Technical Advice – Structural Engineering by Jan Stanway

Date	25.03.2026
To	Trinity White, Environmental Manager – South Island Renewables, Genesis Energy
From	WSP New Zealand Ltd
Project advice provided for	Fast-track Application for Lake Pukaki Hydro Storage and Dam Resilience Works
Documents referred to	• WSP, March 2026 *“Tekapo Submerged Weir – Structural Condition Assessment” Report dated 25/03/2026* • WSP, March 2026 “*Tekapo B Power Station Submerged Weir – Damwatch Document Reviews*” memorandum dated 25/03/2026 • Damwatch, 2026, “*Tekapo B Power Station tailrace weir and chute – condition assessment and review of bathymetric survey data*” memorandum dated 27/02/2026
Qualifications and experience	Chartered Professional Engineer (CPEng) – Building and marine structures Fellow of Engineering NZ (FEngNZ) WSP Senior Technical Director – Marine & Building Structures
Code of Conduct	As an expert witness I have read, and I am familiar with, the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. This memorandum has been prepared in compliance with that Code. In particular, unless I state otherwise, this response is within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.
Signature	

Confidential

Genesis Energy
Tekapo Submerged Weir

Structural Condition Assessment

2-38161.00

Tekapo Submerged Weir

Structural Condition Assessment

Genesis Energy

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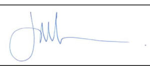
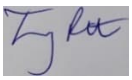
REV	DATE	DETAILS
1	27/11/2025	FINAL
2	19/12/2025	FINAL version 2
3	25/03/2026	Version 3

	NAME	DATE	SIGNATURE
Prepared by:	Jan Stanway	25/03/2026	
Reviewed by:	Gary Chalmers	25/03/2026	
Approved by:	Jeremy Robertson	25/03/2026	

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1 PROJECT BACKGROUND

1.1 GENERAL

Genesis Energy Ltd have engaged WSP NZ Ltd (WSP) to undertake a visual condition assessment of the five uppermost concrete structures that are within a sloped discharge channel that is currently submerged in Lake Pukaki. The objective is to determine if the structure would be in adequate condition to be functional if the lake is lowered in the future.

The channel structure is at a 1:20 slope and includes a concrete control weir at the furthest upstream end of the channel. Downstream of the weir the structure is made up of 760-1500 mm diameter rip-rap with 10 No. concrete ribs situated at equal distances along the length of the channel. The ribs are embedded in the existing soil and act as blocks to prevent the rip-rap from migrating downstream with water flow. The weir and the ribs are intended to be flush with the ground/rip-rap level. Each structure slopes upwards at both ends at an approximate 25-degree incline. Refer to Figure 1-4, Figure 1-5.

Refer to Figure 1-1, Figure 1-2 and Figure 1-3 for drawings of the channel plan and section views, and images of the channel structure are shown in Figure 1-6 and Figure 1-7.

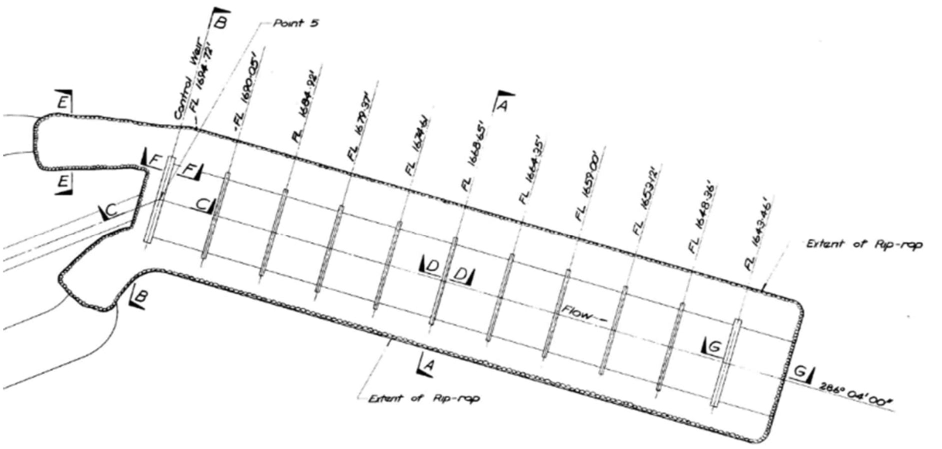


Figure 1-1. Plan view of discharge channel.

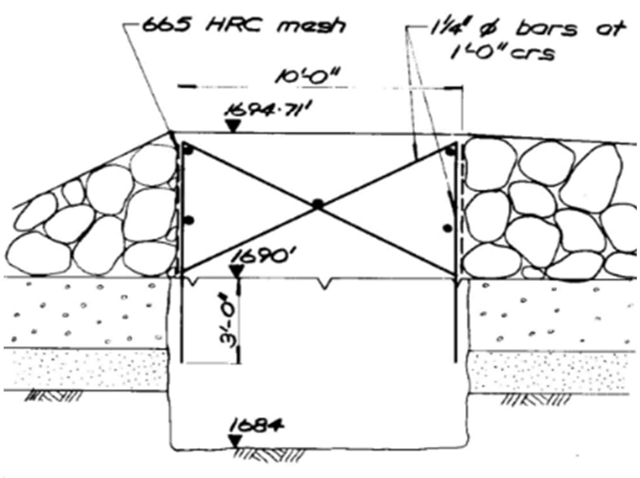


Figure 1-2. Cross section of weir structure.

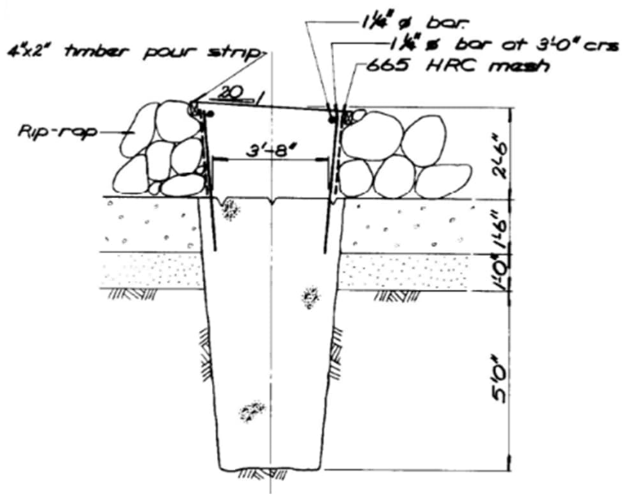


Figure 1-3. Cross section of rib structure.

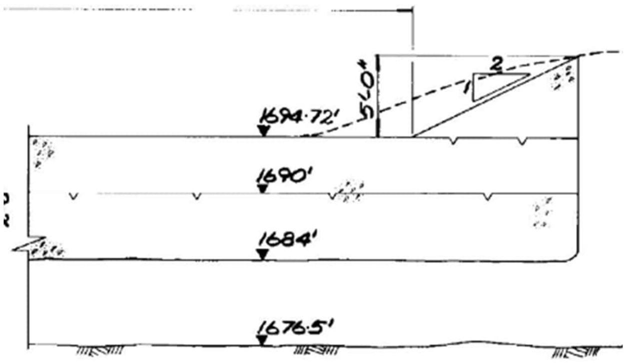


Figure 1-4. Section view of weir structure.

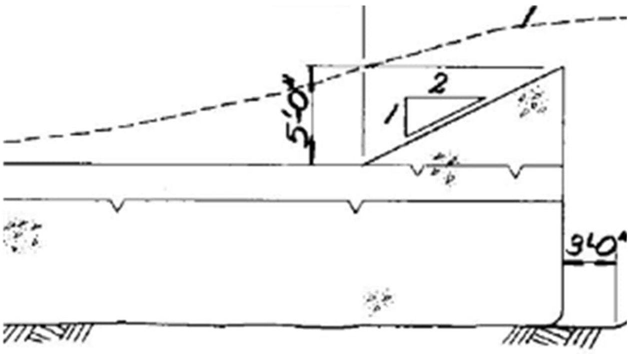


Figure 1-5. Section view of rib structure.

Figure 1-6. Photo of channel structure when Lake Pukaki is lowered.

