QUEENSTOWN LAKES DISTRICT COUNCIL
Private Bag 50072, Queenstown 9348, New Zealand
QUEENSTOWN, 10 Gorge Road | P: +64 3 441 0499
WĀNAKA, 47 Ardmore Street | P: +64 3 443 0024
www.qldc.govt.nz

2 April 2026

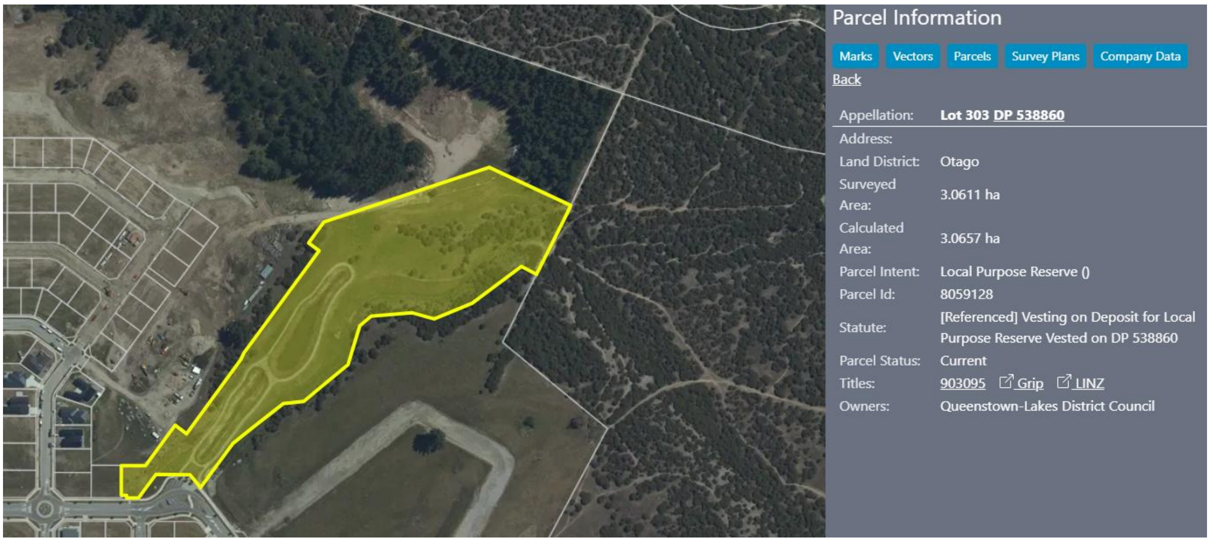
[redacted]
C/- [redacted]
Sent via email to [redacted]

Request for Official Information
LG26-0067 - Lot 303 DP 538860

Dear [redacted],

Thank you for your request for information held by the Queenstown Lakes District Council (QLDC). On 4 March 2026 you requested the following information under the Local Government Official Information and Meetings Act 1987 (LGOIMA):

1. **A copy of any abatement notice/s received by the Queenstown Lakes District Council relating to Lot 303 DP 538860, and**
2. **Any documents (including meeting minutes, correspondence, and plans) relating to any proposed development of the below land, including any upgrades to stormwater infrastructure on Lot 303 DP 538860.**



QLDC RESPONSE

In response to your request, we consulted with the QLDC Property and Infrastructure Directorate.

Decision to release information

1. **A copy of any abatement notice/s received by the Queenstown Lakes District Council relating to Lot 303 DP 538860, and**

Please find attached the abatement notice received by QLDC relating to Lot 303 DP 538860.

Please note that the enclosed link will expire on 10 April 2026, 8:21 AM (UTC+12:00) Auckland, Wellington.

2. **Any documents (including meeting minutes, correspondence, and plans) relating to any proposed development of the below land, including any upgrades to stormwater infrastructure on Lot 303 DP 538860.**

Following your recent conversation with a Council officer, we have identified the attached documents as relevant to your request:

- Project Charter – Rockabilly Gully Erosion Protection (Stormwater)
- Rockabilly Gully Erosion Remediation Project - Progress update
- Rockabilly Gully Technical Options Report

Please note that minor redactions have been made. The reasons for withholding this information are outlined below.

If these documents do not fully address the information you are seeking, or if we have misunderstood your request, please let us know and provide further clarification.

Please note that the enclosed link will expire on 1 May 2026, 5:40 PM (UTC+12:00) Auckland, Wellington.

Decision to withhold information

QLDC has good reason under sections 7(2)(f)(ii) and 7(2)(g) of the LGOIMA for withholding part of the information requested. QLDC consider it is necessary to withhold the requested information on the basis of the following grounds:

- Section 7(2)(f) - maintain the effective conduct of public affairs through—
  - ii. the protection of such members, officers, employees, and persons from improper pressure or harassment.
- Section 7(2)(g) – the withholding of the information is necessary to maintain legal professional privilege.

Section 7(2)(f)(ii) of the LGOIMA protects individuals—such as members, officers, and employees—from improper pressure or harassment, ensuring the effective conduct of public affairs. This provision safeguards public officials from undue influence or intimidation, enabling them to perform their duties impartially and effectively.

In this case, we have provided the roles of individuals and withheld the names and contact emails, to avoid the risk of harassment. The protection of these individuals from improper pressure or harassment takes precedence over the public interest in disclosing specific information. Releasing the names and contact emails could potentially lead to undue pressure or intimidation, which could undermine the effective conduct of public affairs and harm the safety and well-being of those involved. Therefore, withholding this information is justified to preserve both individual rights and the integrity of public offices.

Section 7(2)(g) of the LGOIMA permits the withholding of official information to maintain legal professional privilege. This privilege safeguards the confidentiality of legal advice, ensuring that it can be sought and provided freely without concern of disclosure, thereby supporting effective legal counsel and preserving the integrity of legal processes.

In this case, part of the information in this category is subject to legal privilege. Section 7(2)(g) of the LGOIMA recognises the protection of legal professional privilege as a valid ground for withholding information, underscoring the essential role of confidentiality in legal decision-making. This safeguard is essential for ensuring effective legal counsel and preserving the integrity of legal processes.

Public interest considerations

In assessing whether to withhold information, QLDC carefully evaluates the public interest—particularly whether disclosure would enhance transparency, accountability, or informed public engagement. This assessment includes weighing those benefits against the potential harm that could result from releasing the information.

QLDC acknowledges the public interest in transparency, accountability, and good governance in local authority decision-making, and is committed to releasing information wherever possible. However, in this case, QLDC considers that the public interest in disclosure is outweighed by the need to protect individuals from improper pressure or harassment; and to protect legal professional privilege. Releasing this information could reasonably be expected to expose Council officers, or other affected parties to improper pressure or harassment; and to prejudice the ability of QLDC to obtain confidential legal advice and to maintain its legal position.

Accordingly, QLDC has determined that sections 7(2)(f)(ii) and 7(2)(g) of the LGOIMA apply. No overriding public interest has been identified that would justify release of the withheld information.

Right to review the above decision

Note that you have the right to seek an investigation and review by the Ombudsman of this decision. Information about this process is available at www.ombudsman.parliament.nz or freephone 0800 802 602.

If you wish to discuss this decision with us, please contact Naell.Crosby-Roe@qldc.govt.nz (Director Democracy Services).

We trust that the above information satisfactorily answers your request.

Kind regards,

[redacted]

Democracy Services Team

Corporate Services | Queenstown Lakes District Council
P: +64 3 441 0499
E: informationrequest@qldc.govt.nz

Otago Regional Council

Our Reference: A1539372

File number: EN.RMA.21.0081

1 October 2021

Queenstown Lakes District Council
10 Gorge Road
PO Box 20072
Queenstown 9348

Attention: Ulrich Glasner

Dear Ulrich

Abatement Notice: Stormwater Discharge

Thank you for your time on the phone on Monday of this week regarding this matter. As discussed, please find attached an abatement notice (issued under the authority of sections 322(1)(a) of the Resource Management Act 1991).

As you are aware it relates to the discharge of storm water from Queenstown Lakes District Councils (QLDC) Reticulated Storm Water network onto land, in breach of the Regional Plan: Water for Otago and the Resource Management Act 1991.

The ORC appreciates the planned remediation work that the QLDC have scheduled but believe there is a requirement for this notice to be issued as a formal notice of our expectation that the discharge becomes compliant.

If you do not comply with this notice, you may be prosecuted under section 338 of the Resource Management Act 1991 (unless you appeal, and the notice is stayed as explained below).

You have the right to appeal to the Environment Court against the whole or any part of this notice. If you wish to appeal, you must lodge a notice of appeal in form 49 with the Environment Court within 15 working days of being served with this notice.

An appeal does not automatically stay the notice and so you must continue to comply with it unless you also apply for a stay from an Environment Judge under section 325(3A) of the Resource Management Act 1991 (see form 50). To obtain a stay, you must lodge both an appeal and a stay with the Environment Court.

You also have the right to apply in writing to the Otago Regional Council to change or cancel this notice in accordance with section 325A of the Resource Management Act 1991.

Yours sincerely

Tami Sargeant

Tami Sargeant
Manager Compliance
Encl

Otago Regional Council

File: EN.RMA.21.0081

ABATEMENT NOTICE

Section 324, Resource Management Act 1991

To: Queenstown Lakes District Council

Physical Address: 10 Gorge Road, Queenstown 9013

The Otago Regional Council gives notice that you must take the following actions:

Cease discharging stormwater from Queenstown Lakes District Councils (QLDC) Storm water network within the Hikuwai Subdivision (refer Attachment A) at Joe Brown Drive, Wanaka, onto land, namely land in the Hikuwai Reserve and into the Clutha River/Mata-Aū in circumstances which cause:

- Erosion, land instability, sedimentation or property damage on land within the Hikuwai Reserve.
- Stormwater, after reasonable mixing, creating a conspicuous change in the colour or visual clarity of the water in the Clutha River /Mata-Aū.

The location to which this abatement notice applies is:

Storm water reserve – Joe Brown Drive, Wanaka (See Attachment A)

The property owned by:	Queenstown Lakes District Council
Legal Description:	Lot 303 DP538860
Map Reference:	NZTM **E**1296302 **N**5046058

You must comply with this abatement notice by:

30 November 2021 and continue to comply thereafter.

This notice is issued under section **322(1)(a)** of the **Resource Management Act 1991**.The reasons for this notice are:

1. QLDC owns and operates a stormwater network that is located within the Hikuwai Subdivision.

2. Stormwater discharges from that network and onto land within the Hikuwai Reserve and then into the Clutha River /Mata-Aū.

3. QLDC does not own or occupy the the Hikuwai Reserve, it is Department of Conservation land.

4. The discharge from QLDC's stormwater network is causing erosion, land instability and property damage to land within the Hikuwai Reserve (refer photographs attached – Attachment B).

5. This discharge contravenes rule 12.B.1.8(c) of the Regional Plan: Water for Otago.

6. The discharge from QLDC's stormwater network is resulting in a conspicuous change in colour and visual clarity of water to the Clutha River/Mata-Aū.

7. This contravenes rule 12.B.1.8(d) of the Regional Plan: Water for Otago.

8. QLDC does not hold any resource consent that authorizes the discharge.

9. The discharge is not expressly allowed by a National Environmental Standard or other regulations, a rule in a regional plan, or a resource consent.

10. Based on the above information, you have been acting in breach of section 15(1)(b) of the Resource Management Act 1991.

11. To be compliant, you must cease the discharge of stormwater onto land in a manner which is resulting in:

    a. Erosion, land instability and property damage to an adjacent property, namely the Hikuwai Reserve; and
    b. a conspicuous change in colour and visual clarity of the water in the Clutha River /Mata-Aū.

If you do not comply with this notice, you may be prosecuted under section 338 of the Resource Management Act 1991 (unless you appeal, and the notice is stayed as explained below).

You have the right to appeal to the Environment Court against the whole or any part of this notice. If you wish to appeal, you must lodge a notice of appeal in form 49 with the Environment Court within 15 working days of being served with this notice.

An appeal does not automatically stay the notice and so you must continue to comply with it unless you also apply for a stay from an Environment Judge under section 325(3A) of the Resource Management Act 1991 *(see* form 50). To obtain a stay, you must lodge both an appeal and a stay with the Environment Court.

You also have the right to apply in writing to the Otago Regional Council to change or cancel this notice in accordance with section 325A of the Resource Management Act 1991.

The Otago Regional Council authorized the enforcement officer who issued this notice.

Its address is:

OTAGO REGIONAL COUNCIL
PRIVATE BAG 1954
70 STAFFORD STREET
DUNEDIN
PHONE: (03) 474 0827
FACSIMILE: (03) 479 0015

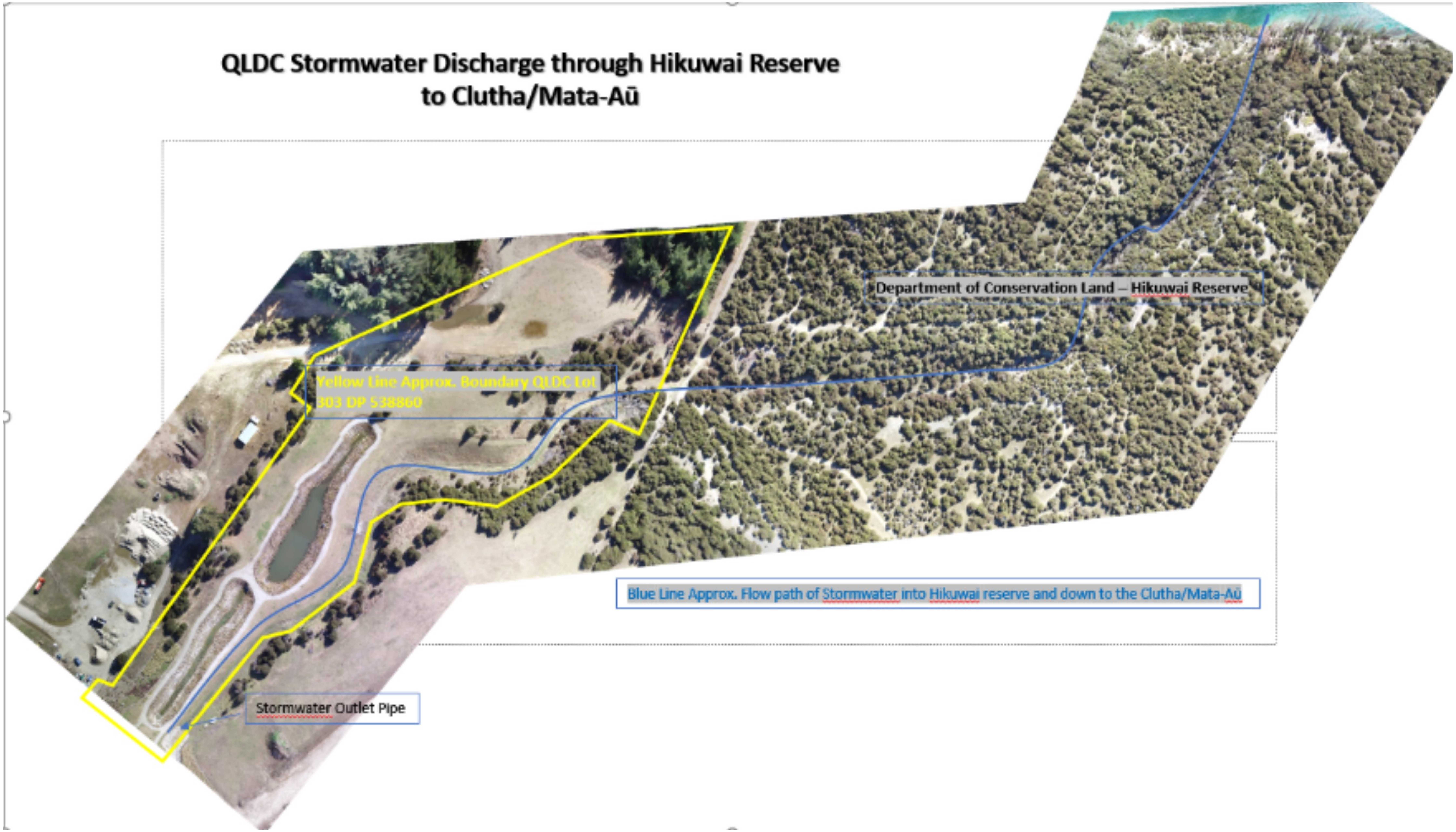
The enforcement officer is acting under the following authorization:

WARRANT NO: 2019/46 dated **4th November 2019** issued by the **OTAGO REGIONAL COUNCIL** to **Mark Payne,** authorizing him to issue abatement notices under **SECTION 322(1)(a)** and **(1)(b)** of the **RESOURCE MANAGEMENT ACT 1991**.

