocktake and review.
- Briefing Mayors/Chair on preliminary and analysis.

5.2. **Three Waters Projects**

- **Hokitika Water Rider Mains Upgrades**
  - Sections of water reticulation in Airport Row, Stafford St, Hoffman St and Dents Rd have been upgraded in the 23/24 year.
  - The remainder of the budget has been tagged for various other upgrades in Hokitika.

- **Brickfield Treated Water Reservoir**
  - In April 2024, WSP undertook a non-invasive condition assessment of the reservoir exterior and interior using a submersible Remote Operated Vehicle.
  - The report makes recommendations to extend the life and operability of the reservoir. These recommendations are currently being prioritised with the remaining project budget.

- **Hokitika Wastewater Z-Line Upgrade**
  - Trenching Dynamics completed the replacement of wastewater main from Park Street to Tudor Street. Final payment for this project will be made when all deliverables are received.

- **Fox Glacier Wastewater Treatment Plant Upgrades**
  - The Tornado Aerator has been delivered and is programmed to be installed in August.

- **Hokitika Wastewater Treatment Plant -**
  - Council's finance team are working with Stantec to get a clear understanding of budgeted costs for the delivery of a new Wastewater treatment plant and the revenue cost implications for service users. Once this exercise is completed the project working group will meet to evaluate the options. The project is still within the timetable for delivery.
  -

- Prioritising and programming of the 24/25 3 Waters CAPEX projects and carry-overs is underway.

6. Solid Waste Management

6.1. **Solid Waste**

- **Waste Minimisation**
  - Council has engaged with Tyrewise to minimize the tyre waste in Westland. Tyrewise work with businesses and communities across New Zealand to make used tyres a resource in the circular economy. Collection will begin from 1st September 2024. Members of the public and businesses can dispose of 5 tyres a day, of any shape and size within the designated area at the Hokitika Transfer Station.
  - Kerbside collection for glass is to be introduced in next years tendered waste management contract, this will increase the amount of glass to be recycled and decrease the amount of glass ending up in the landfill.

- **Butlers Landfill**
  - The current cell is expected to have 12 to 18 months left till it is at capacity, the new cell is ready to use when required.
  - The new leachate field was fenced, and staff are reviewing the cost for the irrigation pipe work, Staff will be planting native vegetation in the leachate field.

7. Transportation

7.1. <u>Transportation Update</u>

- This years Reseal areas have been reviewed and confirmed with 13.4km identified as affordable within the present budget allocation. These areas will now have seal designs created by the resurfacing contractor and will be repriced based on the final seal designs. If there is additional funding available after this exercise, then additional road sections can be added to increase the length of work to be carried out.
- Indicative funding allocations have now been provided for Footpaths and Road Safety, with a 64% reduction on what was requested for footpaths and a 41% reduction to what was requested for Road Safety. This now means that instead of $200,000/pa for Footpath Maintenance and Renewals there will now only be $75,000/pa for both. This means that Council will effectively only be able to maintain footpaths and not carry out any resurfacing renewals.
- With the reduced Road Safety finding allocation the previously shared contract position of Road Safety Coordinator has been disestablished. Buller, Grey and Westland are now looking at revising the delivery of road safety education and promotion for the West Coast with a greater focus on Young and learner driver education. The aim of this is to help provide opportunities for skill training and license support for these young and learner drivers.
- Jackson River Road remains officially closed with a 4x4 track being established following storm erosion. The outcome of this is still to be determined with final confirmed changes in NZTA emergency works rules yet to be published. These will have an impact on how Council can respond financially.

8. Other Projects

8.1. <u>Carnegie Building</u>

- The museum fit-out project base build works has started in August with the museum team handing over the building for construction to on 14 August. The building works and lighting install commenced on 15 August and is scheduled to be completed by 30 August. The flooring installation follows on 2 September, to be completed by 20 September, followed by painting between 23 and 27 October.

8.2. <u>Ōtira Public Toilets</u>

- The new public toilets for Ōtira are ready for installation. Building consent has been granted and resource consent is in process. The installation will take 3 weeks to complete and will start as soon as the Resource Consent has been granted, which is expected on 23 September

8.3. <u>Custom House</u>

- The Custom house restoration project has been completed. The lead-based paint was stripped off, the building repainted, a new flagpole installed, a new sign installed, and a new roof crest installed. Various rotten weatherboards have also been replaced and repairs have been done to the gutters.

8.4. **<u>Civil Defence Containers</u>**

- The civil defence containers for Kumara, Okarito, Otira and Lake Kaniere were delivered recently. The retrospective resource consent is still in process

9. Asset Strategy and Development

9.1. **<u>Asset Valuations</u>**

- In collaboration with BECA, the asset valuation is complete.
- The valuation results indicate the value of Councils assets, as follows:

Activity	**Replacement Cost**
Transportation	$431,407,104
Stormwater	$47,866,755
Wastewater	$50,996,207
Water Supply	$81,381,303
Parks, Reserves & Cemetery	$11,986,359
CycleTrail	$10,478,063
Waste	$5,531,964
Land & Buildings	$38,234,000 (market value)
Total	**$677,881,755**

9.2. **<u>RAMM Migration</u>**

- Council currently operates two Asset Management Information Systems, Univerus Assets and Thinkproject RAMM. Councils databases are small with Univerus Assets holding around 19,000 lines of data and approximately 13,500 in RAMM.
- There have been significant developments in both systems resulting in an opportunity for Council to consolidate and operate one asset management system.
- After considering all options the decision was approved to use Thinkproject RAMM.
- All asset data, excluding transportation which currently sits in RAMM, is being migrated. This will be completed by the 1st October.

9.3. **Land Sale Review**

- A review of the current land parcels Council owns was undertaken.
- This has identified several parcels that Council may not need in the future.
- Further work will be undertaken before a proposal is put forward to Council.

9.4. **Regional Infrastructure Fund**

- In collaboration with the Mayor, the Acting Chief Executive, Destination Westland ltd and Development West Coast staff are putting together a bid for consideration for the Hokitika Airport Upgrade.
- The proposed project will upgrade the runway surface, upgrade runway lights, install runway indication lights, install approach lights, allow pilot activated lighting and install a generator.

9.5. **Policies and Bylaws**

- Drafted Land Acquisition and Disposal Policy.
- Revised Asset Management Policy.
- Revised Procurement Policy.
- All policies will go to Council for approval.

10. Options

10.1. Option 1: To receive the report.

10.2. Option 2: To not receive the report.

11. Risk Analysis

11.1. Risk has been considered and no risks have been identified.

12. Health and Safety

12.1. Health and Safety has been considered and no items have been identified.

13. Significance and Engagement

13.1. The level of significance has been assessed as being low.

- No public consultation is considered necessary.

14. Assessment of Options (including Financial Considerations)

14.1. Option 1 is the preferred option.
There are no financial implications to this option.

14.2. Option 2 is not the preferred option.
There are no financial implications to this option.

15. Preferred Option(s) and Reasons

15.1. The preferred option is Option 1.

15.2. The reason that Option 1 has been identified as the preferred option is that the report enables Council to be kept fully informed of work underway within the teams, projects and matters of significance in the Westland District.

16. Recommendation(s)

16.1. That the Quarterly Report from the Acting Chief Executive dated 29th August 2024 be received.

Scott Baxendale
Acting Chief Executive

Report to Council

DATE: 29 August 2024

TO: Mayor and Councillors

FROM: Facilities and Properties Manager

GEOTECH SUMMARY REPORT - PAKIWAITARA BUILDING

1. Summary

1.1. The purpose of this report is to provide Council with the geotechnical report and seismic strengthening concept design for the Pakiwaitara building.

1.2. This issue arises from Council requesting a geotechnical report for the Pakiwaitara building during a public excluded council workshop on 31 October 2023.

1.3. Council seeks to meet its obligations under the Local Government Act 2002 and the achievement of the District Vision adopted by the Council in June 2024, which are set out in the Enhanced Annual Plan 2024/2025. Refer page 2 of the agenda.

1.4. This report concludes by recommending that Council receive the report and appendices.

2. Background

2.1 The reason the report has come before the Council is due to the request from Council to do a geotechnical report for the Pakiwaitara building.

3. Current Situation

3.1. The current situation is that the geotechnical report and the seismic strengthening concept design has been completed for the Pakiwaitara building. A geotechnical report has been completed and attached as A**ppendix 1.** The below image indicates the three levels of soil types below the Pakiwaitara building. Firstly, there is a 1.9-2.2m thick level of clayey silt, sandy silt, silty sand. Below that is a 3.6-3.3m level of sand and silty sand, followed by inferred sandy gravel and gravelly sand.

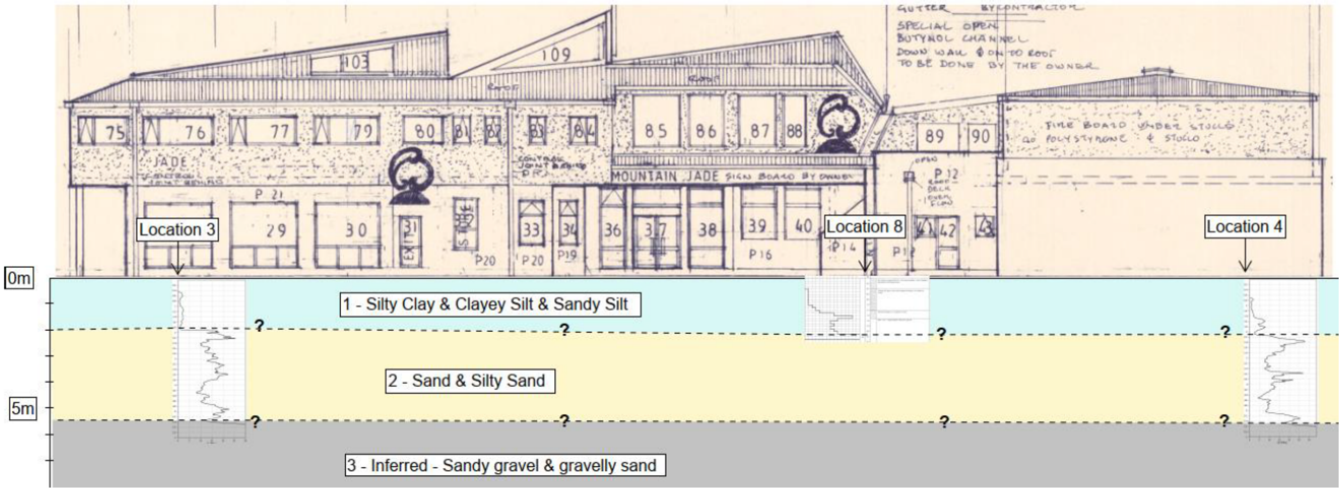


Figure 4. Inferred soil profile beneath 41 Weld Street looking north towards the south elevation.

Table 1. Ground model soil properties

Layer	Depth to top (m bgl)	Thickness (m)	Typical q_c (MPa)	Unit weight (kN/m³)	Phi	Cohesion
1 – Clayey Silt, Sandy Silt, Silty Sand	0	1.9 – 2.2	0.5 – 2.0	17	26°	3
2 – Sand and Silty Sand	1.9 – 2.2	3.6 – 3.3	10 – 20	18	29°	0
3 – Inferred sandy gravel and gravelly sand	5.5	-	>35	20	32°	0

3.2. A liquefaction analysis has been done as part of the geotechnical report and concludes that liquefaction is not a major concern for this building, with an estimated 50mm to 100mm occurring between the western and easter end of the building in an extreme event.

3.3. A seismic strengthening concept design has been completed and attached as **Appendix 2**, with the ultimate target of improving the seismic strength of the building to 67%NBS based on an IL2 building. The proposed concept strengthening design is more than what was identified from the SIMCO reports previously, and as such the cost for this strengthening could increase. There is minimal work identified on the foundations to area D3, which is a relatively easy construction process. There is an extensive amount of work required in the ceiling space and the Cafe area, and if the work were to proceed the recommendation would be to remove all tenants from the building during construction.

4. Options

4.1. Option 1: That council receives the report.

4.2. Option 2: That council does not receive the report.

5. Risk Analysis

5.1. Risk has been considered and no risks have been identified.

6. Health and Safety

6.1. Health and Safety has been considered and no items have been identified.

7. Significance and Engagement

7.1. The level of significance has been assessed as being low

7.1.1. No public consultation is considered necessary.

8. Assessment of Options (including Financial Considerations)

8.1. Option 1

8.1.1. There are no financial implications to this option.

8.2. Option 2

8.2.1. There are no financial implications to this option.

9. Preferred Option(s) and Reasons

9.1. The preferred option is Option 1

9.2. The reason that Option 1 has been identified as the preferred option is that the requested reports have been completed, the Pakiwaitara building is due to be sold, and it does not make sense spending more money on the building or additional reports or investigations.

10. Recommendation(s)

10.1. That the report and appendices be received.

Jan Visser
Facilities and Properties Manager

Appendix 1: Geotechnical Report
Appendix 2: Seismic Strengthening Concept Design

Geotechnical Assessment

Version A

41 Weld Street, Hokitika

Prepared for Westland District Council

503051

eliot sinclair

Geotechnical Assessment

41 Weld Street, Hokitika

Prepared for Westland District Council

503051

Quality Control Certificate

Eliot Sinclair & Partners Limited

eliotsinclair.co.nz

Action	Name	Signature	Date
Prepared by:	David Hatton Geotechnical Engineer BE (Hons) Civil		26 June 2024
Reviewed by:	Andrei Cotiga Geotechnical Engineer BE (Hons) Civil ME CPEng		26 June 2024
Directed and approved for release by:	Travers Armstrong Structural Engineer | Director BE(Hons) Civil CMEngNZ CPEng		26 June 2024
Status:	Version A		
Release date:	26 June 2024		
Distributed to:	Westland District Council		

Version History

Status	Description	Author	Release Date
A	First issue of document	David Hatton	26 June 2024

Contents

1. General

1.1. Introduction

Eliot Sinclair have been engaged by the Westland District Council (WDC) to undertake a seismic assessment and provide seismic strengthening design for the existing Pakiwaitara Building at 41 Weld Street in Hokitika. This report describes the ground conditions encountered at the site and provides geotechnical guidance to inform the seismic assessment and strengthening of the existing building.

This report is valid for two years from the date of issue.

1.2. Scope of Work

Eliot Sinclair were engaged to provide the following scope of geotechnical engineering services:

a) Undertake a review of available data from the NZGD, WCRC hazard maps, and the Institute of Geological and Nuclear Sciences (GNS) Active Faults database.

a) Arrange for a third-party CPT Contractor to undertake two Cone Penetration Tests/DPSH (if required) to 10-15m below ground level or to practical refusal. Also arrange for a concrete cutting contractor to cut through hard-stand areas for the testing.

b) Undertake four Dynamic Cone Penetration tests (DCP's) to 2m depth (or practical refusal), to investigate the bearing capacity of the shallow soils.

c) Undertake two shallow hand-auger test holes to 3m depth (or practical refusal), to investigate the nature of the shallow soils.

d) Calculate the risk of liquefaction and liquefaction-induced settlement using the site-specific CPT results.

e) Prepare a Geotechnical Report that summarises the results of the investigation, the risk of liquefaction, and provides geotechnical parameters that can be used to evaluate the performance of the existing foundations along with foundation upgrades that may be required.

1.3. Site description

The site is located within the centre of the Hokitika township on the south side of Weld Street. The Pakiwaitara Building has a footprint area of approximately 1242m² with a floor area of approximately 2246m². Most of the building was constructed in 1993/94, with the original south-end section constructed at an earlier unknown date.

Figure 1. Overview showing site location (Eliot Sinclair, 2024).

1.4. Building Foundation System

We have been provided building Plans (Drawings S1 to S3) which show the foundation system consists of a Barrette type pile of varying sizes extending down to 2m bgl. The pile widths generally range from 500mm to 900mm.

We understand the southern older part of the building is founded on a 355mm wide, 850mm deep perimeter beam which has been underpinned at several locations with 2m deep piles.

2. Existing geotechnical Information

2.1. Site Geology and Topography

The Geological Map[1] of the area notes the site is underlain with Holocene shoreline deposits (Q1) consisting of Beach sand and gravel underlying present day coastal plain.

The site is relatively flat with a very gentle slope down towards the northwest. The existing building is surrounded by lawns and paved footpaths or parking areas.

2.2. Faults

The nearest active fault is the Alpine Fault, recorded on the GNS Active Faults Database[2], which lies approximately 23km south-east of the site. Based on available data, the site is located outside the minimum 20m fault avoidance zone recommended by the Ministry for the Environment[3].

2.3. Soil Subsoil Class

Based on our geological assessment and in accordance with NZS1170.5, Section 3.1.3, the site subsoil classification, we consider a conservative site subsoil category "*Class D - Deep or soft soil sites*" is appropriate for the site.

2.4. Nearby borehole records

We have searched the NZGD website[4] for borehole records near the site. The following boreholes are located within 200m of the site.

Borehole ID	Distance	Soil profile
BH_88151	22m SW	0 – 1.7m Gravel **FILL** 1.7 – 2.1m Brown **SILT** with organics 2.3 – 6.8m Medium dense to dense **Sandy GRAVEL/Gravelly SAND** 6.8 – 7.7m **Gravelly sandy SILT/silty SAND** 7.7 – 10m Very Dense **Sandy GRAVEL**
BH_193234	70m SW	0 – 1.4m Gravel **FILL** 1.4 – 2.3m Very Soft **SILT** with some fibrous organics 2.3 – 9.5m Medium dense to dense **Sandy GRAVEL**
BH_193233	95m SW	0 – 0.6m Gravel **FILL** 0.6 – 2.3m Very Soft **SILT** with wood fragments 2.3 – 4.2m Loose **Silty SAND** with wood fragments 4.2 – 6.5m Medium dense **SAND** 6.5 – 11m Dense to very dense **sandy GRAVEL**

[1] https://data.gns.cri.nz/mapservice/apps/geology/

[2] Data.gns.cri.nz/af/

[3] Planning for Development of Land on or Close to Active Faults: A Guideline to Assist Resource Management Planners in New Zealand (Published July 2003).

[4] https://www.nzgd.org.nz/

Borehole ID	Distance	Soil profile
		11 – 15.5m Stiff to very stiff **SILT**

2.5. Eliot Sinclair Nearby Deep Investigation Data

In December 2020 Eliot Sinclair carried out two Cone Penetration tests (CPTs) at 53 Weld Street, Hokitika, which is located at around 75m south of the site.

The nearby CPT testing was carried out to practical refusal before then proceeding with Dynamic Probe Super Heavy (DPSH) testing. DPSH tests generally indicate the inferred gravels extend to at least 15m bgl where testing terminated at the target depth.

2.6. Groundwater Monitoring

The investigation of 53 Weld Street also included the installation of a shallow piezometer to monitor the depth to groundwater. Figure 2 below shows the depth to ground water recorded by a water level logger over a two-month period. It shows the depth to groundwater fluctuates with the tide and spikes were observed following large rainfall events. The typical range was between 2.0m bgl and 2.5m bgl. We have adopted a conservative depth to ground water of 2.0m for our liquefaction analysis at the site.

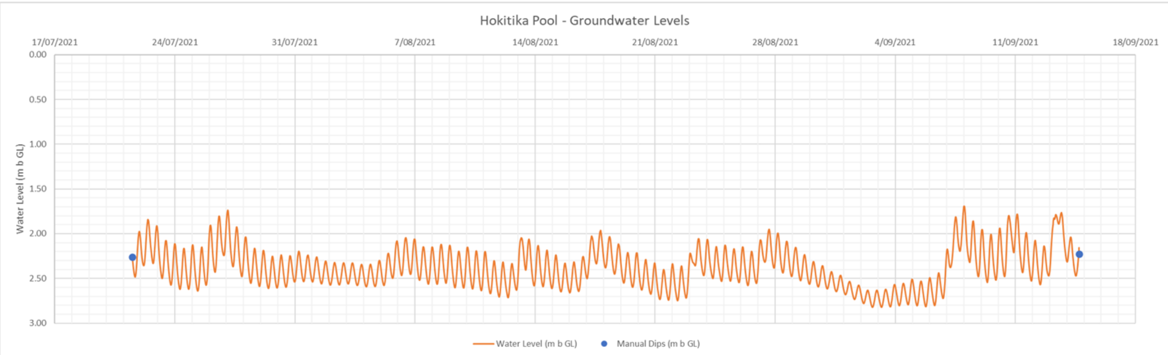


Figure 2. Groundwater monitoring results form 53 Weld Street, July to September 2021.

3. Site investigation

3.1. General

A geotechnical investigation of the site was undertaken on 22 and 23 April 2024 which included shallow hand augers and dynamic cone penetrometer (DCP) tests, and deep CPT testing. The investigation was undertaken as part of a wider investigation that also included 36 Weld Street where the existing building is also undergoing a seismic strengthening assessment. A total of eight locations were investigated, four around each building.

A CPT and DCP were undertaken at each end of the building on its southern side (Location 3 and Location 4). A hand auger and DCP were undertaken at Location 8, and we were unable to penetrate through shallow fill at Location 7. Where investigation locations were on pavement, the hardstanding was broken out using an excavator to provide access to the underlying soils.

All onsite investigations were undertaken by Canterbury Geotest Ltd under the supervision of Eliot Sinclair.

Figure 3. **Geotechnical investigation locations for 36 and 41 Weld Street.**

3.2. CPT

Four CPTs at locations 1 to 4 were advanced until refusal in dense material was encountered. CPT 3 was located at the western end of 41 Weld Street and pushed until refusal was encountered at 5.5m bgl. CPT 4 was located to the south of the eastern end of the building next to the older part of the structure and was pushed to refusal at 5.6m bgl.

Based on our local knowledge of the subsurface conditions, and the nearby borehole information it is more likely than not that the termination depth of the CPT's coincides with an underlying gravel deposit that is prevalent across Hokitika and the wider area.

The CPT data can be found in Appendix B.

3.3. Hand Augers

Hand augers were undertaken at locations 5 to 8 where they were progressed to refusal. Location 7 was in a grass area adjacent to Weld Street on the north side of the building. At this location several attempts were made to penetrate through the dense shallow fill material, however both the hand auger and the Scala were unable to penetrate through to the underlaying natural material. The hand auger at Location 8 encountered 300mm of gravel fill overlaying sandy silt to 0.6m bgl, and then gravelly sand to 0.8m bgl. From 0.8m bgl to clayey silt was encountered until refusal in gravel at 1.7m bgl.

3.4. Dynamic Cone Penetrometer Testing

A DCP test was undertaken adjacent to each CPT and hand auger. DCPs at locations 3, 4, 7, 8 were undertaken around the building at 41 Weld Street. Below any surficial topsoil or fill layers the DCP recorded 1 to 2 blows per 100mm to a depth of 1.0m bgl. From 1.0m bgl this increased to 2 to 3 blows per 100mm until 1.3m bgl where it then increased to greater than 3 blows per 100mm. DCP3 and DCP4 refused at 2.0m bgl and 2.3m bgl, respectively, with DCP 8 refusing at 1.8m bgl.

These results generally indicate the upper soils have a relatively low but consistent geotechnical ultimate bearing capacity across the footprint of the building, in the region of 100kPa. The bearing capacity increases with depth and 300kPa is generally available from 1.3m bgl.

Full DCP profiles are provided in Appendix B.

3.5. Groundwater

Groundwater was not encountered in our shallow testing at up to 1.7m depth.

4. Ground Model

The CPT data was used within CPeT-IT v2.3 software to infer the ground model based on soil behaviour type (SBT) ratios. We used this along with the hand auger and DCP logs to infer a generalised soil profile for the site.

The interpretation of the soil conditions indicates three broad layers are present. A soft silty clay, clayey silt, sandy silt, to 1.9m bgl at the western end of the building, and to 2.2m bgl at the eastern end. This is underlain by sand and silty sand to approximately 5.5m bgl where gravel was encountered.

The software used to represent the subsurface conditions infers the soil type from the CPT data. As no soil samples are taken during this test method, care should be taken in this regard.

For the purposes of this report, we have adopted a GWT of 2.8m bgl during the investigation.

Refer to Appendix B for the CPT data.

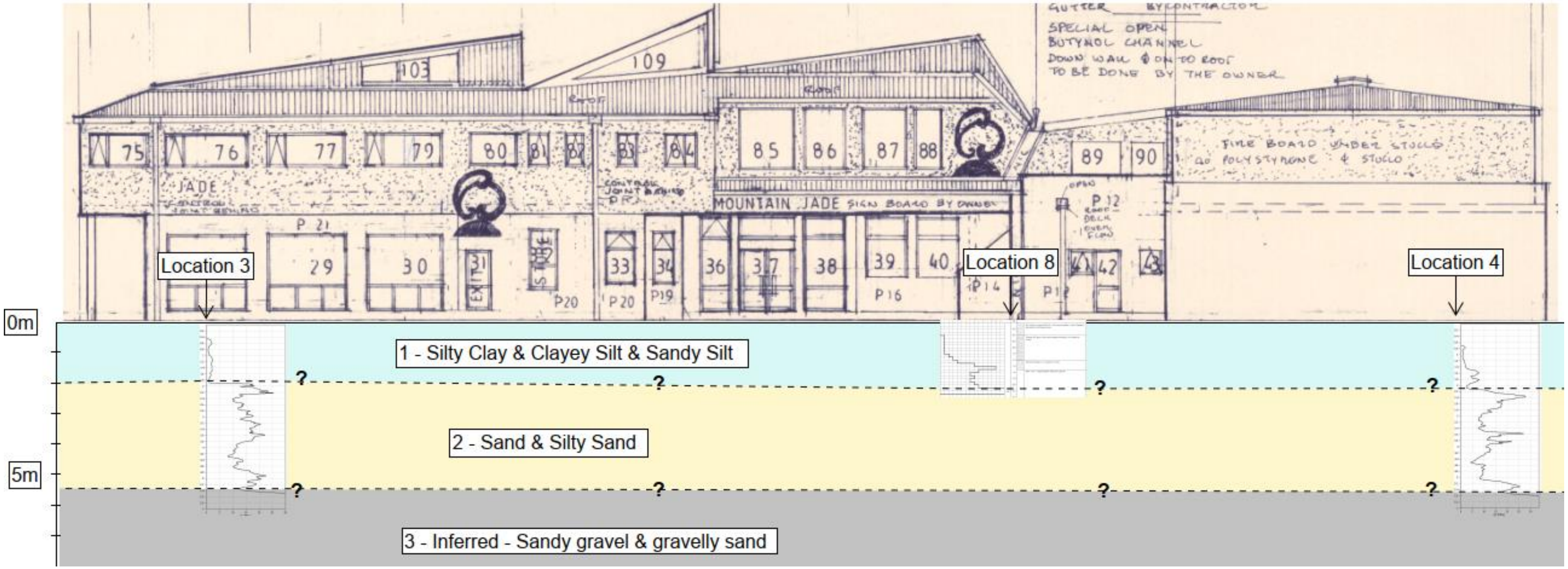


Figure 4. Inferred soil profile beneath 41 Weld Street looking north towards the south elevation.

Table 1. Ground model soil properties

Layer	Depth to top (m bgl)	Thickness (m)	Typical q_c (MPa)	Unit weight (kN/m^3)	Phi	Cohesion
1 – Clayey Silt, Sandy Silt, Silty Sand	0	1.9 – 2.2	0.5 – 2.0	17	26°	3
2 – Sand and Silty Sand	1.9 – 2.2	3.6 – 3.3	10 – 20	18	29°	0
3 – Inferred sandy gravel and gravelly sand	5.5	-	>35	20	32°	0

5. Liquefaction analysis

The BECA 2021 West Coast Regional Liquefaction Assessment Report[5] identifies the site as belonging to *"Liquefaction Damage is Possible"*. Refer to Figure 4.

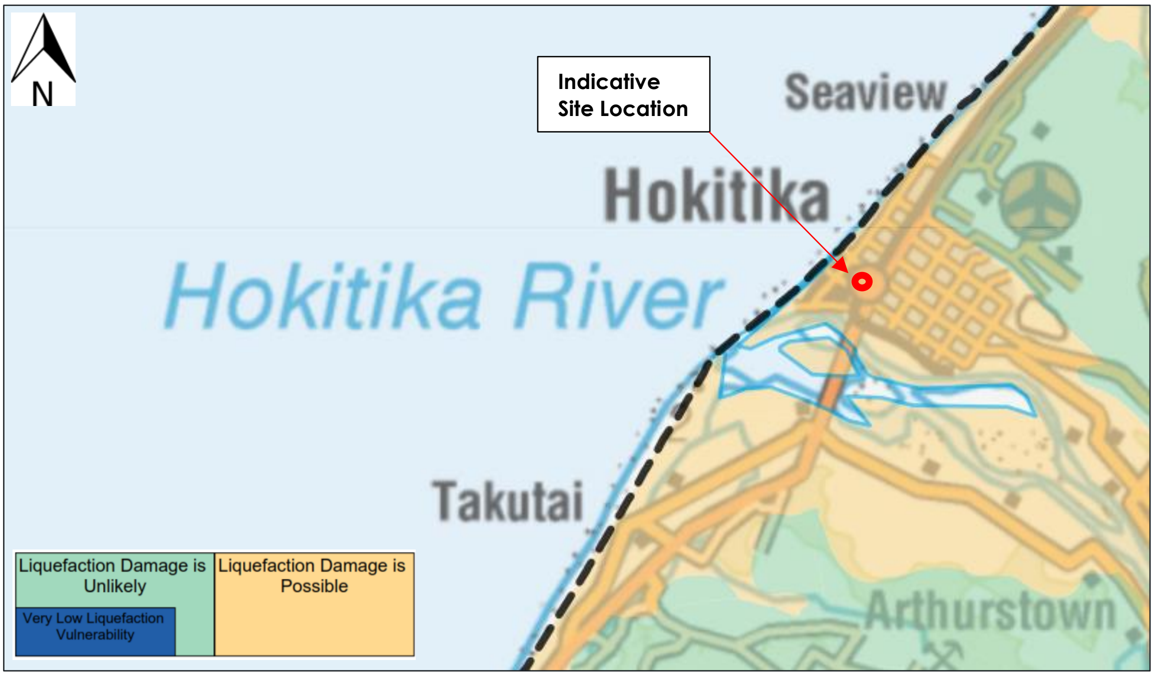


Figure 5. Map of west coast region liquefaction assessment (Beca, Map I7, 2023).

5.1. Assessment Method

The calculation of liquefaction triggering was undertaken using the method outlined in Boulanger & Idriss (2014), and the estimation of post-liquefaction induced settlements using the method outlined by Zhang et al (2002). The liquefaction analysis was calculated using CLiq software.

The site-specific CPT data was analysed for both the Serviceability Limit State (SLS) and the Ultimate Limit State (ULS) levels of earthquake shaking in Hokitika region as per NZGS Module 1 showing below:

- SLS (25-year return period) Case 1: M6.5, PGA 0.13g.
- ILS (100-year return period) Case 2: M6.5, PGA 0.27g.
- ULS (500-year return period) Case 3: M6.7, PGA 0.53g.

Based on our analysis of the CPT data we have assumed the design groundwater depth to be 2.8m bgl during the static condition, and 2.0m bgl during the seismic loading.

Please refer to Appendix C for the Liquefaction Analysis Report.

5.2. Liquefaction susceptibility

Analysis of the CPT 3 and CPT 4 data indicates that loose bands within layer 2 of the soil profile are susceptible to liquefaction. Liquefaction is not triggered during a design SLS level event, with some

[5] https://www.wcrc.govt.nz/publications/natural-hazard-reports

liquefaction occurring during an ILS level event, and a greater level occurring during a design ULS event.

The results of CPT 1 and CPT 2 which were located to the north near 36 Weld Street are not discussed here but show a general agreement with the results from CPT1 and CPT2.

5.3. Liquefaction induced Settlement

5.3.1. Free-Field Vertical Settlement due to Liquefaction (index value)

The liquefaction-induced free-field *'index'* settlement values were calculated using the method by Zhang et al (2002)[12] for a range of parameters that are estimated from the four basic CPT parameters (depth, cone tip resistance, skin friction and pore water pressure) and represent '*free-field*' settlements. Therefore, the settlements shown in Table 2 are not an exact vertical movement, but only index values for interpretation of relative susceptibility to the damaging effect of liquefaction.

Table 2. Liquefaction-induced 'index' settlement values

Test No.	Depth of CPT test (m bgl)	Liquefaction-induced 'index' settlements (mm)			MBIE Equivalent land classification at test location
		SLS1 (M6.5, 0.13g)	ILS (M6.5, 0.27g)	ULS (M6.7, 0.53g)	
CPT3	5.48	0	0.3	8	TC1
CPT4	6.59	0	8	30	TC2

5.3.2. Liquefaction Severity Number (LSN)

The liquefaction severity number (LSN) is a parameter developed to reflect the more damaging effects of shallow liquefaction on residential land and shallow foundations. The number represents the level of ground surface damage that could be expected with higher values indicating a greater chance of ejecta reaching the ground surface. Where surface ejecta occurs, it can significantly increase building settlement due to the removal of material from below foundations. The estimated LSN values for CPT 3 and CPT 4 are summarised in Table 3.

Table 3. Maximum LSN

Event	Maximum LSN Range	Predominant Performance
SLS/ILS	0 - 2	Little to no expression of liquefaction
ULS	2 - 8	Little to no expression of liquefaction

Based on the LSN values calculated for CPT 3 and CPT4 it is unlikely that liquefaction ejecta will contribute to the settlement of the existing foundations during a design ULS event.

5.3.3. Building Shear Settlement

The potential for soil shear induced building settlements during the design seismic events was estimated using the procedure suggested by Bray & Macedo (2017). We have assumed a load of

200kPa for our calculations. This method estimated settlements in the range of 10mm to 30mm towards western end of the building at CPT3, and 25 to 50mm towards the eastern end of the building at CPT4.

5.3.4. Estimated Total and Differential Settlement

We can combine the settlement values for the three methods described above to estimate the magnitude of total settlement during the design seismic events. We have also included the estimated settlements from the CPTs at 53 Weld Street which are approximately 30m east of the site.

Table 4. Differential Settlement

CPT ID	SLS (M6.5, 0.13g)	ILS (M6.5, 0.27g)	ULS (M6.7, 0.53g)
CPT3 (Western end)	Nil	Nil	10mm to 40mm
CPT4 (Eastern End)	Nil	Nil	50mm to 100mm
53 Weld Street CPT 1 & 2	Nil	30mm to 80mm	90mm to 150mm

The results show that the ground conditions become more susceptible to liquefaction induced settlement as you move from west to east across the building footprint. The method we have used estimates 50mm to 100mm of differential settlement may occur between the western and eastern ends of the building during a design ULS event with a foundation load of 200kPa. The higher settlement values of the 53 Weld Street CPTs also show that the liquefaction potential of the surrounding area can change significantly over relatively short distances.

As this analysis is based on a small number of investigation locations, and the estimation of building settlement due to liquefaction is very complex, the above numbers should be used only as an indication of the general magnitude of expected settlements and not an exact number.

5.4. Lateral Displacement

The site is near-level, and the nearest watercourse (i.e. Hokitika River) is located around 160m south of the site. Assuming a free bank face of 4.8m (necessary for software conditions) the calculated amount of global lateral displacement in an ULS event is within the range of MBIE '*Minor to Moderate*' extent.

Lateral displacement and stretching is not considered to be an issue for the site.

5.5. Assessed Technical Category

The TC land classification system is primarily intended for application to residential land. However, it also gives a useful indication of the relative vulnerability to liquefaction and earthquake-induced land deformation for non-residential land, as the site. Based on the liquefaction hazard discussed above, we have assessed the predicted earthquake-induced land deformation around the site to be **equivalent to residential Technical Category 2 (TC2).**

6. Foundation Discussions

6.1. Static and Earthquake Case

In static conditions the foundations are expected to bear exclusively onto the Barrette piles located at a depth of 2.0m bgl. The piles bear onto sand and silty sand as depicted in Figure 3. The geotechnical ultimate bearing capacity of the pads at that depth is expected to be greater than 500kPa.

The older part of the building has a perimeter footing which we understand has been underpinned in several locations as shown in figure 6.

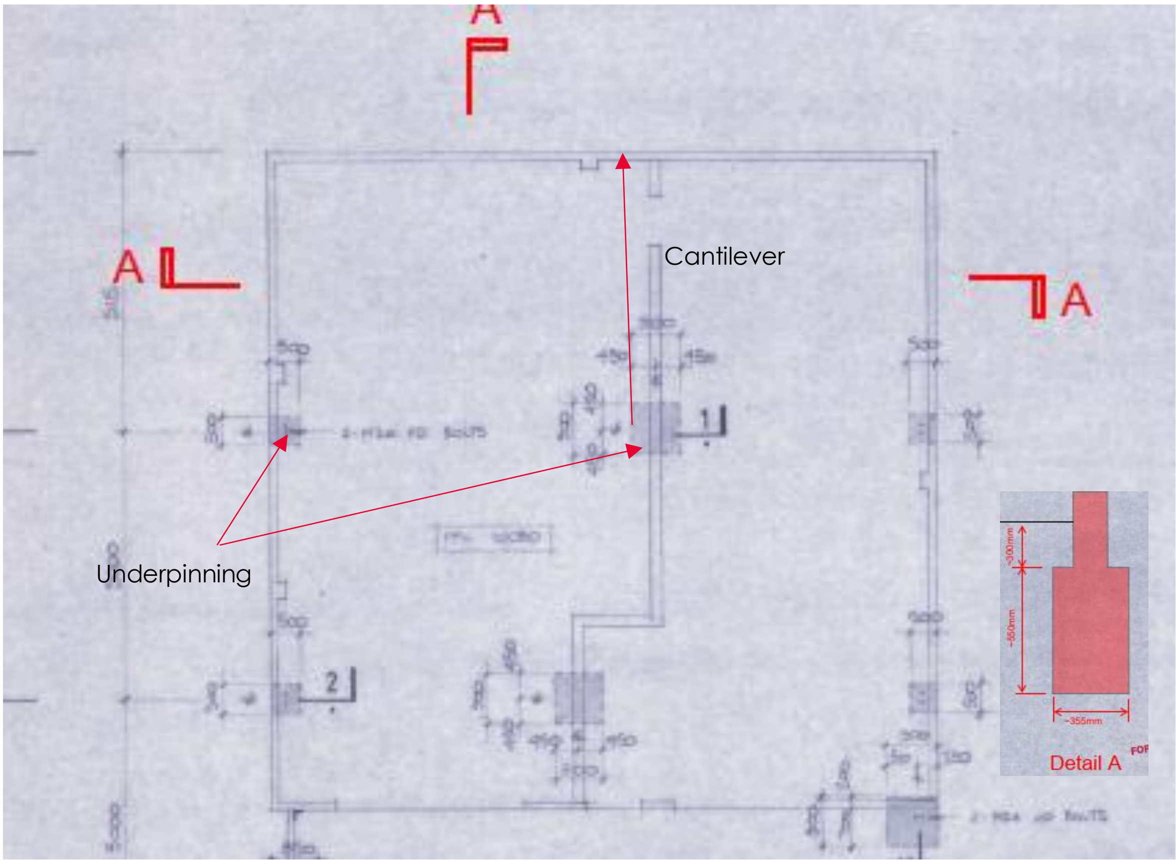


Figure 6. The older section of the building with existing shallow strip footings.

Under static conditions the strip footing can be assumed to have a geotechnical ultimate bearing capacity of q_u=300kPa. Both the Barrette pile foundations bearing capacity and the old building's strip foundations require a strength reduction factor of 0.5 for ULS static and seismic load cases.

Settlement due to primary consolidation is estimated at less than 25mm.

6.2. Post earthquake liquefied case

We have undertaken a post-earthquake liquefaction induced settlement analysis as described in Section 5.3 above. The sand and silty sand of layer 2 generally become looser when advancing from west to east beneath the building, which results in a greater thickness of liquefaction and higher calculated settlements.

We have assumed a 900mm wide pile founded 2m bgl, with a load of 200kPa for our analysis. The method we have used estimates 50mm to 100mm of liquefaction induced differential settlement may occur between the western and eastern ends of the building following a design ULS event. This estimate should be revised once the buildings loads have been refined.

7. Lateral pile capacity

Lateral pile spring values have been calculated assuming a 900mm square pile extending to 2.0m bgl. The values provided in Table 5 can be used to assess the lateral deflections during a seismic event. It is recommended that a sensitivity analysis using 50% and 200% spring stiffness is carried out.

Table 5. Soil springs for a 900mm square pile - 36 Weld Street

Depth (m bgl)	k_s (kN/m)	50% of k_s(kN/m)	200% of k_s (kN/m)
0.0	100	50	200
0.5	4700	2350	9400
1.0	8000	4000	16000
1.5	10500	5250	21000
2.0	12000	6000	24000
2.5	13400	6700	26800
2.8	14600	7300	29200

8. Conclusions

The soil profile at the site consists of silts overlaying sands and then gravels. The variously sized Barrett piles are assumed to be founded in the underlaying sands at 2m bgl. The thickness of the sand overlaying the gravel is believed to be relatively uniform across the site.

Liquefaction is not expected to occur during a design SLS seismic event, with liquefaction of some lenses within the silt and sand layers occurring during a design ULS event. As a result of greater thickness of sand below the eastern end of the building, there is the potential for differential settlement to occur in a post-earthquake liquefied state. With a pile load of 200kPa we have calculated the settlement was greater at the eastern end of the building for CPT4 than for the western end at CPT3. We have estimated 50mm to 100mm may occur during an ULS seismic event due to liquefaction induced settlement.

We have calculated lateral spring stiffness values for the silt layer to be used for the seismic assessment of pile deflections. We recommended that a sensitivity analysis using 50% and 200% of the supplied spring stiffness is carried out.

9. Disclaimer

This report has been prepared by Eliot Sinclair & Partners Limited ("Eliot Sinclair") only for the intended purpose to support the seismic strengthening of the building. Our analysis is based on a visual inspection and shallow soil investigations of the site on 22 and 23 April 2024 comprising shallow Dynamic Cone Penetration (DCP) testing, shallow hand auger testing, and CPT testing around the existing building.

The report is based on:

- The most recent version of the Ministry of Business, Innovation and Employment Guidelines.

Where data supplied by Westland District Council or other external sources, including previous site investigation reports, have been relied upon, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Eliot Sinclair for incomplete or inaccurate data supplied by other parties.

Whilst every care has been taken during our investigation and interpretation of subsurface conditions to ensure that the conclusions drawn, and the opinions and recommendations expressed are correct at the time of reporting, Eliot Sinclair has not performed an assessment of all possible conditions or circumstances that may exist at the site. Variations in conditions may occur between investigatory locations and there may be conditions such as subsoil strata or features at depth that were not detected by the scope of the investigation that was carried out or have been covered over or obscured over time. Additionally, on-going seismicity in the general area may lead to deterioration or additional ground settlement that could not have been anticipated at the time of writing this report. Eliot Sinclair does not provide any warranty, either express or implied, that all conditions will conform exactly to the assessments contained in this report.

At time of foundation excavation, should the exposure of soil conditions that vary from those described in this report, or the requirements of MBIE's guidelines, NZ Standards or the NZBC that relate to foundations and floors be updated, a review of our recommendations may be required. Eliot Sinclair should be contacted to confirm the validity of this report should any of these occur.

This report has been prepared for the benefit of Westland District Council for the purposes as stated above. No liability is accepted by Eliot Sinclair or any of their employees with respect to the use of this report, in whole or in part, for any other purpose or by any other party.

Appendix A. Site plan

G:\Jobs\50\503048\GIS\Automated_Mapping\503048_Core-GS_AutoMAP_240529_1017

NOTES
1. Contractors to verify all dimensions and the location of all underground services on site prior to commencing work.
2. Unless noted otherwise, all work shall be undertaken in accordance with the NZBC and any relevant Territorial Authority Engineering Standards and Specifications as a minimum standard.

LEGEND
- CPT + Dynamic Cone Penetrometer (DCP)
- HA + DCP
- LINZ NZ Primary Parcels

REV.	DRAWN	DATE	NOTE
A	GIS	29.05.24	Preliminary

CLIENT
WESTLAND DISTRICT COUNCIL

DESIGNED		GIS
DRAWN		GIS
CHECKED		DSH
APPROVED	29.05.24	DSH
STATUS		PRELIMINARY
SCALE	1:700	[A3]

TESTING LOCATIONS PLAN FROM CORE-GS
41 Weld Street
Hokitika

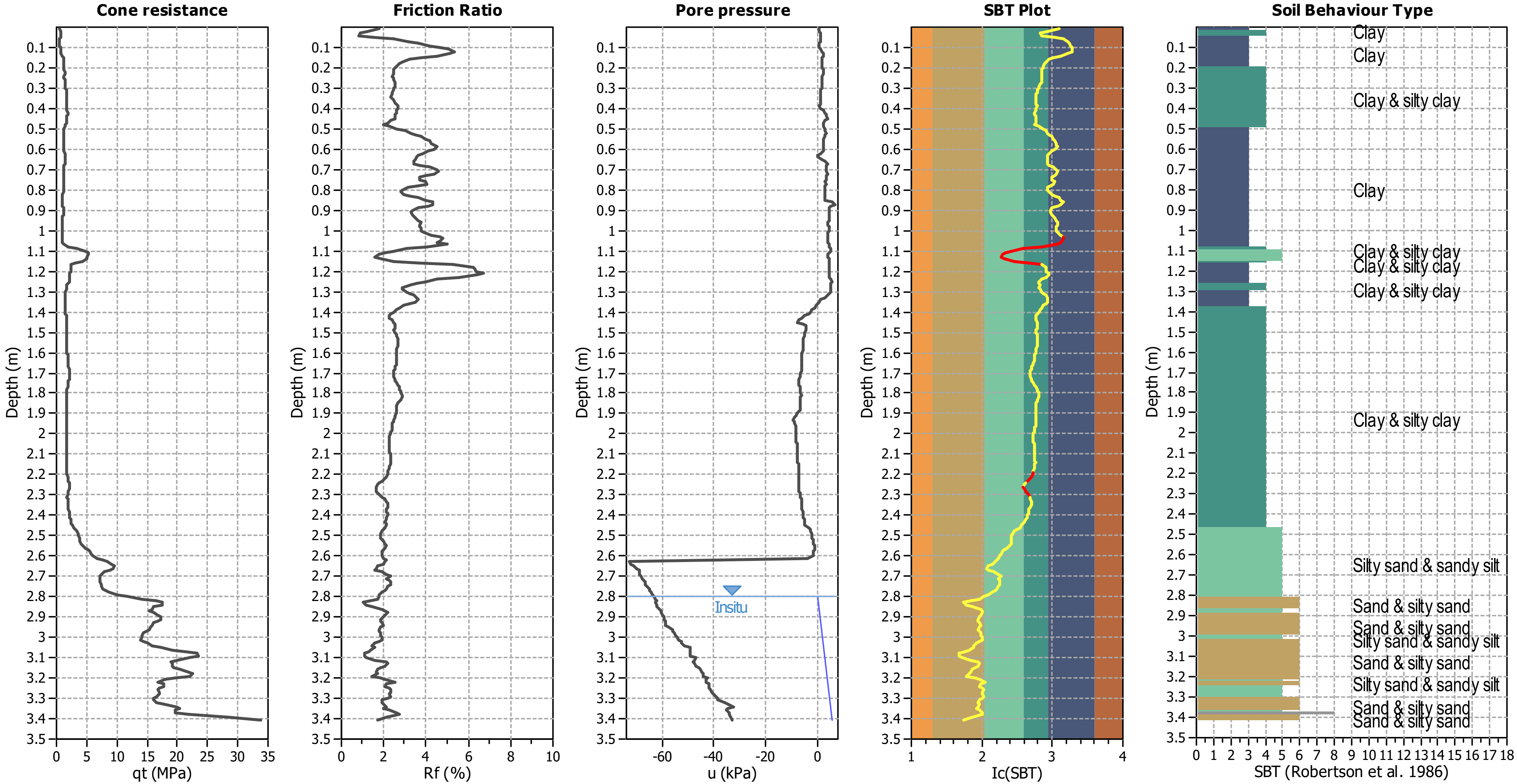
TEST LOCATION PLAN
XX

PROJECT	SET	SHEET	REV.
503051	01	XXXX	A

eliot sinclair

Appendix B. ES Site Investigation Logs

CPT basic interpretation plots



Input parameters and analysis data

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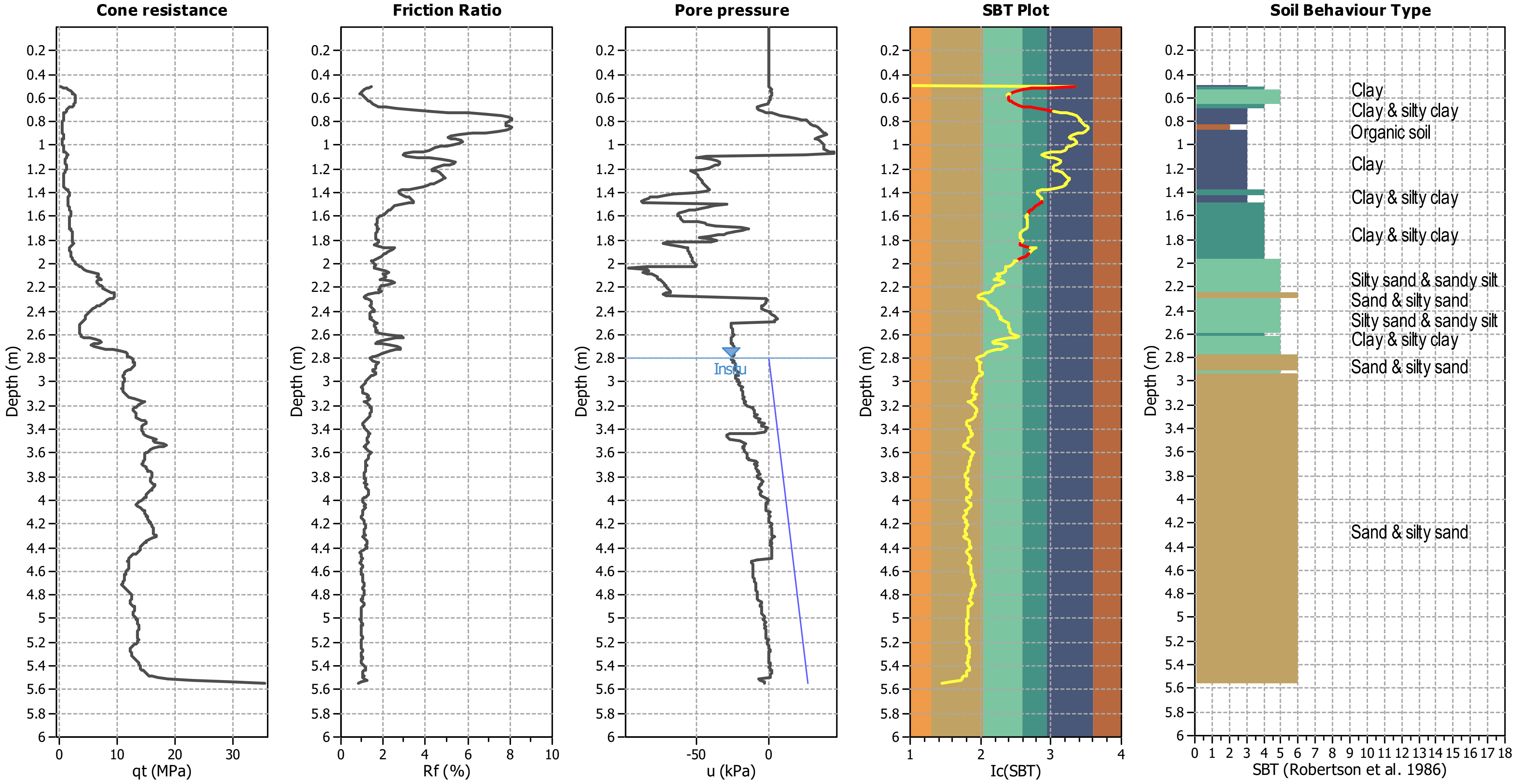
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.80 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

CPT basic interpretation plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
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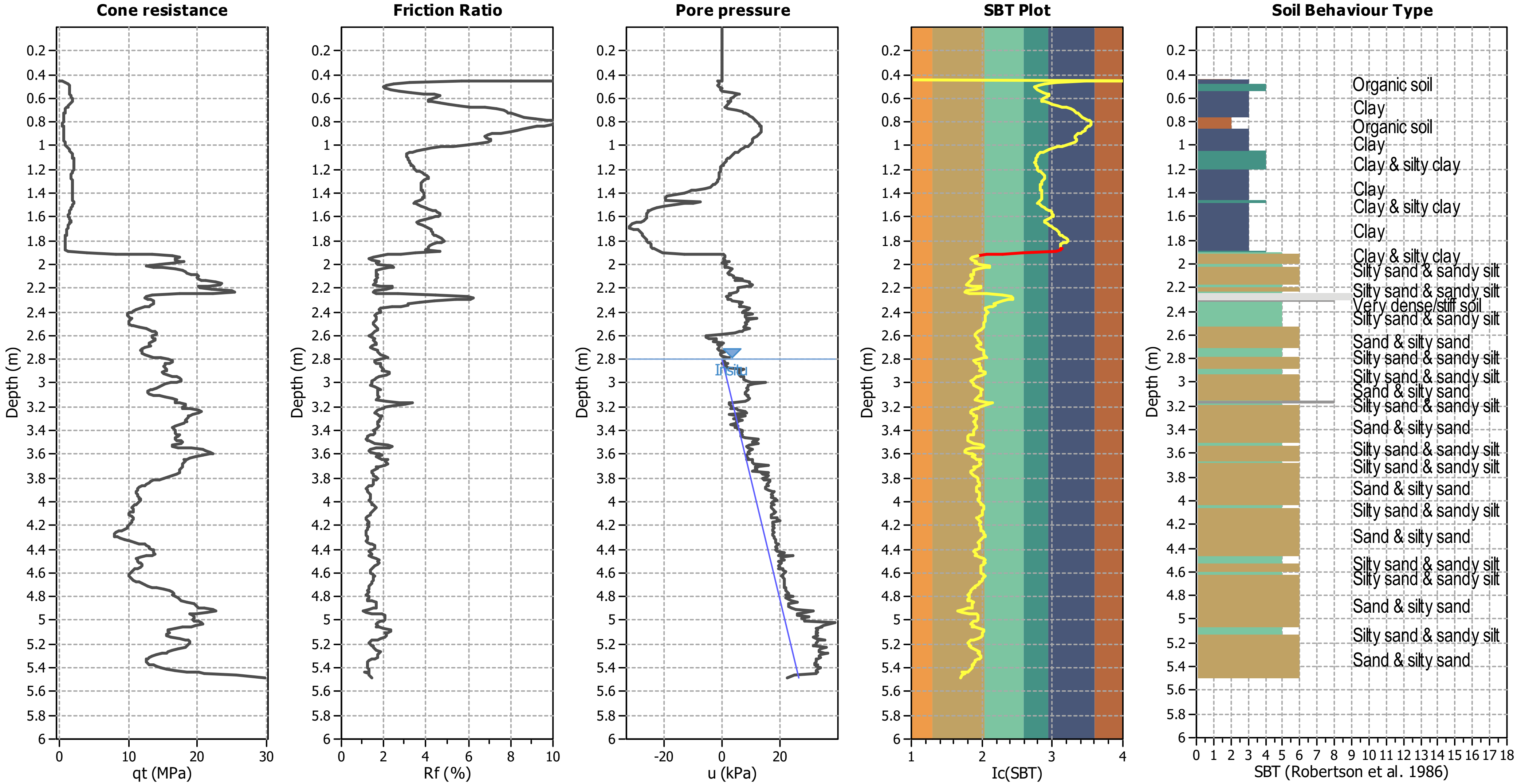
Depth to water table (insitu):	2.80 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots



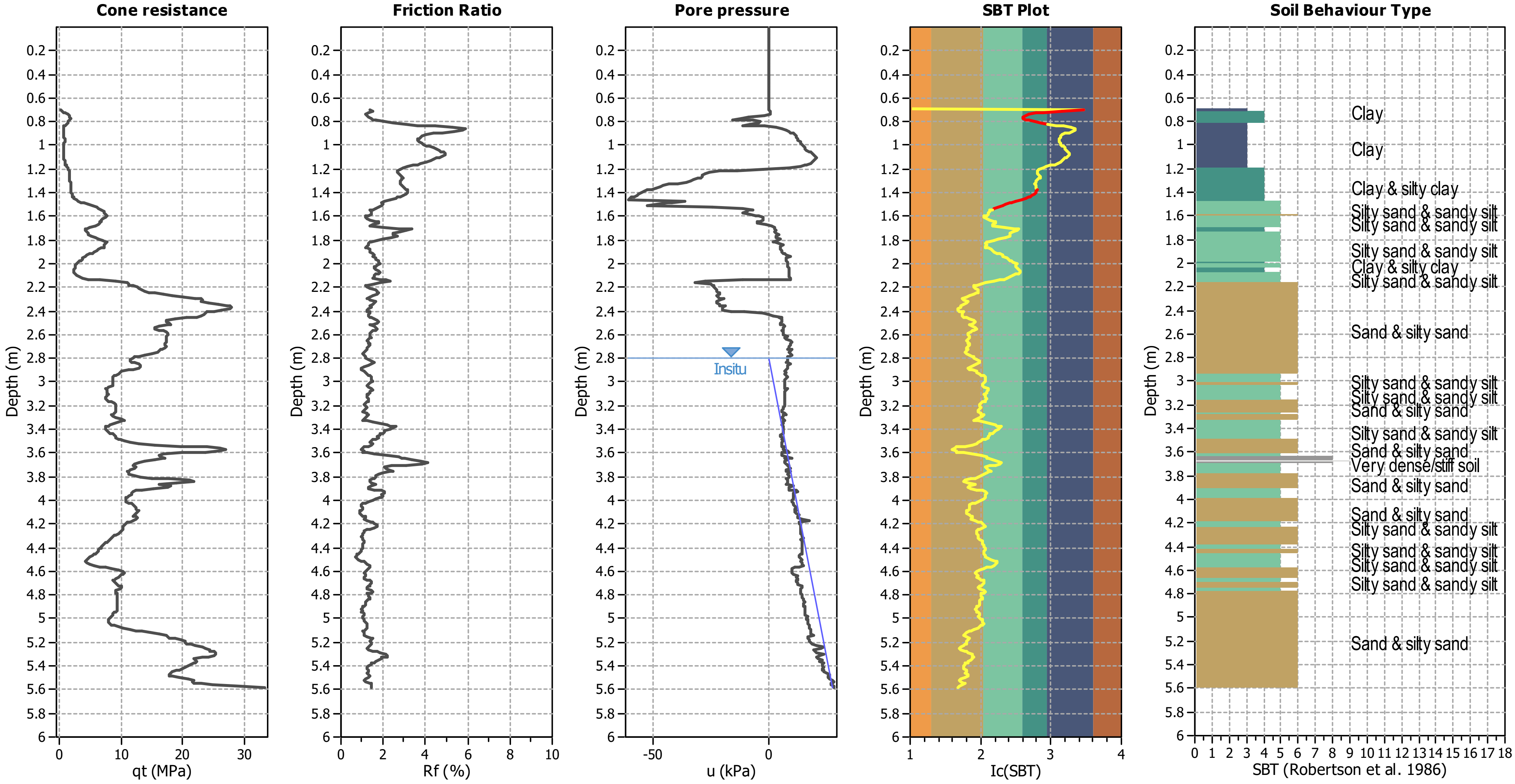
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.80 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CPT basic interpretation plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.80 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

Site Investigation Record

Client: Westland District Council c/- RDB Project Management

Site: 36 & 41 Weld Street, Hokitika

Technical Category:

Lot:

D.P.:

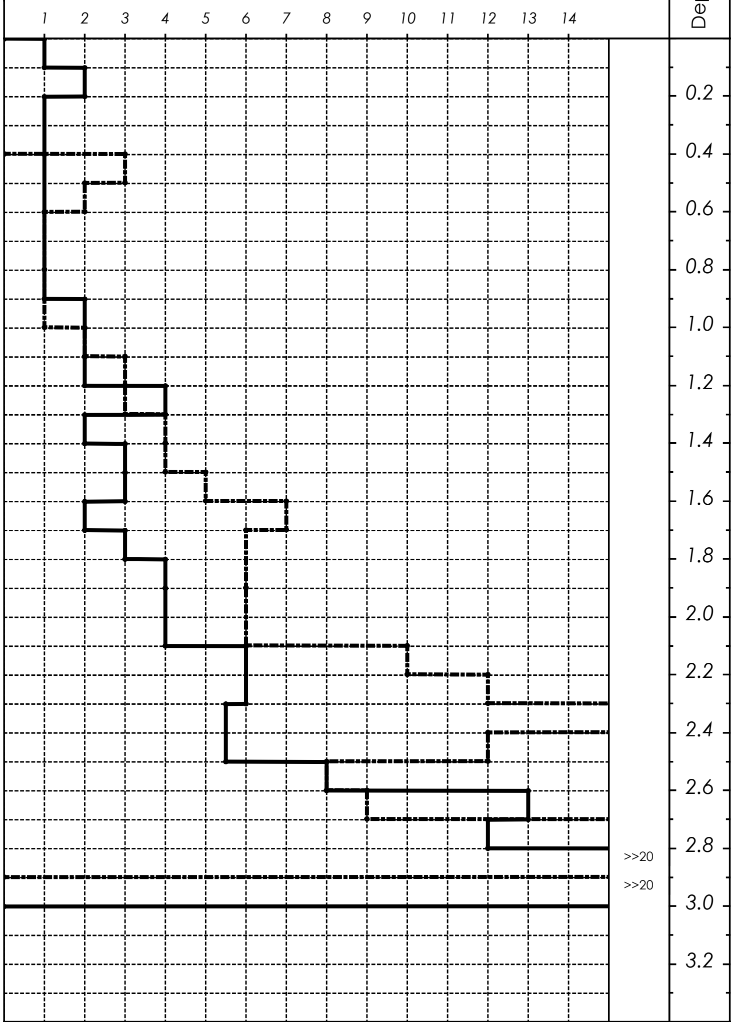
Date Tested: 22-Apr-2024

Log Sheet No.: 1 of 1

Project No.: 503048

Dynamic Cone Penetrometer (DCP) Test Results

Number of Blows per 100mm



01 — 02

Soil Profile

Test Location 01

Water

EOH: 0m - refer to CPT01 and CPT02 for soil profiles

Groundwater Not Encountered

Comments:

Dynamic Cone Penetrometers: Undertaken adjacent to CPT01 and CPT02.

Site Plan: (Not to Scale)

Field Staff:	Prepared By:	Soil Profile From:
Geotest	DSH	☐ Hand Auger
Job Manager:	**Approved By:**	☐ Spade Hole
TIA		☐ Test Pit

Note: This record identifies the geotechnical conditions encountered at the noted test location(s) only. It is possible that ground conditions could be different away from the point(s) of testing.

Produced with CORE-GS Report Published: 6/05/2024 3:25:16 pm

Site Investigation Record

Client: Westland District Council c/- RDB Project Management

Site: 36 & 41 Weld Street, Hokitika

Technical Category:

Lot:

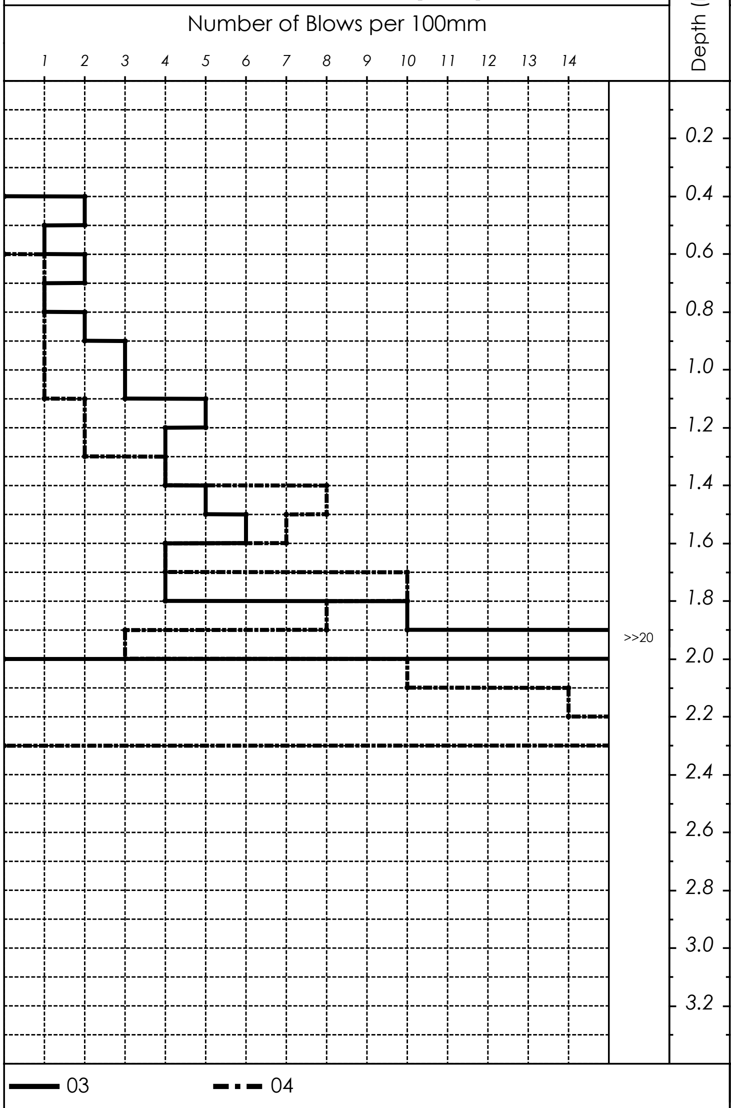
D.P.:

Date Tested: 22-Apr-2024

Log Sheet No.: 1 of 1

Project No.: 503048

Dynamic Cone Penetrometer (DCP) Test Results



Soil Profile

Test Location 03	Water
EOH: 0m - refer to CPT03 and CPT04 for soil profiles	Groundwater Not Encountered

Site Plan: (Not to Scale)

Comments:

Dynamic Cone Penetrometers: Undertaken adjacent to CPT03 and CPT04.

Field Staff:	Prepared By:	Soil Profile From:
Geotest	DSH	☐ Hand Auger
Job Manager:	**Approved By:**	☐ Spade Hole
TIA		☐ Test Pit

Note: This record identifies the geotechnical conditions encountered at the noted test location(s) only. It is possible that ground conditions could be different away from the point(s) of testing.

Site Investigation Record

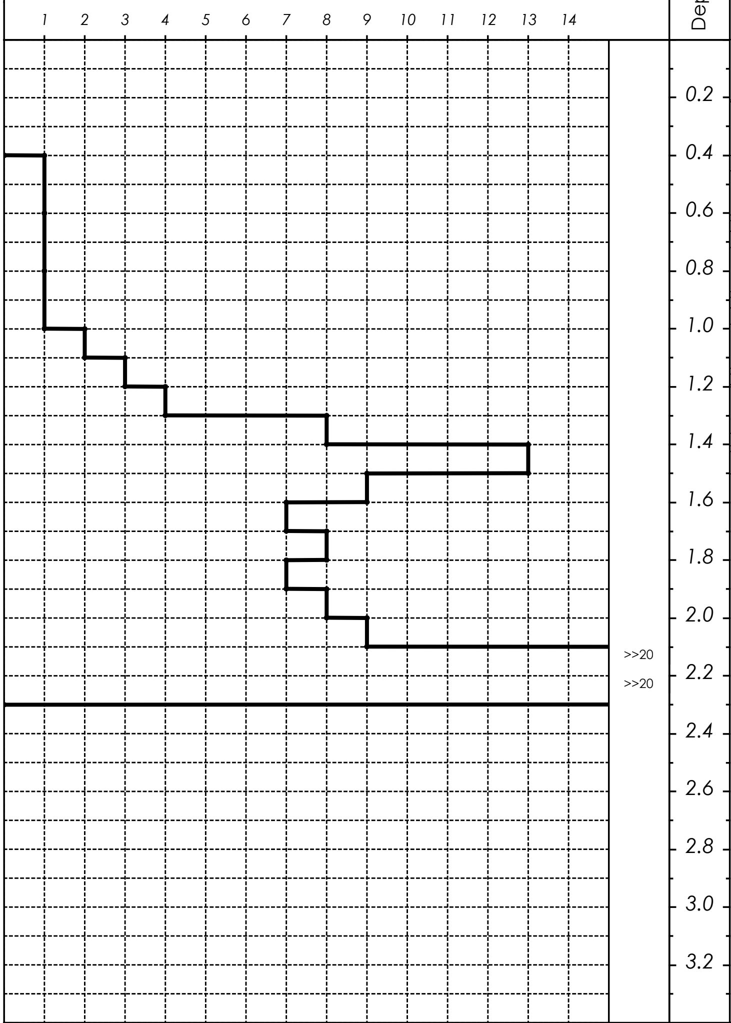
Client: Westland District Council c/- RDB Project Management **Site:** 36 & 41 Weld Street, Hokitika

Technical Category: **Lot:** **D.P.:**

Date Tested: 22-Apr-2024 **Log Sheet No.:** 1 of 1 **Project No.:** 503048

Dynamic Cone Penetrometer (DCP) Test Results

Number of Blows per 100mm



Soil Profile

Test Location 05

Soil Profile	Water
FILL: fine to coarse GRAVEL, with some cobbles. Moist; Chipseal pavement and basecourse.	Groundwater Not Encountered
Clayey SILT; grey with some orange mottling. Low plasticity; moist.	
Sandy SILT; grey. Low plasticity; moist.	
EOH: 1.5m - Target Depth: Refusal in gravel.	

Site Plan: (Not to Scale)

Comments:

Field Staff:	Prepared By:	Soil Profile From:
Geotest	DSH	☑ Hand Auger
Job Manager:	**Approved By:**	☐ Spade Hole
TIA		☐ Test Pit

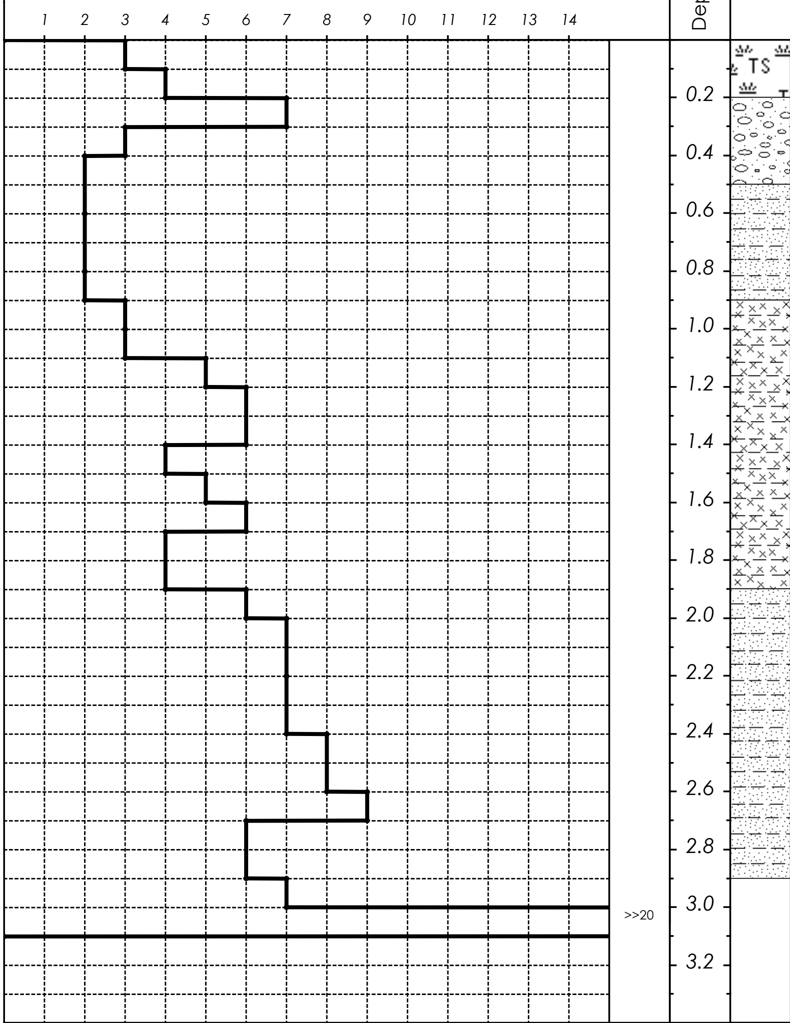
Note: This record identifies the geotechnical conditions encountered at the noted test location(s) only. It is possible that ground conditions could be different away from the point(s) of testing.

Site Investigation Record

Client: Westland District Council c/- RDB Project Management
Site: 36 & 41 Weld Street, Hokitika
Technical Category:
Lot:
D.P.:
Date Tested: 22-Apr-2024
Log Sheet No.: 1 of 1
Project No.: 503048

Dynamic Cone Penetrometer (DCP) Test Results

Number of Blows per 100mm



Soil Profile

Test Location 06

Description	Water
FILL: sandy TOPSOIL; brown. Moist.	Groundwater Not Encountered
FILL: sandy fine to coarse GRAVEL; grey. Moist.	
Clayey silty fine to coarse SAND, with trace gravel; light brown. Gravel, fine to medium.	
Clayey SILT; grey. Low plasticity; moist.	
Clayey silty fine SAND; grey. Low plasticity; wet to saturated.	
EOH: 2.9m - Target Depth: Refusal in gravel.	

Site Plan: (Not to Scale)

Comments:

Field Staff:	Prepared By:	Soil Profile From:
Geotest	DSH	☑ Hand Auger
Job Manager:	**Approved By:**	☐ Spade Hole
TIA		☐ Test Pit

Note: This record identifies the geotechnical conditions encountered at the noted test location(s) only. It is possible that ground conditions could be different away from the point(s) of testing.

Site Investigation Record

Client: Westland District Council c/- RDB Project Management

Site: 36 & 41 Weld Street, Hokitika

Technical Category:

Lot:

D.P.:

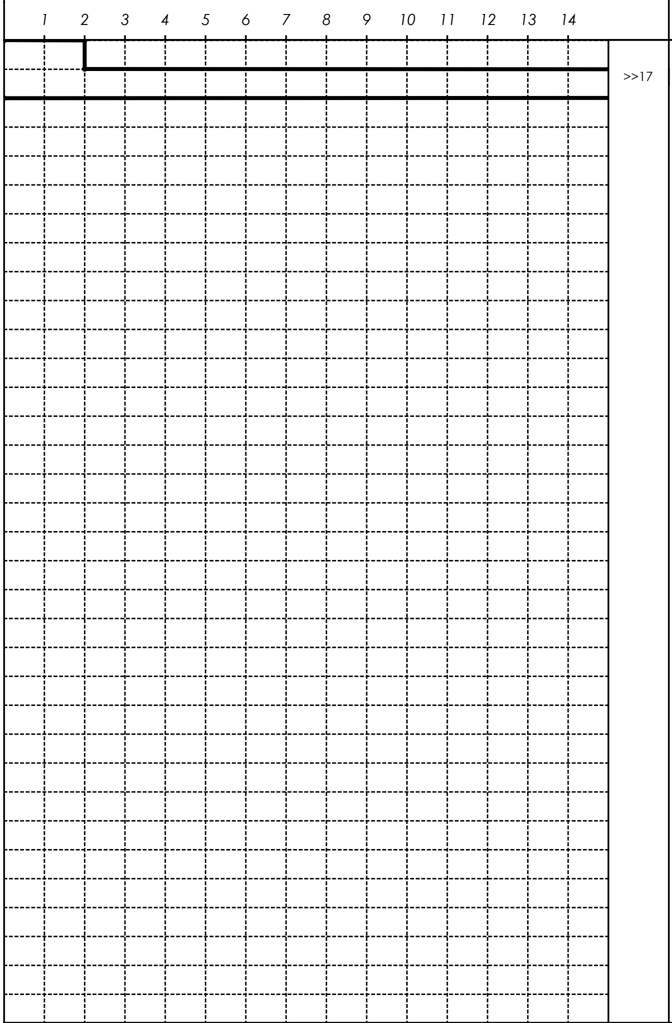
Date Tested: 22-Apr-2024

Log Sheet No.: 1 of 1

Project No.: 503048

Dynamic Cone Penetrometer (DCP) Test Results

Number of Blows per 100mm



Soil Profile

Test Location 07

Water

EOH: 0m - Target Depth: Unable to penetrate hard ground with hand auger.