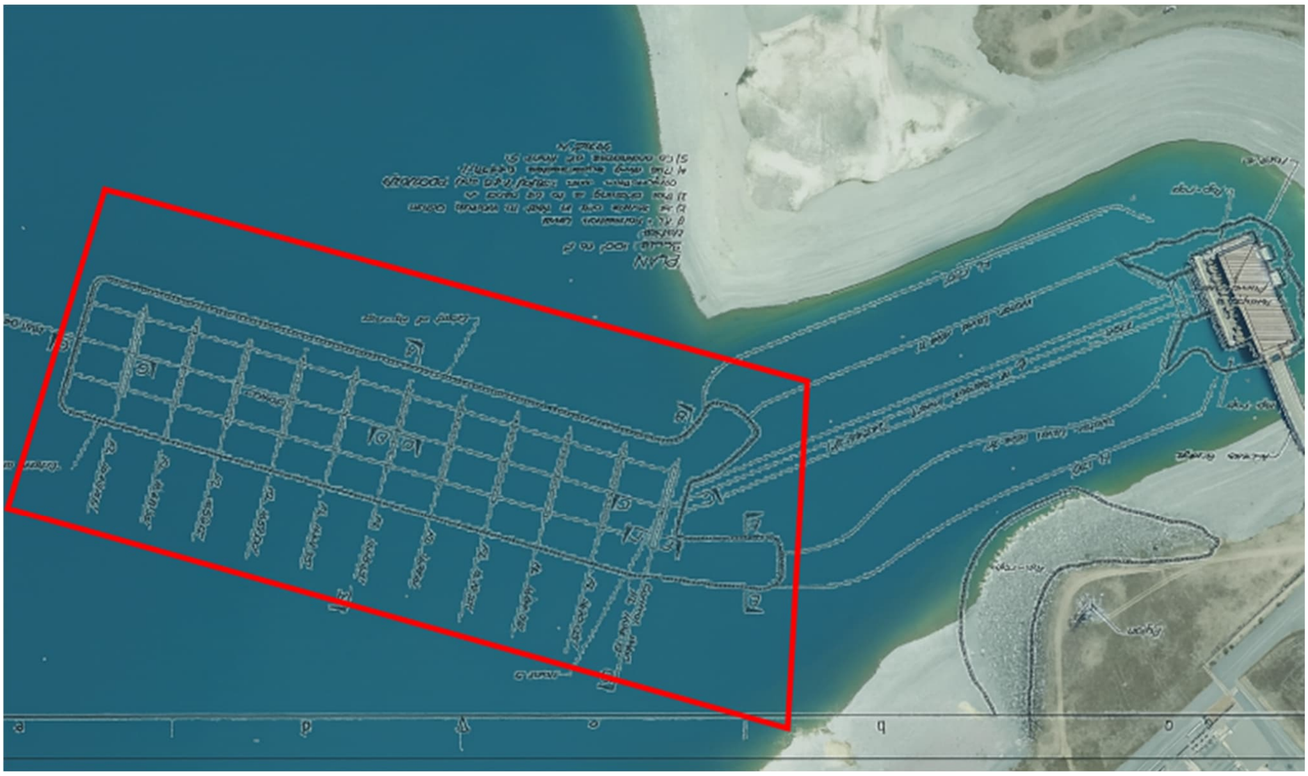


Figure 1-7. Location of structural components of channel structure in Lake Pukaki.

1.2 INSPECTION SCOPE

The inspection was conducted by divers with relevant competencies as the structures are currently submerged in water. The structural engineer on site directed the inspection focusing on the following structural elements:

- Condition of concrete elements, including:
  - Cracking
  - Spalling
  - Exposed Reinforcement
  - Loss of Cover / Exposed Aggregate
  - Displacement / Deformation
  - Construction Joints

2 STRUCTURAL CONDITION ASSESSMENT

2.1 GENERAL

The discharge channel was constructed in 1977 as a temporary structure to ensure Tekapo B power station could remain in service with the lake level approximately 15 m below minimum operating level. The typical structural components of the channel include:

- Concrete Weir
- Concrete Ribs

The divers were only able to inspect the first four ribs downstream of the control weir to an adequate level. The ribs located further downstream were progressively covered in more sediment until the divers conducting the inspection could not remove it without significantly reducing visibility and were thus unable to inspect the downstream ribs in adequate detail.

The main structural observations for the control weir and the first four ribs downstream of the weir are presented below.

2.2 CONCRETE CONTROL WEIR

A typical image of the surface of the control weir is shown below in Figure 2-2.

The structure was covered with sediment approximately 40 mm thick. Overall, the structure was in adequate condition. There were multiple areas of exposed aggregate on the surface of the concrete and there was exposed reinforcement on most of the length of the upstream edge of the weir. The riprap that the weir was poured against has rolled away in several areas, exposing reinforcement that appeared to have not been encased in concrete when the structure was originally poured.

Review of the drawings and a historical photograph (see Figure 2-1) confirms that the reinforcement that was cast into the unreinforced concrete base section of the weir and sills was provided to create a basic formwork to support the riprap. Following riprap placement, the cap section of the weir and sills was poured between the riprap. The reinforcement provided was not intended to create a reinforced concrete section; the weir and sills act as unreinforced concrete sections. Where the rebars were not surrounded by concrete the vertical 'dowel' bars do not act as normal reinforced concrete dowels to provide a shear and overturning connection between the cap and base sections of the sills. Instead, the reinforcement may have held the unreinforced concrete in place where there was no gap between the reinforcement and the concrete, and resist shear and overturning demands by bearing on the downstream reinforcement.

Fig. 4. Rip-rap being placed by a Caterpillar 992 front end loader against the row of starters embedded in the concrete infill

Source: Tekapo station archives

Figure 2-1. Photograph of construction sequence of ribs (source Damwatch Memo dated 27/02/2026).

2.2.1 CRACKING & INDENTATIONS

Due to the reduced visibility, it was impossible for cracks that would warrant repair (greater than 0.2 mm wide) to be observed. As a result, there were no noticeable instances of cracking on the control weir. The weir should be inspected when exposed or when visibility is improved to confirm cracking has not occurred on the structure.

There were several instances of spalling on the top of the weir, forming shaped indentations. The largest being approximately 400x400x100 mm (LxWxD). An example is shown in Figure 2-3, this should be checked to confirm if this has been caused by the passage of water or a crack.

2.2.2 EXPOSED REINFORCEMENT

There were several instances of exposed reinforcement on the upstream side of the control weir. Nearly the entire length of the top longitudinal bar on the upstream side of the weir is exposed and appears to be corroded, with a 40 mm maximum gap between the reinforcement and the concrete. This aligns with the construction methodology as discussed in Section 2-2 where the reinforcement was provided as simple formwork to hold the riprap prior to the concrete being poured between the riprap.

In some instances the longitudinal reinforcement bar appears to be 20-30 mm above the level of the concrete and flush with the surface of the concrete in other areas, which shows that the bar has been exposed for the entirety of the structure's life and the concrete was poured and set with the bar exposed. Examples of exposed longitudinal bars are shown in Figure 2-4 and Figure 2-5.

Vertical reinforcement around the weir was observed where the weir has been cast against the rip-rap which has subsequently been displaced. The vertical reinforcement appears to have never been encased in the concrete based on the distance between the bar and weir structure (approximately 60 mm). An example is shown in Figure 2-6.

2.2.3 SURFACE CONDITION

The surface concrete of the weir was generally in reasonable condition. There were multiple cases of exposed aggregate on the surface of the weir, with a maximum loss of section of 20 mm. An example is shown in Figure 2-7.

2.2.4 DISPLACEMENT / DEFORMATION

There were no noticeable instances of displacement of the control weir. There are areas along the length of the weir that had an overhang of concrete where it was poured against rip-rap which has subsequently been displaced. An example is shown in Figure 2-8.

2.2.5 CONSTRUCTION JOINTS

The construction joints along the weir could not be observed as they were obscured by rip-rap. The lack of a smooth finish on the exposed concrete edges (due to being poured directly on the rip-rap) prevented inspection of the construction joints on the control weir. However, there was no observable deterioration in the areas where construction joints were shown in Figure 1-4.

2.2.6 CONCRETE CONDITION WHEN EXPOSED

The concrete may be subjected to freeze-thaw attack during winter conditions for the portions of the concrete that will not have a constant flow of running water. Freeze-thaw attack is a major cause of concrete degradation in cold climates, which occurs when absorbed water freezes and expands within the pores of the concrete, creating internal pressure that exceeds the concrete's tensile strength. This cyclic damage can lead to surface scaling, cracks, pop-outs, and potential structural failure.

Depending on what is growing on the surface of the concrete the biological growth may have produced acids that have eaten away at the concrete cement since being submerged. If this has occurred this would make the surfaces of the concrete at higher risk of damage and deterioration when put back into use as a weir and chute.

We recommend the concrete is cleaned, inspected and core samples taken for observation and testing.

2.2.7 IMAGES

Figure 2-2. Picture or typical surface condition of control weir.

Figure 2-3. Example of channel formed in top surface of control weir.