………………………………..
Mark Payne
Senior Environmental Officer - Investigations

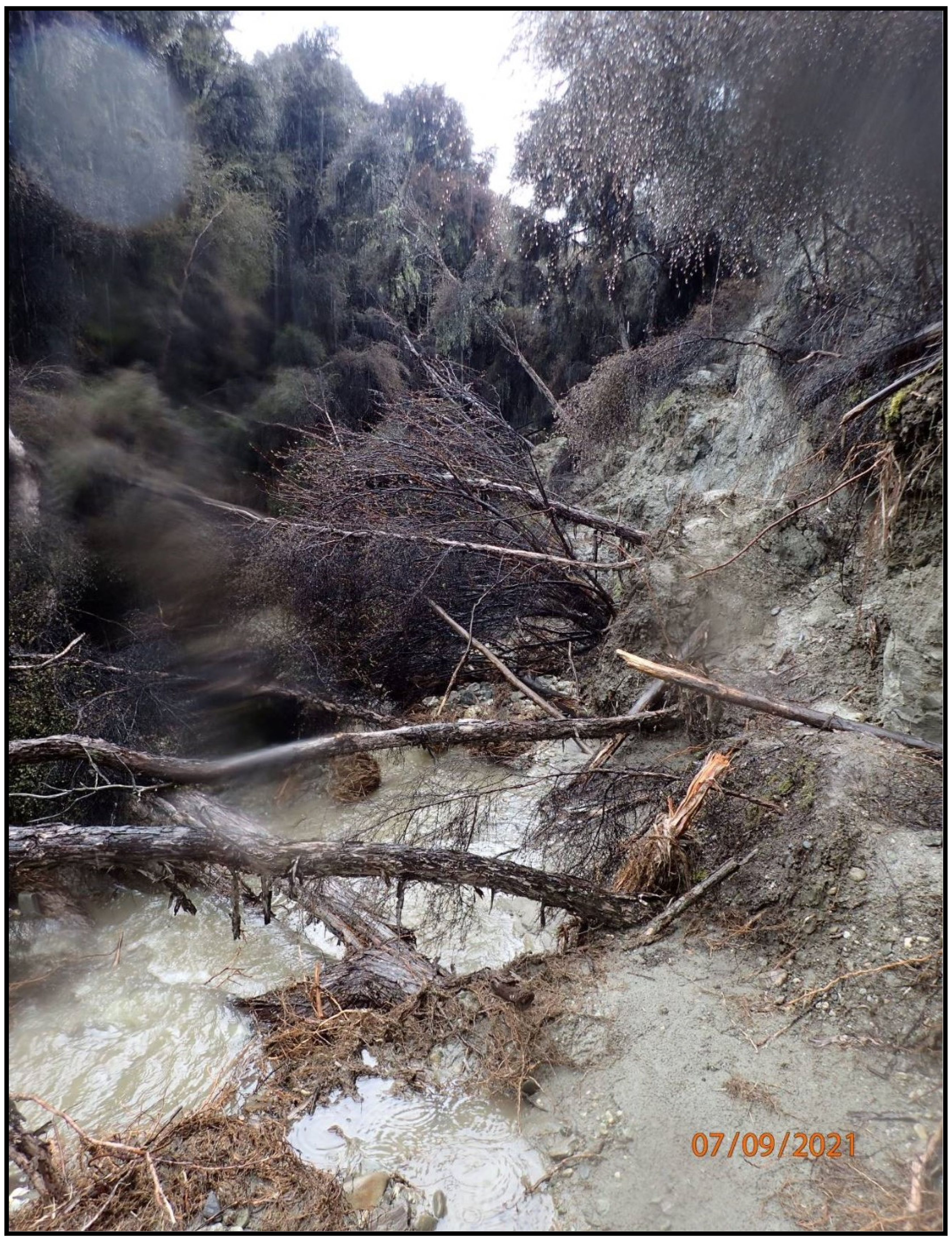
Date: 01/10/2021

Attachment A



Otago Regional Council

Attachment B



PROJECT CHARTER
Rockabilly Gully Erosion Protection (SW)

QUEENSTOWN LAKES DISTRICT COUNCIL

THIS PROJECT CHARTER DEFINES THE KEY ATTRIBUTES OF A PROJECT, INCLUDING THE PROJECT'S OBJECTIVES, SCOPE, AND RESOURCES.

The first iteration of this Project Charter is to be produced when (a) the first business case for the project is approved, or (b) when the project is handed over to the PMO for delivery – whichever falls first. Thereafter, the Project Charter is to be updated at each project gateway.

GENERAL INFORMATION			
Project Name	Rockabilly Gully Erosion Protection (SW)		
Description	Stormwater flow through Rockabilly Gully is causing significant erosion and currently contravenes the *Resource Management Act 1991* and rules of the *Regional Plan: Water for Otago* (Abatement Notice EN.RMA.21.0081). A built solution (yet to be determined) is required to achieve compliance with permitted activities under the regional plan.		
Capital Plan (CP) Code	CP0007765	**Project (T1) Code**	001374
Project Manager	[redacted]	**Accountable Manager**	[redacted]
Project Folder	PI000144 Rockabilly Gully Erosion (SW)		

PROJECT STATUS AND PREVIOUS APPROVALS			
Current phase	Early stage planning/development of an options report and concept design report		
Latest gateway approval	Project Initiation	**Date approved**	7.06.2023
Approval was granted to undertake procurement of a design consultant to enable problem state identification and options analysis.			
Latest design approval	Not yet applicable	**Date approved**	N/A
Beca has been engaged to produce a Technical Options Report (including concept design of preferred option).			
Latest business case approval	N/A	**Date approved**	N/A
At the time of initiating the project, a 'light single stage business case' was indicated for the project. Due to a change in anticipated procurement approach (see comments below) only a Technical Options Report is being developed for the project at this time. The Project Manager, in liaison with the project's Accountable Manager, should reassess the need for a supporting business case following completion of the Technical Options Report. Irrespective of whether a business case is produced during early design stages, a short supporting Implementation Business Case should be completed (award by internal resources if possible) prior to construction contract.			
Procurement approvals	PDR – Technical Option Report	**Date approved**	15.12.2023
P&I originally intended to do a closed, competitive tender for the production of a Technical Options Report and supporting Single-Stage Business Case for this project. Informal market sounding was conducted and supporting procurement plan and RFP documentation prepared. [redacted]			

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PROJECT TEAM

Name	Organisation	Project Role/Responsibilities
[redacted]	QLDC – Infrastructure Delivery & Engineering	Project Manager
[redacted]	QLDC – Infrastructure Delivery & Engineering	Primary Technical Reviewer
[redacted]	QLDC – Infrastructure Delivery & Engineering	Secondary Technical Reviewer
[redacted]	QLDC – Infrastructure Delivery & Engineering	Background advisory/SME (as required)
[redacted]	QLDC – Infrastructure Operations	Operations SME
[redacted]	QLDC – Infrastructure Operations	Compliance SME
[redacted]	QLDC – Investment & Support Services	Business Case Support (if/as required)

CASE FOR INVESTMENT

Need/ opportunity	Rockabilly Gully is located on Department of Conservation land in North Wanaka between the Hikuwai development and the Clutha River/Mata-Au. Stormwater collected within upstream developments is discharged at the top of the gully, travelling overland through a QLDC stormwater reserve before entering the Hikuwai reserve and subsequently flowing through the gully and into the river. The stormwater flow through the gully is causing significant erosion and resulting in sediments entering the river. The current stormwater management arrangements contravene rules 12.B.1.8(c) and 12.B.11.8(d) of the Regional Plan. It is also in breach of section 15(1)(b) of the Resource Management Act 1991. Appendix A includes a high-level plan of the catchment and flow path (figure 1), a schematic of the current stormwater infrastructure (figure 2), and images showing erosion within the gully (figure 3). It is critical that QLDC intervenes as a priority to ensure compliance is achieved, and further environmental degradation of the area is prevented. The need for investment has been recognised as a priority in both Annual Plan 2023-24 and the Adopted 2024 Long Term Plan. Investment directly contributes to the following QLDC infrastructure objectives: • Provide infrastructure services that reliably protect people from harm (the Rockabilly Gully area affected features popular walking and cycling trails) • Prevent contaminants associated with infrastructure services from entering the natural environment (QLDC is in receipt of an abatement notice for the stormwater discharge) • Identify and prioritise opportunities for environmental regeneration (preventing further erosion will enable the area to naturally regenerate over time)
Investment objectives	1. Deliver a compliant and enduring stormwater management solution for the Rockabilly Gully area as soon as practicably possible, no later than the end of the 2026/27 summer construction season.
Benefits	1. Erosion is mitigated within Rockabilly Gully *KPI: Significant reduction in current rates of erosion within Rockabilly Gully similar to the predevelopment environment during primary storm events* 2. Enhanced performance against regulatory requirements and standards *KPI: Removal of current ORC abatement notice* *KPI: No further abatement notices or enforcement activity following completion of the project*

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PROJECT SCOPE

Essential	A solution that achieves compliance with permitted activities under the regional plan and any reasonably anticipated strengthening of rules. The solution must be enduring (i.e. have a useful life of over ten years, giving regard to any further potential development within the upstream catchment).
Optional	Remediation/regeneration of the gully.
Excluded	Management of stormwater flows not reasonably anticipated to occur within the surrounding catchment.

DELIVERABLES

Key milestone/deliverable	Est. Start	Est. Finish
Procurement of Technical Options Report provider	Aug 2023	Sep 2024
Options Report	Sep 2024	Feb 2025
Concept Design Report	Feb 2025	Jun 2025
Subsequent milestones to be developed following confirmation of preferred option.		

BUDGET

Approved budget?	Yes	**Source**	2024 Long Term Plan		
Total	**FY 25**	**FY 26**	**FY 27**	**FY 28**	**FY 29**
$5,255,552	$500,325	$4,755,227	$-	$-	$-
Project estimate	$5,023,545	**Source**	WT Budget Estimate (Jan 2023), QLDC adjusted		
Variance to budget	-$232,007 (covers inflation applied to funding year)				
An updated project budget estimate will be prepared by Beca as part of the Technical Options Report.					

KEY RISKS, DEPENDENCIES, CONSTRAINTS, AND ASSUMPTIONS

Risks	• Cost to execute the project is higher than the available project budget due to unforeseen needs and/or insufficient contingency, resulting in the need to reprioritise other expenditure to support a budget increase. • Design and supporting project approvals cannot be completed/secured ahead of the 2025/26 summer construction season delaying works a further year (it is expected that construction will not be possible in the winter season). Delays may result in increased costs or further enforcement action due to sustained non-compliance. • Contract market (professional services, contract works) is unable to support the project due to insufficient capacity/capability/interest, resulting in an inability to deliver the project within an acceptable timeframe and budget.
[redacted]	[redacted]
Constraints	• It is expected that construction will need to occur during the summer season. Design and any necessary planning permissions will need to be closely managed to maintain the project's programme.

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	• The solution must comply with the Regional Plan, RMA, and any other relevant legislation or regulations. • Physical works are expected to be subjected to a range of constraints including access to site, topography, consenting, erosion and sediment controls, and interested stakeholders.
Assumptions	It has been assumed that the flows into the gully from upstream of the QLDC stormwater reserve are the key contributors to the erosion and sediment discharge only (i.e. rainfall within the Hikuwai reserve is not contributing to the issue). As such, wider works within the Hikuwai reserve are not being considered.

LAND & PLANNING PERMISSIONS

Requirement (known/anticipated)	Status	Source
Approval from DOC to work within their land	Not yet progressed	N/A
Undertake an assessment of consents required to complete the works	Not yet progressed	N/A

DOC are aware of the issues in Rockabilly Gully, however contact needs to be re-established during the design and optioneering phase.

STAKEHOLDERS

Engage	Inform	Monitor
• Department of Conservation	• QLDC Legal Office • Bike Wanaka (Hikuwai Loop)	

OTHER INFORMATION/COMMENTARY

Project record keeping: The P&I Drive folder requires some attention (it mixes PMO and non-PMO folder structure conventions). It is difficult to navigate and there appear to be duplicate documents. It is recommended that final documents be uploaded to ECM and linked to the P&I drive, and working documents organised into a logical folder structure. Document links within project control documentation such as this Project Charter will need to be updated as reorganisation of files occurs. The new P&I Business Support team may be available to assist with this task.

Cameras and potential installation of flow meters: QLDC have had cameras installed to monitor the outlets into the Gully from both the Northlake Subdivision and the Hikuwai Subdivision. In tandem with these cameras, work is underway to explore the possibility of installing flow meters within these two outlet pipes to further inform onsite flows and correlate these flows with rainfall data.

PROJECT CHARTER APPROVAL

Name/Team	Approval Type	Signature	Date
[redacted], Investment & Support Services Manager	ISS Endorsement	[redacted]	19.11.2024
[redacted], Infrastructure Programme Manager	PMO Endorsement	[redacted]	19.11.2024
P&I Leadership Team	**Final Approval**		**27.11.2024**

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SUPPORTING INFORMATION SCHEDULE [section work in progress]			
Section	**Information required**	**File name (attach or link to source)**	**Provided**
Status	Background briefing note	N/A	☐
	Previous gateway approval	PI000144 Rockabilly Gully Initiation Form	✓
	Most recent business case	Not yet applicable (revisit after Options Report)	☐
	[redacted]	[redacted]	✓
	Draft RFP documentation for next procurement	Not yet applicable	☐
Budget	Source of current estimate	Quantity Surveyor estimate: PI000144 Rockabilly Gully Budget Estimate Jan2023 Adjusted by QLDC for LTP24 development: PI000144 24LTP Budget Input	✓
Risks etc.	Risk register	Risk and Issues Register	✓

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APPENDIX A

Figure 1: Rockabilly Gully flow path

Figure 2: Existing stormwater infrastructure

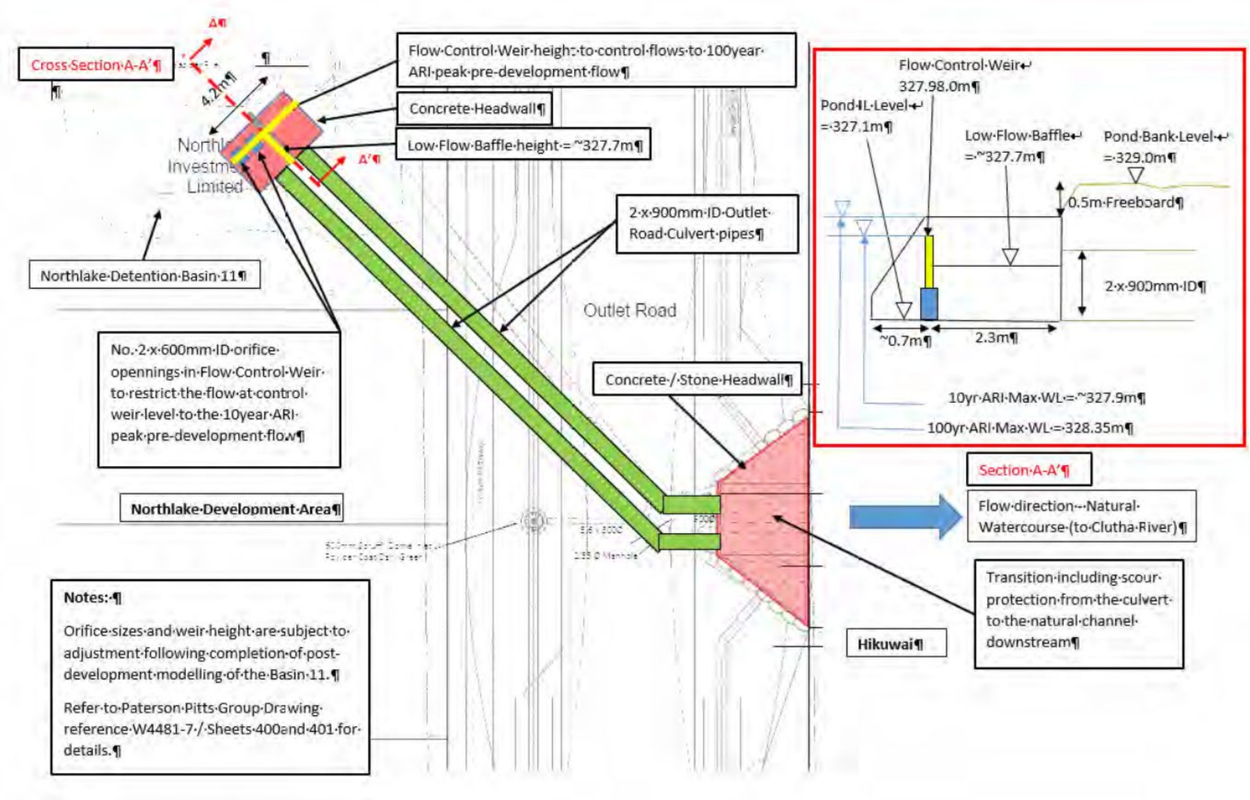


Figure 3: Images of main slip site within Rockabilly Gully

Rockabilly Gully Erosion Remediation Project - Progress update

WUCCB 04 March 2026

[redacted] & [redacted]