Site Plan: (Not to Scale)

Comments:

Dynamic Cone Penetrometer: Unable to penetrate surface layer at this location.

Field Staff:	Prepared By:	Soil Profile From:
Geotest	DSH	☑ Hand Auger
Job Manager:	**Approved By:**	☐ Spade Hole
TIA		☐ Test Pit

Note: This record identifies the geotechnical conditions encountered at the noted test location(s) only. It is possible that ground conditions could be different away from the point(s) of testing.

Site Investigation Record

Client: Westland District Council c/- RDB Project Management

Site: 36 & 41 Weld Street, Hokitika

Technical Category:

Lot:

D.P.:

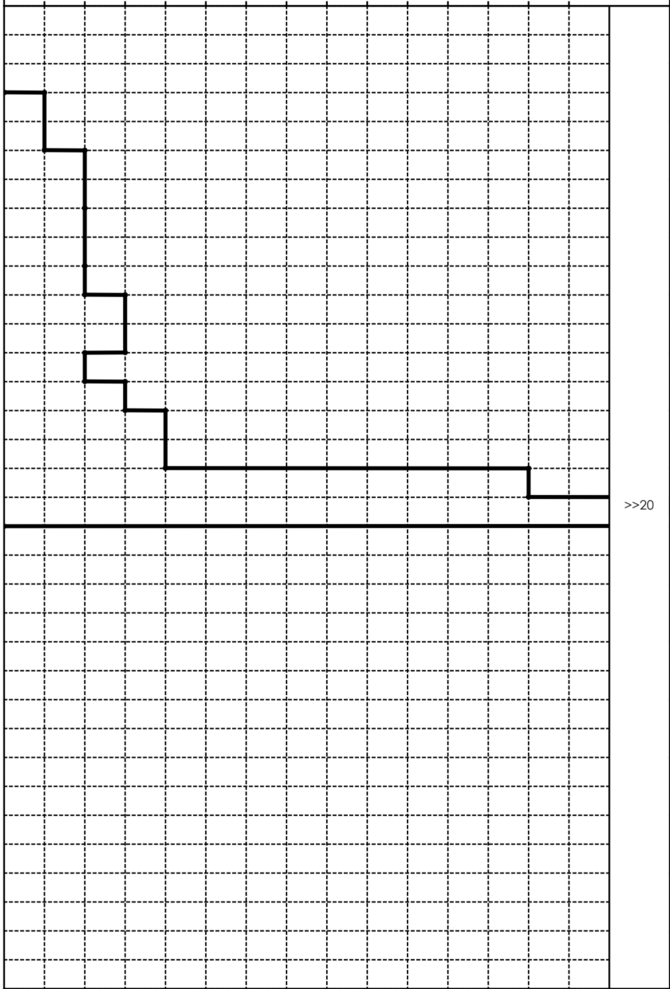
Date Tested: 22-Apr-2024

Log Sheet No.: 1 of 1

Project No.: 503048

Dynamic Cone Penetrometer (DCP) Test Results

Number of Blows per 100mm



— 08

Soil Profile

Test Location 08

Depth (m)	Description	Water
0.0 – 0.3	FILL: GRAVEL, with some cobbles. Moist; Chipseal pavement and basecourse.	Groundwater Not Encountered
0.3 – 0.6	Sandy SILT, with trace gravel; brown. Moist; gravel, fine.	
0.6 – 0.8	Gravelly SAND; brown. Moist to wet; gravel, fine.	
0.8 – 1.7	Clayey SILT; grey. High plasticity; moist.	
1.7	EOH: 1.7m - Target Depth: Refusal in gravel.	

Comments:

Site Plan: (Not to Scale)

Field Staff:	Prepared By:	Soil Profile From:
Geotest	DSH	☑ Hand Auger
Job Manager:	**Approved By:**	☐ Spade Hole
TIA		☐ Test Pit

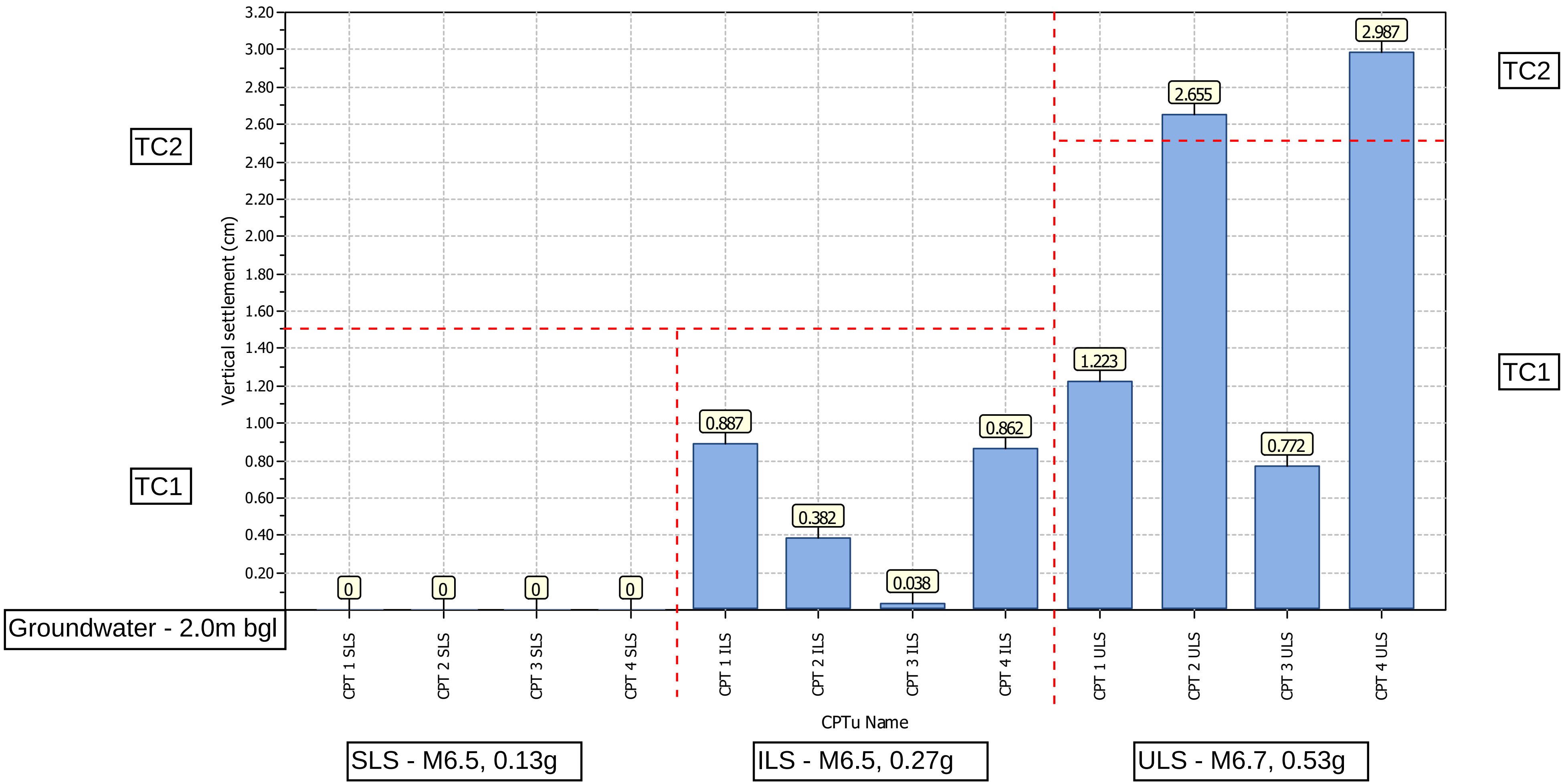
Note: This record identifies the geotechnical conditions encountered at the noted test location(s) only. It is possible that ground conditions could be different away from the point(s) of testing.

Appendix C. Liquefaction analysis

Project title : 41 **Weld Street**

Location : 41 **Weld Street, Hokitika**

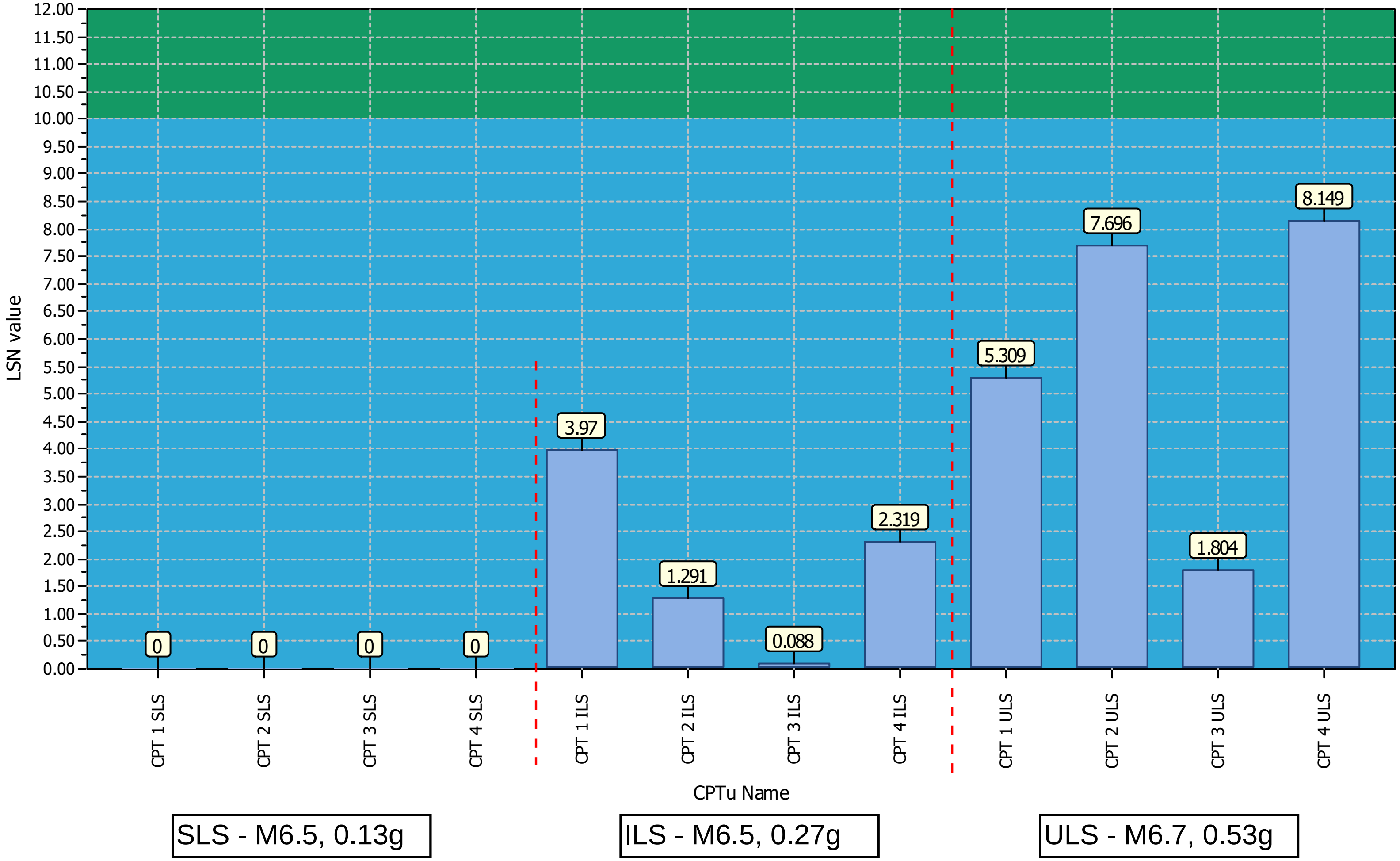
Overall vertical settlements report



Project title : 41 **Weld Street**

Location : 41 **Weld Street, Hokitika**

Overall Liquefaction Severity Number report



LSN color scheme
- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

Basic statistics

Total CPT number: 12

100% little liquefaction

0% minor liquefaction

0% moderate liquefaction

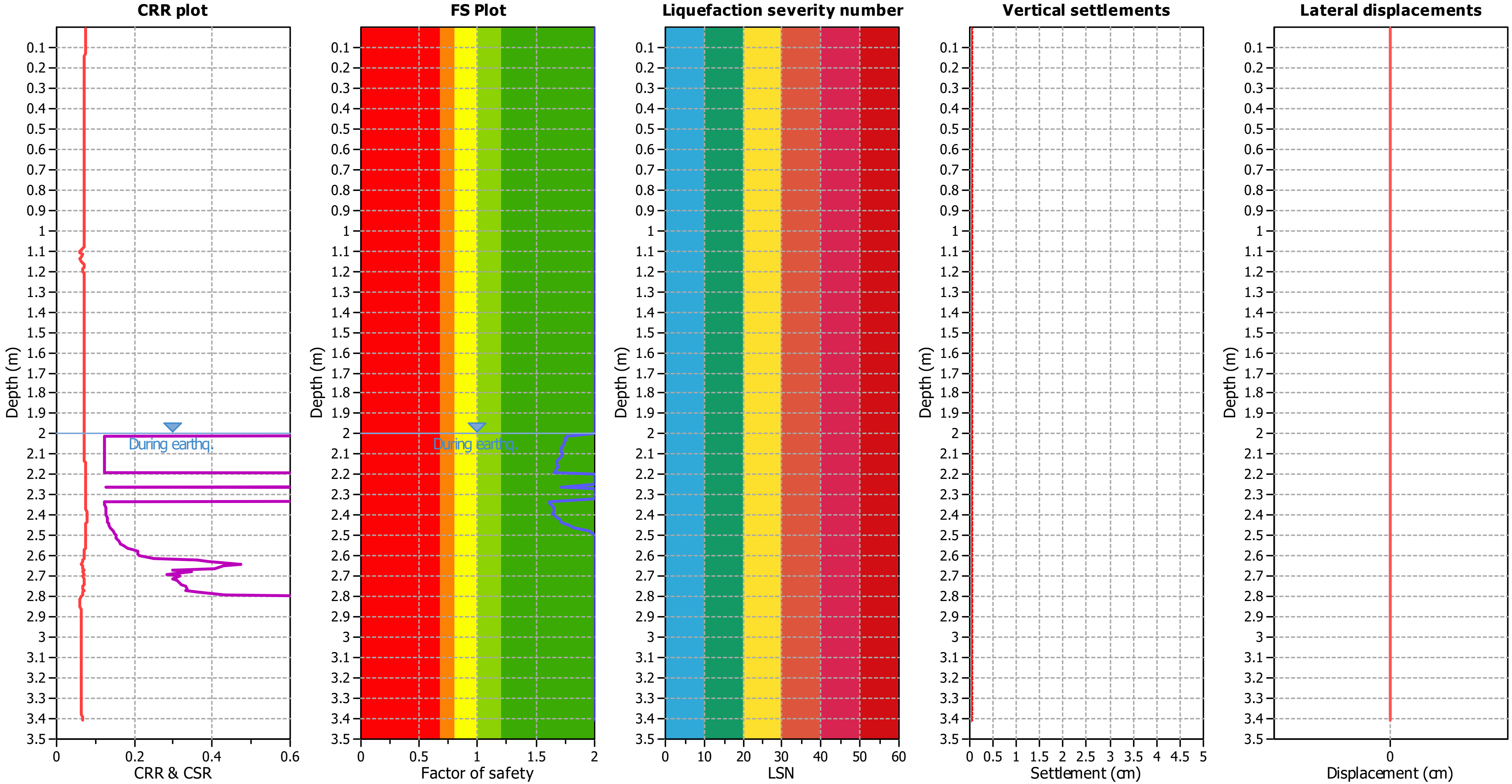
0% moderate to major liquefaction

0% major liquefaction

0% severe liquefaction

Groundwater - 2.0m bgl

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.13	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.80 m	Fill height:	N/A	Limit depth:	N/A

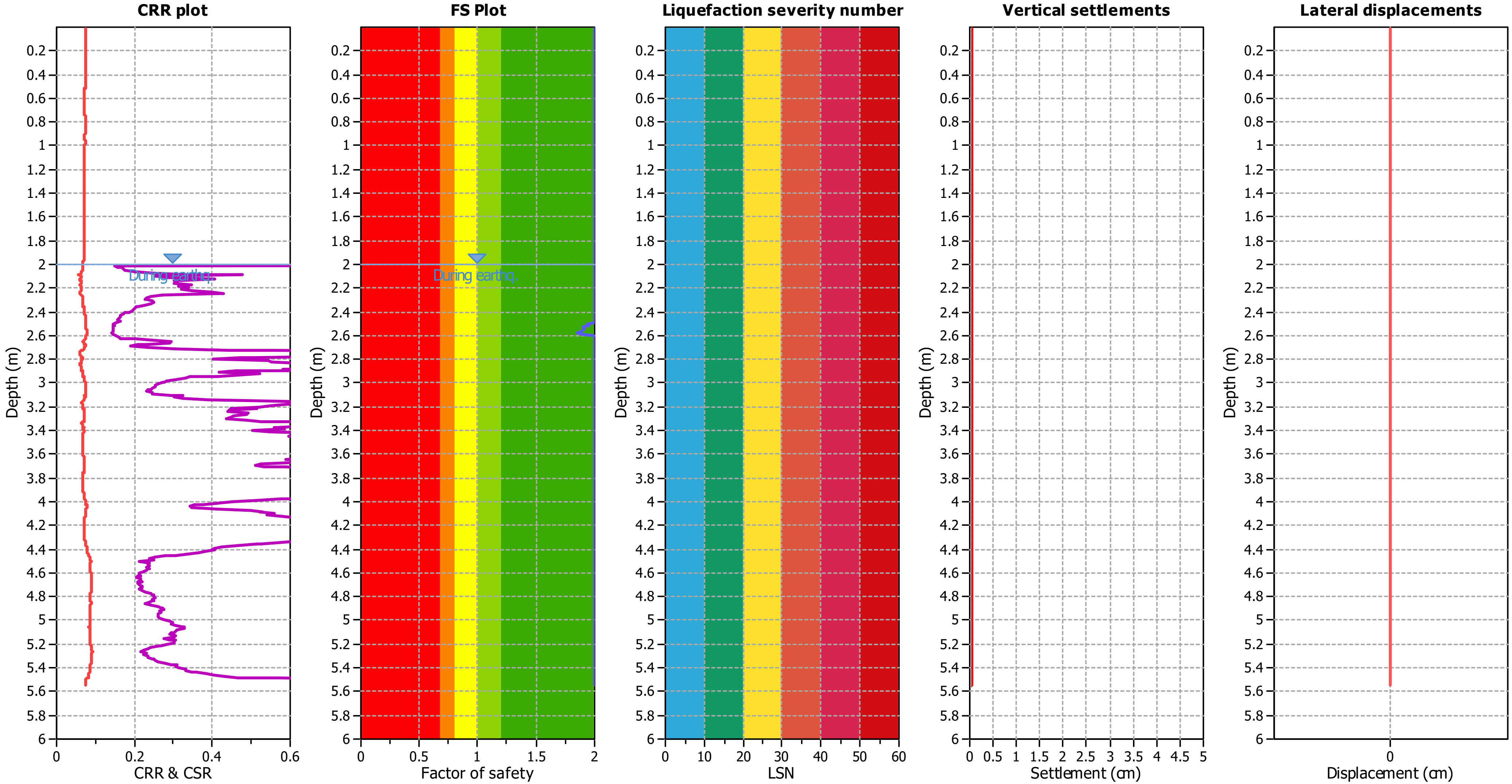
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
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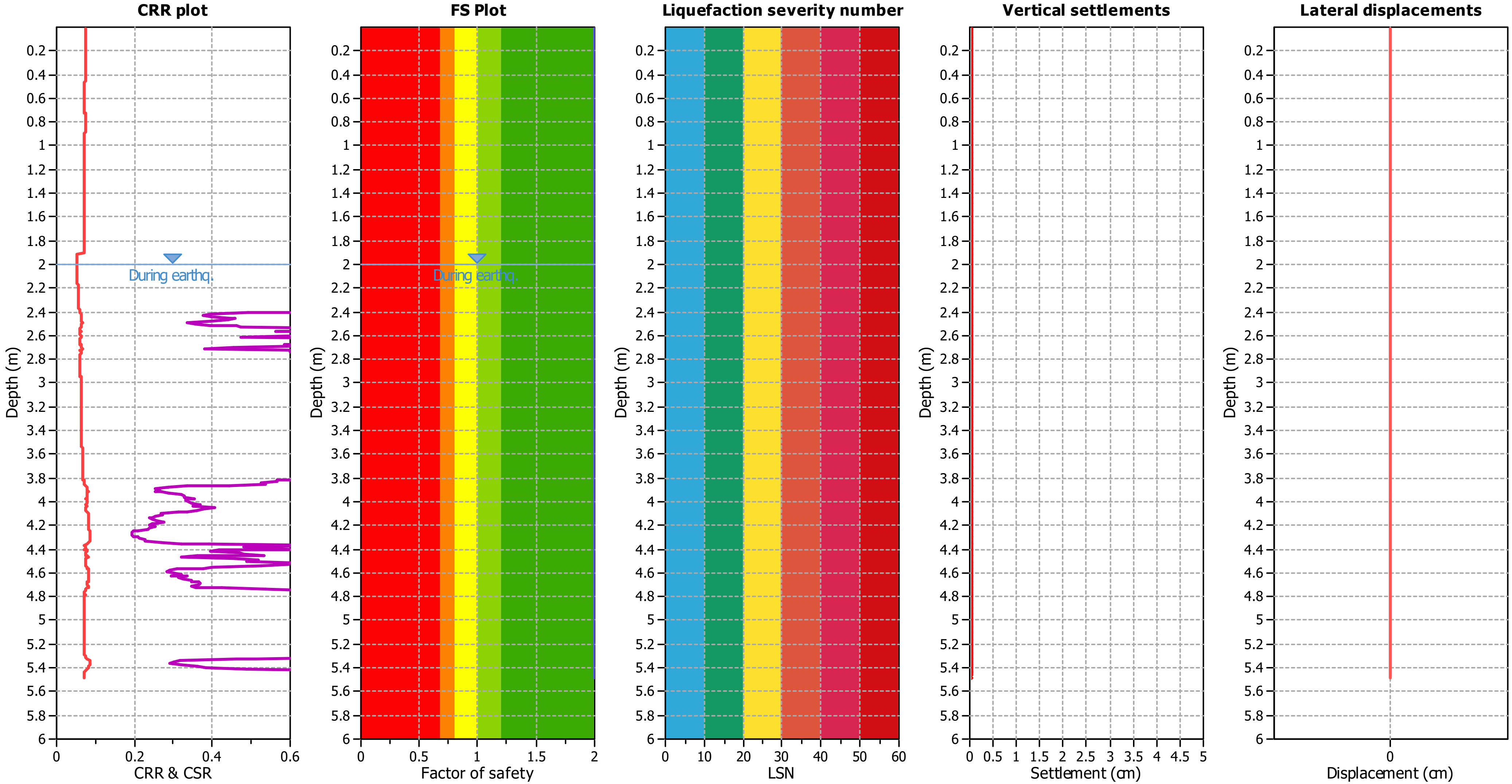
Liquefaction analysis overall plots



Input parameters and analysis data

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LSN color scheme

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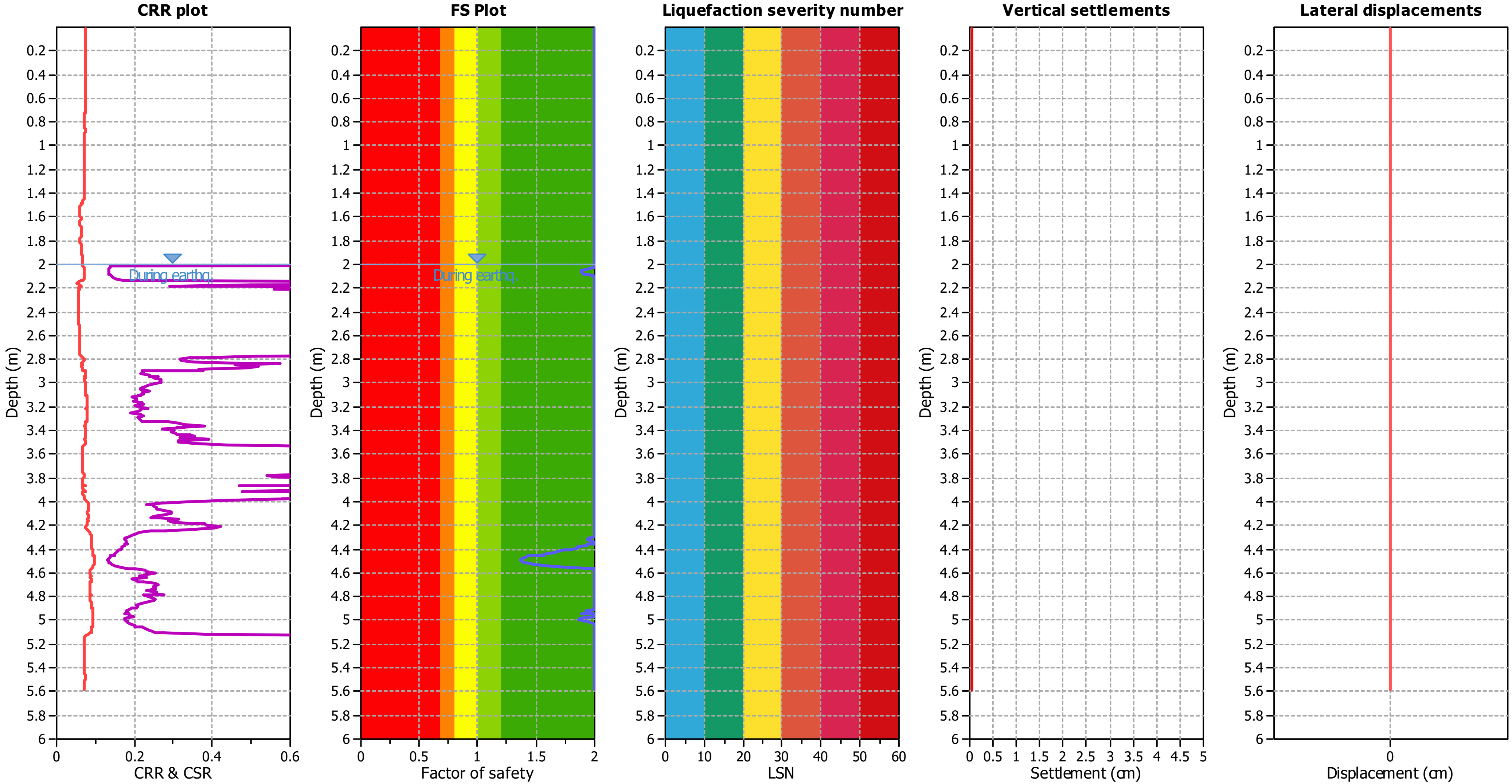
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
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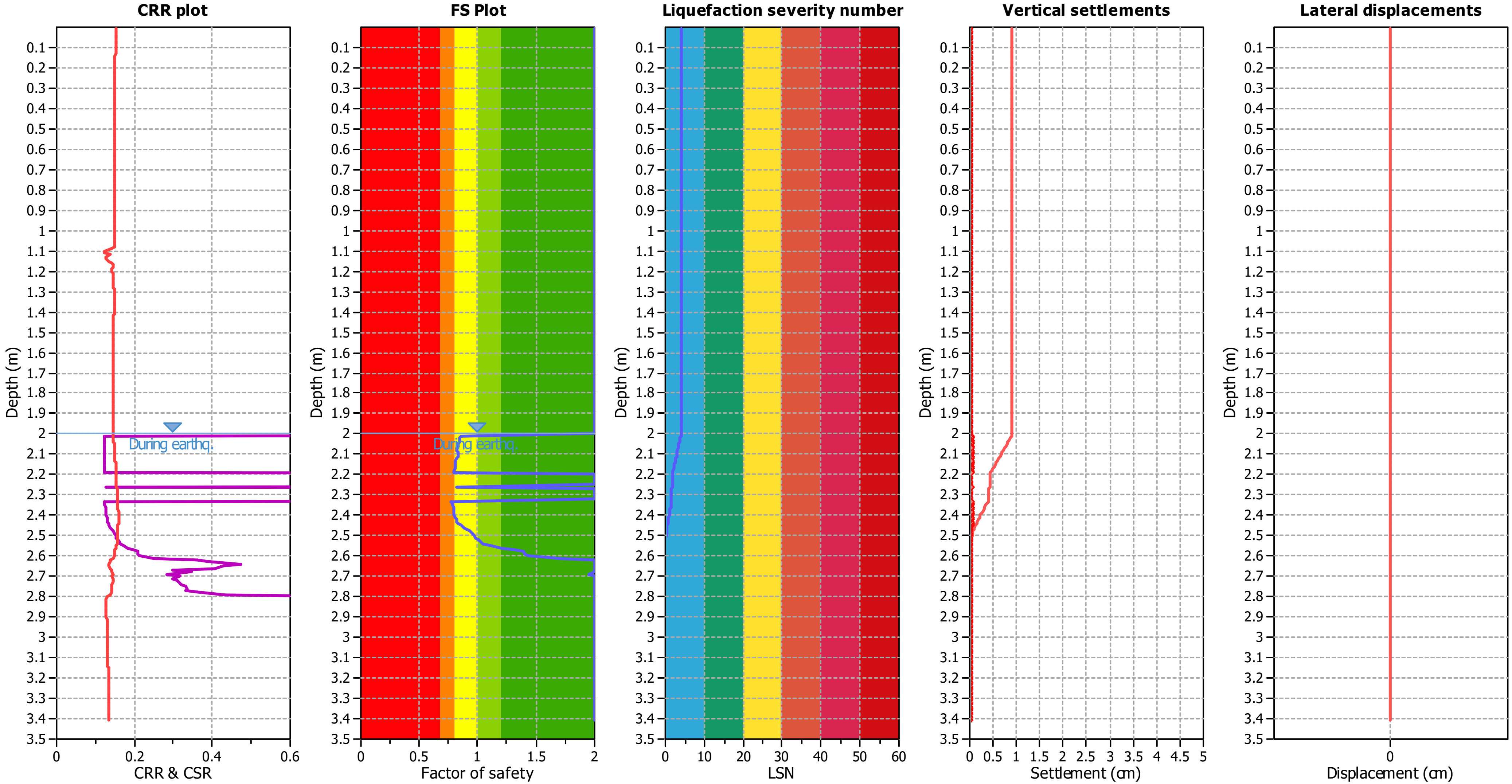
Liquefaction analysis overall plots



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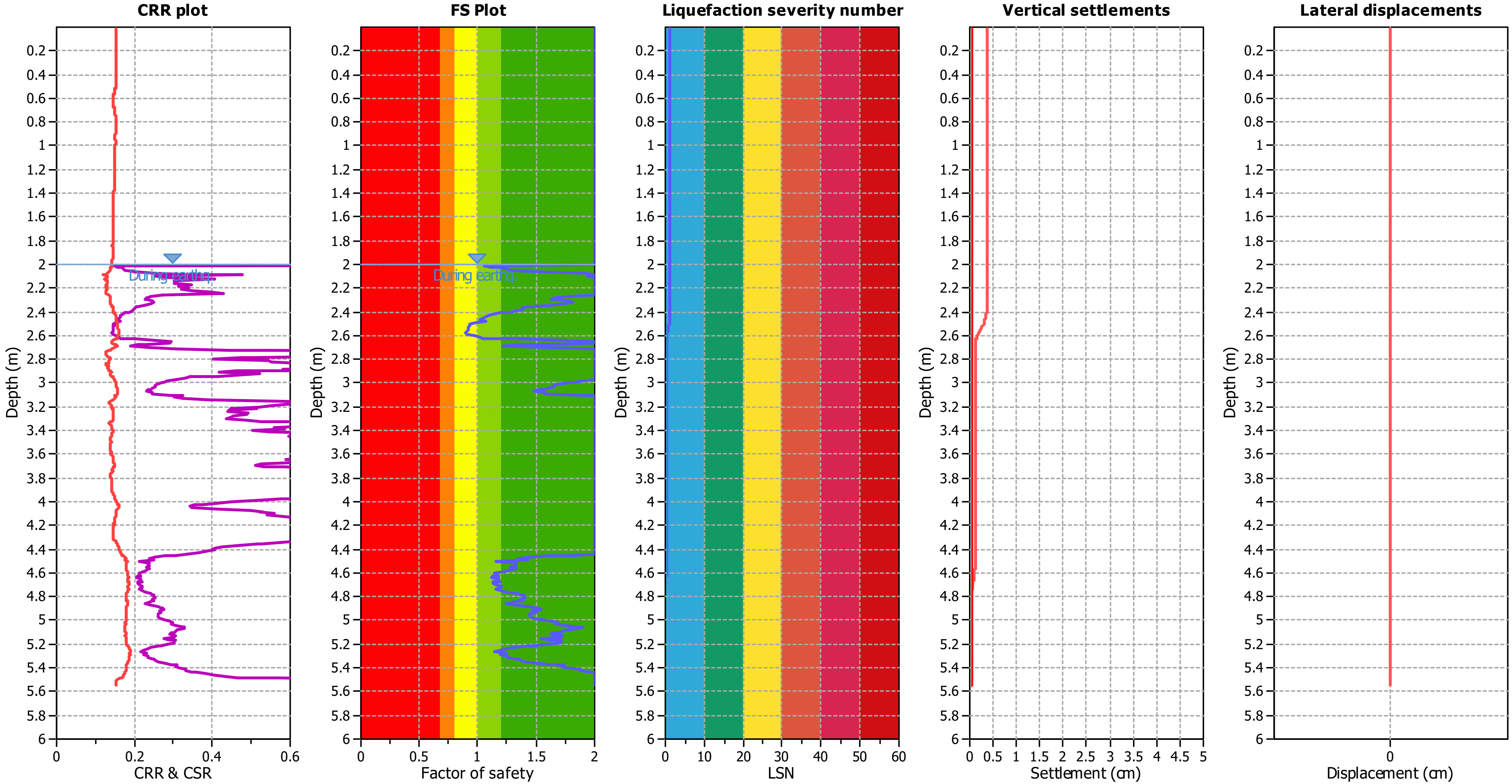
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
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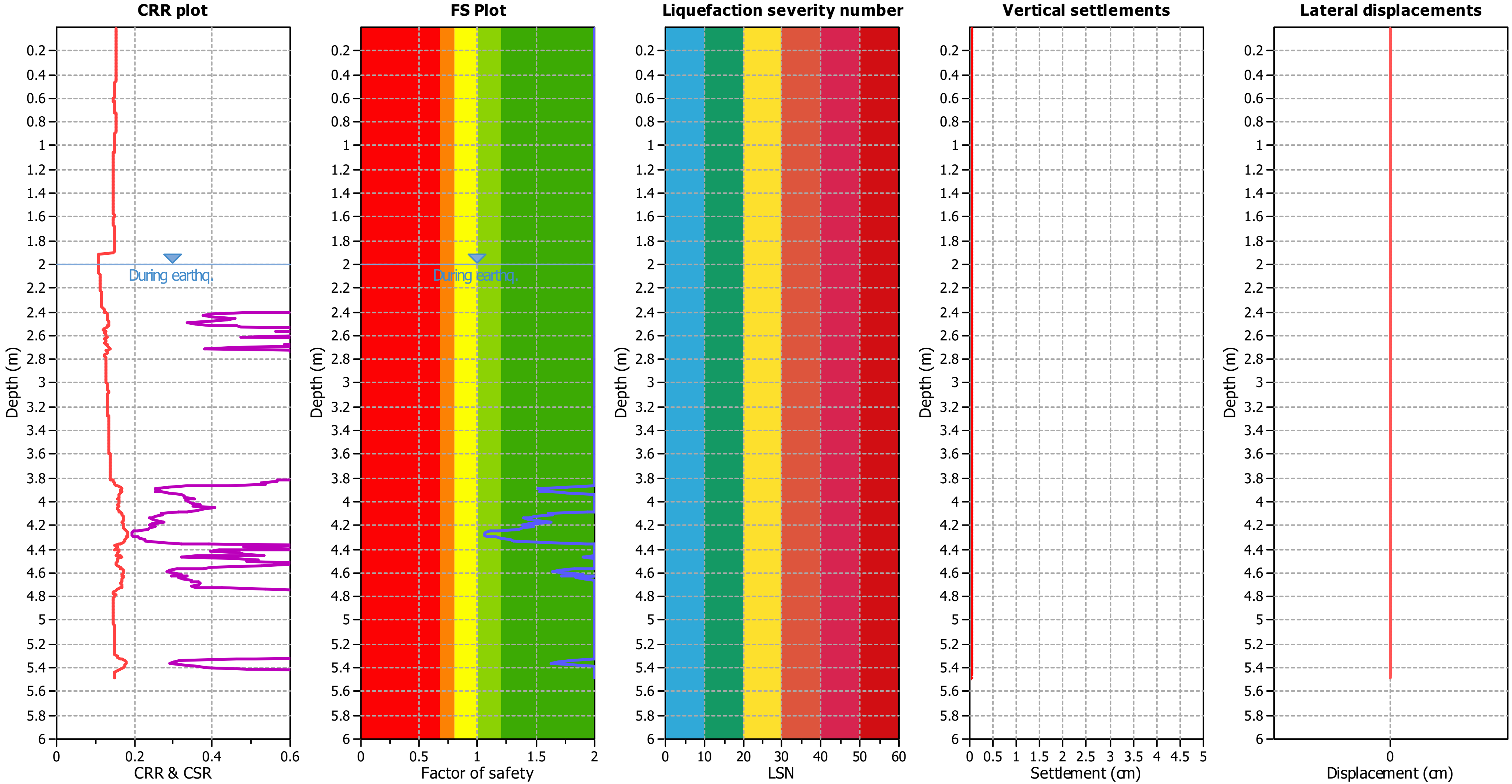
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.27	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.80 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

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- Liquefaction and no liq. are equally likely
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- Almost certain it will not liquefy

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
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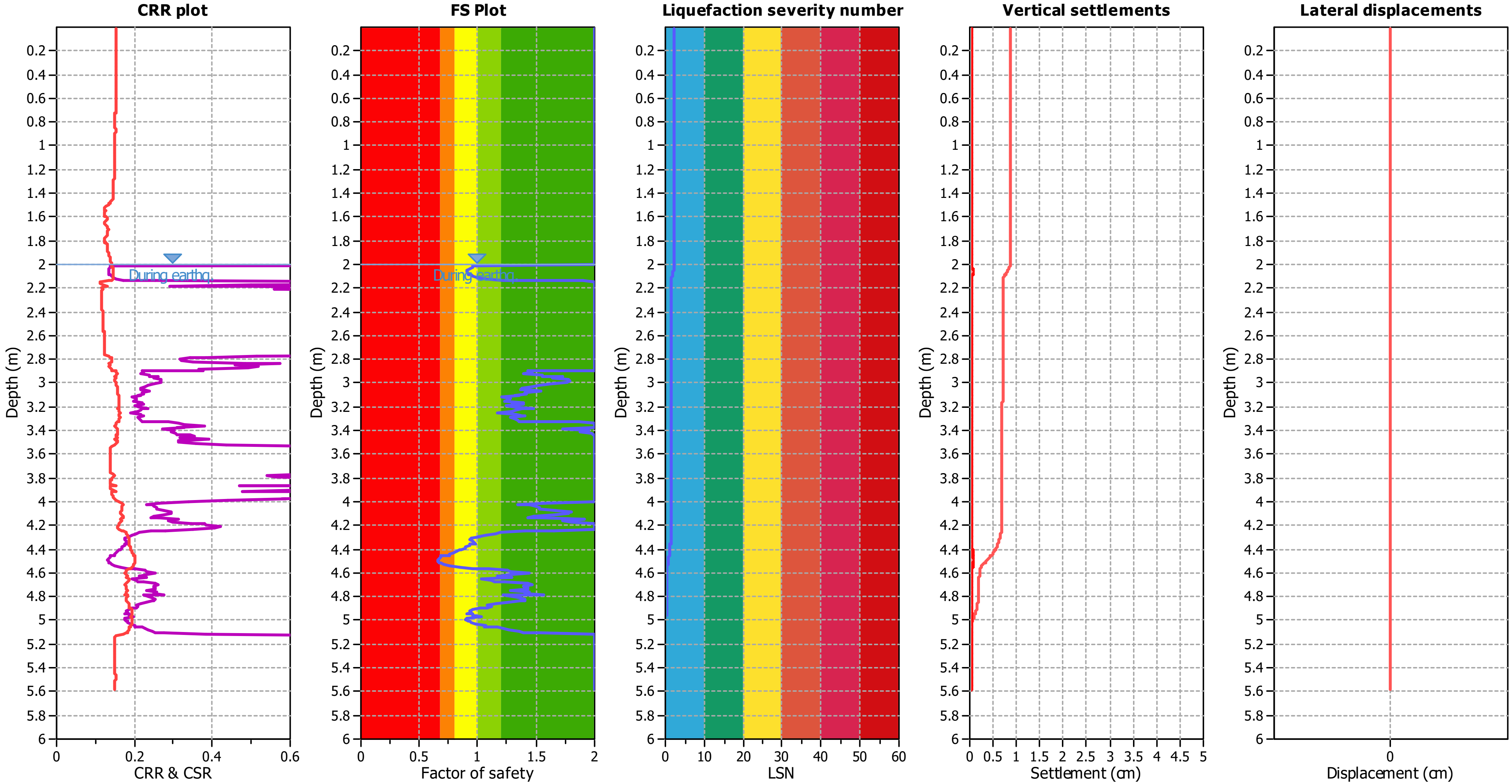
Liquefaction analysis overall plots



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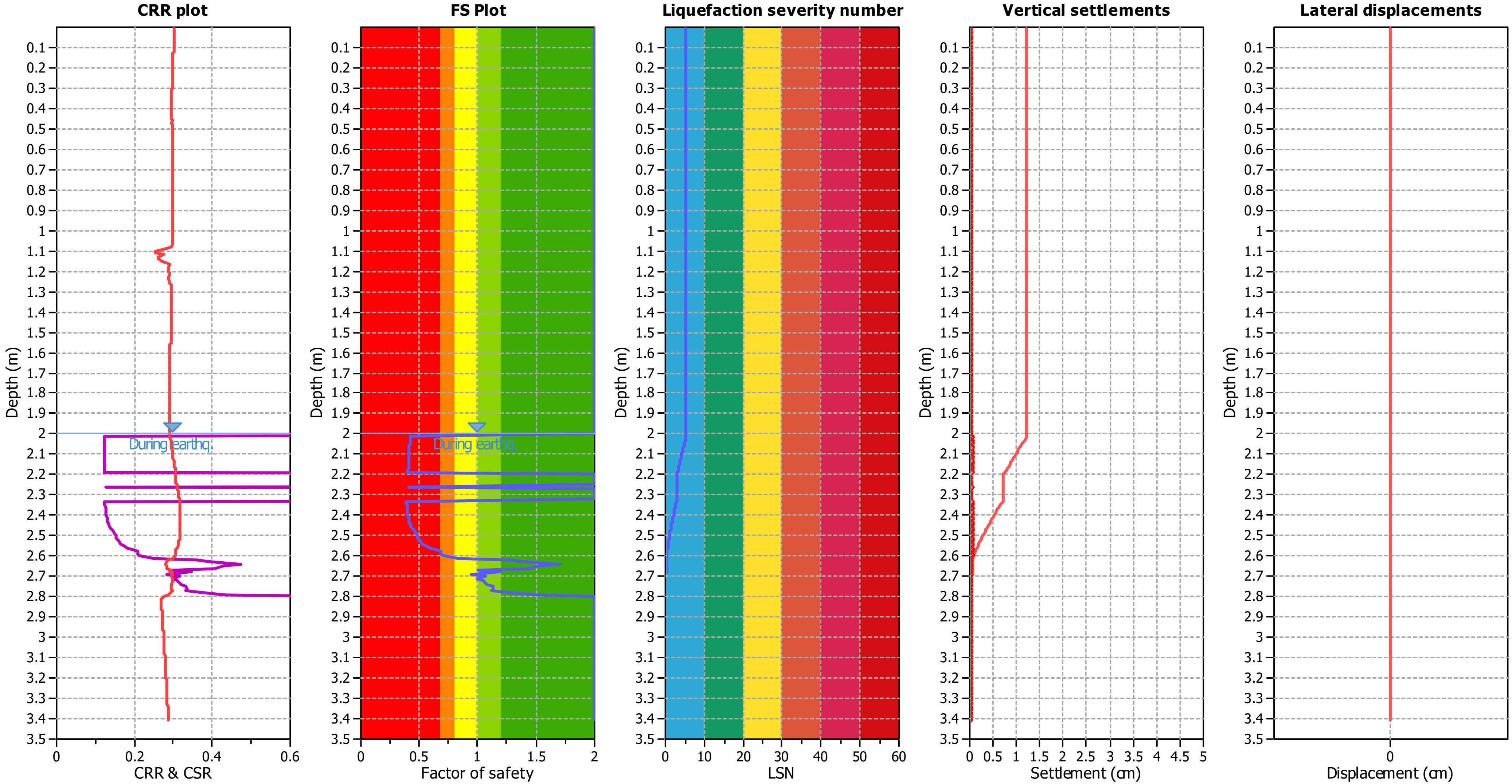

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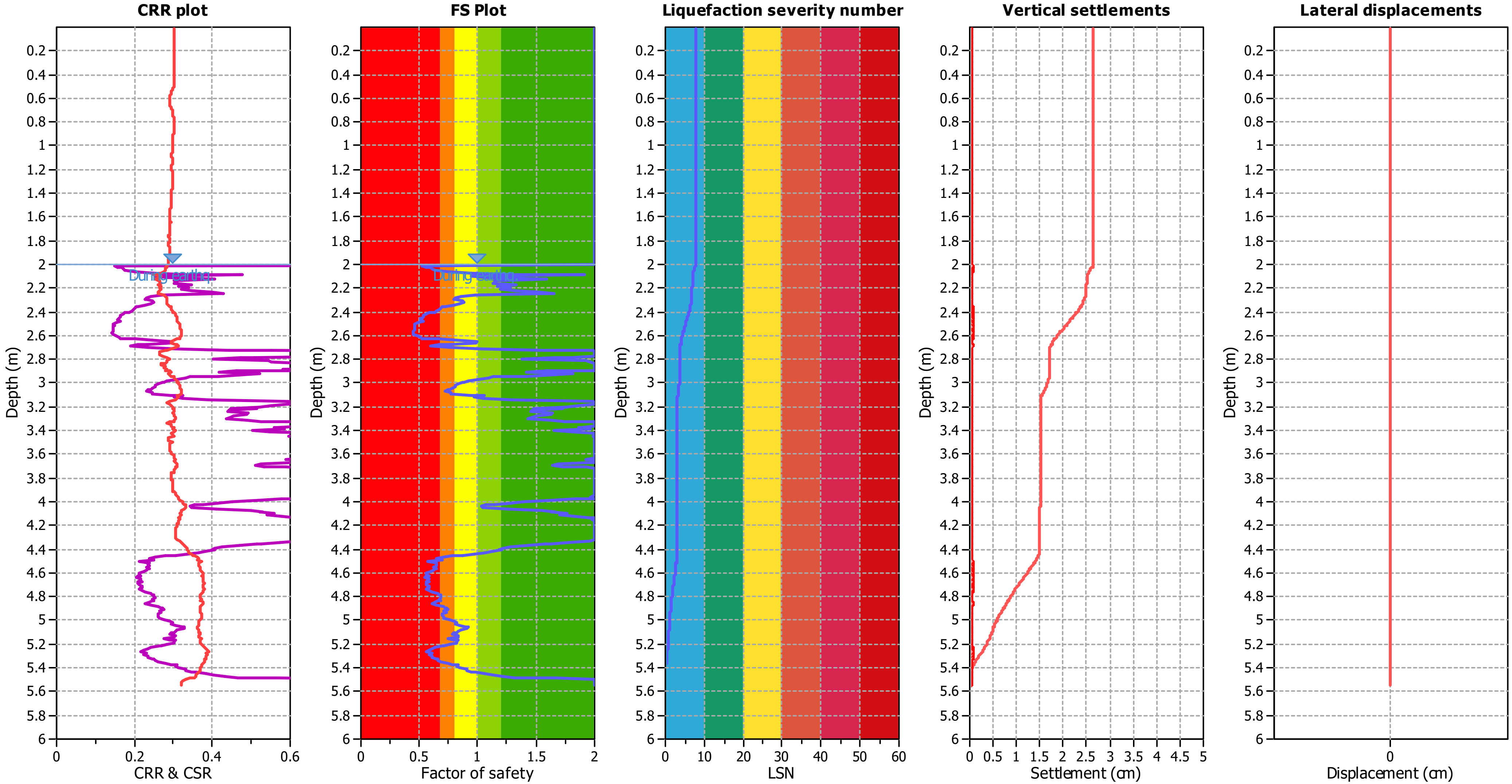

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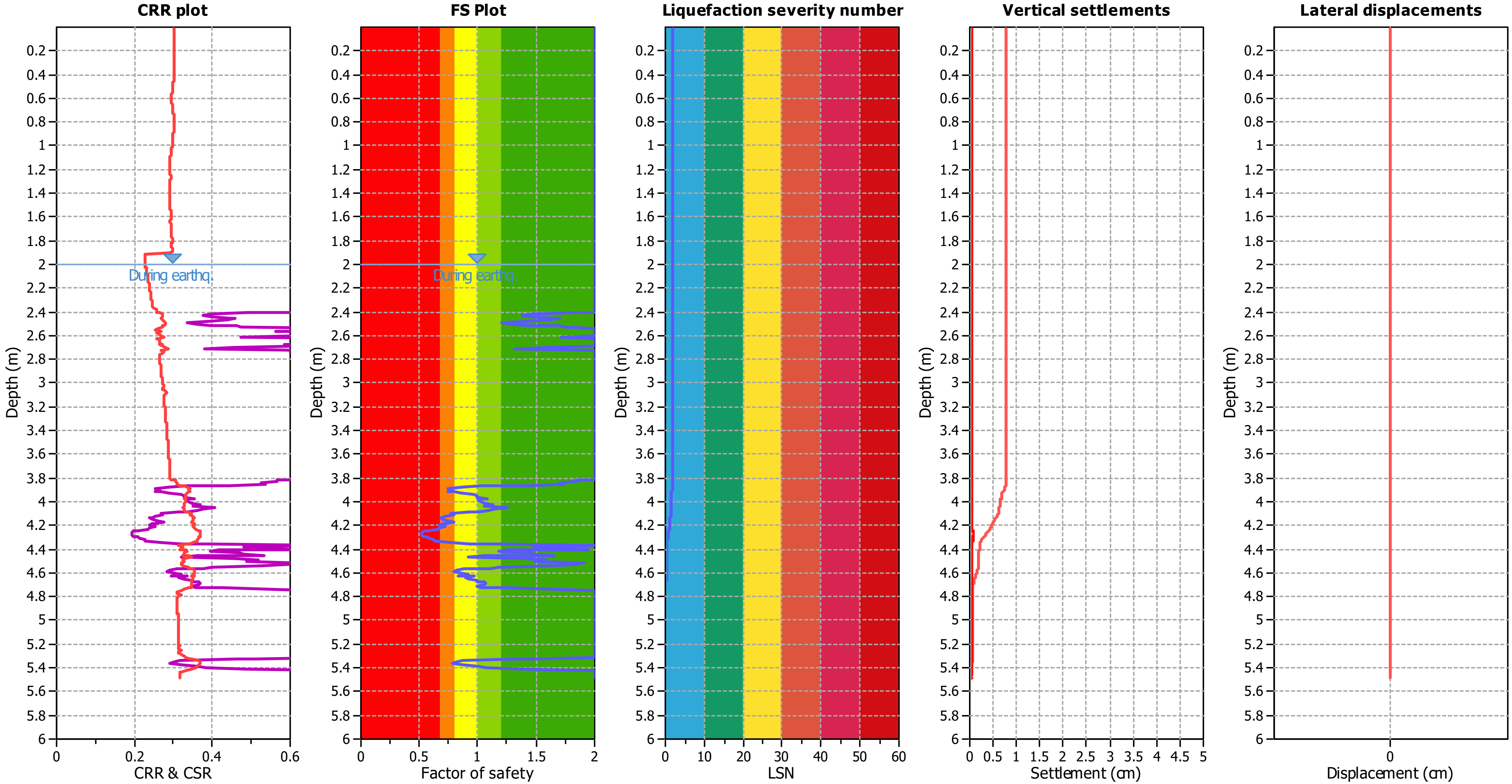

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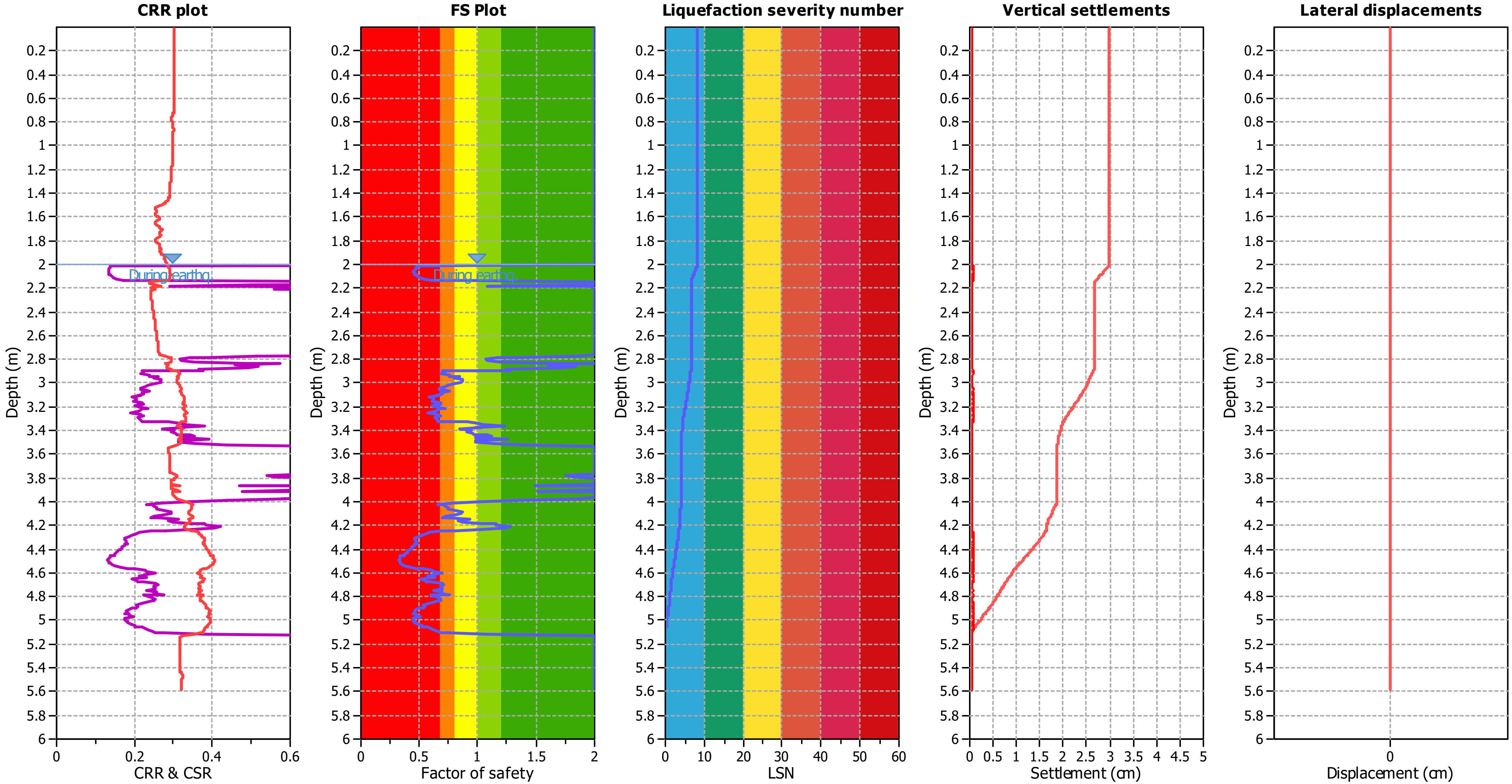

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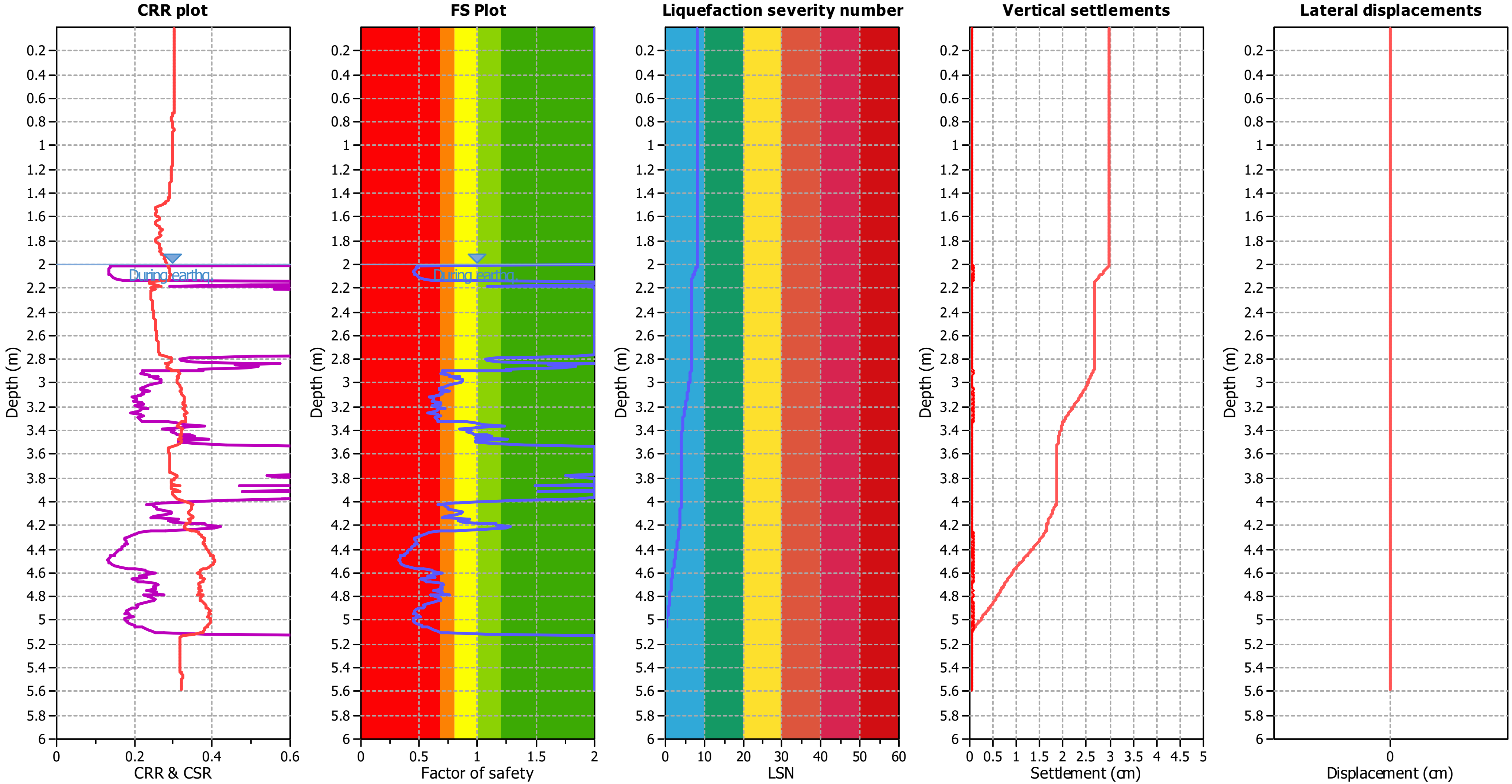

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Seismic Strengthening Concept Design Report

REVISION B

41 Weld Street, Hokitika

Prepared for Westland District Council

503051

eliot sinclair

Seismic Strengthening Concept Design Report

41 Weld Street, Hokitika

Prepared for Westland District Council

Project number: 503051

Quality Control Certificate

Eliot Sinclair & Partners Limited

eliotsinclair.co.nz

Action	Name	Signature	Date
Prepared by:	Travers Armstrong Structural Engineer BE(Hons) Civil CMEngNZ CPEng		19 August 2024
Reviewed by:	Henry Smeaton Structural Engineer BE(Hons) Civil CMEngNZ CPEng		19 August 2024
Directed and approved for release by:	Travers Armstrong Structural Engineer BE(Hons) Civil CMEngNZ CPEng		19 August 2024
Status:	FINAL		
Release date:	19 August 2024		
Reference no:	503051		
Distributed to:	Westland District Council		

Version History

Status	Description	Author	Release Date
A	DRAFT		12 August 2024
B	FINAL		19 August 2024

Contents

1. General

1.1. Purpose

The purpose of this concept strengthening design report is to summarise the current structural concept design as developed to date for the seismic strengthening of the building at 41 Weld Street. This report can be used for continuing coordination purposes and for re-validating the project budget. However, noting the conceptual nature of the information provided, appropriate design and measurement contingencies need to be allowed for in any cost estimates.

This report also records key assumptions and identifies structural related issues that are yet to be resolved.

This report should be read in conjunction with the site-specific Geotechnical Report, and Structural Drawings produced for this concept design.

1.2. Scope

The primary object of the proposed concept design is to improve the seismic strength of the building to a target level of 67%NBS based on an IL2 building in accordance with NZS1170.0:2002. Refer Section 2.2 of this SDFR for further information. The scope of the proposed improvement work is limited to structurally designed elements associated with the seismic strengthening of the building. The seismic assessment and strengthening does not consider wind or snow loading or cover building services or fire safety systems, or the building finishes, glazing systems or the weather tightness envelope.

1.3. Limitations

This report has been prepared by Eliot Sinclair & Partners at the request of our Client and is exclusively for our Client's use for the purpose for which it is intended in accordance with the agreed scope of work. Eliot Sinclair & Partners accepts no responsibility or liability to any third party for any loss or damage whatsoever arising out of the use of or reliance on this report by that party or any party other than our Client.

Eliot Sinclair & Partners have not undertaken an assessment of the seismic restraint of tall or heavy furniture, mechanical services and ceilings. These issues are outside the scope of this assessment but could be the subject of further investigation.

Eliot Sinclair & Partners has not considered any environmental or contamination matters (e.g. asbestos) and accepts no liability, whether in contract, tort, or otherwise for any environmental issues.

The basis of Eliot Sinclair & Partners advice and our responsibility to our Client is set out above and in the terms of engagement with our Client.

2. Structural Design Basis

2.1. Basis of Seismic Strength Assessment & Strengthening Design

The seismic assessment and strengthening of the building have been undertaken in general accordance with the "Seismic Assessment of Existing Buildings – Technical Guidelines for Engineering Assessments" and the following New Zealand Building Code compliance documents:

- New Zealand Loadings Standards - NZS1170(set)
- New Zealand Concrete Structures Standard - NZS3101:2006
- New Zealand Steel Structures Standard - NZS3404:1997

Also, in accordance with the EQ-Assess Guidelines, the seismic capacity of the existing building elements has been assessed using probable material strengths and reduced strength reduction factors. These are as follows:

- Probable steel yield strength fy_{prob} = 1.08fy
- Probable concrete compressive strength $f'c_{prob}$ = 1.5f'c
- Strength reduction factor for flexural capacity ϕ = 1.0
- Strength reduction factor for shear capacity ϕ = 0.85

The EQ-Assess Guidelines provide a method for assigning a seismic rating to an existing building, whereby the assessed ultimate seismic strength of an existing building is reported as a percentage of that required for a new building, designed to current standards. This seismic rating is termed the buildings "%NBS".

Furthermore, Table 1 taken from the NZSEE AISPB Guidelines provide a generally accepted grading system for existing buildings, as one way of interpreting the life safety risk associated with the %NBS seismic rating.

Table 1. Relative Earthquake Risk

Building Grade	Percentage of New Building Standard (%NBS)	Approximate Relative Risk to a New Building	Life-safety Risk Description
A+	>100	<1 times	Low risk
A	80-100	1-2 times	Low risk
B	67-80	2-5 times	Low or Medium risk
C	33-67	5-10 times	Medium risk
D	20-33	10-25 times	High risk
E	<20	>25 times	Very High risk

The primary objective of the seismic strengthening is to reduce the life safety risk to the building occupants during an ultimate limit state earthquake to that associated with a seismic rating of 67%NBS. Table 1 indicates that a building which has been seismically strengthened to 67%NBS is a Grade B building following the NZSEE grading scheme. Grade B buildings represent a life safety risk to occupants of ~5 times that expected for a new building, indicating a medium risk.

The proposed seismic strengthening work is not specifically intended to reduce the potential for damage to occur to the building during an earthquake. As such, damage is still expected to occur to the building during a significant earthquake.

The seismic strengthening work outlined in this report is proposed to be undertaken in accordance with Section 112 of the New Zealand Building Act 2004. That is, once the structural building works are completed, the building structure will continue to comply with the requirements of Clause B1 of the New Zealand Building Code to at least the same extent it did prior to the work being undertaken.

3. Structural Description

3.1. Site

The site is located within the centre of the Hokitika township on the north side of Weld Street.

Figure 1. Arial overview showing site location (Eliot Sinclair, 2024).

3.2. Building

The Pakiwaitara Building has a footprint area of approximately 1242m² with a floor area of approximately 2246m². The majority of the building was constructed in 1993/94, with the original south-end section constructed at an earlier unknown date.

For the purposes of this assessment, the building has been divided into 3 distinct areas: D1, D2 and D3, as shown in Figure 2 below.

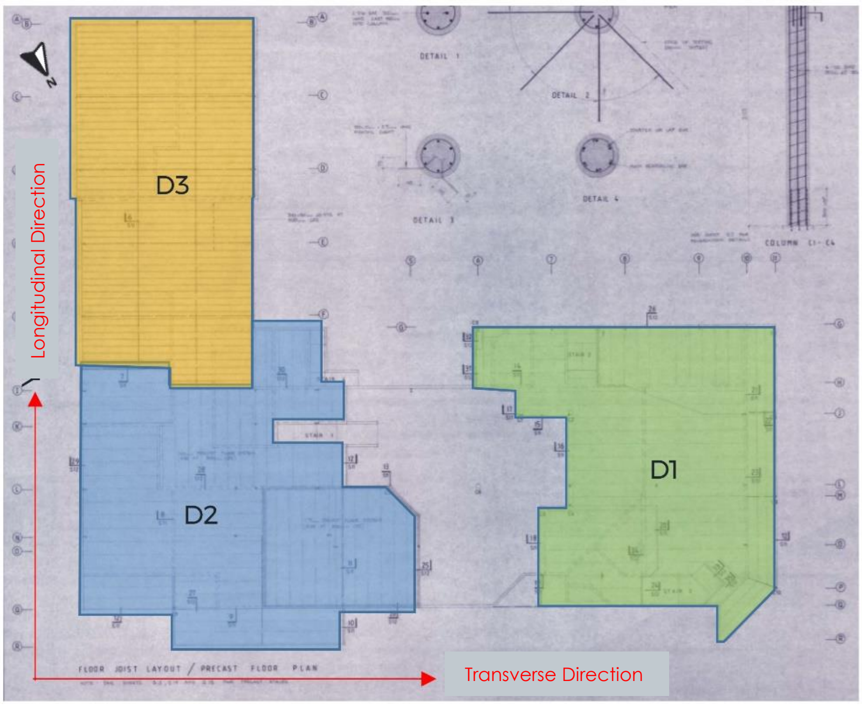

Figure 2. Floor plans indicating original construction (purple) vs later stage extensions (green)

The building is operated primarily as a commercial building for both retail, café, office & recreational activities by various tenants. Based on these uses, the building is classified as importance level 2 in accordance with AS/NZS1170.0:2002.

3.3. Gravity Structure

Based on our review of the available documentation and a site visit to inspect the visible structure, we understand that the primary gravity load-resisting systems for this building comprise:

- **D1 & D2 Areas:** A lightweight metal profiled roof cladding is supported on sawn timber purlins which span between steel portal frames typically oriented in the east-west/transverse direction. The south-eastern boundary wall comprises reinforced concrete precast concrete panels that extend the full height of the building. Other first floor walls are timber-framed, and ground floor walls are precast concrete panels. The first floor is a rib-and-infill precast floor system with a large central atrium space that divides the D1 & D2 areas of the building. This suspended floor slab system is supported on the precast concrete wall panels as well as some cast -insitu concrete beams, Steel beams and concrete circular columns. The ground floor is reinforced concrete slab-on-grade. The structure's foundations are reinforced concrete barrette piles, typically 2.0m deep. The pile width ranges from 500mm to 900mm.
- **D3 Area:** 2-Story steel portal frames orientated in the east-west/transverse direction, support both the roof and first floors. The roof comprises a lightweight metal profiled roof cladding on sawn timber purlins which span between the steel portal frames steel portal frames. The first-floor structure comprises timber particle board flooring on sawn timber joists spanning between steel beams which in turn span between the 2-story portal frames. Part of the south-eastern boundary wall comprises reinforced concrete precast concrete panels that extend the full height of the building. The remainder Timber-framed walls line the remainder of the upper floor, and the original concrete structure forms the remainder of the ground floor walls. The ground floor is RC slab on grade. Parts of the original structure has been underpinned with shallow piles whilst the remainder remains on shallow strip footings build integrally with the original concrete walls.

3.4. Lateral Structure

Based on our review of the available documentation and a site visit to inspect the visible structure, we understand that the primary lateral load resisting system for this building comprises:

- **D1 & D2 Areas:** The lightweight roof with steel tension-only bracing in some locations, acts as a flexible diaphragm, transferring lateral loads to the steel portal frames in the longitudinal direction, and to timber walls in the transverse direction (refer Figure 2). A rib-and-infill precast concrete system acts as a rigid diaphragm at first floor level, transferring lateral loads to the concrete tilt panel walls at ground level. Along the eastern wall, tilt panels extend from ground floor to roof height. A void in the middle of the building presents some plan irregularity (hence dividing into D1 and D2 areas for bracing analysis) and out-of-plane flexure issues for the precast RC wall panels. The precast wall panels are anchored to the concrete foundation via 450mm long fishtail steel plate cast 325mm into the foundation.
- **D3 Area:** In the 'Existing Jade Workshop' original part of the building, the lightweight roof acts as a flexible diaphragm, transferring lateral loads to the two-storey portal frames in the longitudinal direction. In the transverse direction, timber walls resist lateral forces at roof level and the original concrete structure resists lateral forces at ground level. The first-floor is timber, providing a flexible diaphragm.

3.5. Geotechnical

Refer to the site specific *Geotechnical Report* prepared by Eliot Sinclair & Partners Limited dated 26 June 2024.

4. Proposed Building Work

The following section summarises the strengthening work proposed to increase the ultimate limit state seismic capacity of the building to a target strengthening level of 67%NBS.

4.1.1. Foundations

The complete D1 & D2 areas of the building are fully supported on shallow concrete barrette piles whilst only a part of the original D3 section has been underpinned with barrette piles. The grid A end of the D3 remains supported on the strip footings which are built integrally with the original concrete ground floor walls. This presents a mixed foundation system which has the potential to result in significant damage to the building as a result of liquefaction induced differential settlements between the two foundation systems.

To mitigate this risk, we propose to underpin the grid A end of the D3 building with reinforced concrete barrette piles of a similar construction and founding depth as the rest of the building.

4.1.2. Portal Frames

The lateral capacity of the first floor of the D1 & D2 areas, and the ground & first floors of the D3 area, is limited by the lateral stiffness and flexural strength of the existing portal frame structures.

To strengthen & stiffen these areas of the building, the following works area proposed:

- Transverse Direction: Enhance the strength & stiffness of the existing portal frames by the installation of additional steel frames placed strategically within and connected to the existing frames. This methodology promotes the future flexibility of the building by largely retaining the existing open interior spaces. In selected locations to the building perimeter, tension only cross-braces are proposed.
- Longitudinal Direction: Install new steel braced frames to be constructed within or against existing exterior and interior walls.

We note that the exact location and selection of braced frames vs portal frames will need to be reviewed as part of the ongoing design development to ensure coordination and optimisation with any proposed architectural reconfiguration of the internal spaces and any proposed recladding of the building.

4.1.3. Roof Structure

The lateral strength of the existing roof structure relies predominantly on the strength and stiffness offered by the existing timber board and plasterboard clad ceiling diaphragms to distribute loads.

- Installation of tension only reid brace system in selected locations.
- Installation of steel square hollow section (SHS) struts between adjacent portal frames in selected locations to tie the roof structure together and transfer forces to the wall bracing (portal frames & braced frames) system.

4.1.4. Suspended floor & concrete panels

The lateral performance of the ground floor to D1 & D2 relies on the suspended concrete floor diaphragm distributing lateral loads into the in-plane precast concrete shear walls, which then need to transfer these shear loadings down to foundations. Some strengthening of the connections and shear walls will be required as follows:

- Provide new seating angles beneath ribs where seating does not comply (refer to seismic strengthening drawings sheet S04).
- Provide additional shear connections to ensure adequate load transfer from diaphragm into shear-walls (refer to seismic strengthening drawings sheet S04).
- Provide new transom beams across atrium between D1 & D2 areas to restrain full-height panels out-of-plane (refer to seismic strengthening drawings S04).
- Pour cast-insitu additional walls to inside face of existing shear walls where existing walls do not meet 67% NBS performance (refer seismic strengthening drawings sheet S03).
- Provide additional shear / hold down fixings to primary shear walls (Refer to seismic strengthening drawings sheet S02) Note that some additional hold down strengthening may be required (additional to what is shown on S02) depending on condition of welds to existing panel hold down brackets.

5. Issues to be Resolved

The following section summarises the outstanding issues identified to date that need to be resolved as the design progresses through the developed and detailed design phases:

- Coordination of the proposed strengthening work with the architect and services engineers is necessary to confirm the strengthening concept.
- To inform the detailed design of the D3 area strengthening, the original concrete perimeter walls need to be the scanned to confirm the existing reinforcing.
- The original structural drawings are light on detail for some of the existing roof structure connections. Closer inspection of these maybe required during the detailed design phase.
- It is not explicitly clear which way the D1 & D2 concrete stairs are spanning (i.e. Longitudinally or transversely) based on the details provided in structural drawings. Closer inspection of these may be required during the detailed design phase.
- Some invasive inspections of the welds to the panel hold down brackets will be required to gauge any potential additional hold down strengthening requirements.
- Early contractor involvement is recommended to critique the buildability of the proposed strengthening work.

6. Design Loads

6.1. General

For the purposes of consideration of loading, this structure is Importance Level 2 in accordance with AS/NZS 1170.0:2002.

6.1.1. Gravity Loads

Building self-weight = calculated for each element

Super imposed loads = 0.1kPa roof

6.1.2. Live Loads

Roof = 0.25kPa, ψ_e = 0.0

General office areas = 3.00kPa

6.1.3. Seismic Loads: Ultimate limit State

Site subsoil category = D

Hazard Factor = 0.45

Return Period Factor = 1.0

Near fault factor = 1.0

Assumed structural ductility = assessed for each structural element as appropriate. Refer Table 2.

Table 2. Assumed structural ductility

Structural Element	Structural Ductility
Level 3 bracing structure	μ_p = 1.25
Structural steel	μ = 1.25, Sp = 0.90
Reinforced concrete (typical U.N.O.)	μ = 1.25, Sp = 0.90 flexure μ = 1.00, Sp = 1.0 shear
Foundations	μ = 1.25, Sp = 0.90

6.1.4. Exclusions

Other loadings, including wind snow and serviceability limit state earthquake have not been considered as part of the seismic strengthening of the building at 36 Weld Street.

7. Durability of Structural Elements

7.1. Design Life

New concrete work:	50 yrs
New structural steelwork:	50 yrs

Note: The existing structural elements are approximately 76 years old and are not covered by this design features report.

7.2. Means of Compliance

Durability provisions are achieved by:

Acceptable Solutions B2/AS1

- Reinforced Concrete: NZS 3101: 2006 Part 1 Section 5 is an acceptable solution for durability with durability requirements met through covers equal to or in excess of the requirements of the standard.

Alternative Solutions

- Internal Structural Steel**:** Protection is provided through surface treatment comprising primer painting of the steelwork to a minimum coating thickness of 75 microns DFT in accordance with AS/NZS 2312.1.

The maintenance requirements for the above protective coating systems are as per NZS/AS 2312.