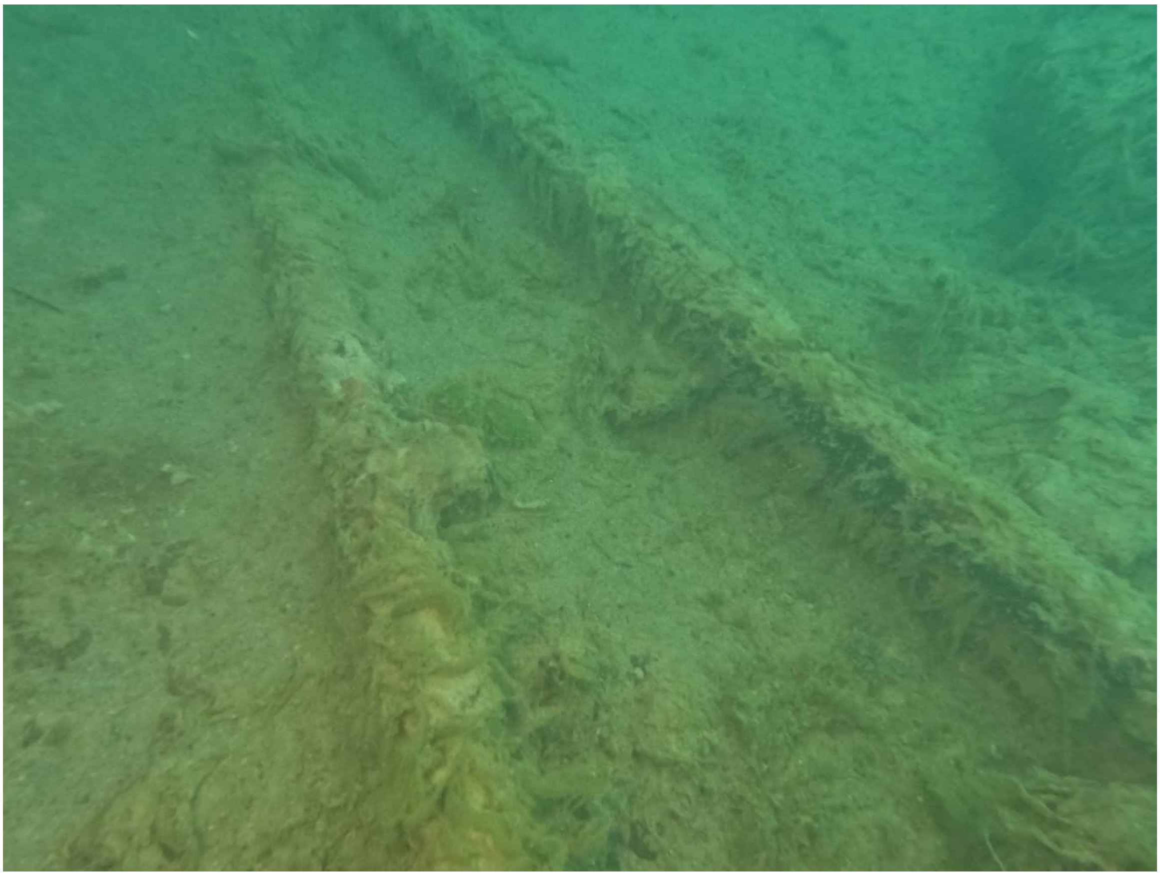


Figure 2-4. Example of exposed reinforcement on top of weir structure.

Figure 2-5. Example of exposed longitudinal reinforcement on upstream corner of weir structure.

Figure 2-6. Example of exposed vertical reinforcement on control weir.

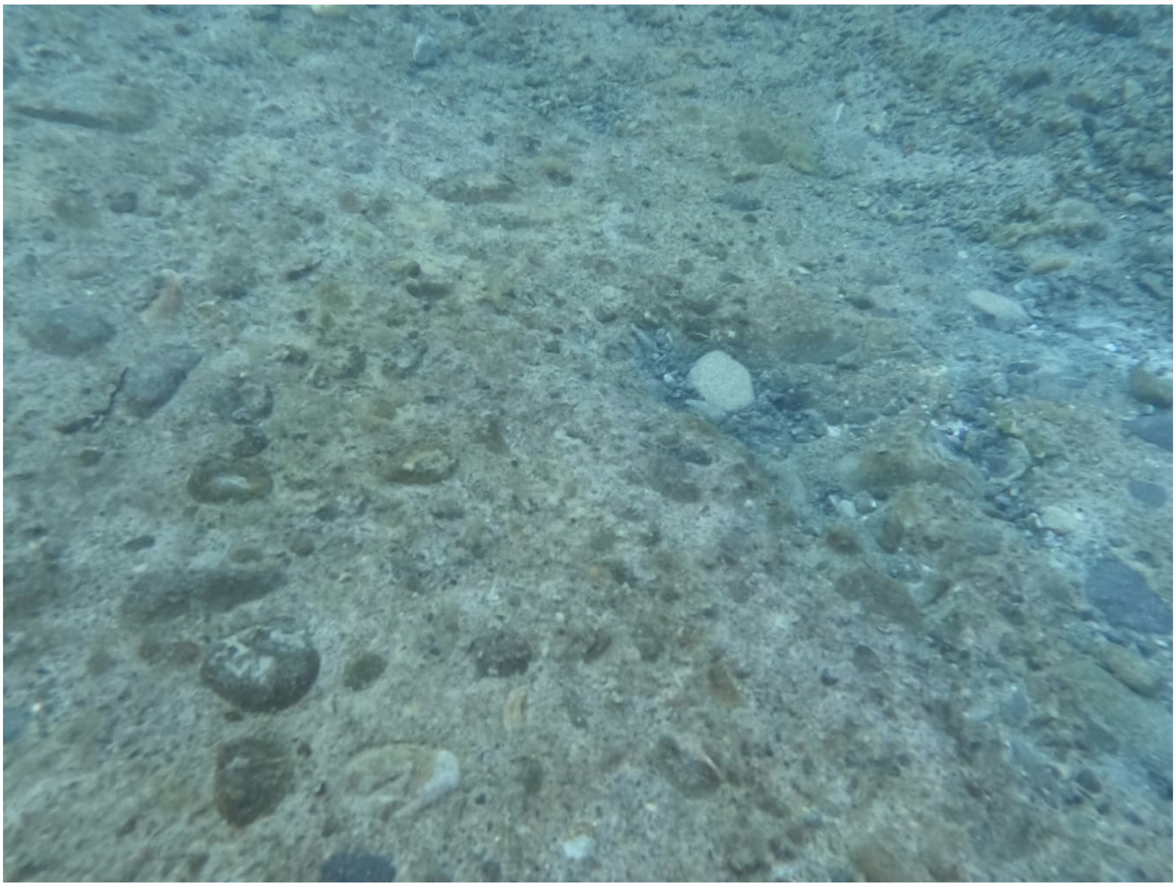


Figure 2-7. Example of exposed aggregate on the surface of the control weir.

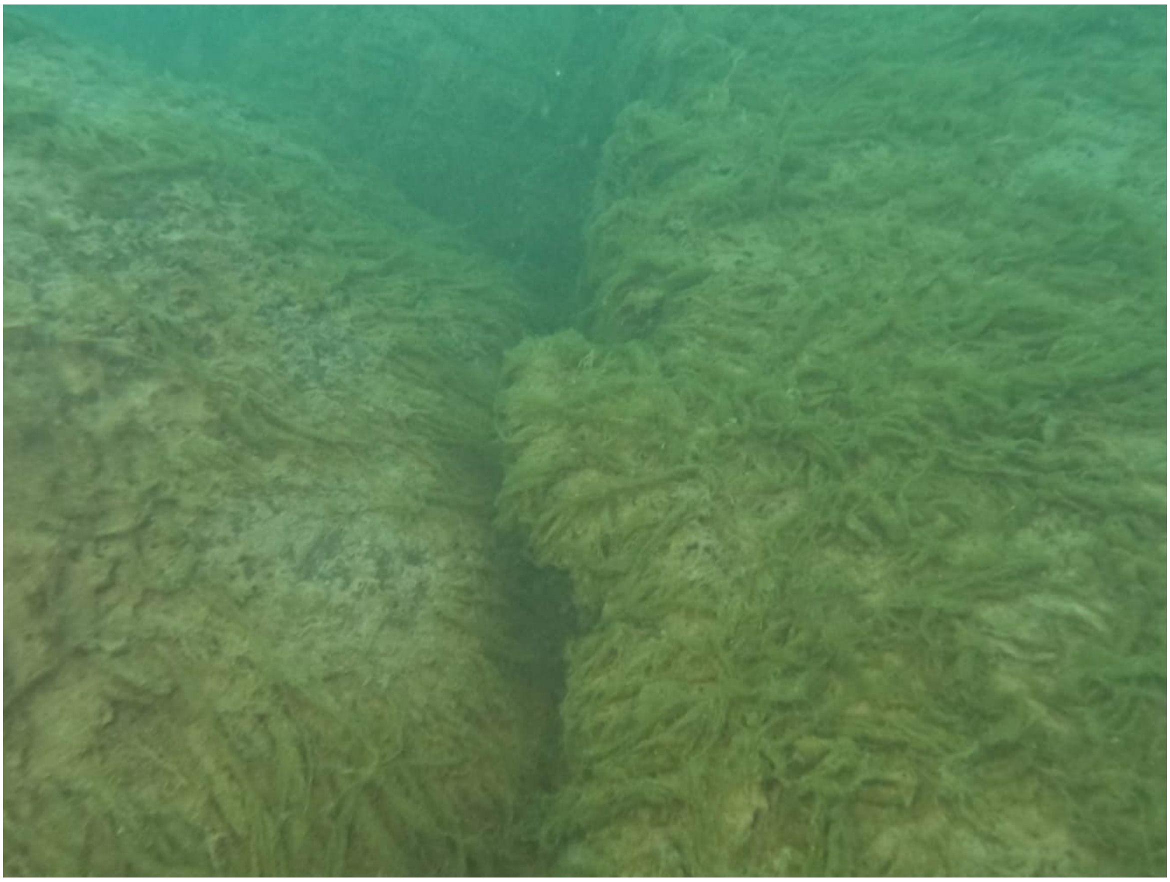


Figure 2-8. Example of rip-rap (left) rolled away from concrete (right).

2.3 RIBS

A typical image of the condition of the four concrete ribs that were able to be inspected is shown below in Figure 2-9. Overall, the concrete was in reasonable condition. There were multiple instances of exposed reinforcement and exposed aggregate, which again aligns with the construction methodology discussed in Section 2.2. The ribs further downstream in the channel were covered in layers of sediment up to 200 mm deep and greater as shown in Figure 2-10. This prevented full inspection of the concrete condition. It was decided that the condition of the first four ribs would be based on the condition of Rib 1, as there was no significant discrepancy observed between each structure.

2.3.1 CRACKING & SURFACE INDENTATION

Due to the reduced visibility, it was impossible for cracks that would warrant repair (greater than 0.2 mm wide) to be observed. As a result, there were no noticeable instances of cracking on the four ribs. The ribs should be inspected when exposed or when visibility is improved to confirm cracking has not occurred on the structure.