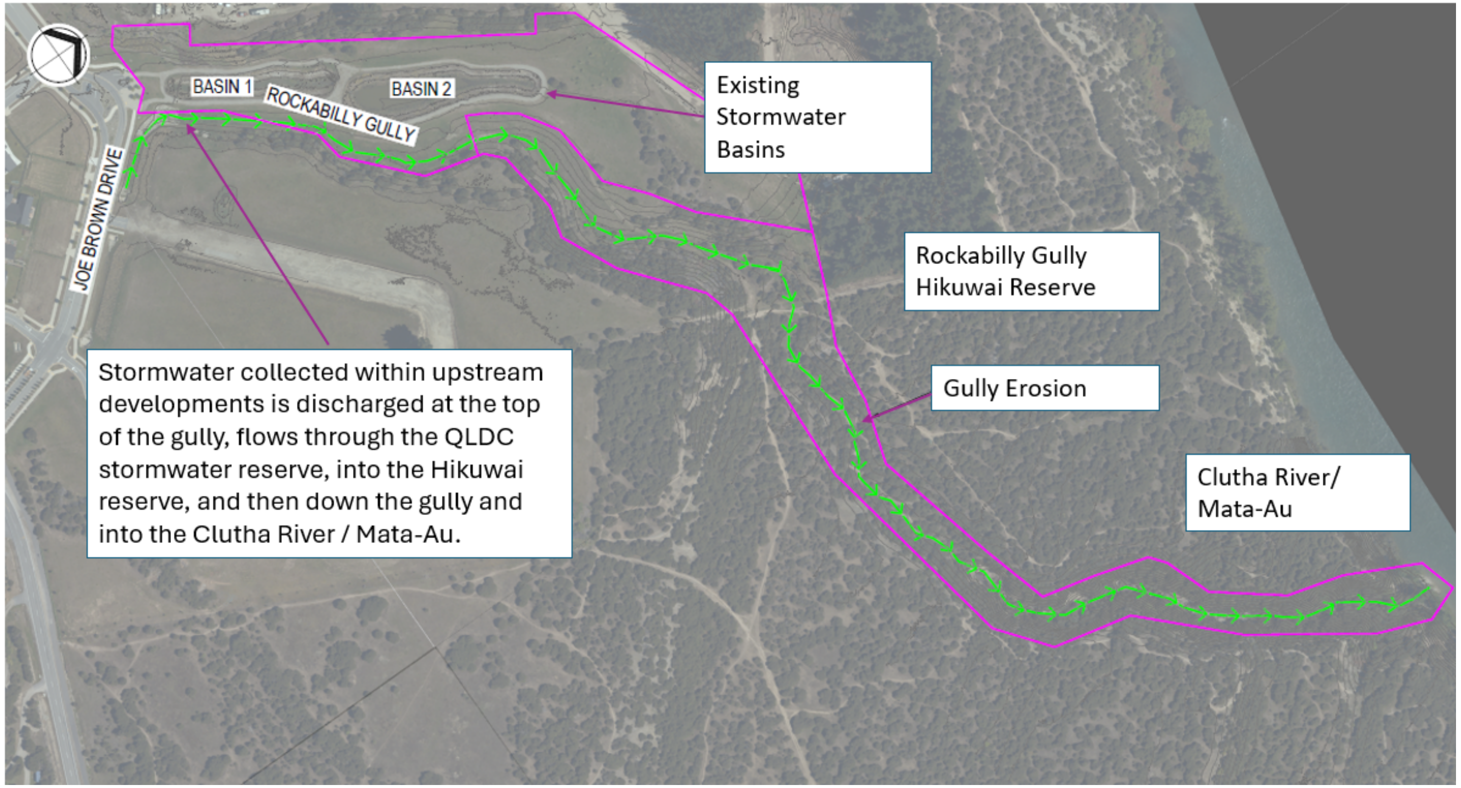
Project Manager & Engineering Manager

QUEENSTOWN LAKES DISTRICT COUNCIL

Project Purpose

Purpose of the Project

To deliver a long-term stormwater management solution that mitigates erosion in Rockabilly Gully, improves how stormwater enters and flows through the Hikuwai Reserve, and into the Clutha River/ Mata-Au, and ensuring compliance with regional regulatory requirements.



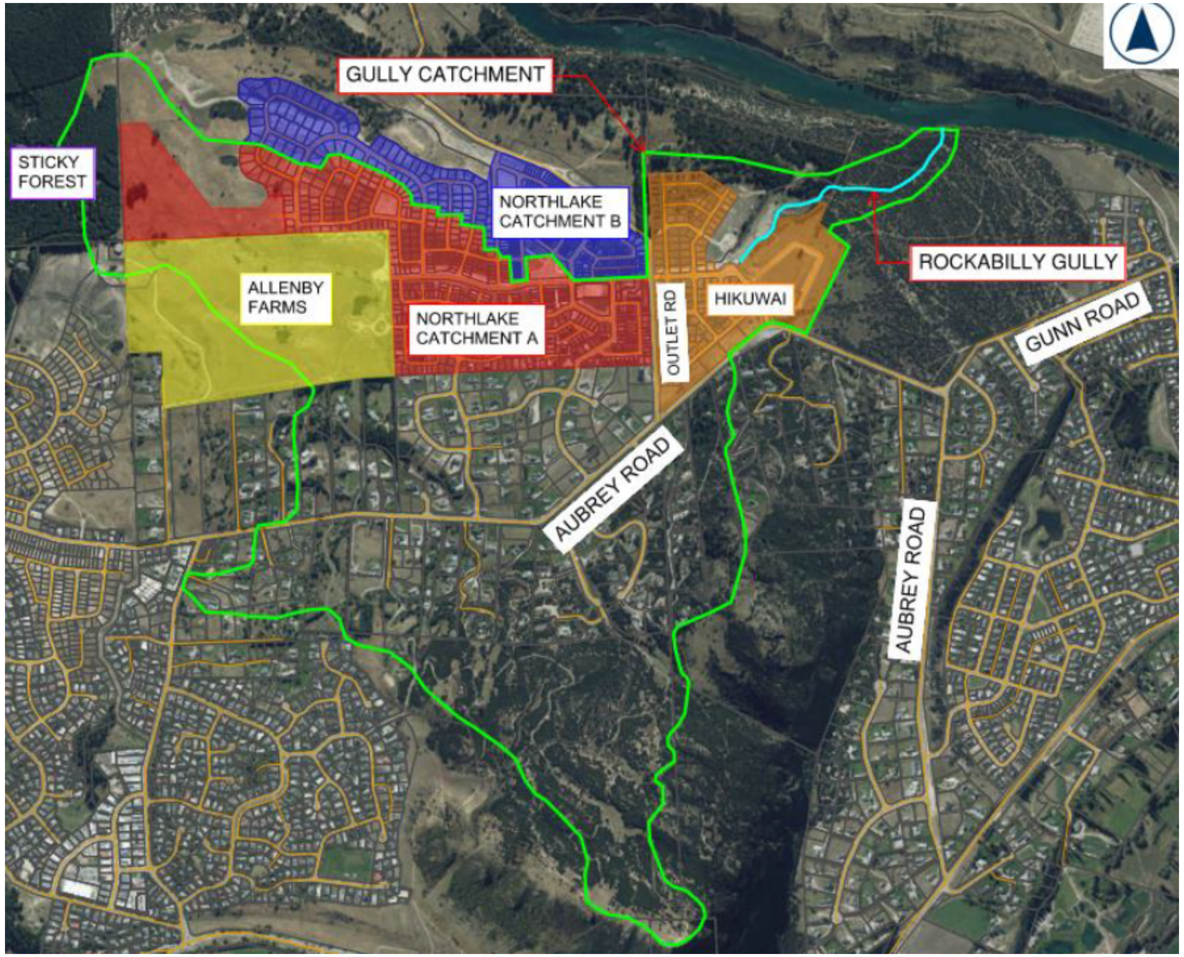
A key component of this work includes the modification of the Hikuwai stormwater ponds and redirection of Northlake (upstream) stormwater flows to reduce the impact of urban runoff on this highly valued natural environment.

Project Background

- Rockabilly Gully is a natural gully and ephemeral waterway located within the Hikuwai Reserve, between Wānaka and Albert Town.
- Historically, the surrounding catchment was predominantly rural, with limited impervious area contributing to stormwater runoff. In the late 1990s and early 2000s, rural residential development began on both sides of Aubrey Road. Since 2016, development has increased significantly.
- With more roofs and paved areas in the developed catchment, more stormwater runs off during rainfall than in the natural catchment before development, leading to more flow in the gully. This is particularly so in smaller rainfall events that happen several times each year.
- The increased flows from these smaller, more frequent rainfall events are a big driver of progressive erosion in the gully. Larger rainfall events also contribute to erosion, but these events occur infrequently.
- In line with historic design guidelines, the existing stormwater network was designed to buffer flows in larger rain events i.e., 10-year ARI and greater. Currently, flows from the Northlake stormwater basins drain direct to the gully.
- In October 2021, the Otago Regional Council (ORC) issued an abatement notice requiring Council address the erosion in the gully and sediment entering the Clutha River / Mata-Au.

Wider Stormwater Catchment

QUEENSTOWN LAKES DISTRICT COUNCIL



- The total Rockabilly Gully catchment is 290 hectares, which includes the 98 ha Northlake (Catchment A) and Allenby Farms developments and the 18 ha Hikuwai development.
- In smaller, more frequent events, the runoff into Rockabilly Gully is dominated by the runoff from the Northlake basins which drain directly to the gully, rather than the remainder of the catchment.
- In the larger events, the contribution from the remainder of the catchment (i.e. lower density residential and rural areas) is larger than the contribution from the Northlake and Hikuwai developments.
- The existing Northlake and Hikuwai Basins were designed to provide storage to buffer flows in large events so that the post-development peak flows are no more than pre-development. This is referred to as flood attenuation storage.
- The project will not improve the flood attenuation in the larger storm events.

Preferred Solution

QUEENSTOWN LAKES DISTRICT COUNCIL

The project comprises two key areas of work:

1. **Stormwater Basin Modifications:**

   Upgrades to reduce the flows in the gully in the smaller, more frequent rain events.

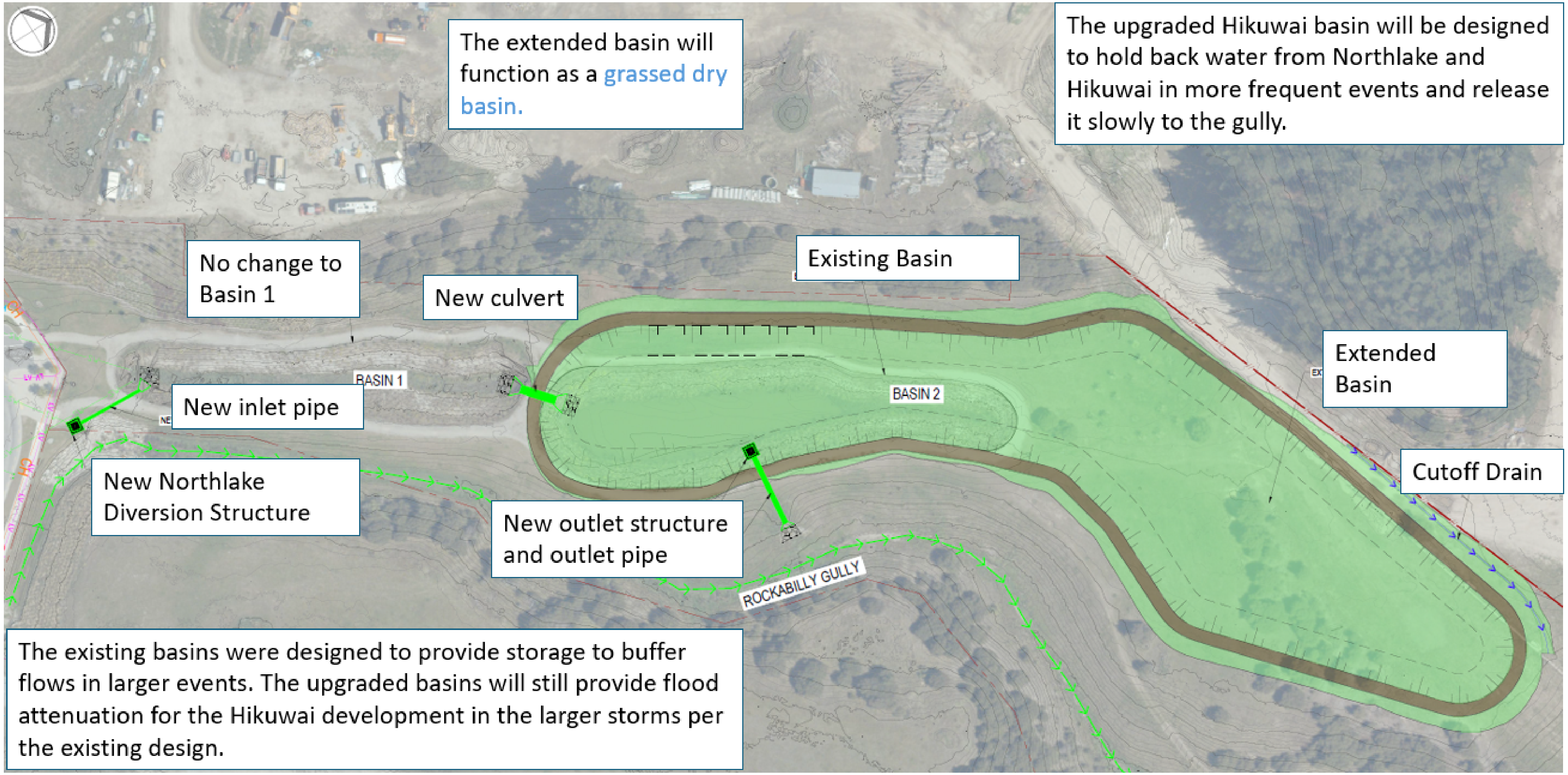
   - Divert those smaller, more frequent flows from the Northlake development into the Hikuwai basin.
   - Significantly increase the storage in the Hikuwai basins (to more than three times the storage of the existing basin).
   - Change the design of the outlet to the gully to change the way the basins operate; to hold back stormwater in more frequent events and release it slowly to the gully.

2. **Gully Erosion Remediation Works:**

   There is existing erosion in Rockabilly Gully which is progressively getting worse. While the basin works will improve the flow regime in the gully compared to the current situation, the works will not restore the natural flow patterns. Additional mitigation measures, including targeted rock armouring and localised channel stabilisation, are recommended to limit further erosion within the gully.

Scope – New Stormwater Basin

QUEENSTOWN LAKES DISTRICT COUNCIL



Scope – Gully Remediation

The works in the gully are separated into five areas:

1. Upper Gully (QLDC Reserve)

- Repair erosion and reestablish grass cover below the basins.

2. Upper Gully (DOC Land)

- Shape channel and add rounded gravels/cobbles for a consistent bed.

Scope – Gully Remediation cont.