8. Material Properties

8.1. Probable Material Strengths of Existing Structural Elements

In accordance with the NZSEE AISPB Guidelines, the seismic capacity of the existing building elements have been assessed using probable material strengths and reduced strength reduction factors. These are as follows:

- Probable steel yield strength fy_{prob} = 1.08fy
    - Structural steel: fy_{prob} = 270MPa
    - Reinforcing steel: fy_{prob} = 270MPa
- Probable concrete compressive strength f'cprob = 1.5f'c
    - Walls: $f'c_{prob}$ = 30MPa
    - Foundations: $f'c_{prob}$ = 30MPa
- Material strength reduction factors
    - Flexural capacity ϕ = 1.0
    - Shear capacity ϕ = 0.85

8.2. Concrete Grades

All concrete materials are specified in accordance with NZS 3104:2003.'Specification for Concrete Production' with compressive strength grades as follows:

- Foundation concrete – 30MPa
- Slab-on-grade – 30MPa

8.3. Reinforcing Grades

All reinforcing materials are specified in accordance with AS/NZS 4671:2001 'Steel Reinforcing Materials' as follows:

- Bars prefixed H – Grade 500E MA, deformed
- Bars prefixed D – Grade 300E, deformed
- Bars prefixed R – Grade 300E, plain
- Mesh prefix SE – Grade 500E MA

8.4. Structural Steel

All structural steel materials are specified in accordance with NZS 3404:1997. 'Steel Structures Standard' as follows:

- Hot rolled sections - AS/NZS 3679:2010, grade 300
- Hot rolled flats - AS/NZS 3679:2010, grade 300
- Hot rolled plate - AS/NZS 3678:2011, grade 350.
- Cold formed hollow sections - AS/NZS1163:2009, grade C350L0 or C450L0.

Appendix A. Seismic Strengthening Concept Drawings

NOTES

Clarifications
The primary objective of the seismic strengthening is to reduce the life safety risk to the building occupants during an ultimate limit state earthquake to that associated with a seismic rating of 67%NBS based on an IL2 building in accordance with NZS1170.0:2002.

The proposed seismic strengthening work is not specifically intended to reduce the potential for damage to occur to the building during an earthquake. As such, damage is still expected to occur to the building during a significant earthquake.

The scope of the proposed improvement work is limited to structurally designed elements associated with the seismic strengthening of the building. The seismic assessment and strengthening does not consider wind or snow loading or cover building services or fire safety systems, or the building finishes, glazing systems or the weather tightness envelope.

The seismic assessment and strengthening of the building have been undertaken in general accordance with the "Seismic Assessment of Existing Buildings - Technical Guidelines for Engineering Assessments" and the following New Zealand Building Code compliance documents:
- New Zealand Loadings Standards - NZS1170(set)
- New Zealand Concrete Structures Standard - NZS3101:2006
- New Zealand Steel Structures Standard - NZS3404:1997
- New Zealand Timber Structures Standard - NZS3603:1993

The seismic strengthening work is proposed to be undertaken in accordance with Section 112 of the New Zealand Building Act 2004. That is, once the structural building works are completed, the building structure will continue to comply with the requirements of Clause B1 of the New Zealand Building Code to at least the same extent it did prior to the work being undertaken.

Assumptions
The proposed seismic strengthening work detailed herein have been developed to concept level only for the purpose of enabling a contractor to establish a preliminary cost estimate for the work. The design is subject to confirmation of the following:
- Detailed geotechnical investigation and report to confirm the bearing capacity and suitability of the existing site to support the proposed foundation loads.
- Feedback on buildability and construction methodologies from Contractor.
- Coordination with the proposed renovation/refit to the interior fitout.
- Completion of developed and detailed structural design and documentation.
- Building consent from the Westland District Council who may require upgrades of fire safety systems and accessible features.

General
1. All work shall comply with the New Zealand Building Code.
2. Do not scale. Refer any discrepancies to the Architect/Engineer.
3. The Contractor shall check all dimensions onsite prior to commencing work.
4. The Contractor shall provide Producer Statements for the following work trades:
   - Main contractor – PS3
   - Site reinforced and poured/sprayed concrete – PS3
   - Structural steelwork fabrication & erection – PS3
5. The form of the producer statements shall be equivalent to the Christchurch City Council standard form B-085.

Sediment Control Management Plan
1. The Contractor/Site Manager is responsible for providing effective erosion protection and sediment control during the entire construction period. Refer to the Westcoast Regional Council for guidance.
2. Sediment control measures shall be taken where appropriate to remove coarse silt and debris from stormwater runoff leaving the site, either overland, via a piped stormwater system.
3. The effectiveness of the measures is to be reviewed immediately after rain or at least weekly by the Contractor and, if necessary, further controls put in place to prevent excess sediment or debris from entering the Westland District Council stormwater system and waterways.
4. The Contractor shall undertake any other practical measure at their cost to comply with good erosion and sediment control practice.

Excavations & Hardfill
1. Excavations for the foundations and ground slab are to be inspected by the Geotechnical Engineer to confirm an ultimate bearing capacity of 380kPa. The final depth of excavation shall be determined by the Geotechnical Engineer.
2. Prior to pouring concrete, the foundation excavations shall be thoroughly cleaned of all water and loose materials.
3. Provide a minimum 150mm thick layer of AP40 hardfill below all ground slabs. Hardfill shall be compacted to a minimum dry density of 2150kg/m3.

Concrete
1. All concrete work and associated reinforcing shall comply with the requirements of NZS3109:1997 'Concrete Construction'.
2. Concrete mixes shall comply with NZS3109 & NZS3104 be as follows:
   - Foundation concrete: 25MPa compressive strength, 19mm aggregate, normal grade.
   - Sprayed/poured concrete walls: 40MPa compressive strength, 13mm aggregate, special grade.
   - Other concrete: 30MPa compressive strength, 19mm aggregate, normal grade.
   - Refer to the Architect for any special finishing requirements for exterior paths, patios and the driveway.
3. All concrete to be well consolidated by a mechanical vibrator and carefully worked around reinforcement and into corners of the formwork.
4. Epoxy resin for installation of reinforcing starters bars and steel studs/anhors shall be Hilti HIT-RE 500V4.
5. The interior concrete surface finish shall comply with 'U3' in accordance with NZS 3114.

Reinforcing
1. Reinforcement steel must comply with the requirements of AS/NZS 4671:2001: Bar designations shown on drawings are to be interpreted as follows -
   - Bars prefixed H – Grade 500E MA, deformed
   - Bars prefixed D – Grade 300E, deformed
   - Bars prefixed HR – Grade 500E MA, plain
   - Bars prefixed R – Grade 300E, plain
   - Mesh prefix SE – Grade 500E MA
2. Minimum lap length for D bars to be 40 x bar diameter; for H bars to be 60 x bar diameter.
3. All bars not lapped are to terminate with a 90° bends unless noted otherwise.
4. Minimum concrete covers (unless stated otherwise):
   - 75mm side and bottom cover against ground;
   - 50mm top, bottom and side cover against boxing, DPM and exposed to exterior environment;
   - 30mm if protected from weather (i.e. internal);
   - All other situations to be as per NZS 3101:2006 unless shown otherwise on the drawings.
5. All mesh to be Grade 500E Ductility Class E welded wire mesh, with 225mm min lap or to Manufacturer's specification, whichever is greater.

Steelwork
1. All steelwork, fabrication, welding and erection shall comply with NZS3404:1997.
2. All Cold formed steel hollow sections (CHS, SHS & RHS) shall comply with AS/NZS 1163:2016 grade C350L0.
3. All hot-rolled bars and sections (UB, UC, PFC, EA, UA & bars, etc) shall comply with AS/NZS3679:2016 grade 300.
4. All steel plate shall comply with AS/NZS 3678:2016 grade 350.
5. Welding electrodes shall be selected for the grade of steel being welded and in accordance with AS/NZS 1554. The nominal tensile strength of the weld material shall not be less than 480MPa.
6. Unless noted otherwise in the structural drawings, all lines of contact shall be welded using 6mm structural purpose fillet weld all round unless noted otherwise.
7. Welding inspection and quality control shall comply with NZS 3404, AS/NZS 5131 and AS/NZS 1554 as appropriate for the welding being undertaken. The extent of non-destructive examination shall be as set out below:
   - 100% of all SP & GP welds shall be visually scanned.
   - 100% of all full penetration butt welds shall be Visually examined (VT).
   - 100% of full penetration butt welds to the portal frame knee joint stiffeners shall be ultrasonically tested (UT).

   The various methods of Non-Destructive Examination shall be in accordance with Section 6 of AS/NZS 1554.1 or AS/NZS 1554.5 as appropriate. Imperfection levels shall not exceed the maximum permissible levels given in Section 6 of AS/NZS 1554.1. It is the Contractor's responsibility to clearly demonstrate that all testing requirements of this specification have been met.
8. Unless noted otherwise in the structural drawings, all bolts shall be M20 8.8/S hot dip galvanised.
9. Holes for bolts to be 2mm larger diameter than the bolt diameter, unless noted otherwise.
10. All interior steelwork shall be prepared and prime painted with Dulux Zincanode 402 in accordance with the Dulux specification DuSpec NZSD1053.
11. All exterior structural steel shall be hot dip galvanised to AS/NZS2312: thermal Contractor's responsibility to clearly demonstrate that all testing requirements of this specification have been met.
12. Unless noted otherwise in the structural drawings, all bolts shall be M20 8.8/S hot dip galvanised.
13. Holes for bolts to be 2mm larger diameter than the bolt diameter, unless noted otherwise.
14. All interior steelwork shall be prepared and prime painted with Dulux Zincanode 402 in accordance with the Dulux specification DuSpec NZSD1053.
15. All exterior structural steel shall be hot dip galvanised to AS/NZS2312: HDG600 or thermal zinc sprayed to TSZ300S. Refer to the Architect for specification of topcoats and colours.

NOTES
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REV.	DRAWN	DATE	NOTE
A	TIA	11.08.24	Preliminary Concept

CLIENT

WESTLAND DISTRICT COUNCIL

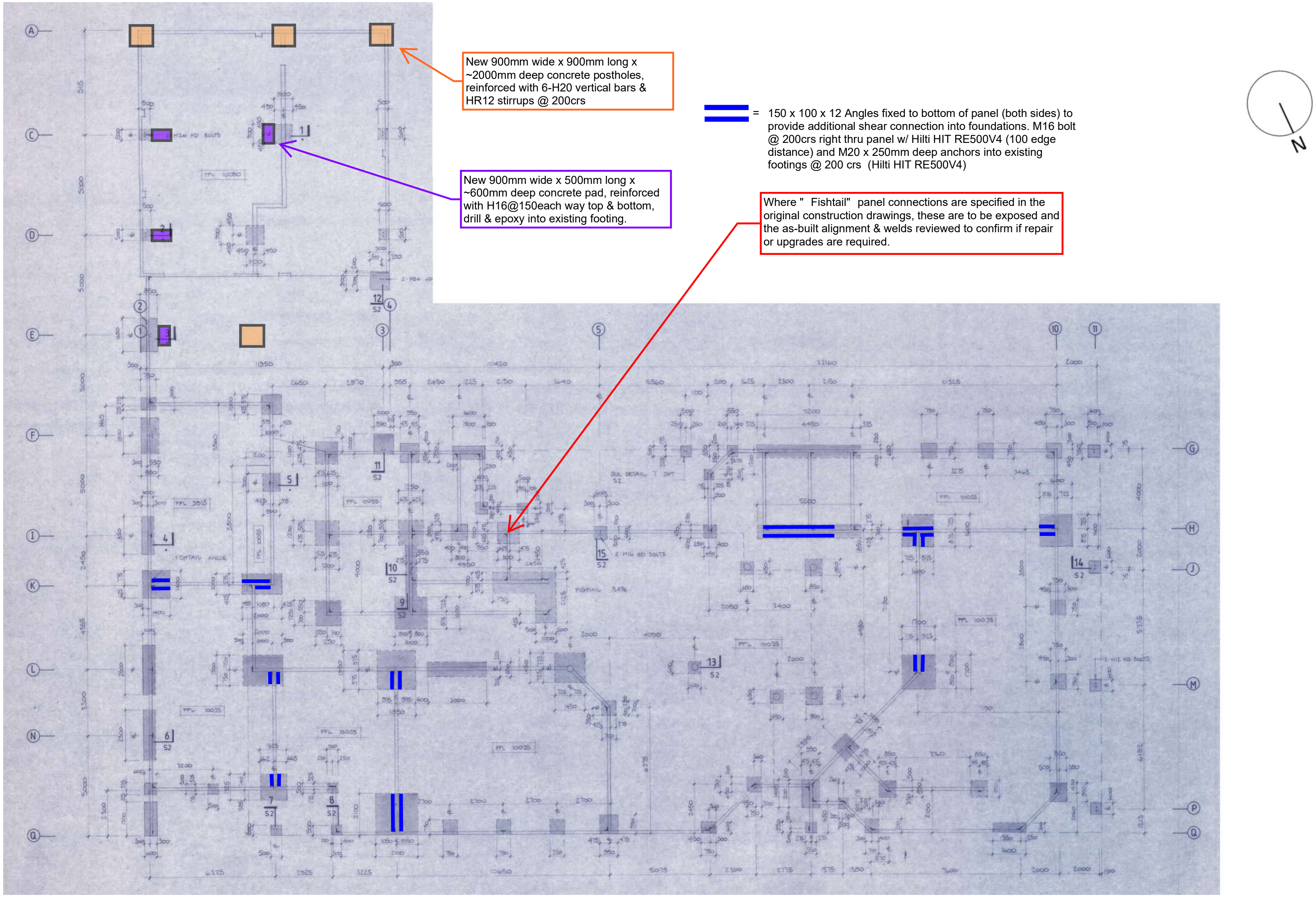
DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	NTS

67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika

GENERAL NOTES & SITE PLAN

PROJECT	REV.
503051	A
SET	SHEET
SC	S01

eliot sinclair



NOTES
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REV.	DRAWN	DATE	NOTE
A	TIA	11.08.24	Preliminary

CLIENT
WESTLAND DISTRICT COUNCIL

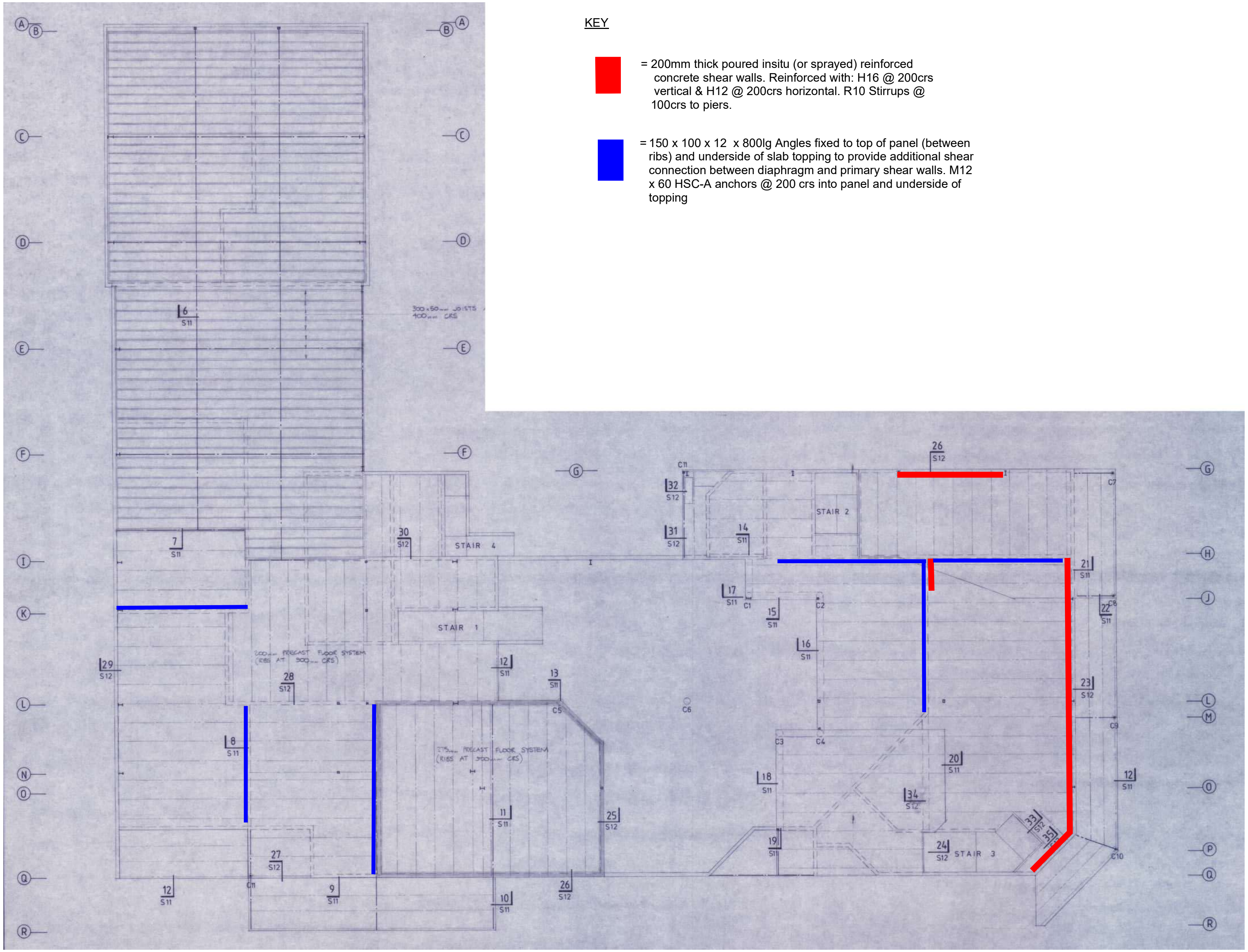
DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	1:100 [A2]

67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika

FOUNDATION PLAN

PROJECT	REV.
503051	A
SET	SHEET
SC	S02

eliot sinclair



KEY

= 200mm thick poured insitu (or sprayed) reinforced concrete shear walls. Reinforced with: H16 @ 200crs vertical & H12 @ 200crs horizontal. R10 Stirrups @ 100crs to piers.

= 150 x 100 x 12 x 800lg Angles fixed to top of panel (between ribs) and underside of slab topping to provide additional shear connection between diaphragm and primary shear walls. M12 x 60 HSC-A anchors @ 200 crs into panel and underside of topping

N

NOTES
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DISCLAIMER

REV.	DRAWN	DATE	NOTE
A	TIA	11.08.24	Preliminary Concept

CLIENT
WESTLAND DISTRICT COUNCIL

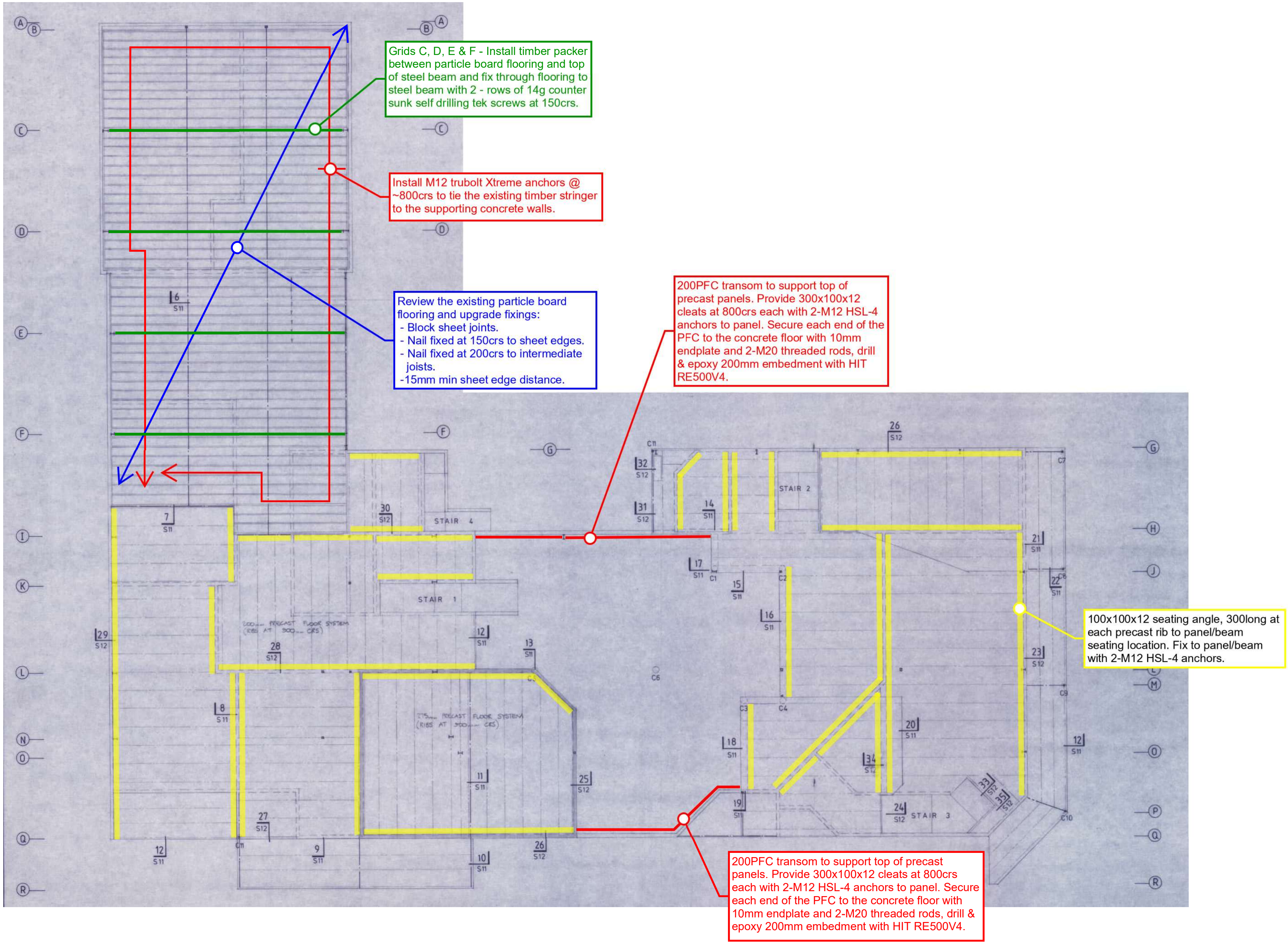
DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	1:100 [A2]

67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika

GROUND FLOOR STRENGTHENING PLAN

PROJECT 503051
REV. A
SET SC
SHEET S03

eliot sinclair



N

NOTES
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REV.	DRAWN	DATE	NOTE
A	TIA	11.08.24	Preliminary Concept

CLIENT
WESTLAND DISTRICT COUNCIL

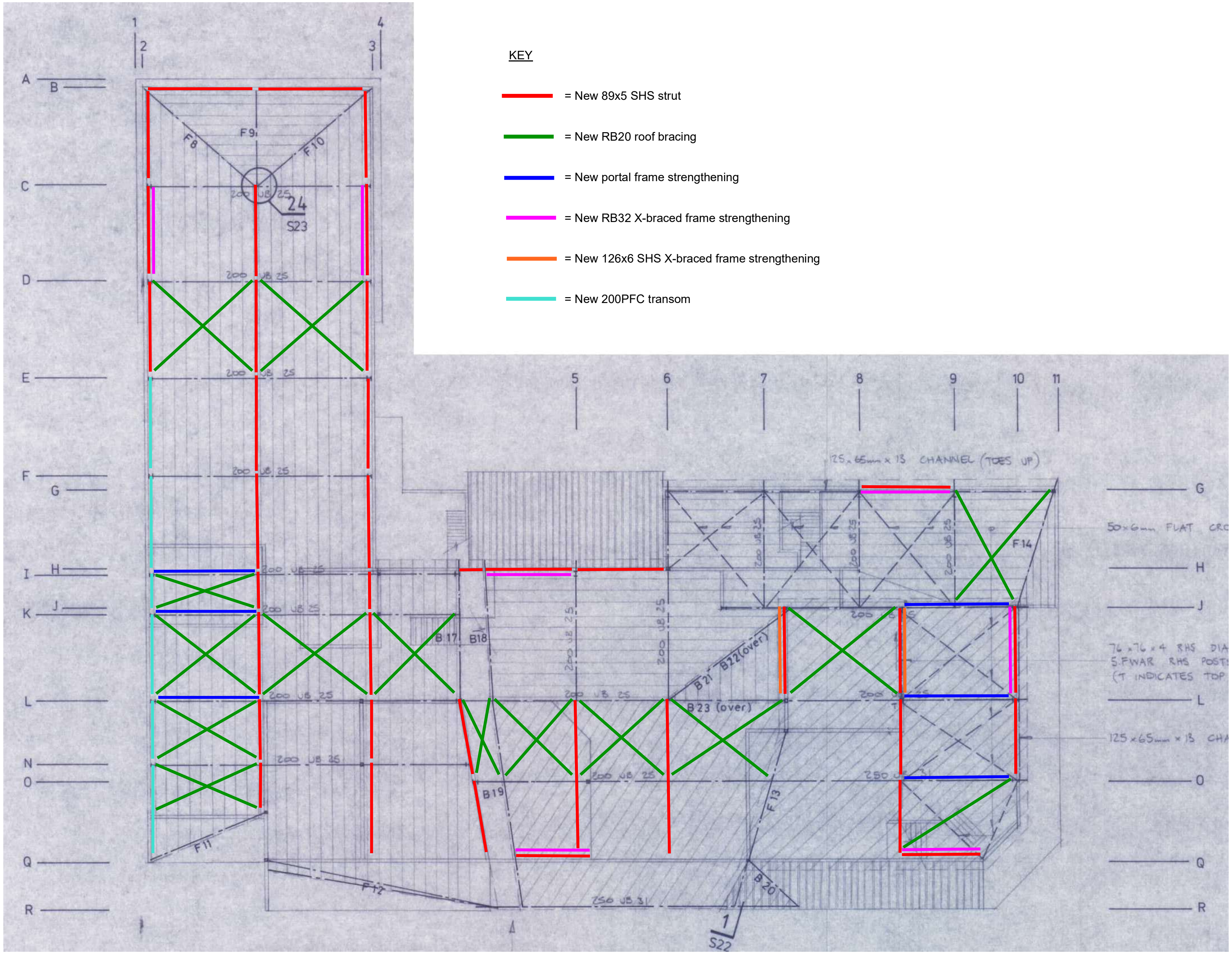
DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	1:100 [A2]

67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika

FIRST FLOOR PLAN

PROJECT	REV.
503051	A
SET	SHEET
SC	S04

eliot sinclair



KEY

- = New 89x5 SHS strut
- = New RB20 roof bracing
- = New portal frame strengthening
- = New RB32 X-braced frame strengthening
- = New 126x6 SHS X-braced frame strengthening
- = New 200PFC transom

N

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DISCLAIMER

REV.	DRAWN	DATE	NOTE
A	TIA	11.08.24	Preliminary Concept

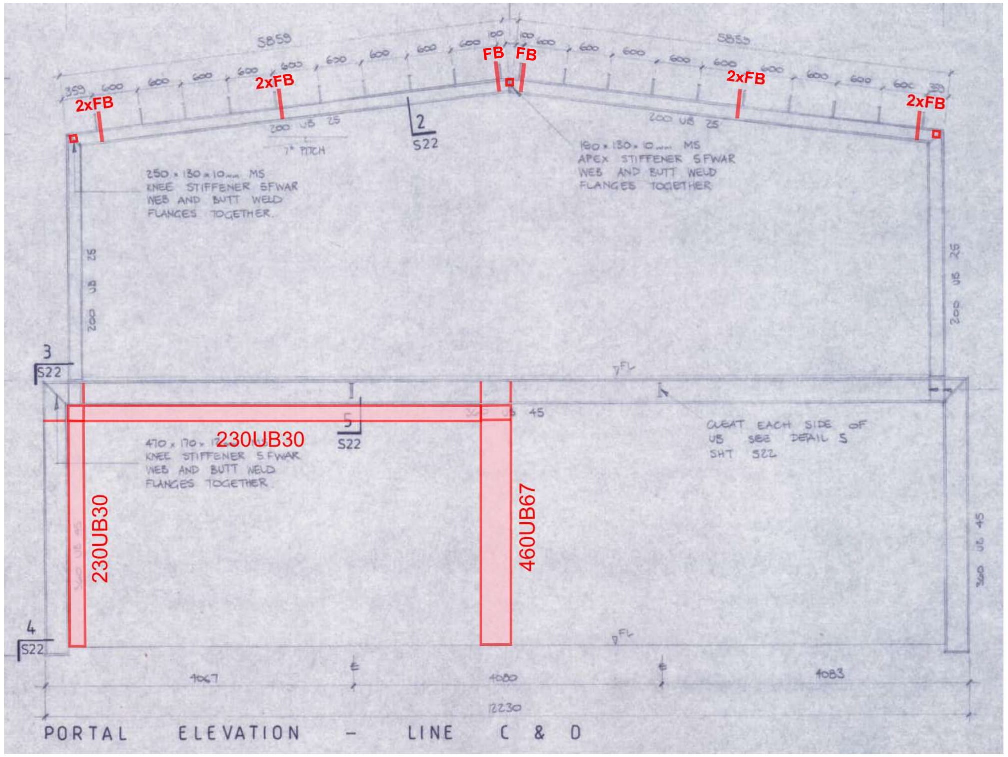
CLIENT
WESTLAND DISTRICT COUNCIL

DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	1:100 [A2]

67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika
ROOF PLAN

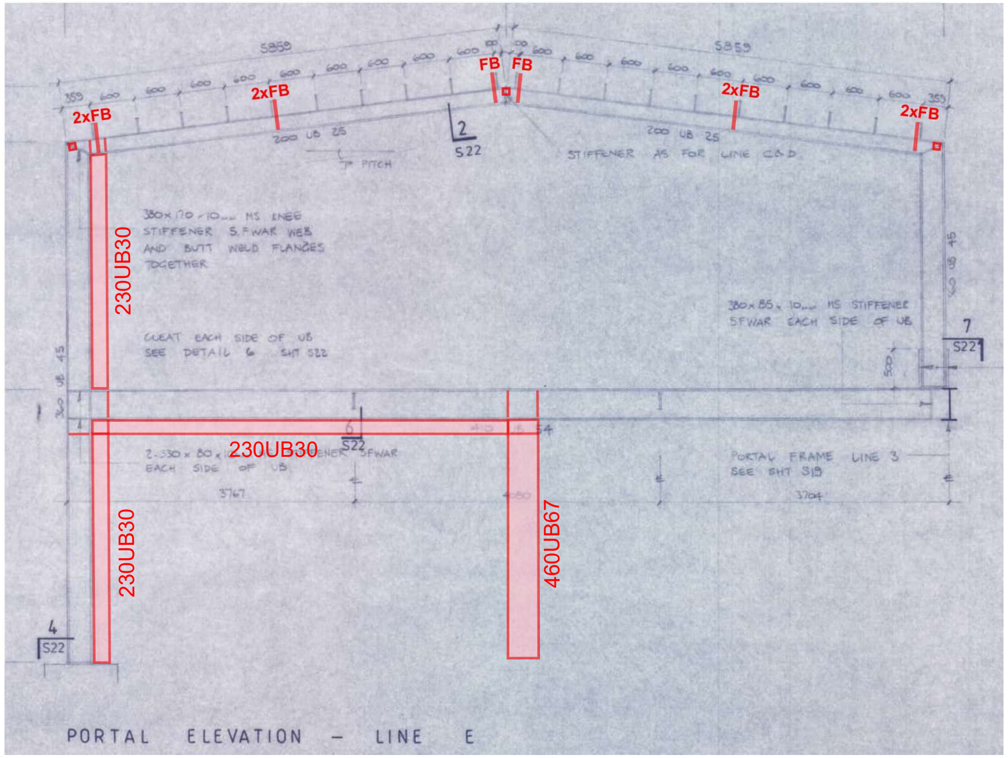
PROJECT	REV.
503051	A
SET	SHEET
SC	S05

eliot sinclair



KEY

FB = New fly bracing



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A	TIA	11.08.24	Preliminary Concept

CLIENT
WESTLAND DISTRICT COUNCIL

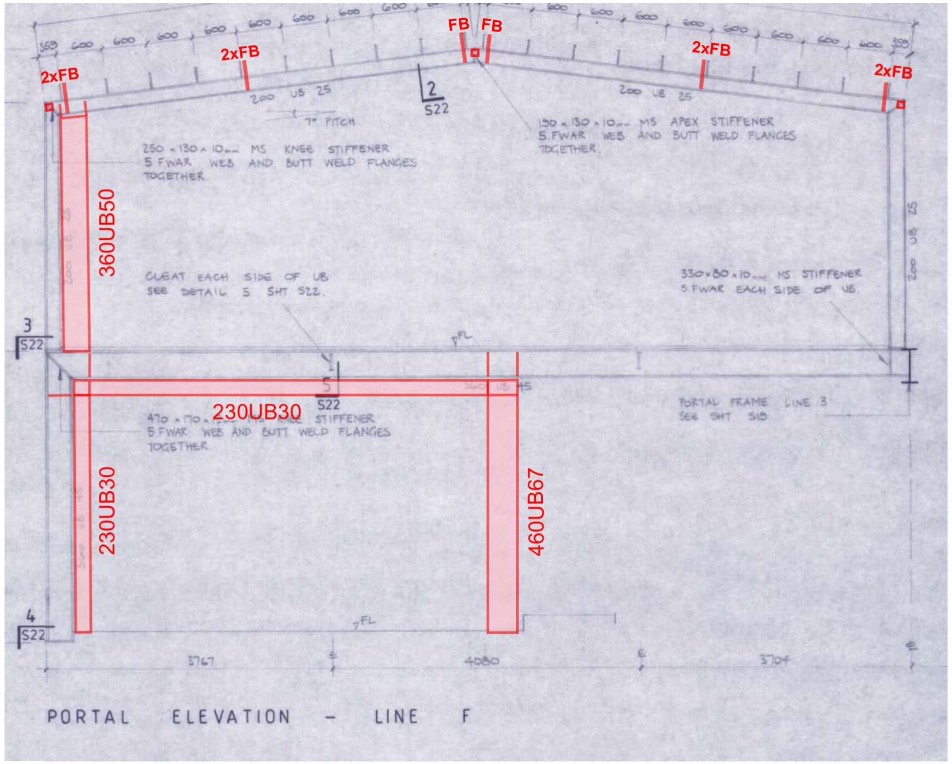
DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	1:100 [A2]

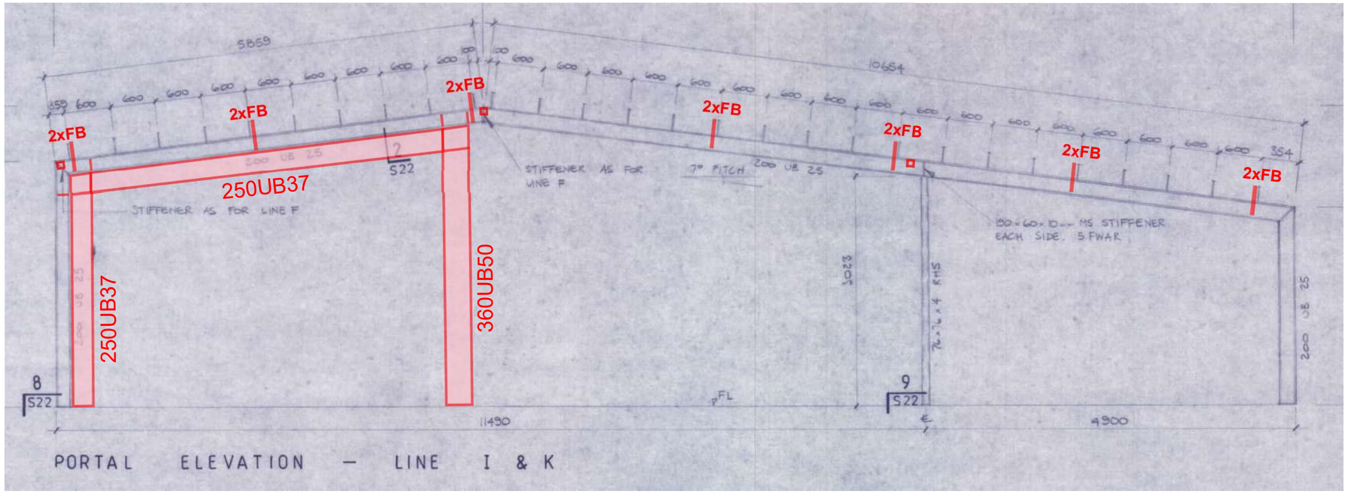
67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika
Portal Frame Strengthening

PROJECT	REV.
503051	A
SET	SHEET
SC	S06

eliot sinclair

Drawing2





KEY

FB = New fly bracing

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DISCLAIMER

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A	TIA	11.08.24	Preliminary Concept

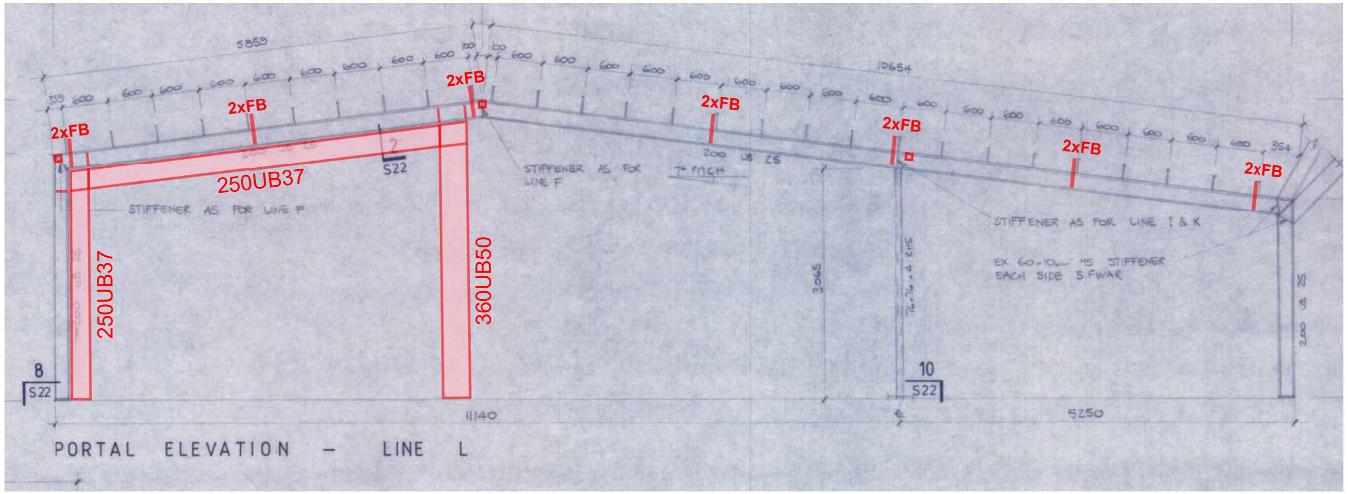
CLIENT
WESTLAND DISTRICT COUNCIL

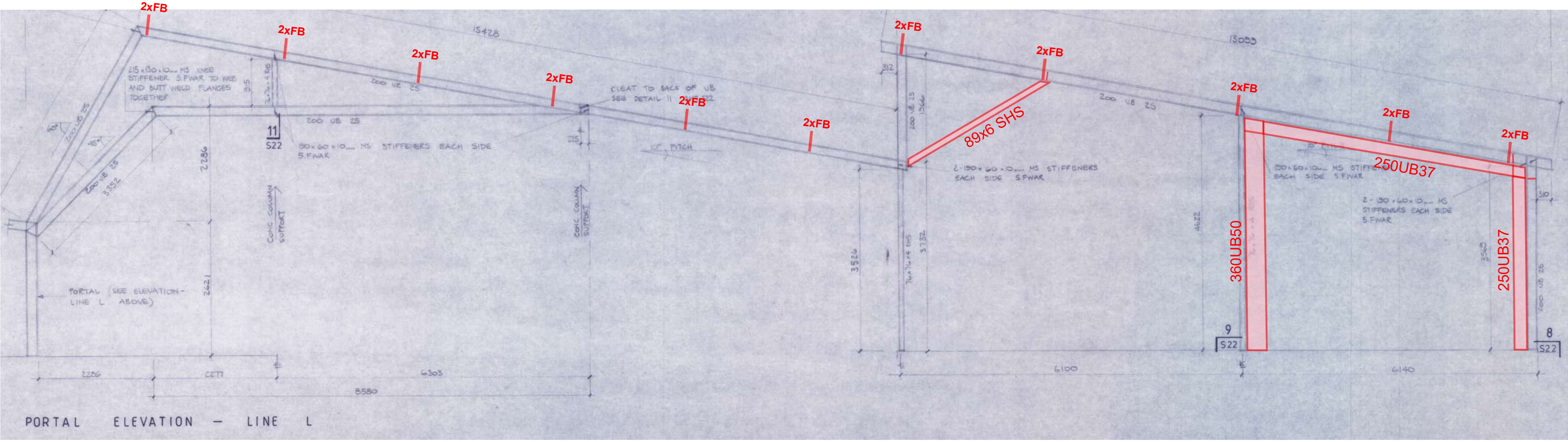
DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	1:100 [A2]

67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika
GRID 6 & 7.5 ELEVATIONS

PROJECT	REV.
503051	A
SET	SHEET
SC	S07

eliot sinclair





KEY

FB = New fly bracing

NOTES
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DISCLAIMER

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A	TIA	11.08.24	Preliminary Concept

WESTLAND DISTRICT COUNCIL

DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	1:100 [A2]

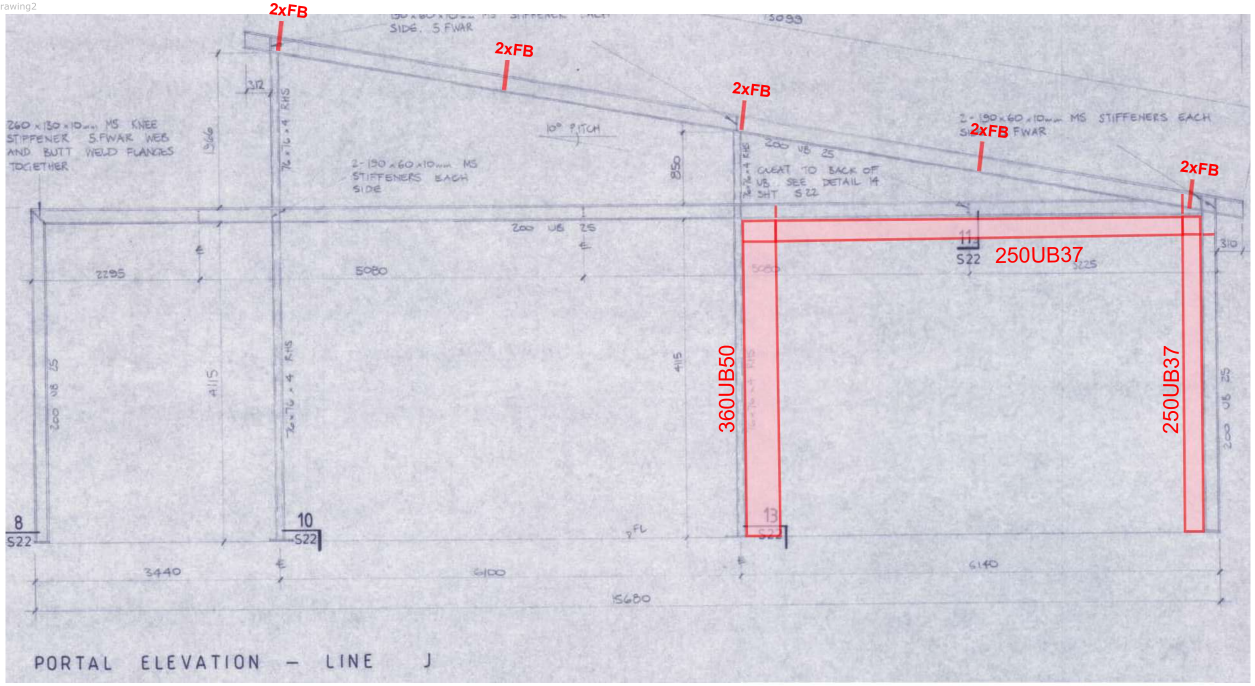
67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika

GRID A & B ELEVATIONS

PROJECT 503051 REV. A
SET SC SHEET S08

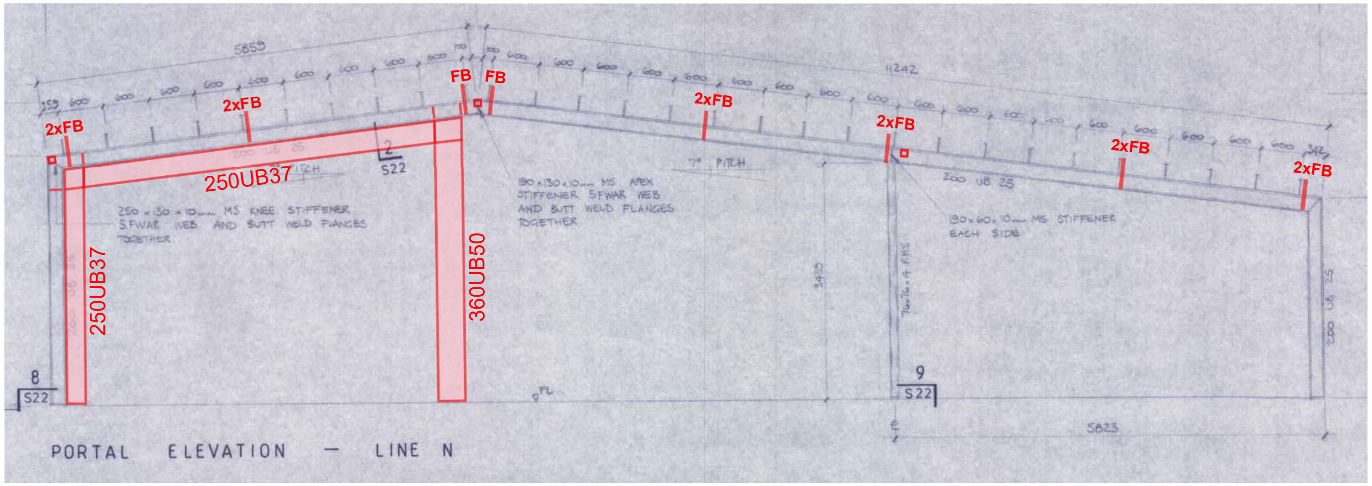
eliot sinclair

Drawing2



KEY

FB = New fly bracing



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REV.	DRAWN	DATE	NOTE
A	TIA	11.08.24	Preliminary Concept

CLIENT
WESTLAND DISTRICT COUNCIL

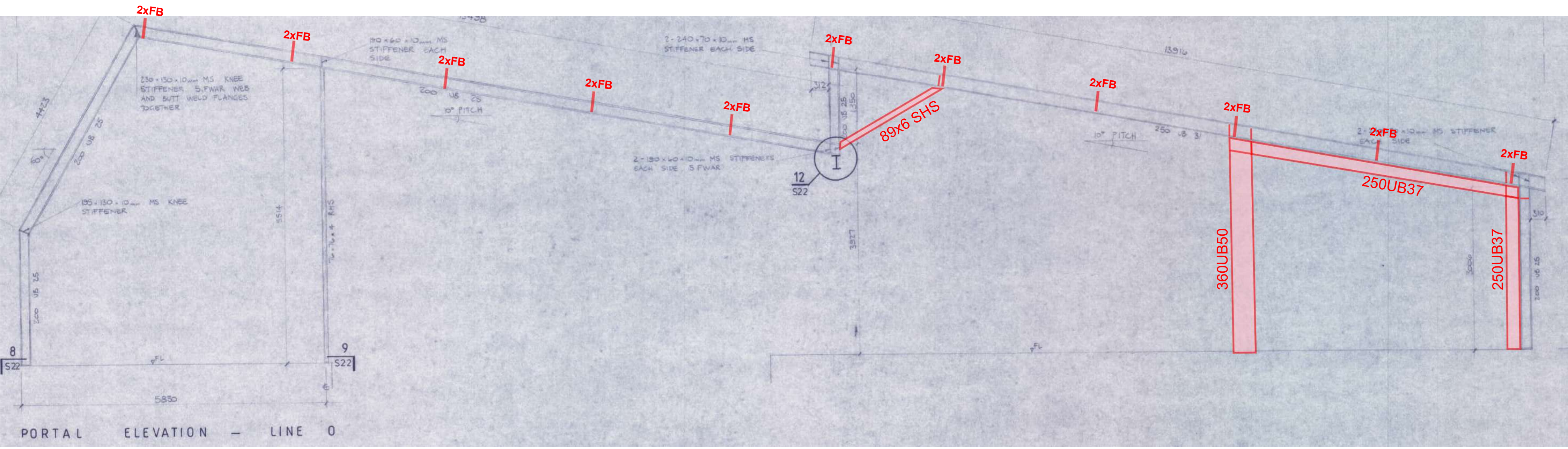
DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	1:100 [A2]

67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika

GRID C ELEVATION

PROJECT 503051 REV. A
SET SC SHEET S09

eliot sinclair



KEY

FB = New fly bracing

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REV.	DRAWN	DATE	NOTE
A	TIA	11.08.24	Preliminary Concept

CLIENT
WESTLAND DISTRICT COUNCIL

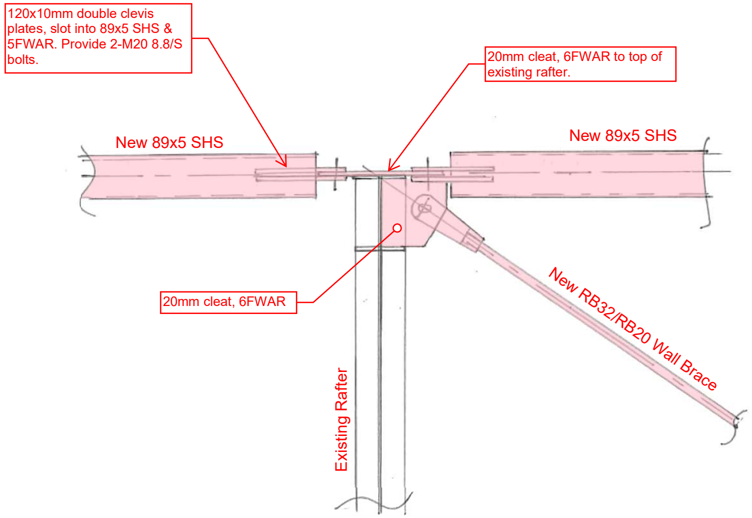
DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	NTS

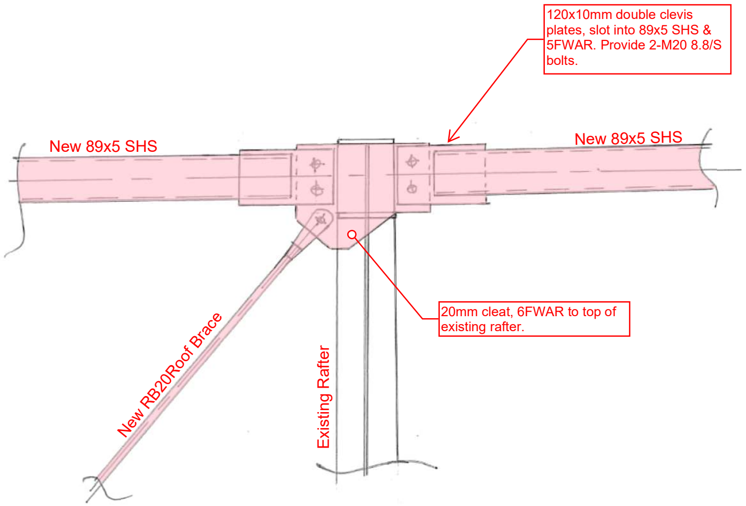
67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika

TYPICAL DETAILS

PROJECT	REV.
503051	A
SET	SHEET
SC	S10

eliot sinclair





Typical New SHS Strut to RB20/30 Wall Brace Connection

Typical New SHS Strut to RB20 Roof Brace Connection

NOTES
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DISCLAIMER

REV.	DRAWN	DATE	NOTE
A	TIA	11.08.24	Preliminary Concept

CLIENT
WESTLAND DISTRICT COUNCIL

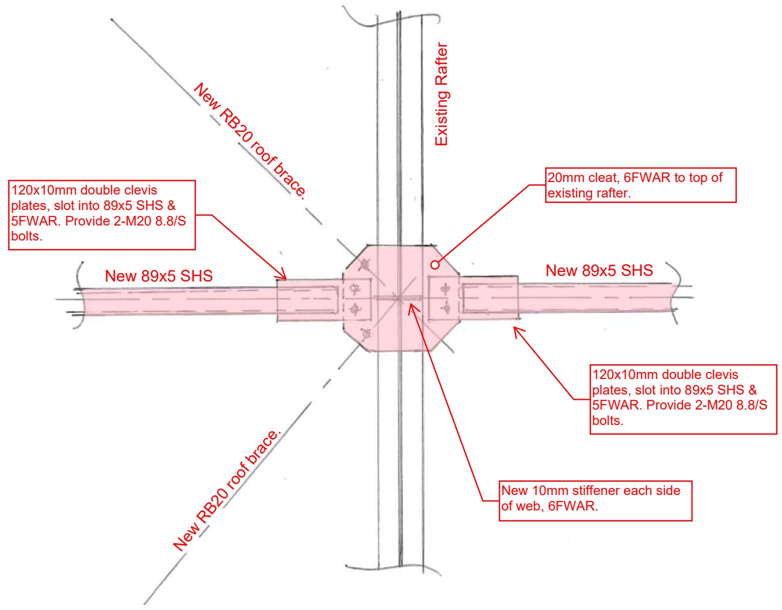
DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	NTS

67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika

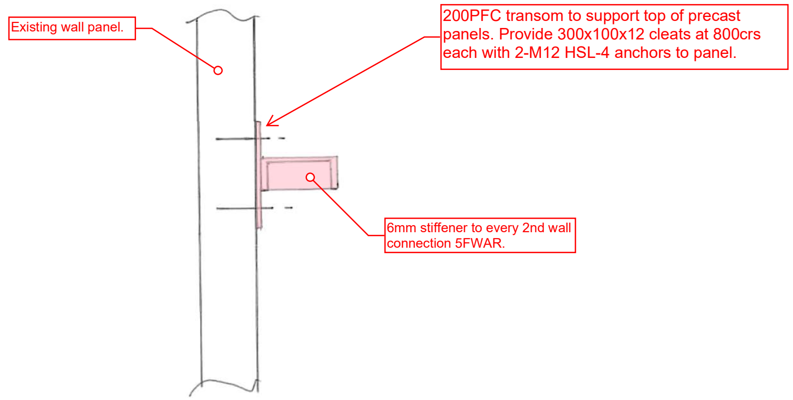
TYPICAL DETAILS

PROJECT	REV.
503051	A
SET	SHEET
SC	S11

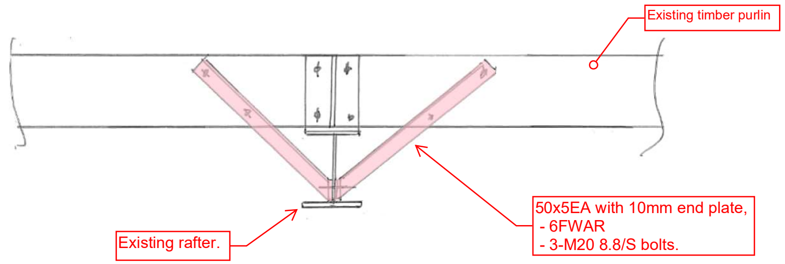
eliot sinclair



Typical New RB20 Roof Bracing to Existing Rafter Connection



Typical PFC Transom to Wall Connection



Typical New Rafter Fly Brace Detail

NOTES
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DISCLAIMER

REV.	DRAWN	DATE	NOTE
A	TIA	11.08.24	Preliminary Concept

CLIENT
WESTLAND DISTRICT COUNCIL

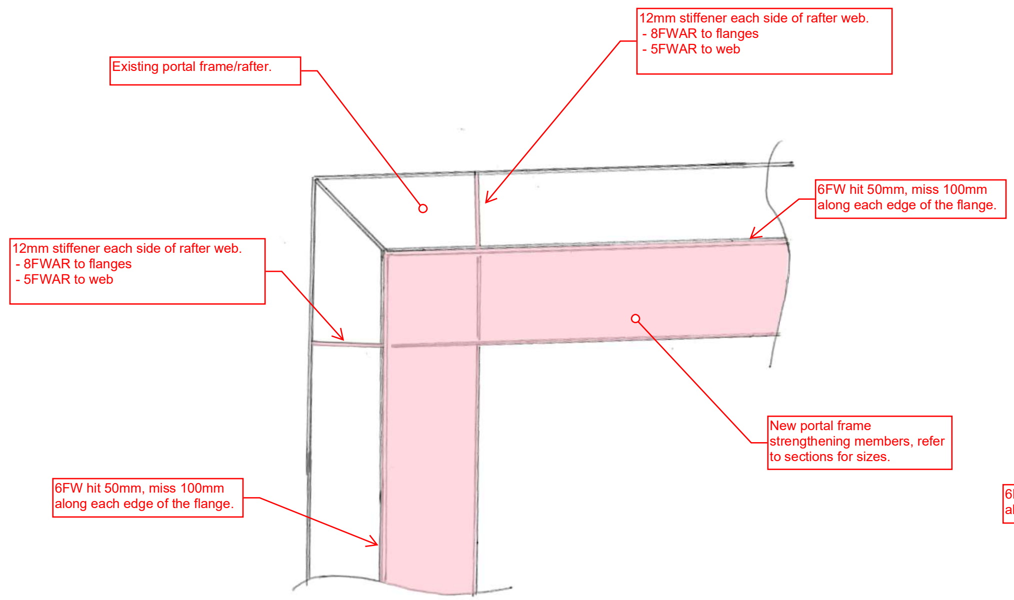
DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	NTS

67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika
TYPICAL DETAILS

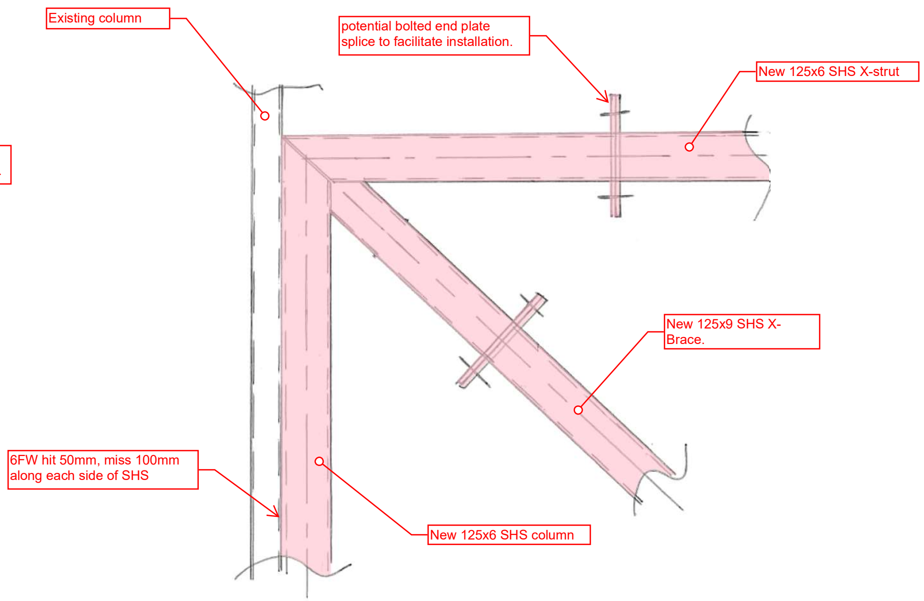
PROJECT	REV.
503051	A
SET	SHEET
SC	S12

eliot sinclair

Drawing2



Typical New Portal Frame Strengthening Detail @ Knee Joint



Typical New Wall Brace Detail at Roof Level.

NOTES
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DISCLAIMER

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CLIENT
WESTLAND DISTRICT COUNCIL

DESIGNED	XX
DRAWN	XX
REVIEWED	XX
APPROVED	XX
STATUS	PRELIMINARY
SCALE	NTS

67%NBS SEISMIC STRENGTHENING CONCEPT
41 Weld Street, Hokitika
TYPICAL DETAILS

PROJECT	REV.
503051	A
SET	SHEET
SC	S13

eliot sinclair

Report to Council

DATE: 29th August 2024

TO: Mayor and Councillors

FROM: Acting Group Manager – District Assets

WESTCOAST WILDERNESS TRAIL TŌTARA BRIDGE – OPTIONS REPORT

1. Summary

1.1. The purpose of this report is to seek Council directive on the future of the West Coast Wilderness Trail (WCWT) crossing structure over the Tōtara River in Ross. The current railway structure has come to the end of its usable life and has had to be closed. This action will isolate the Ross community from direct interaction with the WCWT. Three options are provided for Council selection and opportunity to review. Option two has financial implications that will draw on long term plan funding provisions requiring the moving of expenditure from another project, plus additional unallocated funding depending on outcomes of investigations. External support funding will be requested and is seen as necessary for option 2.

1.2. This issue arises due to the closure of the 1909 ex-Rail crossing bridge (Tōtara bridge) currently utilised as an access point for the WCWT to Ross, due to component age degradation. Staff have reviewed with specialist engineers from WSP and have had advice that potential imminent failure is a very high risk. The Tōtara bridge is now closed. Council needs to review the three options and provide instruction to officers on how to proceed.

1.3. Council seeks to meet its obligations under the Local Government Act 2002 and the achievement of the District Vision adopted by the Council in June 2024, which are set out in the Enhanced Annual Plan 2024/2025. Refer page 2 of the agenda.

1.4. This report concludes by recommending that Council review the report material, inclusive of the WSP engineering document. Provide directive and instruct officers on how to proceed.

2. Background

2.1 The reason the report has come before Council is due to the closure of the Ex-Rail bridge over the Tōtara River. This was the most direct West Coast Wilderness Trail route to Ross from Ruatapu. The Tōtara bridge was constructed in the early part of the twentieth century and became operational for train use in 1909. The structure was decommissioned in the 1980's and was gifted to Westland District Council circa. 2010.

Engineering issues were apparent at this time and limited repairs were undertaken. Following these repairs the Tōtara bridge was redecked, and cycle safety features were installed to allow travel from Ruatapu to Ross and return for West Coast Wilderness Trail cyclists. Various inspections and reports have been undertaken since 2013 with the most recent recommending shutting the Tōtara bridge due significant structural deficiencies. This recommendation was updated after review on the 13th August 2024.

A meeting was held with the Ross community on the 5th of August to table the WSP consultancy report and advise that the Tōtara bridge required closure. Community members requested that Council staff review

the situation again with the WSP structural engineers and seek a temporary waiver to have the Tōtara bridge remain open until the 31st of March 2025 to encompass the next tourist season. A review meeting occurred between WSP Structural specialists and Council staff on the 13th of August 2024. WSP had reviewed relevant information and provided the following commentary –
"Council have now requested if the recommendation to close the bridge can be pushed back 8 months to cater for the upcoming tourist season. We have reviewed our previous findings and, unfortunately, due to the large number of components at end of life throughout the bridge, we do not consider this request suitable in the interest of public safety. We also do not consider that there are practical measures to restore the bridge to a serviceable condition to achieve use of the bridge for the upcoming tourist season."

Local community members were contacted, and a meeting was held in Council chambers on Friday the 16th of August, where attendees were advised that the Tōtara bridge was to close the following week. As a result of the firmer WSP recommendation. Staff closed the Tōtara bridge for all access on Monday the 19th August 2024.

3. Current Situation

3.1. The current situation is that the Tōtara bridge on the West Coast Wilderness Trail north of Ross is now closed due to structural integrity issues and safety concerns. This paper is to supply options for progressing with either:

- Measures to engineer an alternative bridge structure and route to Ross.
- Permanent closure of this section of the trail.

Engineering investigation works will require a budget allocation and staff will also be seeking support funding from Central Government agencies, if this option is directed to proceed.
A permanent closure of the West Coast Wilderness Trail at the Tōtara bridge or possibly even North at the end of Paiere road, will save current maintenance expenditure and the same with capital projects as there are further liabilities with other structures on this trail.

Meetings with the Ross community to provide an overview of the situation were undertaken on the 5th of August 2024 at the community Hall and the 16th of August 2024 in Council chambers.

4. Options

4.1. Option 1: Keep the Ruatapu to Ross section of the West Coast Wilderness Trail closed from the usable section, either from the end of Paiere Road or at the Tōtara bridge itself.

4.2. Option 2: Undertake detailed investigation into alternative routes avoiding the existing Tōtara River crossing or detailed engineering design on a scaled down replacement or internal addition (swing Bridge) to the existing Tōtara bridge site.

4.3. Option 3: Undertake remediation of the existing structure. Seek external funding support.

5. Risk Analysis

5.1. Risk has been considered and the following risks have been identified –

- Financial impact on the local Ross and extended community.
- Lack of available funding to proceed with an alternative.
- Reputational damage through closure of this portion of the West Coast Wilderness Trail.

6. Health and Safety

6.1. Health and Safety has been considered and due to the Tōtara bridge closure no current items have been identified.

7. Significance and Engagement

7.1. The level of significance has been assessed as high.
The Totara bridge is part of the West Coast Wilderness Trail, which is a strategic asset under Part II, cl 2.2 of the Significance and Engagement Policy.
Public consultation may be required depending on the directive provided by Council.

8. Assessment of Options (including Financial Considerations)

8.1. Option 1 –Permanent Closure of the Tōtara bridge.
The advantage to this option is the reduced need for additional funding. If a closure is extended to the Northern end of this portion of the West Coast Wilderness Trail to Paiere road, this will result in a cost reduction of future maintenance works, and other capital investment into other bridge replacements on the same section.

8.1.1. The following financial implications have been identified. The closure will reduce maintenance expenditure and capital replacement costs for other structures on this section of the trail. The current maintenance expenditure for this trail is an average of $10K per / annum. This option will also reduce the capital expenditure planned for current and future years through the LTP which has an allowance of $1,299,000.

8.2. Option 2 – Investigate, design and build either an alternative route to continue the West Coast Wilderness Trail to Ross or a replacement structure at the same location.
Current cost calculations for a basic replacement structure at the same site are between $1.5M - $1.9M but these figures will need peer review.
Estimate on alternative routes (see attached) are between $2.29M - $3.58M dependent on design and location. All investigated alternatives do have interface issues including landowner and Waka Kotahi – New Zealand Transport Authority permissions along with engineering difficulties. The exception is being investigated with an experienced contractor to include an internal swing bridge (see Twin Coast example) this alternative is estimated to cost $1.1 - $1.3M and is a real contender to keep this trail open.

8.2.1. This option does have some current and future budget allocation, noted previously as $1.299M but actual cost to construct is being reviewed with experienced contractors. This would require further financial input via loan funding or external support from Government agencies, such as MBIE.

8.3. Option 3 – Undertake remediation of the existing structure. The estimated value of this option is extensive and could dramatically increase due to unknown factors referred to in the WSP Totara bridge - Summary Assessment 2024. Immediate financial input of $2M with another $4M+ in the very short term. This estimation is calculated on “known” structure condition and external specialist engineers have noted that there is the potential to drastically exceed this figure.

8.3.1. As noted in Option 2, current and future funding through the LTP is $1.299M and this option would require the Westland District Council to fund a large amount of unbudgeted expenditure and / or seek external support from Government agencies or other sources.

9. Preferred Option(s) and Reasons

9.1. The officer seeks direction from Councillors to proceed with one of the Options above.

Financial and community impacts are seen as significant in each of the options provided.
Option 2 and Option 3 will require external engineering inputs which come at a cost, which may not be necessary if Option 1 is directed.
The Totara bridge is part of the West Coast Wilderness Trail, which is a strategic asset under Part II, cl 2.2 of the Significance and Engagement Policy.
Public consultation may be required depending on the directive provided by Council.

10. Recommendation(s)

10.1. That the report be received.

10.2. That Councillors assess the options included in this report and provide direction for Council staff to proceed.

Erle Bencich
Act. Group Manager – District Assets.

Appendix 1: WSP Summary Memo
Appendix 2: Totara Bridge Photos
Appendix 3: Alternative Route Costings
Appendix 4: WSP Assessment
Appendix 5: MWH Structural Condition Assessment 2010
Appendix 6: Totara Bridge Drill Report

Memorandum

To	Erle Bencich
Copy	Mark Smith, Kathie Ragg
From	Rem Markland
Office	Greymouth
Date	19 June 2024
File/Ref	6-WWES5.02
Subject	Totara Rail Bridge - Summary Assessment 2024

Dear Erle,

As requested, we have completed the summary assessment review for the Totara Rail Bridge. This summary report is to aid Westland District Council (WDC) with determining an appropriate management strategy for this pedestrian structure.

This assessment review was undertaken by Tiaan Kramer, WSP Principal Bridge and Civil Structures Engineer with technical review completed by Anthony Rooke, WSP Team Leader Structures Asset Management and supported by Rem Markland, WSP Senior Engineering Technician. All personnel were involved in the previous assessment of the structure in August 2023.

1.1 Background & Scope

WSP completed a visual inspection, assessment and reporting of the Totara Rail Bridge for WDC in August, 2023[1]. An immediate recommendation of this report was to undertake timber drilling to better understand the condition of all hardwood components and provide greater confidence in the large number of component repair/replacement identified. A timber drilling investigation was completed by an external Contractor, Liddell Contracting[2] circa 2023.

WSP has undertaken a comparison of the timber drilling findings with the visual inspection completed August 2023 in order to update "Priority Groups of Main Truss Members Results" (listed in Table 4 of original report). This memorandum summarises our findings.

1.2 Structure Assessment Summary

1.2.1 Comparison Results

The results of the comparison between WSP's previous visual assessment and Liddell's drilling records are as follows:

[1] 6-WWES3.98 Totara Rail Bridge Assessment 2023_FINAL

[2] *Drilling notes were provided to WSP from WDC to use for reference in completing this summary report, but as WSP were not involved in the drilling investigation they have not been thoroughly reviewed or relied upon for information accuracy.*

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It is to be noted that WSP has not been involved in the drilling investigation works or MSQA. Therefore, the drilling notes supplied by Liddell were only used for reference to these works and were not relied upon for information accuracy. In addition, Liddell's findings did not adopt the same priority classification as WSP's report. It was subsequently assumed that priorities classified as "Urgent" and "High" is equivalent to Liddel's "Replacement" classification.

Table A: Original Table 4 comparison of the main truss member priority groups

	WSP's Priority	Liddel's Priority	
Members	Urgent & High	Replace	Repair
Top Chord	1	16	0
Bottom Chord (pier to pier)	4	n/a	n/a
Struts	30	23	1
Hanger/tension rod	19	35	0
Transom	3	2	6
Deck Cross Bracing	47	26	0
Timber Brace	5	14	0

In addition to the main truss member results, Liddel also recorded the member condition of components not summarised in the original Table 4. These are presented in the table below:

Table B: Recommendation comparison of components not included in the original summarised Table 4

	WSP's Priority	Liddel's Priority	
Members	Replace	Replace	Repair
Timber Thrust Blocks, A-Blocks & Saddle Blocks	29	24	5
Road Beams	2	5	1
Corbels	2	7	1
Solid Blocking & tie Rods	2	4	4
Pier components	15	14	0

These results show that the findings of Liddel's investigation are notably worse than what WSP's visual inspection showed. This subsequently reinforces the previous recommendations made by WSP.

In addition, it was also observed that Liddel's only appeared have drilled a sample of timber members and commented on some steel members. We draw this conclusion on the basis that only 267 of 836 total components (32%) have been commented on in their drilling records. While not clear, their investigation appeared to be focussed on the defective components identified in WSP's visual assessment report. This means that there may still be a significant number of timber components with internal decay that haven't been identified.

1.2.1 *Cost Estimates*

WSP compiled a cost estimate for repair/strengthening as part of the original visual assessment report (see Table C below for a copy of the original cost estimate).

Table C: Original Cost Estimate for Strengthening or Repair Work

	Time				Total cost over 10+ years
	Immediate	6 months	2 – 10 years	10+ years	
Cost estimate	$150k	$1.814M	$1.530M	$2.125M	$5.619M

These costs will likely be higher due to the increased number of components requiring replacement as identified in Liddel's report.

1.2.1 *Summary & Recommendations*

As a result, WSP still uphold the recommendations and priorities provided in the original report 6-WWES3.98 Totara Rail Bridge Assessment 2023 dated 21 August 2023. These are:

- A present value end of life (PVEOL) or similar assessment should be undertaken to compare maintenance costs with the cost of establishing an alternative crossing. Given the amount of current deterioration of the bridge and strengthening required, the PVEOL should be used to compare the cost of any repairs against the value of the bridge. As the bridge is now utilised as a cycleway bridge, the replacement value for a cycleway bridge is roughly $2.03M3. Total sum cost of remedial works and future inspections will exceed the replacement value of a cycleway bridge.
- Discussions should be held with Heritage New Zealand Pouhere Taonga (HNZPT) regarding the heritage status of this structure. Strengthening or repair work may be influenced by this as work may result in loss of the historic fabric and character of the bridge. The bridge is not listed as a heritage structure with HNZPT, nor identified as a Historic Place in the WDC District Plan. However, as it was built in the 1800's, it still holds heritage value.
- The existing bridge is potentially at risk to other vulnerabilities which were not investigated or discussed during this visual assessment. Examples of vulnerabilities could include risk to scour, or seismic loading, pile reduction due to abrasion (below the current bed level) and pile damage due to log loading given its demanding operating environment.
- A new structure could be constructed in a location less vulnerable to the environment. This could be further upstream with a cycleway diversion. This investigation is highly recommended to be carried out as a matter of priority.
- Repairs consisting of steel augmentation with protective coating systems would require first minor maintenance within 15-20 years at best in this environment and would add to the ongoing future maintenance costs.

In the interest of public safety we recommend Council considers closing the structure until the Recommendations above are carried out. The bridge should remain closed while the various options are explored.