There were several instances of ‘channels’ forming from the downstream edge to the upstream edge on the top surface of the ribs with a maximum depth of approximately 50 mm. This should be investigated further to confirm the cause of the indentation/’channel’; was it due to the passage of water or it as a result of a crack due to settlement of the rib and initiating the formation of the channel? An example is shown in Figure 2-11.

2.3.2 EXPOSED REINFORCEMENT

There were multiple cases of exposed vertical and horizontal reinforcement on the ribs. The exposed vertical reinforcement was located on the downstream side of Rib 1, protruding approximately 5mm out of the concrete surface. This appeared to have been exposed since original construction based on the condition of the concrete surface and the number of bars exposed. An example is shown in Figure 2-12.

The exposed horizontal reinforcement was on the edge of the upstream face of the ribs and was a maximum distance of 20 mm from the surface of the concrete. An example is shown in Figure 2-13. Loose mesh reinforcing was observed sitting on Rib 1 as shown in Figure 2-14.

2.3.3 SURFACE CONDITION

There were several areas of exposed aggregate on the surface of the ribs, with a maximum of loss of section up to 20mm. An example is shown in Figure 2-15.

2.3.4 DISPLACEMENT / DEFORMATION

A significant number of the large boulders making up the rip-rap on the downstream side have been displaced, leaving an overhang on the downstream face of several ribs. Rib 1 was approximately 1200 mm above ground level with no surrounding rip-rap. An example of the concrete overhang is shown in Figure 2-16. The exposed concrete appeared to be in reasonable condition.

2.3.5 CONSTRUCTION JOINTS

The construction joints along the ribs could not be observed due to the reduced visibility caused by disturbed sediment and debris on the ribs. The lack of a smooth finish on the exposed concrete edges (due to being poured directly on the rip-rap) prevented inspection of the construction joints on the ribs.

2.3.6 CONCRETE CONDITION WHEN EXPOSED

The concrete may be subjected to freeze-thaw attack during winter conditions for the portions of the concrete that will not have a constant flow of running water. Freeze-thaw attack is a major cause of concrete degradation in cold climates, which occurs when absorbed water freezes and expands within the pores of the concrete, creating internal pressure that exceeds the concrete’s tensile strength. This cyclic damage can lead to surface scaling, cracks, pop-outs, and potential structural failure.

Depending on what is growing on the surface of the concrete the biological growth may have produced acids that have eaten away at the concrete cement. If this has occurred this would make the surfaces of the concrete at higher risk of damage and deterioration when put back into use as a weir and chute.

We recommend the concrete is cleaned, inspected and core samples taken for observation and testing.

2.3.7 IMAGES

Figure 2-9. Typical condition of rib concrete (Rib 1).

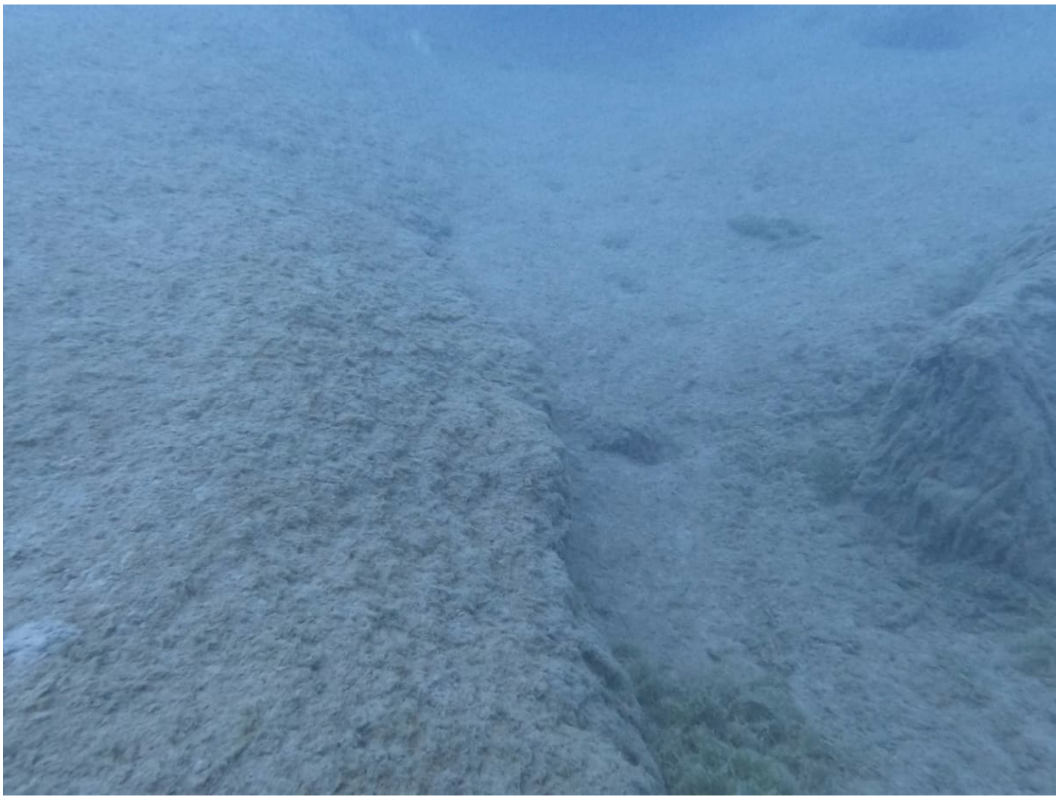


Figure 2-10. Example of extent of sediment coverage on rib structures making inspection impossible (Rib 4).

Figure 2-11. Example of V-shaped channel in concrete on top of rib surface (Rib 1).

Figure 2-12. Example of exposed reinforcement on top surface of rib (Rib 1).

Figure 2-13. Example of exposed reinforcement on ribs (Rib 1).

Figure 2-14. Loose mesh reinforcing on Rib 1.

Figure 2-15. Example of exposed aggregate on rib surface (Rib 1).

Figure 2-16. Example of downstream side of rib where rip-rap has rolled away (Rib 1).

3 REMAINING SERVICE LIFE

3.1 ISSUES OBSERVED

The following issues were observed that should be repaired before the channel can be put into service.

- .
- Following further investigation to confirm the reason for the indentations in the top surface of the weir and ribs, the crack/channels observed on the top of the weir and ribs can then be repaired to prevent further degradation.
- Areas of the weir and ribs where there is loss of section should be repaired with an appropriate repair product.
- Rip-rap is reinstated as per the original design profile.

3.2 RECOMMENDATIONS

Any undermining or loss of structural connection of the top section (above the construction joint) of the concrete weir and sills will compromise the structural performance of the weir and chute structure. Given the proposed future use of this asset, and approximately 50 years have elapsed since construction of this temporary structure, it is recommended that new steel reinforcement dowels are drilled and grouted along the length of the weir and sill beams, to provide a positive and reliable connection between the concrete cap and base concrete.

There are two potential options for conducting the proposed interventions to the rib structures and weir. Both methods include removing all the sediment on each structure to ensure the following interventions can be undertaken.

Both intervention methodologies would require station outage.

The interventions discussed below would return the structural elements to, or close to a state where they can perform their original intended purpose however, due to the design and construction as a temporary structure originally, the interventions will not negate all risk.

3.2.1 OPTION 1 – DRY REPAIRS

Undertake the repairs while Pukaki Lake is lowered, and the structure is above the water level. This option requires the water level to be dropped sufficiently enough to ensure the structures can be accessed, which may not be feasible if the Tekapo B Power Station needs the lake level at a specific height to be operational. This option would be chosen at Genesis Energy's discretion.

3.2.1.1 EXPOSED REINFORCEMENT & NEW DOWELS

Areas of reinforcement corrosion shall be broken out to undamaged concrete. The steel reinforcement is to be cleaned with a mechanical wire brush down to the bare steel and treated with Sika FerroGard 903 Plus or approved alternative. New dowels should be installed along the length of the weir and ribs, then the concrete shall then be reinstated using Sika MonoTop-412N repair mortar or an approved alternative to fill the remainder of the repair area.

3.2.1.2 CRACKING & INDENTATIONS

Areas of concrete subject to section loss or where indentations have formed should be repaired using Sika MonoTop 412N or an approved alternative. It is important to confirm the reason for the indentation in the top surface prior to confirming the repair methodology, if due to channelling due to the passage of water repair with Sika MonoTop 412N is appropriate, however if it is due to a crack, the underlying cause of the crack needs to be addressed as part of the repair works.

3.2.1.3 SURFACE CONDITION

Areas of concrete subject to section loss should be treated with Sika MonoTop 412N, or similar approved, to minimise further damage to the concrete.

3.2.1.4 RIP-RAP REPLACEMENT

Areas around the upper four ribs and weir that have missing rip-rap should have the rip-rap reinstated to match the original design profile.

3.2.2 OPTION 2 – SUBMERGED REPAIRS

Exposed defects, such as concrete spalling and corroded reinforcement could be repaired while submerged by a diver. However, replacement or repositioning of rip rap elements would require the water level to be lowered significantly to allow appropriate access and visibility to undertake the works.

Therefore, while minor superficial repairs to concrete elements could be carried out whilst submerged, any more significant operations would require a lowered water level.

Not accounting for outage costs, this option would include the more expensive physical works costs. The repairs would require divers, additional health and safety measures and specialist repair products.

All submerged repairs should be undertaken by a qualified professional with appropriate training and support team.

3.2.2.1 EXPOSED REINFORCEMENT & NEW DOWELS

Areas of reinforcement corrosion shall be broken out to undamaged concrete. New dowels should be installed along the length of the weir and ribs, then the concrete shall then be reinstated using SikaGrout UW NZ repair mortar or an approved alternative to fill the remainder of the repair area.