QUEENSTOWN LAKES DISTRICT COUNCIL

3. Main Drop / Scour Basin (DOC Land)

- The main drop is an area of major damage within the reserve that needs repairing and made more robust to limit further erosion in this area.
- Shaping and rock armour lining this area with quarried rock designed to be stable in large events i.e. approx. 20 -50 year ARI event.
- Install energy dissipation basin and downstream rock-lined channel.
- Minimise earthworks and vegetation removal; allow for natural revegetation and planting.

Scope – Gully Remediation cont.

QUEENSTOWN LAKES DISTRICT COUNCIL

4. Lower Gully (DOC Land)

- Supplement natural bed with imported gravels and cobbles.
- Use angular rock for grade control in constrained areas.
- Install toe protection to prevent erosion and slope failure.
- Trim overhanging material; limit vegetation removal and earthworks.

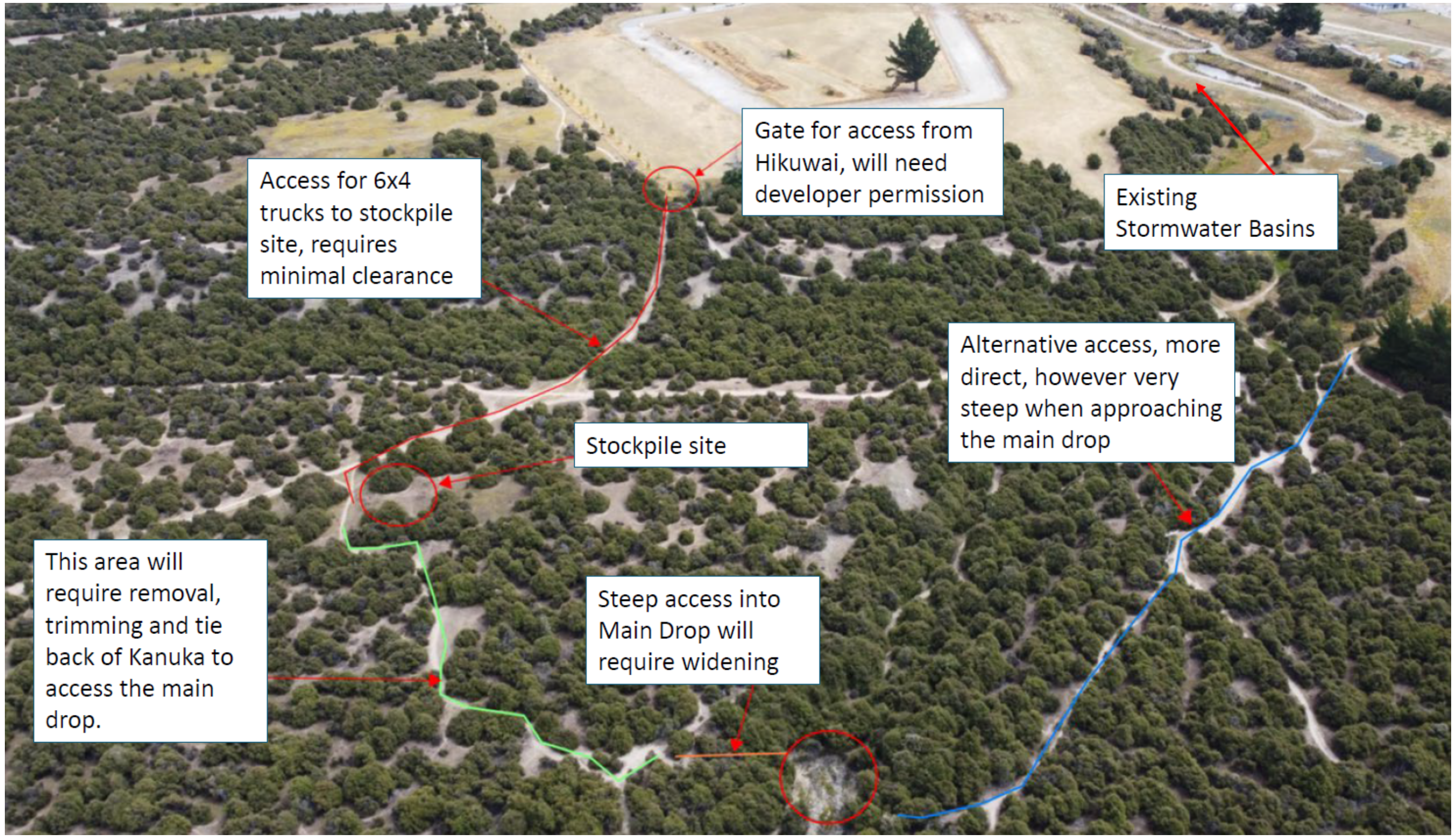
5. Outlet Track Crossing (DOC Land)

- Install angular rock at crossing for grade control.

Constructability Report

QUEENSTOWN LAKES DISTRICT COUNCIL

- Steep valley terrain and dense tree cover significantly constrain access for undertaking remediation works.
- To address these challenges, a constructability report has been commissioned to inform project programme, cost, access arrangements, and the suite of technical assessments required for consenting, including Environmental Management Plans, Ecological Assessments, and Landscape Plans.



Project Progress Summary

QUEENSTOWN LAKES DISTRICT COUNCIL

Northlake Attenuation Ponds

Restrictor plates have been installed on the outlet structures to retain more flow during smaller, high-frequency rainfall events.

Technical Options Report

Options Identification and Assessment is complete.

Key issues and a long list of options were developed and refined through a series of workshops to identify the preferred option for each area.

Concept Design

Draft Concept Design is complete.

Overland Flow Path and Floodplain mapping updates are finished, and hydraulic modelling for the extended stormwater basin is underway.

Completed Technical Work

Geotechnical investigations, Environmental Management Plan (Basin), and the Constructability Report are complete.

Ongoing Work

Topographical survey, Landscape Plan, and Ecological Assessment are currently in progress.

Consenting

QUEENSTOWN LAKES DISTRICT COUNCIL

Resource Consents & Approvals

The following consents and approvals are required for the project:

- **Resource Consent - QLDC**
  For modifications to the existing stormwater basins located within QLDC reserve land.
- **Resource Consent - QLDC and ORC**
  For erosion mitigation works within the gully, including installation of rock lining and armouring.
- **DOC Concession**
  To carry out erosion mitigation works within the gully within DOC land, supported by an Ecological Assessment and Lizard Management Plan.

Next Steps

- Lodge Earthworks Consent for the basin works (late Feb 2026).
- Hold pre-application meetings with ORC and DOC to seek early feedback on the Concept Design and confirm requirements for Detailed Design.
- Use this feedback to refine the design, confirm technical reporting needs, and finalise the consent application package.

Project Implementation

QUEENSTOWN LAKES DISTRICT COUNCIL

The project will be delivered as two separable portions.

1. Basin modifications: Construction of the new stormwater basin is anticipated to commence June 2026.

2. Gully remediation: this element of the project requires a more complex consenting pathway including Landscape and Ecological Assessments. Physical works are anticipated to commence late 2026/early 2027.

Benefits of two stage approach:

- Enables early commencement of priority works while progressing with the consents process and supporting technical reports required for the gully remediation.
- Reduces erosion risk.
- Maintains project momentum.

Questions

Sensitivity: General

Rockabilly Gully Erosion Mitigation

Technical Options Report

Prepared for Queenstown Lakes District Council
Prepared by Beca Limited

14 August 2025

Contents

Appendices

Revision History

Revision Nº	Prepared By	Description	Date
1	[redacted]	Draft for QLDC review	30/05/2025
2	[redacted]	Final	14/08/2025

Document Acceptance

Action	Name	Signed	Date
Prepared by	[redacted]	[redacted]	14/08/2025
Reviewed by	[redacted]	[redacted]	14/08/2025
Approved by	[redacted]	[redacted]	14/08/2025
on behalf of	Beca Limited		

Executive Summary

Beca Limited (Beca) has been engaged by Queenstown Lakes District Council (QLDC) to provide a Technical Options Report for mitigating erosion in Rockabilly Gully. This report is to summarise the work to date (up the completion of Stage 4 - Short-List Options) and recommend a preferred option to be advanced to Concept Design.

The options development and assessment has generally followed the approach set out in the project scope, which had the following stages, with a series of targeted workshops:

1. Initiation and Information Gathering
2. Problem Identification and Future State Requirements
3. Initial Options Identification and Assessment
4. Development and Assessment of Short-Listed Options
5. Concept Design Package for Preferred Option

The work completed at each stage, including the changes from the original process and key decisions made, are summarised in Sections 4 Initial Investigations to Section 7 Short List Options of this report.

At the completion of Stage 4, the preferred option for mitigating erosion in the gully comprises the works summarised in the table below. More detail on this preferred option, including sketches showing the proposed works, is provided in Section 8 Preferred Option.

Table A Preferred Option Summary

Area	Description
Upstream stormwater system (QLDC land)	In the QLDC reserve at the top of the gully: ■ Maximise the storage in the stormwater basins, by extending the existing main Hikuwai stormwater basin to the northeast utilising the available area within the reserve. ■ Combine the Northlake and Hikuwai systems at the upstream end of the reserve. ■ The modified main basin is to be a grassed dry basin (i.e. drain down between events). ■ Construct new hydraulic/outlet controls on the basins to: – Reduce the flows discharged in smaller (more frequent) events compared to existing, to more closely mimic pre-development peak flows in small events. – Maintain a similar regime to the current design in larger (infrequent) events, i.e. aim to limit peak flows to pre-development flows in the 2-year, 10-year, 20-year and 100-year ARI events. ■ Include a forebay to improve the ability to remove sediment.
Upper gully, adjacent to stormwater basins (QLDC land)	■ No works are proposed within the channel adjacent to the existing basins.
Upper gully, below stormwater basins (QLDC land)	■ In targeted areas of existing erosion, fill erosion damage and endeavour to reestablish grass cover.
Upper gully (DOC land)	■ In targeted areas, excavate/shape channel and add rounded river gravel and cobbles to provide a more consistent gravel bed waterway. ■ At the mountain bike track crossings, using larger quarried rock to establish a local grade control point, with rounded river gravels over the top. ■ Where the waterway breaks out of the main channel and flows down the mountain bike track, fill the existing eroded track and modify the track to have a bed like a natural gravel waterway but still be rideable (however, no works are proposed to prevent flows down this track from occurring).

Area	Description
Main drop / scour basin (DOC land)	■ Using larger quarried angular rock, graded to interlock and sized to resist erosion and movement, provide a rock-lined chute (or stepped rock structure/slope) at the existing drop location to control flows over the existing drop and protect the drop from further regression upstream. This would be designed for at least a 10-year ARI event plus freeboard. ■ Waterway works will be required, above the drop, to channelise flow towards the chute/stepped rock slope and will require vegetation removal. ■ Trim of overhanging material/ground as required. ■ Provide a rock-lined energy dissipation basin downslope of the chute/stepped rock slope to reduce velocities and a flatter rock-lined channel immediately downstream, transitioning to existing channel shape and grade. ■ Limit the magnitude of earthworks and vegetation removal. ■ Provide for limited ground reshaping and planting or natural reestablishment of vegetation outside the footprint of the rock works.
Lower gully (DOC land)	■ Add to existing natural bed with imported river gravels and larger cobbles/boulders to reduce the imported material volume. ■ Some large angular quarried rock will be used in the bed at selected locations to provide grade control particularly where the existing gully width constrains flows. ■ In targeted areas, toe protection works with quarried rock lining extending part way up lower part of slopes to reduce future toe erosion and slopes slumping into the waterway. ■ Trim overhanging and precarious material but limiting extent of clearing and vegetation removal. ■ Provide for limited ground reshaping and planting or natural reestablishment of vegetation outside the footprint of the rock works.
Lower gully, immediately upstream of Outlet Track (DOC land)	■ No works proposed.
Outlet Track crossing and confluence with Clutha River/Mata-Au (DOC land)	■ Large angular quarried rock where the gully crosses the Outlet Track to provide grade control. ■ No works proposed downstream of Outlet Track.

This approach has a reduced scope of works in the upper and lower gully to try to balance targeting of the worst erosion, toe scour, and slope failure risks while keeping effects on landform, vegetation and natural character to a practicable minimum within the DOC reserve. With this approach, there is the potential for ongoing erosion to occur. This approach will also require more on-going maintenance in the upper and lower gully than a more engineered approach would require.

We recommend the following next steps:

- QLDC to engage with its key stakeholders (e.g., ORC, DOC, iwi, and mountain bike track/reserve users) and confirm the preferred option to be advanced to Concept Design.
- In parallel with QLDC engaging with its stakeholders, Beca is to advance the design of the upstream stormwater works/basin upgrade works and carry out hydraulic modelling to test the design and understand relative performance of the proposed works compared to the existing/base case and the pre-development case, across a range of events. This would include both larger events (e.g., 2, 10, 20 and 100 year ARI events) and more frequent events (e.g., those which occur several times per year).
- Once QLDC gives approval to proceed, Beca is to develop the remainder of the Concept Design for the preferred option (i.e., the basin upgrades and gully works) including Concept Design drawings, carrying out cost estimates, a carbon assessment, and a planning/consenting requirements assessment, and identifying further investigations required to develop design.
- Beca to work with QLDC to develop a draft programme including design, engagement with stakeholders, consenting and approvals, procurement, and design.

1 Introduction

Beca Limited (Beca) has been engaged by Queenstown Lakes District Council (QLDC) to provide a Technical Options Report for mitigating erosion in Rockabilly Gully. This report is to summarise the work to date and recommend a preferred option to be advanced to Concept Design.

2 Scope

Beca's scope of this project is set out in the contract with QLDC *C-25-016 Rockabilly Gully Technical Options Report, 3 Waters Design Services Panel*, dated 30 August 2024, and in particular Appendix A of the contract, the Beca proposal letter to QLDC, *Rockabilly Gully Technical Options Report*, also dated 30 August 2024.

The stages and deliverables from the Beca proposal letter are set in the table below.

Table 2-1 Project Stages and Deliverables

Stage	Deliverables
1. Initiation and Information Gathering	▪ Desktop Geotechnical Assessment
2. Problem Identification and Future State Requirements	▪ Document existing erosion and likely causes, and Future State Requirements
3. Initial Options Identification and Assessment	▪ Long-list Options Assessment Workshop minutes, assessment table and resulting short-list of options
4. Development and Assessment of Short-Listed Options	▪ High-level Concept Design of short-list options. ▪ Short-list Options Multi-Criteria Analysis Workshop minutes, assessment table and preferred option ▪ Options Report, summarising work to date
5. Concept Design Package for Preferred Option	▪ Draft Concept Design report, for QLDC review ▪ Final Concept Design report, addressing QLDC comments

This report is the Options Report which summaries the work to date; up to the completion of Stage 4.

3 Background

3.1 Location

Rockabilly Gully is a natural gully and ephemeral waterway, discharging to the true right/southern bank of the Clutha River/Mata-Au, north of Mount Iron between Wānaka and Albert Town. Refer Figure 3-1.

Figure 3-1 Rockabilly Gully location. (Base map: LINZ Topo50, not to scale)

The location of the gully and its approximate catchment extent is shown in Figure 3-2.