Kind regards,

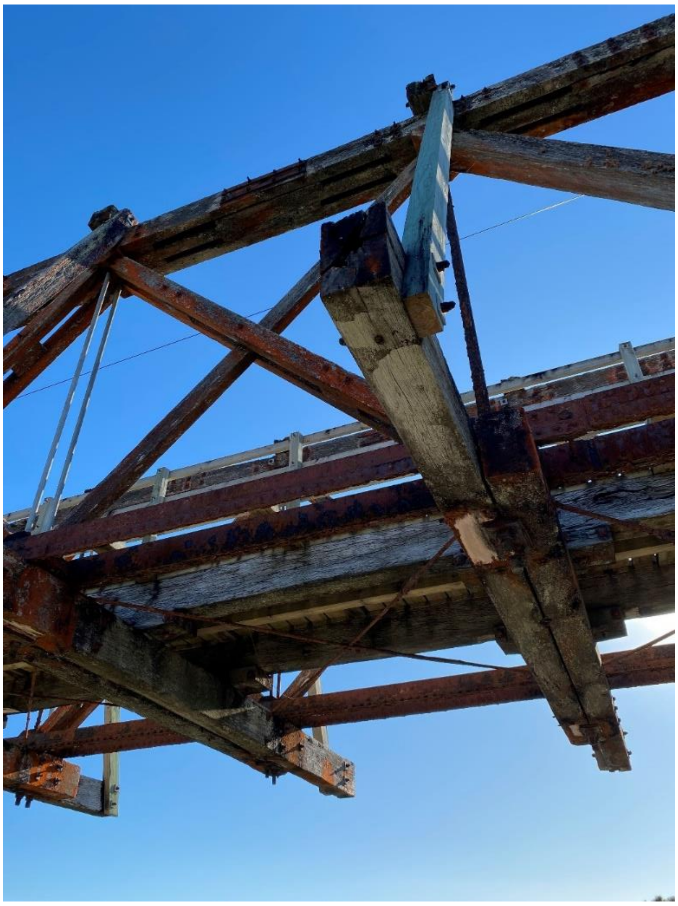
Rem Markland

Senior Engineering Technician

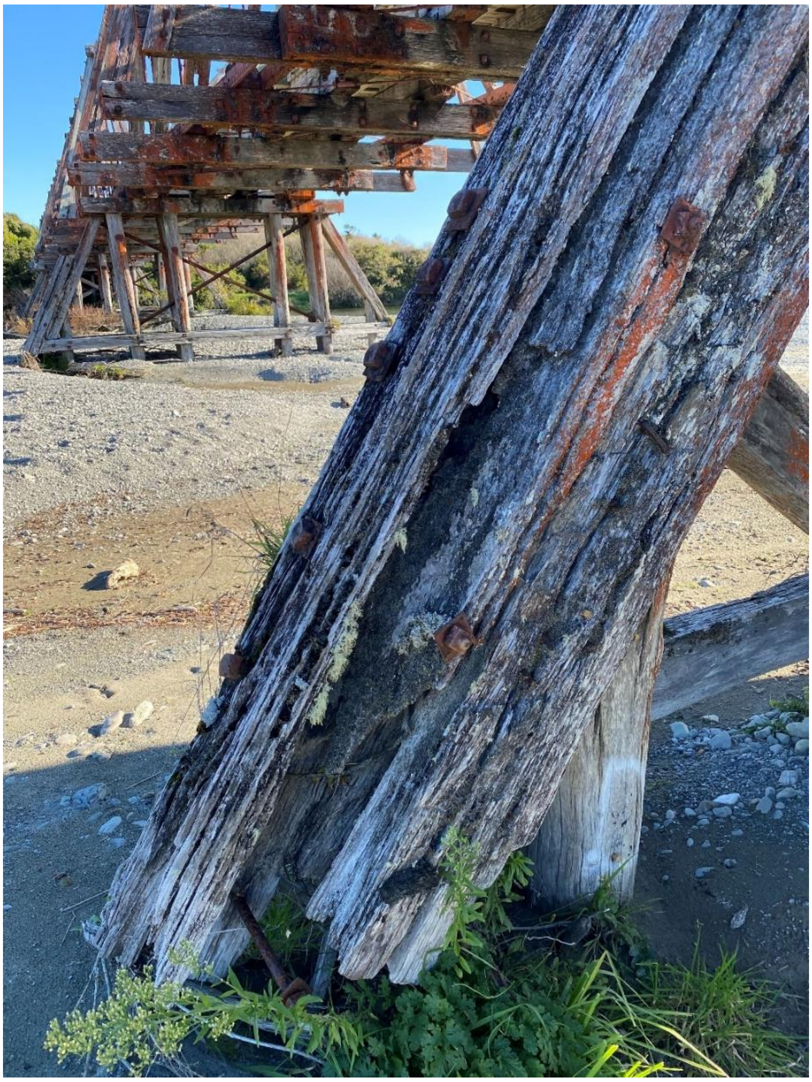
Top Cord Surface loss
Saddle block split in timber and timber decay.

Raking pile timber split and timber decay.

Raking pile timber surface decay



Transom end timber decay.



Raking pile timber decay.

Transom Timber decay and timber split

Cross bracing corroded away.

Timber loss and decay.

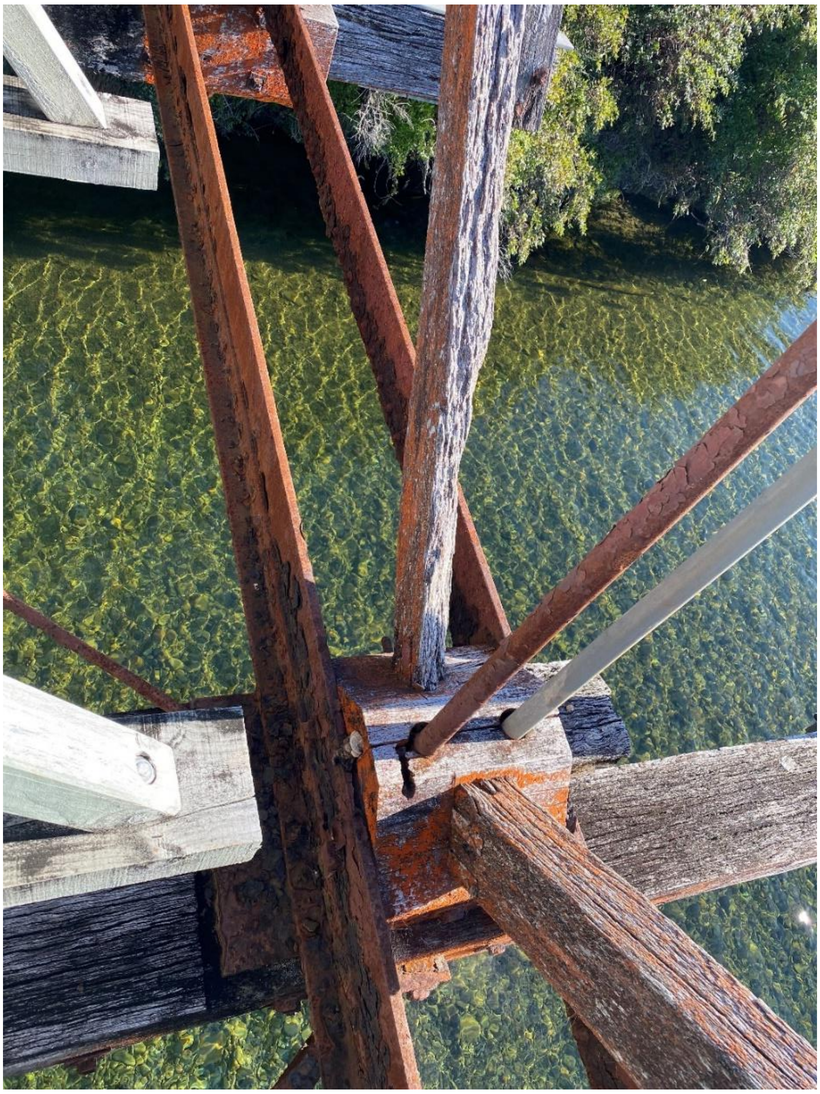
Previous repair to transom end.
More timber decay present

Steel cross bracing needs replacing

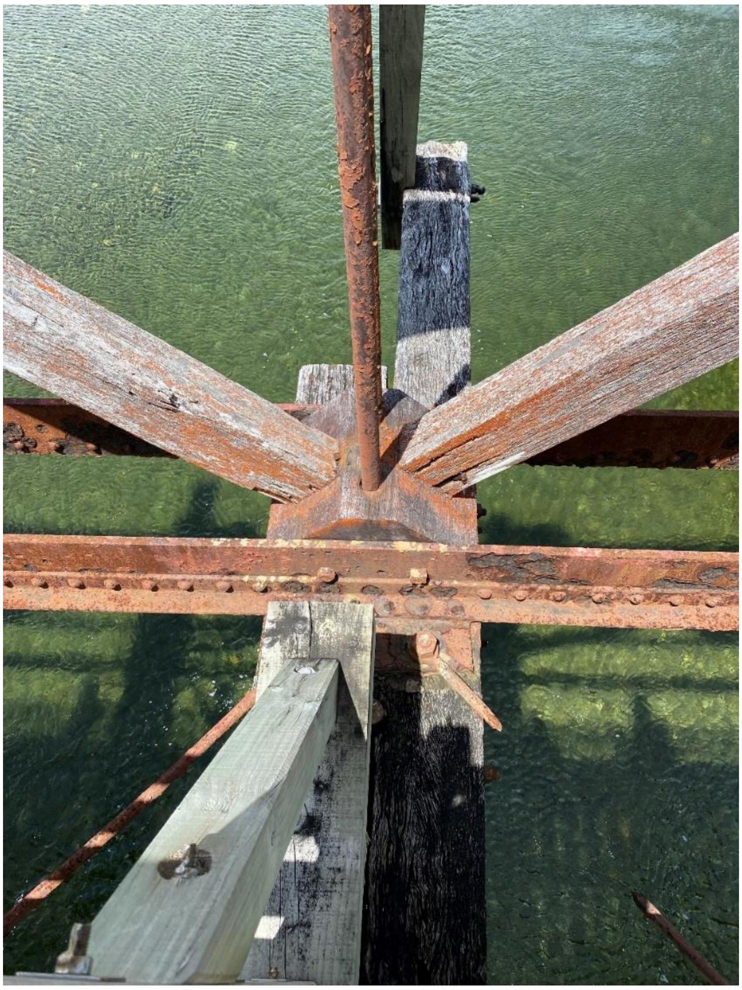
Transom timber end decay
Bottom cord corroded. Previous repair visible

Timber thrust block decay and timber split.
Steel tension rods corroded.

Steel cross bracing corroded. Needs replacing



Loss of section on timber strut.



Steel cross bracing corroded. Needs replacing

Saddle block needs replacing.

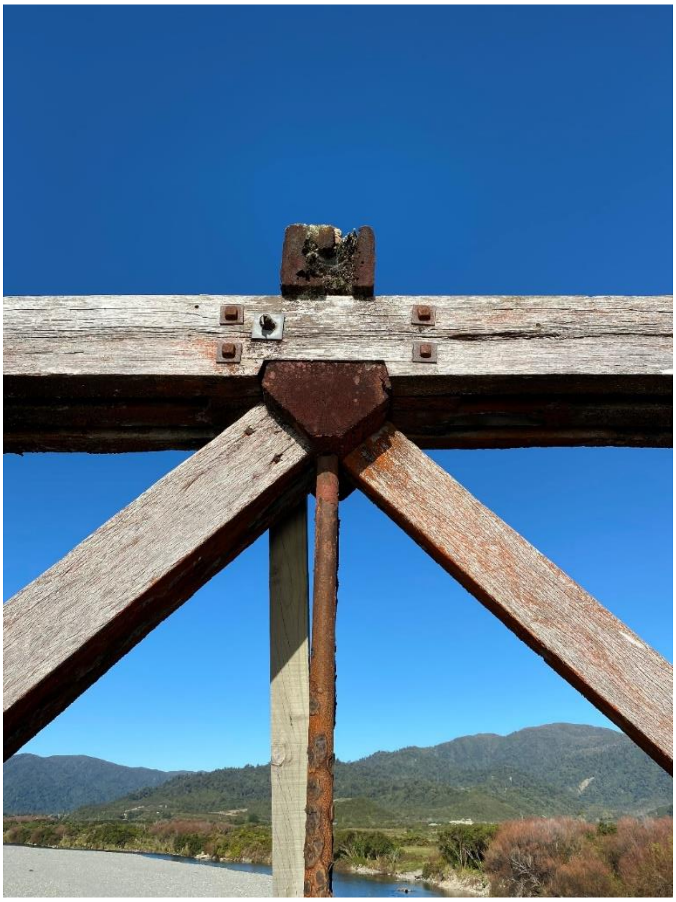
Saddle block split

Bottom cord corroded, needs replacing

Bottom cord corroded, needs replacing.
Cross bracing corroded needs replacing

Saddle block decay and split.

Tension rods corroded.
Previous repair to transom. Needs more repairs.
Decay to timber strut.



Saddle block timber split.

Centre strut timber decay.

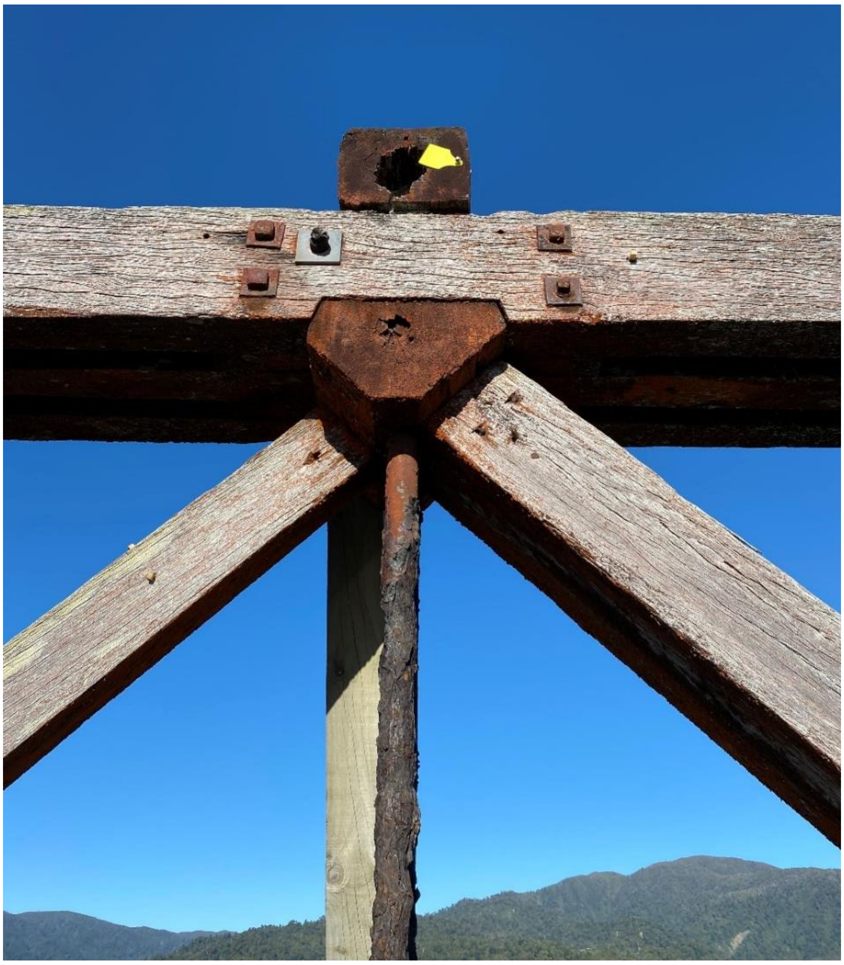
Bottom cord corroded. Needs replacing

Bottom cord corroded. Needs replacing.

Tension rods corroded. Needs replacing

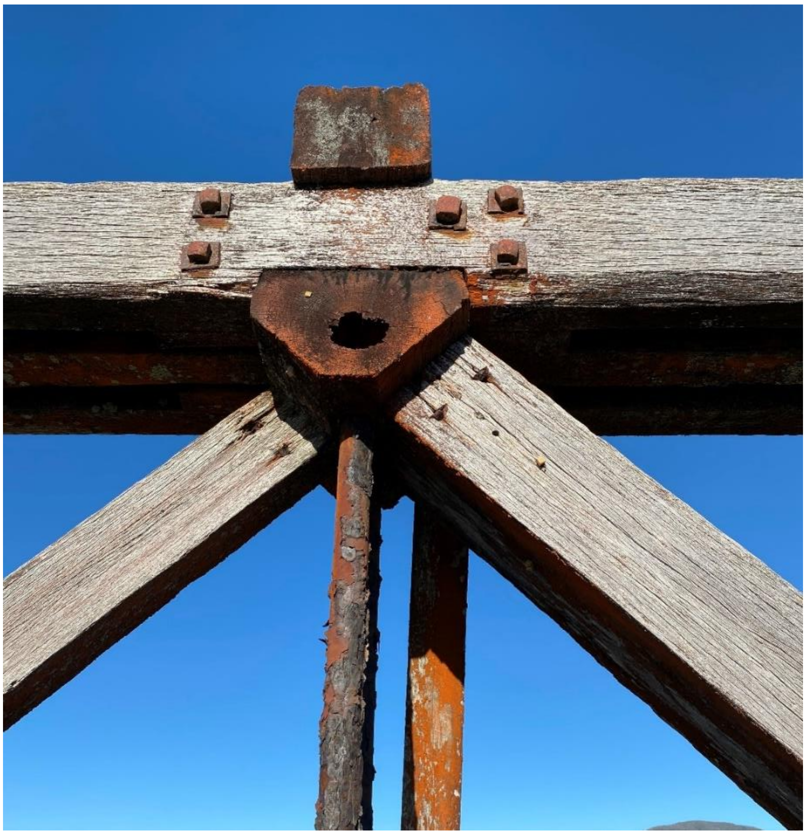
Saddle block timber decay.
Tension rod corroded.

Bottom cord corroded. Previous repair visible.



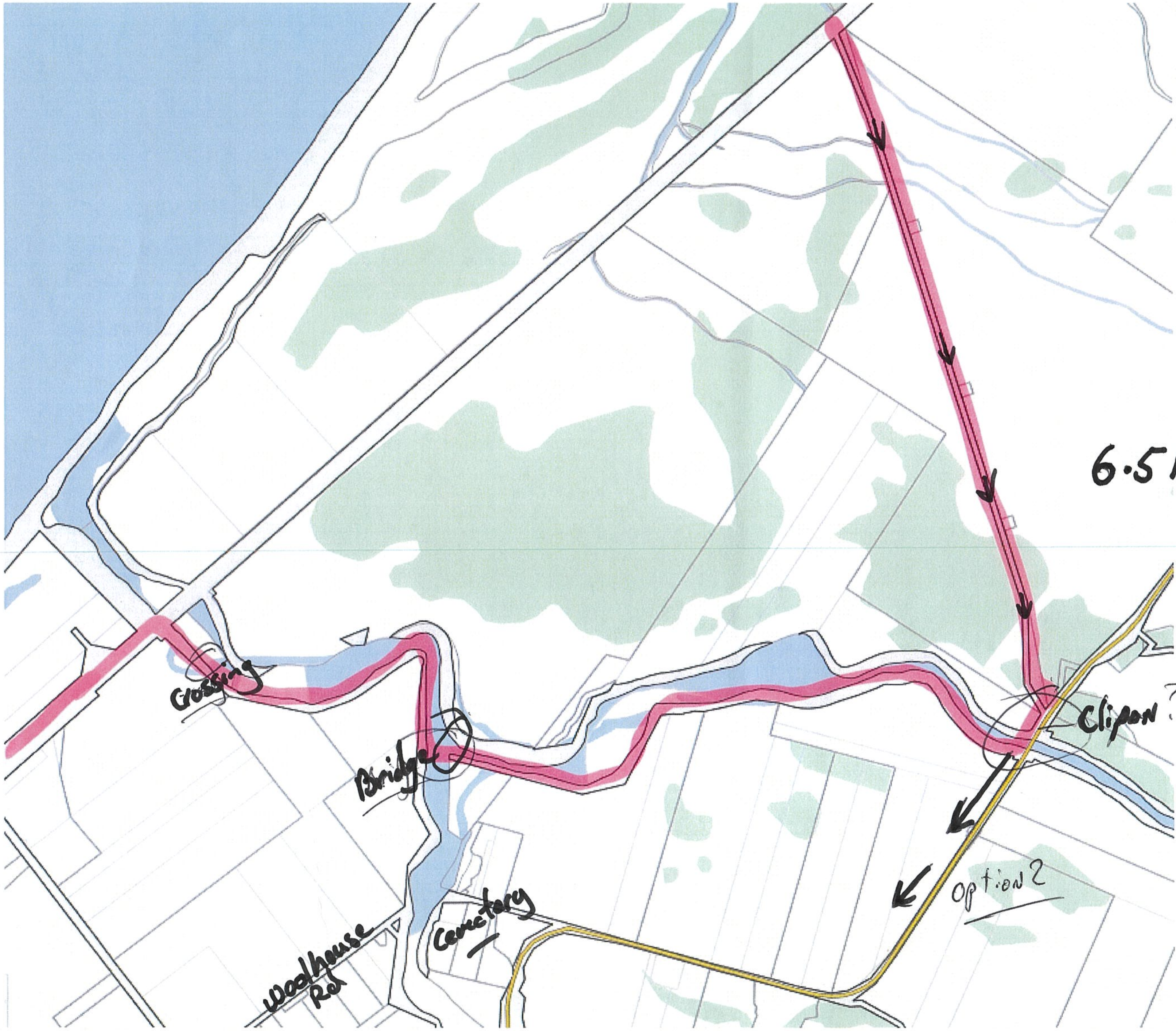
Saddle block with tunnel rot.

Surface loss on timber strut



Tiber A block with tunnel rot.

Timber thrust block with timber decay.



Option 1

- divert to Papakanui Rd
- cross Totara bridge (highway)
  - perhaps a clip on
- divert back to original course via road reserve

Trail est cost

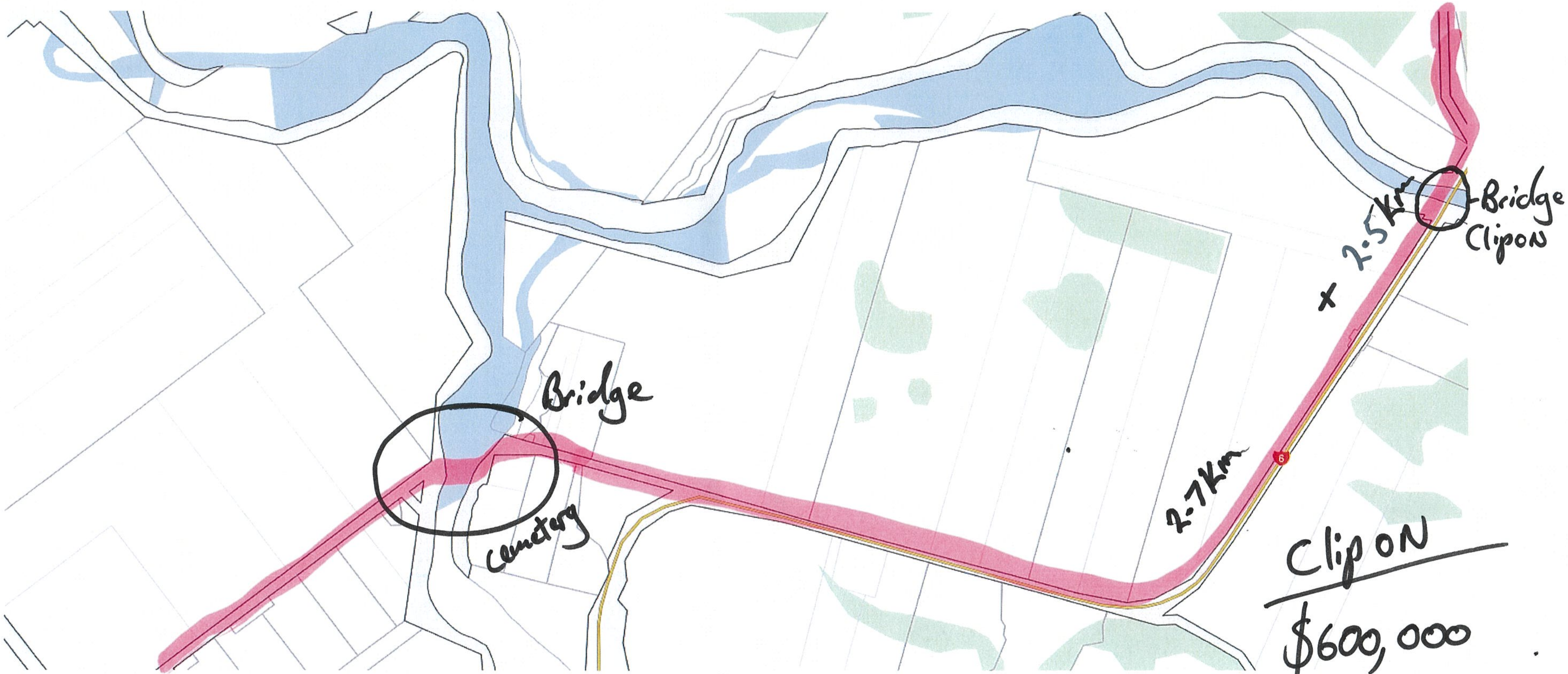
6500m @ $150 per/m
= $975,000-00

Clip on (if viable) 60 meters
= $600,000

Bridge = 1,400,000 70 meters

Engineering/consenting/contingency
= $300,000

$3,275,000-00



Clip ON

$600,000

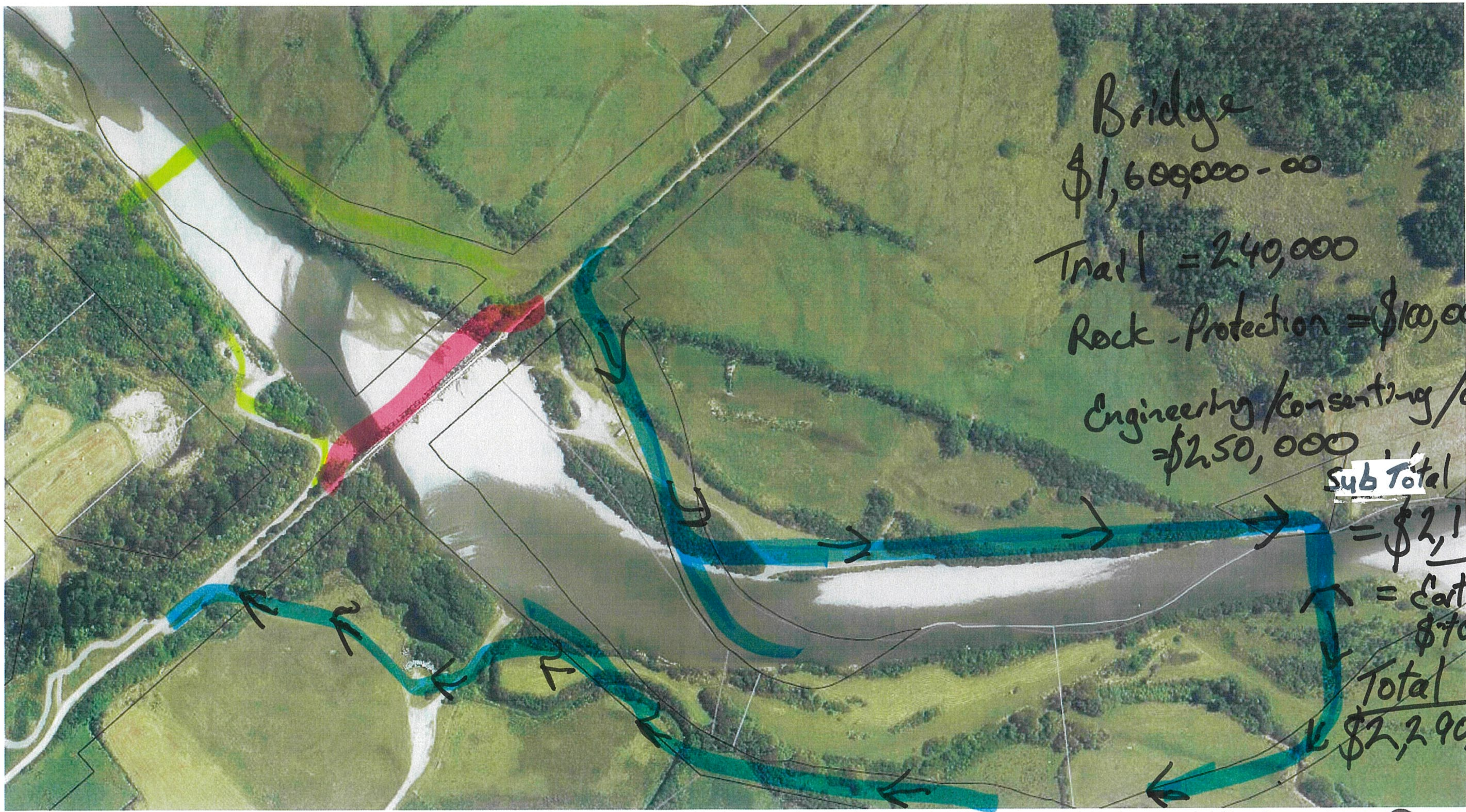
Trail = 5.2km
5200 @ $150 = $780,000
Bridge Est 95m
= $1,900,000

Engineering/consulting/contingency
= $300,000

$3,580,000

Option 2
- divert down Papakamai Rd
- cross highway Totara bridge (clip-on?)
- statehighway - (or across private land)??
- Down ~~hee~~ Woolhouse Rd
-

option 3



Option 3 - new swingbridge beside the Totara Railway Bridge
Option 4 - " " down stream
Option 5 - " " upstream & back up the road reserve

1.6km New trail

80m New Bridge.

Totara Bridge - **Internal Cycling Structure. Viable Option – Potential**

Initial cost estimation $800K - $1M (discussions underway with Contractor)

Pictures courtesy Twin Coast Cycle trail

Project Number: 6-WWES3.98

Totara Rail Bridge

Visual Assessment 2023

21 August 2023

CONFIDENTIAL

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Mark Smith

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0	21/8/2023	E Wilson	A Kuek	M Smith	FINAL

Revision Details

Revision	Details

Contents

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Executive Summary

The current condition of the Totara River Rail Bridge was inspected and assessed based on the pedestrian/cyclist demand load it is subjected to. This involved a structural assessment of the main truss members to determine the allowable section loss through decay, and a site inspection to visually estimate the current condition of each member.

The cost estimate schedule for repair work is shown in *Table 1* below. The cost estimate schedule was developed using rough cost estimates for the main truss components, and high-level estimates for other cost components not assessed through this scope of work.

No specific investigation or design was undertaken for this scope of work.

Table 1. Totara Bridge Cost Schedule Estimate for Strengthening or Repair Work

	Time				Total cost over 10+ years
	Immediate	6 months	2 – 10 years	10+ years	
Cost estimate	$150k	$1.814M	$1.530M	$2.125M	**$5.619M**

Recommendations

- Drilling is strongly recommended to determine the specific condition of each member.
- A present value end of life (PVEoL) assessment to compare maintenance costs over time against replacement cost is recommended.
- Heritage aspects and requirements should be discussed with Heritage New Zealand Pouhere Taonga (HNZPT) and considered in respect to repairs to the structure.

Other Considerations

- The bridge will remain to be subject to vulnerabilities not identified during this work, such as scour, seismic loading, pile reduction due to abrasion (below the current bed level) and pile damage due to log loading given its demanding operating environment.
- A new structure could be in a location less vulnerable to the environment. This could be further upstream with a cycleway diversion.
- Repairs consisting of steel augmentation with protective coating systems would require first minor maintenance within 15-20 years at best in this environment and would add to the ongoing future maintenance costs.

1 Introduction

1.1 Scope of Works

WSP NZ Ltd (WSP) was engaged by Westland District Council (WDC) to investigate and assess the current condition of the Totara River Rail Bridge (Totara bridge). The purpose of this work is to understand the remaining life of the structure, particularly the main truss members, and to determine recommended improvements to ensure the main truss members are structurally adequate for the pedestrian/cyclist load demand they are subjected to. The scope of works carried out involved the following.

1. Structural Assessment on the main truss members to identify required capacity.
2. Visual inspection of the bridge members to assess current condition.
3. Developing a cost estimate schedule for repair work required.

1.2 Previous Inspection

In 2010, MWH undertook a baseline Structural Condition Assessment on the Totara bridge for WDC. The tabled site notes established during this baseline assessment were utilised for the current scope of works to identify the magnitude of member condition deterioration. The previous assessment report conducted by MWH can be found in Appendix A.

1.3 Bridge Inspection

The inspection was carried out over three days on 10, 11, and 12 May 2023 respectively. The inspection consisted of systematically inspecting each member from the cycleway bridge deck, and the riverbed where practicable. Site notes from the previous MWH inspection component condition schedules were updated during the inspection, utilising this as a condition baseline from 13 years ago. The truss components were inspected in detail and the other components inspected in less stringent detail.

2 Bridge Description

The Totara bridge is located approximately 3 km from Ross, in the Westland Region. The bridge was built circa 1909 and once formed part of the Hokitika to Ross Railway Line which closed in 1980. The Totara bridge is now a part of the West Coast Wilderness Cycle Trail. Figure 1 below shows the general location of the bridge, in relation to the Ross township.

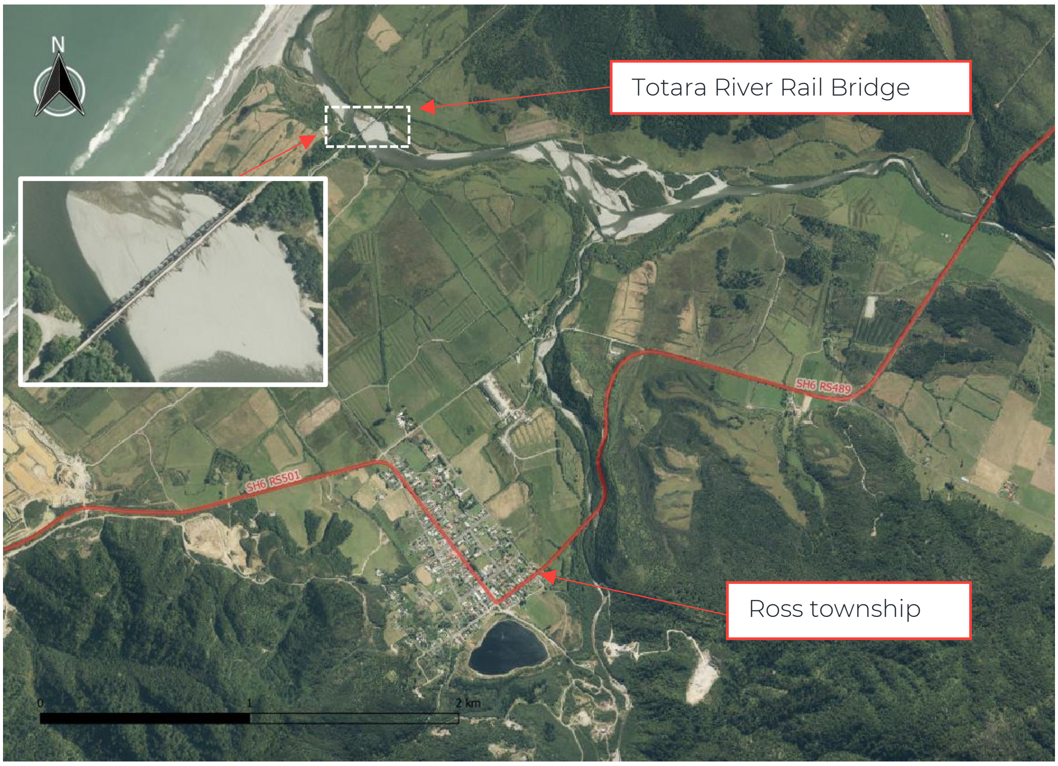

Figure 1: Aerial image mapping of site location of Totara River Rail Bridge
- (QGIS NZ Imagery Basemap, (Nov 2016))

Totara bridge is around 130m meters in length and comprises of nine spans; the first two spans at each end are simply supported timber land spans and the central five spans are typical Howe Trusses designed by the New Zealand Public Works Department. The central truss spans are around 24.4 m in length each. The bridge is predominantly constructed with imported Mixed Australian Hardwood (MAH) beams and piles and have been in service for 114 years.

The naming convention adopted for this assessment was to label the supports “A” through to “J”, with “A” the northernmost abutment, closest to Hokitika and on the true right of the river, and “J” the southernmost abutment, closest to Ross on the true left of the river. The spans of the bridge were labelled as the supports they spanned; from span “AB” between support “A” and “B” and so on.

Figure 2 below is a photo of the bridge towards the upstream direction, also showing the current location of the river channel, and the vegetation around the outside supports.

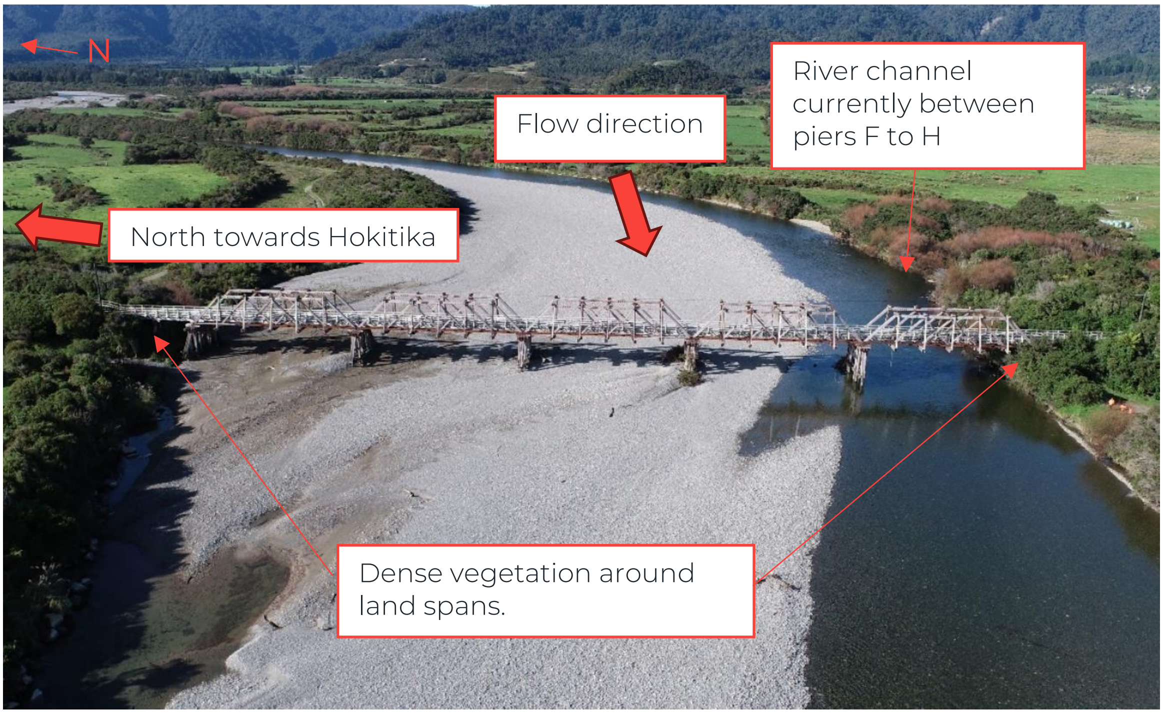

Figure 2. Overview photo of the Totara Bridge showing general site conditions

As seen in Figure 2 above, the central five spans are truss spans which were the main consideration for this structural assessment. These five truss spans assumed the typical design as shown in the elevation below (Figure 3). Also in this figure are the component labels adopted from the MWH assessment and used as naming convention.

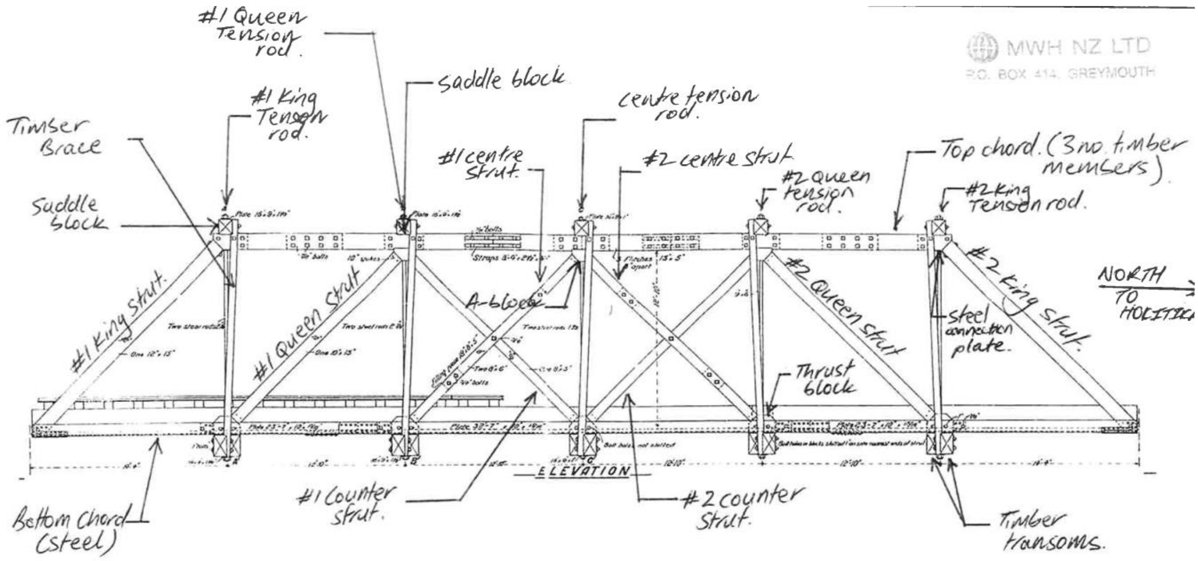

Figure 3. Typical truss elevation showing naming conventions.

3 Structural Assessment

3.1 Structural Assessment Threshold Capacities

The structural assessment was undertaken to determine the threshold section capacity of the main truss members. The threshold capacities for each member can be seen below in *Table 2*. They reflect the tolerance against section loss/decay and represent the minimum acceptable residual capacity of each member to provide adequate strength for the cycleway load demand. The full assessment report can be found in Appendix B. The assessment only considered the main truss members and did not consider secondary members or connections.

Table 2. Minimum Required Threshold Capacities Determined through Structural Assessment of Main Truss Members Under Pedestrian/Cyclist Loading Demand

Member	Threshold Capacity
Top Chord	55%
Bottom Chord	50%
King Strut	70%
Queen Strut	75%
Centre Strut	55%
Counter Strut	50%
Hanger/tension rod	50%
Transom	55%
Deck Cross Bracing	50%
Timber Brace	50%

4 Bridge Inspection

Member condition was visually estimated (i.e. interior defects cannot be quantified) during the site inspection. As condition was only visually assessed on site, specific investigation such as drilling will be required to determine specific condition.

4.1 Inspection Methodology

During the site inspection, the deterioration of each member was visually estimated as a percentage of its original condition. Member conditions were allocated into four priority categorisations, which reflect the level of deterioration and/or the capacity requirements determined form the structural assessment. The four priorities, timeframes for intervention, and descriptions are listed below.

1 Urgent Priority – to be repaired or replaced within 6 months.
Critical deterioration of the member, requiring immediate replacement due to extent of section loss or other visible defects.
OR
Impact on member capacity, estimated as greater than 10% below the threshold capacity, requires further investigation[1].

2 High Priority – to be repaired or replaced within 2 years.
Deterioration is visually significant and requires further investigation in the immediate future. This may show that repair /replacement is required.
OR
Impact on member capacity, estimated as 0% to 10% below the threshold capacity, requires further investigation[1].

3 Medium Priority – to be repaired or replaced between 2 – 10 years.

[1] Further investigation of timber components likely to require drilling.

Minor repair required or monitor through future inspections.
OR
Impact on member capacity, estimated as 0% to 20% above the threshold capacity.

4 Low Priority – to be repaired or replaced in 10+ years or as deterioration progresses.
Lightly deteriorated members.
OR
Impact on member capacity, estimated as greater than 20% above the threshold capacity.

Members identified in the urgent or high priority level should undergo specific investigation to determine capacity of the member. If threshold capacity has been reached, repair or replacement is required. It is anticipated that the condition of specific elements proposed for repair is verified at the time of scoping for each tranche of repair work.

4.2 Site Inspection Exclusions

The main objective was to inspect and assess the truss elements. The simply supported spans and substructure were also inspected, but in less detail. There are several aspects which were excluded from the site inspection as listed below.

- Timber members were not drilled to determine interior deterioration. Members were only visually inspected.
- The existing ground below piles was not excavated for inspection.
- Road beams were only inspected from the riverbed due to the cycleway deck covering the deck from above.
- Span GH was not inspected from the riverbed due to the river channel, with span FG inspected from the edge of the river channel.
- The packers between the pile cap and the beam corbels, perpendicular to the corbels were generally not inspected due to not easily being visible.
- The top side of the top chords were unable to be visually inspected. UAV footage was able to be reviewed to confirm their condition.
- The cycleway elements appear to generally be in good condition; however, they were not inspected in detail as they are beyond the scope of the work.

4.3 Site Inspection Results

The full set of site notes from the site inspection is included in Appendix C. General comments from the site visit, and deterioration trends observed since the previous inspection are provided below in Table 3. Appendix D includes photos which demonstrate defects and signs of decay typically observed during the site inspection.

Table 3. General Site Comments

Member	Comments
All timber members	Significant deterioration and end decay, especially where in permanent shade. Timber elements weathered on top surfaces, ponding water leading to decay. Decay in timber components is often internal and not visible on the surface. Drilling required to quantify degree of deterioration.
All steel components	Since last inspection, the steel components have deteriorated significantly. Many deck plan bracing rods broken, bottom

Member		Comments
		chord and hanger rod members at or approaching critical levels of deterioration. Note that deterioration of steel components is easier to assess visually.
Trusses	Hanger/vertical tension rod	Tension rod corrosion advancing. Bottom plates of tension rods corroded.
	Timber Saddle block	Significant deterioration saddle block end decay in downstream faces. Downstream ends of saddle blocks heavily decayed (>50%).
	Bottom Chord	Significant deterioration.
Beams	Corbels	Significant deterioration of packers below beam corbels. Corbels had corroded bolts and nuts.
	Deck bracing	Significant deterioration bracing (plan) rods. Bracing couplers heavily corroded.
Piers	Pile	Top of piles decayed. Vegetation debris on piers E, F, G causing minor local scour currently. Possible bank escarpment around Pier H but currently well vegetated above. Dry bed level approx. 600 mm below bottom of whalings at bridge, slight local depression compared to upstream and downstream.
	Whalings	Significant deterioration whaling timbers.
	Pile cap	Significant deterioration of pier cap timbers (end splitting), and packers between pile caps decayed.

The sum of the members for each priority group is shown in Table 4 below. Truss members which were replaced since the previous inspection were not included as they had not yet exhibited signs of deterioration.

Table 4. Priority Groups of Main Truss Members Results

	Priority			
Member	Urgent	High	Moderate	Low
Top Chord	0	1	15	24
Bottom Chord (pier to pier)	0	4	6	0
Struts	10	20	26	24
Hanger/tension rod	6	13	40	29
Transom	0	3	9	38

	Priority			
Member	Urgent	High	Moderate	Low
Deck Cross Bracing	40	7	9	3
Timber Brace	0	5	4	19
Sum	56	53	109	137

5 Cost Estimates

5.1 Rough Order Cost to Strengthen

Without undertaking specific design, only rough order cost estimates can be provided. The rough order cost for repairing each member types were developed and are shown below in Table 5.

Table 5. Rough Order Unit Costs for Member Repair

Item	Rough Order Unit Costs (+/- 25%)
Preliminary & General	10% of the overall project costs.
Access for repairs	$100k
Cranage	$100k (estimated as $1k/day for 100 days)
Top Chord	$7k (each)
Bottom Chord	$45k (per side)
King Strut	$8.5k (each)
Queen Strut	
Centre Strut	
Counter Strut	
Hanger	$5.5k (each)
Transom	$15k (each)
Deck Plan Cross Bracing	$5.5k per brace rod (single)
Timber Brace	$3.5k (each)

The rough order costs listed above will require review when specific investigation and design has been carried out to increase accuracy. The rough order costs for access and cranage of components are indicative only and will be subject to change based on specific work to be undertaken during each tranche of repair work. Repetitive access to spans during each tranche of work will reincur the cost of establishing access.

The rough order unit costs in Table 5 above were used to estimate the rough order cost for each of the four priority categories, and these are shown in Table 6. The number of components requiring strengthening or repair is subject to change following specific investigation, such as drilling, to determine specific component condition.

Table 6. Rough Order Costs for Each Priority Group

Item		Priority (timeframe)			
Item		Urgent (6 months)	High (2 years)	Moderate (2-10 years)	Low (10+ years)
Preliminary & General		$68k	$94k	$191k	$234k
Access for repairs[2]		$200k	$200k	$200k	$200k
Members	Top Chord	$0	$7k	$105k	$168k
	Bottom Chord	$0	$180k	$270k	$0
	Struts	$85k	$170k	$221k	$204k
	Hanger/tension rod	$33k	$72k	$220k	$160k
	Transom	$0	$45k	$135k	$570k
	Deck Cross Bracing	$220k	$39k	$50k	$17k
	Timber Brace	$0	$18k	$14k	$67k
SUM		$606k	$821k	$1.367M	$1.558M

5.2 Cost Estimate Schedule

The basis used to develop the cost estimate schedule is described below.

- It is strongly recommended to undertake drilling to specifically investigate the condition of each member. Results from drilling are required to accurately scope and design repair requirements. From detailed design a more accurate strengthening or replacement schedule can be developed.
- To reduce cost incurred for access and cranage, it is recommended to undertake the urgent and high priority work simultaneously. The potential economic benefit of grouping these works could be around $200k or potentially more due to time and resource efficiencies.
- For preliminary budgeting, it is recommended to allocate a percentage of the expected cost of repair work under the moderate priority as contingency for members which, following drilling investigation, may become high priority work.
- Strengthening costs have been estimated for the main truss members only. In addition to these costs, secondary components, connections, the sub-structure, piles, simply supported spans etc will also have strengthening or replacement needs. A high-level estimate for the strengthening or replacement has been allocated for these components but remain indicative until further investigation is undertaken to determine specific condition and required work. A high-level estimate of $250k in the high priority timeframe (2 years), and $300k in the moderate priority timeframe (2-10 years) has been allocated. These are high level estimates made under the assumption these components do not urgently need repair, and reflects continuation of deterioration over time, with a greater number of components requiring strengthening in the two-to-ten-year timeframe.
- It should be noted that the piles are of concern and the cost of underpinning, if required, would significantly increase the overall cost.

[2] The access and cranage costs represent site costs which will be incurred during each tranche of repair work, the estimated costs are indicative only and will be subject to change based on specific work which will be undertaken during each tranche of repair work.

On the basis listed above, the cost estimate schedule shown is shown in Table 7 below was developed.

Table 7. Cost Estimate Schedule for Required Strengthening

Timeframe	Description	Cost Estimate
Immediate	$150k – indicative cost for recommended drilling investigation.	$150k
6 months	$606k – Urgent priority components. $821k – High priority components. Recommend undertaking high priority work at the same time as the urgent priority for economic efficiencies. $137k – 10% of moderate priority components. This is a contingency amount in place for the components which may move from moderate to high priority following drilling investigation. $250k – indicative estimate for the urgent or high priority components of the secondary truss components, the sub-structure, simply supported spans etc.	$1.814M
2-10 years	$1.230M – Moderate priority components minus the 10 percent considered in the first tranche of repair works. Residual moderate components will likely hold up and not require strengthening or replacement until further along towards the 10-year timeframe. $300k – indicative estimate for the moderate priority components of the secondary truss components, the sub-structure, simply supported spans etc. Ongoing monitoring should be undertaken to ensure rate of deterioration does not increase requiring earlier intervention.	$1.530M
10+ years	$2.125M – Low priority components which are at low risk of reaching threshold capacity. Ongoing monitoring should be undertaken to ensure rate of deterioration does not increase requiring earlier intervention.	$2.125M
TOTAL	Excluding detailed design and construction monitoring.	$5.619M

Please note, the rough cost estimates are within +/- 25% accuracy. The high-level estimates for the other cost components are indicative only.

6 Assessment Summary

General findings from the visual site investigation identified all timber members had significant deterioration and end decay, especially where in permanent shade. Since the previous inspection undertaken by MWH in 2010, the steel components have deteriorated significantly. Many deck plan bracing rods are broken, the bottom chord and hanger rod members are at or approaching critical levels of deterioration.

The cost estimate schedule developed for the bridge is shown in Table 6 above and has been developed from visual site inspection, rough order unit costs for repairing the main truss members, and high-level estimates for other cost components. Drilling is required to specifically identify the condition of each component to determine components requiring strengthening or replacement. The cost estimate schedule is subject to change following specific investigation and design.

7 Recommended Actions

- Drilling is strongly recommended to specifically identify the condition of each component to determine which components require strengthening or replacement. The cost estimate schedule is subject to change following specific investigation and design.
- A present value end of life (PVEOL) or similar assessment should be undertaken to compare maintenance costs with the cost of establishing an alternative crossing. Given the amount of current deterioration of the bridge and strengthening required, the PVEOL should be used to compare the cost of any repairs against the value of the bridge. As the bridge is now utilised as a cycleway bridge, the replacement value for a cycleway bridge is roughly $2.03M[3]. Total sum cost of remedial works and future inspections will exceed the replacement value of a cycleway bridge.
- Discussions should be held with Heritage New Zealand Pouhere Taonga (HNZPT) regarding the heritage status of this structure. Strengthening or repair work may be influenced by this as work my result in loss of the historic fabric and character of the bridge. The bridge is not listed as a heritage structure with HNZPT, nor identified as a Historic Place in the WDC District Plan. However, as it was built in the 1800's it holds heritage value.

7.1 Other Considerations

- The existing bridge is potentially at risk to other vulnerabilities which were not investigated or discussed during this visual assessment. Examples of vulnerabilities could include risk to scour, or seismic loading, pile reduction due to abrasion (below the current bed level) and pile damage due to log loading given its demanding operating environment.
- A new structure could be in a location less vulnerable to the environment. This could be further upstream with a cycleway diversion.
- Repairs consisting of steel augmentation with protective coating systems would require first minor maintenance within 15-20 years at best in this environment and would add to the ongoing future maintenance costs.

[3] Replacement Value (non-depreciated, based on cycleway dimensions)
Deck area = 2m wide x 145m long = 290m2
Replacement rate = $7,000/m2 (From Waka Kotahi valuation rates June 2022)
Replacement value = $2.03M
Waka Kotahi valuation rates are likely higher than the cost of a cycle bridge but provide an indicative value for the cost estimate for a replacement cycleway bridge.

Appendix A
MWH Assessment Report

MWH

BUILDING A BETTER WORLD

REPORT

Totara River Bridge
Structural Condition Assessment - Preliminary

Prepared for Westland District Council

AUGUST 2010

This document has been prepared for the benefit of Westland District Council. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.

This disclaimer shall apply notwithstanding that the report may be made available to other persons for an application for permission or approval to fulfil a legal requirement.

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REVISION SCHEDULE

Rev No	Date	Description	Prepared By	Reviewed By	Approved By
1	Dec 09	Draft for Client Comment	JD	JS	J Strange
2	Aug 10	Final	JD	JS	J Strange

WESTLAND DISTRICT COUNCIL

Totara River Bridge
Structural Condition Assessment – Preliminary

CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 Executive Summary

This report was prepared for the Westland District Council to assess the structural condition of the Totara River Bridge.

The on-site visual condition assessment showed that there are considerable variations in the condition of the various structural members. A large portion of the structural members are in sound condition and require only treatment to treat decay and weathering that has occurred and to prolong the life of the members. A small portion of the members have undergone significant decay and corrosion and now require replacement. The remaining members require further investigation to determine if treatment or replacement is required.

Intrusive investigations and detailed structural analysis were not carried out as part of this assessment.

We recommend the following processes be carried out to determine the extent and cost of renewal and maintenance works on the bridge:

1. Carry out a structural assessment
2. Carry out intrusive investigation
3. Prepare recommendations for remedial and maintenance works to the bridge
4. Prepare rough order cost estimates for the renewal and maintenance works

2 Introduction

As requested by Westland District Council, MWH New Zealand Ltd carried out a visual baseline inspection of the Totara River Bridge.

The Totara River Bridge formed part of the Hokitika to Ross Railway Line which was closed in 1980. Westland District Council are proposing to use this bridge as a pedestrian / cycle bridge as part of a proposed cycle way between Hokitika and Ross.

3 Inspection

A visual baseline inspection was carried out over eight days on 19, 20, 21, 23, and 27 October and 03, 25, and 26 November. The inspection was carried out by John Strange and Jason Davidson. Assistance for inspection was provided by the following:

- Dean Arthur (Due West Ltd) - assistance with safety ropes and lines for all work at heights.
- Dave Hawes (Department of Conservation) - assisted with the inspection on 19 October to provide input into inspection and recording techniques, based on his previous experience with similar structures whilst working for NZ Rail and the Department of Conservation.

4 Bridge Description

The Totara River Bridge is the southernmost rail bridge on the old Hokitika to Ross Railway. The Railway was opened on 01 April 1909 following completion of the Totara River Bridge and closed 71 years later in November 1980[1]. Some time following the closure of the railway from Hokitika to Ross, the railway lines and decking on the Totara River Bridge were removed.

1. Mahinapua Creek Railway Bridge – Conservation Plan prepared by Chris Cochran, 30 July 1999

Following removal of the decking (sleepers) only the main longitudinal beams were left remaining. The bridge currently has a timber barrier / balustrade fixed to the downstream beam (refer Figure 4-4). We understand that the Westland District Council had this installed to enable walking access to be maintained across the bridge as the bridge is regularly used by a local farmer to access his land and livestock on the northern side of the Totara River.

The Totara River Bridge is a nine span timber bridge constructed predominantly of what we understand to be Australian Hardwood timbers, and "steel" bracing and tension members. There was a transition from the use of black iron to steel during the period from 1880 to 1910 and during this period it was common for both materials to be used in construction.

The bridge is made up of nine spans with the first two spans constructed using simply supported timber beams and the central five spans, being much longer are Howe Trusses. Figure 4-1 on the following page shows a typical Howe Truss and Table 4-1 below shows the construction of each span.

Table 4-1 : Bridge Spans

Span Number	Structure Description
Span #1	Simply supported timber beams
Span #2	Simply supported timber beams
Span #3	Howe Truss (Standard Railway 80ft truss)
Span #4	Howe Truss (Standard Railway 80ft truss)
Span #5	Howe Truss (Standard Railway 80ft truss)
Span #6	Howe Truss (Standard Railway 80ft truss)
Span #7	Howe Truss (Standard Railway 80ft truss)
Span #8	Simply supported timber beams
Span #9	Simply supported timber beams

The bridge superstructure is supported on timber piers. The timber piers supporting the longer Howe truss spans (river spans) consist of ten piles and the piers supporting the shorter simply supported spans (land spans) and forming the abutment walls consist of five and three piles respectively. Figures 4-2 and 4-3 on the following pages show typical piers supporting both river and land spans.

The hardwood piles forming the piers appear to have been driven and all piles generally have markings to enable the depth of pile below ground level to be determined.

A plan of the bridge which outlines the numbering system for the piers and spans etc is included in Appendix A of this report and Appendix B includes a typical drawing of an 80ft span Howe Truss.

Figure 4-1 : Typical Howe Truss Span (Span 6 – Downstream)

Figure 4-2 : Typical End Span (Spans 8 and 9 – Southern End)

Figure 4-3 : Typical River Pier (Pier No. 7)

Figure 4-4 : Typical View North Along Bridge

5 Bridge Inspection

5.1 Inspection Methodology

The structural inspection of the bridge involved visually inspecting all members / elements. In addition to the visual inspections, timber members were "hammer tested" to check for signs of internal decay. This involved striking the timber members with a hammer and listening to the pitch of the sound which alters with changes in timber density. Intrusive investigations were not carried out as part of these inspections.

In addition to this, excavations were carried out by Westroads Ltd with an excavator down alongside a number of piles to check the condition of these piles at and below existing ground level.

This inspection methodology was used to classify members into the following three categories:

1. ***Member sound, treatment only required***: Members in this category are typically sound and may or may not exhibit one or more of the following signs of decay:

    - No, or limited, signs of centre decay
    - No, or limited, sign of end decay
    - Minor isolated pocket decays
    - Minor surface weathering / decay
    - Minor splitting and associated decay
    - Corrosion of steel members

    In some instances, an assumption has been made during the inspection as to the required member capacity for the intended future use of the structure. Taking this into account some members with greater decay / corrosion have been classed as "sound – treatment only" if they appear to have a sufficient amount of redundancy. For example a steel member with corrosion that has reduced the cross section considerably but which is likely to have sufficient redundancy for the intended future use of the structure.

2. ***Further investigation required***: Members in this category are suspect and exhibit one or more of the following signs of decay:

    - Signs of centre decay where the extent of the decay is unknown (i.e. dull sound)
    - Significant end decay extending into / along member where the extent is unknown
    - Significant pocket decays where the depth / extent is unknown
    - Significant splitting and / or decay where the depth / extent is unknown
    - Heavy corrosion of steel members

    Further investigation is likely to involve core drilling of timbers to assess the extent of any decay and in a number of cases will also include a structural load assessment to determine the required size of members.

3. ***Member requires replacement***: Members in this category are typically heavily decayed or corroded. The following criteria has been used to classify members into this category and further investigation (i.e. structural calculations) may be required to confirm assumptions that have been made:

    - Steel members with >50% loss of cross section
    - Timber members that are decayed to an extent where treatment is no longer an option, i.e. large centre decays reducing cross section

The above classifications do take into account the intended future use of the structure, being a pedestrian / cycle bridge. These classifications therefore take account of the significant redundancies in some members and some assumptions have been made on site as to the required capacity / size of some members for the intended future use of this structure.

Figures 5-1 to 5-4 below and on the following pages show the classification of some structural members.

Figure 5-1 : Top Chord of Timber Trusses – Minor Weathering / Splitting Only, "Sound"

Figure 5-2 : Saddle Block – Large Centre Decay Back Beyond Tension Rod, "Requires Replacement"; A-Block (Top Thrust Block), "Sound"

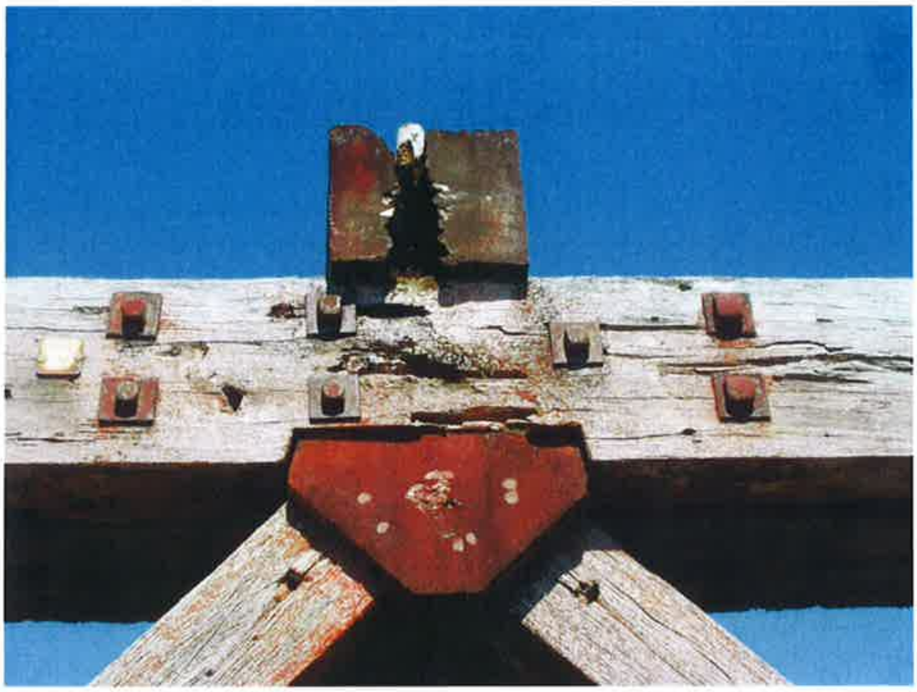


Figure 5-3 : Lateral Braces – Members Completely Decayed at Ends, "Requires Replacement"

Figure 5-4 : King Strut – Significant Surface Decay, Pocket Decay and Splitting, "Investigate Further"

The structural inspections were carried out by John Strange (Senior Engineer) and Jason Davidson (Structural Engineer). Dave Hawes (Department of Conservation) also spent one day (19 October 2009) on site assisting with the structural inspections.

5.2 Inspection Results

The structural inspection of the bridge showed that there is considerable variation in the condition of the various structural elements. When this structure was in service it was subject to regular checks and maintenance by Railways. When timber members were replaced by Railways, the date was chiselled into the surface of the new timber to indicate its age. There are a large number of timber members that have been replaced with dates ranging from 1928 for the earliest replacements to 1978 for the last members replaced before closure of the railway line. A number of those members replaced have been replaced with second hand members, denoted by an "SH" chiselled into the face of the member with the date of replacement. Many of these timber members that have been replaced, and particularly those replaced toward the end of the bridges service period, are in noticeably better condition than those older timber members.

As a result of the exposed location of the bridge in close proximity to the sea, some elements have undergone significant weathering, particularly where they face the prevailing westerly winds. Steel elements including cross bracing, tension rods, bottom truss chord and bolts are typically heavily corroded. Timber members show various signs of decay including surface decay and weathering (particularly on faces exposed to the prevailing weather), small isolated pocket decays typically where there are penetrations in the wood surface allowing moisture into the timber, end decays where the ends of the timber members are exposed to the weather and centre decays where the softer centre of the hardwood timber members have started to decay.

Detailed inspection results are included in Appendices C, D, E and F of this report.

6 Recommendations

We recommend that to more accurately quantify the extent and cost of remedial and maintenance works required to bring this structure up to a standard suitable for a pedestrian / cycle bridge, the following works be carried out:

1. ***Structural Assessment:***

Carry out a desktop structural assessment to determine required sizes of members (steel and timber) for the future intended purpose of the structure.

This would include modelling the bridge to assess loads through individual members and connections and enable treatment or replacement of members to be more accurately quantified.

2. ***Intrusive Investigation:***

Following determination of member and connection requirements by structural assessment, those members currently classified as "investigate further" could be investigated by intrusive methods to confirm whether or not they meet structural requirements. If so they would be reclassified as "treatment required" and if not would be reclassified as "require replacement".

Investigation would involve carrying out core drilling of timber members.

3. ***Recommendations for Renewal / Maintenance Works***

Prepare recommendations for renewal and maintenance works. These recommendations would be classified as immediate, short term and long term

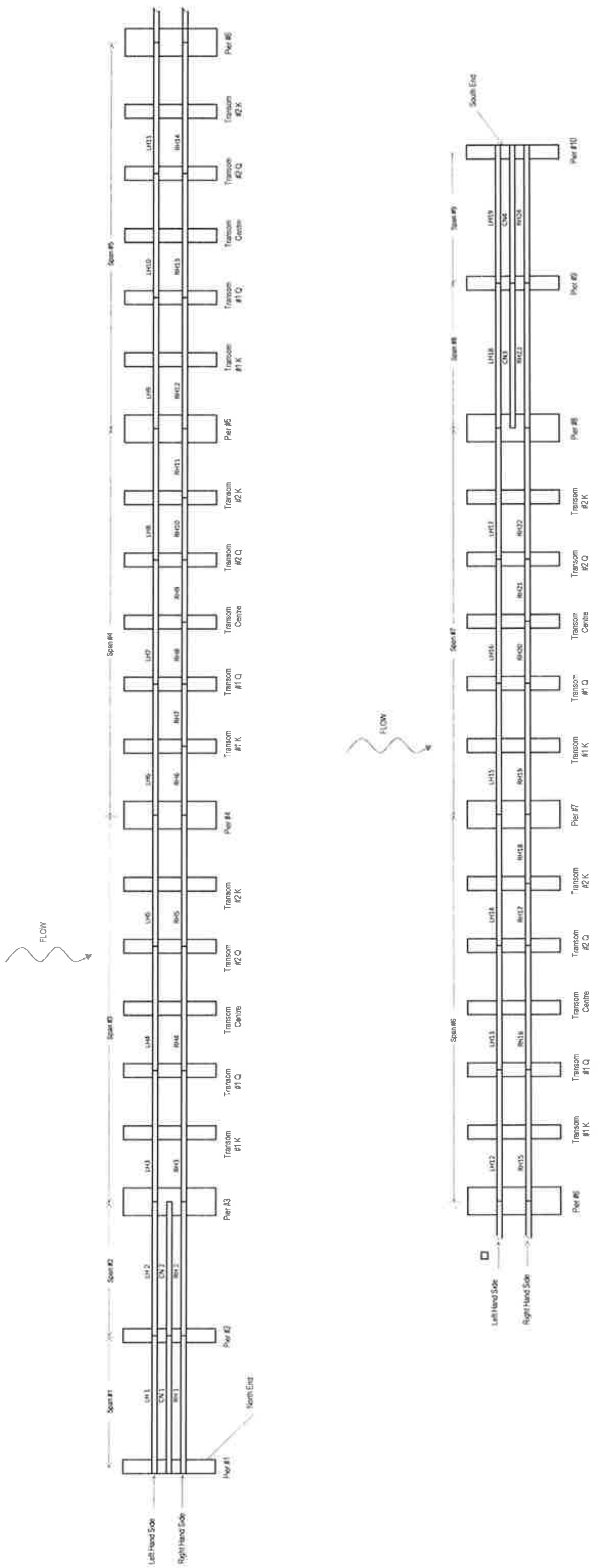
4. ***Rough Order Cost Estimates***

Prepare rough order cost estimates for renewal and maintenance works.

Appendix A:

- **Indicative Plan of Totara River Bridge**
- **Pier Pile Plan**
- **Truss Elevation**

(3 pages total)



PLAN - TOTARA RIVER BRIDGE

August 2010
Our ref 215487 WDC Totara River Bridge Appendix A Plan.docx
Status Final
Project number Z1548700

MWH

BUILDING A BETTER WORLD

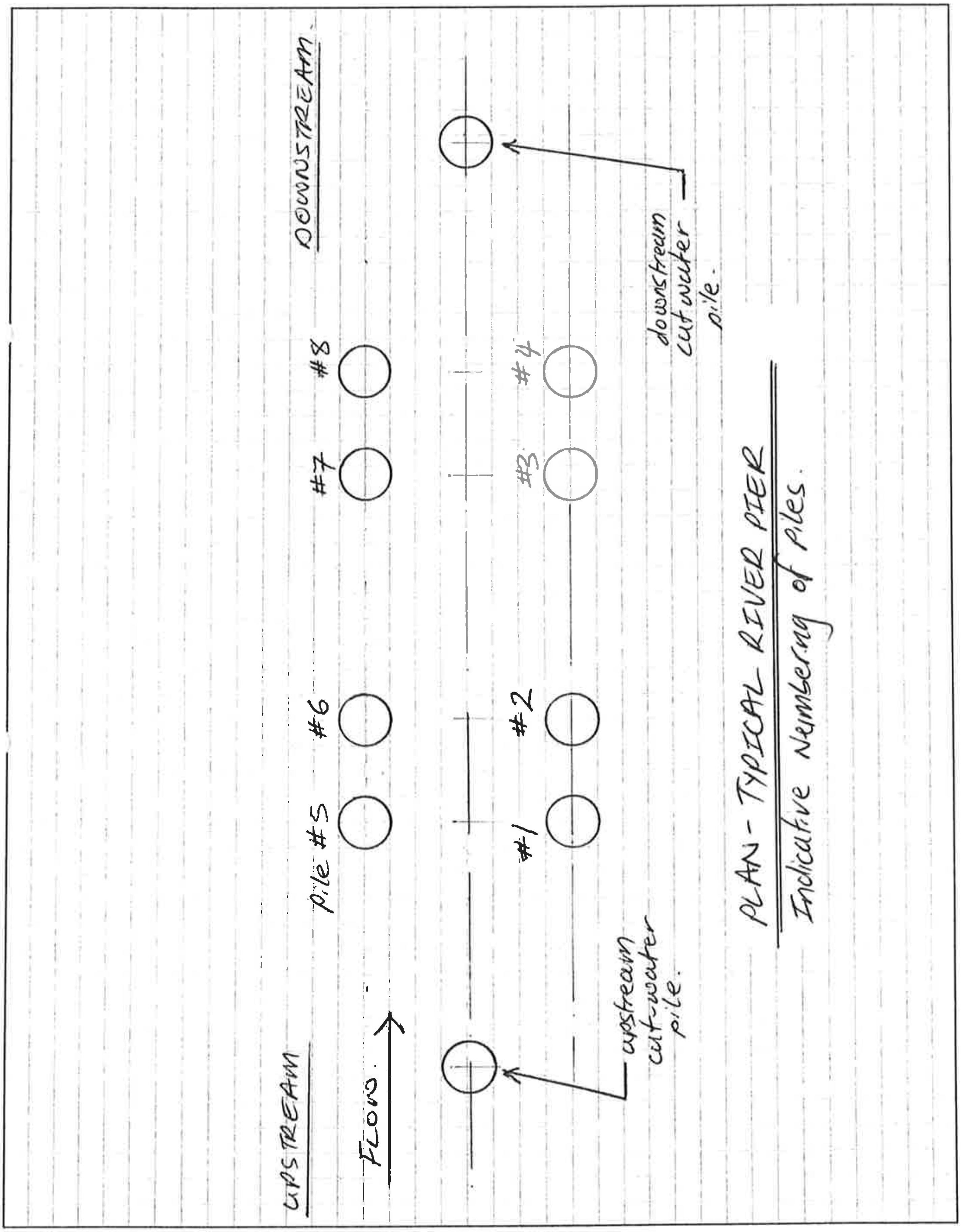
PROJECT: WDC Totara River Bridge
PROJECT NO.: Z1845400

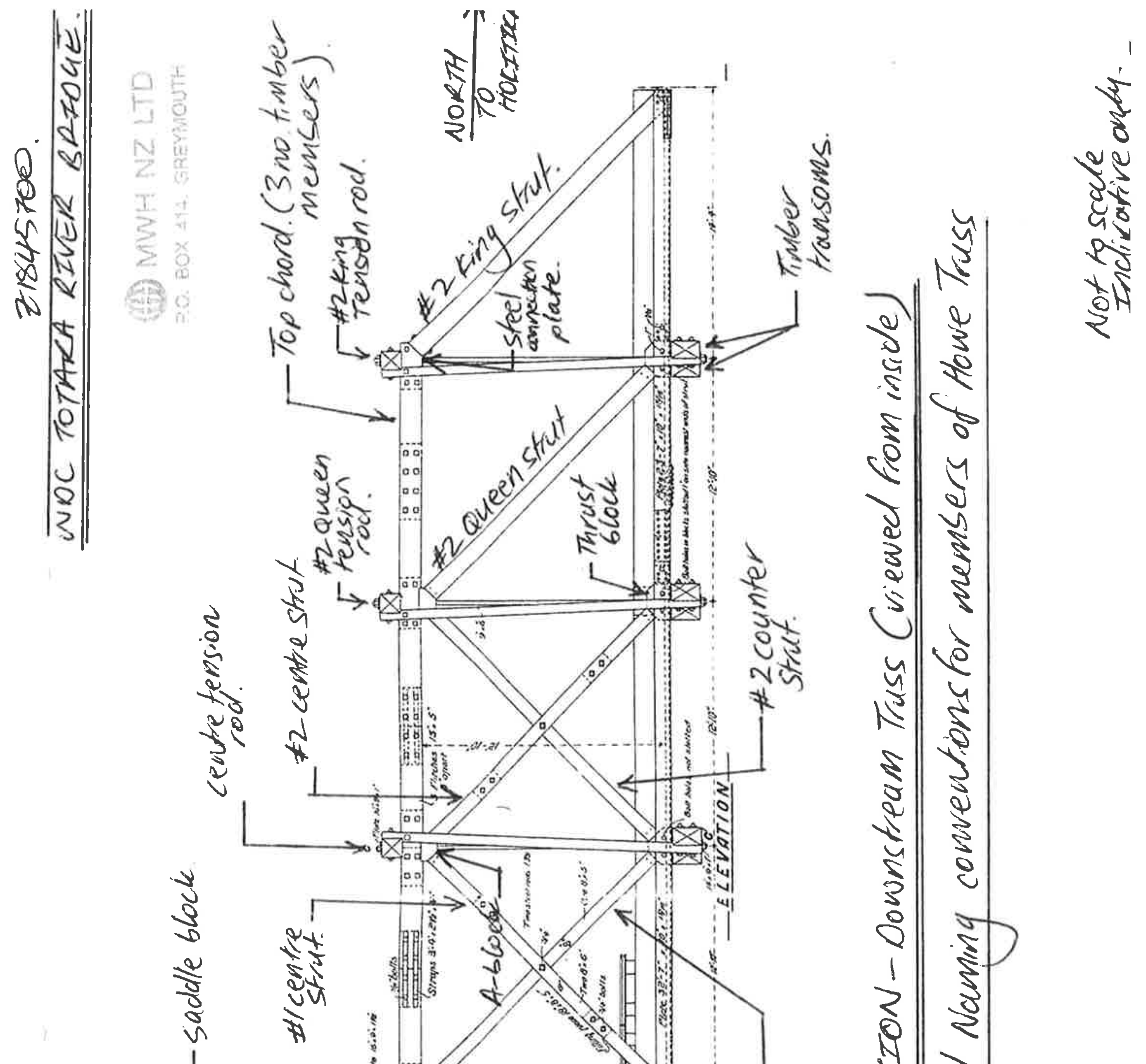
DESCRIPTION: PLAN - RIVER PIER (Numbering Convention

PREPARED BY: JKD
DATE:

CHECKED BY:
DATE:

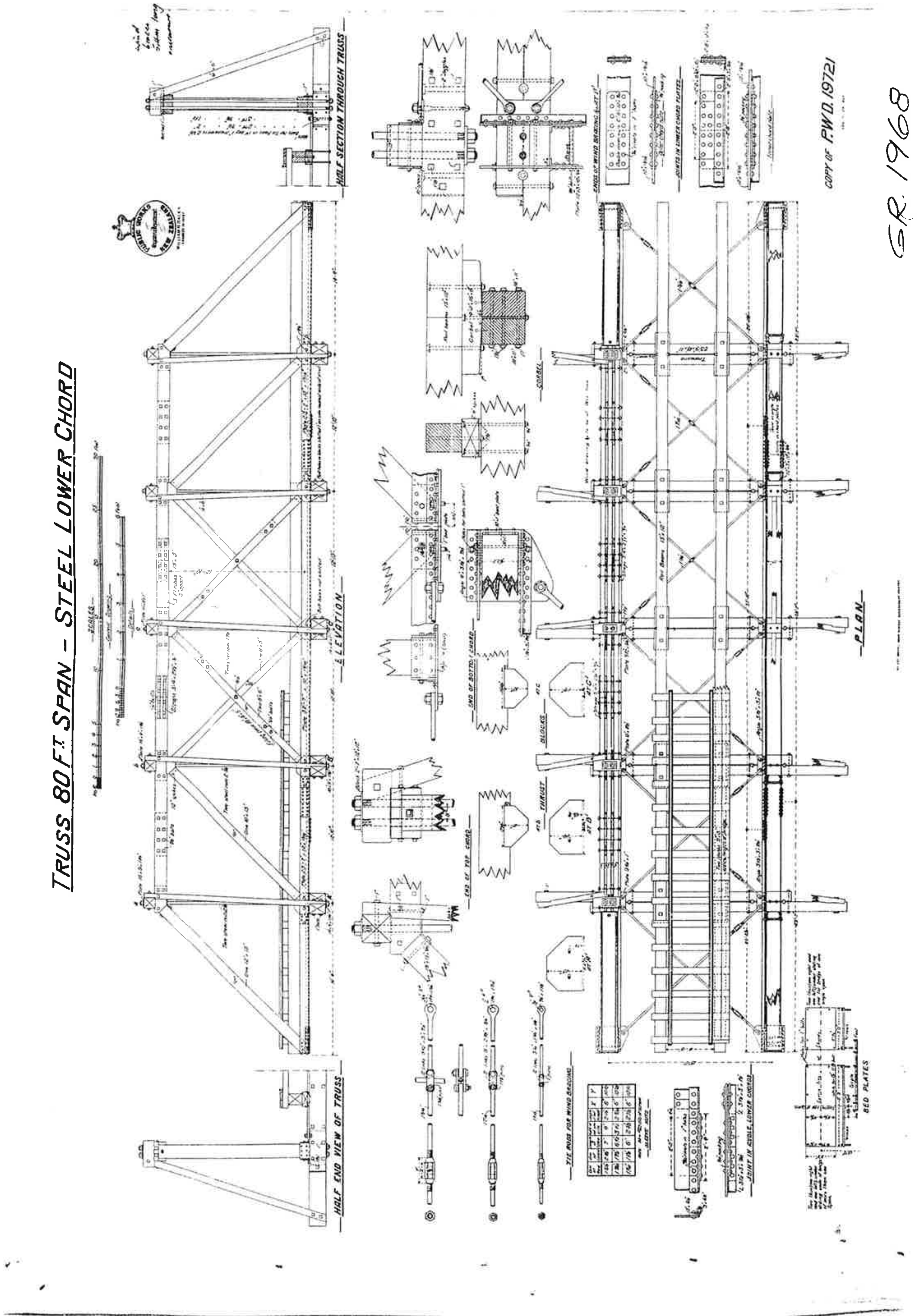
REF/DWGS:
SHEET: 1 OF: 1




Z18457OO.
WDC TOTARA RIVER BRIDGE.
MWH NZ LTD
P.O. BOX 414, GREYMOUTH
NORTH
TO HOKITIKA
Top chord. (3no timber members)
#2 King tension rod.
#2 King strut.
Steel connection plate.
Timber transoms.
#2 Queen tension rod.
#2 Queen strut
Thrust block
#2 centre strut
centre tension rod.
#2 counter strut.
ELEVATION
A-block
#1 centre strut.
saddle block
#1 Queen tension rod.
#1 King Tension rod.
#1 Queen strut
#1 counter strut.
#1 King strut.
Timber Brace
Saddle block
Bottom Chord (steel)
ELEVATION - Downstream Truss (viewed from inside)
Typical Naming conventions for members of Howe Truss
Not to scale
Indicative only.