When the water level is dropped and the ribs and weir are exposed, the exposed steel reinforcement is to be cleaned with a mechanical wire brush down to the bare steel and treated with Sika FerroGard 903 Plus or approved alternative.

3.2.2.2 CRACKING & INDENTATIONS

Areas of concrete subject to section loss or where channels have formed should be repaired using SikaGrout UW NZ repair mortar or an approved alternative. It is important to confirm the reason for the indentation in the top surface prior to confirming the repair methodology, if due to channelling of the water repair with SikaGrout UW NZ repair mortar, however if it is due to a crack, the underlying cause of the crack needs to be addressed as part of the repair works.

3.2.2.3 SURFACE CONDITION

Areas of concrete subject to loss of section should be treated with SikaGrout UW NZ repair mortar with smaller areas patched using Sikadur UA, or similar approved, to minimise further damage to the concrete.

3.2.2.4 RIP-RAP REPLACEMENT

Areas around the upper four ribs and weir that have missing rip-rap should have the rip-rap reinstated to match the original design profile.

3.3 REPAIR SCHEDULE

All repairs listed in Option 1 or Option 2 should be completed before the channel is made operational. The repairs would return the structural elements to, or close to a state where they can perform their original intended purpose however, due to the design and construction as a temporary structure originally, repairs will not negate all risk.

The repairs relate to the structural elements. The hydraulic performance is also critical in considering if the temporary tailrace can be safely operated. Refer to Tekapo Submerged Weir Bathymetric Survey and Hydraulic Assessment, Hydraulic Assessment, Rev 3.

3.4 RESIDUAL SERVICE LIFE

The issues observed indicate that the capacity and stability of the concrete elements (weir and top four ribs) have been compromised. Because the weir and ribs were originally designed as a temporary structure and were constructed in 1978, the structure has now passed its intended service life.

3.4.1 FUTURE INSPECTIONS

As the spillway is now 47 years old and was originally intended as a temporary structure, it has now exceeded its service life. Therefore:

- If the spillway were to be brought back into operation, it should be inspected for deterioration by operations staff on a weekly basis, and by specialist engineers every year. If operations staff observe any deterioration of concrete surface, movement of riprap or movement of weir and/or rib concrete caps a specialist engineer should inspect within 1 week of the observation being made.
- If the spillway remains submerged and out of service, it should be inspected every year, with the inspection data and photographs provided to the specialist engineer to confirm it is suitable to be brought into service in the following year.

4 CONCLUSIONS AND RECOMMENDATIONS

From the structural condition inspection, multiple defects or durability issues were observed. WSP recommends the following:

- If the spillway is brought back into service:
    - All rip-rap to be reinstated to match the original design profile immediately.
    - All concrete repairs and interventions identified to be repaired prior to being brought back into service.
        - Cut back and treat exposed reinforcement.
        - Install new dowels along the length of the weir and ribs to positively connect the concrete cap to the base concrete section.
        - Clean surfaces and reinstate concrete where aggregate is exposed and/or concrete section loss has occurred.
    - Inspections are to be carried out thus:
        - Weekly inspection by operations staff to identify possible deterioration.
        - Structural condition assessments by specialist engineers:
            - When deterioration of concrete surface, movement of riprap or movement of weir and/or rib concrete caps is identified by operations staff, or
            - Post any significant seismic event, or
            - Maximum of every year.
- If the spillway is to remain submerged, it should be inspected every year, with the inspection data and photographs provided to the specialist engineer to confirm it is suitable to be brought into service in the following year.
- This condition assessment is limited to the structural condition of the concrete elements, not the performance of the Temporary Tailrace Structure.
- The hydraulic performance is also critical in considering if the temporary tailrace can be safely operated. Refer to Tekapo Submerged Weir Bathymetric Survey and Hydraulic Assessment, Hydraulic Assessment, Rev 3.

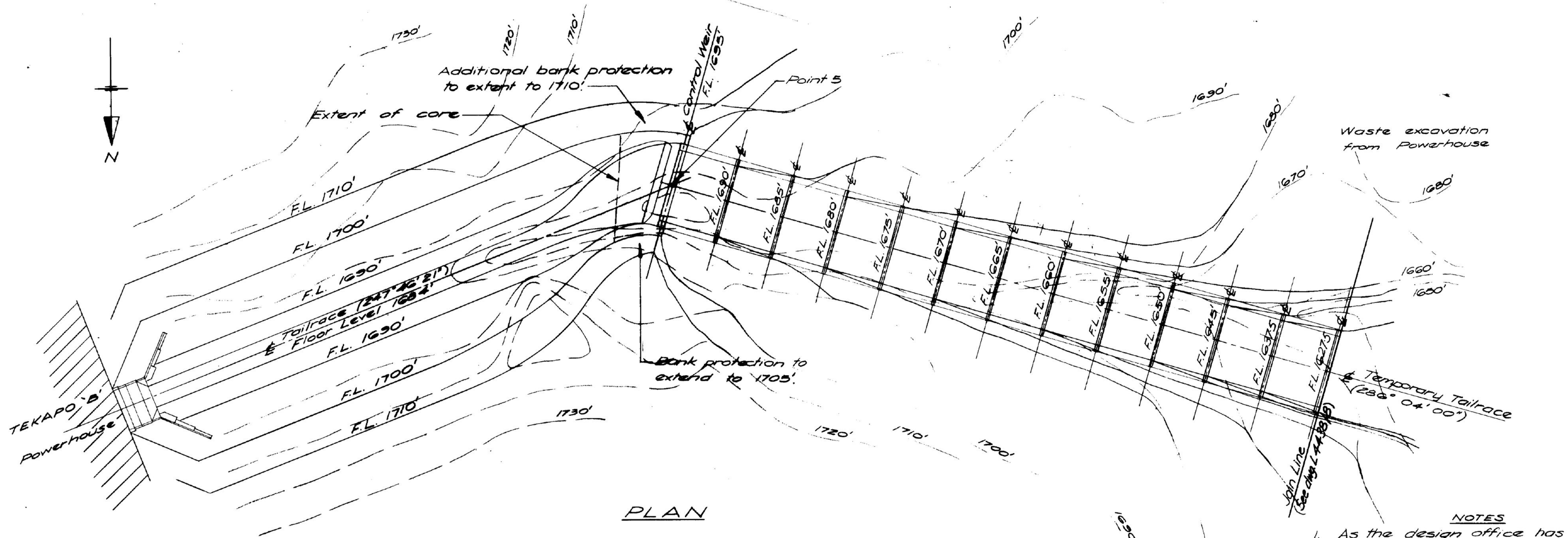
5 LIMITATIONS

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Genesis Energy Limited ('Client') in relation to Tekapo Submerged Weir – Structural Condition Assessment ('Purpose') and in accordance with the Offer of Service with Genesis Energy Limited dated 10th of July 2025 ('Agreement'). The findings in this Report are based on and are subject to the assumptions specified in the Report and the Offer of Service with Genesis Energy Limited dated 10th of July 2025. WSP accepts no liability whatsoever for any use or reliance on this Report, in whole or in part, for any purpose other than the Purpose or for any use or reliance on this Report by any third party.

In preparing this Report, WSP has relied upon data, surveys, analyses, designs, plans and other information ('Client Data') provided by or on behalf of the Client. Except as otherwise stated in this Report, WSP has not verified the accuracy or completeness of the Client Data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in this Report are based in whole or part on the Client Data, those conclusions are contingent upon the accuracy and completeness of the Client Data. WSP will not be liable for any incorrect conclusions or findings in the Report should any Client Data be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

APPENDIX A

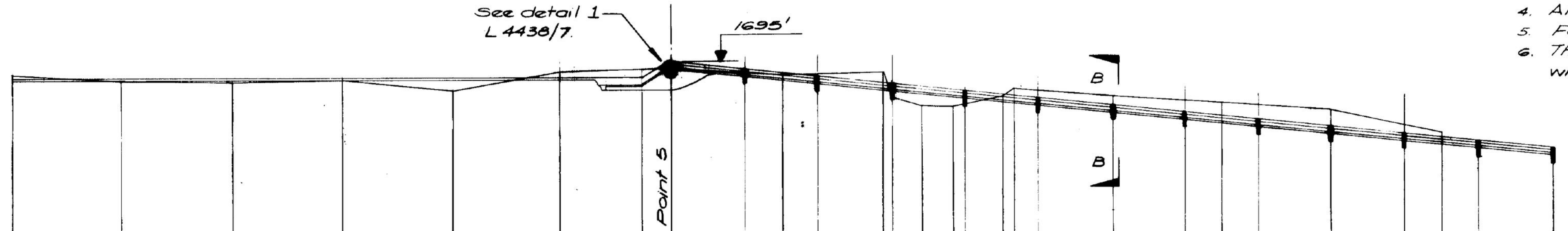
AS BUILT DRAWINGS



PLAN

NOTES

1. As the design office has no positive information on the Haul Road it has been omitted from these drawings. It will be left up to site to move all material necessary to attain formation levels shown on this drawing.
2. Existing contours shown dotted.
3. F.L. = Formation Level.
4. All levels are to Waitaki Datum.
5. Formation Levels have a tolerance of ±2".
6. This drawing is to be read in conjunction with drawing L 4438/7, & L 4438/8.