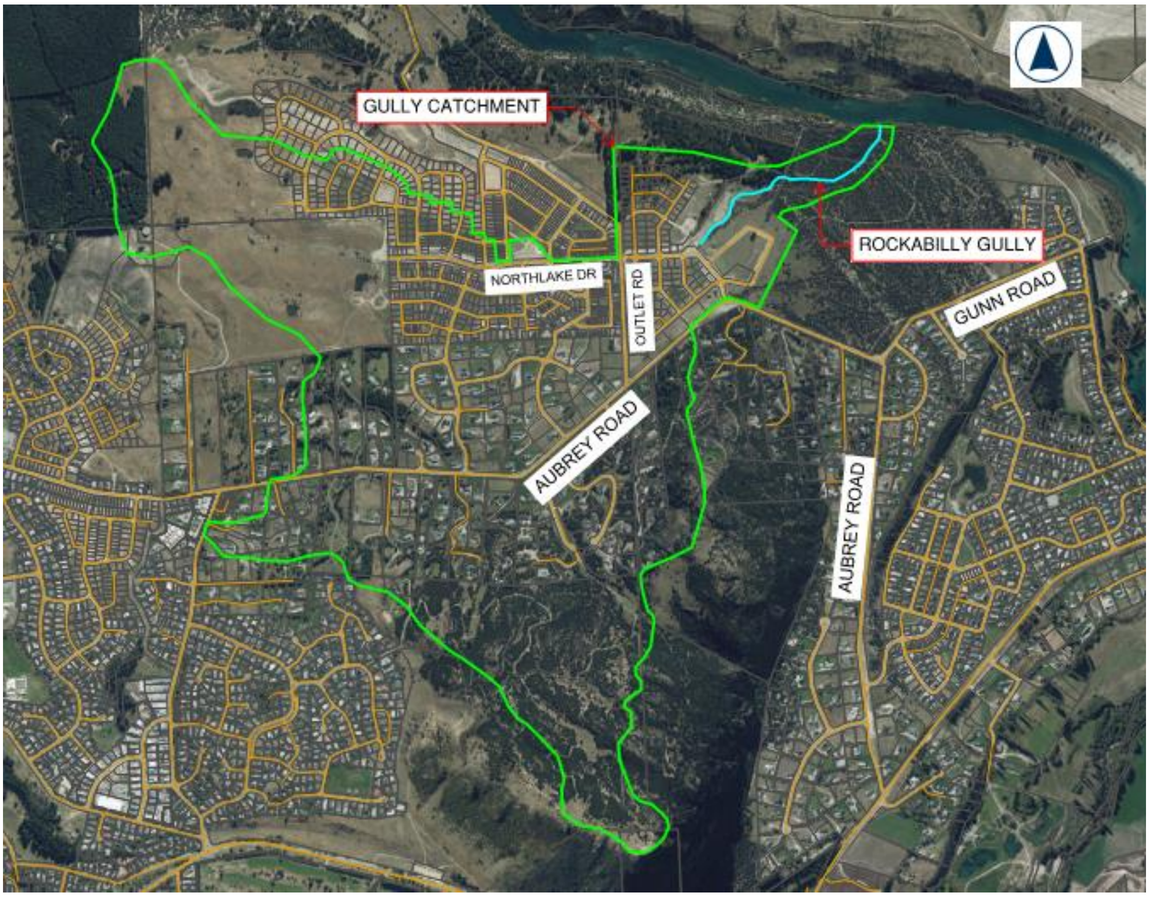


Figure 3-2 Rockabilly Gully catchment. (Base map: QLDC GIS, not to scale)

3.2 Development in the Catchment

In the late 1990s/early 2000s, rural residential development began on both sides of Aubrey Road, resulting in relatively small increases in impervious area. Since 2016, there has been much more significant development in the catchment with large increases in impervious area, with residential and commercial development in the Northlake development, and residential development in the Hikuwai development.

Further residential development is also underway with the upper stages of Northlake and the Allenby Farms/WHF Properties development currently in construction. There may also be future development in the Sticky Forest, part of which is within the gully catchment.

Development in the catchment has, and continues to, increase the impervious area (e.g., roads, roofs, and hardstand) and decrease the pervious area (e.g., grass, gardens, and parks). This increase in impervious area changes the nature of the stormwater runoff for any given rainfall event, resulting in more frequent runoff, larger volumes of runoff, and higher peak flow rates, contributing to erosion in the gully.

3.3 Reported Erosion, DOC Complaint, and ORC Abatement Notice

We have seen reports of silty water, erosion, and scour in Rockabilly Gully from October 2019 onwards. (We are not aware of when these issues commenced.) On 7 September 2021, the Department of Conservation (DOC) wrote a formal complaint to QLDC about the stormwater erosion damage to the Hikuwai Reserve. On 1 October 2021, Otago Regional Council (ORC) issued QLDC with an abatement notice for erosion in the Hikuwai Reserve and discharge of sediment to the Clutha River/Mata-Au.

4 Initial Investigations

4.1 Purpose

The purpose of this stage of the project was collate existing information and carry out other investigations to provide key information to understand the issue and inform the options identification and assessment.

4.2 Collate Existing Information

At the start of the project Beca collated existing information, including land use zoning and existing development, LiDAR, aerial photography, catchment information, existing stormwater system asset data, cadastral boundaries and land ownership, and our previous stormwater peer review advice regarding Northlake. This data was used to approximate the catchment extent shown in Figure 3-2 and understand catchment and discharge characteristics. It was also used to understand the topography, zoning, land ownership and site constraints.

We also undertook a desktop geotechnical assessment and site visit to understand likely geotechnical conditions. The desktop assessment included collating available geotechnical data from the NZ Geotechnical Database, available geotechnical reports from previous nearby development, published geological maps, and Beca's in-house geotechnical database. The results of the geotechnical assessment are presented in the *Rockabilly Gully Geotechnical Desktop Assessment* report.

4.3 Topographic Data/LiDAR

Our survey team download the existing QLDC 2022 LiDAR data, processed this and provided it to the project team both digitally and as PDF plans of contours and long section along the gully.

4.4 Site Visit

On 25 September 2024 a walk-over the site was carried out to inspect the erosion in the gully. This was attended by QLDC staff ([redacted]) and Beca staff ([redacted]).

4.5 Geotechnical Conditions

From the Beca, *Rockabilly Gully Geotechnical Desktop Assessment*[1], the following key geotechnical considerations relating to the project were noted:

- Rockabilly Gully has been formed by natural processes associated with the stream eroding and 'cutting down' the gully. Observed scour and instability/slips of the gully slopes in the middle and lower part of the gully suggests that this has been exacerbated in recent times.
- Based on available geotechnical data, the ground conditions are inferred to vary between the area of the stormwater ponds and the gully. The available investigation data around the stormwater ponds generally indicates topsoil, overlying varying deposits of outwash gravels and glacial till.
- The ground conditions in the gully are inferred from the exposures observed during the site visit which generally indicates topsoil, of variable thickness and not present in all locations, overlying a veneer of glacial outwash gravels. The outwash gravels are also of variable thickness (typically varying from 0.5 m

[1] Beca, *Rockabilly Gully Geotechnical Desktop Assessment*, revision 1, dated 23 October 2024.

and up to 2 m thick), and in some places not present. The outwash gravels were underlain by glacial meltwater lake deposits comprising thinly bedded silts and clays.

- The lake deposits present at the site were likely deposited in a ‘low energy’ environment and were observed to be highly dispersive, of very low strength and susceptible to erosion. While some erosion of the outwash gravels has been observed, they will be far more resistant than the underlying lake deposits.
- Lake deposits are observed in the upstream face of the main scour basin and therefore the erosion is expected to continue to regress upstream at this location unless controls are put in place.
- Where lake deposit slopes have been subject to toe scour and the upper part of the slope overhangs, these would be expected to be subject to slips with time. In many places, the meltwater lake deposits do naturally stand relatively steep or vertical.

5 Current Erosion and Future State Requirements

5.1 Purpose

The purpose for this stage of the project was to:

- Summarise the existing gully erosion issue and likely causes of the erosion.
- Have an online meeting (Future State Requirements Workshop) with key QLDC staff to discuss QLDC’s ‘*non-negotiable*’ requirements and ‘*nice to have*’ aspirations for the project.
- Document the outcome of this discussion and use it to inform the options identification assessment.

5.2 Current Erosion

The current erosion in the gully was discussed in the Future State Requirements Workshop (refer Section 5.3) and is summarised in the Beca letter to QLDC, *Rockabilly Gully – Current Erosion and Future State Requirements,* dated 22 November 2024, a copy of which is included in Appendix B.

The following figures show examples of the current state of erosion (late 2024) in various areas of the gully.

Figure 5-1 Example of upper gully (QLDC land)

Figure 5-2 Example of upper gully (DOC land)

Figure 5-3 Upper gully – breakout into mountain bike track

Figure 5-4 Adjacent to upper gully - erosion of mountain bike track

Figure 5-5 Main erosion basin / drop, looking upstream

Figure 5-6 Main erosion basin / drop, looking downstream

Figure 5-7 Example of lower gully

Figure 5-8 Example of lower gully just upstream of Outlet Track and confluence with Clutha River/Mata-Au

5.3 Future State Requirements Workshop

On 4 November 2024, a Future State Requirements Workshop was held via Teams to discuss QLDC's '*non-negotiable*' requirements and '*nice to have*' aspirations for the project. This was attended by QLDC staff and Beca staff. The considerations included:

- Expected performance of the stormwater system.
- Expected performance of erosion mitigation in the gully.
- Acceptable maintenance for stormwater system and gully.
- Landscape and environmental requirements.
- Recreation requirements including for walking and mountain biking tracks.
- Any other important requirements identified by QLDC or stakeholders.

The outcomes of this Future State Requirements Workshop were then summarised in a Beca letter to QLDC, *Rockabilly Gully – Current Erosion and Future State Requirements,* dated 22 November 2024, which included the workshop presentation as an attachment. A copy of this letter (including the workshop presentation) in included in Appendix B.

This letter sets out:

- The current erosion issue and likely causes.
- The future state requirements for the project as discussed and agreed at the workshop with QLDC held on 4 November 2024.

The letter describes the gully catchment, development in the catchment, and existing erosion. It notes that Rockabilly Gully is a natural gully which, prior to development in the catchment, would have formed by natural processes of downcutting and erosion through these soils, and associated toe scour and bank instability. It also notes that the development in the catchment is likely to have accelerated the erosion in the gully. The letter also sets out the agreed project scope, key external and internal stakeholders, and requirements for the gully and upstream system. These are summarised in the following section5.3.1.

5.3.1 Agreed scope, key stakeholders, and requirements

Scope and key stakeholders

- The project should mitigate the erosion in the gully and the discharge of sediment to the Clutha River/Mata-Au.
- Key external stakeholders are mana whenua, ORC, DOC, and users of reserve/mountain bike community. QLDC to engage with these stakeholders as appropriate.
- Key internal QLDC stakeholders are reserves and three waters operations team. QLDC PM to engage internally with them.

In the gully and reserve

- The gully does not need to be reinstated to its pre-development form.
- Given existing natural slopes in the general area are steep or vertical in places, it is reasonable to leave gully slopes steep or vertical and it is not necessary to demonstrate a certain stability. Slope 'overhangs' should be removed where instability has occurred.
- The health and safety of track users' needs to be considered, especially where tracks lead to dead ends at the eroded gully.
- Works will be needed to stabilise the main scour basin/drop in the gully where the waterway drops into it and to mitigate further cutting back of the scour basin. This will likely require rock protection or other engineered approach.
- The mitigation works in the gully should be sympathetic with the existing environment in the reserve.

- Fallen/dead kanuka and any debris should be cleared from the gully as part of the mitigation works. Where possible, the dead kanuka should be reused within the reserve (e.g. mulched or used to form barriers).
- Works in the gully should provide for a track (or tracks) crossing the gully near the main scour basin/drop.
- Planting should be carried out in the reserve to mitigate the loss of vegetation from the erosion and from any works. This may be at a different location.
- Permits and approvals will be required from DOC for works within the gully.
- Following the completion of the mitigation works, the gully should be as low maintenance as possible.
- It may be acceptable to have some erosion in the gully in larger events (e.g., 10-year event), which would require maintenance work afterwards.

Upstream of the gully

- Modifications to the existing stormwater system upstream (e.g. modifications to existing basins and/or new basins) should be part of the mitigation works.
- This should include considering opportunities for soakage.
- It is unlikely that stormwater works upstream will be able to mimic pre-development hydrology, as without large-scale soakage or reuse there will be additional runoff volume post-development compared to pre-development.
- Stormwater basins should be designed to drain down (i.e. be dry basins).
- Maintainability of stormwater assets needs to be considered as part of the design.

General

- An adaptive management approach can be considered.

6 Long-list Options

6.1 Purpose

The purpose of this stage of the project was to:

- Identify an initial long-list of options or approaches.
- Agree criteria with QLDC to assess the options against using a simple traffic light system (or similar comparative tool).
- Have a Long-list Options Assessment Workshop, to carry out an assessment of the options against the agreed criteria.
- Arrive at a long-list options assessment table and resulting short-list of options.

6.2 Options Identification

Building on the work carried out in the previous stages to understand the issues, site and constraints, and define the project requirements, the Beca team developed a list of potential options.

6.3 Options Workshop

A Long-list Options Workshop with QLDC was held on 27 November 2024 at the Beca Queenstown office and on Teams, to discuss and assess the long-list of options. The workshop was attended by a multi-disciplinary team of QLDC, DOC, and Beca staff with the intention to:

- Confirm the future state requirements;
- Work through and discuss long-list options (identified by the Beca team ahead of the workshop);
- Assess these long-list options against criteria; and
- Short list of (three) options to be advanced to the next stage.

The minutes of this workshop and copy of the presentation are included in Appendix C.

In the workshop, the future state requirements were confirmed, and options were discussed for five different areas:

- Upstream stormwater system (i.e., works on the Northlake or Hikuwai stormwater systems to modify the stormwater discharge to the gully)
- Within the gully:
  - Upper gully (i.e. upstream of the main drop)
  - At main erosion basin/drop
  - Lower gully (i.e. downstream of the main drop)
- Reinstatement in and around gully

These areas are shown schematically in Figure 6-1.

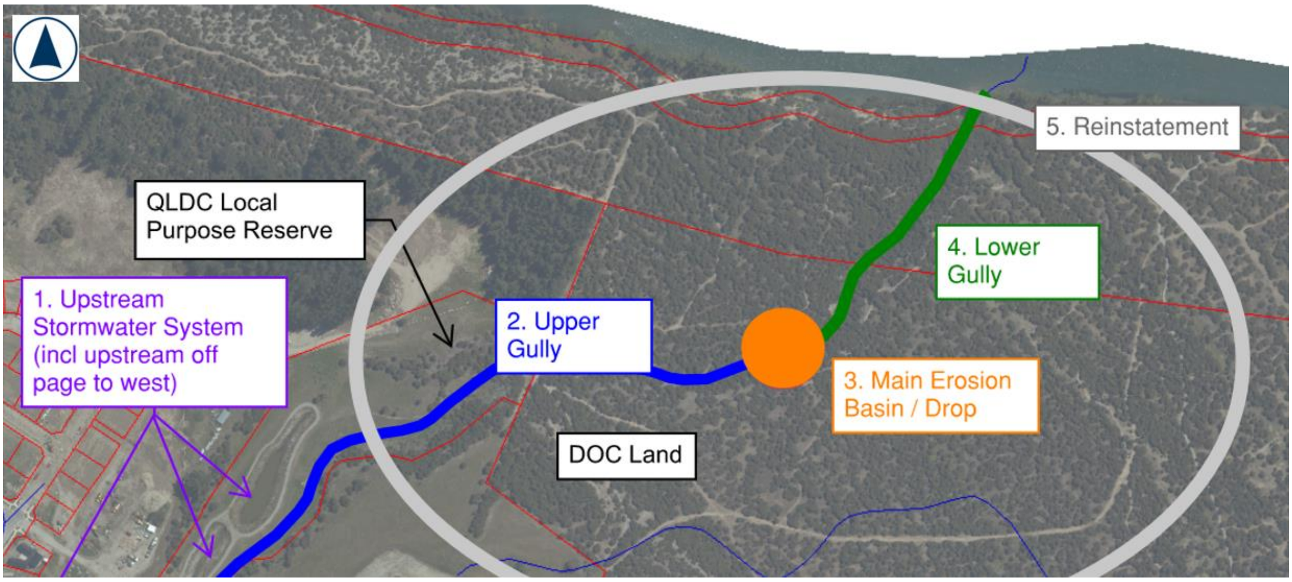


Figure 6-1 Five project areas used for identifying and assessing options (Base map: LINZ Aerial Imagery, not to scale).

The key issues for each of the five areas as discussed at the Long-list Workshop (Workshop) are summarised in Section 6.3.1 and options discussed at the Workshop are listed in Section 6.3.2.

While the Workshop facilitated good discussion about the issues and options, we did not get to the assessment and short-listing as originally intended. Following the workshop, Beca prepared a letter to QLDC (*Long-list Options – Initial Comments and Preferences* letter) summarising the options discussed at the workshop, with our comments on these options, and preferred options (refer Section 6.4). A Long-list Options Review meeting was then held to discuss this letter (refer Section 6.5).

6.3.1 Key issues by area

The key issues for each area as discussed at the Workshop are summarised below.