Appendix B:

- **Typical Construction Drawing – 80ft Howe Truss**
  (1 page)


TRUSS 80 FT. SPAN - STEEL LOWER CHORD
ELEVATION
PLAN
HALF SECTION THROUGH TRUSS
HALF END VIEW OF TRUSS
END OF TOP CHORD
END OF BOTTOM CHORD
THRUST
BLOCKS
CORBEL
BED PLATES
TIE RODS FOR WIND BRACING
JOINT IN MIDDLE LOWER CHORD
JOINTS IN LOWER CHORD PLATES
ENDS OF WIND BRACING STRUTS
COPY OF P.W.D. 19721
GR 1968

Appendix C: Inspection Results – Trusses (10 pages)

Definition of terminology used

- "PDK" – Pocket Decay
- "EDK" – End Decay
- "CDK" – Centre Decay

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element		Structural Assessment / Recommendation			Estimated	Comments
				Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
3	LH	**Timber Struts**						
		#1 - King Strut			•		50%	Significant weathering and deep cracking top surface; bottom half section sound; large PDK at base
		#1 - Queen Strut			•		50%	Heavy weathering and deep cracking top surface; bottom half section sound;
		#1 - Counter Strut			•			Large split through centre; large PDK at base
		#1 - Centre Strut	- Inside		•			Bottom sounds drummy; PDK inside face; splitting
			- Outside		•			Large PDK at base; top surface weathering and splitting
		#2 - Centre Strut	- Inside		•			Sounds drummy,
			- Outside		•			PDK inside face; sounds drummy at top
		#2 - Counter Strut			•			Vertical splitting at top; sounds drummy
		#2 - Queen Strut			•		50%	PDK top face; weathering and splitting top face
		#2 - King Strut		•			50%	Large horizontal split inside face; significant weathering / splitting on top surface
		Vertical Steel Tension Rods						
		#1 - King Rods	- Inside	•			80%	Heavily corroded
			- Outside	•			70%	Heavily corroded
		#1 - Queen Rods	- Inside	•			70%	Heavily corroded
			- Outside	•			70%	Heavily corroded
		#1 - Centre Rods	- Inside	•			50%	Heavily corroded
			- Outside	•			50%	Heavily corroded
		#2 - Queen Rods	- Inside	•			80%	Heavily corroded
			- Outside	•			60%	Heavily corroded
		#2 - King Rods	- Inside	•			90%	Heavily corroded
			- Outside	•			70%	Heavily corroded
		Timber Thrust Blocks						
		#1 - King Timber Thrust Block		•				
		#1 - Queen Timber Thrust Block			•			Large PDK at outside rod
		Centre Timber Thrust Block		•				
		#2 - Queen Timber Thrust Block		•				
		#2 - King Timber Thrust Block		•				
		Timber A-Blocks						
		#1 - Queen A-Block		•				
		Centre A-Block		•				
		#2 - Queen A-Block		•				
		Timber Saddle Blocks						
		#1 - King Saddle Block				•		Large CDK; sounds hollow
		#1 - Queen Saddle Block			•			Weathered with large splits on top; sounds drummy
		Centre Saddle Block			•			Large CDK inside end
		#2 - Queen Saddle Block			•			CDK inside end; otherwise appears sound
		#2 - King Saddle Block		•				Typical EDK and weathering; otherwise sound
		Top Chord						
		#1 King - #1 Queen	- Inside			•		Large PDK; significant weathering
			- Middle		•			
			- Outside		•			
		#1 Queen - Centre	- Inside	•				
			- Middle	•				Significant weathering
			- Outside	•				Significant weathering
		Centre - #2 Queen	- Inside	•				Surface weathering
			- Middle	•				
			- Outside		•			Sounds drummy
		#2 Queen - #2 King	- Inside	•				
			- Middle		•			EDK at king strut; large PDK near #2 queen
			- Outside		•			Sounds Drummy
		Bottom Chord						
		Steel Bottom Chord		•			80%	Heavy corrosion, King strut seatings at piers sound
		Steel Connection Plates						
		#1 King Strut to top chord		•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord		•			80%	Heavily corroded; bolts gone
		Timber Braces						
		#1 - King Timber Brace				•		EDK top end
		#1 - Queen Timber Brace				•		EDK top end
		Centre Timber Brace		•				EDK top end; connection to saddle block OK, bolt / nuts corroded
		#2 - Queen Timber Brace				•		EDK top end
		#2 - King Timber Brace				•		EDK top end

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element	Structural Assessment / Recommendation: Sound / Treatment only	Structural Assessment / Recommendation: Investigate Further	Structural Assessment / Recommendation: Replace	Estimated % of Original Capacity	Comments
3	RH	**Timber Struts**					
		#1 - King Strut		•			Sounds Drummy
		#1 - Queen Strut		•			Replaced 1966; Sounds drummy lower portion
		#1 - Counter Strut	•				Vertical splitting through top surface full length
		#1 - Centre Strut - Inside		•			PDK at thrust block; Splitting and Pad top surface
		- Outside	•				PDK outside face around bolts
		#2 - Centre Strut - Inside		•			
		- Outside	•				
		#2 - Counter Strut	•				PDK outside face; vertical splitting
		#2 - Queen Strut		•			Surface weathering; dull sound at base
		#2 - King Strut		•			Surface weathering; insect holes noted near top
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			70%	
		- Outside	•			70%	
		#1 - Queen Rods - Inside	•			80%	
		- Outside	•			90%	
		#1 - Centre Rods - Inside	•			80%	
		- Outside	•			80%	
		#2 - Queen Rods - Inside	•			70%	
		- Outside	•			70%	
		#2 - King Rods - Inside		•		30%	
		- Outside		•		30%	
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block			•		Significant decay top surface; large PDK between rods and on outside of rods
		#1 - Queen Timber Thrust Block	•				
		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
		Timber A-Blocks					
		#1 - Queen A-Block	•				
		Centre A-Block	•				
		#2 - Queen A-Block	•				
		Timber Saddle Blocks					
		#1 - King Saddle Block		•			Large CDK inside end
		#1 - Queen Saddle Block	•				Typical EDK and weathering
		Centre Saddle Block	•				CDK inside end; significant decay / weathering on top surface
		#2 - Queen Saddle Block	•				
		#2 - King Saddle Block		•			Small CDK inside end; several PDK's on northern face
		Top Chord					
		#1 King - #1 Queen - Inside		•			Remove vegetation at end and investigate further
		- Middle		•			Replaced 1950; remove vegetation at end and investigate further
		- Outside		•			Remove vegetation at end and investigate further
		#1 Queen - Centre - Inside	•				Significant surface decay top surface
		- Middle	•				
		- Outside	•				
		Centre - #2 Queen - Inside	•				Surface decay inside face
		- Middle	•				Weathered
		- Outside	•				Weathered
		#2 Queen - #2 King - Inside		•			Replaced 1933 (second hand); large PDK inside face at bolt group
		- Middle	•				Weathered
		- Outside	•				Weathered
		Bottom Chord					
		Steel Bottom Chord	•			60 - 80%	Heavy corrosion, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			60%	Heavy corrosion; bolts gone
		#2 King Strut to top chord	•			90%	Heavy corrosion; bolts gone
		Timber Braces					
		#1 - King Timber Brace			•		EDK top end
		#1 - Queen Timber Brace			•		EDK top end
		Centre Timber Brace			•		EDK top end; large PDK (approx. half section gone)
		#2 - Queen Timber Brace			•		EDK top end; extensive splitting throughout
		#2 - King Timber Brace	•				PDK at connection to transom

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
4	LH	**Timber Struts**					
		#1 - King Strut	•			50%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull
		#1 - Queen Strut	•			50%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull
		#1 - Counter Strut	•				Small PDK inside face at base; splitting in top surface
		#1 - Centre Strut - Inside	•				Some splitting along inside face
		- Outside	•				Some surface splitting
		#2 - Centre Strut - Inside	•				PDK on top surface
		- Outside	•				Some splitting top surface
		#2 - Counter Strut	•				Split in top surface full length of member
		#2 - Queen Strut		•			Deep splitting / weathering in top surface
		#2 - King Strut	•				Replaced 1944
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			80%	Heavy corroded
		- Outside	•			80%	Heavy corroded
		#1 - Queen Rods - Inside	•			60%	Heavy corroded
		- Outside	•			80%	Heavy corroded
		#1 - Centre Rods - Inside	•			90%	Heavy corroded
		- Outside	•			60%	Heavy corroded
		#2 - Queen Rods - Inside	•			70%	Heavy corroded
		- Outside	•			70%	Heavy corroded
		#2 - King Rods - Inside	•			60%	Heavy corroded
		- Outside	•			60%	Heavy corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				
		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
		Timber A-Blocks					
		#1 - Queen A-Block	•				Small CDK
		Centre A-Block	•				
		#2 - Queen A-Block		•			CDK approx. 120mm diameter
		Timber Saddle Blocks					
		#1 - King Saddle Block	•				CDK inside end approx. 50mm diameter
		#1 - Queen Saddle Block	•				Surface decay on top extending down into saddle block
		Centre Saddle Block	•				CDK inside end approx. 40mm diameter
		#2 - Queen Saddle Block	•				
		#2 - King Saddle Block	•				CDK inside end approx. 20mm diameter; Pad at drill holes on northern face
		Top Chord					
		#1 King - #1 Queen - Inside	•				Weathered
		- Middle	•				Replaced 1933 (second hand); weathered
		- Outside	•				Weathered
		#1 Queen - Centre - Inside	•				Weathered
		- Middle	•				Weathered
		- Outside		•			Large PDK at end or flitch (approx. half section missing)
		Centre - #2 Queen - Inside	•				
		- Middle	•				PDK top surface and inside face; weathered
		- Outside	•				PDK top surface; weathered
		#2 Queen - #2 King - Inside	•				Weathered
		- Middle	•				Significant weathering and Isolated PDK
		- Outside		•			Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection
		Bottom Chord					
		Steel Bottom Chord	•			80%	Typically heavily corroded, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			90%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			80%	Heavily corroded; bolts gone
		Timber Braces					
		#1 - King Timber Brace	•				
		#1 - Queen Timber Brace	•				Nuts missing from bolts
		Centre Timber Brace	•				
		#2 - Queen Timber Brace		•			Large PDK at base; bolts fully corroded
		#2 - King Timber Brace	•				Split at bolt otherwise sound

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Span	Side	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
4	RH	**Timber Struts**					
		#1 - King Strut	•				Significant surface weathering top surface; several PDK top surface.
		#1 - Queen Strut	•				Weathered top surface
		#1 - Counter Strut		•			Split and PDK top surface
		#1 - Centre Strut - Inside	•				Some vertical cracking noted
		- Outside	•				Some vertical cracking noted
		#2 - Centre Strut - Inside		•			Some surface decay and splitting at base
		- Outside		•			Large vertical split full length; surface decay
		#2 - Counter Strut	•				Splitting in top surface full length
		#2 - Queen Strut		•			Cracking in top surface; sounds hollow from 1m below A-block
		#2 - King Strut	•				Weathered top surface; isolated PDK inside surface
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			50%	Heavily corroded
		- Outside	•			40%	Heavily corroded
		#1 - Queen Rods - Inside	•			30%	Heavily corroded
		- Outside	•			30%	Heavily corroded
		#1 - Centre Rods - Inside	•			40%	Heavily corroded
		- Outside	•			40%	Heavily corroded
		#2 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#2 - King Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				
		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
		Timber A-Blocks					
		#1 - Queen A-Block	•				
		Centre A-Block	•				
		#2 - Queen A-Block	•				Small CDK inside end
		Timber Saddle Blocks					
		#1 - King Saddle Block	•				Small CDK and splitting inside end; significant EDK outside end to beyond brace connection
		#1 - Queen Saddle Block	•				EDK outside end
		Centre Saddle Block	•				Advanced CDK
		#2 - Queen Saddle Block		•			Small CDK inside end; significant EDK outside end to beyond Timber brace connection; sounds hollow
		#2 - King Saddle Block		•			Large CDK inside end up to 150mm diameter; surface decay; sounds hollow; investigate and treat / replace
		Top Chord					
		#1 King - #1 Queen - Inside		•			Weathered; sounds hollow
		- Middle		•			Large PDK inside face approx. 50mm deep; weathered
		- Outside		•			Large PDK, approx half cross section missing
		#1 Queen - Centre - Inside	•				
		- Middle	•				
		- Outside	•				EDK at splice connection
		Centre - #2 Queen - Inside	•				Weathered
		- Middle	•				Weathered
		- Outside	•				Weathered; small PDK top surface
		#2 Queen - #2 King - Inside		•			Weathered; split; PDK inside flitch below saddle; sounds hollow
		- Middle	•				Weathered; split
		- Outside	•				Weathered; split
		Bottom Chord					
		Steel Bottom Chord	•			70%	Moderate to heavy corrosion, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•				
		#2 King Strut to top chord	•			70%	Heavily corroded
		Timber Braces					
		#1 - King Timber Brace	•				PDK at base; weathered and splitting
		#1 - Queen Timber Brace	•				Large split from top end through bolted connection; install split bolt
		Centre Timber Brace	•				
		#2 - Queen Timber Brace		•			Significant cracking; hollow sound
		#2 - King Timber Brace	•				Split in end; large PDK at connection to transom

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Span	Side	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
5	LH	**Timber Struts**					
		#1 - King Strut		•			Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull
		#1 - Queen Strut	•			50%	Weathered top surface with large splits down centre; PDK and split on underside
		#1 - Counter Strut		•			PDK top surface
		#1 - Centre Strut - Inside	•				Vertical splitting full length; some horizontal splitting on sides
		- Outside		•			Significant vertical splitting and decay of top surface; horizontal splitting inside face
		#2 - Centre Strut - Inside			•		Large horizontal crack full length; significant surface decay and PDK
		- Outside			•		Significant splitting and PDK at base; large split at top
		#2 - Counter Strut		•			PDK at thrust block; splitting at base; sounds dull
		#2 - Queen Strut				70%	PDK at base; significant weathering and cracking top surface approx 1/4 depth
		#2 - King Strut	•				Surface weathering on top surface
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			90%	Heavily corroded
		- Outside	•			90%	Heavily corroded
		#1 - Queen Rods - Inside	•			90%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#1 - Centre Rods - Inside	•			80%	Heavily corroded
		- Outside	•			60%	Heavily corroded
		#2 - Queen Rods - Inside	•			60%	Heavily corroded
		- Outside	•			60%	Heavily corroded
		#2 - King Rods - Inside	•			80%	Heavily corroded
		- Outside	•			90%	Heavily corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				
		Centre Timber Thrust Block		•			Some splitting and compression occurring
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
		Timber A-Blocks					
		#1 - Queen A-Block	•				Small CDK inside end
		Centre A-Block	•				Small CDK inside end; small PDK at strut
		#2 - Queen A-Block	•				Large CDK inside end approx. 100mm diameter
		Timber Saddle Blocks					
		#1 - King Saddle Block	•				Small CDK; large vertical split; treat and provide horizontal split bolts
		#1 - Queen Saddle Block	•				CDK approx. 80mm diameter inside end
		Centre Saddle Block	•				CDK inside end; PDK on south side
		#2 - Queen Saddle Block			•		Large CDK extending to top chord of truss (approx. 150mm diameter), extends to vertical tie rod
		#2 - King Saddle Block		•			Soft end; sounds dull
		Top Chord					
		#1 King - #1 Queen - Inside	•				
		- Middle	•				
		- Outside	•				Replaced 1940
		#1 Queen - Centre - Inside		•			Large PDK, approx. half section missing
		- Middle		•			Large PDK and split through side; sounds drummy
		- Outside	•				
		Centre - #2 Queen - Inside	•				Large vertical split approx. 50mm deep
		- Middle	•				
		- Outside	•				
		#2 Queen - #2 King - Inside		•			CDK at south end; large vertical split
		- Middle		•			Significant weathering; PDK inside face
		- Outside		•			Large PDK inside face, approx. half section gone;
		Bottom Chord					
		Steel Bottom Chord	•			70%	Heavily corroded, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			60%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			50%	Heavily corroded; bolts gone
		Timber Braces					
		#1 - King Timber Brace			•		EDK to beyond fixing bolt to saddle block
		#1 - Queen Timber Brace	•				
		Centre Timber Brace	•				Some end splitting
		#2 - Queen Timber Brace		•			CDK approx. 60mm diameter at top
		#2 - King Timber Brace		•			Large PDK south face; large split

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Span	Side	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
5	RH	**Timber Struts**					
		#1 - King Strut		•			Weathered top surface; decay to approximately half depth of member
		#1 - Queen Strut	•				Minor splitting in top surface
		#1 - Counter Strut	•				
		#1 - Centre Strut - Inside	•				Vertical splitting in lower half
		- Outside	•				Vertical splitting in lower half
		#2 - Centre Strut - Inside	•				
		- Outside	•				
		#2 - Counter Strut	•				
		#2 - Queen Strut		•			Surface decay at top; dull sound in lower portion, possible CDK
		#2 - King Strut	•				
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			90%	Heavily corroded
		- Outside	•			90%	Heavily corroded
		#1 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#1 - Centre Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#2 - Queen Rods - Inside	•			50%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#2 - King Rods - Inside	•			60%	Heavily corroded
		- Outside	•			60%	Heavily corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				
		Centre Timber Thrust Block	•				PDK top surface and inside contact area for #2 Counter Strut
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
		Timber A-Blocks					
		#1 - Queen A-Block	•				
		Centre A-Block	•				
		#2 - Queen A-Block	•				Small CDK inside end
		Timber Saddle Blocks					
		#1 - King Saddle Block	•				CDK inside end approx 50mm diameter; EDK outside end
		#1 - Queen Saddle Block	•				EDK outside end
		Centre Saddle Block	•				Small CDK and vertical split inside end; EDK outside end
		#2 - Queen Saddle Block	•				CDK inside end; EDK outside end
		#2 - King Saddle Block		•			CDK inside end approx. 70mm diameter; EDK outside end; PDK northern face
		Top Chord					
		#1 King - #1 Queen - Inside	•				
		- Middle	•				
		- Outside		•			PDK top surface approx 300mm long; PDK on underside
		#1 Queen - Centre - Inside	•				
		- Middle	•				Replaced 1976
		- Outside		•			PDK to half section depth
		Centre - #2 Queen - Inside	•				
		- Middle	•				
		- Outside	•				
		#2 Queen - #2 King - Inside	•				Replaced 1933 (second hand)
		- Middle	•				
		- Outside	•				
		Bottom Chord					
		Steel Bottom Chord	•			60-80%	Heavily corroded, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			60%	Heavily corroded; steel delaminating at edges
		#2 King Strut to top chord	•			60%	Heavily corroded; steel delaminating at edges
		Timber Braces					
		#1 - King Timber Brace	•				EDK at top connection; nut missing from bolted connection; extensive splitting
		#1 - Queen Timber Brace	•				Nut missing from bolt connecting to transom
		Centre Timber Brace	•				EDK and vertical split at top
		#2 - Queen Timber Brace	•				
		#2 - King Timber Brace	•				

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Span	Side	Structural Element	Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
6	LH	**Timber Struts**					
		#1 - King Strut	•			70%	Significant surface weathering and PDK in top surface; top 1/4 section no longer contributing to strength
		#1 - Queen Strut		•			Advanced surface decay top surface; splitting in top surface approx. 100mm deep
		#1 - Counter Strut	•			60%	Significant splitting on top surface and inside face, full length; PDK top surface; top 1/3 section no longer contributing to strength
		#1 - Centre Strut - Inside	•				Splitting in top surface; PDK near top
		- Outside		•			Splitting in top surface; PDK top surface and outside face
		#2 - Centre Strut - Inside		•			PDK at base; weathering of top surface
		- Outside	•				Weathering of top surface
		#2 - Counter Strut	•				Weathering and splitting of top surface; PDK top surface; some splitting in side at top
		#2 - Queen Strut	•				PDK and thrust block; weathered top surface
		#2 - King Strut		•			Replaced 1928; advance surface decay on top surface; PDK on sides and top surface; horizontal split bolts at top
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			70%	Heavily corroded
		- Outside	•			80%	Heavily corroded
		#1 - Queen Rods - Inside	•			60%	Heavily corroded
		- Outside	•			60%	Heavily corroded
		#1 - Centre Rods - Inside	•			70%	Heavily corroded
		- Outside	•			50%	Heavily corroded
		#2 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#2 - King Rods - Inside	•			95%	Light surface corrosion only
		- Outside	•			60%	Heavily corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block		•			Significant splitting and decay
		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block		•			Significant decay across top in line of tension rods.
		Timber A-Blocks					
		#1 - Queen A-Block	•				Small CDK inside end
		Centre A-Block	•				Small CDK inside end
		#2 - Queen A-Block	•				
		Timber Saddle Blocks					
		#1 - King Saddle Block		•			Significant EDK (approx 1/3 of end) extending to top surface; dull sound at top
		#1 - Queen Saddle Block	•				Replaced 1967; small CDK inside end; soft
		Centre Saddle Block		•			CDK inside end approx. 80mm diameter extending to base of saddle block
		#2 - Queen Saddle Block		•			CDK inside end extending up to top surface
		#2 - King Saddle Block		•			EDK inside end (approx. 1/3 of end); dull sound on northern face
		Top Chord					
		#1 King - #1 Queen - Inside	•				
		- Middle	•				Weathered
		- Outside	•				Weathered
		#1 Queen - Centre - Inside	•				
		- Middle	•				Weathered
		- Outside	•				Weathered
		Centre - #2 Queen - Inside	•				Horizontal splitting inside face
		- Middle	•				Isolated PDK
		- Outside		•			PDK inside face, approx. 50% loss of section
		#2 Queen - #2 King - Inside	•				Weathered
		- Middle	•				
		- Outside	•				Weathered; PDK
		Bottom Chord					
		Steel Bottom Chord	•			70%	Heavily corroded, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			80%	Heavily corroded; bolts gone
		Timber Braces					
		#1 - King Timber Brace	•				Splitting and surface decay at base; nut missing from bolt connecting to saddle
		#1 - Queen Timber Brace	•				Large split through centre; PDK outside edge near base; nut missing from bolt connecting to saddle
		Centre Timber Brace			•		Top end completed decayed
		#2 - Queen Timber Brace	•				
		#2 - King Timber Brace	•				

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Span	Side	Structural Element	Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
6	RH	**Timber Struts**					
		#1 - King Strut	•				Replaced 1977
		#1 - Queen Strut	•				Replaced 1965
		#1 - Counter Strut	•				
		#1 - Centre Strut - Inside	•				Surface weathering
		- Outside	•				Surface weathering
		#2 - Centre Strut - Inside	•				Surface weathering
		- Outside	•				Surface weathering
		#2 - Counter Strut	•				
		#2 - Queen Strut		•			Some hollowing in bottom end; PDK top surface
		#2 - King Strut	•				
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			60%	Heavily corroded
		- Outside	•			80%	Heavily corroded
		#1 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#1 - Centre Rods - Inside	•			80%	Heavily corroded
		- Outside	•			80%	Heavily corroded
		#2 - Queen Rods - Inside	•			95%	Very light surface corrosion
		- Outside	•			80%	Heavily corroded
		#2 - King Rods - Inside	•			90%	Light corrosion only
		- Outside	•			70%	Heavily corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				Small section missing from top outside of outside tie rod
		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				CDK started on outside face
		Timber A-Blocks					
		#1 - Queen A-Block	•				
		Centre A-Block	•				CDK inside end approx. 80mm diameter
		#2 - Queen A-Block	•				
		Timber Saddle Blocks					
		#1 - King Saddle Block	•				EDK at Timber brace connection
		#1 - Queen Saddle Block	•				Vertical split through inside face
		Centre Saddle Block			•		PDK; outside tension rod loose due to saddle block crushing
		#2 - Queen Saddle Block	•				EDK at Timber brace connection
		#2 - King Saddle Block	•				Significant EDK at outside end; up to 20% CDK inside end
		Top Chord					
		#1 King - #1 Queen - Inside	•				Splitting and PDK top surface; EDK and southern end
		- Middle	•				
		- Outside	•				
		#1 Queen - Centre - Inside	•				Splitting in top surface
		- Middle	•				
		- Outside	•				PDK
		Centre - #2 Queen - Inside	•				
		- Middle	•				
		- Outside	•				
		#2 Queen - #2 King - Inside	•				
		- Middle	•				
		- Outside	•				
		Bottom Chord					
		Steel Bottom Chord	•			80-90%	Light to moderate corrosion, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		Timber Braces					
		#1 - King Timber Brace	•				Significant splitting and PDK
		#1 - Queen Timber Brace	•				Split through centre at top end
		Centre Timber Brace			•		EDK top end
		#2 - Queen Timber Brace			•		EDK top end; large split through centre
		#2 - King Timber Brace	•				

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Span	Side	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
7	LH	**Timber Struts**					
		#1 - King Strut	•			70%	Extensive surface weathering and splitting
		#1 - Queen Strut	•				
		#1 - Counter Strut	•				
		#1 - Centre Strut - Inside			•		Large PDK inside face; splitting
		- Outside	•				Splitting and associated PDK; ropey top surface
		#2 - Centre Strut - Inside	•				Vertical splitting top surface; small PDK at base
		- Outside	•				Vertical splitting top surface
		#2 - Counter Strut	•				PDK both ends; some horizontal splitting; weathering and surface decay on top surface
		#2 - Queen Strut	•				Replaced 1960; Splitting and PDK top surface
		#2 - King Strut	•			70%	Vertical splitting and PDK top surface up to 60mm deep
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			95%	Light surface corrosion
		- Outside	•			60%	Heavily corroded
		#1 - Queen Rods - Inside	•			20%	Heavily corroded
		- Outside	•			40%	Heavily corroded
		#1 - Centre Rods - Inside	•			20%	Heavily corroded
		- Outside	•			40%	Heavily corroded
		#2 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			95%	Light surface corrosion
		#2 - King Rods - Inside	•			80%	Heavily corroded
		- Outside	•			90%	Heavily corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				Second hand (replaced); PDK top surface; small PDK inside of inside rod
		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				Second hand (replaced); Some decay along top through centre
		Timber A-Blocks					
		#1 - Queen A-Block	•				Split with some decay south edge
		Centre A-Block	•				Small CDK inside end; small PDK behind strut
		#2 - Queen A-Block	•				Small CDK and some splitting through end
		Timber Saddle Blocks					
		#1 - King Saddle Block		•			Large split inside end from top to centre; Significant EDK outside end; sounds hollow
		#1 - Queen Saddle Block		•			Large EDK extending full depth; sounds hollow underneath bolts
		Centre Saddle Block			•		Large CDK inside end full depth of saddle
		#2 - Queen Saddle Block	•				CDK starting at inside end with vertical crack
		#2 - King Saddle Block			•		Large CDK inside end through centre extending to top surface; outside end similar; sounds very hollow
		Top Chord					
		#1 King - #1 Queen - Inside	•				Replaced 1960; some splitting and PDK inside face
		- Middle	•				
		- Outside	•				Significant weathering and PDK inside face
		#1 Queen - Centre - Inside	•				Large PDK inside face
		- Middle	•				
		- Outside	•				Small PDK on top; splitting on inside face
		Centre - #2 Queen - Inside	•				Replaced 1960; Large split on inside face
		- Middle	•				Replaced 1960
		- Outside	•				
		#2 Queen - #2 King - Inside	•				Replaced 1960; PDK and splitting inside face
		- Middle	•				Replaced 1960
		- Outside	•				Weathered top surface
		Bottom Chord					
		Steel Bottom Chord	•			70-80%	Heavily corroded; Up to 50% loss in section between #2 King Rods and pier, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			60%	Heavily corroded; bolts gone
		Timber Braces					
		#1 - King Timber Brace			•		Large cracks; Large PDK below saddle block
		#1 - Queen Timber Brace	•				Large CDK at top (splice in short section at top?)
		Centre Timber Brace			•		EDK at top to beyond fixing bolt to saddle block
		#2 - Queen Timber Brace			•		EDK at top to beyond fixing bolt to saddle block
		#2 - King Timber Brace			•		Large PDK at base and mid height

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element	Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
7	RH	**Timber Struts**					
		#1 - King Strut	•				
		#1 - Queen Strut	•				Significant surface cracking top surface
		#1 - Counter Strut	•				
		#1 - Centre Strut - Inside	•				Some cracking and isolated PDK
		- Outside	•				Some cracking and isolated PDK
		#2 - Centre Strut - Inside	•				Split at top
		- Outside	•				Split with PDK at top
		#2 - Counter Strut			•		Significant loss of section at bottom end through decay otherwise sound; splice in a short length?
		#2 - Queen Strut	•				
		#2 - King Strut	•				Replaced 1933 (second hand); surface decay inside face
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			95%	Light surface corrosion only
		- Outside	•			95%	Light surface corrosion only
		#1 - Queen Rods - Inside	•			50%	Heavily corroded
		- Outside	•			50%	Heavily corroded
		#1 - Centre Rods - Inside	•			95%	Light surface corrosion only
		- Outside	•			50%	Heavily corroded
		#2 - Queen Rods - Inside	•			40%	Heavily corroded
		- Outside	•			40%	Heavily corroded
		#2 - King Rods - Inside	•			90%	Light corrosion only
		- Outside	•			90%	Light corrosion only
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				
		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
		Timber A-Blocks					
		#1 - Queen A-Block			•		CDK; PDK and splitting on counter strut side; signs of compression; replace within 5yrs
		Centre A-Block	•				Small PDK around strut
		#2 - Queen A-Block	•				
		Timber Saddle Blocks					
		#1 - King Saddle Block			•		CDK; PDK top at top
		#1 - Queen Saddle Block			•		Large CDK inside end; replace within 5 years
		Centre Saddle Block	•				EDK outside end
		#2 - Queen Saddle Block	•				Some surface decay and weathering
		#2 - King Saddle Block	•				EDK outside end
		Top Chord					
		#1 King - #1 Queen - Inside			•		PDK inside and outside faces at #1 Queen A-block
		- Middle	•				
		- Outside			•		Large PDK around bolts; completely gone near #1 Queen A-block
		#1 Queen - Centre - Inside			•		PDK inside and outside faces at #1 Queen A-block
		- Middle	•				
		- Outside			•		Large PDK around bolts; completely gone near #1 Queen A-block
		Centre - #2 Queen - Inside	•				
		- Middle	•				
		- Outside	•				PDK around bolts
		#2 Queen - #2 King - Inside	•				
		- Middle	•				Replaced 1974 (second hand)
		- Outside	•				
		Bottom Chord					
		Steel Bottom Chord			•	60%	Heavily corroded, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		Timber Braces					
		#1 - King Timber Brace			•		Large PDK at end
		#1 - Queen Timber Brace	•				
		Centre Timber Brace	•				Crack through centre (top half)
		#2 - Queen Timber Brace	•				Spilt through lower half of brace
		#2 - King Timber Brace	•				EDK top end

Appendix D: Inspection Results – Transoms (2 pages)

<u>Definition of terminology used</u>

- “PDK” – Pocket Decay
- “EDK” – End Decay
- “CDK” – Centre Decay

TOTARA RIVER BRIDGE - TRANSOMS

Span	Side	Structural Element	Structural Assessment / Recommendation			Estimated %	Comments
			Sound / Treatment only	Further Investigation	Replace	Original Capacity	
3	LH	#1 King Transom	•				Bolts heavily corroded
	RH	#1 King Transom	•				Replaced 1960
	LH	#1 Queen Transom	•				Condition of bolts is mixed
	RH	#1 Queen Transom	•				Replaced 1944; PDK downstream end
	LH	Centre Transom	•				Weathered
	RH	Centre Transom	•				Replaced 1977 (second hand); PDK top surface between road beams
	LH	#2 Queen Transom	•				Replaced 1977
	RH	#2 Queen Transom	•				Replaced 1960
	LH	#2 King Transom	•				Replaced 1977; small surface defect top surface between RH truss and RH road beam
	RH	#2 King Transom	•				Replaced 1967 (second hand)
4	LH	#1 King Transom		•			large CDK; Sounds hollow under road beams
	RH	#1 King Transom		•			Significant EDK upstream end; sounds hollow under truss
	LH	#1 Queen Transom		•			Sounds hollow under LH road beam
	RH	#1 Queen Transom	•				Honey combing and surface decay downstream end; large split between RH road beam and RH truss; small CDK upstream end
	LH	Centre Transom		•			Sounds hollow under LH road beam
	RH	Centre Transom	•				Isolated PDK south face; surface weathering and decay
	LH	#2 Queen Transom		•			Replaced 1960; large CDK downstream end extending back to thrust block; EDK upstream end; large PDK northern face between RH road beam and RH truss
	RH	#2 Queen Transom		•			Replaced 1960; EDK upstream end; condition of bolts is mixed
	LH	#2 King Transom	•				Condition of bolts is mixed
	RH	#2 King Transom	•				
5	LH	#1 King Transom	•				Replaced 1975
	RH	#1 King Transom	•				Some horizontal splitting downstream end; condition of bolts is mixed
	LH	#1 Queen Transom	•				Replaced 1977
	RH	#1 Queen Transom	•				Split through top at upstream end
	LH	Centre Transom	•				Replaced 1944
	RH	Centre Transom	•				Split through top at upstream end
	LH	#2 Queen Transom					
	RH	#2 Queen Transom		•			Significant EDK upstream end extending up to 1.5m from end; extensive surface decay on top surface; member collapsing inward; (likely replacement required)
	LH	#2 King Transom	•				Condition of bolts is mixed; 5 splice bolts between transoms are missing
	RH	#2 King Transom	•				

TOTARA RIVER BRIDGE - TRANSOMS

Span	Side	Structural Element	Structural Assessment / Recommendation			Estimated %	Comments
			Sound / Treatment only	Further Investigation	Replace	Original Capacity	
6	LH	#1 King Transom	•				PDK top surface; EDK upstream end; condition of bolts mixed
	RH	#1 King Transom	•				End splitting upstream end
	LH	#1 Queen Transom	•				Replaced 1944; condition of bolts is mixed
	RH	#1 Queen Transom	•				
	LH	Centre Transom	•				large CDK / EDK upstream end; surface decay / weathering on top surface
	RH	Centre Transom	•				Weathered; large horizontal split through side at upstream end - install vertical split bolts
	LH	#2 Queen Transom	•				Splitting downstream end; significant horizontal splitting upstream end - install vertical split bolts
	RH	#2 Queen Transom	•				Weathered
	LH	#2 King Transom		•			CDK downstream end; large PDK south face; PDK upstream face; hollow sound from LH truss to end
	RH	#2 King Transom	•				Weathered; splitting on north and south face with associated decay
7	LH	#1 King Transom		•			Small EDK upstream end; splitting; sounds drummy
	RH	#1 King Transom	•				
	LH	#1 Queen Transom	•				Large CDK downstream end; significant weathering; PDK
	RH	#1 Queen Transom	•				large CDK upstream end; splitting both ends; horizontal split and downstream end requires vertical split bolts
	LH	Centre Transom		•			Significant weathering; large PDK upstream end; sounds drummy
	RH	Centre Transom	•				Horizontal split through centre at downstream end; install vertical split bolts
	LH	#2 Queen Transom	•				Replaced 1977
	RH	#2 Queen Transom		•			Significant EDK upstream end in horizontal plane, extending back under truss; large PDK south face; significant weathering; soft
	LH	#2 King Transom	•				Surface weathering
	RH	#2 King Transom	•				PDK upstream end; significant weathering

Appendix E: Inspection Results – Road Beams, Corbels and Deck Bracing (9 pages)

Definition of terminology used

- "PDK" – Pocket Decay
- "EDK" – End Decay
- "CDK" – Centre Decay

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
Road Beams	LH1		•			Significant weathering and splitting; large PDK outside face; PDK top surface and outside face near pier #2; vegetation growing on top
	LH2		•			Significant weathering and splitting; PDK inside and outside face at northern end; PDK top surface; *- bottom half of section appears sound*
	LH3	•				Numerous PDK top surface and both sides; significant horizontal splitting through sides over top 1/2 to 2/3 section depth
	LH4	•				Weathering and splitting top surface; minor horizontal cracking in sides; numerous PDK top surface
	LH5	•				Replaced 1974; diagonal splitting on side and PDK both sides of beam at #2 Queen corbel ; PDK at northern end; drummy sound at pier #4 end
	LH6		•			Large PDK at north end extending from top to within 150mm of base (2/3 section gone); significant weathering and splitting; numerous PDK top surface; large PDK between #1 King and #1 Queen transoms approx. 40mm deep; dull sound at southern end
	LH7	•				Weathering , splitting and surface decay on top and both sides; numerous PDK on top surface and on sides
	LH8		•			Significant weathering; significant splitting both sides; PDK inside and outside faces; evidence of insect attack; hollow sound at north end *- estimate top half of beam not contributing structurally*
	LH9			•		Significant weathering and surface decay all faces; evidence of insect attack; large PDK top surface at north end; PDK sides and underside
	LH10	•				Replaced 1960; large PDK inside face at south end; isolated PDK top and outside face; weathering and splitting on outside face; vertical splitting on top; evidence of insect attack;
	LH11		•			Replaced 1933 (second hand); top surface weathering and splitting; large PDK inside face and significant vertical splitting at south end; significant weathering south end *- Investigate south end*
	LH12	•				Typical surface weathering
	LH13	•				Typical surface weathering and splitting; isolated PDK top surface; evidence of insect attack
	LH14		•			Weathering and isolated PDK to top surface and sides; horizontal splitting to sides; top 1/4 depth sounds drummy to end of corbel at south end; large horizontal split to end of corbel at north end
	LH15	•				Replaced 1966; weathering, splitting and isolated PDK top surface; significant weathering and surface decay, outside face; PDK both ends; sounds drummy at ends *- Assume top 1/4 section does not contribute structurally*
	LH16		•			Weathering and PDK, top surface; split and associated PDK, and large split in side with associated decay at south end; *- Investigate south end*

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
	LH17		•			Vertical and horizontal cracking with associated decay at north end; hollow sound at north end; numerous PDK top surface; splitting and PDK to sides *- Investigate further (likely replacement)*
	LH18	•				Replaced 1966
	LH19		•			Replaced 1940; advanced surface decay and weathering on top and sides; soft sound at south end
	CN1		•			Significant weathering and splitting; PDK on downstream face at cross member; vegetation growing on top; hollow sound at pier #2 end
	CN2	•				Significant weathering and splitting; PDK top surface and inside face; horizontal split and CDK at pier #3
	CN3		•			Significant weathering, splitting and associated decay top and downstream face; isolated PDK upstream face; probable end decay at pier #9 *- Investigation end south end and PDK at mid span (upstream face)*
	CN4		•			Surface weathering; general decay; PDK on sides; horizontal split at north end *- Likely redundant*
	RH1		•			Significant weathering and splitting; splitting and associated PDK on inside face; *- bottom half of beam appears sound*
	RH2	•				Weathering and vertical splitting top surface; minor horizontal splitting and weathering to sides
	RH3	•				
	RH4	•				Weathering and splitting top surface; minor horizontal cracking in sides; numerous PDK top surface
	RH5		•			Significant splitting and associated PDK in top and both sides; evidence of insect attack; large PDK / EDK at pier #4 end
	RH6		•			Advanced surface decay and weathering; numerous PDK top surface; horizontal splitting through top half of section; estimate top 1/4 of section not contributing structurally; soft surface and dull sound at south end;
	RH7	•				
	RH8	•				Replaced (est. 1950 - 1965, barrier post covering date); isolated PDK top surface; weathering and horizontal splitting on sides
	RH9	•				Replaced 1950; numerous small PDK top surface; weathering and PDK outside face; large PDK approx. 600 long x 40 deep and approx. 1/3 section depth on outside face
	RH10	•				
	RH11		•			Weathering and decay both sides; large split and PDK at south end extending full width of section; horizontal split inside face at north end
	RH12			•		Several large PDK along member *- Parts of beam may be reused elsewhere*
	RH13		•			Weathering and splitting; large PDK on outside face at north end extending to end of corbel; large vertical split from north end to first bolt; sounds hollow at north end.

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
	RH14		•			Significant weathering and splitting and associated PDK on top and both sides; large horizontal split at south end with PDK; large vertical split at north end; PDK over #2 King corbel (both sides of beam); sounds drummy both ends
	RH15		•			Weathering and associated decay to top surface; PDK south end and sounds hollow; top half sounds drummy at north end; dull sound inside face between #1 King and #1 Queen transoms - *Assume top 1/4 of member does not contribute structurally*
	RH16	•				Weathering and associated PDK top surface; weathered sides; splitting resulting in loose segments at top corners of beam.
	RH17	•				Replaced 1963
	RH18	•				Replaced 1940; extensive weathering and decay on outside face; weathering and PDK top surface; worm holes outside face
	RH19		•			Significant weathering and splitting and associated PDK on top surface; large PDK to half width of member over #1 King transom; significant splitting at south end, sounds drummy out to end of corbel
	RH20	•				Splitting and decay on top surface and sides; PDK and horizontal split outside face at south end.
	RH21	•				Replaced 1968; minor weathering
	RH22		•			Large PDK / EDK at both ends; Large PDK top surface at #2 King transom; significant weathering outside face; horizontal splitting north end
	RH23	•				EDK south end; weathering, splitting and associated decay to top surface; large horizontal split at north end (approx. 600 long, near centre); hollow sound at north end
	RH24	•				General weathering only

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
Corbels						
Pier # 2	LH Corbel	•				
	Centre Corbel	•				
	RH Corbel		•			CDK southern end; large PDK outside face
Pier # 3	LH Corbel	•				Cracking at end and small CDK starting; surface weathering and cracking on outside face
	Centre Corbel		•			EDK southern end; PDK both sides; honeycombing of upstream and downstream sides; evidence of possible insect attack
	RH Corbel	•				Splitting at ends; CDK southern end
#1 King	LH Corbel	•				PDK at sides; surface decay
	RH Corbel			•		PDK inside and outside extending in under beams; EDK - *Replace within 5yrs*
#1 Queen	LH Corbel		•			PDK at sides of corbel extending in under beams
	RH Corbel	•				CDK starting at southern end
Centre	LH Corbel	•				PDK at fixing to transom
	RH Corbel	•				PDK at fixing to transom
#2 Queen	LH Corbel	•				Replaced 1966
	RH Corbel	•				PDK at sides
#2 King	LH Corbel	•				Replaced 1977 (second Hand); large vertical split at northern end - *Replace corroded splitter bolts*
	RH Corbel	•				Splitting at ends; PDK at fixings to transom
Pier #4	LH Corbel	•				CDK southern end; significant splitting and PDK outside face
	RH Corbel	•				Replaced 1944
#1 King	LH Corbel	•				Replaced 1966
	RH Corbel					Replaced 1965
#1 Queen	LH Corbel	•				PDK inside face near centre
	RH Corbel	•				PDK top surface and inside and outside faces
Centre	LH Corbel	•				PDK both sides
	RH Corbel	•				PDK inside vertical face; surface decay and soft on sides
#2 Queen	LH Corbel	•				PDK outside face at base
	RH Corbel	•				PDK outside face; large area of decay on inside top and side.
#2 King	LH Corbel	•				PDK both side above transom; PDK top surface inside face
	RH Corbel	•				Weathering and splitting; PDK both sides above transom

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
Pier #5	LH Corbel	•				Replaced 1960; split at north end near centre; weathering and softening on outside surface; horizontal split inside face
	RH Corbel		•			Replaced 1977 (second hand); weathered
#1 King	LH Corbel	•				PDK outside face overtop of transoms; decay at base of corbel over LH transom extending approx. 150mm over transom (20mm deep); split along inside top edge; large PDK inside face
	RH Corbel		•			Significant weathering and decay inside face; large diagonal crack and associated decay extending from top surface down under beam - *Investigate further when beam is replaced*
#1 Queen	LH Corbel	•				Small EDK north end; PDK both sides overtop of transoms
	RH Corbel	•				Weathering on outside face; PDK inside and outside faces
Centre	LH Corbel	•				PDK inside and outside face; weathering and softening to outside surface
	RH Corbel	•				Typical weathering; PDK outside face; split and PDK linking spike holes on inside face
#2 Queen	LH Corbel	•				Typical weathering and splitting; PDK over LH transom
	RH Corbel	•				Split on inside face; weathered outside face
#2 King	LH Corbel	•				
	RH Corbel	•				Typical weathering and splitting
Pier #6	LH Corbel	•				CDK / EDK at south end; weathered outside face; horizontal split and associated PDK outside face; significant splitting and decay to inside face; splitting at north end
	RH Corbel	•				CDK both ends; significant weathering and splitting both sides
#1 King	LH Corbel		•			Surface decay to top surface extending in under beams (both sides); vertical split through centre at north end; - *Install horizontal split bolt at north end*
	RH Corbel	•				
#1 Queen	LH Corbel		•			Significant amount of decay at top extending in under beam (both sides of corbel)
	RH Corbel	•				Surface decay at top (inside face)
Centre	LH Corbel		•			Decay at top surface extending in under beam (both sides of corbel); extensive PDK both sides
	RH Corbel		•			Decay at top surface extending in under beam (both sides of corbel); - *Likely replace*

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
#2 Queen	LH Corbel		•			Advanced decay at top on outside *- Likely replace*
	RH Corbel	•				
#2 King	LH Corbel	•				
	RH Corbel	•				Decay to contract surface with transoms on inside face
Pier #7	LH Corbel	•				Decay along bottom edge in contact with packers (inside face)
	RH Corbel	•				Weathered
#1 King	LH Corbel	•				Weathering; isolated PDK
	RH Corbel	•				Weathering; splitting and PDK on outside
#1 Queen	LH Corbel			•		Large CDK at both ends (full depth); large crack and associated decay under beam
	RH Corbel	•				PDK inside face around spikes; splitting and PDK outside face; *- Vegetation in the way on inside at transom*
Centre	LH Corbel	•				Top surface decay on outside; some isolated PDK
	RH Corbel	•				Top surface cracking and associated decay; some isolated PDK
#2 Queen	LH Corbel	•				Top decay on outside extending under beam; some PDK
	RH Corbel	•				Replaced 1960; weathered
#2 King	LH Corbel	•				End splitting and weathering; split bolts both ends
	RH Corbel	•				Large vertical split separating two halves with split bolt at north end; sounds drummy but likely due to split *- Install split bolt at south end*
Pier #8	LH Corbel		•			Manmade vertical cut on south side near outside edge of pier, still approx. 600mm seating for beam; decay
	Centre Corbel	•				Replaced 1967 (second hand); surface decay upstream face
	RH Corbel		•			Isolated PDK inside face; large horizontal split and PDK under beam RH22 *- Investigate PDK under beam (otherwise sound)*
Pier #9	LH Corbel		•			Splitting and EDK both ends; numerous PDK on sides
	Centre Corbel	•				Surface decay and splitting both ends
	RH Corbel		•			CDK / PDK and splitting both ends

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
Cross Bracing, Solid Blocking and Tie Rods						
Span #1	Solid Blocking			•		4 no. at 1/3 points; various states of decay; blocks falling out - *Replace / reinstate*
	Tie Rods	•				Rods generally ok; some nuts missing - *Replace nuts*
Span #2	Solid Blocking			•		4 no. at 1/3 points; various states of decay; blocks falling out - *Replace / reinstate*
	Tie Rods	•				Rods generally ok; some nuts missing - *Replace nuts*
Span #3	**Cross Bracing**					
Pier #3 to #1K	LH			•	30%	
	RH	•				Sound
#1K to #1Q	LH	•				Sound
	RH	•			50%	
#1Q to Centre	LH	•				Sound
	RH			•	0%	1/2 rod missing from centre to #1Q transom
Centre to #2Q	LH	•			80%	
	RH	•			80%	
#2Q to #2K	LH	•			50%	Sound through centre
	RH			•	30%	Ends sound
#2K to Pier #4	LH			•	20%	Sound through centre
	RH			•	40%	Heavily corroded at pier end; otherwise sound

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
Span #4	**Cross Bracing**					
Pier #4 to #1K	LH			•	40%	
	RH			•	40%	40% at pier end; 70% under LH beam; otherwise sound
#1K to #1Q	LH			•	25%	25% under LH beam; otherwise sound
	RH			•	10%	10% at #1K transom; 50% under RH beam; otherwise sound
#1Q to Centre	LH	•			70%	
	RH	•			70%	
Centre to #2Q	LH	•			50%	
	RH	•			70%	
#2Q to #2K	LH	•			50%	
	RH	•			50%	
#2K to Pier #5	LH	•			60%	
	RH			•	5%	5% and 25% at ends, otherwise sound
Span #5	**Cross Bracing**					
Pier #5 to #1K	LH			•	0%	Almost gone at King Transom; 30% at pier end
	RH	•			70%	
#1K to #1Q	LH			•	0%	Eyes at end sound; rest of rod completely gone
	RH	•			50%	
#1Q to Centre	LH	•			60%	
	RH			•	10%	10% at centre transom end; 50% along rod; sound at #1Q transom
Centre to #2Q	LH	•			60%	Sound at ends
	RH	•			50%	50% at coupler under LH beam; 60% under RH beam; otherwise sound
#2Q to #2K	LH	•			70%	
	RH	•			50%	Railway iron replacement; heavily corroded along full length
#2K to Pier #6	LH			•	20%	20% and 40% at ends; 70% along rod
	RH			•	40%	40% at #2K end; 80% along rod

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation: Sound / Treatment only	Structural Assessment / Recommendation: Investigate Further	Structural Assessment / Recommendation: Replace	Estimated % of Original Capacity	Comments
Span #6	**Cross Bracing**					
Pier #6 to #1K	LH	•				Sound
	RH			•	0%	Completely gone at #1K end; 80% along rod
#1K to #1Q	LH	•			70%	
	RH			•	20%	20% both ends; 40% along rod
#1Q to Centre	LH	•			60%	60% at coupler under LH beam; 80% under RH beam; otherwise sound
	RH	•			60%	60% under beams; otherwise sound
Centre to #2Q	LH	•			70%	Sound at ends
	RH	•			60%	60% under beams; otherwise sound
#2Q to #2K	LH			•	<10%	<10% at #2K transom; 30% at coupler under LH beam; otherwise sound
	RH			•		Almost completely gone at #2K end; otherwise sound *- Replace from centre to #2K end*
#2K to Pier #7	LH	•			60%	
	RH	•			50%	
Span #7	**Cross Bracing**					
Pier #7 to #1K	LH			•	<10%	<10% at #1K transom; remaining rod >60%
	RH	•			80%	
#1K to #1Q	LH			•	30%	30% and 40% at ends; 60% along rod
	RH			•	30%	30% at #1Q end; remaining rod >80%
#1Q to Centre	LH	•			80%	Railway iron replacement
	RH	•			70%	
Centre to #2Q	LH			•	0%	Rod completely gone at centre transom end; 50% along rod; sound at #2Q end
	RH			•	40%	sound at eyes
#2Q to #2K	LH	•			60%	
	RH			•	30%	30% under RH beam; 50% under LH beam; sound at ends
#2K to Pier #8	LH			•	30%	30% at pier end; 70% under LH beam
	RH	•				Sound
Span #8	Solid Blocking	•				4 no. at 1/3 points; various states of decay; blocks falling out; one block missing *- Replace / reinstate*
	Tie Rods	•				Rods generally ok; some nuts missing *- Replace nuts*
Span #9	Solid Blocking	•				4 no. at 1/3 points; various states of decay; blocks falling out *- Replace / reinstate*
	Tie Rods	•				Rods generally ok; some nuts missing *- Replace nuts*

Appendix F: Inspection Results – Piers (8 pages)

Definition of terminology used

- "PDK" – Pocket Decay
- "EDK" – End Decay
- "CDK" – Centre Decay

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
1	**Piles**					
	Upstream Pile	•				PDK at top where previously drilled; general splitting and weathering
	Centre Pile	•				Surface soft but sound underneath; general weathering
	Downstream Pile	•				Surface splitting; EDK at top where previously drilled; excavation around pile showed pile sound below ground
	Pile Cap	•				CDK both ends; significant weathering and splitting; appears sound over piles
	Abutment Walls - Timber facing			•		Top part collapsing; ends gone; otherwise appears ok; top part needs replacing
	Abutment Walls - Vertical Railway Irons	•			60%	Extensive corrosion
2	**Piles**					
	Upstream Pile	•				Surface splitting and weathering; PDK under pile cap, at top of pile, and several small isolated PDK along pile
	Centre Pile	•				Vertical splitting and weathering; small loss of outer section at ground level; excavation around pile showed pile sound below ground
	Downstream Pile	•				Large vertical splits in top 1/3 pile; hollow sound at top likely due to splitting; large PDK at top; excavation around pile showed pile sound below ground
	Upstream Cut Water Pile	•				EDK and splitting at top
	Downstream Cut Water Pile	•				Large CDK / EDK at top
	Raker Studs					
	Upstream Raker Stud	•				Significant weathering; top surface has honeycomb effect and worm holes
	Downstream Raker Stud		•			Surface decay and weathering to downstream face; PDK / EDK at base
	Diagonal Bracing					
	Cross bracing	•			70%	Steel railway iron; varying amounts of corrosion
	Whaling's					
	Whaling's	•			50%	Steel railway irons; heavily corroded
	Pile Cap	•				Replaced 1975

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
3	**Piles**					
	Pile #1	•				Vertical splitting above whalers
	Pile #2	•				Vertical splitting above whalers
	Pile #3	•				Deep splits / pockets on north face from spikes
	Pile #4	•				Vertical splitting above whalers
	Pile #5	•				Replaced 1961
	Pile #6	•				Splitting; weathering; block bolted to outside face at top to support pile cap
	Pile #7		•			Large CDK just above whaler; sound at ground and cap *- Consider splicing in section of pile or redundant*
	Pile #8		•			Large CDK just above whaler; sound at ground and cap *- Consider splicing in section of pile or redundant*
	Upstream cut-water pile		•			Has sunk approx 600mm; significant splitting and decay at top
	Downstream cut-water pile	•				Splitting and small EDK at top
	Raker Studs					
	Upstream Raker Stud			•		Has come free of fixing at top due to sinking cut-water pile; large split and EDK at top; large split upstream face; weathered
	Downstream Raker Stud			•		Splitting, surface weathering and significant decay downstream face; large CDK / EDK at base *- Probable replacement*
	Diagonal Bracing					
	Cross Bracing	•			70%	Railway iron cross bracing; varying amounts of corrosion
	Whaling's					
	Whaling's	•				All present; individual assessment of each whaler not carried out
	Pile Caps					
	Pile Cap #1	•				Replaced 1975; EDK downstream end
	Pile Cap #2	•				Splitting and associated CDK downstream end; EDK and splitting upstream end
	Pile Cap #3	•				Splitting and EDK starting downstream end; EDK upstream end
	Pile Cap #4			•		Large end section gone downstream end; large PDK along length and extensive decay upstream end *- Replace or consider redundant*
	Corbels					
	LH Truss Corbel - Inside	•				Replaced 1975 second hand; vertical split north end
	- Outside	•				PDK outside face; weathered
	RH Truss Corbel - Inside	•				Replaced 1975 second hand; minor end splitting
	- Outside	•				EDK and splitting both ends
	Packers Between Pile Cap and Beam Corbel					
	Perpendicular to corbel	•				4 no. total; weathered
	Parallel to corbel	•	•			Weathered but generally sound except for packer under LH corbel which has significant decay *- Consider packing or replacement*

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
4	**Piles**					
	Pile #1		•			Extensive CDK at top; vertical splitting above whalers at spike locations
	Pile #2		•			Major splitting and decay on outside face and other areas; sound at base and top
	Pile #3	•				Vertical splitting above whalers
	Pile #4	•				Advanced EDK at top; vertical splitting above whalers
	Pile #5		•			Splitting and associated decay on outside face due to spikes; sounds drummy above whaler; possible CDK
	Pile #6		•			Splitting and associated decay on outside face going into centre due to spikes; possible CDK
	Pile #7		•			Splitting and associated decay outside face but appears sounds; sounds drummy at top *- Investigate top further*
	Pile #8	•				EDK at top; splitting and associated decay due to spike holes
	Upstream cut-water pile		•			Significant CDK / EDK
	Downstream cut-water pile	•				
	Raker Studs					
	Upstream Raker Stud		•			Packer missing at top; significant splitting and decay on north face; large split and CDK at base *- Possible replacement*
	Downstream Raker Stud	•				Weathering and splitting on sides and downstream face
	Diagonal Bracing					
	Cross bracing	•			50%	Heavily corroded railway irons
	Whaling's					
	Whaling's	•				All present; individual assessment of each whaler not carried out
	Pile Caps					
	Pile Cap #1	•				Small EDK downstream end
	Pile Cap #2	•				Small EDK downstream end
	Pile Cap #3	•				Replaced 1960
	Pile Cap #4	•				Replaced 1967 second hand
	Corbels					
	LH Truss Corbel - Inside	•				
	- Outside	•				
	RH Truss Corbel - Inside	•				Splitting at south end
	- Outside	•				EDK both ends
	Packers Between Pile Cap and Beam Corbel					
	LH Beam	•				
	RH Beam	•				

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation: Sound / Treatment only	Structural Assessment / Recommendation: Investigate Further	Structural Assessment / Recommendation: Replace	Estimated % of Original Capacity	Comments
5	**Piles**					
	Pile #1		•			EDK at top; typical splitting and decay on outside face *- worst pile of group therefore recommend investigating*
	Pile #2	•				Typical splitting and decay on outside face
	Pile #3	•				Typical splitting and decay on outside face
	Pile #4		•			Large split and associated decay on outside face due to spike holes; CDK; excavation around pile showed pile sound below ground *- Investigate or may be redundant*
	Pile #5		•			EDK at top; deep splitting and associated decay all around pile; numerous drill holes from previous investigations
	Pile #6	•				Minor splitting and associated decay
	Pile #7	•				Typical splitting and decay on outside face; excavation around pile showed pile sound below ground
	Pile #8	•				EDK at top; evidence of insect attack; significant splitting and associated decay
	Upstream cut-water pile	•				Splitting and EDK at top
	Downstream cut-water pile	•				Significant EDK at top, full of soil
	Raker Studs					
	Upstream Raker Stud	•				Splitting and EDK at top
	Downstream Raker Stud		•			Significant weathering / splitting and associated decay; EDK at base; possible CDK at connection to cut-water pile
	Diagonal Bracing					
	Brace #1	•			50%	Heavily corroded railway irons
	Brace #2	•			50%	Heavily corroded railway irons
	Whaling's					
	Whaling's	•				Whalers all there; soil + vegetation on top of whalers; individual assessment of each whaler not carried out
	Pile Caps					
	Pile Cap #1	•				Replaced 1977; minor splitting downstream end only
	Pile Cap #2	•				
	Pile Cap #3	•				Replaced 1977; minor splitting downstream end only
	Pile Cap #4	•				EDK downstream end
	Corbels					
	LH Truss Corbel - Inside	•				
	- Outside	•				
	RH Truss Corbel - Inside	•				
	- Outside	•				Small EDK and splitting south end
	Packers Between Pile Cap and Beam Corbel					
	LH Beam	•				Typical sound; packer directly under and parallel to corbel is sound but packer on outside is not
	RH Beam	•				Small amount of decay on downstream packer // to corbel - not supporting corbel; otherwise typically sound

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
6	**Piles**					
	Pile #1	•				Vertical split at top; timber on outside covering spike lines; isolated honeycombing
	Pile #2	•				EDK at top; typical splitting outside face; multiple drill holes; small amount of decay at each seating; excavation around pile showed pile sound below ground
	Pile #3	•				Decay below whaler at seating on inside of pile
	Pile #4	•				Typical splitting outside face
	Pile #5	•				Significant EDK at top; vertical splitting on outside face; minor splitting elsewhere
	Pile #6	•				Minor honeycombing through midsection; minor splitting
	Pile #7	•				Minor splitting and decay; excavation around pile showed pile sound below ground
	Pile #8	•				Minor splitting on outside face; excavation around pile showed pile sound below ground
	Upstream cut-water pile					
	Downstream cut-water pile	•				EDK at top; appears sound at attachment to raking stud
	Raker Studs					
	Upstream Raker Stud	•				Minor splitting along lines of spikes Fenders in good condition, SH61 (inside), SH77 (outside / upstream)
	Downstream Raker Stud			•	30%	Significant CDK; decay on downstream face to 1/2 depth *- Replace or consider redundant*
	Diagonal Bracing					
	Cross bracing	•			50%	Steel railway irons; varying amounts of corrosion
	Whaling's					
	Whaling's	•				All present; vegetation on top; generally appear sound
	Pile Caps					
	Pile Cap #1	•				Replaced 1944
	Pile Cap #2	•				Replaced 1977
	Pile Cap #3	•				Replaced 1977
	Pile Cap #4	•				
	Corbels					
	LH Truss Corbel - Inside	•				EDK both ends
	- Outside	•				Replaced 1967
	RH Truss Corbel - Inside		•			Vertical split north end; large CDK south end
	- Outside	•				Replaced 1960; vertical split north end
	Packers Between Pile Cap and Beam Corbel					
	LH Beam	•				Typically 2 no. parallel to corbel and 4 no. perpendicular; packer #1 perpendicular to corbel dozy; others typically sound
	RH Beam	•				

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
7	**Piles**					
	Pile #1	•				Isolated weathering and honeycombing; timber covering spike holes
	Pile #2	•				Typical splitting on outside face from spikes up to 100mm deep; surface decay and weathering; packer missing at top to cap - *Reinstate packer at top to pile cap*
	Pile #3	•				Typical splitting on outside face from spikes; lower 2/3 of pile has advanced surface decay and splitting; advanced decay at top below cap - *Further assess decay at top when treating*
	Pile #4	•				Minor splitting at top; typical splitting and decay
	Pile #5	•			70%	Split running approx. 1m down pile from backside of seating at top; typical splitting due to spikes - *Replace split bolt at top*
	Pile #6	•				Vertical split extending down from cap seat; split bolt corroded; typical vertical splitting on outside face extending into core - *Replace split bolt at top*
	Pile #7	•				Large split and EDK at top; outside face covered in timber; large vertical split extends down approx. 600mm from cap seating; split bolt corroded - *Replace split bolt at top*
	Pile #8	•				Large split and EDK at top; vertical split and Pad behind brace connection at top; typical splitting on outside face
	Upstream cut-water pile	•				
	Downstream cut-water pile	•				Minor splitting and weathering; some EDK
	Raker Studs					
	Upstream Raker Stud	•				EDK / CDK at base; weathering and splitting on sides and upstream face
	Downstream Raker Stud	•				Splitting in side due to spikes; weathering, splitting and decay on downstream face; packer at top about to fall out
	Diagonal Bracing					
	Cross bracing	•			50%	Timber; PDK behind pile connections
	Whaling's					
	Whaling's	•				All present; sound condition
	Pile Caps					
	Pile Cap #1	•				
	Pile Cap #2	•				Replaced 1933 second hand
	Pile Cap #3	•				Replaced 1975
	Pile Cap #4	•				Replaced 1975
	Corbels					
	LH Truss Corbel - Inside	•				Replaced 1967 second hand; minor end splitting
	- Outside	•				Replaced 1967 second hand; minor end splitting
	RH Truss Corbel - Inside	•				
	- Outside	•				Vertical split at south end
	Packers Between Pile Cap and Beam Corbel					
	LH Beam	•				General weathering only
	RH Beam	•				

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
8	**Piles**					
	Pile #1	●			70%	Typical vertical splitting on outside face
	Pile #2	●			70%	Typical vertical splitting on outside face
	Pile #3	●			70%	Typical vertical splitting on outside face; significant split on downstream face starting above whaler
	Pile #4	●			50%	Top filled with pitch; vertical splitting on outside face through mid section through to CDK *- Estimate only 50% of pile contributing due to splitting*
	Pile #5	●			70%	EDK at top; splitting through mid section due to spikes; vertical splitting on backside approx. 30mm deep
	Pile #6	●			70%	Full length splits on backside approx. 70mm deep; large vertical splits on outside extending into pile centre; excavation around pile showed pile sound below ground
	Pile #7	●			70%	Minor splitting only
	Pile #8	●			50%	Top filled with pitch; vertical splitting on outside face through mid section through to CDK *- Estimate only 50% of pile contributing due to splitting*
	Upstream cut-water pile			●		Splitting and hollow at top; heavily decayed *- Replace or consider redundant*
	Downstream cut-water pile			●		Splitting and hollow at top; heavily decayed *- Replace or consider redundant*
	Raker Studs					
	Upstream Raker Stud	●				Splitting along lines of spikes; decayed over lower section where previously buried in vegetation
	Downstream Raker Stud	●				Splitting along lines of spikes; decayed over lower section where previously buried in vegetation
	Diagonal Bracing					
	Cross bracing	●			70%	Varying amounts of corrosion; railway iron braces
	Whaling's					
	Whaling's		●			Buried in soil - not assessed, may be redundant
	Pile Caps					
	Pile Cap #1			●		Advanced EDK upstream end; extensive PDK and splitting back to RH truss corbel at downstream end
	Pile Cap #2	●				Splitting at upstream end; general weathering and splitting and EDK at downstream end
	Pile Cap #3	●				Splitting at upstream end; general weathering and splitting and EDK at downstream end
	Pile Cap #4	●				Replaced 1978; EDK downstream end
	Corbels					
	LH Truss Corbel - Inside	●				Vertical splits at both ends
	- Outside	●				Replaced 1967 second hand
	RH Truss Corbel - Inside		●			Large CDK / EDK north end; significant decay all way along *- Investigate further, likely replace*
	- Outside	●				Replaced 1967 second hand
	Packers Between Pile Cap and Beam Corbel					
	Perpendicular to corbel	●				#1 packer rotten at downstream end in under corbel *- Rotten packer likely redundant*
	Parallel to corbel	●				Sound under beams; downstream packer completely rotten *- Rotten packer likely redundant*

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
9	**Piles**					
	Upstream Pile	•				Splitting and EDK at top; vertical splitting and associated decay further down; sounds drummy
	Centre Pile	•				Significant splitting full length; sounds drummy but likely due to splitting; small EDK at top; excavation around pile showed pile sound below ground
	Downstream Pile	•				Minor splitting and decay; small EDK at top
	Upstream Cut Water Pile					
	Downstream Cut Water Pile	•				Large CDK / EDK at top; significant weathering, splitting and decay; appears reasonably sound at connection to raking stud
	Raker Studs					
	Upstream Raker Stud			•		Splitting and decay at top; highly decayed at base
	Downstream Raker Stud	•				Large vertical split and decay at top; significant weathering and decay on sides and downstream face
	Diagonal Bracing					
	Cross bracing	•			80%	Light to moderate corrosion; railway iron braces
	Whaling's					
	Whaling's			•		Timber splitting and decayed through centre; south side buried under soil; effectively not doing anything - *Replace or may be redundant as pier is on river bank not subject to any water flow*
	Pile Cap			•		Heavily decayed
10	**Piles**					
	Upstream Pile	•				Spliced at ground level 1966; splice split at top; top of splice section sounds hollow; EDK at top of original pile; original pile - pile surface soft and wet below ground level, otherwise sound
	Centre Pile	•				Replaced 1966; some splitting
	Downstream Pile	•				Splitting down to ground level; excavation around pile showed pile sound below ground
	Pile Cap	•				Replaced 1944; splitting and EDK both ends; typical weathering
	Abutment Walls - Timber facing			•		Various states of decay; collapsing at upstream end
	Abutment Walls - Vertical Railway Irons	•		•		4 no. railway irons; various states of decay / corrosion

Appendix B
WSP Structural Assessment Report

25 July 2023

Rem Markland
WSP
23 High Street
Greymouth 7805

Totara Rail Bridge Load Assessment

6-WWES3.98

Dear Rem,

This letter report outlines the results of our load assessment on Totara Rail Bridge located near Ross.

WSP Greymouth requested on behalf of Westland District Council (WDC) that we carry out an assessment of the truss components to determine the permanent and live load demand on the structure. The assessment had to provide the undeteriorated capacity of members to determine the tolerance against section loss/decay. The intention is for these results to be used as an estimated intervention threshold for deteriorated members.

The assessment was restricted to the original truss structure and only pedestrian/cyclist live load was considered.

Bridge Description

The Totara Rail Bridge is located on the West Coast Wilderness Cycle Trail approximately 3 km from Ross, in the Westland Region. It comprises nine spans with the first two spans at each end constructed using simply supported timber beams. The central five spans are Howe Trusses with a span length of 24.4 m (80 ft). The assessment only considers the truss spans.

A general location plan and elevation of the bridge is shown in Figures 1 to 3.

The truss of this bridge appears to be of the same arrangement as a typical Howe Truss designed by the New Zealand Public Works Department (refer Figure 4).

Assessment Criteria

Our assessment was completed in accordance with the following documents:

- Section 7 of the Waka Kotahi NZ Transport Agency Bridge Manual, 3rd Edition, including Amendments 1, 2, 3 and 4 (Bridge Manual)
- NZS 3404: Part 1: 1997 (including Amendments 1, and 2)
- AS 1720: Part 1: 2010

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Figure 1: General location of Totara Bridge.


Figure 2: Elevation of Totara Bridge.

Figure 3: Deck Approach of Totara Bridge.

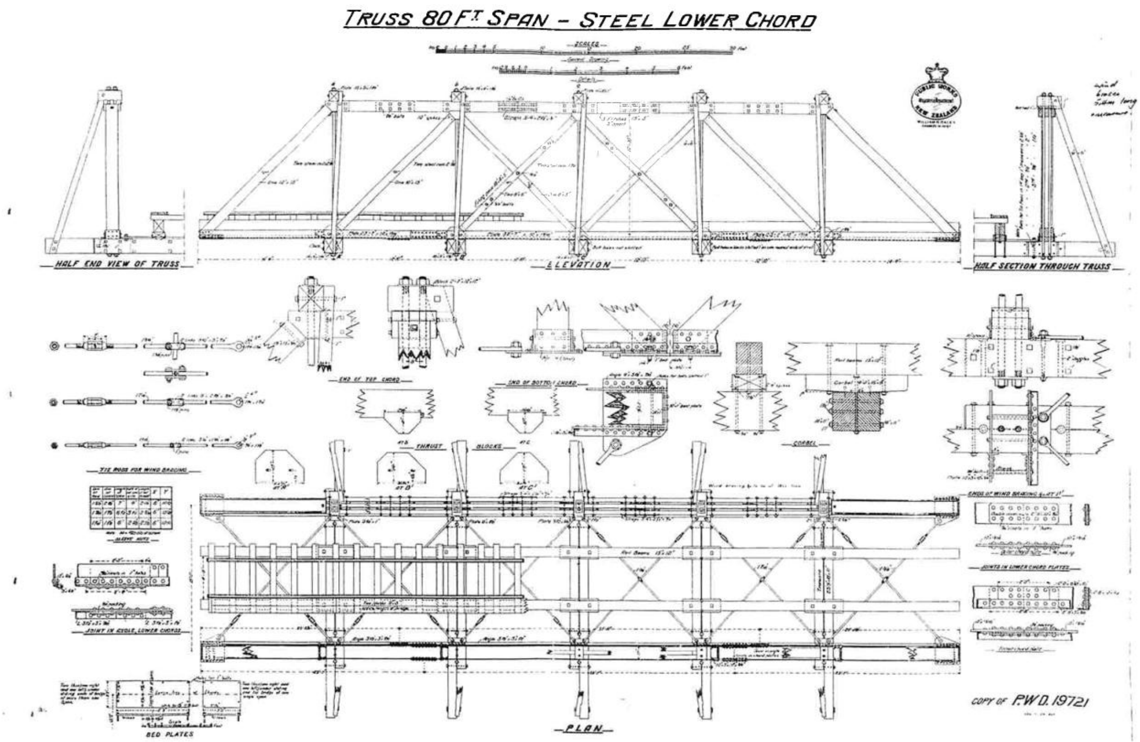

Figure 4: Typical Howe Truss Layout

Material Properties

Material strengths and factors

The material strengths assumed in our assessment were taken from the previous John Greenfields analysis of the truss (date of assessment unknown). Ironbark was adopted as the applicable timber with a calculated allowable compression strength of 7.4 MPa. The nominal strength was back calculated, as based on a load factor of 1.35 and a strength factor of 0.7 and found to be 14.3 MPa. The nearest comparable timber stress grade from AS 1720: Part 1 was found to be MGP 10 and was subsequently adopted for the assessment (refer to Table H3 of AS 1720.1). See Table 1 for the assumed timber strengths.

Wrought iron was adopted for the steel members as based on John Greenfields analysis (see Table 1 for assumed yield strength).

Other material factors applicable to the timber and steel capacity calculations were based on the requirements of AS 1720.1 and NZS 3404, respectively and are listed in Table 2.