H.A.D. 1667'

DISTANCE (FT)	FORMATION LEVEL (See note 3) (FT)	EXISTING GROUND LEVEL (FT)
223	1684	1687.00
373		1683.50
523		1682.50
673		1683.00
823		1676.60
973		1688.00
1090.49	1684	
1123.49	1695	1690.30
1223	1690	
1273		1687.60
1323	1685	
1412		1688.70
1423	1680	1671.90
1468		1666.70
1505		1665.93
1523	1675	
1573		1673.10
1590		1677.03
1623	1670	
1723	1665	1672.60
1823	1660	
1873		1667.30
1923	1655	
2023	1650	1663.30
2123	1645	
2173		1645.50
2223	1637.5	
2323	1627.5	

LONGITUDINAL SECTION

Scale: Horiz. 100' to 1 inch
Vert. 50' to 1 inch

REFERENCE DRAWINGS
T 38/01/2 Plan & Long Section, Tailrace
T 38/01/3, 4 & 5 Cross Sections

ORIGINAL DESIGN DWG. as built details on T38/01/6, 7 & 8

This drawing complies with the requirements of N.Z. Electricity Department
Snr. Design Engineer N.Z. Elect. Dept.
Date 17-11-76

100'-0" to 1 inch GRAPHIC SCALES: 100 0 100 200' 300' 400' 500'

AMENDMENTS	BY	APPD	DATE
X As Built			5/81

	BY	CHECKED BY	DATE
Drawn			10/11/76
Computed			11/76

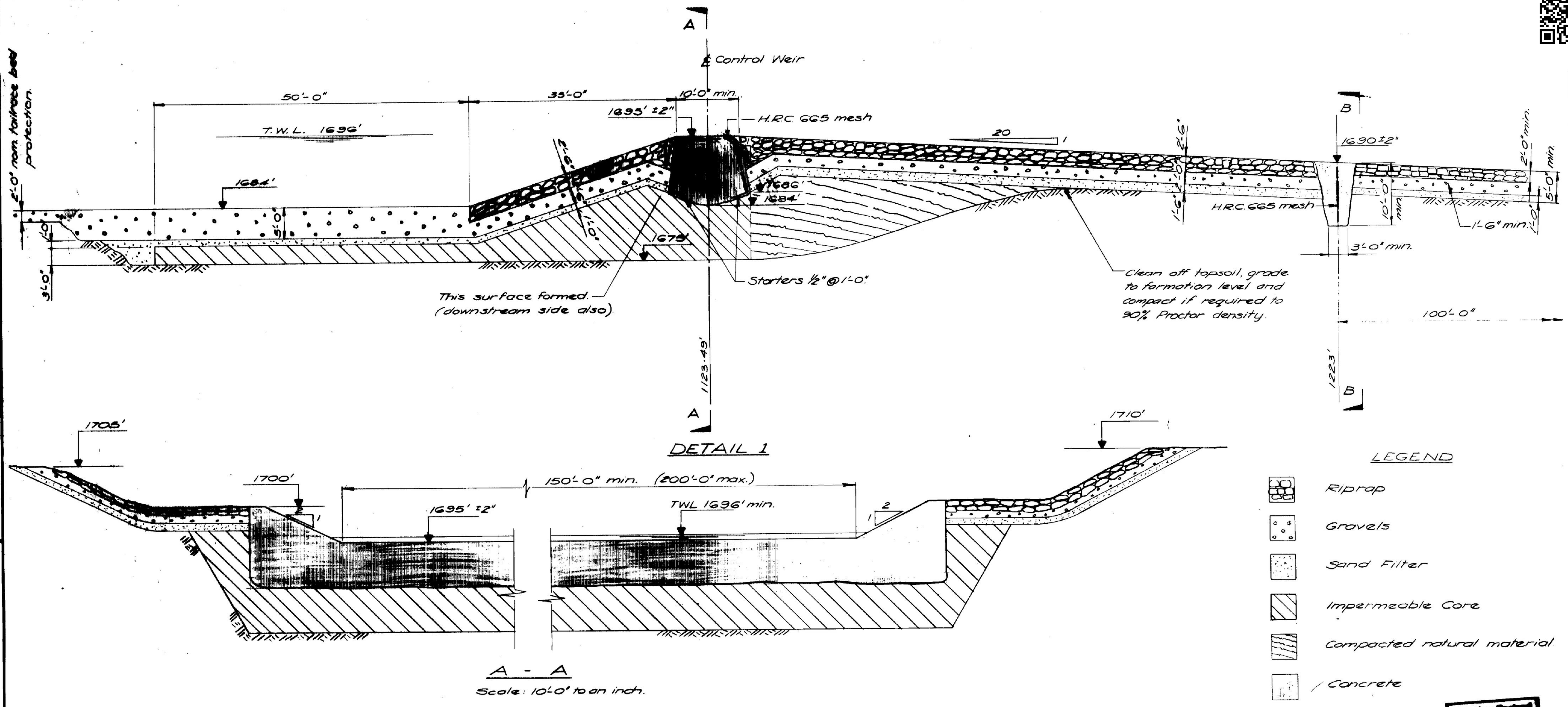
RECOMMENDED: 17/11/76
APPROVED: 18/11/76 CHIEF DESIGNING ENGINEER

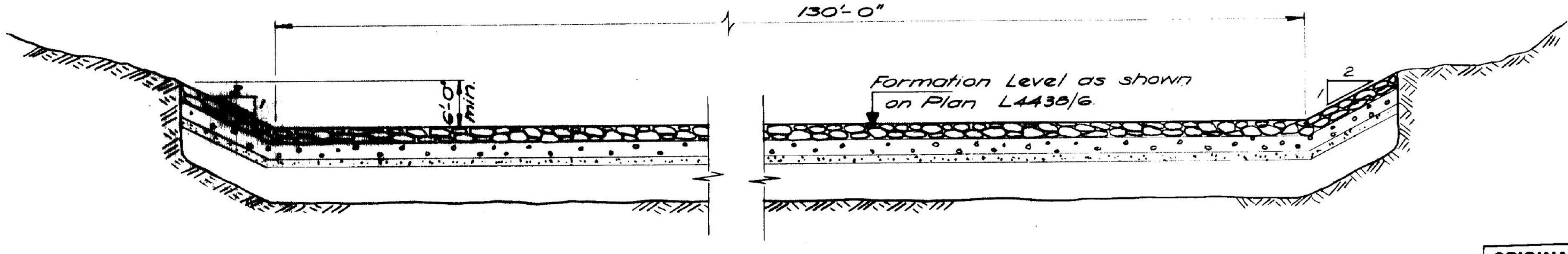
Ministry of Works and Development
POWER
J. J. CHESTERMAN-CHIEF ENGINEER
N.C. McLEOD Commissioner

TEKAPO 'B' POWER STATION
TEMPORARY TAILRACE
PLAN AND LONGITUDINAL SECTION

ORIGINAL SCALES: 100'-0" to 1 inch or as shown.
FILE: 92/12/77/42 FOLDER: P77/3j SPEC: H.D.1147
ISSUE: X
POWER DESIGN
SHEET No. L 4438/6 IN SHEETS

L 4438/7





T38/3F1

Notes:

2. Min lap for mesh 1'-0"
3. Reinforcement to pass through all construction joints.
4. Stockpile 2,000 cub.yds riprap and 1,000 cub.yds. gravel for repair and emergency work.
5. Dump random rocks on downstream side of final weir at distance 2323'.

ORIGINAL DESIGN DWG.
as built details on
T38/01/6,7 & 8.

8'-0" to an inch
GRAPHIC SCALES: 10' 0' 10' 20' 30' 40'

	BY	APP'D	DATE
X As Built			8/81
AMENDMENTS	BY	APP'D	DATE

	BY	CHECKED BY	DATE
Drawn			12/11/76
Computed			11/76

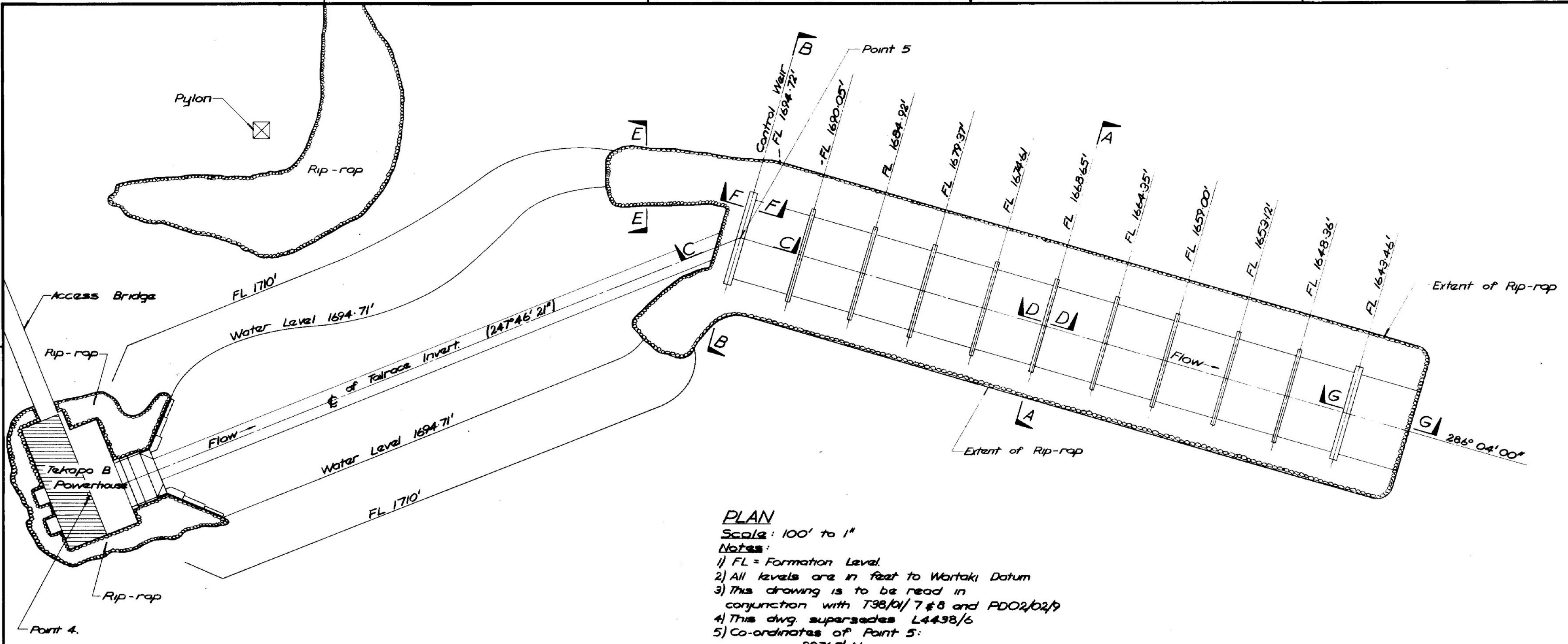
RECOMMENDED: 17/4/76
APPROVED: 18/11/76 SHEET ENGINEER