Upstream stormwater system

The erosion in the gully has likely been accelerated by the development in the catchment. The developers' design approach to the stormwater management for the Northlake and Hikuwai developments discharging to the gully was focused on attenuating peak flows in the large (less frequent) events, to mitigate downstream flood risk. However, this approach does not mitigate the effects of more frequent runoff, higher peak flows in small (more frequent) events, and increased runoff volume with development, which each contribute to erosion.

Works in the upstream stormwater system would be designed to reduce the rate of discharge from the upstream stormwater system in small storms (to reduce the risk of accelerated erosion), by providing additional storage and limiting outflow, but still maintaining attenuation of peak flows in larger storms (to manage flood risk). The aim of this would be to more closely mimic the pre-development flow regime.

If soakage is feasible, then the works could also reduce the volume of discharge compared to the current system (which could also assist with reducing the risk of accelerated erosion). However, due to the scale of the development in the catchment compared to any potential soakage retrofit, the volume of discharge to the gully would likely still be much greater than pre-development.

Upper gully

Currently in the upper gully there are discrete areas of erosion, which is not as significant as the erosion further downstream (below the main erosion basin/drop). There are areas of exposed meltwater deposits and areas of exposed outwash gravel, as well as areas of gravel which may have been imported. Mountain bike tracks cross the upper gully in several locations.

Works in the upper gully would be designed to reduce the potential for further scour by covering and protecting the soils and reducing the water velocity. We note that there are two separate landowners for this section of the gully: QLDC (upstream end); and then DOC. There may be differences in the solutions between QLDC land (mostly grassy area) and DOC land (generally exposed soil and more erosion). For the purposes of this letter, both areas were still considered together.

Main erosion basin/drop

At this location there is a significant scour hole with large vertical drop, bank failures, and fallen/dead vegetation. This is continuing to increase in size and the head of the scour basin/drop is expected to continue to ‘cut back’ upstream.

Works at the main erosion basin/drop would be designed to stabilise the waterway channel at this location, to reduce the potential for further cutting back and scour by installing rock protection and energy dissipation. Loose material and overhanging banks would be removed, and rerouting of tracks would need to be considered.

Lower gully

Downstream of the main scour basin/drop the gully varies in width but is generally wide with sections of toe scour, bank failures, and loose overhanging banks. There is vegetation on the banks and fallen vegetation and debris in the channel. There is some gravel in the bed which appears to have been placed or washed down from upstream (although not confirmed).

Works in the lower gully would be designed to reduce the potential for further scour by installing protective barriers over the soils and/or reducing the water velocity. Loose material and overhanging banks would be removed, with associated vegetation and debris.

Reinstatement

Reinstatement works would be to remove debris from the gully and mitigating or offsetting the effects of the works on the landscape (for both the works in the gully and at the stormwater basins).

6.3.2 Options considered

The options considered at the Long-list Workshop are listed below.

Upstream stormwater system

- Upgrade Hikuwai Basins to add storage.
- Combine Northlake and Hikuwai systems, in conjunction with adding storage.

- Modify existing basin outlets (to reduce discharge), in conjunction with adding storage.
- Add soakage in some basins, to reduce volume of discharge.
- Low level weirs in the upper gully, to provide additional storage within the upper gully.
- New basins in Northlake pocket parks to add storage.
- Do nothing.

Upper gully

- Rock-lined (fully)
- Targeted rock linings
- Low rock weirs
- Do nothing

Main erosion basin/drop

- Rock-lined – battered
- Stepped drop structure
- Gabion baskets

Lower gully

- Rock-lined (fully)
- Targeted rock linings
- Reno/gabion mattress
- Low rock weirs
- Do nothing

Reinstatement

- Removing dead vegetation and debris
- Remove loose and surplus soil
- Planting battered slopes
- Planting/natural barriers
- Diverting tracks
- Block off dead ends of tracks

6.4 Options Letter

Following the Workshop, Beca provided a letter to QLDC; *Long-list Options – Initial Comments and Preferences,* dated 6 December 2024. The purpose this letter was to summarise:

- The options identified and discussed at the Long-list Options workshop.
- Our initial comments on these options and preferences, taking into account the project objectives, the future state requirements, and feedback received from the QLDC at the Workshop.

This was split into the five areas noted above and included a description of the issues for each area, as well as comparing the options. The options comparison focused on advantages, disadvantages and risks for each option, rather than assessing the options against more comprehensive list of criteria (as this could be carried out on the short list at the next stage). Traffic light colour coding used to identify preferences, and a clear way forward were identified for each area. Options which had been considered and discounted were also listed for each area. A copy of this letter is included in Appendix D.

The preferred way forward identified for each area was:

- **Upstream stormwater system** – A combination of upgrading the Hikuwai Basins, combining the Northlake and Hikuwai stormwater systems, and modifying the existing basin outlets. Soakage could also be included in some basins (as this is the only option to reduce volume). There could be different sub-options within this. Options would be designed to capture and slowly release runoff from small/frequent events to reduce the erosion risk compared to the current situation and still attenuate peak flows in large/less frequent event to match pre-development to mitigate the flood risk.
- **Upper gully** - Use targeted rock lining. This will help reduce the erosion of dispersive soils within the upper gully, targeting key locations. There is also the potential for combining this option with low rock weirs to reduce velocities and create some storage in the upper gully.
- **Main erosion basin/drop** - Consider options for lining the waterway channel with a battered rock-lined slope.
- **Lower gully -** Targeted rock lining to provide bed and toe scour protection and to also consider adding low rock weirs in targeted areas. These approaches would reduce the scour in the channel including scour at the toe of the adjacent slopes and subsequent slope failures. The extent of rock lining will be developed during later stages.
- **Reinstatement** - Reinstatement options should be discussed with the DOC and other stakeholders. A combination of the methods above could be used throughout the gully to be sympathetic with the existing landscape of each section. For example, planting options may be considered more suitable for the upper gully as there is more existing vegetation in that section than others.

6.5 Options Review Meeting

To discuss the key points of the 6 December 2024 letter and agree the options to be advanced to the next stage, a Long-List Options Review meeting was held on 23rd January 2025. This meeting was held in the QLDC office and online via Teams and attended by QLDC, DOC, and Beca staff. A copy of the minutes from the meeting, including the presentation, is included in Appendix E. QLDC staff confirmed that they were happy with the short-listed options presented, and we could progress to the next stage.

7 Short List Options

7.1 Purpose and Approach

The purpose of this stage of the project was to progress from a short-list of options to one preferred option to be progress to the next stage, Concept Design.

In the proposal for the project, we envisaged that:

- There would be three short-listed options agreed at the end of the previous stage.
- These would be developed to a high-level Concept Design.
- We would agree the criteria (and their definitions) with QLDC to assess the short-listed options against.
- Short-listed options would then be assessed against the agreed criteria in Short-List Options Multi-Criteria Analysis workshop.

However, because of the change in approach from the long-list options stage, which identified preferred options for each area rather than overall end-to-end options, a different approach was required to the Short-List Options Multi-Criteria Analysis workshop.

7.2 Short-List Options MCA Workshop

The Short-List Options Multi-Criteria Analysis Workshop was held at QLDC's offices and online via Teams on 14th March 2025. The workshop was attended by QLDC ([redacted]), DOC ([redacted] and Beca staff ([redacted]), in-person (except [redacted] online). A copy of the Short List MCA workshop slides and meeting minutes are included in Appendix F.

The workshop included:

- Overview of planning context
- Confirm MCA approach – criteria, scoring, and weighting
- For each of the five areas, presentation of:
  - Developed short-listed options
  - Planning assessment
  - Cost estimates
- Assessment against the MCA criteria
- Agreeing actions and next steps

The high-level cost estimate for the short-list options is included in Appendix G.

7.2.1 MCA approach

The MCA criteria, definitions, scoring, and weighting were discussed with QLDC in advance of the workshop in an online meeting on 7 March 2025. The MCA criteria and definitions adopted are shown in Table 7-1, the simple -2 to +2 scoring shown in Table 7-2 was used with no weighting applied.

Table 7-1 MCA Criteria

Criteria	Definition
Performance confidence	Expected technical performance, including risk and resilience.
Constructability	Complexity of construction and risk.
Cost	Capital and operational costs.
Environmental impact	Impact on environment of works including being sympathetic to the landscape; ecology; and recreation. Both long term and construction effects.
Community acceptability	Likely acceptability to key stakeholders and wider community.
Consenting/approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.
Operation & maintenance	Ease of inspections, operations and maintenance.
Sustainability	Relative carbon assessment.

Table 7-2 MCA Scoring

Colour	Rating	Level of Criteria	Description
	-2	Very unfavourable	Alternative absolutely less favourable than others on this criterion
	-1	Unfavourable	Alternative less favourable than others on this criterion
	0	Neutral	Alternative average, unquantifiable or not applicable
	1	Favourable	Alternative more favourable than others on this criterion
	2	Very favourable	Alternative absolutely more favourable that others on this criterion

The approach used in this workshop was different to most MCAs, as rather than comparing complete/end-to-end options and picking one winner, the process was used to assess options for each area against the criteria, highlighting issues and picking a preferred way forward for each area.

7.2.2 Options by area

Options put forward by Beca for discussion in the Short-List MCA workshop are summarised below by area.

Upstream stormwater system

- Add additional storage by modifying the existing basins in the QLDC reserve either by:
  - Keeping the Hikuwai and Northlake systems separate
  - Combining the Hikuwai and Northlake systems
- Plus adding soakage

Upper gully

- Targeted rock lining of the gully
- Plus adding rock weirs

Main erosion basin/drop

- Rock-lined battered slopes with channel/chute and energy dissipation basin

Lower gully

- Rock lining of channel with toe scour protection

Reinstatement

- Removing dead vegetation and debris, loose soil, and battering slopes

7.2.3 Change in approach regarding level of intervention

Through the discussion at the Short-List Options MCA workshop, it became apparent that the proposed works within the gully were of a much more substantial scale than DOC would accept. As a result, options which were less engineered (i.e., reduced erosion protection but more sympathetic with the existing natural environment in the gully and accepting greater residual risk of future erosion), were established in the workshop and scored.

The updated options by area, which were compared in the workshop using the MCA, are summarised below.

Upstream stormwater system

- Upgrade storage, keep Hikuwai & Northlake separate
- Upgrade storage, combine Hikuwai & Northlake
- Upgrade storage, keep Hikuwai & Northlake separate, plus soakage if soils suitable
- Upgrade storage, combine Hikuwai & Northlake, plus soakage if soils suitable

Upper gully

- Do nothing
- Do minimal - targeted locations, low level intervention (e.g., 10%)
- Long length rock lining

Main erosion basin/drop

- Rock-lined, steeper drop/natural stepped
- Rock-lined, battered

Lower gully

- Partial length rock lining with toe scour protection (e.g., 50%)
- Partial length rock lining with toe scour protection (e.g., 80%)
- Full length rock lining with toe scour protection

Reinstatement

- Removing dead vegetation, foreign debris, and loose soils in gully. Battering overhanging slopes and planting

7.3 Post-Workshop Updated MCA-Scoring

Following the MCA workshop the MCA scoping tables were checked for consistency of scoring and further commentary added and then issued. These updated MCA tables are included in Appendix H.

7.4 Post-Workshop April 2025 Site Visit

On 9th April 2025 staff from QLDC ([redacted] and Beca ([redacted]), as well as HEB ([redacted]), carried out a walkover of the site to consider what the preferred options discussed at the Short-List MCA workshop may look like in practice and how they may be constructed. While it was originally intended that DOC staff would also attend the site visit to better understand the works associated with the preferred option, they were not available and did not attend.

Notes from the site visit are included in Appendix I.

7.5 Gully Works Philosophy

Prior to the site walkover referred to above, Beca prepared some draft mark-ups on photographs of the gully and commentary to explain the proposed works philosophy. These were shared and discussed during the site visit.

Following the site visit, this proposed Gully Works Philosophy was updated and issued to QLDC for review. QLDC provided review comments on this, which were addressed, and the latest version is included in Appendix J.

8 Preferred Option

The preferred option for mitigating erosion in Rockabilly Gully is:

- Upstream stormwater system – In the QLDC reserve at the top of the gully, modify the existing stormwater basins to maximise the storage and reduce the peak flow discharged in small (more frequent) events.
- Upper gully
  - For the reach of waterway adjacent to the existing basins, no works are proposed.
  - Within the QLDC reserve below the stormwater basins – In targeted areas of existing erosion, fill erosion damage and endeavour to reestablish grass cover.
  - Within DOC land:
    - In targeted areas, shaping the channel and adding rounded river gravels and cobbles to the bed to achieve a more consistent mobile gravel bed like a natural gravel waterway.
    - At the mountain bike track crossings, using larger quarried rock to establish a local grade control point, with rounded river gravels over the top.
    - Where the waterway breaks out of the main channel and flows down the mountain bike track, not trying to prevent this from occurring and modifying the track to have a bed like a natural gravel waterway but still be rideable.
- Main erosion basin / drop
  - Using larger quarried rock, establish a rock-lined chute (battering back the existing slope) discharging to a rock-lined energy dissipation basin (to reduce velocities) and section of rock-lined channel, transitioning to the natural waterway downstream.
  - Waterway works above the drop, to channelise flow towards the chute/stepped rock slope and will require vegetation removal.
  - Trimming overhanging banks and endeavouring to reestablish vegetation outside the rock-lined areas.
- Lower gully
  - Add to existing natural bed with imported river gravels and larger cobbles/boulders to reduce the imported material volume.
  - In targeted areas:
    - Large angular quarried rock will be used in the bed at selected locations to provide grade control
    - Toe protection works with quarried rock lining extending part way up lower part of slopes to reduce future toe erosion and slopes slumping into the waterway.
  - Trim overhanging and precarious material but limiting extent of clearing and vegetation removal.

This is described in more detail below.

8.1 Proposed Works on Upstream Stormwater System

Additional stormwater storage will be provided by combining the Hikuwai and Northlake systems at the existing Hikuwai basins in the QLDC reserve at the top of the gully – i.e., extending the main Hikuwai basin to create additional storage. The proposed works include:

- Increasing the size of main Hikuwai basin to create additional storage.
- Creating a forebay for simplified maintenance by focusing initial sediment capture at one accessible point.
- Changing the hydraulic/outlet controls for both basins and therefore the operation of the Hikuwai basins.

The extended main basin would be grassed (rather than planted) and both basins would operate as dry basins (i.e., drain down between events), as this is QLDC's preference for maintenance. Planting could be provided elsewhere in the reserve. The upstream Northlake basins would be left as designed and constructed (i.e. the temporary QLDC weir plates removed).

Figure 8-1 Sketch of proposed basin modifications. Pipework not shown. (Base map: QLDC GIS)

The additional storage in the basins would be utilised to provide detention and slow release of runoff in small storm events, to try to more closely mimic pre-development peak flows in small events, in addition to the large events the system is currently designed for. In larger events (e.g., 2 year to 100 year ARI event), the modified system would operate similarly how it does at present.

Soakage could still be considered, and while this could assist with reducing discharge volume and mitigating the effects on the gully, the post-development volumes discharged will still be much greater than they would have been pre-development. QLDC has also raised concerns about the long-term operation of soakage systems. From discussion with QLDC, rather than using an imported sand media in the base of the basin (which is expensive and difficult to maintain), the preferred option for soakage is an open manhole with scruffy dome inlet connected to a subsoil system installed in the higher permeability soils below.

8.2 Proposed Works in the Gully

8.2.1 Upper gully (within QLDC Local Purpose Reserve)

For this upper section of waterway, the channel is grassed, and only local areas of erosion have occurred. Where erosion has occurred, we propose that the area is reinstated by filling with graded fill and endeavouring to reestablish grass.

Figure 8-2 Sketch of example of area of existing erosion to be filled and re-grassed.

Given erosion observed to date and proposed mitigation, we expect that other local areas of erosion within the waterway will continue to occur in the future; either in new areas or areas that have previously eroded. Future erosion could be left untreated or periodically repaired noting that the grassed section of waterway is within QLDC Local Purpose Reserve and therefore it is assumed access would be relatively straightforward.

8.2.2 Upper gully (within DOC land)

For the upper section of gully with DOC land, the proposed approach involves:

- Shaping the channel to contain frequent flows and adding rounded gravel and cobbles to the waterway to provide a more consistent mobile gravel bed like a natural gravel waterway.
- Some minor increase in width of existing waterway to protect exposed dispersive soils is proposed but with the intent of avoiding significant removal of established vegetation.
- Some excavation of site soil will be required. Where possible this will be placed as fill and retained on site near the location that it was excavated from.