Table 1: Material strengths adopted for the assessment.

Material	Characteristic Action	Strength (MPa)
Timber MGP 10	Compression parallel to grain	16
	Bending	14
	Tension parallel to grain	6.1
Wrought Iron	Yield strength	205

Table 2: Material factors adopted for the assessment.

Material	Factor	Value
Wrought Iron	Strength reduction	0.8
Timber	Strength reduction	0.7
	k_1 – load duration factor	1.0
	k_4 – moisture condition (seasoned)	1.0
	k_6 - temperature	1.0
	k_9 – strength sharing factor (varies as based on slenderness)	varies
	k_{12} – stability factor (varies as based on slenderness)	varies
	p_b – material constant bending	0.75
	p_c – material constant compression	0.96

Structural Condition

The assessment was based on the undeteriorated capacity of the members, with the intention to establish the tolerance against section loss/decay.

Structural Convention

The same naming convention as previously used in the assessment by John Greenfields was also adopted for this exercise, see Figure 5 for the convention.

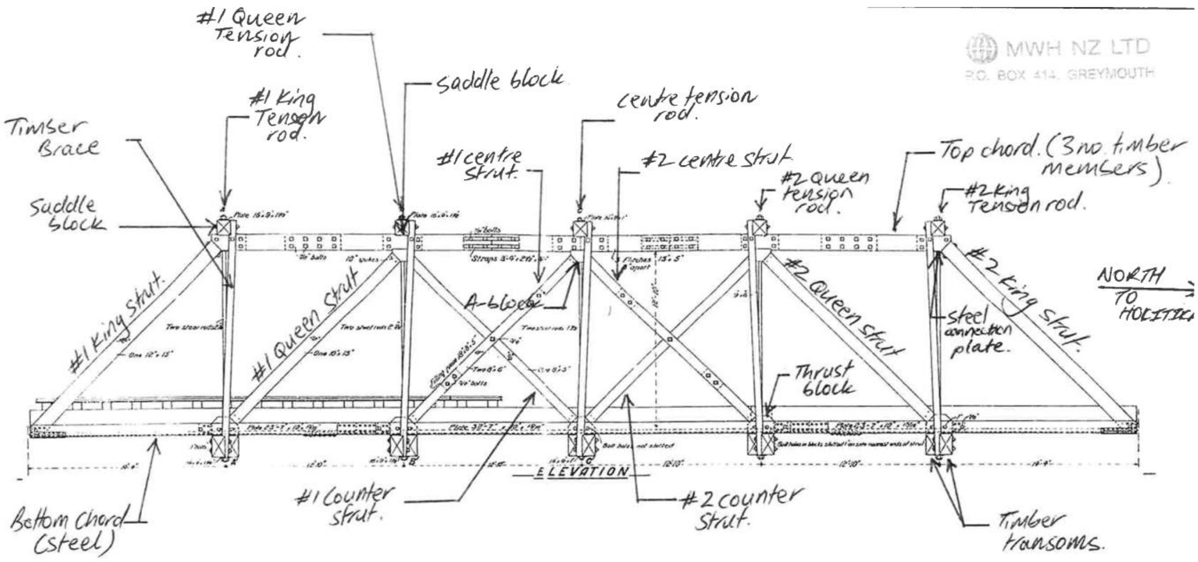

Figure 5: Structural convention

Typical Member Sizes

The truss member sizes were based on the typical section dimensions measured as part of the condition inspection. These are listed in Table 3.

Table 3: Composition of truss elements

Member	Material	Typical Dimensions (mm)
Top Chord	Timber	360 x 300
Bottom Chord	Wrought Iron	280 x 22 plate 82 x 82 x 22 angle
King Strut	Timber	360 x 300
Queen Strut	Timber	320 x 250
Centre Strut	Timber	200 x 140
Counter Strut	Timber	210 x 115
Hanger	Wrought Iron	2 no. 80 ø
Transom	Timber	2 no. 440 x 310
Cross Bracing	Wrought Iron	28 ø
Timber Brace	Timber	250 x 150

It is to be noted that the assessment was based on the main truss members only, and that verification of the connections did not form part of the scope.

Load Demands

The dead load of the truss and walkway were based on the following material unit weights:

- Timber truss members (Ironbark) = 1200 kg/m^3
- Wrought Iron members = 7850 kg/m^3

- Timber walkway = 650 kg/m^3

The pedestrian live loading was based on 5 kN/m^2 as per section 3.4.14 of the Bridge Manual.

The following load factors were used:

- Dead load, Υ_D = 1.2
- Pedestrian live load, Υ_L = 1.5

Assessment Results

Table 4 provides a summary of the assessment results that relate to the truss members. It shows the undeteriorated member capacities against the calculated load demands. The factor of safety percentages have been capped at 200%. The table also shows the threshold sectional condition factor that will trigger further action (this includes additional investigations such as drilling of timber members, repair or replacement). It is to be noted that this condition factor does not relate to the overall condition of a member but to the most deteriorated specific section/location along a member. This means for example that if the overall condition of a top chord member is rated at say 90% but the end bearing is showing severe decay to a condition rating of 50%, further action may be required. The same goes for any connections, splices, packers, and thrust blocks associated with a specific truss member. Further action will be required if any of these components have a condition rating less than the listed value for the associated truss member.

Table 4: Summary of truss member results

Member	Capacity (kN) [1]	Load Demand (kN) [1]	Factor of Safety (%)	Threshold Sectional Condition Factor
Top Chord	1040	418	> 200%	55%
Bottom Chord	-1240	-420	> 200%	50%
King Strut	720	346	> 200%	70%
Queen Strut	380	200	190%	75%
Centre Strut	170	53	> 200%	55%
Counter Strut	-103	-17	> 200%	50%
Hanger	-1657	-214	> 200%	50%
Transom	177	95	186%	55%
Cross Bracing	-101	-25	> 200%	50%
Timber Brace	112	10	> 200%	50%

[1] A negative sign indicates a tension force.

Conclusions and Recommendations

This assessment report forms part of the investigation into the current condition of Totara Rail Bridge. The main aim of the investigation is to inform the structural investigations, improvements, repairs, or replacement management plan for the bridge.

The member conditions recorded as part of the visual inspection programme can subsequently be compared against the sectional condition listed in Table 4, which provides an estimated intervention threshold for deteriorated members. An indicative investigation, repair or replacement schedule/forward works programme can subsequently be developed on the basis of the recorded assessment results.

It is important to note that the threshold condition factors listed in Table 4 do not relate to the general condition rating of a member but to the rating of specific member defects. Investigations, repairs or replacements should therefore be managed on a weakest point basis and not on the overall/general condition of a member.

The assessment showed that the undeteriorated strength of the truss members carry substantial reserve capacity given that it was originally built as a rail bridge and now only utilised as a pedestrian / cycle bridge. However, severe deterioration of the truss members/components has been recorded and it is recommended that the results of Table 4 are utilised to identify these elements as part of the development of the forward works programme.

We trust that the above meets your requirements. If we can be of any further assistance, then please do not hesitate to contact us.

Regards.

Prepared by:		Approved by:	
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Appendix C
Site Inspection Notes

Truss SPAN C - D (Upstream)					
Span	Side	Structural Element		Estimated %	Comments
		CD UPSTREAM		Original Capacity	#1 North (Hoki) #2 South (Ross)
CD	US	**Timber Struts**			
		#1 - King Strut		50%	Significant weathering and deep cracking top surface; bottom half section sound; large PDK at base; splitting inside face
		#1 - Queen Strut		50%	Heavy weathering and deep cracking top surface; bottom half section sound;
		#1 - Counter Strut		75%	Large split through centre; large PDK at base
		#1 - Centre Strut	- Inside	80%	Bottom sounds drumy; PDK inside face; splitting
			- Outside	50-75%	Large PDK at base; top surface weathering and splitting
		#2 - Centre Strut	- Inside	50-75%	Sounds drummy
			- Outside	70%	PDK inside face; sounds drummy at top
		#2 - Counter Strut		50-75%	Vertical splitting throughout; sounds drummy
		#2 - Queen Strut		50%	PDK top face; weathering and splitting top face
		#2 - King Strut		50%	Large horizontal split inside face; significant weathering / splitting on top surface
CD	US	**Vertical Steel Tension Rods**			
		#1 - King Rods	- Inside	80%	Heavily corroded
			- Outside	60%	Heavily corroded
		#1 - Queen Rods	- Inside	70%	Heavily corroded
			- Outside	60%	Heavily corroded
		#1 - Centre Rods	- Inside	>90%	New
			- Outside	>90%	New
		#2 - Queen Rods	- Inside	80%	Heavily corroded
			- Outside	50%	Heavily corroded
		#2 - King Rods	- Inside	90%	Heavily corroded
			- Outside	70%	Heavily corroded
CD	US	**Timber Thrust Blocks**			
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Block		50-75%	Large PDK at outside rod
		Centre Thrust Block		75-90%	
		#2 - Queen Thrust Block		75-90%	
		#2 - King Thrust Block		75-90%	PDK at outside rod
CD	US	**Timber A-Blocks**			
		#1 - Queen A-Block		75-90%	
		Centre A-Block		75-90%	
		#2 - Queen A-Block		75-90%	
CD	US	**Timber Saddle Blocks**			
		#1 - King Saddle Block		<50%	Large CDK; sounds hollow
		#1 - Queen Saddle Block		50-75%	Weathered with large splits on top; sounds drummy; end PDK
		Centre Saddle Block		50-75%	Large CDK inside end
		#2 - Queen Saddle Block		50-75%	CDK inside end; otherwise appears sound
		#2 - King Saddle Block		75-90%	Typical EDK and weathering; otherwise sound

Truss SPAN C - D (Upstream)					
CD	**US**	**Top Chord**			
		#1 King - #1 Queen	- Inside	<50%	Large PDK; significant weathering
			- Middle	50-75%	
			- Outside	50-75%	
		#1 Queen - Centre	- Inside	75-90%	Replaced 1960
			- Middle	75-90%	Significant weathering
			- Outside	75-90%	Significant weathering
		Centre - #2 Queen	- Inside	75-90%	
			- Middle	75-90%	
			- Outside	50-75%	Sounds drummy
		#2 Queen - #2 King	- Inside	75-90%	
			- Middle	50-75%	EDK at king strut; large PDK near #2 queen; PDK throughout
			- Outside	50-75%	Sounds Drummy
CD	**US**	**Steel Connection Plates**			
		#1 King Strut to top chord		70%	Heavily corroded; bolts gone
		#2 King Strut to top chord		80%	Heavily corroded; bolts gone
CD	**US**	**Timber Braces**			
		#1 - King Timber Brace		>90%	New
		#1 - Queen Timber Brace		>90%	New
		Centre Timber Brace		<50%	EDK top end; connection to saddle block OK, bolt / nuts corroded - Section loss at bottom connection; split
		#2 - Queen Timber Brace		>90%	New
		#2 - King Timber Brace		>90%	New
CD	**US**	**Bottom Cord (Steel)**			
		Pier - #1 King	- Inside	50-75%	Bottom flange ineffective
			- Outside	50-75%	Web Strengthened
		#1 King - #1 Queen	- Inside	50-75%	Splice plate corrosion
			- Outside	50-75%	Mostly strengthened (Up to splice plate)
		#1 Queen - Centre	- Inside	50-75%	Minor pockets of corrosion
			- Outside	50-75%	Heavy web corrosion
		Centre - #2 Queen	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Heavy corrosion
		#2 Queen - #2 King	- Inside	50-75%	Moderate to heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#2 King - Pier	- Inside	50-75%	Moderate to heavy corrosion
			- Outside	50-75%	Heavy corrosion

Truss SPAN C - D (Downstream)					
Span	Side	Structural Element		Estimated %	Comments
		CD DOWNSTREAM		Original Capacity	#1 North (Hoki) #2 South (Ross)
CD	DS	**Timber Struts**			
		#1 - King Strut		50-75%	Sounds Drummy - PDK Throughout
		#1 - Queen Strut		50-75%	Replaced 1966; Sounds drummy lower portion
		#1 - Counter Strut		75-90%	Vertical splitting through top surface full length
		#1 - Centre Strut	- Inside	50-75%	PDK at thrust block; Splitting and PDK top surface
			- Outside	75-90%	PDK outside face around bolts
		#2 - Centre Strut	- Inside	<50%	PDK Throughout
			- Outside	75-90%	
		#2 - Counter Strut		75-90%	PDK outside face; vertical splitting
		#2 - Queen Strut		50-75%	Surface weathering; dull sound at base
		#2 - King Strut		50-75%	Surface weathering; insect holes noted near top
CD	DS	**Vertical Steel Tension Rods**			
		#1 - King Rods	- Inside	70%	
			- Outside	60%	
		#1 - Queen Rods	- Inside	60%	
			- Outside	>90%	New
		#1 - Centre Rods	- Inside	80%	
			- Outside	90%	
		#2 - Queen Rods	- Inside	>90%	New
			- Outside	90%	
		#2 - King Rods	- Inside	30%	
			- Outside	30%	
CD	DS	**Timber Thrust Blocks**			
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Block		75-90%	
		Centre Thrust Block		75-90%	
		#2 - Queen Thrust Block		75-90%	
		#2 - KingThrust Block		<50%	Significant decay top surface; large PDK between rods and on outside of rods; heavy top section loss
CD	DS	**Timber A-Blocks**			
		#1 - Queen A-Block		75-90%	
		Centre A-Block		75-90%	
		#2 - Queen A-Block		75-90%	
CD	DS	**Timber Saddle Blocks**			
		#1 - King Saddle Block		50-75%	Small CDK inside end; several PDK's on northern face
		#1 - Queen Saddle Block		75-90%	PDK on Top
		Centre Saddle Block		75-90%	CDK inside end; significant decay / weathering on top surface
		#2 - Queen Saddle Block		75-90%	Typical EDK and weathering
		#2 - King Saddle Block		50-75%	Large CDK inside end

Truss SPAN C - D (Downstream)					
CD	DS	**Top Chord**			
		#1 King - #1 Queen	- Inside	50-75%	Replaced 1933 (second hand); large PDK inside face at bolt group
			- Middle	75-90%	Weathered
			- Outside	75-90%	Weathered
		#1 Queen - Center	- Inside	75-90%	Surface decay inside face - Loss of section
			- Middle	75-90%	Weathered
			- Outside	75-90%	Weathered
		Centre - #2 Queen	- Inside	75-90%	Significant surface decay top surface - Loss of section
			- Middle	75-90%	PDK Decay
			- Outside	75-90%	Splitting
		#2 Queen - #2 King	- Inside	50-75%	Remove vegetation at end and investigate further - EDK around bolts
			- Middle	50-75%	Replaced 1950; remove vegetation at end and investigate further
			- Outside	50-75%	Remove vegetation at end and investigate further
CD	DS	**Steel Connection Plates**			
		#1 King Strut to top chord		90%	Heavy corrosion; bolts gone
		#2 King Strut to top chord		60%	Heavy corrosion; bolts gone
CD	DS	**Timber Braces**			
		#1 - King Timber Brace		75-90%	PDK at connection to transom
		#1 - Queen Timber Brace		>90%	New
		Centre Timber Brace		>90%	New
		#2 - Queen Timber Brace		>90%	New
		#2 - King Timber Brace		>90%	New
CD	DS	**Bottom Chord**			
		Pier - #1 King	- Inside	50-75%	Heavy Corrosion
			- Outside	50-75%	Heavy
		#1 King - #1 Queen	- Inside	50-75%	Heavy
			- Outside	50-75%	Heavy
		#1 Queen - Centre	- Inside	50-75%	Moderate
			- Outside	50-75%	Moderate
		Centre - #2 Queen	- Inside	50-75%	Moderate
			- Outside	50-75%	Moderate
		#2 Queen - #2 King	- Inside	50-75%	Heavy
			- Outside	50-75%	Heavy but Strengthened
		#2 King - Pier	- Inside	50-75%	Heavy
			- Outside	50-75%	Heavy but Strengthened

Truss SPAN D - E (Upstream)					
Span	Side	Structural Element		Estimated %	Comments
		DE UPSTREAM		Original Capacity	#1 North (Hoki) #2 South (Ross)
DE	**US**	**Timber Struts**			
		#1 - King Strut		50%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull
		#1 - Queen Strut		50%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull
		#1 - Counter Strut		75-90%	Small PDK inside face at base; splitting in top surface; PDK inside face at top by bolt
		#1 - Centre Strut	- Inside	75-90%	Some splitting along inside face; splitting and PDK throughout
			- Outside	75-90%	Some surface splitting; splitting and PDK throughout
		#2 - Centre Strut	- Inside	75-90%	PDK on top surface; splitting and PDK throughout
			- Outside	75-90%	Some splitting top surface; splitting and PDK throughout
		#2 - Counter Strut		75-90%	Split in top surface full length of member; EDK at top
		#2 - Queen Strut		50-75%	Deep splitting / weathering in top surface
		#2 - King Strut		75-90%	Replaced 1944; weathered
DE	**US**	**Vertical Steel Tension Rods**			
		#1 - King Rods	- Inside	70%	Heavy corroded
			- Outside	60%	Heavy corroded
		#1 - Queen Rods	- Inside	60%	Heavy corroded
			- Outside	80%	Heavy corroded
		#1 - Centre Rods	- Inside	80%	Heavy corroded
			- Outside	50%	Heavy corroded
		#2 - Queen Rods	- Inside	70%	Heavy corroded
			- Outside	70%	Heavy corroded
		#2 - King Rods	- Inside	60%	Heavy corroded
			- Outside	60%	Heavy corroded
DE	**US**	**Timber Thrust Blocks**			
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Block		75-90%	
		Centre Thrust Block		75-90%	
		#2 - Queen Thrust Block		75-90%	
		#2 - King Thrust Block		75-90%	
DE	**US**	**Timber A-Blocks**			
		#1 - Queen A-Block		75-90%	Small CDK
		Centre A-Block		75-90%	
		#2 - Queen A-Block		50-75%	CDK approx. 120mm diameter
DE	**US**	**Timber Saddle Blocks**			
		#1 - King Saddle Block		75-90%	CDK inside end approx. 50mm diameter
		#1 - Queen Saddle Block		75-90%	Surface decay on top extending down into saddle block
		Centre Saddle Block		75-90%	CDK inside end approx. 40mm diameter
		#2 - Queen Saddle Block		75-90%	Weathered on top
		#2 - King Saddle Block		75-90%	CDK inside end approx. 20mm diameter; PDk at drill holes on northern face.

Truss SPAN D - E (Upstream)					
DE	**US**	**Top Chord**			
		#1 King - #1 Queen	- Inside	75-90%	Weathered
			- Middle	75-90%	Replaced 1933 (second hand); weathered
				75-90%	Weathered
		#1 Queen - Centre	- Inside	75-90%	Weathered; PDK
			- Middle	75-90%	Weathered
			- Outside	50-75%	Large PDK at end or flitch (approx. half section missing) - Check UAV?
		Centre - #2 Queen	- Inside	75-90%	
				75-90%	PDK top surface and inside face; weathered
			- Outside	75-90%	PDK top surface; weathered
		#2 Queen - #2 King	- Inside	75-90%	Weathered
			- Middle	75-90%	Significant weathering and Isolated PDK
			- Outside	50-75%	Significant weathering and Isolated PDK; dozy near #2 king windbrace connection.
DE	**US**	**Steel Connection Plates**			
		#1 King Strut to top chord		90%	Heavily corroded; bolts gone
		#2 King Strut to top chord		80%	Heavily corroded; bolts gone
DE	**US**	**Timber Braces**			
		#1 - King Timber Brace		75-90%	Organic growth from splits centre; heavy decay at bottom
		#1 - Queen Timber Brace		75-90%	Nuts missing from bolts
		Centre Timber Brace		75-90%	Section loss at bottom; decay lower section
		#2 - Queen Timber Brace		50-75%	Large PDK at base; bolts fully corroded; surface splitting at centre
		#2 - King Timber Brace		75-90%	Split at bolt otherwise sound; mid-splice
DE	**US**	**Bottom Chord**			
		Pier - #1 King	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#1 King - #1 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#1 Queen - Centre	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		Centre - #2 Queen	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		#2 Queen - #2 King	- Inside	50-75%	Heavy corrosion including splice plate
			- Outside	50-75%	Heavy corrosion including splice plate; bolts cracked and corroded
		#2 King - Pier	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Heavy corrosion

Truss SPAN D - E (Downstream)					
Span	Side	Structural Element		Estimated % Original Capacity	Comments #1 North (Hoki) #2 South (Ross)
DE	DS	**Timber Struts**			
		#1 - King Strut		75-90%	Significant surface weathering top surface; several PDK top surface.
		#1 - Queen Strut		75-90%	Weathered top surface
		#1 - Counter Strut		50-75%	Split and PDK top surface; bottom edge splitting; bottom decaying inside face
		#1 - Centre Strut	- Inside	75-90%	Some vertical cracking noted
			- Outside	75-90%	Some vertical cracking noted; PDK inside face
		#2 - Centre Strut	- Inside	50-75%	Some surface decay and splitting at base
			- Outside	50-75%	Large vertical split full length; surface decay
		#2 - Counter Strut		75-90%	Splitting in top surface full length; edge decay inside face
		#2 - Queen Strut		50-75%	Cracking in top surface; sounds hollow from 1m below A-block; PDK inside face; likely CDK
		#2 - King Strut		75-90%	Weathered top surface; isolated PDK inside surface
DE	DS	**Vertical Steel Tension Rods**			
		#1 - King Rods	- Inside	>90%	New
			- Outside	40%	Heavily corroded
		#1 - Queen Rods	- Inside	30%	Heavily corroded
			- Outside	30%	Heavily corroded
		#1 - Centre Rods	- Inside	>90%	New
			- Outside	>90%	New
		#2 - Queen Rods	- Inside	60%	Heavily corroded
			- Outside	60%	Heavily corroded
		#2 - King Rods	- Inside	70%	Heavily corroded
			- Outside	70%	Heavily corroded
DE	DS	**Timber Thrust Blocks**			
		#1 - King Portal Thrust Block		75-90%	
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Block		75-90%	
		Centre Thrust Block		75-90%	
		#2 - Queen Thrust Block		75-90%	
		#2 - KingThrust Block		75-90%	
		#2 - King Portal Thrust Block		75-90%	
DE	DS	**Timber A-Blocks**			
		#1 - Queen A-Block		75-90%	CDK
		Centre A-Block		75-90%	
		#2 - Queen A-Block		75-90%	
DE	DS	**Timber Saddle Blocks**			
		#1 - King Saddle Block		75-90%	Small CDK and splitting inside end; significant EDK outside end to beyond brace connection; top decay
		#1 - Queen Saddle Block		75-90%	EDK outside end
		Centre Saddle Block		75-90%	Advanced decay all round
		#2 - Queen Saddle Block		50-75%	Small CDK inside end; significant EDK outside end to beyond windbrace connection; sounds hollow
		#2 - King Saddle Block		<50%	Large CDK inside end up to 150mm diameter; surface decay; sounds hollow; investigate and treat / replace; decay advanced inside face

Truss SPAN D - E (Downstream)					
DE	DS	**Top Chord**			
		#1 King - #1 Queen	- Inside	50-75%	Weathered; sounds hollow
			- Middle	50-75%	Large PDK inside face approx. 50mm deep; weathered
			- Outside	50-75%	Large PDK, approx half cross section missing
		#1 Queen - Centre	- Inside	75-90%	
			- Middle	75-90%	Bottom surface decay
			- Outside	75-90%	EDK at splice connection; vegetation growing from splice connection
		Centre - #2 Queen	- Inside	75-90%	Weathered
			- Middle	75-90%	Weathered
			- Outside	75-90%	Weathered; small PDK top surface; advancing surface decay
		#2 Queen - #2 King	- Inside	50-75%	Weathered; split; PDK inside flitch below saddle; sounds hollow
			- Middle	75-90%	Weathered; split
			- Outside	75-90%	Weathered; split
DE	DS	**Steel Connection Plates**			
		#1 King Strut to top chord			Heavily corroded
		#2 King Strut to top chord		70%	Heavily corroded
DE	DS	**Timber Braces**			
		#1 - King Timber Brace		75-90%	PDK at base; weathered and splitting
		#1 - Queen Timber Brace		75-90%	Large split from top end through bolted connection; install split bolt; loose bottom bolt; some organice growth
		Centre Timber Brace		75-90%	Surface decay and splitting
		#2 - Queen Timber Brace		50-75%	Significant cracking; hollow sound
		#2 - King Timber Brace		<50%	Split in end; large PDK at connection to transom; one bolt at bottom ineffective
DE	DS	**Bottom chord (Steel)**			
		Pier - #1 King	- Inside	70%	Heavy isolated corrosion
			- Outside	50%	Heavy corrosion
		#1 King - #1 Queen	- Inside	50%	Heavy corrosion
			- Outside	80%	Heavy corrosion
		#1 Queen - Centre	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		Centre - #2 Queen	- Inside	50-75%	Moderate isolated heavy
			- Outside	50-75%	Heavy corrosion at centre thrust bock
		#2 Queen - #2 King	- Inside	50-75%	Heavy Corrosion
			- Outside	50-75%	Heavy Corrosion
		#2 King - Pier	- Inside	50-75%	Heavy Corrosion
			- Outside	50-75%	Heavy Corrosion

Truss SPAN E - F (Upstream)					
Span	Side	Structural Element		Estimated % Original Capacity	Comments #1 North (Hoki) #2 South (Ross)
EF	US	**Timber Struts**			
		#1 - King Strut		50-75%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull; large decay at top
		#1 - Queen Strut		50%	Weathered top surface with large splits down centre; PDK and split on underside
		#1 - Counter Strut		~0%	PDK top surface; minimal contact at bottom (Decay)
		#1 - Centre Strut	- Inside	75-90%	Vertical splitting full length; some horizontal splitting on sides
			- Outside	<50%	Significant vertical splitting and dacay of top surface; horizontal splitting inside face; condition likely deteriorated
		#2 - Centre Strut	- Inside	<50%	Large horizontal crack full length; significant surface decay and PDK; base decay
			- Outside	<50%	Significant splitting and PDK at base; large split at top
		#2 - Counter Strut		50-75%	PDK at thrust block; splitting at base; sounds dull
		#2 - Queen Strut		70%	PDK at base; significant weathering and cracking top surface approx 1/4 depth
		#2 - King Strut		75-90%	Surface weathering on top surface
EF	US	**Vertical Steel Tension Rods**			
		#1 - King Rods	- Inside	90%	Heavily corroded
			- Outside	80%	Heavily corroded
		#1 - Queen Rods	- Inside	90%	Heavily corroded
			- Outside	60%	Heavily corroded
		#1 - Centre Rods	- Inside	70%	Heavily corroded
			- Outside	>90%	New
		#2 - Queen Rods	- Inside	50%	Heavily corroded
			- Outside	60%	Heavily corroded
		#2 - King Rods	- Inside	70%	Heavily corroded
			- Outside	90%	Heavily corroded
EF	US	**Timber Thrust Blocks**			
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Block		75-90%	
		Centre Thrust Block		50-75%	Some splitting and compression occuring
		#2 - Queen Thrust Block		75-90%	
		#2 - KingThrust Block		75-90%	
EF	US	**Timber A-Blocks**			
		#1 - Queen A-Block		75-90%	Small CDK inside end
		Centre A-Block		75-90%	Small CDK inside end; small PDK at strut
		#2 - Queen A-Block		75-90%	Large CDK inside end approx. 100mm diameter

Truss SPAN E - F (Upstream)					
EF	**US**	**Timber Saddle Blocks**			
		#1 - King Saddle Block		75-90%	Small CDK; large vertical split; treat and provice horizontal split bolts; full depth split
		#1 - Queen Saddle Block		75-90%	CDK approx. 80mm diameter inside end
		Centre Saddle Block		75-90%	CDK inside end; PDK on south side
		#2 - Queen Saddle Block		<50%	Large CDK extending to top chord of truss (approx. 200mm diameter), extends to vertical tie rod
		#2 - King Saddle Block		<50%	Soft end; sounds dull; deteriorated overall
EF	**US**	**Top Chord**			
		#1 King - #1 Queen	- Inside	75-90%	Weathering
			- Middle	75-90%	
			- Outside	75-90%	Replaced 1940
		#1 Queen - Centre	- Inside	50-75%	Large PDK, approx. half section missing
			- Middle	50-75%	Large PDK and split through side; sounds drummy
			- Outside	75-90%	
		Centre - #2 Queen	- Inside	75-90%	Large vertical split approx. 50mm deep
			- Middle	75-90%	
			- Outside	75-90%	
		#2 Queen - #2 King	- Inside	50-75%	CDK at south end; large vertical spilt; one corroeded splice bolt
			- Middle	50-75%	Significant weathering; PDK inside face; blocking ineffective
			- Outside	50-75%	Large PDK inside face, approx. half section gone;
EF	**US**	**Steel Connection Plates**			
		#1 King Strut to top chord		60%	Heavily corroded; bolts gone
		#2 King Strut to top chord		50%	Heavily corroded; bolts gone
EF	**US**	**Timber Braces**			
		#1 - King Timber Brace		>90%	New
		#1 - Queen Timber Brace		50-75%	PDK throughout
		Centre Timber Brace		<50%	Some end splitting and section loss
		#2 - Queen Timber Brace		>90%	New
		#2 - King Timber Brace		<50%	Large PDK south face; large split through; PDK both sides
EF	**US**	**Bottom chord (Steel)**			
		Pier - #1 King	- Inside	50-75%	Heavy corrosion
			- Outside	30%	Heavy corrosion
		#1 King - #1 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#1 Queen - Centre	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		Centre - #2 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#2 Queen - #2 King	- Inside	<50%	Severe corrosion
			- Outside	<50%	Severe corrosion
		#2 King - Pier	- Inside	<50%	Severe corrosion
			- Outside	<50%	Severe corrosion

Truss SPAN E - F (Downstream)					
Span	Side	Structural Element		Estimated % Original Capacity	Comments #1 North (Hoki) #2 South (Ross)
EF	**DS**	**Timber Struts**			
		#1 - King Strut		50-75%	Weathered top surface; decay to approximately half depth of member; water ponding at base
		#1 - Queen Strut		75-90%	Minor splitting in top surface
		#1 - Counter Strut		75-90%	
		#1 - Centre Strut	- Inside	<50%	Vertical splitting in lower half; some PDK at centre inside fall
			- Outside	75-90%	Vertical splitting in lower half
		#2 - Centre Strut	- Inside	75-90%	
			- Outside	75-90%	Splitting at bottom
		#2 - Counter Strut		75-90%	Top splitting
		#2 - Queen Strut		50-75%	Surface decay at top; dull sound in lower portion, possible CDK; section necking
		#2 - King Strut		75-90%	Weathered
EF	**DS**	**Vertical Steel Tension Rods**			
		#1 - King Rods	- Inside	85%	Heavily corroded
			- Outside	90%	Heavily corroded
		#1 - Queen Rods	- Inside	60%	Heavily corroded
			- Outside	40%	Heavily corroded
		#1 - Centre Rods	- Inside	>90%	New
			- Outside	50%	Heavily corroded
		#2 - Queen Rods	- Inside	50%	Heavily corroded
			- Outside	50%	Heavily corroded
		#2 - King Rods	- Inside	50%	Heavily corroded
			- Outside	60%	Heavily corroded
EF	**DS**	**Timber Thrust Blocks**			
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Block		75-90%	
		Centre Thrust Block		75-90%	PDK top surface and inside contact area for #2 Counter Strut
		#2 - Queen Thrust Block		75-90%	
		#2 - KingThrust Block		75-90%	Centre spilt; EDK outside face
EF	**DS**	**Timber A-Blocks**			
		#1 - Queen A-Block		75-90%	
		Centre A-Block		75-90%	
		#2 - Queen A-Block		75-90%	Small CDK inside end
EF	**DS**	**Timber Saddle Blocks**			
		#1 - King Saddle Block		75-90%	CDK inside end approx 50mm diameter; EDK outside end
		#1 - Queen Saddle Block		75-90%	EDK outside end
		Centre Saddle Block		75-90%	Small CDK and vertical split inside end; EDK outside end; significant top decay north face
		#2 - Queen Saddle Block		75-90%	CDK inside end; EDK outside end
		#2 - King Saddle Block		50-75%	CDK inside end approx. 70mm diameter; EDK outside end; PDK northern face

Truss SPAN E - F (Downstream)					
EF	**DS**	**Top Chord**			
		#1 King - #1 Queen	- Inside	75-90%	Splitting inside face
			- Middle	75-90%	
			- Outside	50-75%	PDK top surface approx 300mm long; PDK on underside; splitting inside face
		#1 Queen - Centre	- Inside	75-90%	Weathered
			- Middle	75-90%	Replaced 1976
			- Outside	50-75%	PDK to half section depth
		Centre - #2 Queen	- Inside	75-90%	Bottom decay
			- Middle	75-90%	Splitting
			- Outside	75-90%	
		#2 Queen - #2 King	- Inside	75-90%	Replaced 1933 (second hand)
			- Middle	75-90%	PDK
			- Outside	75-90%	
EF	**DS**	**Steel Connection Plates**			
		#1 King Strut to top chord		60%	Heavily corroded; steel delamination at edges
		#2 King Strut to top chord		60%	Heavily corroded; steel delamination at edges
EF	**DS**	**Timber Braces**			
		#1 - King Timber Brace		>90%	New
		#1 - Queen Timber Brace		75-90%	Nut missing from bolt connecting to transom
		Centre Timber Brace		75-90%	EDK and vertical split at top
		#2 - Queen Timber Brace		75-90%	Split and PDK
		#2 - King Timber Brace		75-90%	PDK
EF	**DS**	**Bottom chord (Steel)**			
		Pier - #1 King	- Inside	75-90%	Strengthened
			- Outside	60%	Heavy Corrosion
		#1 King - #1 Queen	- Inside	75-90%	Strengthened
			- Outside	50-75%	Heavy Corrosion
		#1 Queen - Centre	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		Centre - #2 Queen	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		#2 Queen - #2 King	- Inside	50-75%	Isolated heavy corrosion
			- Outside	75-90%	Strengthened
		#2 King - Pier	- Inside	50-75%	Heavy Corrosion
			- Outside	75-90%	Strengthened

Truss SPAN F - G (Upstream)					
Span	Side	Structural Element		Estimated % Original Capacity	Comments #1 North (Hoki) #2 South (Ross)
FG	**US**	**Timber Struts**			
		#1 - King Strut		70%	Significant surface weathering and PDK in top surface; top 1/4 section no longer contributing to strength
		#1 - Queen Strut		50-75%	Advanced surface decay top surface; splitting in top surface approx. 100mm deep
		#1 - Counter Strut		60%	Significant splitting on top surface and inside face, full length; PDK top surface; top 1/3 section no longer contributing to strength
		#1 - Centre Strut	- Inside	75-90%	Splitting in top surface; PDK near top
			- Outside	50-75%	Splitting in top surface; PDK top surface and outside face
		#2 - Centre Strut	- Inside	50-75%	PDK at base; weathering of top surface; bottom and top decay at base
			- Outside	75-90%	Weathering of top surface
		#2 - Counter Strut		75-90%	Weathering and splitting of top surface; PDK top surface; some splitting in side at top
		#2 - Queen Strut		75-90%	PDK throughout
		#2 - King Strut		50-75%	Replaced 1928; advance surface decay on top surface; PDK on sides, top and bottom surface; horizontal split bolts at top; advancing decay
FG	**US**	**Vertical Steel Tension Rods**			
		#1 - King Rods	- Inside	60%	Heavily corroded
			- Outside	80%	Heavily corroded
		#1 - Queen Rods	- Inside	60%	Heavily corroded
			- Outside	60%	Heavily corroded
		#1 - Centre Rods	- Inside	90-100%	New
			- Outside	90-100%	New
		#2 - Queen Rods	- Inside	50%	Heavily corroded
			- Outside	50%	Heavily corroded
		#2 - King Rods	- Inside	90%	Pitting
			- Outside	60%	Heavily corroded
FG	**US**	**Timber Thrust Blocks**			
		#1 - King Thrust Block		75-90%	Split in centre
		#1 - Queen Thrust Block		<50%	Significant splitting and decay
		Centre Thrust Block		75-90%	
		#2 - Queen Thrust Block		75-90%	
		#2 - KingThrust Block		<50%	Significant decay across top in line of tension rods.
FG	**US**	**Timber A-Blocks**			
		#1 - Queen A-Block		75-90%	Small CDK inside end
		Centre A-Block		75-90%	Small CDK inside end
		#2 - Queen A-Block		75-90%	
FG	**US**	**Timber Saddle Blocks**			
		#1 - King Saddle Block		50-75%	Significant EDK (approx 1/3 of end approaching 1/2) extending to top surfce; dull sound at top
		#1 - Queen Saddle Block		75-90%	Replaced 1967; small CDK inside end; soft
		Centre Saddle Block		50-75%	CDK inside end approx. 80mm diameter extending to base of saddle block
		#2 - Queen Saddle Block		50-75%	CDK inside end extending up to top surface
		#2 - King Saddle Block		50-75%	EDK inside end (approx. 1/3 of end approaching 1/2); dull sound on northern face

Truss SPAN F - G (Upstream)					
FG	**US**	**Top Chord**			
		#1 King - #1 Queen	- Inside	75-90%	Inside face splits
			- Middle	75-90%	Weathered
			- Outside	75-90%	Weathered
		#1 Queen - Centre	- Inside	75-90%	Inside face splits
			- Middle	75-90%	Weathered; moss growing
			- Outside	75-90%	Weathered; moss growing
		Centre - #2 Queen	- Inside	75-90%	Horizontal splitting inside face
			- Middle	75-90%	Isolated PDK
			- Outside	50-75%	PDK inside face, approx. 50% loss of section
		#2 Queen - #2 King	- Inside	75-90%	Weathered
			- Middle	75-90%	
			- Outside	75-90%	Weathered; PDK
FG	**US**	**Steel Connection Plates**			
		#1 King Strut to top chord		30%	Heavily corroded; bolts gone
		#2 King Strut to top chord		70%	Heavily corroded; bolts gone
FG	**US**	**Timber Braces**			
		#1 - King Timber Brace		75-90%	Splitting and surface decay at base; nut missing from bolt connecting to saddle
		#1 - Queen Timber Brace		75-90%	Large split through centre; PDK outside edge near base; nut missing from bolt connecting to saddle; bolt missing at base
		Centre Timber Brace		<50%	Top end completed decayed; organic matter growing
		#2 - Queen Timber Brace		75-90%	Nut missing at bottom; replace bottom bolt
		#2 - King Timber Brace		75-90%	PDK at bottom around bolts
FG	**US**	**Bottom chord (Steel)**			
		Pier - #1 King	- Inside	50-75%	Heavy corrosion
			- Outside	<50%	Approaching severe corrosion
		#1 King - #1 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#1 Queen - Centre	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		Centre - #2 Queen	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		#2 Queen - #2 King	- Inside	50-75%	Heavy corrosion
			- Outside	<50%	Severe corrosion
		#2 King - Pier	- Inside	50-75%	Heavy corrosion
			- Outside	<50%	Severe corrosion

Truss SPAN F - G (Downstream)					
Span	Side	Structural Element		Estimated % Original Capacity	Comments #1 North (Hoki) #2 South (Ross)
FG	**DS**	**Timber Struts**			
		#1 - King Strut		75-90%	Replaced 1977
		#1 - Queen Strut		75-90%	Replaced 1965; splitting top surface
		#1 - Counter Strut		75-90%	
		#1 - Centre Strut	- Inside	75-90%	Surface weathering; splitting
			- Outside	75-90%	Surface weathering
		#2 - Centre Strut	- Inside	75-90%	Surface weathering; splitting top surface
			- Outside	75-90%	Surface weathering; bottom face splitting at top
		#2 - Counter Strut		75-90%	Weathering and splitting
		#2 - Queen Strut		50-75%	Some hollowing in bottom end; PDK top surface; weathered throughout
		#2 - King Strut		75-90%	
FG	**DS**	**Vertical Steel Tension Rods**			
		#1 - King Rods	- Inside	50%	Heavily corroded
			- Outside	80%	Heavily corroded
		#1 - Queen Rods	- Inside	60%	Heavily corroded
			- Outside	60%	Heavily corroded
		#1 - Centre Rods	- Inside	60%	Heavily corroded
			- Outside	80%	Heavily corroded
		#2 - Queen Rods	- Inside	85%	Light corrosion
			- Outside	70%	Heavily corroded
		#2 - King Rods	- Inside	70%	Heavily corroded
			- Outside	60%	Heavily corroded
FG	**DS**	**Timber Thrust Blocks**			
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Block		75-90%	Small section missing from top outside of outside tie rod
		Centre Thrust Block		75-90%	Centre split
		#2 - Queen Thrust Block		75-90%	
		#2 - King Thrust Block		75-90%	CDK started on outside face; small section missing from top outside of outside tie rod
FG	**DS**	**Timber A-Blocks**			
		#1 - Queen A-Block		75-90%	
		Centre A-Block		75-90%	CDK inside end approx. 100mm+ diameter
		#2 - Queen A-Block		75-90%	
FG	**DS**	**Timber Saddle Blocks**			
		#1 - King Saddle Block		75-90%	EDK at windbrace connection
		#1 - Queen Saddle Block		75-90%	Vertical split through inside face
		Centre Saddle Block		<50%	PDK; outside tension rod loose due to saddle block crushing; 30% section gone by crushing
		#2 - Queen Saddle Block		75-90%	EDK at windbrace connection; CDK inside approx 70mm diameter
		#2 - King Saddle Block		75-90%	Significant EDK at outside end; up to 20% CDK inside end

Truss SPAN F - G (Downstream)					
FG	DS	**Top Chord**			
		#1 King - #1 Queen	- Inside	75-90%	Splitting and PDK top surface; EDK and southern end
			- Middle	75-90%	
			- Outside	75-90%	
		#1 Queen - Centre	- Inside	<50%	Splitting in top surface; heavy bottom decay
			- Middle	75-90%	
			- Outside	75-90%	PDK
		Centre - #2 Queen	- Inside	75-90%	Weathered
			- Middle	75-90%	Weathering
			- Outside	75-90%	Weathering
		#2 Queen - #2 King	- Inside	75-90%	
			- Middle	75-90%	
			- Outside	75-90%	
FG	DS	**Steel Connection Plates**			
		#1 King Strut to top chord		70%	Heavily corroded, bolts gone
		#2 King Strut to top chord		60%	Heavily corroded, bolts gone
FG	DS	**Timber Braces**			
		#1 - King Timber Brace		75-90%	
		#1 - Queen Timber Brace		75-90%	Split through centre at top end
		Centre Timber Brace		>90%	New
		#2 - Queen Timber Brace		>90%	New
		#2 - King Timber Brace		75-90%	
FG	DS	**Bottom chord (Steel)**			
		Pier - #1 King	- Inside	50-75%	Heavy corrosion
			- Outside	<50%	Severe corrosion
		#1 King - #1 Queen	- Inside	<50%	Severe corrosion
			- Outside	50-75%	Heavy corrosion
		#1 Queen - Centre	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		Centre - #2 Queen	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Moderate corrosion
		#2 Queen - #2 King	- Inside	<50%	Severe corrosion
			- Outside	<50%	Isolated severe corrosion
		#2 King - Pier	- Inside	<50%	Severe corrosion
			- Outside	50-75%	Heavy corrosion

Truss SPAN G - H (Upstream)					
Span	Side	Structural Element		Estimated % Original Capacity	Comments #1 North (Hoki) #2 South (Ross)
GH	**US**	**Timber Struts**			
		#1 - King Strut		70%	Extensive surface weathering and splitting
		#1 - Queen Strut		75-90%	
		#1 - Counter Strut		75-90%	
		#1 - Centre Strut	- Inside	<50%	Large PDK inside face; splitting
			- Outside	<50%	Splitting and associated PDK; ropey top surface
		#2 - Centre Strut	- Inside	75-90%	Vertical splitting top surface; small PDK at base
			- Outside	75-90%	Vertical splitting top surface
		#2 - Counter Strut		75-90%	PDK both ends; some horizontal splitting; weathering and surface decay on top surface
		#2 - Queen Strut		75-90%	Repaced 1960; Splitting and PDK top surface
		#2 - King Strut		70%	Vertical splitting and PDK top surface up to 60mm deep
GH	**US**	**Vertical Steel Tension Rods**			
		#1 - King Rods	- Inside	85%	Surface corrosion
			- Outside	60%	Heavily corroded
		#1 - Queen Rods	- Inside	80%	Heavily corroded
			- Outside	60%	Heavily corroded
		#1 - Centre Rods	- Inside	80%	Heavily corroded
			- Outside	50%	Heavily corroded
		#2 - Queen Rods	- Inside	70%	Heavily corroded
			- Outside	95%	Light surface corrosion
		#2 - King Rods	- Inside	80%	Heavily corroded
			- Outside	90%	Heavily corroded
GH	**US**	**Timber Thrust Blocks**			
		#1 - King Thrust Block		75-90%	
		#1 - Queen Thrust Block		75-90%	Second hand (replaced); PDK top surface; small PDK inside of inside rod
		Centre Thrust Block		75-90%	
		#2 - Queen Thrust Block		75-90%	
		#2 - King Thrust Block		75-90%	Second hand (replaced); Some decay along top through centre; cement repair outside north corner
GH	**US**	**Timber A-Blocks**			
		#1 - Queen A-Block		75-90%	Split with some decay south edge
		Centre A-Block		75-90%	Small CDK inside end; small PDK behind strut
		#2 - Queen A-Block		75-90%	Small CDK and some splitting through end
GH	**US**	**Timber Saddle Blocks**			
		#1 - King Saddle Block		50-75%	Large split inside end from top to centre; Significant EDK outside end; sounds hollow; ply over inside end
		#1 - Queen Saddle Block		50-75%	Large EDK extending full depth; souds hollow underneath bolts
		Centre Saddle Block		<50%	Large CDK inside end full depth of saddle; ply covered inside end
		#2 - Queen Saddle Block		75-90%	CDK starting at inside end with vertical crack
		#2 - King Saddle Block		75-90%	Large CDK inside end through centre extending to top surface; outside end similar; sounds very hollow; cement patched

Truss SPAN G - H (Upstream)					
GH	**US**	**Top Chord**			
		#1 King - #1 Queen	- Inside	75-90%	Replaced 1960; some splitting and PDK inside face
			- Middle	75-90%	
			- Outside	75-90%	Significant weathering and PDK inside face
		#1 Queen - Centre	- Inside	75-90%	Large PDK inside face
			- Middle	75-90%	
			- Outside	75-90%	Small PDK on top; splitting on inside face; significantly weathered
		Centre - #2 Queen	- Inside	75-90%	Replaced 1960; Large split on inside face
			- Middle	75-90%	Replaced 1960
			- Outside	75-90%	Significantly weathered
		#2 Queen - #2 King	- Inside	75-90%	Replaced 1960; PDK and splitting inside face
			- Middle	75-90%	Replaced 1960
			- Outside	75-90%	Weathered top surface
GH	**US**	**Steel Connection Plates**			
		#1 King Strut to top chord		30%	Heavily corroded; bolts gone
		#2 King Strut to top chord		40%	Heavily corroded; bolts gone
GH	**US**	**Timber Braces**			
		#1 - King Timber Brace		>90%	New
		#1 - Queen Timber Brace		>90%	New
		Centre Timber Brace		>90%	New
		#2 - Queen Timber Brace		>90%	New; dark staining south face
		#2 - King Timber Brace		>90%	New
GH	**US**	**Bottom chord**			
		Pier - #1 King	- Inside	50-75%	Moderate corrosion
			- Outside	<50%	Severe corrosion
		#1 King - #1 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#1 Queen - Centre	- Inside	50-75%	Moderate corrosion
			- Outside	50-75%	Heavy corrosion
		Centre - #2 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#2 Queen - #2 King	- Inside	50-75%	Heavy corrosion
			- Outside	75-90%	Strengthened
		#2 King - Pier	- Inside	50-75%	Heavy corrosion
			- Outside	75-90%	Strengthened

Truss SPAN G - H (Downstream)					
Span	Side	Structural Element		Estimated % Original Capacity	Comments #1 North (Hoki) #2 South (Ross)
GH	**DS**	**Timber Struts**			
		#1 - King Strut		75-90%	Weathering; PDK on top face
		#1 - Queen Strut		75-90%	Significant surface cracking top surface and inside face
		#1 - Counter Strut		75-90%	Weathering; splitting on top
		#1 - Centre Strut	- Inside	75-90%	Some cracking and isolated PDK
			- Outside	75-90%	Some cracking and isolated PDK
		#2 - Centre Strut	- Inside	75-90%	Split at top; splits and PDK throughout
			- Outside	75-90%	Split with PDK at top
		#2 - Counter Strut		<50%	Significant loss of section at bottom end through decay
		#2 - Queen Strut		75-90%	Top surface weathering
		#2 - King Strut		75-90%	Replaced 1933 (second hand); surface decay inside face
GH	**DS**	**Vertical Steel Tension Rods**			
		#1 - King Rods	- Inside	85%	Corrosion
			- Outside	70%	Corrosion
		#1 - Queen Rods	- Inside	50%	Heavily corroded
			- Outside	50%	Heavily corroded
		#1 - Centre Rods	- Inside	95%	Light surface corrosion only
			- Outside	>90%	New
		#2 - Queen Rods	- Inside	60%	Heavily corroded
			- Outside	60%	Heavily corroded
		#2 - King Rods	- Inside	90%	Corrosion
			- Outside	80%	Corrosion
GH	**DS**	**Timber Thrust Blocks**			
		#1 - King Thrust Block		50-75%	Top section loss
		#1 - Queen Thrust Block		75-90%	
		Centre Thrust Block		75-90%	Centre split
		#2 - Queen Thrust Block		75-90%	
		#2 - King Thrust Block		75-90%	Weathering
GH	**DS**	**Timber A-Blocks**			
		#1 - Queen A-Block		<50%	CDK; PDK and splitting on counter strut side; signs of compression; replace within 5yrs
		Centre A-Block		75-90%	Small PDK around strut
		#2 - Queen A-Block		75-90%	

Truss SPAN G - H (Downstream)					
GH	DS	Timber Saddle Blocks			
		#1 - King Saddle Block		50-75%	CDK; PDK top at top; ply covered
		#1 - Queen Saddle Block		<50%	Large CDK inside end; replace within 5 years
		Centre Saddle Block		75-90%	EDK outside end and inside end
		#2 - Queen Saddle Block		75-90%	Some surface decay and weathering
		#2 - King Saddle Block		75-90%	EDK; all round vegetation growing
GH	DS	Top Chord			
		#1 King - #1 Queen	- Inside	75-90%	Splice plate over A-block
			- Middle	75-90%	
			- Outside	75-90%	Large PDK around bolts; completely gone near #1 Queen A-block
		#1 Queen - Centre	- Inside	<50%	PDK around splice; plate strengthened
			- Middle	75-90%	
			- Outside	75-90%	Plate strengthened
		Centre - #2 Queen	- Inside	75-90%	
			- Middle	75-90%	
			- Outside	75-90%	PDK around bolts
		#2 Queen - #2 King	- Inside	75-90%	Weathered
			- Middle	75-90%	Replaced 1974 (second hand)
			- Outside	75-90%	Moss growth
GH	DS	Steel Connection Plates			
		#1 King Strut to top chord		50%	Heavily corroded; bolts gone
		#2 King Strut to top chord		70%	Heavily corroded, bolts gone
GH	DS	Timber Braces			
		#1 - King Timber Brace		>90%	New; splintered at top
		#1 - Queen Timber Brace		>90%	New
		Centre Timber Brace		>90%	New
		#2 - Queen Timber Brace		50-75%	Spilt through lower half of brace
		#2 - King Timber Brace		>90%	New
GH	DS	Bottom chord			
		Pier - #1 King	- Inside	<50%	Severe corrosion
			- Outside	<50%	Severe corrosion
		#1 King - #1 Queen	- Inside	<50%	Severe corrosion
			- Outside	<50%	Severe corrosion
		#1 Queen - Centre	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		Centre - #2 Queen	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#2 Queen - #2 King	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion
		#2 King - Pier	- Inside	50-75%	Heavy corrosion
			- Outside	50-75%	Heavy corrosion

TRANSOMS (per span)				
Span	Side	Structural Element	Estimated % Original Capacity	Comments #1 North (Hoki) #2 South (Ross)
CD	US	#1 King Transom	75-90%	Bolts heavily corroded; horizontal split US; EDK DS
	DS	#1 King Transom	75-90%	Replaced 1960
	US	#1 Queen Transom	75-90%	Condition of bolts is mixed; EDK upstream
	DS	#1 Queen Transom	<50%	Replaced 1944; PDK downstream end; EDK severe
	US	Centre Transom	75-90%	Weathered; EDK; cement reapir; bolts corroded and missing
	DS	Centre Transom	75-90%	Replaced 1977 (second hand); PDK top surface between road beams; bolts corroded and missing; horizontal split DS
	US	#2 Queen Transom	75-90%	Replaced 1977; nuts missing
	DS	#2 Queen Transom	75-90%	Replaced 1960; weathered; horizontel crack and EDK both ends
	US	#2 King Transom	75-90%	Replaced 1977; small surface defect top surface between RH truss and RH road beam
	DS	#2 King Transom	75-90%	Replaced 1967 (second hand); organic growth; horizontal splitting
DE	US	#1 King Transom	<50%	large CDK; Sounds hollow under road beams; EDK and splititng both ends
	DS	#1 King Transom	<50%	Significant EDK upstream end; sounds hollow under truss; EDK downstream and fixings corroded
	US	#1 Queen Transom	50-75%	Sounds hollow under US road beam; top decay and weathering, splitting, CDK, EDK
	DS	#1 Queen Transom	75-90%	Honey combing and surface decay downstream end; large split between DS road beam and DS truss; small CDK upstream end; plate repair DS end with cement
	US	Centre Transom	50-75%	Sounds hollow under US road beam; weathering; splitting; EDK US
	DS	Centre Transom	75-90%	Isolated PDK south face; surface weathering and decay; weathering; splitting, EDK DS
	US	#2 Queen Transom	50-75%	Replaced 1960; large CDK downstream end extending back to thrust block; EDK upstream end; large PDK northern face between DS road beam and DS truss; bolts/fixings corroded
	DS	#2 Queen Transom	50-75%	Replaced 1960; EDK upstream end; condition of bolts is mixed - Splitting DS end
	US	#2 King Transom	75-90%	Condition of bolts is mixed; EDK upstream and downstream
	DS	#2 King Transom	75-90%	PDK
EF	US	#1 King Transom	75-90%	Replaced 1975; weathered EDK DS; US end split
	DS	#1 King Transom	75-90%	Some horizontal splitting downstream end; condition of bolts is mixed; nuts misisng
	US	#1 Queen Transom	75-90%	Replaced 1977; splitting DS end
	DS	#1 Queen Transom	75-90%	Split through top at upstream end
	US	Centre Transom	75-90%	Replaced 1944; weathered; splitting at ends
	DS	Centre Transom	75-90%	Split through top at upstream end; EDK; PDK throughout
	US	#2 Queen Transom	75-90%	Replaced 1960; splitting DS end
	DS	#2 Queen Transom	50-75%	Significant EDK upstream end extending up to 1.5m from end; extensive surface decay on top surface; member collapsing inward; (likely replacement required); EDK DS; end plate strengthend
	US	#2 King Transom	75-90%	Condition of bolts is mixed; 5 splice bolts between transoms are missing; EDK both ends, PDK; Replaced 1933
	DS	#2 King Transom	75-90%	Horizontal split DS end
FG	US	#1 King Transom	75-90%	PDK top surface; EDK upstream end; condition of bolts mixed
	DS	#1 King Transom	75-90%	End splitting upstream end; CDK DS end 200m diameter
	US	#1 Queen Transom	75-90%	Replaced 1944; condition of bolts is mixed; splits at both ends
	DS	#1 Queen Transom	75-90%	
	US	Centre Transom	75-90%	large horizontal split through side at upstream end - install vertical split bolts
	DS	Centre Transom	75-90%	large CDK / EDK upstream end; surface decay / weathering on top surface; EDK DS
	US	#2 Queen Transom	75-90%	Weathered; EDK US
	DS	#2 Queen Transom	75-90%	Splitting downstream end; install vertical split bolts
	US	#2 King Transom	50-75%	CDK downstream end; large PDK south face; PDK upstream face; hollow sound from LH truss to end; cement repair south face and plate repair US
	DS	#2 King Transom	75-90%	Weathered; splitting on north and south face with associated decay
GH	US	#1 King Transom	50-75%	Small EDK upstream end; splitting; sounds drummy
	DS	#1 King Transom	75-90%	EDK US
	US	#1 Queen Transom	75-90%	Large CDK downstream end; significant weathering; PDK
	DS	#1 Queen Transom	75-90%	large CDK upstream end; splitting both ends; horizontal split and downstream end; plate reapir DS
	US	Centre Transom	50-75%	Significant weathering; large PDK upstream end; sounds drummy
	DS	Centre Transom	75-90%	Horizontal split through centre at downstream end; install vertical split bolts; replaced 1961
	US	#2 Queen Transom	75-90%	Replaced 1977; PDK
	DS	#2 Queen Transom	50-75%	Significant EDK upstream end in horizontal plane, extending back under truss; large PDK south face; significant weathering; soft; plate repair effectiveness questionable due to significant DS end decay
	US	#2 King Transom	75-90%	Surface weathering EDK and splitting US
	DS	#2 King Transom	75-90%	PDK upstream end; significant weathering; DS plate repaired effectiveness questionable due to significant DS end decay

PIERS (Abutment A - Abutment J)						
Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	#1 North (Hoki) #2 South (Ross)
Abut. A	**Piles**					
Abut. A	Upstream Pile	•				PDK at top where previously drilled; general splitting and weathering
Abut. A	Centre Pile	•				Surface soft but sound underneath; general weathering
Abut. A	Downstream Pile	•				Surface splitting; EDK at top where previously drilled; excavation around pile showed pile sound below ground (2010?)
Abut. A	Pile Cap	•				CDK both ends; significant weathering and splitting; appears sound over piles
Abut. A	Abutment Walls - Timber facing	•				Top part collapsing; ends gone; otherwise appears ok
Abut. A	Abutment Walls - Vertical Railway Irons	•			60%	Extensive corrosion
Pier B	**Piles**					
Pier B	Upstream Pile	•				Surface splitting and weathering; PDK under pile cap, at top of pile, and several small isolated PDK along pile
Pier B	Centre Pile	•				Small outer section missing top and US end; vertical splitting and weathering; small loss of outer section at ground level; excavation around pile showed pile sound below ground
Pier B	Downstream Pile	•				Large vertical splits in top 1/3 pile; hollow sound at top likely due to splitting; large PDK at top;
Pier B	Upstream Cut Water Pile	•				EDK and splitting at top; vegetation growth all around
Pier B	Downstream Cut Water Pile	•				Not inspected due to vegetation
Pier B	**Raker Studs**					
Pier B	Upstream Raker Stud	•				Significant decay at bottom; significant weathering; top surface has honeycomb effect and worm holes
Pier B	Downstream Raker Stud		•			Not inspected to due vegetation
Pier B	**Diagonal Bracing**					
Pier B	Cross bracing	•			70%	Steel railway iron; varying amounts of corrosion
Pier B	**Whaling's**					
Pier B	Whaling's	•			50%	Steel railway irons; heavily corroded
Pier B	Pile Cap	•				Replaced 1975; surface decay North Face
Pier C	**Piles**					
Pier C	Pile #1	•				Vertical splitting above whalers
Pier C	Pile #2	•				Vertical splitting above whalers
Pier C	Pile #3	•				Deep splits / pockets on north face from spikes >1/2 depth over 2m length
Pier C	Pile #4	•				Vertical splitting above whalers; surface loss US stream
Pier C	Pile #5	•				Replaced 1961
Pier C	Pile #6	•				Splitting; weathering; block bolted to outside face at top to support pile cap
Pier C	Pile #7		•			Large CDK just above whaler; sound at ground and cap - *Consider splicing in section of pile or redundant; h* ollow sounding
Pier C	Pile #8		•			Large CDK just above whaler; sound at ground and cap - *Consider splicing in section of pile or redundant*
Pier C	Upstream cut-water pile		•			Has sunk approx 600mm; significant splitting and decay at top
Pier C	Downstream cut-water pile	•				Splitting and small EDK at top
Pier C	**Raker Studs**					
Pier C	Upstream Raker Stud			•		Has come free of fixing at top due to sinking cut-water pile; large split and EDK at top; large split upstream face; weathered
Pier C	Downstream Raker Stud			•		Splitting, surface weathering and significant decay downstream face; large CDK / EDK at base - *Probable replacement*
Pier C	**Diagonal Bracing**					
Pier C	Cross Bracing	•			70%	Railway iron cross bracing; varying amounts of corrosion
Pier C	**Whaling's**					
Pier C	Whaling's	•				All present; individual assessment of each whaler not carried out
						All whalings significantly deteriorated

PIERS (Abutment A - Abutment J)						
Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	#1 North (Hoki) #2 South (Ross)
Pier C	**Pile Caps**					
Pier C	Pile Cap #1	•				Replaced 1975; EDK downstream end; PDK upstream
Pier C	Pile Cap #2	•				Splitting and associated CDK downstream end; EDK and splitting upstream end
Pier C	Pile Cap #3	•				Splitting and EDK starting downstream end; EDK upstream end; PDK centre
Pier C	Pile Cap #4			•		Large end section gone downstream end; large PDK along length and extensive decay upstream end and ineffective *- Replace or consider redundant*
Pier C	**Corbels**					
Pier C	LH Truss Corbel - Inside	•				Replaced 1975 second hand; vertical split north end
Pier C	- Outside	•				PDK outside face; weathered
Pier C	RH Truss Corbel - Inside	•				Replaced 1975 second hand; minor end splitting
Pier C	- Outside	•				EDK and splitting both ends
Pier C	**Packers Between Pile Cap and Beam Corbel**					
Pier C	Perpendicular to corbel	•				4 no. total; weathered
Pier C	Parallel to corbel	•	•			Weathered but generally sound except for packer under LH corbel which has significant decay; all deteriorated *- Consider packing or replacement*
Pier D	**Piles**					
Pier D	Pile #1		•			Extensive CDK at top; vertical splitting above whalers at spike locations
Pier D	Pile #2		•			Major splitting and decay on outside face and other areas; sound at base and top
Pier D	Pile #3	•				Vertical splitting above whalers
Pier D	Pile #4	•				Advanced EDK at top; vertical splitting above whalers
Pier D	Pile #5		•			Splitting and associated decay on outside face due to spikes; sounds drummy above whaler; possible CDK
Pier D	Pile #6		•			Splitting and associated decay on outside face going into centre due to spikes; possible CDK; deep split >1/2 depth
Pier D	Pile #7		•			Splitting and associated decay outside face but appears sounds; sounds drummy at top *- Investigate top further*
Pier D	Pile #8	•				EDK at top; splitting and associated decay due to spike holes
Pier D	Upstream cut-water pile		•			Significant CDK / EDK
Pier D	Downstream cut-water pile	•				
Pier D	**Raker Studs**					
Pier D	Upstream Raker Stud		•			Packer missing at top; significant splitting and decay on north face; large split and CDK at base *- Possible replacement*
Pier D	Downstream Raker Stud	•				Weathering and splitting on sides and downstream face
Pier D	**Diagonal Bracing**					
Pier D	Cross bracing	•			50%	Heavily corroded railway irons
Pier D	**Whaling's**					
Pier D	Whaling's	•				All present; individual assessment of each whaler not carried out; US North end missing between pile 1 and raker stud
Pier D	**Pile Caps**					
Pier D	Pile Cap #1	•				Typically split and EDK
Pier D	Pile Cap #2	•				Typically split and EDK
Pier D	Pile Cap #3	•				Replaced 1960; typically split and EDK
Pier D	Pile Cap #4	•				Replaced 1967 second hand; typically split and EDK
Pier D	**Corbels**					
Pier D	US Truss Corbel - Inside	•				
Pier D	- Outside	•				End Splitting
Pier D	DS Truss Corbel - Inside	•				Splitting at south end
Pier D	- Outside	•				EDK both ends
Pier D	**Packers Between Pile Cap and Beam Corbel**					
Pier D	US Beam	•				Weathered and deteriorated
Pier D	DS Beam	•				Weathered and deteriorated

PIERS (Abutment A - Abutment J)						
Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	#1 North (Hoki) #2 South (Ross)
Pier E	**Piles**					
Pier E	Pile #1		•			EDK at top; typical splitting and decay on outside face; deep split - *worst pile of group therefore recommend investigating*
Pier E	Pile #2	•				Typical splitting and decay on outside face
Pier E	Pile #3	•				Typical splitting and decay on outside face
Pier E	Pile #4			•		Large split and associated decay on outside face due to spike holes; CDK; excavation around pile showed pile sound below ground; only shell remaining above whaler - *Investigate or may be redundant*
Pier E	Pile #5		•			EDK at top; deep splitting and associated decay all around pile; numerous drill holes from previous investigations
Pier E	Pile #6	•				Minor splitting and associated decay
Pier E	Pile #7	•				Typical splitting and decay on outside face; excavation around pile showed pile sound below ground
Pier E	Pile #8	•				EDK at top; evidence of insect attack; significant splitting and associated decay
Pier E	Upstream cut-water pile	•				Splitting and EDK at top
Pier E	Downstream cut-water pile	•				Significant EDK at top, full of soil
Pier E	**Raker Studs**					
Pier E	Upstream Raker Stud	•				Splitting and EDK at top; some debris
Pier E	Downstream Raker Stud		•			Significant weathering / splitting and associated decay; EDK at base; possible CDK at connection to cut-water pile
Pier E	**Diagonal Bracing**					
Pier E	Brace #1	•			50%	Heavily corroded railway irons
Pier E	Brace #2	•			50%	Heavily corroded railway irons
Pier E	**Whaling's**					
Pier E	Whaling's	•				Whalers all there; soil + vegetation on top of whalers; individual assessment of each whaler not carried out; weathered; deteriation around fixings
Pier E	**Pile Caps**					
Pier E	Pile Cap #1	•				Replaced 1977; typical splitting and EDK
Pier E	Pile Cap #2	•				Typical splitting and EDK
Pier E	Pile Cap #3	•				Replaced 1977; minor splitting downstream end only; typical splitting and EDK
Pier E	Pile Cap #4	•				Typical splitting and EDK
Pier E	**Corbels**					
Pier E	US Truss Corbel - Inside	•				
Pier E	- Outside	•				
Pier E	DS Truss Corbel - Inside	•				
Pier E	- Outside	•				Small EDK and splitting south end
Pier E	**Packers Between Pile Cap and Beam Corbel**					
Pier E	US Beam	•				Typical sound; packer directly under and parallel to corbel is sound but packer on outside is not
Pier E	DS Beam	•				Small amount of decay on downstream packer // to corbel - not supporting corbel; otherwise typically sound
Pier F	**Piles**					
Pier F	Pile #1	•				Vertical split at top; timber on outside covering spike lines; isolated honeycombing
Pier F	Pile #2	•				EDK at top; typical splitting outside face; multiple drill holes; small amount of decay at each seating; excavation around pile showed pile sound below ground; deep pockets
Pier F	Pile #3	•				Decay below whaler at seating on inside of pile; 2023 debris below whaler
Pier F	Pile #4	•				Typical splitting outside face
Pier F	Pile #5	•				Significant EDK at top; vertical splitting on outside face; minor splitting elsewhere
Pier F	Pile #6	•				Minor honeycombing through midsection; minor splitting
Pier F	Pile #7	•				Minor splitting and decay; excavation around pile showed pile sound below ground
Pier F	Pile #8	•				Minor splitting on outside face; excavation around pile showed pile sound below ground; splits and surface decay
Pier F	Upstream cut-water pile					
Pier F	Downstream cut-water pile	•				EDK at top; appears sound at attachment to raking stud

PIERS (Abutment A - Abutment J)						
Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	#1 North (Hoki) #2 South (Ross)
Pier F	**Raker Studs**					
Pier F	Upstream Raker Stud	•				Minor splitting along lines of spikes Fenders in good condition, SH61 (inside), SH77 (outside / upstream)
Pier F	Downstream Raker Stud			•	30%	Significant CDK; decay on downstream face to 1/2 depth; vegetation - *Replace or consider redundant*
Pier F	**Diagonal Bracing**					
Pier F	Cross bracing	•			50%	Steel railway irons; varying amounts of corrosion
Pier F	**Whaling's**					
Pier F	Whaling's	•				All present; vegetation on top; weathered and deteriorated
Pier F	**Pile Caps**					
Pier F	Pile Cap #1	•				Replaced 1944; end splitting typical
Pier F	Pile Cap #2	•				Replaced 1977; end splitting typical
Pier F	Pile Cap #3	•				Replaced 1977; end splitting typical
Pier F	Pile Cap #4	•				End splitting typical
Pier F	**Corbels**					
Pier F	US Truss Corbel - Inside	•				
Pier F	- Outside	•				Replaced 1967; EDK both ends
Pier F	DS Truss Corbel - Inside		•			Vertical split north end; large CDK south end
Pier F	- Outside	•				Replaced 1960; vertical split north end; EDK South
Pier F	**Packers Between Pile Cap and Beam Corbel**					
Pier F	US Beam	•				Typically 2 no. parallel to corbel and 4 no. perpendicular; packer #1 perpendicular to corbel dozy; others typically sound; perpendicular ones generally deteriorated
Pier F	DS Beam	•				Generally deteriorated
Pier G	**Piles**					
Pier G	Pile #1	•				Isolated weathering and honeycombing; timber covering spike holes
Pier G	Pile #2	•				Typical splitting on outside face from spikes up to 100mm deep; surface decay and weathering; packer missing at top to cap - *Reinstate packer at top to pile cap*
Pier G	Pile #3	•				Typical splitting on outside face from spikes; lower 2/3 of pile has advanced surface decay and splitting; advanced decay at top below cap - *Further assess decay at top when treating*
Pier G	Pile #4	•				Minor splitting at top; typical splitting and decay
Pier G	Pile #5	•			70%	Split running approx. 1m down pile from backside of seating at top; typical splitting due to spikes - *Replace split bolt at top*
Pier G	Pile #6	•				Vertical split extending down from cap seat; split bolt corroded; typical vertical splitting on outside face extending into core - *Replace split bolt at top*
Pier G	Pile #7	•				Large split and EDK at top; outside face covered in timber; large vertical split extends down approx. 600mm from cap seating; split bolt corroded - *Replace split bolt at top*
Pier G	Pile #8	•				Large split and EDK at top; vertical split and PDK behind brace connection at top; typical splitting on outside face
Pier G	Upstream cut-water pile	•				Debris build up against
Pier G	Downstream cut-water pile	•				Minor splitting and weathering; some EDK
Pier G	**Raker Studs**					
Pier G	Upstream Raker Stud	•				EDK / CDK at base; weathering and splitting on sides and upstream face; vegetated
Pier G	Downstream Raker Stud	•				Splitting in side due to spikes; weathering, splitting and decay on downstream face; packer at top fallen out
Pier G	**Diagonal Bracing**					
Pier G	Cross bracing	•			50%	Timber; PDK behind pile connections

PIERS (Abutment A - Abutment J)						
Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	#1 North (Hoki) #2 South (Ross)
Pier G	**Whaling's**					
Pier G	Whaling's	•				All present; sound condition; not fully inspected
Pier G	**Pile Caps**					
Pier G	Pile Cap #1	•				
Pier G	Pile Cap #2	•				Replaced 1933 second hand; end splitting and EDK
Pier G	Pile Cap #3	•				Replaced 1975; end splitting and EDK
Pier G	Pile Cap #4	•				Replaced 1975; end splitting and EDK
Pier G	**Corbels**					
Pier G	US Truss Corbel - Inside	•				Replaced 1967 second hand; minor end splitting
Pier G	- Outside	•				Replaced 1967 second hand; minor end splitting
Pier G	DS Truss Corbel - Inside	•				
Pier G	- Outside	•				Vertical split at south end
Pier G	**Packers Between Pile Cap and Beam Corbel**					
Pier G	US Beam	•				General weathering only
Pier G	DS Beam		•			Deteriorated
Pier H	**Piles**					
Pier H	Pile #1	•			70%	Typical vertical splitting on outside face
Pier H	Pile #2	•			70%	Typical vertical splitting on outside face; top decay
Pier H	Pile #3	•			70%	Typical vertical splitting on outside face; significant split on downstream face starting above whaler
Pier H	Pile #4	•			50%	Top filled with pitch; vertical splitting on outside face through mid section through to CDK; top splitting and decay - *Estimate only 50% of pile contributing due to splitting*
Pier H	Pile #5	•			70%	EDK at top; splitting through mid section due to spikes; vertical splitting on backside approx. 30mm deep
Pier H	Pile #6	•			70%	Full length splits on backside approx. 70mm deep; large vertical splits on outside extending into pile centre; excavation around pile showed pile sound below ground; CDK
Pier H	Pile #7	•			70%	Minor splitting only
Pier H	Pile #8	•			50%	Top filled with pitch; vertical splitting on outside face through mid section through to CDK - *Estimate only 50% of pile contributing due to splitting*
Pier H	Upstream cut-water pile			•		Splitting and hollow at top; heavily decayed - *Replace or consider redundant*
Pier H	Downstream cut-water pile			•		Splitting and hollow at top; heavily decayed - *Replace or consider redundant*
Pier H	**Raker Studs**					
Pier H	Upstream Raker Stud	•				Splitting along lines of spikes; decayed over lower section where previously buried in vegetation; vegetation growth
Pier H	Downstream Raker Stud	•				Splitting along lines of spikes; decayed over lower section where previously buried in vegetation
Pier H	**Diagonal Bracing**					
Pier H	Cross bracing	•			70%	Varying amounts of corrosion; railway iron braces
Pier H	**Whaling's**					
Pier H	Whaling's		•			Buried in soil - not assessed, may be redundant
Pier H	**Pile Caps**					
Pier H	Pile Cap #1			•		Advanced EDK upstream end; extensive PDK and splitting back to RH truss corbel at downstream end
Pier H	Pile Cap #2	•				Splitting at upstream end; general weathering and splitting and EDK at downstream end
Pier H	Pile Cap #3	•				Splitting at upstream end; general weathering and splitting and EDK at downstream end
Pier H	Pile Cap #4	•				Replaced 1978; EDK downstream end

PIERS (Abutment A - Abutment J)						
Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	#1 North (Hoki) #2 South (Ross)
Pier H	**Corbels**					
Pier H	US Truss Corbel - Inside	•				Vertical splits at both ends; decay top surface
Pier H	- Outside	•				Replaced 1967 second hand
Pier H	DS Truss Corbel - Inside			•		Large CDK / EDK north end; significant decay all way along; EDK Severe - *Investigate further, likely replace*
Pier H	- Outside			•		Replaced 1967 second hand; EDK severe
Pier H	**Packers Between Pile Cap and Beam Corbel**					
Pier H	Perpendicular to corbel	•				#1 packer rotten at downstream end in under corbel; all packers likely decayed due to moisture - *Rotten packer likely redundant*
Pier H	**Parallel to corbel**	•				Sound under beams; downstream packer completely rotten - *Rotten packer likely redundant* due to moisture
Pier I	**Piles**					
Pier I	Upstream Pile	•				Splitting and EDK at top; vertical splitting and associated decay further down; sounds drummy
Pier I	Centre Pile	•				Significant splitting full length; sounds drummy but likely due to splitting; small EDK at top; excavation around pile showed pile sound below ground
Pier I	Downstream Pile	•				Minor splitting and decay; small EDK at top
Pier I	Upstream Cut Water Pile					
Pier I	Downstream Cut Water Pile	•				Large CDK / EDK at top; significant weathering, splitting and decay; appears reasonably sound at connection to raking stud; not inspected due to vegetation
Pier I	**Raker Studs**					
Pier I	Upstream Raker Stud			•		Splitting and decay at top; highly decayed at base; decay throughout
Pier I	Downstream Raker Stud	•				Large vertical split and decay at top; significant weathering and decay on sides and downstream face
Pier I	**Diagonal Bracing**					
Pier I	Cross bracing	•			80%	Light to moderate corrosion; railway iron braces
Pier I	**Whaling's**					
Pier I	Whaling's			•		Timber splitting and decayed through centre; south side buried under soil; effectively not doing anything - *Replace or may be redundant as pier is on river bank not subject to any water flow*
Pier I	**Pile Cap**			•		Heavily decayed; moist likely internally too
Abut. J	**Piles**					
Abut. J	Upstream Pile	•				Spliced at ground level 1966; splice split at top; top of splice section sounds hollow; EDK at top of original pile; original pile - pile surface soft and wet below ground level, otherwise sound
Abut. J	Centre Pile	•				Replaced 1966; some splitting
Abut. J	Downstream Pile	•				Splitting down to ground level; excavation around pile showed pile sound below ground
Abut. J	Pile Cap	•				Replaced 1944; splitting and EDK both ends; typical weathering
Abut. J	Abutment Walls - Timber facing			•		Various states of decay; collapsing at upstream end
Abut. J	Abutment Walls - Vertical Railway Irons	•		•		4 no. railway irons; various states of decay / corrosion