Ministry of Works and Development
POWER
J. J. CHESTERMAN-CHIEF ENGINEER
N.C. McLEOD Commissioner

TEKAPO 'B' POWER STATION
TEMPORARY TAILRACE DETAILS

ORIGINAL SCALES: 8'-0" to an inch or as shown
FILE: 92/12/7/42 | FOLDER: P77/3j | SPECI: H.D. 1147
ISSUE: X X
SHEET No.
POWER DESIGN
L 4438/7
IN SHEETS

P.W. 482-A1
Rev. July 1972

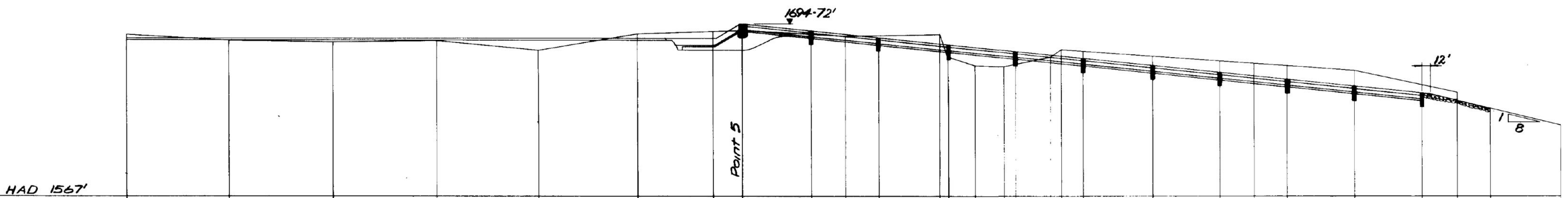


PLAN

Scale: 100' to 1"

Notes:

1) FL = Formation Level.
2) All levels are in feet to Waitaki Datum
3) This drawing is to be read in conjunction with T38/01/7 & 8 and PD02/02/9
4) This dwg. supersedes L4438/6
5) Co-ordinates of Point 5:
   99765' N
   223000' W
   in feet Mt. Horrible.



Distance (0·00' is at Pt 4)	Formation Level	Pre-construction Ground Level
223'	1684'	1687·00'
373'		1683·50'
523'		1682·50'
673'		1683·00'
823'		1676·60'
973'		1688·00'
1090·49'	1684'	
1123·49'	1694·72'	1690·30'
1223'	1690·05'	
1273'		1687·60'
1323'	1684·92'	
1412'		1688·70'
1423'	1679·37'	1671·90'
1468'		1666·70'
1505'		1665·93'
1523'	1674·61'	
1573'		1673·10'
1590'		1677·03'
1623'	1668·65'	
1723'	1664·35'	1672·60'
1823'	1659·00'	
1873'		1667·30'
1923'	1653·12'	
2023'	1648·36'	1663·30'
2123'	1643·46'	
2173'		1645·50'
2223'		
2323'		

LONGITUDINAL SECTION

Scale: Horizontal = 100' to 1"
Vertical = 50' to 1"

50' 25' 0 50' 100' 150' 200' 250' 50' to 1"

100' 50' 0 100' 200' 300' 400' 500' 100' to 1"

CERTIFIED **AS BUILT** DRAWING
ENGINEER 26/11/77 DATE
~~NO CHANGE~~
REVISED
SEE ALSO T38/01/7-8

New Zealand Electricity
FOLDER: T25/3F1

AMENDMENTS	BY	APP'D	DATE
⊠ AS BUILT - Supersedes L4438/6	CGB		

	BY	CHECKED BY	DATE
DRAWN	C. Baxter	[signature]	10-77
SUP'D	[signature]	[signature]	10·77

Recommended: [signature] 22/11/77

S M J Smith
Project Engineer

Approved [signature] 23-11-77
Resident Engineer

Ministry of Works New Zealand

POWER
J J Chesterman
Chief Engineer

N C McLeod Commissioner

TEKAPO B POWER PROJECT

TEMPORARY TAILRACE
PLAN AND LONGITUDINAL SECTION

ORIGINAL SCALES: AS SHOWN

FILE:

TWIZEL

T38/01/6

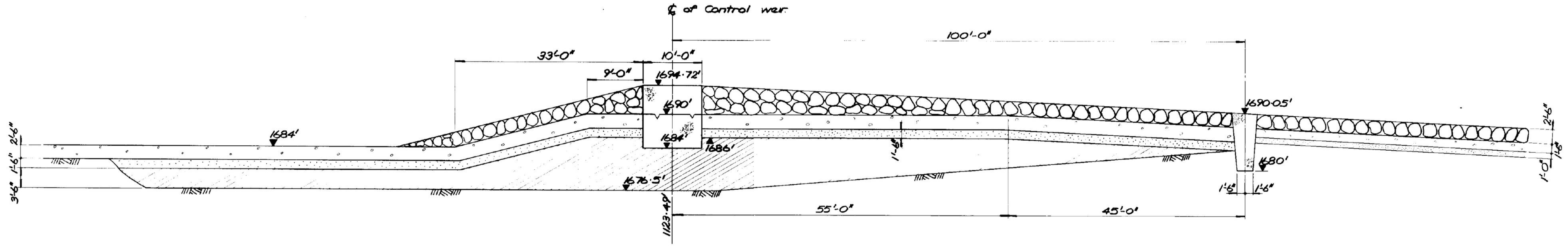
ISSUE: X

SHEET No.

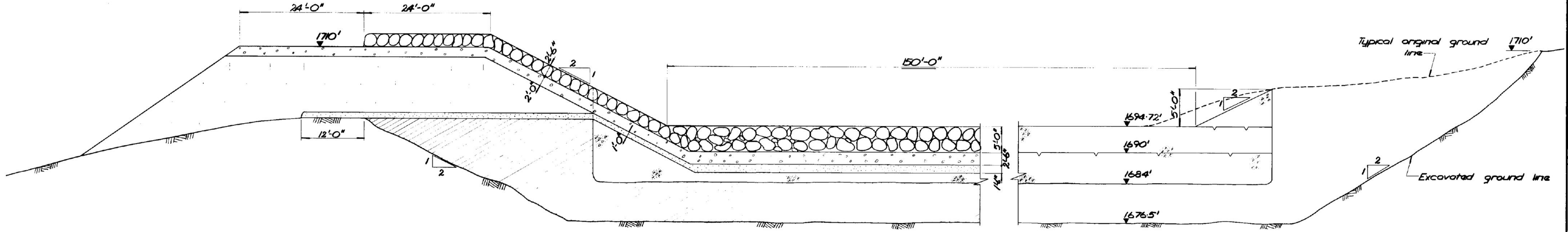
IN SHEETS

ORIGINAL SIZE mm INCHES

P.W. 482-A1
Rev. July 1972



SECTION C-C



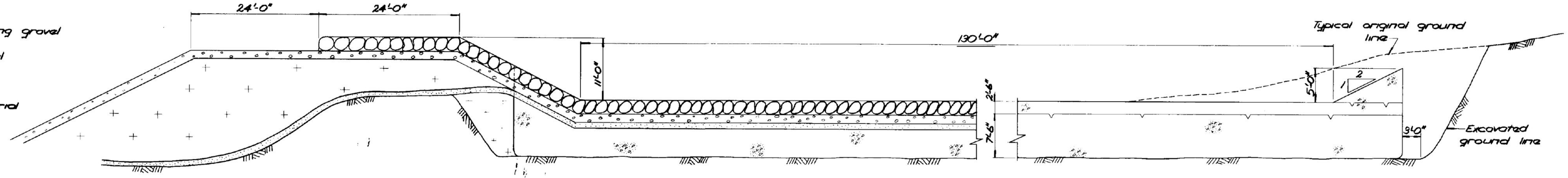
HALF SECTION SHOWING EARTHWORKS

HALF SECTION SHOWING CONSTRUCTION JOINTS

SECTION B-B

Legend

- Rip-rap
- Free draining gravel
- Silty gravel
- Sand
- Core material
- Concrete