The above approach is based on DOC feedback regarding providing a solution that is sympathetic to the environment, limiting the removal of vegetation. With this approach, it would be accepted that the rock within the waterway would move and local erosion of the waterway in the future is acceptable.

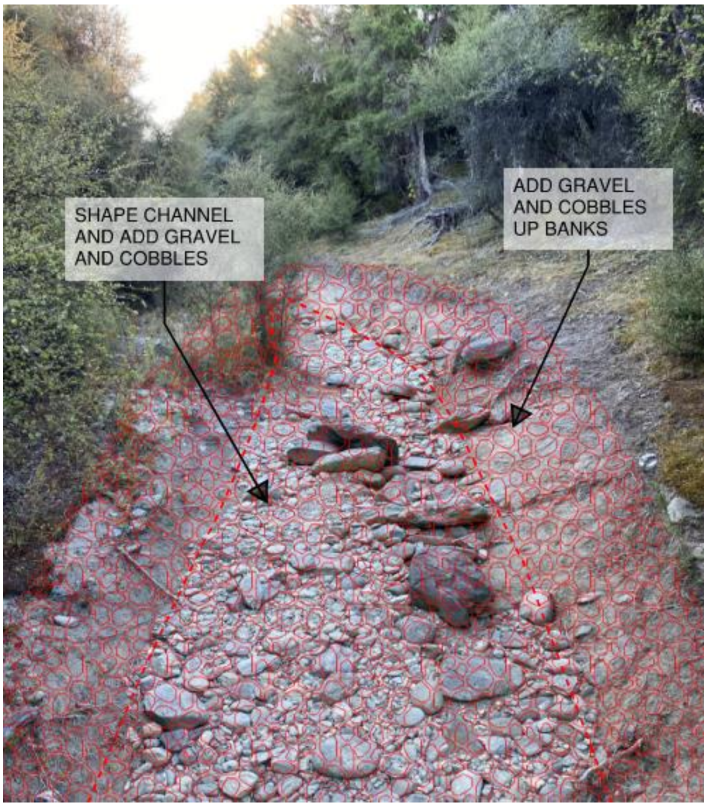


Figure 8-3 Sketch of example of area where channel would be shaped and rounded gravel and cobbles added to provide more natural mobile waterway bed.

8.2.2.1 At break-out onto Mountain Bike Track

Over a short section of the upper gully, the waterway has broken out of its channel during higher flows and flowed along an existing mountain bike track which has scoured. We do not consider it possible to avoid break-out of flows from the main waterway channel while still limiting the works in the waterway and meeting DOC expectations, noting that during high flows the water will tend to follow the lowest possible flow path.

At this location, we propose to add river gravels and cobbles (suitable for biking) to the bed of the track locally, rather than attempting to train the waterway and keep flows within the main waterway channel. With this approach we acknowledge that flows could break out and run down the track in the future and while the works would reinstate the track to a more usable surface in the short term, erosion could still occur further in the future. To reduce the risk of track erosion in the future, some large buried quarried rock would be provided at selected locations to provide some local grade control as previously used near track crossings across the existing stream.

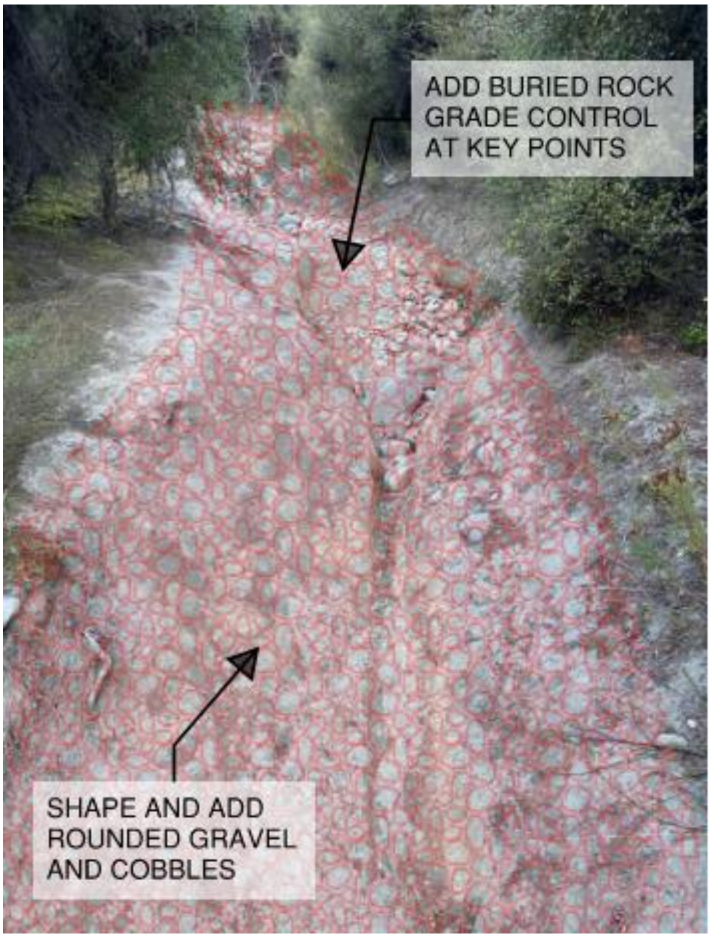


Figure 8-4 Sketch of works to section of mountain bike track where flow runs down the track.

8.2.2.2 At Track Crossings

Where local tracks cross the waterway, we propose that some large, buried quarried rock is used to provide a local grade control point. This would be buried under gravel/cobbles, tying into the river gravel waterway bed upstream and downstream and providing a suitable track surface. The proposed form/function of the crossings is intended to be similar to other existing examples and may require some ongoing maintenance after significant high flow events.

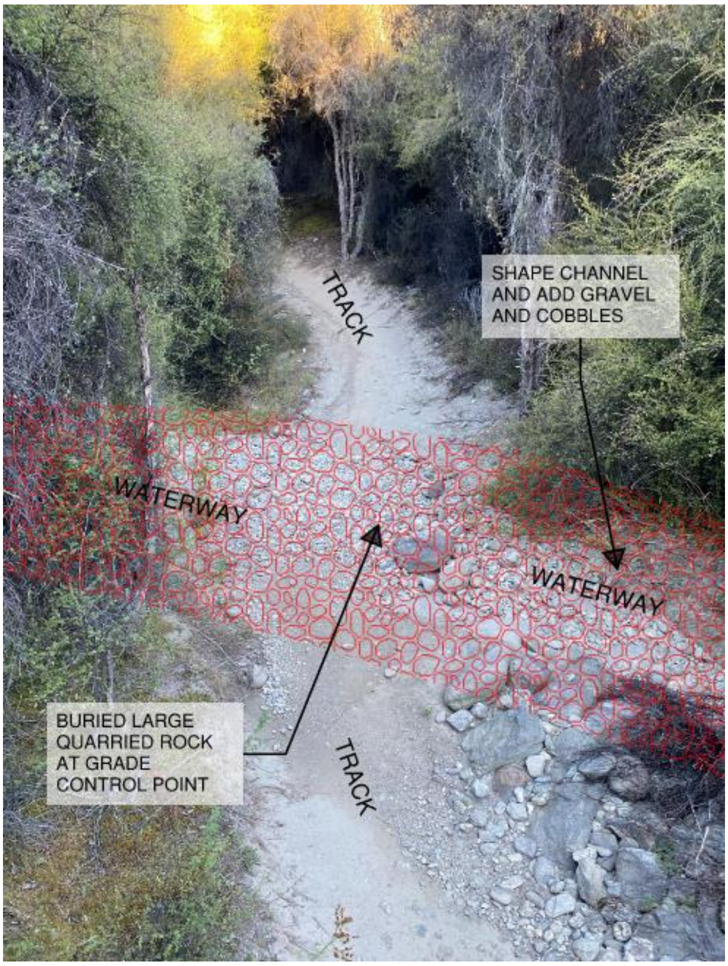


Figure 8-5 Sketch of example of track waterway crossing.

8.2.3 Main erosion basin/drop

At the main erosion basin/drop, the proposed approach involves:

- Providing a rock-lined chute at the existing drop location to control flows over the existing drop and protect the drop from further regression. This would be designed for at least a 10-year ARI event plus freeboard. This could be hybrid of a rock-line chute and a stepped rock structure/slope, with a variable form to look less engineered and reduce velocity. The chute/stepped rock slope will likely extend over the width of the 'drop' that currently has water flowing over it during high flows. Waterway works will be required above the drop to channelise flow towards the chute/stepped rock slope and will require vegetation removal.
- Trimming of overhanging material/ground as required.
- Providing a rock-lined energy dissipation basin downslope of the chute/stepped rock slope to reduce velocities.
- Flatter rock-lined channel immediately downstream, transitioning to existing channel shape and grade.
- The rock lining would be large angular quarried rock, graded to interlock and sized to resist erosion and movement in at least the 10-year ARI event (e.g. a median rock size in the order of 300 mm to 600 mm). The rock lining would extend approximately 1 m up the bank to provide scour protection to the toe of slope.
- While the intention will be to remove overhanging material/ground on the slope above, the slopes will largely be left steep and exposed to limit the magnitude of earthworks and vegetation removal consistent with DOC feedback. There is the potential for future scour/slumping of these slopes but to fully mitigate this risk would require significant works which would not in keeping with the environment.

- Some ground reshaping and planting or natural reestablishment of vegetation outside the footprint of the rock works.
- Options to plant native species around the drop to offset some of the loss of vegetation in the reserve and improve landscape values and stability will be investigated during design.

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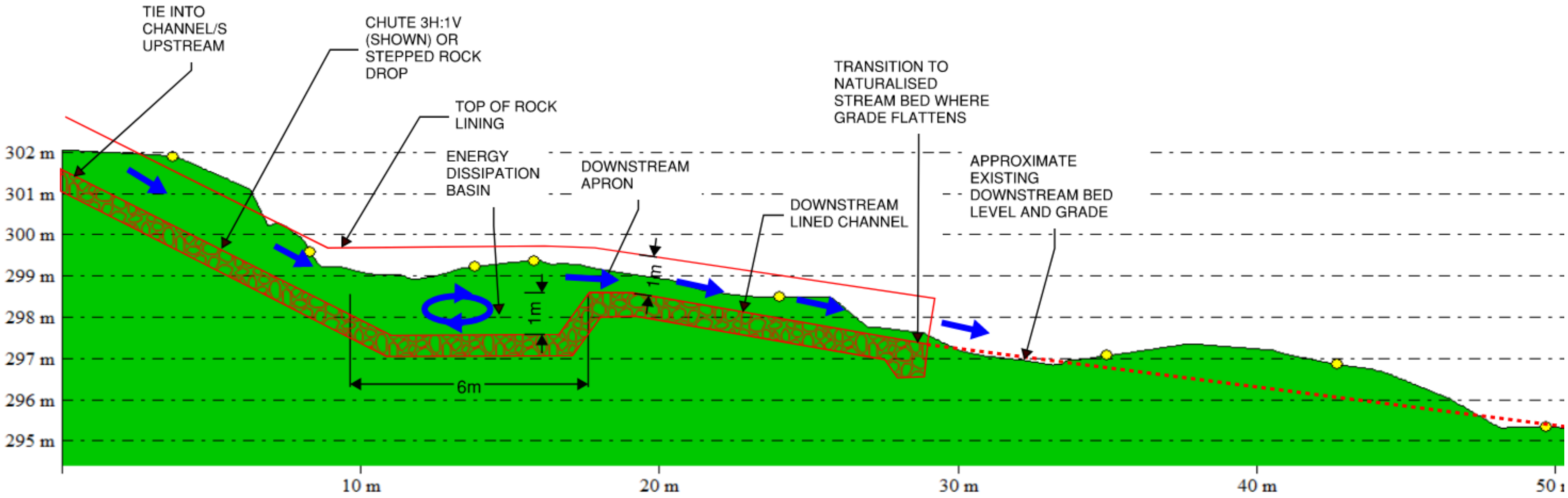

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Figure 8-6 Sketch long section of chute and energy dissipation basin at main drop.

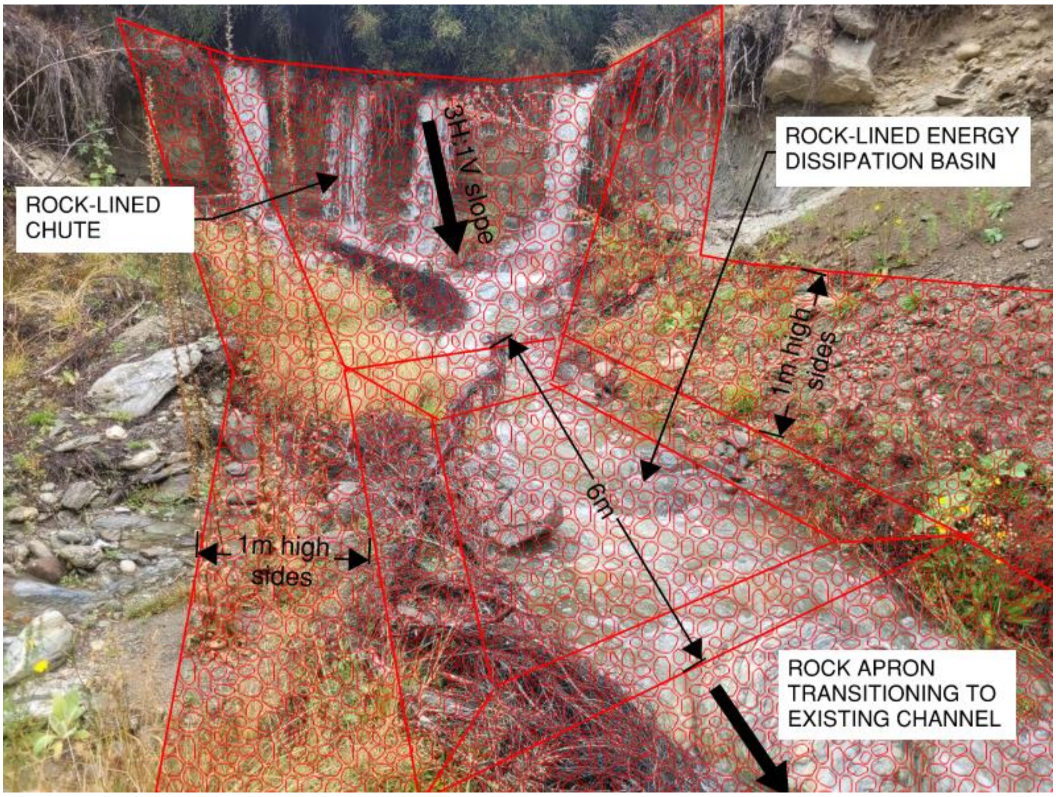

Figure 8-7 Sketch mark-up of chute and energy dissipation basin at main drop.

8.2.4 Lower gully (within DOC land)

For the lower gully, the proposed approach involves:

- Large gravel/cobbles/boulder lining of base of waterway. Where existing large gravel and cobbles are present in the base of the waterway, we propose to add to this with large river gravels and large cobbles/boulders to reduce the imported material volume. Some large angular quarried rock will be used in the bed at selected locations to provide grade control particularly where the existing gully width constrains flows (which leads to localised increases in velocity). The intention will generally be to provide a river gravel / cobble lined channel with a base width of approximately 2 to 4 m, which would be mobile in large events.
- Toe protection works with quarried rock lining extending part way up lower part of slopes (approximately 0.5 to 1.0 m) to reduce future toe erosion and slopes slumping into the waterway.
- For narrow sections of gully with potential for toe scour but insufficient space to construct battered rock lining, consideration should be given to the use of gabions.
- Trimming of superficial slope material, that appears precarious and there is a high risk that it will slip into the waterway and contribute to sediment discharge, will be undertaken. However, this will be balanced with the desire to keep trees where possible. In endeavouring to limit tree removal, there will inevitably be some trees that are left in place but will have a reasonably high risk of being undermined in the future, leading to slope failure/falling into the stream.
- Limited ground reshaping and planting or natural reestablishment of vegetation outside the footprint of the rock works.
- Options to plant native species to offset some of the loss of vegetation in the reserve and improve landscape values and stability will be investigated during design.
- Toppled trees and vegetation removed out of the waterway will be left at a location nearby, to be agreed with DOC.