ROAD BEAMS, CORBELS & BRACING						
Structural Element		Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	Road beams Only inspected from beneath
Road Beams	US1		•			Significant weathering and splitting; large PDK outside face; PDK top surface and outside face near pier B; vegetation growing on top
Road Beams	US2		•			Significant weathering and splitting; PDK inside and outside face at northern end; PDK top surface; *- bottom half of section appears sound*
Road Beams	US3	•				Numerous PDK top surface and both sides; significant horizontal splitting through sides over top 1/2 to 2/3 section depth
Road Beams	US4	•				Weathering and splitting top surface; minor horizontal cracking in sides; numerous PDK top surface
Road Beams	US5	•				Replaced 1974; diagonal splitting on side and PDK both sides of beam at #2 Queen corbel ; PDK at northern end; drummy sound at pier D end
Road Beams	US6		•			Large PDK at north end extending from top to within 150mm of base (2/3 section gone); significant weathering and splitting; numerous PDK top surface; large PDK between #1 King and #1 Queen transoms approx. 40mm deep; dull sound at southern end; horizontal splitting
Road Beams	US7	•				Weathering , splitting and surface decay on top and both sides; numerous PDK on top surface and on sides; PDK US end between Center-#2 Queen
Road Beams	US8		•			Significant weathering; significant splitting both sides; PDK inside and outside faces; evidence of insect attack; hollow sound at north end; significant horizontal splitting PDK US between #2 King - Pier *- estimate top half of beam not contributing structurally*
Road Beams	US9			•		Significant weathering and surface decay all faces; evidence of insect attack; large PDK top surface at north end; PDK sides and underside; evidence of cement repair top; PDK under repair US
Road Beams	US10		•			Replaced 1960; large PDK inside face at south end; isolated PDK top and outside face; weathering and splitting on outside face; vertical splitting on top; evidence of insect attack; horizontal splitting DS
Road Beams	US11		•			Replaced 1933 (second hand); top surface weathering and splitting; large PDK inside face and significant vertical splitting at south end; significant weathering south end; cement repair at pier *- Investigate south end*
Road Beams	US12	•				Typical surface weathering; PDK south end US; PDK north end DS
Road Beams	US13	•				Typical surface weathering and splitting; isolated PDK top surface; evidence of insect attack; PDK bottom north end
Road Beams	US14		•			Weathering and isolated PDK to top surface and sides; horizontal splitting to sides; top 1/4 depth sounds drummy to end of corbel at south end; large horizontal split to end of corbel at north end
Road Beams	US15	•				Replaced 1966; weathering, splitting and isolated PDK top surface; significant weathering and surface decay, outside face; PDK both ends; sounds drummy at ends *- Assume top 1/4 section does not contribute structurally*
Road Beams	US16		•			Weathering and PDK, top surface; split and associated PDK, and large split in side with associated decay at south end; *- Investigate south end*
Road Beams	US17		•			Vertical and horizontal cracking with associated decay at north end; hollow sound at north end; numerous PDK top surface; splitting and PDK to sides *- Investigate further (likely replacement)*
Road Beams	US18	•				Replaced 1966; EDK
Road Beams	US19		•			Replaced 1940; advanced surface decay and weathering on top and sides; soft sound at south end
Road Beams	CN1		•			Significant weathering and splitting; PDK on downstream face at cross member; vegetation growing on top; hollow sound at pier B end
Road Beams	CN2	•				Significant weathering and splitting; PDK top surface and inside face; horizontal split and CDK at pier C
Road Beams	CN3		•			Significant weathering, splitting and associated decay top and downstream face; isolated PDK upstream face; probable end decay at pier I - Investigation end south end and PDK at mid span (upstream face)
Road Beams	CN4		•			Surface weathering; general decay; PDK on sides; horizontal split at north end *- Likely redundant*
Road Beams	DS1		•			Significant weathering and splitting; splitting and associated PDK on inside face; *- bottom half of beam appears sound*
Road Beams	DS2	•				Weathering and vertical splitting top surface; minor horizontal splitting and weathering to sides; replaced 1941; splitting and decay US; spliting US south end
Road Beams	DS3	•				Weathered north end; minor splitting

ROAD BEAMS, CORBELS & BRACING						
Structural Element		Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	Road beams Only inspected from beneath
Road Beams	DS4	•				Weathering and splitting top surface; minor horizontal cracking in sides; numerous PDK top surface
Road Beams	DS5		•			Significant splitting and associated PDK in top and both sides; evidence of insect attack; large PDK / EDK at both ends
Road Beams	DS6		•			Advanced surface decay and weathering; numerous PDK top surface; horizontal splitting through top half of section; estimate top 1/4 of section not contributing structurally; soft surface and dull sound at south end; PDK DS end
Road Beams	DS7	•				Replaced 1965, PDK north end splitting throughout
Road Beams	DS8	•				Replaced (est. 1950 - 1965, barrier post covering date); isolated PDK top surface; weathering and horizontal splitting on sides
Road Beams	DS9	•				Replaced 1950; numerous small PDK top surface; weathering and PDK outside face; large PDK approx. 600 long x 40 deep and approx. 1/3 section depth on outside face
Road Beams	DS10	•				Horizontal splitting US face
Road Beams	DS11		•			Weathering and decay both sides; large split and PDK at south end extending full width of section; horizontal split inside face at north end
Road Beams	DS12			•		Several large PDK along member; ply repair work both sides *- Parts of beam may be reused elsewhere*
Road Beams	DS13		•			Weathering and splitting; large PDK on outside face at north end extending to end of corbel; large vertical split from north end to first bolt; sounds hollow at north end; horizontal splitting US side
Road Beams	DS14		•			Significant weathering and splitting and associated PDK on top and both sides; large horizontal split at south end with PDK; large vertical split at north end; PDK over #2 King corbel (both sides of beam); sounds drummy both ends
Road Beams	DS15		•			Weathering and associated decay to top surface; PDK south end and sounds hollow; top half sounds drummy at north end; dull sound inside face between #1 King and #1 Queen transoms; horizontal splitting US face *- Assume top 1/4 of member does not contribute structurally*
Road Beams	DS16	•				Weathering and associated PDK top surface; weathered sides; splitting resulting in loose segments at top corners of beam; PDK DS side
Road Beams	DS17	•				Replaced 1963; splitting US face
Road Beams	DS18	•				Replaced 1940; extensive weathering and decay on outside face; weathering and PDK top surface; worm holes outside face
Road Beams	DS19		•			Significant weathering and splitting and associated PDK on top surface; large PDK to half width of member over #1 King transom; significant splitting at south end, sounds drummy out to end of corbel
Road Beams	DS20	•				Splitting and decay on top surface and sides; PDK and horizontal split outside face at south end.
Road Beams	DS21	•				Replaced 1968; minor weathering
Road Beams	DS22		•			Large PDK / EDK at both ends; Large PDK top surface at #2 King transom; significant weathering outside face; horizontal splitting north end
Road Beams	DS23	•				EDK south end; weathering, splitting and associated decay to top surface; large horizontal split at north end (approx. 600 long, near centre); hollow sound at north end
Road Beams	DS24	•				General weathering only

ROAD BEAMS, CORBELS & BRACING						
Structural Element		Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	Road beams Only inspected from beneath
Corbels						
Pier B	US Corbel	•				Surface decay
	Centre Corbel	•				
	DS Corbel		•			CDK southern end; large PDK outside face
Pier C	US Corbel	•				Cracking at end and small CDK starting; surface weathering and cracking on outside face
	Centre Corbel		•			EDK southern end; PDK both sides; honeycombing of upstream and downstream sides; evidence of possible insect attack
	DS Corbel	•				Splitting at ends; CDK southern end
#1 King	US Corbel	•				PDK at sides; surface decay
	DS Corbel			•	40%	PDK inside and outside extending in under beams; EDK - *Replace within 5yrs*
#1 Queen	US Corbel		•			PDK at sides of corbel extending in under beams
	DS Corbel	•				CDK starting at southern end
Centre	US Corbel	•				PDK at fixing to transom
	DS Corbel	•				PDK at fixing to transom
#2 Queen	US Corbel	•				Replaced 1966
	DS Corbel	•				PDK at sides; bolt corroded
#2 King	US Corbel	•				Replaced 1977 (second Hand); large vertical split at northern end - *Replace corroded splitter nuts*
	DS Corbel	•				Splitting at ends; PDK at fixings to transom
Pier D	US Corbel	•				CDK southern end; significant splitting and PDK outside face
	DS Corbel	•				Replaced 1944
#1 King	US Corbel	•				Replaced 1966
	DS Corbel					Replaced 1965
#1 Queen	US Corbel	•				PDK inside face near centre
	DS Corbel	•				PDK top surface and inside and outside faces
Centre	US Corbel	•				PDK both sides
	DS Corbel	•				PDK inside vertical face; surface decay and soft on sides
#2 Queen	US Corbel	•				PDK outside face at base
	DS Corbel	•				PDK outside face; large area of decay on inside top and side; PDK around bolts
#2 King	US Corbel	•				PDK both side above transom; PDK top surface inside face
	DS Corbel	•				Weathering and splitting; PDK both sides above transom; corbel is bowed

ROAD BEAMS, CORBELS & BRACING						
Structural Element		Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	Road beams Only inspected from beneath
Corbels						
Pier E	US Corbel	•				Replaced 1960; split at north end near centre; weathering and softening on outside surface; horizontal split inside face; end split south
	DS Corbel		•			Replaced 1977 (second hand); weathered; end split south
#1 King	US Corbel	•				PDK outside face overtop of transoms; decay at base of corbel over US transom extending approx. 150mm over transom (20mm deep); split along inside top edge; large PDK inside face
	DS Corbel		•			Significant weathering and decay inside face; large diagonal crack and associated decay extending from top surface down under beam *- Investigate further when beam is replaced*
#1 Queen	US Corbel	•				Small EDK north end; PDK both sides overtop of transoms
	DS Corbel	•				Weathering on outside face; PDK inside and outside faces
Centre	US Corbel	•				PDK inside and outside face; weathering and softening to outside surface
	DS Corbel	•				Typical weathering; PDK outside face; split and PDK linking spike holes on inside face
#2 Queen	US Corbel	•				Typical weathering and splitting; PDK over US transom
	DS Corbel	•				Split on inside face; weathered outside face
#2 King	US Corbel	•				Vertical Split
	DS Corbel	•				Typical weathering and splitting
Pier F	US Corbel	•				CDK / EDK at south end; weathered outside face; horizontal split and associated PDK outside face; significant splitting and decay to inside face; splitting at north end
	DS Corbel	•				CDK both ends; significant weathering and splitting both sides
#1 King	US Corbel		•			Surface decay to top surface extending in under beams (both sides); vertical split through centre at north end; *- Install horizontal split bolt at north end*
	DS Corbel	•				PDK
#1 Queen	US Corbel		•			Significant amount of decay at top extending in under beam (both sides of corbel)
	DS Corbel	•				Surface decay at top (inside face)
Centre	US Corbel		•			Decay at top surface extending in under beam (both sides of corbel); extensive PDK both sides
	DS Corbel		•			Decay at top surface extending in under beam (both sides of corbel); *- Likely replace*
#2 Queen	US Corbel		•			Advanced decay at top on outside *- Likely replace*
	DS Corbel	•				PDK
#2 King	US Corbel	•				
	DS Corbel	•				Decay to contract surface with transoms on inside face

ROAD BEAMS, CORBELS & BRACING						
Structural Element		Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	Road beams Only inspected from beneath
Corbels						
Pier G	US Corbel	•				Decay along bottom edge in contact with packers (inside face)
	DS Corbel	•				Weathered
#1 King	US Corbel	•				Weathering; isolated PDK
	DS Corbel	•				Weathering; splitting and PDK on outside
#1 Queen	US Corbel			•		Large CDK at both ends (full depth); large crack and associated decay under beam
	DS Corbel	•				PDK inside face around spikes; splitting and PDK outside face; - *Vegetation in the way on inside at transom*
Centre	US Corbel	•				Top surface decay on outside; some isolated PDK
	DS Corbel	•				Top surface cracking and associated decay; some isolated PDK
#2 Queen	US Corbel	•				Top decay on outside extending under beam; some PDK
	DS Corbel	•				Replaced 1960; weathered
#2 King	US Corbel	•				End splitting and weathering; split bolts both ends
	DS Corbel	•				Large vertical split separating two halves with split bolt at north end; sounds drummy but likely due to split - *Install split bolt at south end*
Pier H	US Corbel		•			Manmade vertical cut on south side near outside edge of pier, still approx. 600mm seating for beam; decay
	Centre Corbel	•				Replaced 1967 (second hand); surface decay upstream face
	DS Corbel		•			Isolated PDK inside face; large horizontal split and PDK under beam DS22 - Investigate PDK under beam (otherwise sound)
Pier I	US Corbel		•			Splitting and EDK both ends; numerous PDK on sides; end splitting; weathering and decay
	Centre Corbel	•				Surface decay and splitting both ends; end splitting; weathering and decay
	DS Corbel		•			CDK / PDK and splitting both ends; end splitting; weathering and decay

ROAD BEAMS, CORBELS & BRACING						
Structural Element		Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	Road beams Only inspected from beneath
Cross Bracing, Solid Blocking and Tie Rods						
Span AB	Solid Blocking			•		4 no. at 1/3 points; various states of decay; blocks falling out - *Replace / reinstate*
	Tie Rods	•				Rods generally ok; some nuts missing - *Replace nuts*
Span BC	Solid Blocking			•		4 no. at 1/3 points; various states of decay; blocks falling out - *Replace / reinstate*
	Tie Rods	•				Rods generally ok; some nuts missing - *Replace nuts*
Span CD	**Cross Bracing**					
Pier C to #1K	US				20%	
	DS				75-90%	Sound
#1K to #1Q	US				20%	
	DS				30%	
#1Q to Centre	US				70%	Sound
	DS				60%	
Centre to #2Q	US				70%	
	DS				80%	
#2Q to #2K	US				0%	Broken detached at 2K end
	DS				0%	Broken
#2K to Pier D	US				5%	Pitch point at pier end
	DS				30%	Heavily corroded at pier end; otherwise sound
Span DE	**Cross Bracing**					
Pier D to #1K	US				40%	Heavy corrosion at pier end
	DS				30%	40% at pier end; 70% under US beam; otherwise sound
#1K to #1Q	US				0%	25% at both ends, broken centre rod
	DS				10%	Ineffective at K1 end
#1Q to Centre	US				40%	
	DS				50%	Bent
Centre to #2Q	US				50%	
	DS				0%	Broken at 2Q end
#2Q to #2K	US				5%	Rail iron heavily corroded along lenth
	DS				50%	Rail iron heavily corroded along lenth
#2K to Pier E	US				40%	
	DS				0%	Broken at piers end
Span EF	**Cross Bracing**					
Pier E to #1K	US				0%	gone at King Transom; 30% at pier end; gone at 1K
	DS				70%	
#1K to #1Q	US				0%	Broken/gone
	DS				20%	
#1Q to Centre	US				40%	
	DS				0%	0% at centre transom end; 50% along rod; sound at #1Q transom; nut missing 1Q end
Centre to #2Q	US				50%	Sound at ends
	DS				50%	50% at coupler under US beam; 60% under DS beam; otherwise sound
#2Q to #2K	US				70%	
	DS				50%	Railway iron replacement; heavily corroded along full length
#2K to Pier F	US				0%	0% and 0% at ends; 70% along rod
	DS				30%	30% at #2K end; 80% along rod

ROAD BEAMS, CORBELS & BRACING						
Structural Element		Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	Road beams Only inspected from beneath
Cross Bracing, Solid Blocking and Tie Rods						
Span FG	**Cross Bracing**					
Pier F to #1K	US				90%	Sound
	DS				0%	Completely gone at #1K end; 80% along rod; broken at 1K
#1K to #1Q	US				70%	
	DS				0%	0% both ends; 40% along rod
#1Q to Centre	US				0%	60% at coupler under US beam; 80% under DS beam; otherwise sound; broken at coupler
	DS				30%	60% under beams; otherwise sound
Centre to #2Q	US				0%	Sound at ends; broken at coupler
	DS				50%	60% under beams; otherwise sound
#2Q to #2K	US				0%	0% at #2K transom; 30% at coupler under US beam; otherwise sound
	DS				0%	gone at #2K end; otherwise sound - *Replace from centre to #2K end*
#2K to Pier G	US				40%	Pier G end
	DS				30%	Pier G end
Span GH	**Cross Bracing**					
Pier G to #1K	US				0%	Broken at #1K transom; remaining rod >60%
	DS				60%	Pier G end
#1K to #1Q	US				10%	10% and 30% at ends; 60% along rod
	DS				20%	20% at #1Q end; remaining rod >80%
#1Q to Centre	US				80%	Railway iron replacement; corroded significantly
	DS				70%	
Centre to #2Q	US				0%	Rod completely gone at centre transom end; 50% along rod; sound at #2Q end
	DS				40%	sound at eyes
#2Q to #2K	US				60%	
	DS				30%	30% under DS beam; 50% under US beam; sound at ends
#2K to Pier H	US				20%	20% at pier end; 70% under US beam
	DS				40%	Pier H end
Span HI	Solid Blocking	•				4 no. at 1/3 points; various states of decay; blocks falling out; one block missing - *Replace / reinstate*
	Tie Rods	•				Rods generally ok; some nuts missing - *Replace nuts*
Span IJ	Solid Blocking	•				4 no. at 1/3 points; various states of decay; blocks falling out - *Replace / reinstate*
	Tie Rods	•				Rods generally ok; some nuts missing - *Replace nuts*

Appendix D
Typical Defect Photos

Moderate to Heavy Bottom Chord Corrosion.

Critical Bottom Chord Corrosion.

Typical Timber Splitting – Top Chord Shown.

Typical Timber Splitting – King Strut Shown.

Typical Weathered Timber and Ponding Moisture.

Typical Weathered Timber.

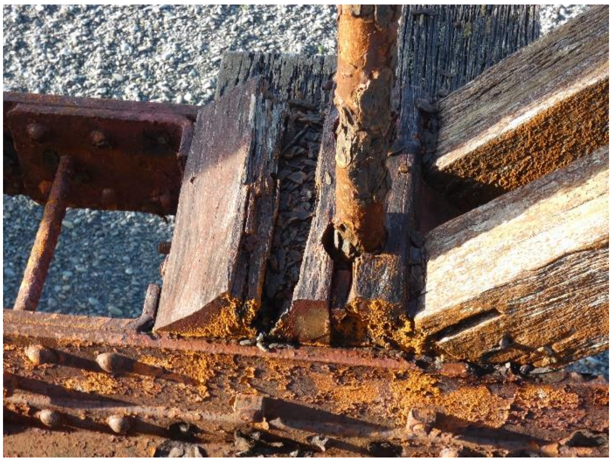
Typical Corroded (Pack Rusting) Hanger Rods – Heavy to Critical Corrosion Shown.

Timber Decay – Heavy to Critical Decay Shown.

Typical Decay and Loss of Timber Section at Connections – Top of Wind Brace Shown.

Typical Decay and Loss of Timber Section at Connections – Bottom of Wind Brace Shown.

Typical Decay of Top Blocks.



Typical Splitting and Section Loss of Thrust Blocks.

Typical Moderate Decay of ‘A’ Block.

Typical Heavy to Critical Decay of ‘A’ Block.

Corrosion of Truss Connection Plates.

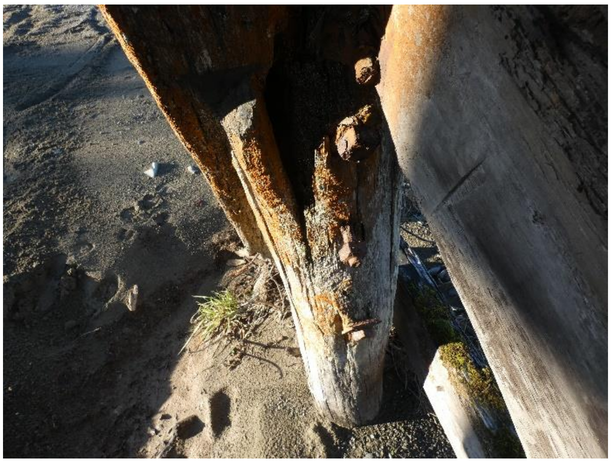
Corrosion and Loss of Fixing Components. Missing Nut and Necked Bolt Shown.

Typical Loose Fixings. Corroded Steel Components.

Widespread Loss of Deck Bracing Due to Corrosion.

Missing Pier Waling Timbers

Typical Decay of Pier Cap Timbers



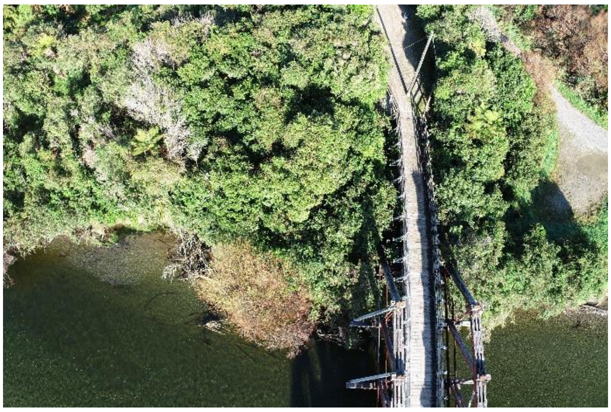
Typical Decay of Pier Piles

Typical Splitting and Decay of Pier Piles

Vegetation Growth From Timber Decay Pockets

Debris Caught on Piers Causing Local Scour.

Approach Spans Shrouded in Dense Vegetation. Northern Approach.



Approach Spans Shrouded in Dense Vegetation. Southern Approach.

Moisture in Timber Components. Reduced Air Flow for Drying due to Vegetation.

Dislodged and Missing Timber Bracing Blocks Typical.

Observation – Flow Favours True Left of River as this is the Outside of the Curved Alignment. Significant Gravel Deposition.

Pier G and Underside of Span G-H not inspected due to Channel Location. Main Channel is Deep. Pile Embedment Depth Unknown.

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BUILDING A BETTER WORLD

REPORT

Totara River Bridge
Structural Condition Assessment - Preliminary

Prepared for Westland District Council

AUGUST 2010

QUALITY ASSURANCE STATEMENT

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REVISION SCHEDULE

Rev No	Date	Description	Prepared By	Reviewed By	Approved By
1	Dec 09	Draft for Client Comment	JD	JS	J Strange
2	Aug 10	Final	JD	JS	J Strange

WESTLAND DISTRICT COUNCIL

Totara River Bridge
Structural Condition Assessment – Preliminary

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1 Executive Summary

This report was prepared for the Westland District Council to assess the structural condition of the Totara River Bridge.

The on-site visual condition assessment showed that there are considerable variations in the condition of the various structural members. A large portion of the structural members are in sound condition and require only treatment to treat decay and weathering that has occurred and to prolong the life of the members. A small portion of the members have undergone significant decay and corrosion and now require replacement. The remaining members require further investigation to determine if treatment or replacement is required.

Intrusive investigations and detailed structural analysis were not carried out as part of this assessment.

We recommend the following processes be carried out to determine the extent and cost of renewal and maintenance works on the bridge:

1. Carry out a structural assessment
2. Carry out intrusive investigation
3. Prepare recommendations for remedial and maintenance works to the bridge
4. Prepare rough order cost estimates for the renewal and maintenance works

2 Introduction

As requested by Westland District Council, MWH New Zealand Ltd carried out a visual baseline inspection of the Totara River Bridge.

The Totara River Bridge formed part of the Hokitika to Ross Railway Line which was closed in 1980. Westland District Council are proposing to use this bridge as a pedestrian / cycle bridge as part of a proposed cycle way between Hokitika and Ross.

3 Inspection

A visual baseline inspection was carried out over eight days on 19, 20, 21, 23, and 27 October and 03, 25, and 26 November. The inspection was carried out by John Strange and Jason Davidson. Assistance for inspection was provided by the following:

- Dean Arthur (Due West Ltd) - assistance with safety ropes and lines for all work at heights.
- Dave Hawes (Department of Conservation) - assisted with the inspection on 19 October to provide input into inspection and recording techniques, based on his previous experience with similar structures whilst working for NZ Rail and the Department of Conservation.

4 Bridge Description

The Totara River Bridge is the southernmost rail bridge on the old Hokitika to Ross Railway. The Railway was opened on 01 April 1909 following completion of the Totara River Bridge and closed 71 years later in November 1980[1]. Some time following the closure of the railway from Hokitika to Ross, the railway lines and decking on the Totara River Bridge were removed.

1. Mahinapua Creek Railway Bridge – Conservation Plan prepared by Chris Cochran, 30 July 1999

Following removal of the decking (sleepers) only the main longitudinal beams were left remaining. The bridge currently has a timber barrier / balustrade fixed to the downstream beam (refer Figure 4-4). We understand that the Westland District Council had this installed to enable walking access to be maintained across the bridge as the bridge is regularly used by a local farmer to access his land and livestock on the northern side of the Totara River.

The Totara River Bridge is a nine span timber bridge constructed predominantly of what we understand to be Australian Hardwood timbers, and "steel" bracing and tension members. There was a transition from the use of black iron to steel during the period from 1880 to 1910 and during this period it was common for both materials to be used in construction.

The bridge is made up of nine spans with the first two spans constructed using simply supported timber beams and the central five spans, being much longer are Howe Trusses. Figure 4-1 on the following page shows a typical Howe Truss and Table 4-1 below shows the construction of each span.

Table 4-1 : Bridge Spans

Span Number	Structure Description
Span #1	Simply supported timber beams
Span #2	Simply supported timber beams
Span #3	Howe Truss (Standard Railway 80ft truss)
Span #4	Howe Truss (Standard Railway 80ft truss)
Span #5	Howe Truss (Standard Railway 80ft truss)
Span #6	Howe Truss (Standard Railway 80ft truss)
Span #7	Howe Truss (Standard Railway 80ft truss)
Span #8	Simply supported timber beams
Span #9	Simply supported timber beams

The bridge superstructure is supported on timber piers. The timber piers supporting the longer Howe truss spans (river spans) consist of ten piles and the piers supporting the shorter simply supported spans (land spans) and forming the abutment walls consist of five and three piles respectively. Figures 4-2 and 4-3 on the following pages show typical piers supporting both river and land spans.

The hardwood piles forming the piers appear to have been driven and all piles generally have markings to enable the depth of pile below ground level to be determined.

A plan of the bridge which outlines the numbering system for the piers and spans etc is included in Appendix A of this report and Appendix B includes a typical drawing of an 80ft span Howe Truss.

Figure 4-1 : Typical Howe Truss Span (Span 6 – Downstream)

Figure 4-2 : Typical End Span (Spans 8 and 9 – Southern End)

Figure 4-3 : Typical River Pier (Pier No. 7)

Figure 4-4 : Typical View North Along Bridge

5 Bridge Inspection

5.1 Inspection Methodology

The structural inspection of the bridge involved visually inspecting all members / elements. In addition to the visual inspections, timber members were "hammer tested" to check for signs of internal decay. This involved striking the timber members with a hammer and listening to the pitch of the sound which alters with changes in timber density. Intrusive investigations were not carried out as part of these inspections.

In addition to this, excavations were carried out by Westroads Ltd with an excavator down alongside a number of piles to check the condition of these piles at and below existing ground level.

This inspection methodology was used to classify members into the following three categories:

1. ***Member sound, treatment only required***: Members in this category are typically sound and may or may not exhibit one or more of the following signs of decay:

    - No, or limited, signs of centre decay
    - No, or limited, sign of end decay
    - Minor isolated pocket decays
    - Minor surface weathering / decay
    - Minor splitting and associated decay
    - Corrosion of steel members

    In some instances, an assumption has been made during the inspection as to the required member capacity for the intended future use of the structure. Taking this into account some members with greater decay / corrosion have been classed as "sound – treatment only" if they appear to have a sufficient amount of redundancy. For example a steel member with corrosion that has reduced the cross section considerably but which is likely to have sufficient redundancy for the intended future use of the structure.

2. ***Further investigation required***: Members in this category are suspect and exhibit one or more of the following signs of decay:

    - Signs of centre decay where the extent of the decay is unknown (i.e. dull sound)
    - Significant end decay extending into / along member where the extent is unknown
    - Significant pocket decays where the depth / extent is unknown
    - Significant splitting and / or decay where the depth / extent is unknown
    - Heavy corrosion of steel members

    Further investigation is likely to involve core drilling of timbers to assess the extent of any decay and in a number of cases will also include a structural load assessment to determine the required size of members.

3. ***Member requires replacement***: Members in this category are typically heavily decayed or corroded. The following criteria has been used to classify members into this category and further investigation (i.e. structural calculations) may be required to confirm assumptions that have been made:

    - Steel members with >50% loss of cross section
    - Timber members that are decayed to an extent where treatment is no longer an option, i.e. large centre decays reducing cross section

The above classifications do take into account the intended future use of the structure, being a pedestrian / cycle bridge. These classifications therefore take account of the significant redundancies in some members and some assumptions have been made on site as to the required capacity / size of some members for the intended future use of this structure.

Figures 5-1 to 5-4 below and on the following pages show the classification of some structural members.

Figure 5-1 : Top Chord of Timber Trusses – Minor Weathering / Splitting Only, "Sound"

Figure 5-2 : Saddle Block – Large Centre Decay Back Beyond Tension Rod, "Requires Replacement"; A-Block (Top Thrust Block), "Sound"

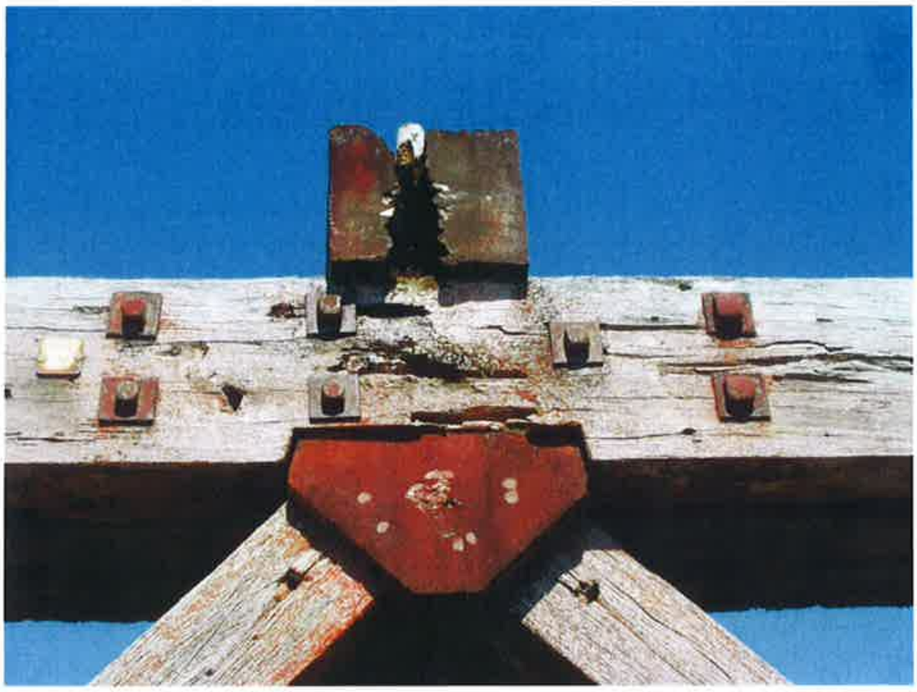


Figure 5-3 : Lateral Braces – Members Completely Decayed at Ends, "Requires Replacement"

Figure 5-4 : King Strut – Significant Surface Decay, Pocket Decay and Splitting, "Investigate Further"

The structural inspections were carried out by John Strange (Senior Engineer) and Jason Davidson (Structural Engineer). Dave Hawes (Department of Conservation) also spent one day (19 October 2009) on site assisting with the structural inspections.

5.2 Inspection Results

The structural inspection of the bridge showed that there is considerable variation in the condition of the various structural elements. When this structure was in service it was subject to regular checks and maintenance by Railways. When timber members were replaced by Railways, the date was chiselled into the surface of the new timber to indicate its age. There are a large number of timber members that have been replaced with dates ranging from 1928 for the earliest replacements to 1978 for the last members replaced before closure of the railway line. A number of those members replaced have been replaced with second hand members, denoted by an "SH" chiselled into the face of the member with the date of replacement. Many of these timber members that have been replaced, and particularly those replaced toward the end of the bridges service period, are in noticeably better condition than those older timber members.

As a result of the exposed location of the bridge in close proximity to the sea, some elements have undergone significant weathering, particularly where they face the prevailing westerly winds. Steel elements including cross bracing, tension rods, bottom truss chord and bolts are typically heavily corroded. Timber members show various signs of decay including surface decay and weathering (particularly on faces exposed to the prevailing weather), small isolated pocket decays typically where there are penetrations in the wood surface allowing moisture into the timber, end decays where the ends of the timber members are exposed to the weather and centre decays where the softer centre of the hardwood timber members have started to decay.

Detailed inspection results are included in Appendices C, D, E and F of this report.

6 Recommendations

We recommend that to more accurately quantify the extent and cost of remedial and maintenance works required to bring this structure up to a standard suitable for a pedestrian / cycle bridge, the following works be carried out:

1. ***Structural Assessment:***

Carry out a desktop structural assessment to determine required sizes of members (steel and timber) for the future intended purpose of the structure.

This would include modelling the bridge to assess loads through individual members and connections and enable treatment or replacement of members to be more accurately quantified.

2. ***Intrusive Investigation:***

Following determination of member and connection requirements by structural assessment, those members currently classified as "investigate further" could be investigated by intrusive methods to confirm whether or not they meet structural requirements. If so they would be reclassified as "treatment required" and if not would be reclassified as "require replacement".

Investigation would involve carrying out core drilling of timber members.

3. ***Recommendations for Renewal / Maintenance Works***

Prepare recommendations for renewal and maintenance works. These recommendations would be classified as immediate, short term and long term

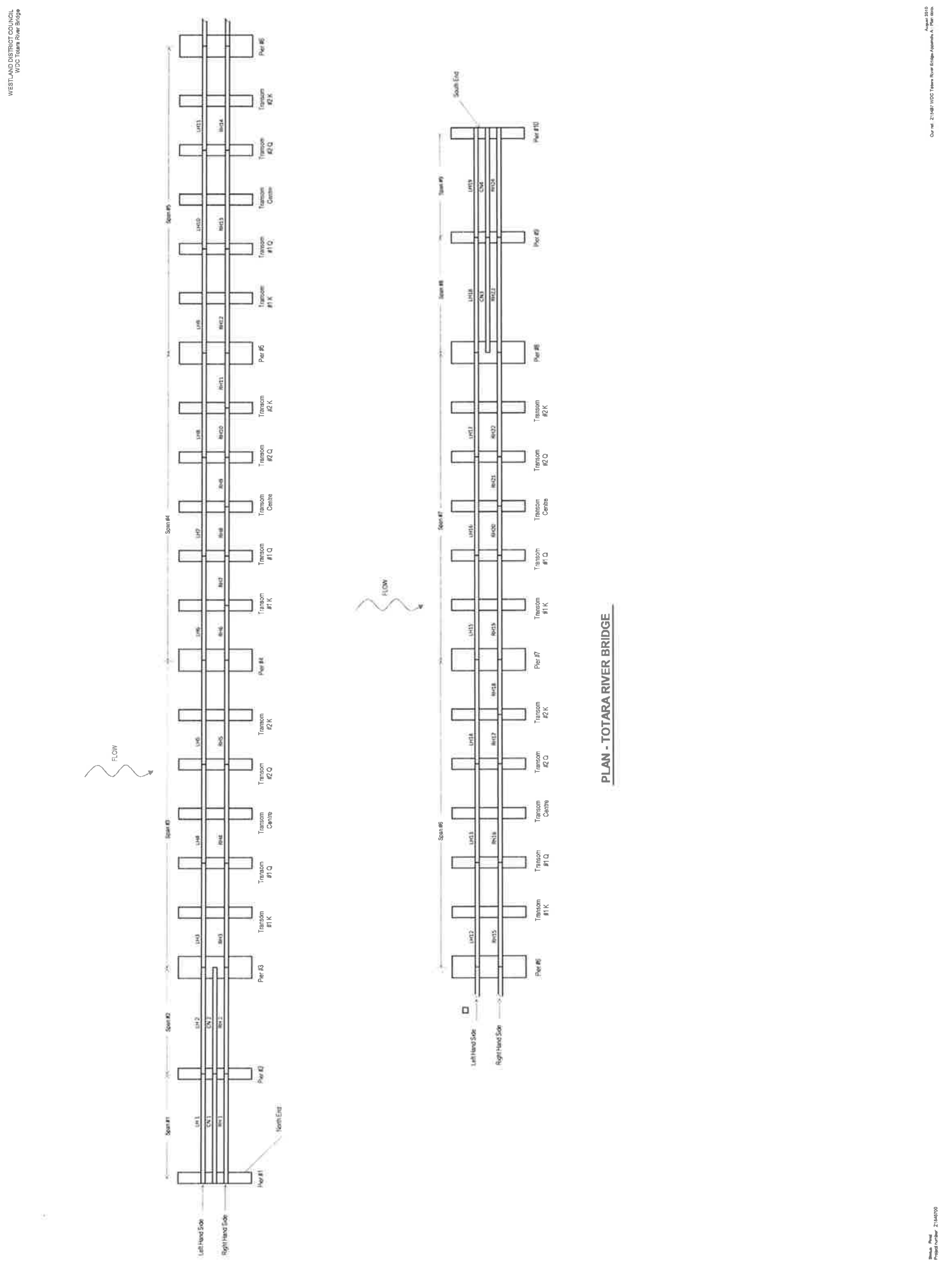
4. ***Rough Order Cost Estimates***

Prepare rough order cost estimates for renewal and maintenance works.

Appendix A:

- **Indicative Plan of Totara River Bridge**
- **Pier Pile Plan**
- **Truss Elevation**

(3 pages total)


WESTLAND DISTRICT COUNCIL
WDC Totara River Bridge
PLAN - TOTARA RIVER BRIDGE
FLOW
North End
South End
Left Hand Side
Right Hand Side
Pier #1
Pier #2
Pier #3
Pier #4
Pier #5
Pier #6
Pier #7
Pier #8
Pier #9
Pier #10
Transom #1 K
Transom #1 Q
Transom Centre
Transom #2 Q
Transom #2 K

MWH

BUILDING A BETTER WORLD

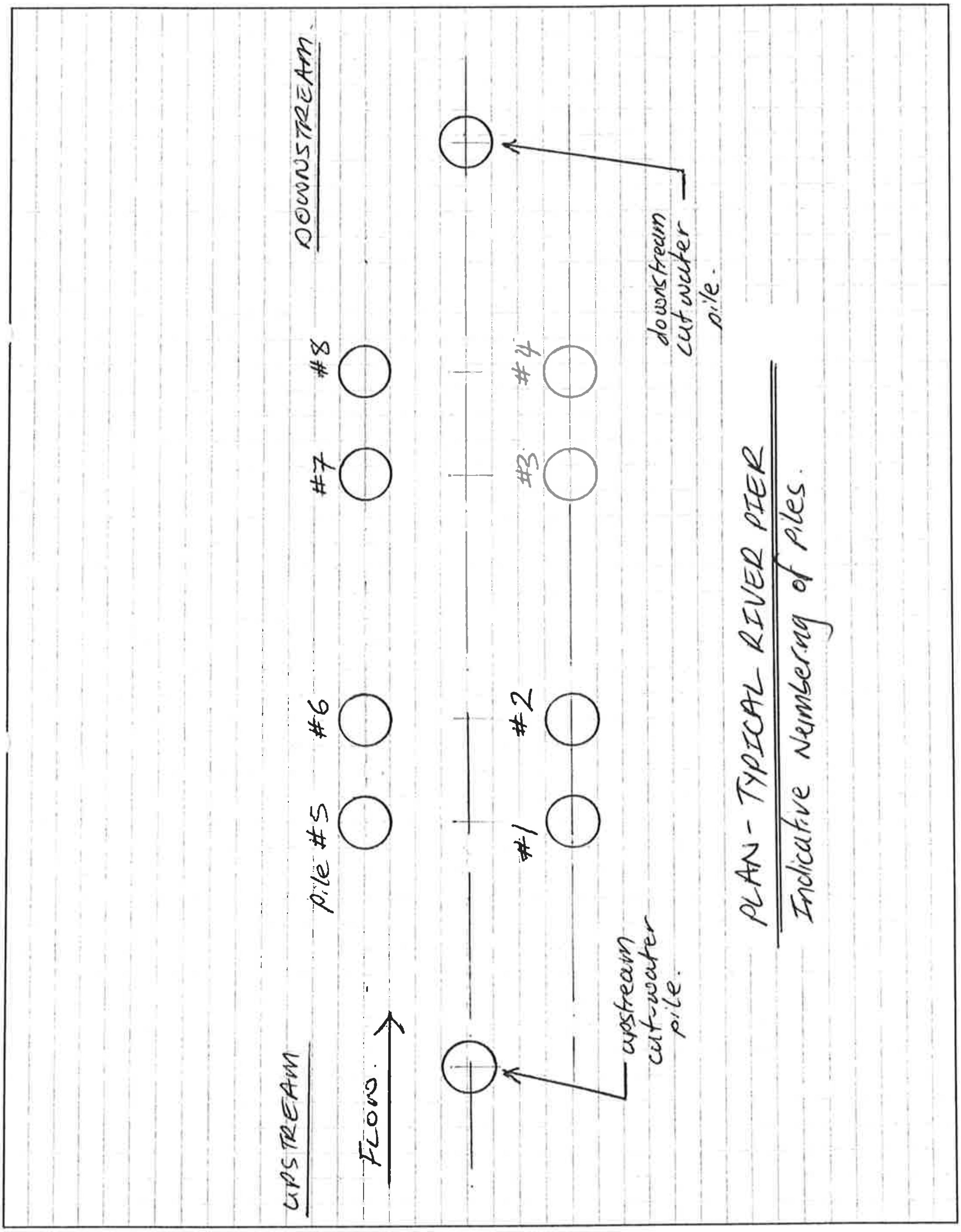
PROJECT WDC Totara River Bridge PROJECT NO. Z1845700

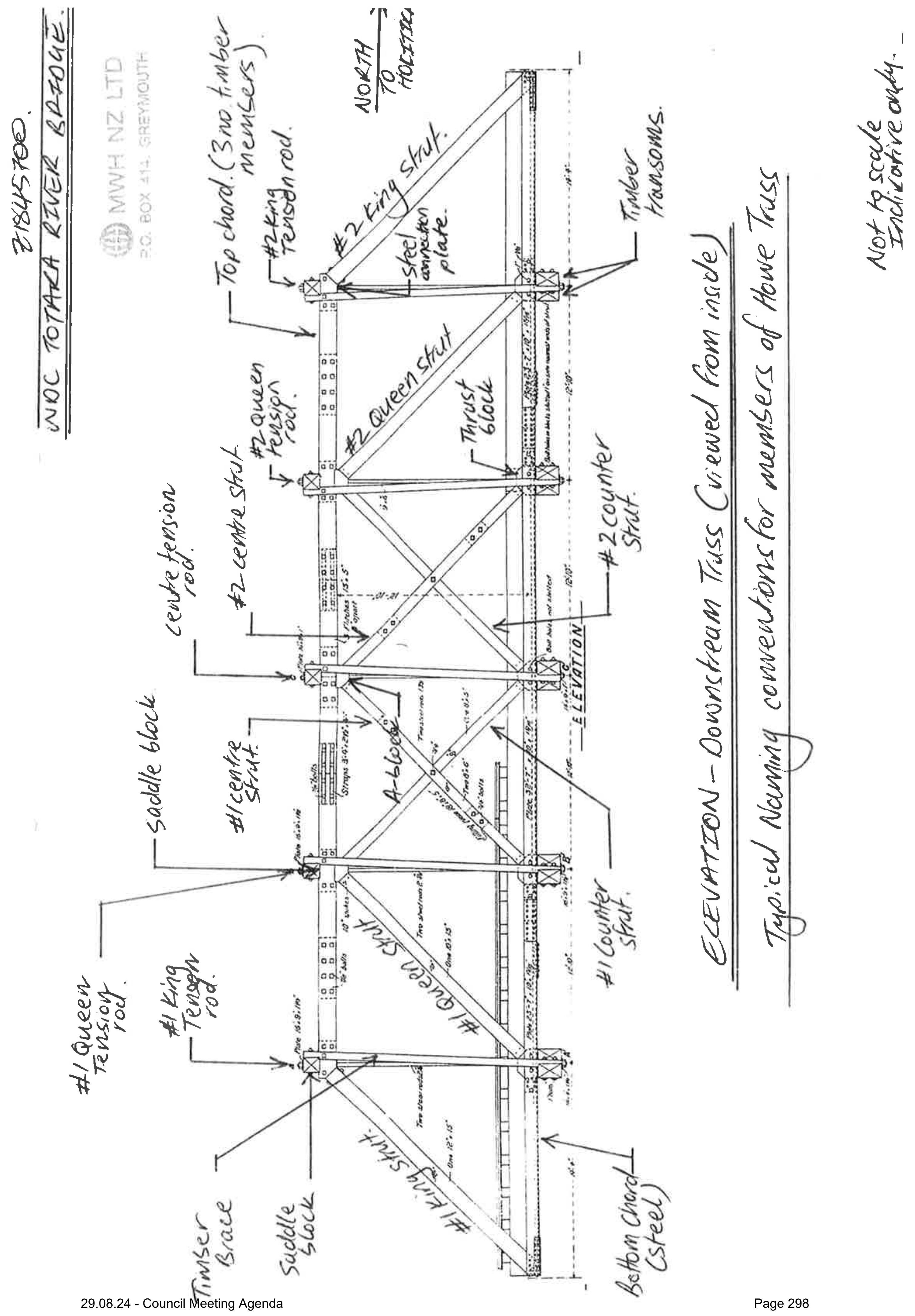
DESCRIPTION PLAN - RIVER PIER (Numbering Convention)

PREPARED BY JKD. DATE

CHECKED BY DATE

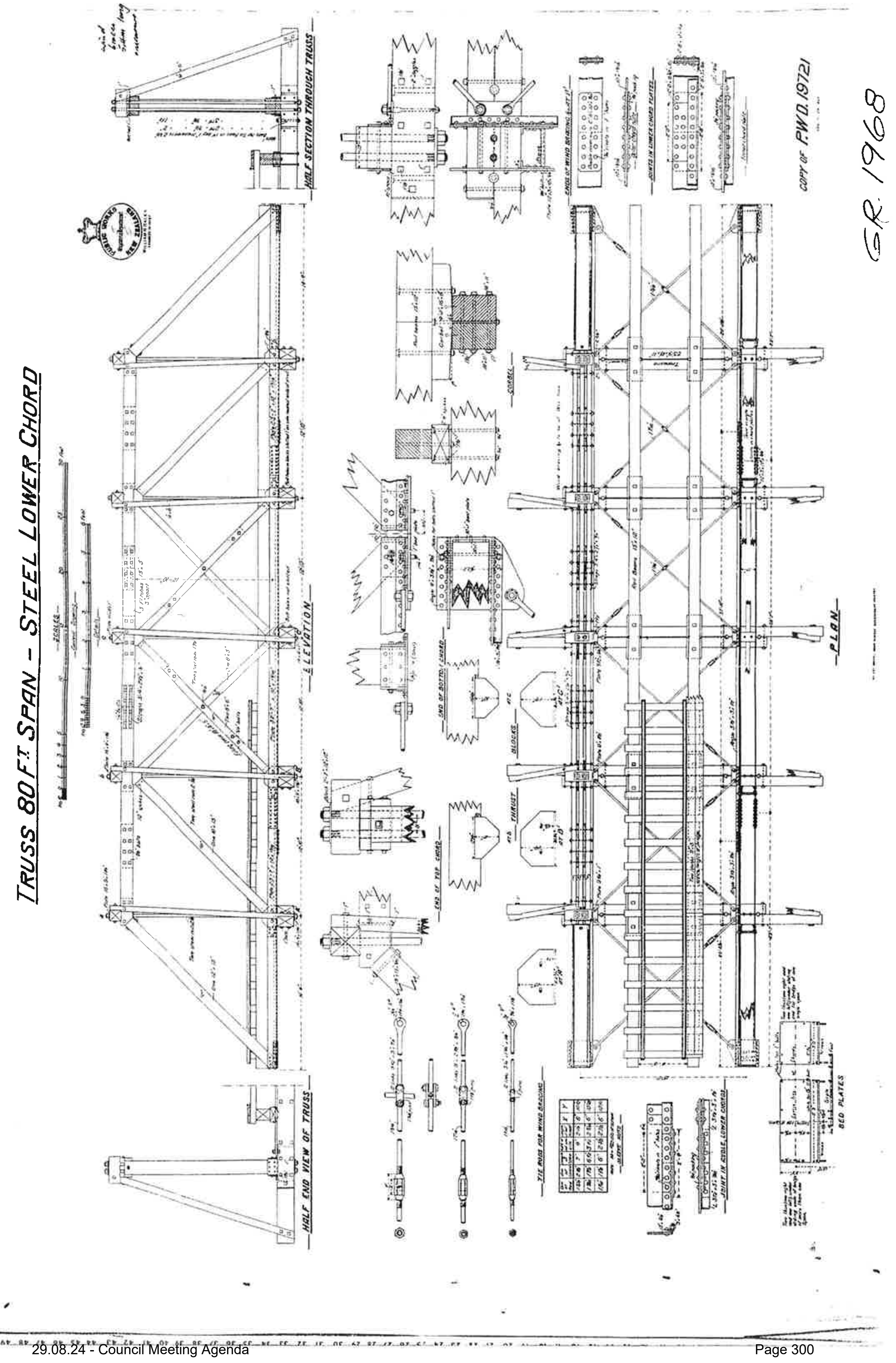
REF/DWGS SHEET 1 OF 1




Z1845700.
WDC TOTARA RIVER BRIDGE.
MWH NZ LTD
P.O. BOX 414, GREYMOUTH
NORTH
TO HOKITIKA
Top chord. (3no. timber members)
#2 King tension rod.
#2 King strut.
steel connection plate.
Timber transoms.
#2 Queen tension rod.
#2 Queen strut
Thrust block
centre tension rod.
#2 centre strut
#2 counter strut.
saddle block
#1 centre strut.
A-block
#1 Queen tension rod.
#1 King Tension rod.
#1 Queen strut
#1 Counter strut.
#1 King strut.
Timber Brace
Saddle block
Bottom Chord (steel)
ELEVATION
ELEVATION - Downstream Truss (viewed from inside)
Typical Naming conventions for members of Howe Truss
Not to scale Indicative only.

Appendix B:

- **Typical Construction Drawing – 80ft Howe Truss**
  (1 page)


TRUSS 80 FT. SPAN - STEEL LOWER CHORD
HALF SECTION THROUGH TRUSS
ELEVATION
HALF END VIEW OF TRUSS
PLAN
CORBEL
BLOCKS
THRUST
END OF BOTTOM CHORD
END OF TOP CHORD
ENDS OF WIND BRACING STRUTS
JOINTS IN LOWER CHORD PLATES
TIE RODS FOR WIND BRACING
JOINT IN MIDDLE LOWER CHORD
BED PLATES
SCALES
COPY OF P.W.D. 19721
GR 1968

Appendix C: Inspection Results – Trusses (10 pages)

Definition of terminology used

- "PDK" – Pocket Decay
- "EDK" – End Decay
- "CDK" – Centre Decay

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element	Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
3	LH	**Timber Struts**					
		#1 - King Strut		•		50%	Significant weathering and deep cracking top surface; bottom half section sound; large PDK at base
		#1 - Queen Strut		•		50%	Heavy weathering and deep cracking top surface; bottom half section sound;
		#1 - Counter Strut		•			Large split through centre; large PDK at base
		#1 - Centre Strut - Inside		•			Bottom sounds drummy; PDK inside face; splitting
		- Outside		•			Large PDK at base; top surface weathering and splitting
		#2 - Centre Strut - Inside		•			Sounds drummy,
		- Outside		•			PDK inside face; sounds drummy at top
		#2 - Counter Strut		•			Vertical splitting at top; sounds drummy
		#2 - Queen Strut		•		50%	PDK top face; weathering and splitting top face
		#2 - King Strut	•			50%	Large horizontal split inside face; significant weathering / splitting on top surface
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			80%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#1 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#1 - Centre Rods - Inside	•			50%	Heavily corroded
		- Outside	•			50%	Heavily corroded
		#2 - Queen Rods - Inside	•			80%	Heavily corroded
		- Outside	•			60%	Heavily corroded
		#2 - King Rods - Inside	•			90%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block		•			Large PDK at outside rod
		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
		Timber A-Blocks					
		#1 - Queen A-Block	•				
		Centre A-Block	•				
		#2 - Queen A-Block	•				
		Timber Saddle Blocks					
		#1 - King Saddle Block			•		Large CDK; sounds hollow
		#1 - Queen Saddle Block		•			Weathered with large splits on top; sounds drummy
		Centre Saddle Block		•			Large CDK inside end
		#2 - Queen Saddle Block		•			CDK inside end; otherwise appears sound
		#2 - King Saddle Block	•				Typical EDK and weathering; otherwise sound
		Top Chord					
		#1 King - #1 Queen - Inside			•		Large PDK; significant weathering
		- Middle		•			
		- Outside		•			
		#1 Queen - Centre - Inside	•				
		- Middle	•				Significant weathering
		- Outside	•				Significant weathering
		Centre - #2 Queen - Inside	•				Surface weathering
		- Middle	•				
		- Outside		•			Sounds drummy
		#2 Queen - #2 King - Inside	•				
		- Middle		•			EDK at king strut; large PDK near #2 queen
		- Outside		•			Sounds Drummy
		Bottom Chord					
		Steel Bottom Chord	•			80%	Heavy corrosion, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			80%	Heavily corroded; bolts gone
		Timber Braces					
		#1 - King Timber Brace			•		EDK top end
		#1 - Queen Timber Brace			•		EDK top end
		Centre Timber Brace	•				EDK top end; connection to saddle block OK, bolt / nuts corroded
		#2 - Queen Timber Brace			•		EDK top end
		#2 - King Timber Brace			•		EDK top end

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element		Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
3	RH	**Timber Struts**						
		#1 - King Strut			•			Sounds Drummy
		#1 - Queen Strut			•			Replaced 1966; Sounds drummy lower portion
		#1 - Counter Strut		•				Vertical splitting through top surface full length
		#1 - Centre Strut	- Inside		•			PDK at thrust block; Splitting and Pad top surface
			- Outside	•				PDK outside face around bolts
		#2 - Centre Strut	- Inside		•			
			- Outside	•				
		#2 - Counter Strut		•				PDK outside face; vertical splitting
		#2 - Queen Strut			•			Surface weathering; dull sound at base
		#2 - King Strut			•			Surface weathering; insect holes noted near top
		Vertical Steel Tension Rods						
		#1 - King Rods	- Inside	•			70%	
			- Outside	•			70%	
		#1 - Queen Rods	- Inside	•			80%	
			- Outside	•			90%	
		#1 - Centre Rods	- Inside	•			80%	
			- Outside	•			80%	
		#2 - Queen Rods	- Inside	•			70%	
			- Outside	•			70%	
		#2 - King Rods	- Inside		•		30%	
			- Outside		•		30%	
		Timber Thrust Blocks						
		#1 - King Timber Thrust Block				•		Significant decay top surface; large PDK between rods and on outside of rods
		#1 - Queen Timber Thrust Block		•				
		Centre Timber Thrust Block		•				
		#2 - Queen Timber Thrust Block		•				
		#2 - King Timber Thrust Block		•				
		Timber A-Blocks						
		#1 - Queen A-Block		•				
		Centre A-Block		•				
		#2 - Queen A-Block		•				
		Timber Saddle Blocks						
		#1 - King Saddle Block			•			Large CDK inside end
		#1 - Queen Saddle Block		•				Typical EDK and weathering
		Centre Saddle Block		•				CDK inside end; significant decay / weathering on top surface
		#2 - Queen Saddle Block		•				
		#2 - King Saddle Block			•			Small CDK inside end; several PDK's on northern face
		Top Chord						
		#1 King - #1 Queen	- Inside		•			Remove vegetation at end and investigate further
			- Middle		•			Replaced 1950; remove vegetation at end and investigate further
			- Outside		•			Remove vegetation at end and investigate further
		#1 Queen - Centre	- Inside	•				Significant surface decay top surface
			- Middle	•				
			- Outside	•				
		Centre - #2 Queen	- Inside	•				Surface decay inside face
			- Middle	•				Weathered
			- Outside	•				Weathered
		#2 Queen - #2 King	- Inside		•			Replaced 1933 (second hand); large PDK inside face at bolt group
			- Middle	•				Weathered
			- Outside	•				Weathered
		Bottom Chord						
		Steel Bottom Chord		•			60 - 80%	Heavy corrosion, King strut seatings at piers sound
		Steel Connection Plates						
		#1 King Strut to top chord		•			60%	Heavy corrosion; bolts gone
		#2 King Strut to top chord		•			90%	Heavy corrosion; bolts gone
		Timber Braces						
		#1 - King Timber Brace				•		EDK top end
		#1 - Queen Timber Brace				•		EDK top end
		Centre Timber Brace				•		EDK top end; large PDK (approx. half section gone)
		#2 - Queen Timber Brace				•		EDK top end; extensive splitting throughout
		#2 - King Timber Brace		•				PDK at connection to transom

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element		Structural Assessment / Recommendation			Estimated	Comments
				Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
4	LH	**Timber Struts**						
		#1 - King Strut		•			50%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull
		#1 - Queen Strut		•			50%	Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull
		#1 - Counter Strut		•				Small PDK inside face at base; splitting in top surface
		#1 - Centre Strut	- Inside	•				Some splitting along inside face
			- Outside	•				Some surface splitting
		#2 - Centre Strut	- Inside	•				PDK on top surface
			- Outside	•				Some splitting top surface
		#2 - Counter Strut		•				Split in top surface full length of member
		#2 - Queen Strut			•			Deep splitting / weathering in top surface
		#2 - King Strut		•				Replaced 1944
		Vertical Steel Tension Rods						
		#1 - King Rods	- Inside	•			80%	Heavy corroded
			- Outside	•			80%	Heavy corroded
		#1 - Queen Rods	- Inside	•			60%	Heavy corroded
			- Outside	•			80%	Heavy corroded
		#1 - Centre Rods	- Inside	•			90%	Heavy corroded
			- Outside	•			60%	Heavy corroded
		#2 - Queen Rods	- Inside	•			70%	Heavy corroded
			- Outside	•			70%	Heavy corroded
		#2 - King Rods	- Inside	•			60%	Heavy corroded
			- Outside	•			60%	Heavy corroded
		Timber Thrust Blocks						
		#1 - King Timber Thrust Block		•				
		#1 - Queen Timber Thrust Block		•				
		Centre Timber Thrust Block		•				
		#2 - Queen Timber Thrust Block		•				
		#2 - King Timber Thrust Block		•				
		Timber A-Blocks						
		#1 - Queen A-Block		•				Small CDK
		Centre A-Block		•				
		#2 - Queen A-Block			•			CDK approx. 120mm diameter
		Timber Saddle Blocks						
		#1 - King Saddle Block		•				CDK inside end approx. 50mm diameter
		#1 - Queen Saddle Block		•				Surface decay on top extending down into saddle block
		Centre Saddle Block		•				CDK inside end approx. 40mm diameter
		#2 - Queen Saddle Block		•				
		#2 - King Saddle Block		•				CDK inside end approx. 20mm diameter; Pad at drill holes on northern face.
		Top Chord						
		#1 King - #1 Queen	- Inside	•				Weathered
			- Middle	•				Replaced 1933 (second hand); weathered
			- Outside	•				Weathered
		#1 Queen - Centre	- Inside	•				Weathered
			- Middle	•				Weathered
			- Outside		•			Large PDK at end or flitch (approx. half section missing)
		Centre - #2 Queen	- Inside	•				
			- Middle	•				PDK top surface and inside face; weathered
			- Outside	•				PDK top surface; weathered
		#2 Queen - #2 King	- Inside	•				Weathered
			- Middle	•				Significant weathering and Isolated PDK
			- Outside		•			Significant weathering and Isolated PDK; dozy near #2 king Timber brace connection.
		Bottom Chord						
		Steel Bottom Chord		•			80%	Typically heavily corroded, King strut seatings at piers sound
		Steel Connection Plates						
		#1 King Strut to top chord		•			90%	Heavily corroded; bolts gone
		#2 King Strut to top chord		•			80%	Heavily corroded; bolts gone
		Timber Braces						
		#1 - King Timber Brace		•				
		#1 - Queen Timber Brace		•				Nuts missing from bolts
		Centre Timber Brace		•				
		#2 - Queen Timber Brace			•			Large PDK at base; bolts fully corroded
		#2 - King Timber Brace		•				Split at bolt otherwise sound

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
4	RH	**Timber Struts**					
		#1 - King Strut	•				Significant surface weathering top surface; several PDK top surface.
		#1 - Queen Strut	•				Weathered top surface
		#1 - Counter Strut		•			Split and PDK top surface
		#1 - Centre Strut - Inside	•				Some vertical cracking noted
		- Outside	•				Some vertical cracking noted
		#2 - Centre Strut - Inside		•			Some surface decay and splitting at base
		- Outside		•			Large vertical split full length; surface decay
		#2 - Counter Strut	•				Splitting in top surface full length
		#2 - Queen Strut		•			Cracking in top surface; sounds hollow from 1m below A-block
		#2 - King Strut	•				Weathered top surface; isolated PDK inside surface
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			50%	Heavily corroded
		- Outside	•			40%	Heavily corroded
		#1 - Queen Rods - Inside	•			30%	Heavily corroded
		- Outside	•			30%	Heavily corroded
		#1 - Centre Rods - Inside	•			40%	Heavily corroded
		- Outside	•			40%	Heavily corroded
		#2 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#2 - King Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				
		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
		Timber A-Blocks					
		#1 - Queen A-Block	•				
		Centre A-Block	•				
		#2 - Queen A-Block	•				Small CDK inside end
		Timber Saddle Blocks					
		#1 - King Saddle Block	•				Small CDK and splitting inside end; significant EDK outside end to beyond brace connection
		#1 - Queen Saddle Block	•				EDK outside end
		Centre Saddle Block	•				Advanced CDK
		#2 - Queen Saddle Block		•			Small CDK inside end; significant EDK outside end to beyond Timber brace connection; sounds hollow
		#2 - King Saddle Block		•			Large CDK inside end up to 150mm diameter; surface decay; sounds hollow; investigate and treat / replace
		Top Chord					
		#1 King - #1 Queen - Inside		•			Weathered; sounds hollow
		- Middle		•			Large PDK inside face approx. 50mm deep; weathered
		- Outside		•			Large PDK, approx half cross section missing
		#1 Queen - Centre - Inside	•				
		- Middle	•				
		- Outside	•				EDK at splice connection
		Centre - #2 Queen - Inside	•				Weathered
		- Middle	•				Weathered
		- Outside	•				Weathered; small PDK top surface
		#2 Queen - #2 King - Inside		•			Weathered; split; PDK inside flitch below saddle; sounds hollow
		- Middle	•				Weathered; split
		- Outside	•				Weathered; split
		Bottom Chord					
		Steel Bottom Chord	•			70%	Moderate to heavy corrosion, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•				
		#2 King Strut to top chord	•			70%	Heavily corroded
		Timber Braces					
		#1 - King Timber Brace	•				PDK at base; weathered and splitting
		#1 - Queen Timber Brace	•				Large split from top end through bolted connection; install split bolt
		Centre Timber Brace	•				
		#2 - Queen Timber Brace		•			Significant cracking; hollow sound
		#2 - King Timber Brace	•				Split in end; large PDK at connection to transom

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
			Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
5	LH	**Timber Struts**					
		#1 - King Strut		•			Significant weathering / cracking top surface; small PDK at base; top half of section sounds dull
		#1 - Queen Strut	•			50%	Weathered top surface with large splits down centre; PDK and split on underside
		#1 - Counter Strut		•			PDK top surface
		#1 - Centre Strut - Inside	•				Vertical splitting full length; some horizontal splitting on sides
		- Outside		•			Significant vertical splitting and decay of top surface; horizontal splitting inside face
		#2 - Centre Strut - Inside			•		Large horizontal crack full length; significant surface decay and PDK
		- Outside			•		Significant splitting and PDK at base; large split at top
		#2 - Counter Strut		•			PDK at thrust block; splitting at base; sounds dull
		#2 - Queen Strut				70%	PDK at base; significant weathering and cracking top surface approx 1/4 depth
		#2 - King Strut	•				Surface weathering on top surface
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			90%	Heavily corroded
		- Outside	•			90%	Heavily corroded
		#1 - Queen Rods - Inside	•			90%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#1 - Centre Rods - Inside	•			80%	Heavily corroded
		- Outside	•			60%	Heavily corroded
		#2 - Queen Rods - Inside	•			60%	Heavily corroded
		- Outside	•			60%	Heavily corroded
		#2 - King Rods - Inside	•			80%	Heavily corroded
		- Outside	•			90%	Heavily corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				
		Centre Timber Thrust Block		•			Some splitting and compression occurring
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
		Timber A-Blocks					
		#1 - Queen A-Block	•				Small CDK inside end
		Centre A-Block	•				Small CDK inside end; small PDK at strut
		#2 - Queen A-Block	•				Large CDK inside end approx. 100mm diameter
		Timber Saddle Blocks					
		#1 - King Saddle Block	•				Small CDK; large vertical split; treat and provide horizontal split bolts
		#1 - Queen Saddle Block	•				CDK approx. 80mm diameter inside end
		Centre Saddle Block	•				CDK inside end; PDK on south side
		#2 - Queen Saddle Block			•		Large CDK extending to top chord of truss (approx. 150mm diameter), extends to vertical tie rod
		#2 - King Saddle Block		•			Soft end; sounds dull
		Top Chord					
		#1 King - #1 Queen - Inside	•				
		- Middle	•				
		- Outside	•				Replaced 1940
		#1 Queen - Centre - Inside		•			Large PDK, approx. half section missing
		- Middle		•			Large PDK and split through side; sounds drummy
		- Outside	•				
		Centre - #2 Queen - Inside	•				Large vertical split approx. 50mm deep
		- Middle	•				
		- Outside	•				
		#2 Queen - #2 King - Inside		•			CDK at south end; large vertical split
		- Middle		•			Significant weathering; PDK inside face
		- Outside		•			Large PDK inside face, approx. half section gone;
		Bottom Chord					
		Steel Bottom Chord	•			70%	Heavily corroded, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			60%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			50%	Heavily corroded; bolts gone
		Timber Braces					
		#1 - King Timber Brace			•		EDK to beyond fixing bolt to saddle block
		#1 - Queen Timber Brace	•				
		Centre Timber Brace	•				Some end splitting
		#2 - Queen Timber Brace		•			CDK approx. 60mm diameter at top
		#2 - King Timber Brace		•			Large PDK south face; large split

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element	Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
5	RH	**Timber Struts**					
		#1 - King Strut		•			Weathered top surface; decay to approximately half depth of member
		#1 - Queen Strut	•				Minor splitting in top surface
		#1 - Counter Strut	•				
		#1 - Centre Strut - Inside	•				Vertical splitting in lower half
		- Outside	•				Vertical splitting in lower half
		#2 - Centre Strut - Inside	•				
		- Outside	•				
		#2 - Counter Strut	•				
		#2 - Queen Strut		•			Surface decay at top; dull sound in lower portion, possible CDK
		#2 - King Strut	•				
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			90%	Heavily corroded
		- Outside	•			90%	Heavily corroded
		#1 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#1 - Centre Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#2 - Queen Rods - Inside	•			50%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#2 - King Rods - Inside	•			60%	Heavily corroded
		- Outside	•			60%	Heavily corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				
		Centre Timber Thrust Block	•				PDK top surface and inside contact area for #2 Counter Strut
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
		Timber A-Blocks					
		#1 - Queen A-Block	•				
		Centre A-Block	•				
		#2 - Queen A-Block	•				Small CDK inside end
		Timber Saddle Blocks					
		#1 - King Saddle Block	•				CDK inside end approx 50mm diameter; EDK outside end
		#1 - Queen Saddle Block	•				EDK outside end
		Centre Saddle Block	•				Small CDK and vertical split inside end; EDK outside end
		#2 - Queen Saddle Block	•				CDK inside end; EDK outside end
		#2 - King Saddle Block		•			CDK inside end approx. 70mm diameter; EDK outside end; PDK northern face
		Top Chord					
		#1 King - #1 Queen - Inside	•				
		- Middle	•				
		- Outside		•			PDK top surface approx 300mm long; PDK on underside
		#1 Queen - Centre - Inside	•				
		- Middle	•				Replaced 1976
		- Outside		•			PDK to half section depth
		Centre - #2 Queen - Inside	•				
		- Middle	•				
		- Outside	•				
		#2 Queen - #2 King - Inside	•				Replaced 1933 (second hand)
		- Middle	•				
		- Outside	•				
		Bottom Chord					
		Steel Bottom Chord	•			60-80%	Heavily corroded, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			60%	Heavily corroded; steel delaminating at edges
		#2 King Strut to top chord	•			60%	Heavily corroded; steel delaminating at edges
		Timber Braces					
		#1 - King Timber Brace	•				EDK at top connection; nut missing from bolted connection; extensive splitting
		#1 - Queen Timber Brace	•				Nut missing from bolt connecting to transom
		Centre Timber Brace	•				EDK and vertical split at top
		#2 - Queen Timber Brace	•				
		#2 - King Timber Brace	•				

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element		Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
6	LH	**Timber Struts**						
		#1 - King Strut		•			70%	Significant surface weathering and PDK in top surface; top 1/4 section no longer contributing to strength
		#1 - Queen Strut			•			Advanced surface decay top surface; splitting in top surface approx. 100mm deep
		#1 - Counter Strut		•			60%	Significant splitting on top surface and inside face, full length; PDK top surface; top 1/3 section no longer contributing to strength
		#1 - Centre Strut	- Inside	•				Splitting in top surface; PDK near top
			- Outside		•			Splitting in top surface; PDK top surface and outside face
		#2 - Centre Strut	- Inside		•			PDK at base; weathering of top surface
			- Outside	•				Weathering of top surface
		#2 - Counter Strut		•				Weathering and splitting of top surface; PDK top surface; some splitting in side at top
		#2 - Queen Strut		•				PDK and thrust block; weathered top surface
		#2 - King Strut			•			Replaced 1928; advance surface decay on top surface; PDK on sides and top surface; horizontal split bolts at top
		Vertical Steel Tension Rods						
		#1 - King Rods	- Inside	•			70%	Heavily corroded
			- Outside	•			80%	Heavily corroded
		#1 - Queen Rods	- Inside	•			60%	Heavily corroded
			- Outside	•			60%	Heavily corroded
		#1 - Centre Rods	- Inside	•			70%	Heavily corroded
			- Outside	•			50%	Heavily corroded
		#2 - Queen Rods	- Inside	•			70%	Heavily corroded
			- Outside	•			70%	Heavily corroded
		#2 - King Rods	- Inside	•			95%	Light surface corrosion only
			- Outside	•			60%	Heavily corroded
		Timber Thrust Blocks						
		#1 - King Timber Thrust Block		•				
		#1 - Queen Timber Thrust Block			•			Significant splitting and decay
		Centre Timber Thrust Block		•				
		#2 - Queen Timber Thrust Block		•				
		#2 - King Timber Thrust Block			•			Significant decay across top in line of tension rods.
		Timber A-Blocks						
		#1 - Queen A-Block		•				Small CDK inside end
		Centre A-Block		•				Small CDK inside end
		#2 - Queen A-Block		•				
		Timber Saddle Blocks						
		#1 - King Saddle Block			•			Significant EDK (approx 1/3 of end) extending to top surface; dull sound at top
		#1 - Queen Saddle Block		•				Replaced 1967; small CDK inside end; soft
		Centre Saddle Block			•			CDK inside end approx. 80mm diameter extending to base of saddle block
		#2 - Queen Saddle Block			•			CDK inside end extending up to top surface
		#2 - King Saddle Block			•			EDK inside end (approx. 1/3 of end); dull sound on northern face
		Top Chord						
		#1 King - #1 Queen	- Inside	•				
			- Middle	•				Weathered
			- Outside	•				Weathered
		#1 Queen - Centre	- Inside	•				
			- Middle	•				Weathered
			- Outside	•				Weathered
		Centre - #2 Queen	- Inside	•				Horizontal splitting inside face
			- Middle	•				Isolated PDK
			- Outside		•			PDK inside face, approx. 50% loss of section
		#2 Queen - #2 King	- Inside	•				Weathered
			- Middle	•				
			- Outside	•				Weathered; PDK
		Bottom Chord						
		Steel Bottom Chord		•			70%	Heavily corroded, King strut seatings at piers sound
		Steel Connection Plates						
		#1 King Strut to top chord		•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord		•			80%	Heavily corroded; bolts gone
		Timber Braces						
		#1 - King Timber Brace		•				Splitting and surface decay at base; nut missing from bolt connecting to saddle
		#1 - Queen Timber Brace		•				Large split through centre; PDK outside edge near base; nut missing from bolt connecting to saddle
		Centre Timber Brace				•		Top end completed decayed
		#2 - Queen Timber Brace		•				
		#2 - King Timber Brace		•				

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element	Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
6	RH	**Timber Struts**					
		#1 - King Strut	•				Replaced 1977
		#1 - Queen Strut	•				Replaced 1965
		#1 - Counter Strut	•				
		#1 - Centre Strut - Inside	•				Surface weathering
		- Outside	•				Surface weathering
		#2 - Centre Strut - Inside	•				Surface weathering
		- Outside	•				Surface weathering
		#2 - Counter Strut	•				
		#2 - Queen Strut		•			Some hollowing in bottom end; PDK top surface
		#2 - King Strut	•				
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			60%	Heavily corroded
		- Outside	•			80%	Heavily corroded
		#1 - Queen Rods - Inside	•			70%	Heavily corroded
		- Outside	•			70%	Heavily corroded
		#1 - Centre Rods - Inside	•			80%	Heavily corroded
		- Outside	•			80%	Heavily corroded
		#2 - Queen Rods - Inside	•			95%	Very light surface corrosion
		- Outside	•			80%	Heavily corroded
		#2 - King Rods - Inside	•			90%	Light corrosion only
		- Outside	•			70%	Heavily corroded
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				Small section missing from top outside of outside tie rod
		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				CDK started on outside face
		Timber A-Blocks					
		#1 - Queen A-Block	•				
		Centre A-Block	•				CDK inside end approx. 80mm diameter
		#2 - Queen A-Block	•				
		Timber Saddle Blocks					
		#1 - King Saddle Block	•				EDK at Timber brace connection
		#1 - Queen Saddle Block	•				Vertical split through inside face
		Centre Saddle Block			•		PDK; outside tension rod loose due to saddle block crushing
		#2 - Queen Saddle Block	•				EDK at Timber brace connection
		#2 - King Saddle Block	•				Significant EDK at outside end; up to 20% CDK inside end
		Top Chord					
		#1 King - #1 Queen - Inside	•				Splitting and PDK top surface; EDK and southern end
		- Middle	•				
		- Outside	•				
		#1 Queen - Centre - Inside	•				Splitting in top surface
		- Middle	•				
		- Outside	•				PDK
		Centre - #2 Queen - Inside	•				
		- Middle	•				
		- Outside	•				
		#2 Queen - #2 King - Inside	•				
		- Middle	•				
		- Outside	•				
		Bottom Chord					
		Steel Bottom Chord	•			80-90%	Light to moderate corrosion, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		Timber Braces					
		#1 - King Timber Brace	•				Significant splitting and PDK
		#1 - Queen Timber Brace	•				Split through centre at top end
		Centre Timber Brace			•		EDK top end
		#2 - Queen Timber Brace			•		EDK top end; large split through centre
		#2 - King Timber Brace	•				