HALF SECTION SHOWING EARTHWORKS

HALF SECTION SHOWING CONSTRUCTION JOINTS

SECTION A-A

Note:
1) This dwg. to be read in conjunction with T38/01/6 & 8
2) This dwg supersedes L4438/7

CERTIFIED **AS BUILT** DRAWING
ENGINEER 28/11/77 DATE
REVISED
SEE ALSO T38/01/6 + 8

10' 5' 0 10' 20' 30' 40' 50' 10' to 1"

New Zealand Electricity
FOLDER: T25/3F1

	BY	CHECKED	DATE
DRAWN	C Baxter		10·77
SUP'D	D. Dunn		10·77
Recommended			22/11/77

SMJ Smith, Project Engineer

APPROVED 23-11-77, Resident Engineer

Ministry of Works and Development
POWER
J J Chesterman, Chief Engineer
N.C. McLEOD Commissioner

TEKAPO B POWER PROJECT

TEMPORARY TAILRACE DETAILS - SHEET 1

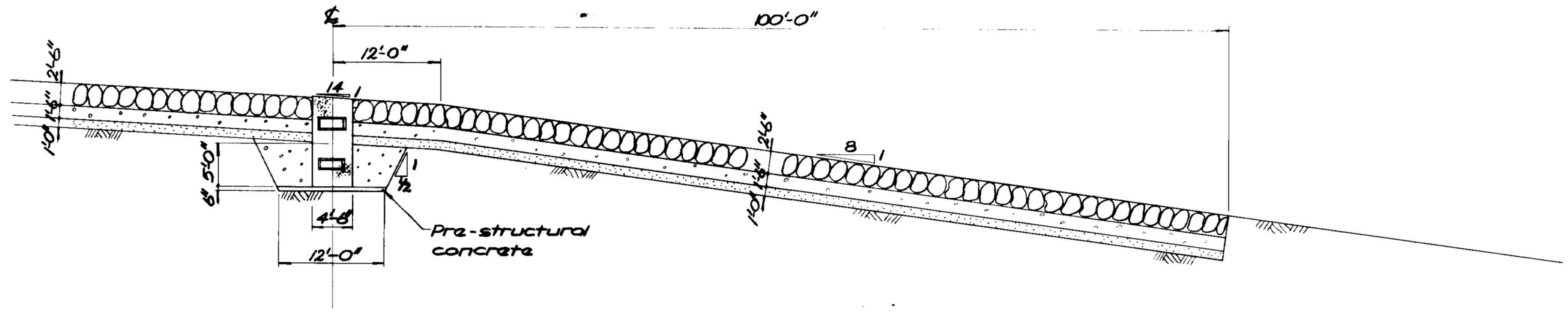
ORIGINAL SCALES 10' to 1"
FILE
TWIZEL

JOB	CODE	SHEET	REVISION
T38/01/7			X

AMENDMENTS	BY	APPD.	DATE
X AS BUILT - Supersedes L4438/7	CGB		

ORIGINAL SIZE A1

P.W. 482-A1
Rev. JAN. 1977
LOCAL OR TRACING No.

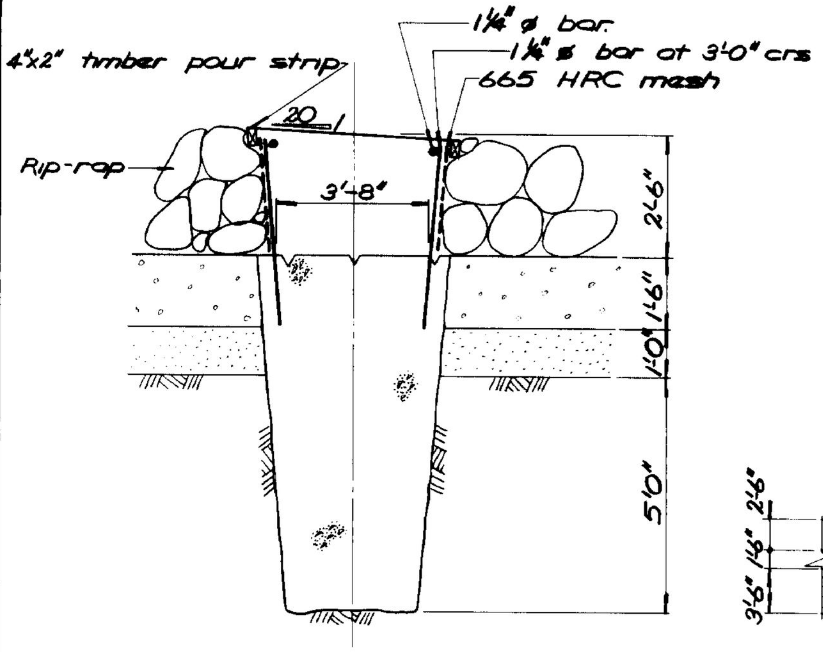


SECTION G-G

Scale: 10' to 1"

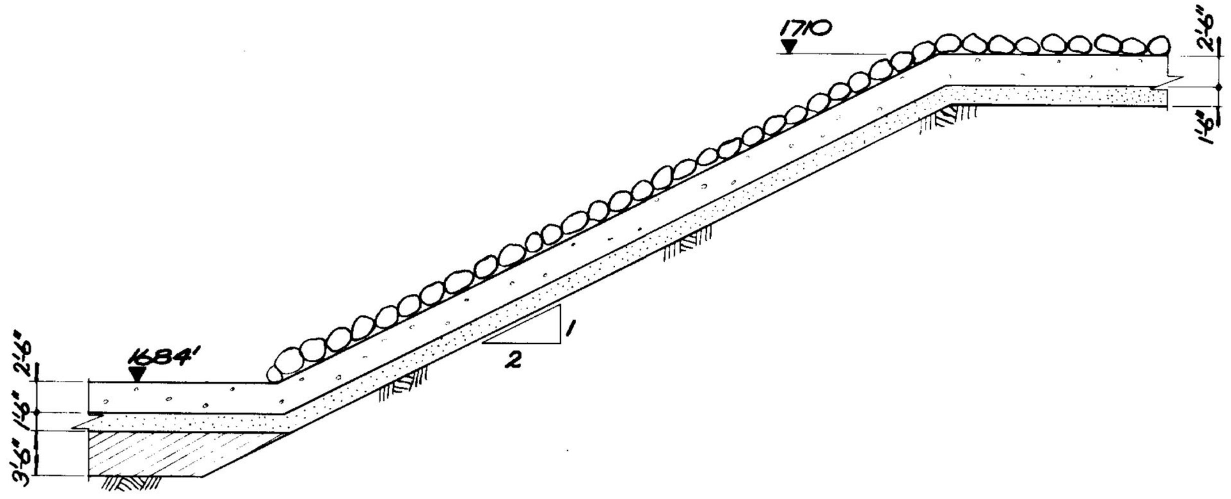
Note: This rib was formed with standard shutters

Note: This dwg. to be read in conjunction with T38/01/6 & 7



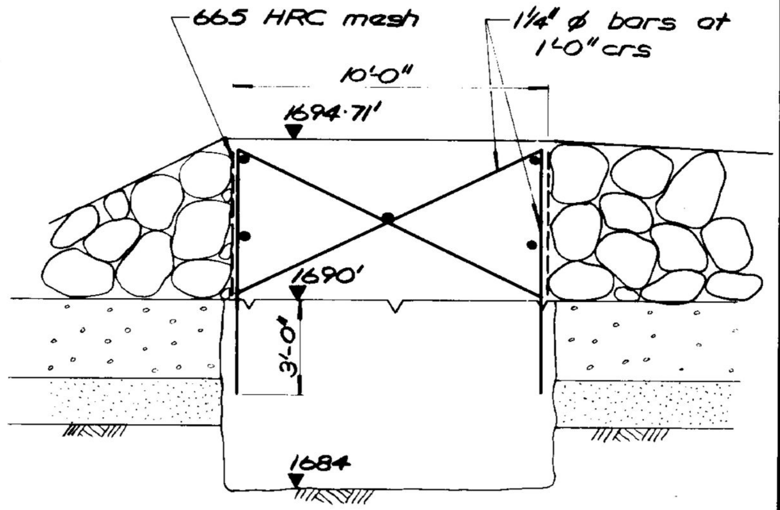
SECTION D-D

Scale: ⅜" = 1'-0"



SECTION E-E

Scale: 10' to 1"



SECTION F-F

Scale: ¼" = 1'-0"

Note: All horizontal reinforcing to be 1¼" ø bars

CERTIFIED **AS BUILT** DRAWING
ENGINEER 25/11/77 DATE
~~NO CHANGE~~
REVISED
SEE ALSO T38/01/6 & 7

New Zealand Electricity
FOLDER: T25/3F1

⅜" = 1'-0" ¼" = 1'-0" 10'-0" to 1"

Supersedes L4438/7			
X / AS BUILT	CGB		
AMENDMENTS	BY	APP'D	DATE

	BY	CHECKED	DATE
DRAWN	C. Baxter		10-77
SUP'D			10-77
Recommended:			22/11/77

SMJ Smith, Project Engineer
APPROVED 23-11-77 Resident Eng

Ministry of Works and Development
POWER — J J Chesterman, Chief Engineer
N.C. McLeod, Commissioner

TEKAPO B POWER PROJECT
TEMPORARY TAILRACE
DETAILS - SHEET 2

ORIGINAL SCALES: AS SHOWN
FILE
TWIZEL
T38/01/8
SHEET
REVISION X

P.W. 483-A 2
Rev. JAN 1976
LOCAL OR TRACING No.
1:1 1:2 1:5 1:25