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element		Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
7	LH	**Timber Struts**						
		#1 - King Strut		•			70%	Extensive surface weathering and splitting
		#1 - Queen Strut		•				
		#1 - Counter Strut		•				
		#1 - Centre Strut	- Inside			•		Large PDK inside face; splitting
			- Outside	•				Splitting and associated PDK; ropey top surface
		#2 - Centre Strut	- Inside	•				Vertical splitting top surface; small PDK at base
			- Outside	•				Vertical splitting top surface
		#2 - Counter Strut		•				PDK both ends; some horizontal splitting; weathering and surface decay on top surface
		#2 - Queen Strut		•				Replaced 1960; Splitting and PDK top surface
		#2 - King Strut		•			70%	Vertical splitting and PDK top surface up to 60mm deep
		Vertical Steel Tension Rods						
		#1 - King Rods	- Inside	•			95%	Light surface corrosion
			- Outside	•			60%	Heavily corroded
		#1 - Queen Rods	- Inside	•			20%	Heavily corroded
			- Outside	•			40%	Heavily corroded
		#1 - Centre Rods	- Inside	•			20%	Heavily corroded
			- Outside	•			40%	Heavily corroded
		#2 - Queen Rods	- Inside	•			70%	Heavily corroded
			- Outside	•			95%	Light surface corrosion
		#2 - King Rods	- Inside	•			80%	Heavily corroded
			- Outside	•			90%	Heavily corroded
		Timber Thrust Blocks						
		#1 - King Timber Thrust Block		•				
		#1 - Queen Timber Thrust Block		•				Second hand (replaced); PDK top surface; small PDK inside of inside rod
		Centre Timber Thrust Block		•				
		#2 - Queen Timber Thrust Block		•				
		#2 - King Timber Thrust Block		•				Second hand (replaced); Some decay along top through centre
		Timber A-Blocks						
		#1 - Queen A-Block		•				Split with some decay south edge
		Centre A-Block		•				Small CDK inside end; small PDK behind strut
		#2 - Queen A-Block		•				Small CDK and some splitting through end
		Timber Saddle Blocks						
		#1 - King Saddle Block			•			Large split inside end from top to centre; Significant EDK outside end; sounds hollow
		#1 - Queen Saddle Block			•			Large EDK extending full depth; sounds hollow underneath bolts
		Centre Saddle Block				•		Large CDK inside end full depth of saddle
		#2 - Queen Saddle Block		•				CDK starting at inside end with vertical crack
		#2 - King Saddle Block				•		Large CDK inside end through centre extending to top surface; outside end similar; sounds very hollow
		Top Chord						
		#1 King - #1 Queen	- Inside	•				Replaced 1960; some splitting and PDK inside face
			- Middle	•				
			- Outside	•				Significant weathering and PDK inside face
		#1 Queen - Centre	- Inside	•				Large PDK inside face
			- Middle	•				
			- Outside	•				Small PDK on top; splitting on inside face
		Centre - #2 Queen	- Inside	•				Replaced 1960; Large split on inside face
			- Middle	•				Replaced 1960
			- Outside	•				
		#2 Queen - #2 King	- Inside	•				Replaced 1960; PDK and splitting inside face
			- Middle	•				Replaced 1960
			- Outside	•				Weathered top surface
		Bottom Chord						
		Steel Bottom Chord		•			70-80%	Heavily corroded; Up to 50% loss in section between #2 King Rods and pier, King strut seatings at piers sound
		Steel Connection Plates						
		#1 King Strut to top chord		•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord		•			60%	Heavily corroded; bolts gone
		Timber Braces						
		#1 - King Timber Brace				•		Large cracks; Large PDK below saddle block
		#1 - Queen Timber Brace		•				Large CDK at top (splice in short section at top?)
		Centre Timber Brace				•		EDK at top to beyond fixing bolt to saddle block
		#2 - Queen Timber Brace				•		EDK at top to beyond fixing bolt to saddle block
		#2 - King Timber Brace				•		Large PDK at base and mid height

TOTARA RIVER BRIDGE - TRUSSES

Span	Side	Structural Element	Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
7	RH	**Timber Struts**					
		#1 - King Strut	•				
		#1 - Queen Strut	•				Significant surface cracking top surface
		#1 - Counter Strut	•				
		#1 - Centre Strut - Inside	•				Some cracking and isolated PDK
		- Outside	•				Some cracking and isolated PDK
		#2 - Centre Strut - Inside	•				Split at top
		- Outside	•				Split with PDK at top
		#2 - Counter Strut			•		Significant loss of section at bottom end through decay otherwise sound; splice in a short length?
		#2 - Queen Strut	•				
		#2 - King Strut	•				Replaced 1933 (second hand); surface decay inside face
		Vertical Steel Tension Rods					
		#1 - King Rods - Inside	•			95%	Light surface corrosion only
		- Outside	•			95%	Light surface corrosion only
		#1 - Queen Rods - Inside	•			50%	Heavily corroded
		- Outside	•			50%	Heavily corroded
		#1 - Centre Rods - Inside	•			95%	Light surface corrosion only
		- Outside	•			50%	Heavily corroded
		#2 - Queen Rods - Inside	•			40%	Heavily corroded
		- Outside	•			40%	Heavily corroded
		#2 - King Rods - Inside	•			90%	Light corrosion only
		- Outside	•			90%	Light corrosion only
		Timber Thrust Blocks					
		#1 - King Timber Thrust Block	•				
		#1 - Queen Timber Thrust Block	•				
		Centre Timber Thrust Block	•				
		#2 - Queen Timber Thrust Block	•				
		#2 - King Timber Thrust Block	•				
		Timber A-Blocks					
		#1 - Queen A-Block			•		CDK; PDK and splitting on counter strut side; signs of compression; replace within 5yrs
		Centre A-Block	•				Small PDK around strut
		#2 - Queen A-Block	•				
		Timber Saddle Blocks					
		#1 - King Saddle Block			•		CDK; PDK top at top
		#1 - Queen Saddle Block			•		Large CDK inside end; replace within 5 years
		Centre Saddle Block	•				EDK outside end
		#2 - Queen Saddle Block	•				Some surface decay and weathering
		#2 - King Saddle Block	•				EDK outside end
		Top Chord					
		#1 King - #1 Queen - Inside			•		PDK inside and outside faces at #1 Queen A-block
		- Middle	•				
		- Outside			•		Large PDK around bolts; completely gone near #1 Queen A-block
		#1 Queen - Centre - Inside			•		PDK inside and outside faces at #1 Queen A-block
		- Middle	•				
		- Outside			•		Large PDK around bolts; completely gone near #1 Queen A-block
		Centre - #2 Queen - Inside	•				
		- Middle	•				
		- Outside	•				PDK around bolts
		#2 Queen - #2 King - Inside	•				
		- Middle	•				Replaced 1974 (second hand)
		- Outside	•				
		Bottom Chord					
		Steel Bottom Chord			•	60%	Heavily corroded, King strut seatings at piers sound
		Steel Connection Plates					
		#1 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		#2 King Strut to top chord	•			70%	Heavily corroded; bolts gone
		Timber Braces					
		#1 - King Timber Brace			•		Large PDK at end
		#1 - Queen Timber Brace	•				
		Centre Timber Brace	•				Crack through centre (top half)
		#2 - Queen Timber Brace	•				Spilt through lower half of brace
		#2 - King Timber Brace	•				EDK top end

Appendix D: Inspection Results – Transoms (2 pages)

Definition of terminology used

- "PDK" – Pocket Decay
- "EDK" – End Decay
- "CDK" – Centre Decay

TOTARA RIVER BRIDGE - TRANSOMS

Span	Side	Structural Element	Structural Assessment / Recommendation			Estimated %	Comments
			Sound / Treatment only	Further Investigation	Replace	Original Capacity	
3	LH	#1 King Transom	•				Bolts heavily corroded
	RH	#1 King Transom	•				Replaced 1960
	LH	#1 Queen Transom	•				Condition of bolts is mixed
	RH	#1 Queen Transom	•				Replaced 1944; PDK downstream end
	LH	Centre Transom	•				Weathered
	RH	Centre Transom	•				Replaced 1977 (second hand); PDK top surface between road beams
	LH	#2 Queen Transom	•				Replaced 1977
	RH	#2 Queen Transom	•				Replaced 1960
	LH	#2 King Transom	•				Replaced 1977; small surface defect top surface between RH truss and RH road beam
	RH	#2 King Transom	•				Replaced 1967 (second hand)
4	LH	#1 King Transom		•			large CDK; Sounds hollow under road beams
	RH	#1 King Transom		•			Significant EDK upstream end; sounds hollow under truss
	LH	#1 Queen Transom		•			Sounds hollow under LH road beam
	RH	#1 Queen Transom	•				Honey combing and surface decay downstream end; large split between RH road beam and RH truss; small CDK upstream end
	LH	Centre Transom		•			Sounds hollow under LH road beam
	RH	Centre Transom	•				Isolated PDK south face; surface weathering and decay
	LH	#2 Queen Transom		•			Replaced 1960; large CDK downstream end extending back to thrust block; EDK upstream end; large PDK northern face between RH road beam and RH truss
	RH	#2 Queen Transom		•			Replaced 1960; EDK upstream end; condition of bolts is mixed
	LH	#2 King Transom	•				Condition of bolts is mixed
	RH	#2 King Transom	•				
5	LH	#1 King Transom	•				Replaced 1975
	RH	#1 King Transom	•				Some horizontal splitting downstream end; condition of bolts is mixed
	LH	#1 Queen Transom	•				Replaced 1977
	RH	#1 Queen Transom	•				Split through top at upstream end
	LH	Centre Transom	•				Replaced 1944
	RH	Centre Transom	•				Split through top at upstream end
	LH	#2 Queen Transom					
	RH	#2 Queen Transom		•			Significant EDK upstream end extending up to 1.5m from end; extensive surface decay on top surface; member collapsing inward; (likely replacement required)
	LH	#2 King Transom	•				Condition of bolts is mixed; 5 splice bolts between transoms are missing
	RH	#2 King Transom	•				

TOTARA RIVER BRIDGE - TRANSOMS

Span	Side	Structural Element	Structural Assessment / Recommendation			Estimated %	Comments
			Sound / Treatment only	Further Investigation	Replace	Original Capacity	
6	LH	#1 King Transom	•				PDK top surface; EDK upstream end; condition of bolts mixed
	RH	#1 King Transom	•				End splitting upstream end
	LH	#1 Queen Transom	•				Replaced 1944; condition of bolts is mixed
	RH	#1 Queen Transom	•				
	LH	Centre Transom	•				large CDK / EDK upstream end; surface decay / weathering on top surface
	RH	Centre Transom	•				Weathered; large horizontal split through side at upstream end - install vertical split bolts
	LH	#2 Queen Transom	•				Splitting downstream end; significant horizontal splitting upstream end - install vertical split bolts
	RH	#2 Queen Transom	•				Weathered
	LH	#2 King Transom		•			CDK downstream end; large PDK south face; PDK upstream face; hollow sound from LH truss to end
	RH	#2 King Transom	•				Weathered; splitting on north and south face with associated decay
7	LH	#1 King Transom		•			Small EDK upstream end; splitting; sounds drummy
	RH	#1 King Transom	•				
	LH	#1 Queen Transom	•				Large CDK downstream end; significant weathering; PDK
	RH	#1 Queen Transom	•				large CDK upstream end; splitting both ends; horizontal split and downstream end requires vertical split bolts
	LH	Centre Transom		•			Significant weathering; large PDK upstream end; sounds drummy
	RH	Centre Transom	•				Horizontal split through centre at downstream end; install vertical split bolts
	LH	#2 Queen Transom	•				Replaced 1977
	RH	#2 Queen Transom		•			Significant EDK upstream end in horizontal plane, extending back under truss; large PDK south face; significant weathering; soft
	LH	#2 King Transom	•				Surface weathering
	RH	#2 King Transom	•				PDK upstream end; significant weathering

Appendix E: Inspection Results – Road Beams, Corbels and Deck Bracing (9 pages)

Definition of terminology used

- "PDK" – Pocket Decay
- "EDK" – End Decay
- "CDK" – Centre Decay

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
Road Beams	LH1		●			Significant weathering and splitting; large PDK outside face; PDK top surface and outside face near pier #2; vegetation growing on top
	LH2		●			Significant weathering and splitting; PDK inside and outside face at northern end; PDK top surface; *- bottom half of section appears sound*
	LH3	●				Numerous PDK top surface and both sides; significant horizontal splitting through sides over top 1/2 to 2/3 section depth
	LH4	●				Weathering and splitting top surface; minor horizontal cracking in sides; numerous PDK top surface
	LH5	●				Replaced 1974; diagonal splitting on side and PDK both sides of beam at #2 Queen corbel ; PDK at northern end; drummy sound at pier #4 end
	LH6		●			Large PDK at north end extending from top to within 150mm of base (2/3 section gone); significant weathering and splitting; numerous PDK top surface; large PDK between #1 King and #1 Queen transoms approx. 40mm deep; dull sound at southern end
	LH7	●				Weathering , splitting and surface decay on top and both sides; numerous PDK on top surface and on sides
	LH8		●			Significant weathering; significant splitting both sides; PDK inside and outside faces; evidence of insect attack; hollow sound at north end *- estimate top half of beam not contributing structurally*
	LH9			●		Significant weathering and surface decay all faces; evidence of insect attack; large PDK top surface at north end; PDK sides and underside
	LH10	●				Replaced 1960; large PDK inside face at south end; isolated PDK top and outside face; weathering and splitting on outside face; vertical splitting on top; evidence of insect attack;
	LH11		●			Replaced 1933 (second hand); top surface weathering and splitting; large PDK inside face and significant vertical splitting at south end; significant weathering south end *- Investigate south end*
	LH12	●				Typical surface weathering
	LH13	●				Typical surface weathering and splitting; isolated PDK top surface; evidence of insect attack
	LH14		●			Weathering and isolated PDK to top surface and sides; horizontal splitting to sides; top 1/4 depth sounds drummy to end of corbel at south end; large horizontal split to end of corbel at north end
	LH15	●				Replaced 1966; weathering, splitting and isolated PDK top surface; significant weathering and surface decay, outside face; PDK both ends; sounds drummy at ends *- Assume top 1/4 section does not contribute structurally*
	LH16		●			Weathering and PDK, top surface; split and associated PDK, and large split in side with associated decay at south end; *- Investigate south end*

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
	LH17		•			Vertical and horizontal cracking with associated decay at north end; hollow sound at north end; numerous PDK top surface; splitting and PDK to sides *- Investigate further (likely replacement)*
	LH18	•				Replaced 1966
	LH19		•			Replaced 1940; advanced surface decay and weathering on top and sides; soft sound at south end
	CN1		•			Significant weathering and splitting; PDK on downstream face at cross member; vegetation growing on top; hollow sound at pier #2 end
	CN2	•				Significant weathering and splitting; PDK top surface and inside face; horizontal split and CDK at pier #3
	CN3		•			Significant weathering, splitting and associated decay top and downstream face; isolated PDK upstream face; probable end decay at pier #9 *- Investigation end south end and PDK at mid span (upstream face)*
	CN4		•			Surface weathering; general decay; PDK on sides; horizontal split at north end *- Likely redundant*
	RH1		•			Significant weathering and splitting; splitting and associated PDK on inside face; *- bottom half of beam appears sound*
	RH2	•				Weathering and vertical splitting top surface; minor horizontal splitting and weathering to sides
	RH3	•				
	RH4	•				Weathering and splitting top surface; minor horizontal cracking in sides; numerous PDK top surface
	RH5		•			Significant splitting and associated PDK in top and both sides; evidence of insect attack; large PDK / EDK at pier #4 end
	RH6		•			Advanced surface decay and weathering; numerous PDK top surface; horizontal splitting through top half of section; estimate top 1/4 of section not contributing structurally; soft surface and dull sound at south end;
	RH7	•				
	RH8	•				Replaced (est. 1950 - 1965, barrier post covering date); isolated PDK top surface; weathering and horizontal splitting on sides
	RH9	•				Replaced 1950; numerous small PDK top surface; weathering and PDK outside face; large PDK approx. 600 long x 40 deep and approx. 1/3 section depth on outside face
	RH10	•				
	RH11		•			Weathering and decay both sides; large split and PDK at south end extending full width of section; horizontal split inside face at north end
	RH12			•		Several large PDK along member *- Parts of beam may be reused elsewhere*
	RH13		•			Weathering and splitting; large PDK on outside face at north end extending to end of corbel; large vertical split from north end to first bolt; sounds hollow at north end.

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
	RH14		•			Significant weathering and splitting and associated PDK on top and both sides; large horizontal split at south end with PDK; large vertical split at north end; PDK over #2 King corbel (both sides of beam); sounds drummy both ends
	RH15		•			Weathering and associated decay to top surface; PDK south end and sounds hollow; top half sounds drummy at north end; dull sound inside face between #1 King and #1 Queen transoms - *Assume top 1/4 of member does not contribute structurally*
	RH16	•				Weathering and associated PDK top surface; weathered sides; splitting resulting in loose segments at top corners of beam.
	RH17	•				Replaced 1963
	RH18	•				Replaced 1940; extensive weathering and decay on outside face; weathering and PDK top surface; worm holes outside face
	RH19		•			Significant weathering and splitting and associated PDK on top surface; large PDK to half width of member over #1 King transom; significant splitting at south end, sounds drummy out to end of corbel
	RH20	•				Splitting and decay on top surface and sides; PDK and horizontal split outside face at south end.
	RH21	•				Replaced 1968; minor weathering
	RH22		•			Large PDK / EDK at both ends; Large PDK top surface at #2 King transom; significant weathering outside face; horizontal splitting north end
	RH23	•				EDK south end; weathering, splitting and associated decay to top surface; large horizontal split at north end (approx. 600 long, near centre); hollow sound at north end
	RH24	•				General weathering only

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation: Sound / Treatment only	Investigate Further	Replace	Estimated % of Original Capacity	Comments
Corbels						
Pier # 2	LH Corbel	•				
	Centre Corbel	•				
	RH Corbel		•			CDK southern end; large PDK outside face
Pier # 3	LH Corbel	•				Cracking at end and small CDK starting; surface weathering and cracking on outside face
	Centre Corbel		•			EDK southern end; PDK both sides; honeycombing of upstream and downstream sides; evidence of possible insect attack
	RH Corbel	•				Splitting at ends; CDK southern end
#1 King	LH Corbel	•				PDK at sides; surface decay
	RH Corbel			•		PDK inside and outside extending in under beams; EDK - *Replace within 5yrs*
#1 Queen	LH Corbel		•			PDK at sides of corbel extending in under beams
	RH Corbel	•				CDK starting at southern end
Centre	LH Corbel	•				PDK at fixing to transom
	RH Corbel	•				PDK at fixing to transom
#2 Queen	LH Corbel	•				Replaced 1966
	RH Corbel	•				PDK at sides
#2 King	LH Corbel	•				Replaced 1977 (second Hand); large vertical split at northern end - *Replace corroded splitter bolts*
	RH Corbel	•				Splitting at ends; PDK at fixings to transom
Pier #4	LH Corbel	•				CDK southern end; significant splitting and PDK outside face
	RH Corbel	•				Replaced 1944
#1 King	LH Corbel	•				Replaced 1966
	RH Corbel					Replaced 1965
#1 Queen	LH Corbel	•				PDK inside face near centre
	RH Corbel	•				PDK top surface and inside and outside faces
Centre	LH Corbel	•				PDK both sides
	RH Corbel	•				PDK inside vertical face; surface decay and soft on sides
#2 Queen	LH Corbel	•				PDK outside face at base
	RH Corbel	•				PDK outside face; large area of decay on inside top and side.
#2 King	LH Corbel	•				PDK both side above transom; PDK top surface inside face
	RH Corbel	•				Weathering and splitting; PDK both sides above transom

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
Pier #5	LH Corbel	•				Replaced 1960; split at north end near centre; weathering and softening on outside surface; horizontal split inside face
	RH Corbel		•			Replaced 1977 (second hand); weathered
#1 King	LH Corbel	•				PDK outside face overtop of transoms; decay at base of corbel over LH transom extending approx. 150mm over transom (20mm deep); split along inside top edge; large PDK inside face
	RH Corbel		•			Significant weathering and decay inside face; large diagonal crack and associated decay extending from top surface down under beam *- Investigate further when beam is replaced*
#1 Queen	LH Corbel	•				Small EDK north end; PDK both sides overtop of transoms
	RH Corbel	•				Weathering on outside face; PDK inside and outside faces
Centre	LH Corbel	•				PDK inside and outside face; weathering and softening to outside surface
	RH Corbel	•				Typical weathering; PDK outside face; split and PDK linking spike holes on inside face
#2 Queen	LH Corbel	•				Typical weathering and splitting; PDK over LH transom
	RH Corbel	•				Split on inside face; weathered outside face
#2 King	LH Corbel	•				
	RH Corbel	•				Typical weathering and splitting
Pier #6	LH Corbel	•				CDK / EDK at south end; weathered outside face; horizontal split and associated PDK outside face; significant splitting and decay to inside face; splitting at north end
	RH Corbel	•				CDK both ends; significant weathering and splitting both sides
#1 King	LH Corbel		•			Surface decay to top surface extending in under beams (both sides); vertical split through centre at north end; *- Install horizontal split bolt at north end*
	RH Corbel	•				
#1 Queen	LH Corbel		•			Significant amount of decay at top extending in under beam (both sides of corbel)
	RH Corbel	•				Surface decay at top (inside face)
Centre	LH Corbel		•			Decay at top surface extending in under beam (both sides of corbel); extensive PDK both sides
	RH Corbel		•			Decay at top surface extending in under beam (both sides of corbel); *- Likely replace*

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation: Sound / Treatment only	Structural Assessment / Recommendation: Investigate Further	Structural Assessment / Recommendation: Replace	Estimated % of Original Capacity	Comments
#2 Queen	LH Corbel		•			Advanced decay at top on outside *- Likely replace*
	RH Corbel	•				
#2 King	LH Corbel	•				
	RH Corbel	•				Decay to contract surface with transoms on inside face
Pier #7	LH Corbel	•				Decay along bottom edge in contact with packers (inside face)
	RH Corbel	•				Weathered
#1 King	LH Corbel	•				Weathering; isolated PDK
	RH Corbel	•				Weathering; splitting and PDK on outside
#1 Queen	LH Corbel			•		Large CDK at both ends (full depth); large crack and associated decay under beam
	RH Corbel	•				PDK inside face around spikes; splitting and PDK outside face; *- Vegetation in the way on inside at transom*
Centre	LH Corbel	•				Top surface decay on outside; some isolated PDK
	RH Corbel	•				Top surface cracking and associated decay; some isolated PDK
#2 Queen	LH Corbel	•				Top decay on outside extending under beam; some PDK
	RH Corbel	•				Replaced 1960; weathered
#2 King	LH Corbel	•				End splitting and weathering; split bolts both ends
	RH Corbel	•				Large vertical split separating two halves with split bolt at north end; sounds drummy but likely due to split *- Install split bolt at south end*
Pier #8	LH Corbel		•			Manmade vertical cut on south side near outside edge of pier, still approx. 600mm seating for beam; decay
	Centre Corbel	•				Replaced 1967 (second hand); surface decay upstream face
	RH Corbel		•			Isolated PDK inside face; large horizontal split and PDK under beam RH22 *- Investigate PDK under beam (otherwise sound)*
Pier #9	LH Corbel		•			Splitting and EDK both ends; numerous PDK on sides
	Centre Corbel	•				Surface decay and splitting both ends
	RH Corbel		•			CDK / PDK and splitting both ends

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation: Sound / Treatment only	Structural Assessment / Recommendation: Investigate Further	Structural Assessment / Recommendation: Replace	Estimated % of Original Capacity	Comments
Cross Bracing, Solid Blocking and Tie Rods						
Span #1	Solid Blocking			•		4 no. at 1/3 points; various states of decay; blocks falling out - *Replace / reinstate*
	Tie Rods	•				Rods generally ok; some nuts missing - *Replace nuts*
Span #2	Solid Blocking			•		4 no. at 1/3 points; various states of decay; blocks falling out - *Replace / reinstate*
	Tie Rods	•				Rods generally ok; some nuts missing - *Replace nuts*
Span #3	**Cross Bracing**					
Pier #3 to #1K	LH			•	30%	
	RH	•				Sound
#1K to #1Q	LH	•				Sound
	RH	•			50%	
#1Q to Centre	LH	•				Sound
	RH			•	0%	1/2 rod missing from centre to #1Q transom
Centre to #2Q	LH	•			80%	
	RH	•			80%	
#2Q to #2K	LH	•			50%	Sound through centre
	RH			•	30%	Ends sound
#2K to Pier #4	LH			•	20%	Sound through centre
	RH			•	40%	Heavily corroded at pier end; otherwise sound

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
Span #4	**Cross Bracing**					
Pier #4 to #1K	LH			•	40%	
	RH			•	40%	40% at pier end; 70% under LH beam; otherwise sound
#1K to #1Q	LH			•	25%	25% under LH beam; otherwise sound
	RH			•	10%	10% at #1K transom; 50% under RH beam; otherwise sound
#1Q to Centre	LH	•			70%	
	RH	•			70%	
Centre to #2Q	LH	•			50%	
	RH	•			70%	
#2Q to #2K	LH	•			50%	
	RH	•			50%	
#2K to Pier #5	LH	•			60%	
	RH			•	5%	5% and 25% at ends, otherwise sound
Span #5	**Cross Bracing**					
Pier #5 to #1K	LH			•	0%	Almost gone at King Transom; 30% at pier end
	RH	•			70%	
#1K to #1Q	LH			•	0%	Eyes at end sound; rest of rod completely gone
	RH	•			50%	
#1Q to Centre	LH	•			60%	
	RH			•	10%	10% at centre transom end; 50% along rod; sound at #1Q transom
Centre to #2Q	LH	•			60%	Sound at ends
	RH	•			50%	50% at coupler under LH beam; 60% under RH beam; otherwise sound
#2Q to #2K	LH	•			70%	
	RH	•			50%	Railway iron replacement; heavily corroded along full length
#2K to Pier #6	LH			•	20%	20% and 40% at ends; 70% along rod
	RH			•	40%	40% at #2K end; 80% along rod

TOTARA RIVER BRIDGE - ROAD BEAMS, CORBELS and DECK BRACING

Structural Element		Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
Span #6	**Cross Bracing**					
Pier #6 to #1K	LH	•				Sound
	RH			•	0%	Completely gone at #1K end; 80% along rod
#1K to #1Q	LH	•			70%	
	RH			•	20%	20% both ends; 40% along rod
#1Q to Centre	LH	•			60%	60% at coupler under LH beam; 80% under RH beam; otherwise sound
	RH	•			60%	60% under beams; otherwise sound
Centre to #2Q	LH	•			70%	Sound at ends
	RH	•			60%	60% under beams; otherwise sound
#2Q to #2K	LH			•	<10%	<10% at #2K transom; 30% at coupler under LH beam; otherwise sound
	RH			•		Almost completely gone at #2K end; otherwise sound - *Replace from centre to #2K end*
#2K to Pier #7	LH	•			60%	
	RH	•			50%	
Span #7	**Cross Bracing**					
Pier #7 to #1K	LH			•	<10%	<10% at #1K transom; remaining rod >60%
	RH	•			80%	
#1K to #1Q	LH			•	30%	30% and 40% at ends; 60% along rod
	RH			•	30%	30% at #1Q end; remaining rod >80%
#1Q to Centre	LH	•			80%	Railway iron replacement
	RH	•			70%	
Centre to #2Q	LH			•	0%	Rod completely gone at centre transom end; 50% along rod; sound at #2Q end
	RH			•	40%	sound at eyes
#2Q to #2K	LH	•			60%	
	RH			•	30%	30% under RH beam; 50% under LH beam; sound at ends
#2K to Pier #8	LH			•	30%	30% at pier end; 70% under LH beam
	RH	•				Sound
Span #8	Solid Blocking	•				4 no. at 1/3 points; various states of decay; blocks falling out; one block missing - *Replace / reinstate*
	Tie Rods	•				Rods generally ok; some nuts missing - *Replace nuts*
Span #9	Solid Blocking	•				4 no. at 1/3 points; various states of decay; blocks falling out - *Replace / reinstate*
	Tie Rods	•				Rods generally ok; some nuts missing - *Replace nuts*

Appendix F: Inspection Results – Piers (8 pages)

<u>Definition of terminology used</u>

- "PDK" – Pocket Decay
- "EDK" – End Decay
- "CDK" – Centre Decay

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
1	**Piles**					
	Upstream Pile	•				PDK at top where previously drilled; general splitting and weathering
	Centre Pile	•				Surface soft but sound underneath; general weathering
	Downstream Pile	•				Surface splitting; EDK at top where previously drilled; excavation around pile showed pile sound below ground
	Pile Cap	•				CDK both ends; significant weathering and splitting; appears sound over piles
	Abutment Walls - Timber facing			•		Top part collapsing; ends gone; otherwise appears ok; top part needs replacing
	Abutment Walls - Vertical Railway Irons	•			60%	Extensive corrosion
2	**Piles**					
	Upstream Pile	•				Surface splitting and weathering; PDK under pile cap, at top of pile, and several small isolated PDK along pile
	Centre Pile	•				Vertical splitting and weathering; small loss of outer section at ground level; excavation around pile showed pile sound below ground
	Downstream Pile	•				Large vertical splits in top 1/3 pile; hollow sound at top likely due to splitting; large PDK at top; excavation around pile showed pile sound below ground
	Upstream Cut Water Pile	•				EDK and splitting at top
	Downstream Cut Water Pile	•				Large CDK / EDK at top
	Raker Studs					
	Upstream Raker Stud	•				Significant weathering; top surface has honeycomb effect and worm holes
	Downstream Raker Stud		•			Surface decay and weathering to downstream face; PDK / EDK at base
	Diagonal Bracing					
	Cross bracing	•			70%	Steel railway iron; varying amounts of corrosion
	Whaling's					
	Whaling's	•			50%	Steel railway irons; heavily corroded
	Pile Cap	•				Replaced 1975

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
3	**Piles**					
	Pile #1	•				Vertical splitting above whalers
	Pile #2	•				Vertical splitting above whalers
	Pile #3	•				Deep splits / pockets on north face from spikes
	Pile #4	•				Vertical splitting above whalers
	Pile #5	•				Replaced 1961
	Pile #6	•				Splitting; weathering; block bolted to outside face at top to support pile cap
	Pile #7		•			Large CDK just above whaler; sound at ground and cap *- Consider splicing in section of pile or redundant*
	Pile #8		•			Large CDK just above whaler; sound at ground and cap *- Consider splicing in section of pile or redundant*
	Upstream cut-water pile		•			Has sunk approx 600mm; significant splitting and decay at top
	Downstream cut-water pile	•				Splitting and small EDK at top
	Raker Studs					
	Upstream Raker Stud			•		Has come free of fixing at top due to sinking cut-water pile; large split and EDK at top; large split upstream face; weathered
	Downstream Raker Stud			•		Splitting, surface weathering and significant decay downstream face; large CDK / EDK at base *- Probable replacement*
	Diagonal Bracing					
	Cross Bracing	•			70%	Railway iron cross bracing; varying amounts of corrosion
	Whaling's					
	Whaling's	•				All present; individual assessment of each whaler not carried out
	Pile Caps					
	Pile Cap #1	•				Replaced 1975; EDK downstream end
	Pile Cap #2	•				Splitting and associated CDK downstream end; EDK and splitting upstream end
	Pile Cap #3	•				Splitting and EDK starting downstream end; EDK upstream end
	Pile Cap #4			•		Large end section gone downstream end; large PDK along length and extensive decay upstream end *- Replace or consider redundant*
	Corbels					
	LH Truss Corbel - Inside	•				Replaced 1975 second hand; vertical split north end
	- Outside	•				PDK outside face; weathered
	RH Truss Corbel - Inside	•				Replaced 1975 second hand; minor end splitting
	- Outside	•				EDK and splitting both ends
	Packers Between Pile Cap and Beam Corbel					
	Perpendicular to corbel	•				4 no. total; weathered
	Parallel to corbel	•	•			Weathered but generally sound except for packer under LH corbel which has significant decay *- Consider packing or replacement*

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
4	**Piles**					
	Pile #1		•			Extensive CDK at top; vertical splitting above whalers at spike locations
	Pile #2		•			Major splitting and decay on outside face and other areas; sound at base and top
	Pile #3	•				Vertical splitting above whalers
	Pile #4	•				Advanced EDK at top; vertical splitting above whalers
	Pile #5		•			Splitting and associated decay on outside face due to spikes; sounds drummy above whaler; possible CDK
	Pile #6		•			Splitting and associated decay on outside face going into centre due to spikes; possible CDK
	Pile #7		•			Splitting and associated decay outside face but appears sounds; sounds drummy at top *- Investigate top further*
	Pile #8	•				EDK at top; splitting and associated decay due to spike holes
	Upstream cut-water pile		•			Significant CDK / EDK
	Downstream cut-water pile	•				
	Raker Studs					
	Upstream Raker Stud		•			Packer missing at top; significant splitting and decay on north face; large split and CDK at base *- Possible replacement*
	Downstream Raker Stud	•				Weathering and splitting on sides and downstream face
	Diagonal Bracing					
	Cross bracing	•			50%	Heavily corroded railway irons
	Whaling's					
	Whaling's	•				All present; individual assessment of each whaler not carried out
	Pile Caps					
	Pile Cap #1	•				Small EDK downstream end
	Pile Cap #2	•				Small EDK downstream end
	Pile Cap #3	•				Replaced 1960
	Pile Cap #4	•				Replaced 1967 second hand
	Corbels					
	LH Truss Corbel - Inside	•				
	- Outside	•				
	RH Truss Corbel - Inside	•				Splitting at south end
	- Outside	•				EDK both ends
	Packers Between Pile Cap and Beam Corbel					
	LH Beam	•				
	RH Beam	•				

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
5	**Piles**					
	Pile #1		•			EDK at top; typical splitting and decay on outside face *- worst pile of group therefore recommend investigating*
	Pile #2	•				Typical splitting and decay on outside face
	Pile #3	•				Typical splitting and decay on outside face
	Pile #4		•			Large split and associated decay on outside face due to spike holes; CDK; excavation around pile showed pile sound below ground *- Investigate or may be redundant*
	Pile #5		•			EDK at top; deep splitting and associated decay all around pile; numerous drill holes from previous investigations
	Pile #6	•				Minor splitting and associated decay
	Pile #7	•				Typical splitting and decay on outside face; excavation around pile showed pile sound below ground
	Pile #8	•				EDK at top; evidence of insect attack; significant splitting and associated decay
	Upstream cut-water pile	•				Splitting and EDK at top
	Downstream cut-water pile	•				Significant EDK at top, full of soil
	Raker Studs					
	Upstream Raker Stud	•				Splitting and EDK at top
	Downstream Raker Stud		•			Significant weathering / splitting and associated decay; EDK at base; possible CDK at connection to cut-water pile
	Diagonal Bracing					
	Brace #1	•			50%	Heavily corroded railway irons
	Brace #2	•			50%	Heavily corroded railway irons
	Whaling's					
	Whaling's	•				Whalers all there; soil + vegetation on top of whalers; individual assessment of each whaler not carried out
	Pile Caps					
	Pile Cap #1	•				Replaced 1977; minor splitting downstream end only
	Pile Cap #2	•				
	Pile Cap #3	•				Replaced 1977; minor splitting downstream end only
	Pile Cap #4	•				EDK downstream end
	Corbels					
	LH Truss Corbel - Inside	•				
	- Outside	•				
	RH Truss Corbel - Inside	•				
	- Outside	•				Small EDK and splitting south end
	Packers Between Pile Cap and Beam Corbel					
	LH Beam	•				Typical sound; packer directly under and parallel to corbel is sound but packer on outside is not
	RH Beam	•				Small amount of decay on downstream packer // to corbel - not supporting corbel; otherwise typically sound

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
6	**Piles**					
	Pile #1	•				Vertical split at top; timber on outside covering spike lines; isolated honeycombing
	Pile #2	•				EDK at top; typical splitting outside face; multiple drill holes; small amount of decay at each seating; excavation around pile showed pile sound below ground
	Pile #3	•				Decay below whaler at seating on inside of pile
	Pile #4	•				Typical splitting outside face
	Pile #5	•				Significant EDK at top; vertical splitting on outside face; minor splitting elsewhere
	Pile #6	•				Minor honeycombing through midsection; minor splitting
	Pile #7	•				Minor splitting and decay; excavation around pile showed pile sound below ground
	Pile #8	•				Minor splitting on outside face; excavation around pile showed pile sound below ground
	Upstream cut-water pile					
	Downstream cut-water pile	•				EDK at top; appears sound at attachment to raking stud
	Raker Studs					
	Upstream Raker Stud	•				Minor splitting along lines of spikes Fenders in good condition, SH61 (inside), SH77 (outside / upstream)
	Downstream Raker Stud			•	30%	Significant CDK; decay on downstream face to 1/2 depth *- Replace or consider redundant*
	Diagonal Bracing					
	Cross bracing	•			50%	Steel railway irons; varying amounts of corrosion
	Whaling's					
	Whaling's	•				All present; vegetation on top; generally appear sound
	Pile Caps					
	Pile Cap #1	•				Replaced 1944
	Pile Cap #2	•				Replaced 1977
	Pile Cap #3	•				Replaced 1977
	Pile Cap #4	•				
	Corbels					
	LH Truss Corbel - Inside	•				EDK both ends
	- Outside	•				Replaced 1967
	RH Truss Corbel - Inside		•			Vertical split north end; large CDK south end
	- Outside	•				Replaced 1960; vertical split north end
	Packers Between Pile Cap and Beam Corbel					
	LH Beam	•				Typically 2 no. parallel to corbel and 4 no. perpendicular; packer #1 perpendicular to corbel dozy; others typically sound
	RH Beam	•				

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
7	**Piles**					
	Pile #1	•				Isolated weathering and honeycombing; timber covering spike holes
	Pile #2	•				Typical splitting on outside face from spikes up to 100mm deep; surface decay and weathering; packer missing at top to cap - *Reinstate packer at top to pile cap*
	Pile #3	•				Typical splitting on outside face from spikes; lower 2/3 of pile has advanced surface decay and splitting; advanced decay at top below cap - *Further assess decay at top when treating*
	Pile #4	•				Minor splitting at top; typical splitting and decay
	Pile #5	•			70%	Split running approx. 1m down pile from backside of seating at top; typical splitting due to spikes - *Replace split bolt at top*
	Pile #6	•				Vertical split extending down from cap seat; split bolt corroded; typical vertical splitting on outside face extending into core - *Replace split bolt at top*
	Pile #7	•				Large split and EDK at top; outside face covered in timber; large vertical split extends down approx. 600mm from cap seating; split bolt corroded - *Replace split bolt at top*
	Pile #8	•				Large split and EDK at top; vertical split and Pad behind brace connection at top; typical splitting on outside face
	Upstream cut-water pile	•				
	Downstream cut-water pile	•				Minor splitting and weathering; some EDK
	Raker Studs					
	Upstream Raker Stud	•				EDK / CDK at base; weathering and splitting on sides and upstream face
	Downstream Raker Stud	•				Splitting in side due to spikes; weathering, splitting and decay on downstream face; packer at top about to fall out
	Diagonal Bracing					
	Cross bracing	•			50%	Timber; PDK behind pile connections
	Whaling's					
	Whaling's	•				All present; sound condition
	Pile Caps					
	Pile Cap #1	•				
	Pile Cap #2	•				Replaced 1933 second hand
	Pile Cap #3	•				Replaced 1975
	Pile Cap #4	•				Replaced 1975
	Corbels					
	LH Truss Corbel - Inside	•				Replaced 1967 second hand; minor end splitting
	- Outside	•				Replaced 1967 second hand; minor end splitting
	RH Truss Corbel - Inside	•				
	- Outside	•				Vertical split at south end
	Packers Between Pile Cap and Beam Corbel					
	LH Beam	•				General weathering only
	RH Beam	•				

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated % of Original Capacity	Comments
		Sound / Treatment only	Investigate Further	Replace		
8	**Piles**					
	Pile #1	•			70%	Typical vertical splitting on outside face
	Pile #2	•			70%	Typical vertical splitting on outside face
	Pile #3	•			70%	Typical vertical splitting on outside face; significant split on downstream face starting above whaler
	Pile #4	•			50%	Top filled with pitch; vertical splitting on outside face through mid section through to CDK - *Estimate only 50% of pile contributing due to splitting*
	Pile #5	•			70%	EDK at top; splitting through mid section due to spikes; vertical splitting on backside approx. 30mm deep
	Pile #6	•			70%	Full length splits on backside approx. 70mm deep; large vertical splits on outside extending into pile centre; excavation around pile showed pile sound below ground
	Pile #7	•			70%	Minor splitting only
	Pile #8	•			50%	Top filled with pitch; vertical splitting on outside face through mid section through to CDK - *Estimate only 50% of pile contributing due to splitting*
	Upstream cut-water pile			•		Splitting and hollow at top; heavily decayed - *Replace or consider redundant*
	Downstream cut-water pile			•		Splitting and hollow at top; heavily decayed - *Replace or consider redundant*
	Raker Studs					
	Upstream Raker Stud	•				Splitting along lines of spikes; decayed over lower section where previously buried in vegetation
	Downstream Raker Stud	•				Splitting along lines of spikes; decayed over lower section where previously buried in vegetation
	Diagonal Bracing					
	Cross bracing	•			70%	Varying amounts of corrosion; railway iron braces
	Whaling's					
	Whaling's		•			Buried in soil - not assessed, may be redundant
	Pile Caps					
	Pile Cap #1			•		Advanced EDK upstream end; extensive PDK and splitting back to RH truss corbel at downstream end
	Pile Cap #2	•				Splitting at upstream end; general weathering and splitting and EDK at downstream end
	Pile Cap #3	•				Splitting at upstream end; general weathering and splitting and EDK at downstream end
	Pile Cap #4	•				Replaced 1978; EDK downstream end
	Corbels					
	LH Truss Corbel - Inside	•				Vertical splits at both ends
	- Outside	•				Replaced 1967 second hand
	RH Truss Corbel - Inside		•			Large CDK / EDK north end; significant decay all way along - *Investigate further, likely replace*
	- Outside	•				Replaced 1967 second hand
	Packers Between Pile Cap and Beam Corbel					
	Perpendicular to corbel	•				#1 packer rotten at downstream end in under corbel - *Rotten packer likely redundant*
	Parallel to corbel	•				Sound under beams; downstream packer completely rotten - *Rotten packer likely redundant*

TOTARA RIVER BRIDGE - PIERS

Pier Number	Structural Element	Structural Assessment / Recommendation			Estimated	Comments
		Sound / Treatment only	Investigate Further	Replace	% of Original Capacity	
9	**Piles**					
	Upstream Pile	•				Splitting and EDK at top; vertical splitting and associated decay further down; sounds drummy
	Centre Pile	•				Significant splitting full length; sounds drummy but likely due to splitting; small EDK at top; excavation around pile showed pile sound below ground
	Downstream Pile	•				Minor splitting and decay; small EDK at top
	Upstream Cut Water Pile					
	Downstream Cut Water Pile	•				Large CDK / EDK at top; significant weathering, splitting and decay; appears reasonably sound at connection to raking stud
	Raker Studs					
	Upstream Raker Stud			•		Splitting and decay at top; highly decayed at base
	Downstream Raker Stud	•				Large vertical split and decay at top; significant weathering and decay on sides and downstream face
	Diagonal Bracing					
	Cross bracing	•			80%	Light to moderate corrosion; railway iron braces
	Whaling's					
	Whaling's			•		Timber splitting and decayed through centre; south side buried under soil; effectively not doing anything - *Replace or may be redundant as pier is on river bank not subject to any water flow*
	Pile Cap			•		Heavily decayed
10	**Piles**					
	Upstream Pile	•				Spliced at ground level 1966; splice split at top; top of splice section sounds hollow; EDK at top of original pile; original pile - pile surface soft and wet below ground level, otherwise sound
	Centre Pile	•				Replaced 1966; some splitting
	Downstream Pile	•				Splitting down to ground level; excavation around pile showed pile sound below ground
	Pile Cap	•				Replaced 1944; splitting and EDK both ends; typical weathering
	Abutment Walls - Timber facing			•		Various states of decay; collapsing at upstream end
	Abutment Walls - Vertical Railway Irons	•		•		4 no. railway irons; various states of decay / corrosion

Span 3 - LH

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Side	Structural Element	PIPE	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
LH	**Timber Struts**									
	#1-King Strut (Dia 330x300x5.3m)	X		X		X		X		Bottom -100x90 Middle- Sound Top-120x70.
	#1-Queen Strut (Dia 250x300x5.3)	X	X	X		X		X		50x70 Pipe - 90x120 PDK-Sound.
	#1 Counter Strut					X				Sound
	#1- Centre Strut-Inside					X				Sound
	Outside	X								Bottom 40x70 Remainder sound
	#2- Centre Strut- Inside	X				X				Bottom 35x70 remainder sound
	Outside									Sound
	#2-Counter Strut					X		X		Sound
	#2-Queen Strut	X		X	X			X		40x30 HDK-110x150 Pipe &WS-135x80 Pipe&WS
	#2-King Strut					X				
	Vertical Steel Tension Rods									
	#1-King Rods -Inside									
	Outside									
	#1-Queen Rods -Inside									
	Outside									
	#1-Centre Rods- Inside									
	Outside									
	#2-Queen Rods -Inside									
	Outside							X		
	#2- King Rods -Inside									
	Outside									
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#1 Queen Timber Thrust Block	X						X		100x55 pipe
	Centre Timber Thrust Blocks									
	#2 Queen Timber Thrust Blocks									
	#2 King Timber Thrust Blocks									
	Timber A-Blocks									
	#1-Queen A-Blocks									
	Centre A-Block									
	#2-Queen A-Blocks									
	Timber Saddle Blocks									
	#1 King saddle Block							X		AS Per WSP Report
	#1 Queen saddle block	X							X	30x90 pipe has open pipe both ends Grout Repair
	Centre Saddle Block	X				X		X		45x130 Pipe Has major spilting bothends
	#2- Queen Saddle Block	X						X		90x135 Pipe
	Top Chord									
	#1-King-#1Queen -Inside							X		As per WSP report
	Middle									Sound
	Outside									Sound
	#1 Queen- Centre Inside									
	Middle									
	Outside									
	Centre- #2 Queen Inside									
	Middle									
	Outside									
	#2 Queen # 2 King Inside									Sound
	Middle							X		Minor Pipe- 40x90 Pipe-60x120 Pipe
	Outside							X		
	Steel Plate Connections									
	#1-King Strut to Top Cord							X	X	Bolt replacement/Plate Replacement
	#2-King Strut to Top Cord							X	X	
	Timber Braces									
	#1-King Timber Brace									
	#1-Queen Timber Brace									
	Centre Timber Brace							X		
	#2-Queen Timber Brace									
	#2-King Timber Brace									

Span 3 - RH

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
RH	**Timber Struts**									
	#1-King Strut (Dia 330x300x5.3m)	X		X		X		X		Bottom -Sound Middle- Sound Top-85x135 Pipe
	#1-Queen Strut (Dia 250x300x5.3)									
	#1 Counter Strut									
	#1- Centre Strut-Inside					X				Sound
	Outside									Bottom 40x70 Remainder sound
	#2- Centre Strut- Inside							X		Sound
	Outside									
	#2-Counter Strut					X				Sound
	#2-Queen Strut									Sound
	#2-King Strut					X				Sound
	Vertical Steel Tension Rods									
	#1-King Rods -Inside									
	Outside									
	#1-Queen Rods -Inside									
	Outside									
	#1-Centre Rods- Inside									
	Outside									
	#2-Queen Rods -Inside									
	Outside									
	# 2 King Rods -Inside						X	X		
	-Outside						X	X		
	Timber Thrust Blocks									
	#1 King Timber Thrust Block							X		
	#2 Queen Timber Thrust block									
	Centre Timber Thrust Blocks									
	#2 Queen Timber Thrust Blocks									
	#2 King Timber Thrust Blocks							X		
	Timber Saddle Blocks									
	#1 King saddle Block							X		
	#2 Queen saddle block									
	Centre Saddle Block									
	#2 Queen Saddle Block									
	#2 King saddle block	X						X		
	Top Chord									
	#1-King-#1Queen -Inside									
	Middle									
	Outside									
	#1 Queen-Centre - Inside									
	Middle									
	Outside									
	Centre-#2 Queen- Inside									
	Middle									
	Outside									
	#2 Queen-#2 King - Inside							X		Replace High amount of Surface Decay
	Middle							X		Replace High amount of Surface Decay
	Outside							X		Replace High amount of Surface Decay
	Steel Connection Plate									
	#1-King Strut to Top Cord								X	Bolt Replacement
	#2-King Strut to Top Cord								X	Bolt Replacement
	Timber Braces									
	#1-King Timber Brace									
	#1-Queen Timber Brace									
	Centre Timber Brace									
	#2-Queen Timber Brace									
	#2-King Timber Brace									

Span 4 - LH

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
LH	**Timber Struts**									
	#1-King Strut (Dia 330x300x5.3m)							X		Need to re visit
	#1-Queen Strut (Dia 250x300x5.3)							X		Need to re visit
	#1 Counter Strut									
	#1- Centre Strut-Inside									
	Outside									
	#2- Centre Strut- Inside									
	Outside									
	#2-Counter Strut									
	#2-Queen Strut	X						X		95x60-120x70-Top Sound
	#2-King Strut									
	Vertical Steel Tension Rods									
	# 1 King Rods -Inside									
	-Outside							X		
	#1 Queen Rods -Inside							X		
	-Outside									
	#1-Centre Rods -Inside									
	-Outside							X		
	#2 Queen Rods-Inside									
	Outside									
	#2 King Rods -Inside							X		
	Outside							X		
	Timber A-Blocks									
	#1- Queen A-Blocks									Open Pipe at End-Grout Repair
	Centre Saddle Block									
	#2-Queen A- Block								X	Grout Repair Hole in middle of block Bores minor Decay
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#2 Queen Timber Thrust block									
	Centre Timber Thrust Blocks									
	#2 Queen Timber Thrust Blocks									
	#2 King Timber Thrust Blocks									
	Timber Saddle Blocks									
	#1 King saddle Block									
	#1-Queen saddle block									
	Center Saddle Block									
	#2- Queen Saddle Block									
	#2-King Saddle Block									
	Top Chord									
	#1-King-#1Queen - Inside									
	Middle									
	Outside									
	#1-Queen -Centre Inside									
	Middle									
	Outside	X						X		70x90-60x120-Sound
	#2 Queen-#2 King - Inside									
	Middle									
	Outside	X						X		Sound-60x100-75x125
	Steel Connection Plate									
	#1-King Strut To Top Chord								X	Replace bolts
	#2 King Strut To Top Chord								X	Replace bolts
	Timber Braces									
	#1-King Timber Brace									
	#1-Queen Timber Brace									
	Centre Timber Brace									
	#2-Queen Timber Brace									
	#2-King Timber Brace	X						X		Sound-80x135.Bad surface Decay

Span 4 - RH

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
RH	**Timber Struts**									
	#1-King Strut (Dia 330x300x5.3m)									
	#1-Queen Strut (Dia 250x300x5.3)									
	#1 Counter Strut									Sound
	#1- Centre Strut-Inside									Sound
	Outside	X						X		70x80-Sound
	#2- Centre Strut- Inside									Sound
	Outside	X						X		70x80- large full length spilt and surface decay
	#2-Counter Strut									
	#2-Queen Strut	X			X			X		50x40-60x120-65x75 Pipe/WS
	#2-King Strut									
	Vertical Steel Tension Rods									
	# 1 King Rods -Inside									
	-Outside							X		
	#1 Queen Rods -Inside							X		
	-Outside							X		
	#1-Centre Rods -Inside									
	-Outside									
	#2 Queen Rods-Inside									
	Outside									
	#2 King Rods -Inside									
	Outside									
	Timber A-Blocks									
	#1- Queen A-Blocks									
	Centre A-Blocks									
	#2-Queen A-Blocks									
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#1-Queen Timber Thrust Block									
	Centre Timber thrust Block									
	#2- Queen Timber Thrust Block									
	#2-King Timber Thrust Block									
	Timber Saddle Blocks									
	#1 King saddle Block									
	#2 Queen saddle block									
	Centre Saddle Block									
	#2 Queen saddle Block	X						X		80x100
	#2 King saddle Block	X							X	50x40 Grout Repair open pipe ends
	Top Chord									
	#1-King-#1Queen - Inside	X						X		45x50-50-40-Sound. High amount of decay inside face
	Middle									Sound
	Outside	x								60x40-Sound
	#1-Queen-Centre- Inside									
	Middle									Sound
	Outside									
	Centre-#2Queen - Inside									
	Middle									
	Outside									
	#2 Queen-#2 King -Inside									Minor decay otherwise sound
	Middle									
	Outside									
	Steel Connection Plate									
	#1 King Strut To Top Cord									
	#2 King Strut To Top Cord									
	Timber Braces									
	#1-King Timber Brace									
	#1 Queen Timber Brace									
	Centre Timber Brace									
	#2 Queen Timber Brace							X		
	#2 King Timber Brace							X		

Span 5 - LH

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
LH	**Timber Struts**									
	#1-King Strut (Dia 330x300x5.3m)	X							X	40x25-30x80. Big split through top. Split clamp or split bolt repair
	#1-Queen Strut (Dia 250x300x5.3)							X		
	#1 Counter Strut							X		Bores sound. Split at bottom. Split clamp or split bolt repair
	#1- Centre Strut-Inside									
	Outside							X		Sound
	#2- Centre Strut- Inside							X		
	Outside							X		
	#2-Counter Strut									Sound
	#2-Queen Strut									
	#2-King Strut									
	Vertical Steel Tension Rods									
	# 1 King Rods -Inside									
	-Outside									
	#1 Queen Rods -Inside									
	-Outside							X		
	#1-Centre Rods -Inside									
	-Outside									
	#2 Queen Rods-Inside							X		
	Outside									
	#2 King Rods -Inside									
	Outside									
	Timber A-Blocks									
	#1- Queen A-Blocks									
	Centre A-Blocks									
	#2-Queen A-Blocks									
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#1-Queen Timber Thrust Block									
	Centre Timber thrust Block	X						X		100x130
	#2- Queen Timber Thrust Block									
	#2-King Timber Thrust Block									Sound
	Timber Saddle Blocks									
	#1 King saddle Block									
	#2 Queen saddle block									
	Centre Saddle Block									
	#2 Queen saddle Block							X		
	#2 King saddle Block							X		
	Top Chord									
	#1-King-#1Queen -Inside									
	Middle									
	Outside									
	#1 King- #1 Queen Inside									
	Middle									
	Outside									
	#1-Queen To Centre Inside									
	Middle							X		End Sound however centre has major decay unable to drill
	Outside									Sound
	Centre-#2 Queen Inside									
	Middle									
	Outside	X								
	#2 Queen-#2 King - Inside			X				X		Sound-Soft to drill through out
	Middle									Sound-Sound-60x65
	Outside									Sound
	Steel Connection Plate									
	#1 King Strut To Top Cord							X		
	#2 King Strut To Top Cord							X		
	Timber Braces									
	#1-King Timber Brace									
	#1 Queen Timber Brace									
	Centre Timber Brace							X		
	#2 Queen Timber Brace									Has been replace
	#2 King Timber Brace							X		Major decay to soft to drill

Span 5 - RH

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
RH	**Timber Struts**									
	#1-King Strut (Dia 330x300x5.3m)	X		X				X	X	Minor decay and Pipe through out 150mm deep split Weathered at top grout repair top
	#1-Queen Strut (Dia 250x300x5.3)									
	#1 Counter Strut									
	#1- Centre Strut-Inside									
	Outside									
	#2- Centre Strut- Inside									
	Outside									
	#2-Counter Strut									
	#2-Queen Strut									Sound
	#2-King Strut									
	Vertical Steel Tension Rods									
	# 1 King Rods -Inside									
	-Outside									
	#1 Queen Rods -Inside									
	-Outside							X		
	#1-Centre Rods -Inside									
	-Outside							X		
	#2 Queen Rods- Inside							X		
	Outside							X		
	#2 King Rods -Inside							X		
	Outside							X		
	Timber A-Blocks									
	#1- Queen A-Blocks									
	Centre A-Blocks									
	#2-Queen A-Blocks									
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#1-Queen Timber Thrust Block									
	Centre Timber Thrust Block									
	#2- Queen Timber Thrust Block									
	#2-King Timber Thrust Block									
	Timber Saddle Blocks									
	#1 King saddle Block	X							X	
	#2 Queen saddle block									
	Centre Saddle Block									
	#2 Queen saddle Block									
	#2 King saddle Block	X							X	60x90. Open Pipe at ends grout repair
	Top Chord									
	#1-King-#1Queen - Inside									
	Middle									
	Outside									Sound
	#1-Queen-Centre -Inside									
	Middle									
	Outside									Sound
	Centre-#2 Queen - Inside									
	Middle									
	Outside									
	#2 Queen-#2 King - Inside									
	Middle									
	Outside									
	Steel Connection Plate									
	#1 King Strut To Top Cord							X		
	#2 King Strut To Top Cord							X		
	Timber Braces									
	#1-King Timber Brace									
	#1 Queen Timber Brace									
	Centre Timber Brace									
	#2 Queen Timber Brace									
	#2 King Timber Brace									

Span 6 - LH

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
LH	**Timber Struts**									
	#1-King Strut (Dia 330x300x5.3m)									
	#1-Queen Strut (Dia 250x300x5.3)	X				X		X		170x 120 Through split-60x60-Sound. Major surface decay top face
	#1 Counter Strut									
	#1- Centre Strut-Inside									
	Outside									Sound
	#2- Centre Strut- Inside									Sound
	Outside									
	#2-Counter Strut									
	#2-Queen Strut									
	#2-King Strut						x	X	X	Top of strut has top face decay grout repair
	Vertical Steel Tension Rods									
	# 1 King Rods -Inside							X		
	-Outside									
	#1 Queen Rods -Inside							X		
	-Outside							X		
	#1-Centre Rods -Inside									
	-Outside									
	#2 Queen Rods- Inside							X		
	Outside							X		
	#2 King Rods -Inside									
	Outside									
	Timber A-Blocks									
	#1- Queen A-Blocks									
	Centre A-Blocks									
	#2-Queen A-Blocks									
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#1-Queen Timber Thrust Block					X		X		Major splits and decay
	Centre Timber Thrust Block									
	#2- Queen Timber Thrust Block									
	#2-King Timber Thrust Block							X		Sound
	Timber Saddle Blocks									
	#1 King saddle Block	X								90x65
	#2 Queen saddle block									Sound
	Centre Saddle Block	X			X			X		120 x110
	#2 Queen saddle Block									
	#2 King saddle Block	X						X		115x90
	Top Chord									
	#1-King-#1Queen - Inside									
	Middle									
	Outside									
	#1-Queen-Centre -Inside									
	Middle									
	Outside	X								60x70
	Centre-#2 Queen - Inside									
	Middle									
	Outside							X		
	#2 Queen-#2 King -Inside									
	Middle									
	Outside									
	Steel Connection Plate									
	#1 King Strut To Top Cord							X		
	#2 King Strut To Top Cord								X	Replace Bolts
	Timber Braces									
	#1-King Timber Brace									
	#1 Queen Timber Brace									
	Centre Timber Brace							X		As per WSP Report
	#2 Queen Timber Brace									
	#2 King Timber Brace									

Span 6 - RH

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
RH	**Timber Struts**									
	#1-King Strut (Dia 330x300x5.3m)									
	#1-Queen Strut (Dia 250x300x5.3)									Sound
	#1 Counter Strut									
	#1- Centre Strut-Inside									
	Outside									
	#2- Centre Strut- Inside									
	Outside									
	#2-Counter Strut									
	#2-Queen Strut									
	#2-King Strut									
	Vertical Steel Tension Rods									
	# 1 King Rods -Inside							X		
	-Outside									
	#1 Queen Rods -Inside							X		
	-Outside							X		
	#1-Centre Rods -Inside							X		
	-Outside									
	#2 Queen Rods- Inside									
	Outside									
	#2 King Rods -Inside									
	Outside							X		
	Timber A-Blocks									
	#1- Queen A-Blocks									
	Centre A-Blocks									
	#2-Queen A-Blocks									
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#1-Queen Timber Thrust Block									
	Centre Timber Thrust Block									
	#2- Queen Timber Thrust Block									
	#2-King Timber Thrust Block									
	Timber Saddle Blocks									
	#1 King saddle Block									
	#2 Queen saddle block									
	Centre Saddle Block							X		As Per WSP Report
	#2 Queen saddle Block									
	#2 King saddle Block									
	Top Chord									
	#1-King-#1Queen - Inside									
	Middle									
	Outside									
	#1-Queen-Centre -Inside							X		Not bore. However signs of failure
	Middle									
	Outside									
	Centre-#2 Queen - Inside									
	Middle									
	Outside									
	#2 Queen-#2 King -Inside									
	Middle									
	Outside									
	Steel Connection Plate									
	#1 King Strut To Top Cord									
	#2 King Strut To Top Cord							X		
	Timber Braces									
	#1-King Timber Brace									
	#1 Queen Timber Brace									
	Centre Timber Brace							X		As per WSP Report
	#2 Queen Timber Brace							X		As per WSP Report
	#2 King Timber Brace									

Span 7 - LH

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
LH	**Timber Struts**									
	#1-King Strut (Dia 330x300x5.3m)									
	#1-Queen Strut (Dia 250x300x5.3)									
	#1 Counter Strut									
	#1- Centre Strut-Inside							X		AS Per WSP report
	Outside							X		
	#2- Centre Strut- Inside									
	Outside									
	#2-Counter Strut									
	#2-Queen Strut									
	#2-King Strut									
	Vertical Steel Tension Rods									
	# 1 King Rods -Inside									
	-Outside							X		
	#1 Queen Rods -Inside									
	-Outside									
	#1-Centre Rods -Inside									
	-Outside							X		
	#2 Queen Rods- Inside									
	Outside									
	#2 King Rods -Inside									
	Outside									
	Timber A-Blocks									
	#1- Queen A-Blocks									
	Centre A-Blocks									
	#2-Queen A-Blocks									
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#1-Queen Timber Thrust Block									
	Centre Timber Thrust Block									
	#2- Queen Timber Thrust Block									
	#2-King Timber Thrust Block									
	Timber Saddle Blocks									
	#1 King saddle Block							X		Sound
	#2 Queen saddle block							X		Sound
	Centre Saddle Block							X		As Per WSP
	#2 Queen saddle Block									
	#2 King saddle Block							X		As Per WSP
	Top Chord									
	#1-King-#1Queen - Inside									
	Middle									
	Outside									
	#1-Queen-Centre -Inside									
	Middle									
	Outside									
	Centre-#2 Queen - Inside									
	Middle									
	Outside									
	#2 Queen-#2 King - Inside									
	Middle									
	Outside									
	Steel Connection Plate									
	#1 King Strut To Top Cord							X		
	#2 King Strut To Top Cord							X		
	Timber Braces									
	#1-King Timber Brace							X		As Per WSP report
	#1 Queen Timber Brace									
	Centre Timber Brace							X		AS Per WSP Report
	#2 Queen Timber Brace							X		AS Per WSP Report
	#2 King Timber Brace							X		AS Per WSP Report

Span 7 - RH

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
RH	**Timber Struts**									
	#1-King Strut (Dia 330x300x5.3m)									
	#1-Queen Strut (Dia 250x300x5.3)									
	#1 Counter Strut									
	#1- Centre Strut- Inside									
	Outside									
	#2- Centre Strut- Inside									
	Outside									
	#2-Counter Strut							X		As per WSP report
	#2-Queen Strut									
	#2-King Strut									
	Vertical Steel Tension Rods									
	# 1 King Rods - Inside									
	- Outside									
	#1 Queen Rods -Inside							X		
	-Outside							X		
	#1-Centre Rods -Inside									
	-Outside									
	#2 Queen Rods- Inside							X		
	Outside							X		
	#2 King Rods - Inside									
	Outside									
	Timber A-Blocks									
	#1- Queen A-Blocks							X		As per WSP report
	Centre A-Blocks									
	#2-Queen A-Blocks									
	Timber Thrust Blocks									
	#1 King Timber Thrust Block									
	#1-Queen Timber Thrust Block									
	Centre Timber Thrust Block									
	#2- Queen Timber Thrust Block									
	#2-King Timber Thrust Block									
	Timber Saddle Blocks									
	#1 King saddle Block							X		
	#2 Queen saddle block							X		
	Centre Saddle Block									
	#2 Queen saddle Block									
	#2 King saddle Block									
	Top Chord									
	#1-King-#1Queen - Inside							X		
	Middle									
	Outside							X		
	#1-Queen-Centre -Inside									
	Middle									
	Outside							X		
	Centre-#2 Queen -Inside									
	Middle									
	Outside									
	#2 Queen-#2 King - Inside									
	Middle									
	Outside									
	Steel Connection Plate									
	#1 King Strut To Top Cord							X		
	#2 King Strut To Top Cord								X	Bolts gone
	Timber Braces									
	#1-King Timber Brace							X		
	#1 Queen Timber Brace									
	Centre Timber Brace									
	#2 Queen Timber Brace									
	#2 King Timber Brace									

Transoms

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Span	Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
3											All from upstream to downstream
	LH	#1-King Transom									
	RH	#1-King Transom									
	LH	#1 Queen Transom									
	RH	#1-Queen Transm							X		
	LH	Centre Transom									
	RH	Centre Transom									
	LH	#2 Queen Transom									
	RH	#2 Queen Transom									
	LH	#2 King Transom									
	RH	#2-King Transom									
4	LH	#1-King Transom	X							X	Sound from upstream to downstream end 85x85 Open pipe grout Repair
	RH	#1-King Transom	X							X	Sound from upstream to downstream end 130x200 Open pipe grout Repair bothends
	LH	#1 Queen Transom	X							X	100x80 Pipe Upstream end remainder sound
	RH	#1-Queen Transm									
	LH	Centre Transom									Sound
	RH	Centre Transom									
	LH	#2 Queen Transom	X							X	Upstream 150x140. Remainder sound. Grout repair
	RH	#2 Queen Transom	X							X	Sound -120x150-80x125-Sound-Repair steel PFC bothsides
	LH	#2 King Transom									
	RH	#2 King Transom									
5	LH	#1-King Transom									
	RH	#1-King Transom									
	LH	#1 Queen Transom									
	RH	#1 Queen Transom									
	LH	Centre Transom									
	RH	Centre Transom									
	LH	#2 Queen Transom									
	RH	#2 Queen Transom					X		X		Sound. Split Downstream side
	LH	#2 King Transom									
	RH	#2 King Transom								X	Grout repair
6	LH	#1-King Transom									
	RH	#1-King Transom									
	LH	#1 Queen Transom									
	RH	#1 Queen Transom									
	LH	Centre Transom									
	RH	Centre Transom									
	LH	#2 Queen Transom									Sound
	RH	#2 Queen Transom									
	LH	#2 King Transom									
	RH	#2 King Transom									
7	LH	#1-King Transom									
	RH	#1-King Transom									
	LH	#1 Queen Transom									
	RH	#1 Queen Transom									
	LH	Centre Transom									
	RH	Centre Transom									
	LH	#2 Queen Transom									
	RH	#2 Queen Transom									
	LH	#2 King Transom									
	RH	#2 King Transom									

Road Beams

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
									Bores are from Hoki to Ross
LH1					X			X	Split clamp repair Grout repair to Face Decay
LH2	X								80x125- sound
LH3									
LH4									
LH5									
LH6	X				X		X		125x195-130x195-60x110-sound. Steel PFC repair
LH7									
LH8					X		X		Sound.Major Surface decay and spliting
LH9							X		As per WSP report
LH10									
LH11					X				Sound
LH12									
LH13									
LH14					X				Sound
LH15									
LH16					X				Sound
LH17									
LH18									
LH19									
CN1					X				Sound
CN2									
CN3									
CN4									
									Sound
RH1									
RH2									
RH3									
RH4									
RH5	X				X		X		Sound-110x75-100x140-150x150
RH6	X				X				Sound-80x90-Sound -Sound
RH7									
RH8									
RH9									
RH10									
RH11	X				X				Sound-85x80-Sound-Sound
RH12							X		As per WSP report
RH13					X				Sound
RH14	X				X				Bores sound however major surface decay and spliting
RH15					X				Sound
RH16									
RH17									
RH18									
RH19					X				Sound
RH20									
RH21									
RH22					X				Sound
RH23									
RH24									

Corbels

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Pier	Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
		Corbels									
2		LH Corbel									
		Centre Corbel									
		RH Corbel	X								120x90
3		LH Corbel									
		Centre Corbel									Sound
		RH Corbel									
	1#King	LH Corbel									
		RH Corbel							X		AS Per WSP Report
	1#Queen	LH Corbel									Sound
		RH Corbel									
	Centre	LH Corbel									
		RH Corbel									
	#2Queen	LH Corbel									
		RH Corbel									
	#2King	LH Corbel									
		RH Corbel									
4		LH Corbel									
		Centre Corbel									
		RH Corbel									
	1#King	LH Corbel									
		RH Corbel									
	1#Queen	LH Corbel									
		RH Corbel									
	Centre	LH Corbel									
		RH Corbel									
	#2Queen	LH Corbel									
		RH Corbel									
	#2King	LH Corbel									
		RH Corbel									
5		LH Corbel									
		Centre Corbel									
		RH Corbel					X		X		Sound, Dia spilts. Replace when beam is replaced
	1#King	LH Corbel									
		RH Corbel	X						X		200x200
	1#Queen	LH Corbel									
		RH Corbel									
	Centre	LH Corbel									
		RH Corbel									
	#2Queen	LH Corbel									
		RH Corbel									
	#2King	LH Corbel									
		RH Corbel									
6		LH Corbel									
		Centre Corbel									
		RH Corbel									
	1#King	LH Corbel								X	Sound, Split clamp
		RH Corbel									
	1#Queen	LH Corbel									Sound
		RH Corbel									
	Centre	LH Corbel	X						X		250x250
		RH Corbel									Sound
	#2Queen	LH Corbel	X						X		150x230
		RH Corbel									
	#2King	LH Corbel									
		RH Corbel									
7		LH Corbel							X		As per WSP report
		Centre Corbel									
		RH Corbel									
	1#King	LH Corbel									
		RH Corbel									
	1#Queen	LH Corbel									
		RH Corbel									
	Centre	LH Corbel									
		RH Corbel									
	#2Queen	LH Corbel									
		RH Corbel									
	#2King	LH Corbel									
		RH Corbel									
8		LH Corbel	X						X		sound-140x140-105x120
		Centre Corbel									
		RH Corbel	X								90x130-Sound
9		LH Corbel	X				X				70x140
		Centre Corbel									
		RH Corbel									Sound

Cross Bracing, Solid Blocking & Tie Rods

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
HDK - Heart Decay
WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Pier/Span	Side	Structural Element	PIPE	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
		Cross Bracing,Soild Blocking & Tie Rods									
Span # 1		Soild Blocking							X		As per WSP report
		Tie Rods								X	Nuts missing, WSP Report
Span #2		Soild Blocking							X		As Per WSP report
		Tie Rods								X	Nuts missing, WSP Report
Span #3		**Cross Bracing**									
Pier #3 To #1K	LH								X		
	RH										
#1K to #1Q	LH										
	RH										
#1Q to Centre	LH										
	RH								X		
#2Q to#2K	LH										
	RH								X		
#2K to Pier #4	LH								X		
	RH								X		
Span # 4											
Pier #4 To #1K	LH								X		
	RH								X		
#1K to #1Q	LH								X		
	RH								X		
#1Q to Centre	LH										
	RH										
#2Q to#2K	LH										
	RH										
#2K to Pier #5	LH										
	RH								X		
Span #5											
Pier #5 To #1K	LH								X		
	RH										
#1K to #1Q	LH								X		
	RH										
#1Q to Centre	LH										
	RH								X		
#2Q to#2K	LH										
	RH										
#2K to Pier #6	LH								X		
	RH								X		
Span #6											
Pier #6 To #1K	LH										
	RH								X		
#1K to #1Q	LH										
	RH								X		
#1Q to Centre	LH										
	RH										
#2Q to#2K	LH								X		
	RH								X		
#2K to Pier #7	LH										
	RH										
Span #7											
Pier #7 To #1K	LH								X		
	RH										
#1K to #1Q	LH								X		
	RH								X		
#1Q to Centre	LH										
	RH										
centre to #2Q	LH								X		
	RH								X		
#2Q to#2K	LH										
	RH								X		
#2K to Pier #8	LH								X		
	RH										
Span #8	Soild Blocking								X		As per WSP report
	Tie Rods									X	Nuts missing
Span #9	Soild Blocking								X		As per WSP report
	Tie Rods									X	Nuts Missing

Piles

TOTARA RIVER BRIDGE - ROSS

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WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Pier	Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
3		**Piles**									Bores = Bottom to top
		Pile #1									
		Pile #2									
		Pile #3									
		Pile #4									
		Pile #5									
		Pile #6									
		Pile #7	X				X		X		Sound- 105x140-Sound
		Pile #8	X				X		X		Sound- 130x140-Sound
		Upstream cut water pile	X				X		X		Sound-265x155-Sound
		Downstream cut water pile									
		Raker Studs									
		Upstream raker Stud					X		X		Major decay and splits
		Downstream Raker Stud					X		X		Major decay and splits
		Diagonal Bracing									
		Cross Bracing									
		Whalings									
		Whalings									
		Pile Cap									
		Cap #1									
		Cap #2									
		Cap #3									
		Cap #4							X		Poor condition
4		**Piles**									
		Pile #1	X				X				95x70-remainder sound
		Pile #2	X				X		X		Sound-105x40-sound.Major spilting
		Pile #3									
		Pile #4									
		Pile #5	X						X		145x155-90x85-Sound
		Pile #6	X				X		X		130x125-210x165-sound-sound
		Pile #7									Sound
		Pile #8									
		Upstream cut water pile									Sound
		Downstream cut water pile									
		Raker Studs									
		Upstream raker Stud	X				X		X		Major Decay
		Downstream Raker Stud									
		Diagonal Bracing									
		Cross Bracing									
		Whalings									
		Whalings									
		Pile Cap									
		Cap #1									
		Cap #2									
		Cap #3									
		Cap #4									

Piles

TOTARA RIVER BRIDGE - ROSS

Key:
Pipe - interal Pocket
PDK - Powder Decay
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WS - White Spot/Yellow Spot
Spilt - Major Spilts in Timber
Other - Corroision, Missing bolts, Damaged, loose
RED - From WSP Report

Pier	Side	Structural Element	Pipe	PDK	HDK	WS	Split	Other	Replace	Repair	Comments-
5		**Piles**									
		Pile #1	X				X		X		50x110-80x90-120x200
		Pile #2									
		Pile #3									
		Pile #4	x				X				Sound-Sound-150x90
		Pile #5	X				X		X		Sound-260x235-200x190-230x195
		Pile #6									
		Pile #7									
		Pile #8									
		Upstream cut water pile									
		Downstream cut water pile									
		Raker Studs									
		Upstream raker Stud									
		Downstream Raker Stud	X				X		X		Major Decay
		Diagonal Bracing									
		Cross Bracing									
		Whalings									
		Whalings									
		Pile Cap									
		Cap #1									
		Cap #2									
		Cap #3									
		Cap #4									
6		**Piles**									
		Pile #1									
		Pile #2									
		Pile #3									
		Pile #4									
		Pile #5									
		Pile #6									
		Pile #7									
		Pile #8									
		Upstream cut water pile									
		Downstream cut water pile									
		Raker Studs									
		Upstream raker Stud									
		Downstream Raker Stud							X		
		Diagonal Bracing									
		Cross Bracing									
		Whalings									
		Whalings									
		Pile Cap									
		Cap #1									
		Cap #2									
		Cap #3									
		Cap #4									
7		**Piles**									
		Pile #1									
		Pile #2									
		Pile #3									
		Pile #4									
		Pile #5									
		Pile #6									
		Pile #7									
		Pile #8									
		Upstream cut water pile									
		Downstream cut water pile									
		Raker Studs									
		Upstream raker Stud									
		Downstream Raker Stud									
		Diagonal Bracing									
		Cross Bracing									
		Whalings									
		Whalings									
		Pile Cap									
		Cap #1									
		Cap #2									
		Cap #3									
		Cap #4									