8.2.5 Lower gully – Immediately upstream of Outlet Track (DOC land)

Generally, no works are proposed for the lower gully section immediately upstream of the Outlet Track and the confluence with the Clutha River/Mata-Au given the visibility of this section of the gully from the Outlet Track and the large number of established kanuka trees that are intended to be left in place. Some ongoing local erosion should be expected, however, based on historic observed erosion, but this section is expected to contribute less sediment relative to other sections of the gully. Consideration could be given to some large rock at selected locations to provide some grade control.

8.2.6 Lower gully – At Outlet Track and confluence with Clutha River/Mata-Au

At the Outlet Track crossing, large angular quarried rock is proposed to provide grade control. This would be buried the track surface. Downstream of this to the confluence with the Clutha River/Mata-Au no works are proposed.

8.3 Construction Considerations

As noted above, [redacted] from HEB attended the site walkover on 9 April 2025 to provide initial constructability inputs. Based on these discussions, the following constructability considerations have been identified for the preferred option at this stage of the project:

- The proposed works for the Hikuwai basins would be expected to involve typical earthworks machinery, with the site accessed from Joe Brown Drive.
- Works in the upper part of the gully would generally involve smaller machinery like that used by DOC for track maintenance. We expect that the upper gully would be accessed from the QLDC Local Purpose Reserve, from the main basin and with smaller machinery via existing tracks.
- An access route to the main drop will be required for larger earthworks machinery and importing rock. The access track would generally follow existing tracks to reduce vegetation removal; some local trimming of vegetation will be required. As the access track approaches the main erosion basin/drop, some earthworks and removal of established vegetation will be required.
- A permanent access track to the main basin will be required for maintenance and lower gully access.
- Significant excavation into the toe of steep slopes should be avoided where possible due to temporary stability concerns. This may constrain toe scour protection works where the waterway is relatively narrow; in these locations, gabions would be an easier scour protection measure.
- Main stockpile/storage area would be within the QLDC reserve. Other staging areas would also likely be required, however, these could utilise existing wider cleared areas adjacent to existing tracks.

We recommend that further constructability inputs are provided by a contractor following Concept Design to assist in informing the consenting strategy and applications as well stakeholder engagement.

8.4 Operations and Maintenance

We have identified the following operations and maintenance considerations for the preferred option:

- Regular inspection of stormwater basin inlets and outlets and clearing of debris.
- Regular inspection and clearing of sediment from the stormwater basin forebay.
- Regular inspection of waterway and track crossings within the gully, especially after large storm events, and reinstatement of any areas of significant erosion with rock.
- Regular inspection of lower gully sides slopes and removal of any significant vegetation or soil that has slumped into the waterway and considered unacceptable.
- Establishment and weeding of any new vegetation.

9 Preferred Option Cost Estimate

A cost estimate has been carried out for the preferred option based on the pre-concept high-level design work carried out to date. This includes a range to account for some variability in quantities of selected items, but not all items, and does not include a range to account for variability in rates. The cost estimate is summarised in Table 9-1. Refer to Appendix K for the full cost estimate (for both quantity low and quantity high) and more detail on the assumptions.

Table 9-1 Preferred Option Cost Estimate Summary

Description	Item Numbers in Estimate in Appendix K	Estimate (Quantity Low)	Estimate (Quantity High)
General	1	$684,527	$757,303
Upstream Stormwater System	2	$724,998	$724,998
Upper Gully	3, 4 & 5	$51,700	$135,690
Drop	6	$309,422	$336,922
Lower Gully	7, 8, 9 & 10	$168,486	$348,103
At Outlet Track Crossing	11	$3,500	$3,500
Subtotal		**$1,942,633**	**$2,306,517**
Contingency 30%		$582,790	$691,955
Total Physical Works		**$2,525,423**	**$2,998,472**
Professional Fees 20%		$505,085	$599,694
Client Costs 4%		$101,017	$119,939
Consenting 2%		$50,508	$59,969
Total (Rounded)		**$3,180,000**	**$3,780,000**

10 Recommendations/Next Steps

We recommend that the following next steps are undertaken:

- QLDC to engage with its key stakeholders (e.g., ORC, DOC, iwi, and mountain bike track/reserve users) and confirm the preferred option to be advanced to Concept Design.
- In parallel with QLDC engaging with its stakeholders, Beca will advance the design of the upstream stormwater works/basin upgrade works and carry out hydraulic modelling to test the design and understand relative performance of the proposed works compared to the existing/base case and the pre-development case, across a range of events. This would include both larger events (e.g., 2, 10, 20 and 100 year ARI events) and more frequent events (e.g., those which occur a number of times per year).
- Once QLDC gives approval to proceed, Beca is to develop the remainder of the Concept Design for the preferred option (i.e., the basin upgrades and gully works) including Concept Design drawings, updated cost estimates, carbon assessment, planning/consenting requirements assessment, and identifying further investigations required to develop design.
- Beca to work with QLDC to develop a draft programme including design, engagement with stakeholders, consenting and approvals, procurement, and design.

A

Appendix A – Meeting Register

Meeting Register

25 September 2024	Site Visit	[redacted]	[redacted]	N/A	N/A
4 November 2024	Future State Requirements Workshop	[redacted]	[redacted]	N/A	N/A
27 November 2024	Long-list Options Workshop	[redacted]	[redacted]	[redacted]	N/A
23 January 2025	Long-list Options Review meeting	[redacted]	[redacted]	[redacted]	N/A
7 March 2025	MCA criteria meeting	[redacted]	[redacted]	N/A	N/A
14 March 2025	Short-List Options Multi-Criteria Analysis Workshop	[redacted]	[redacted]	[redacted]	N/A
9 April 2025	Site Walkover	[redacted]	[redacted]	N/A	[redacted] (HEB)

B

Appendix B – Current and Future State Requirements Letter

ANZ Centre, 267 High Street,
PO Box 13960, Christchurch,
8141, New Zealand
T: +64 3 366 3521 // **F:** +64 3 366 3188
E: info@beca.com // www.beca.com

22 November 2024

Queenstown Lakes District Council
Private Bag 50072
Queenstown 9348
New Zealand

Attention: [redacted]

Dear [redacted]

Rockabilly Gully – Current Erosion and Future State Requirements

1 Introduction

Beca Limited (Beca) has been engaged by Queenstown Lakes District Council (QLDC) to carry out a technical options report for mitigating the erosion in Rockabilly Gully.

The purpose of this letter is to describe:

- The current erosion issue and likely causes.
- The future state requirements for the project as discussed and agreed at the workshop with QLDC held on 4 November 2024.

2 Erosion

2.1 Natural gully

Rockabilly Gully is a natural gully and ephemeral waterway discharging to the Clutha River / Mata-Au. Its catchment extends to the west and south of the gully as shown in Figure 1.

An excerpt of the QLDC 100 year modelled flood depth map from QLDC's GIS, which shows the overland flow paths heading to the gully, is shown in Figure 2.

make everyday better.

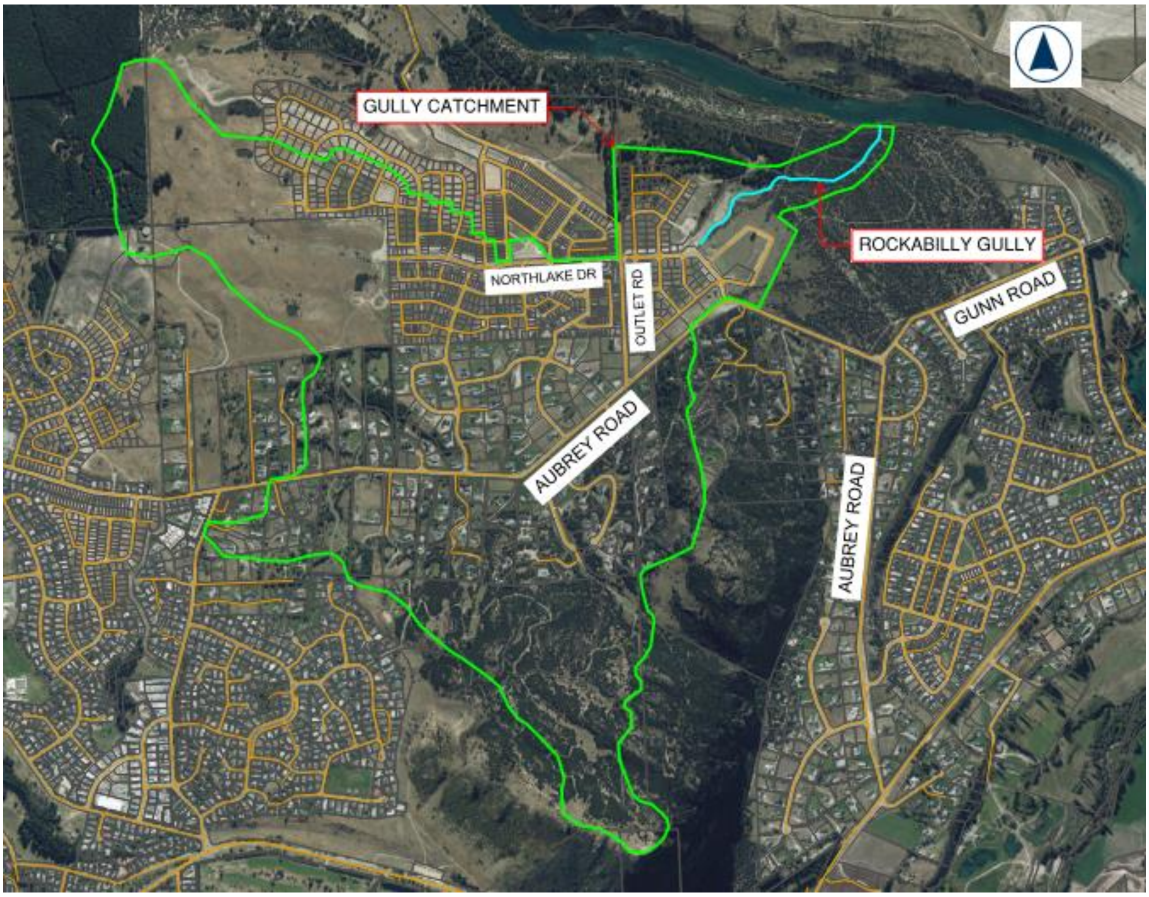

Figure 1. Rockabilly Gully catchment (Source: QLDC GIS, not to scale)

Figure 2. 100 year ARI modelled flood depth (Source: QLDC GIS, not to scale)

From the Beca, Rockabilly Gully Geotechnical Desktop Assessment[1], the soils in the gully comprise outwash gravels underlain by glacial lake deposits. The outwash gravels provide some resistance to erosion but are variable thickness, and in some places not present. The lake deposits are highly dispersive and susceptible to erosion.

Prior to development in the catchment, the gully would have formed by natural processes of downcutting and erosion through these soils, and associated toe scour and bank instability.

2.2 Development

General

Development of rural land to residential or commercial increases the impervious area (e.g. roads, roofs, and hardstand) and decreases the pervious area (e.g. grass, gardens, and parks). This increase in impervious area changes the nature of the stormwater runoff for any given rainfall event, resulting in more frequent runoff, larger volumes of runoff, and higher peak flow rates. If these effects are not mitigated, this can result in downstream flooding and erosion.

Development in Rockabilly Gully catchment

In the late 1990s/early 2000s, rural residential development began on both sides of Aubrey Road, resulting in relatively small increases in impervious area. Since 2016, there has been much more significant development in the catchment with large increases in impervious area, with residential and commercial development in the Northlake development, and residential development in the Hikuwai development. Further residential development is also underway with the upper stages of Northlake and the Allenby Farms/WHF Properties development currently in construction. There may also be future development in the Sticky Forest, part of which is within the gully catchment. These areas are shown in Figure 3.

[1] Beca, *Rockabilly Gully Geotechnical Desktop Assessment*, revision 1, dated 23 October 2024.

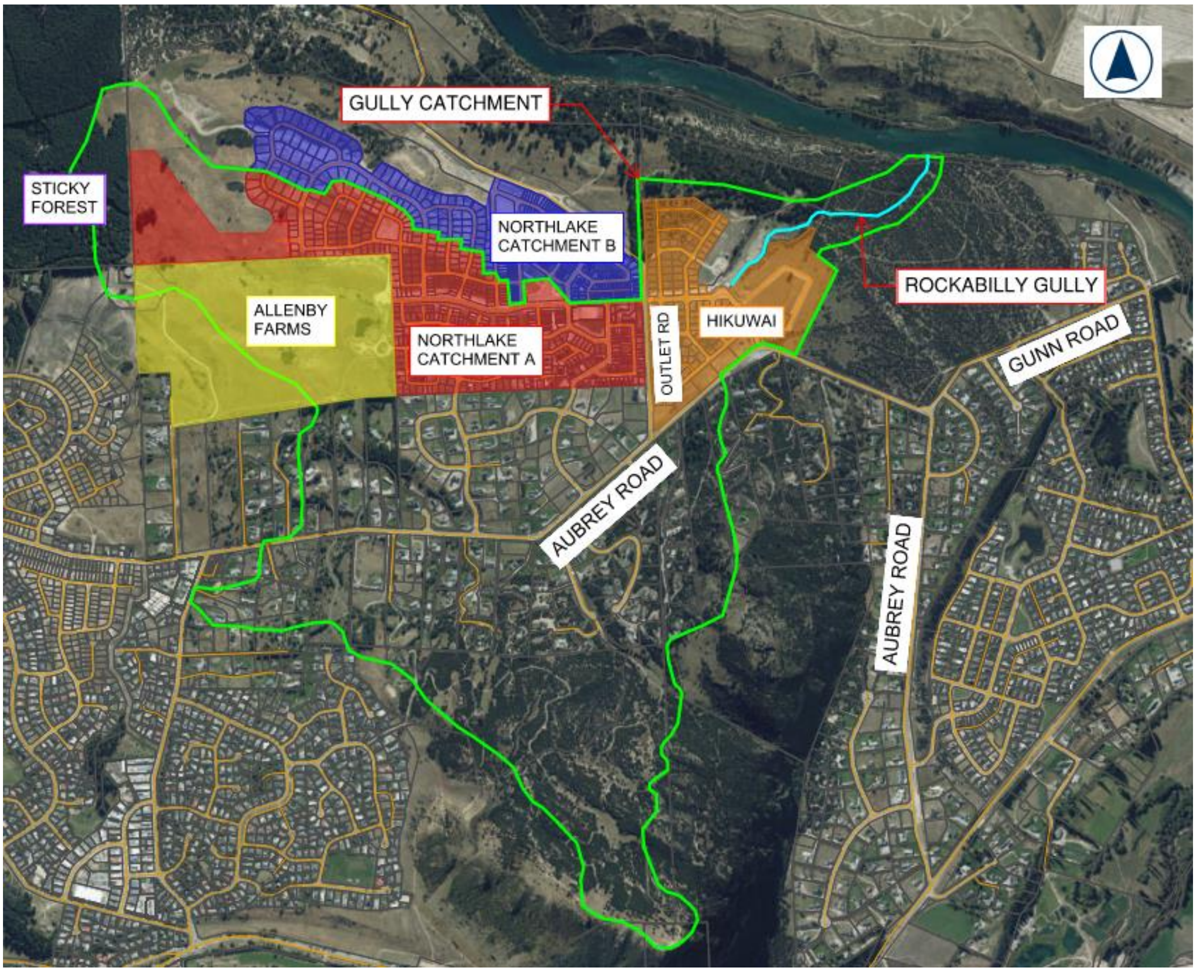

Figure 3. Rockabilly Gully catchment and development areas (Source: QLDC GIS, not to scale)

Reported erosion

We have seen reports of silty water, erosion, and scour in Rockabilly Gully from October 2019 onwards. (We are not aware of when these issues commenced.) On 7 September 2021, the Department of Conservation (DOC) wrote a formal complaint to QLDC about the stormwater erosion damage to the Hikuwai Reserve. On 1 October 2021, Otago Regional Council (ORC) issued QLDC with an abatement notice for erosion in the Hikuwai Reserve and discharge of sediment to the Clutha River / Mata-Au.

Stormwater management and effects on erosion

The rural residential development included some soakage disposal.

The Northlake development is split into two catchments: catchment A which discharges to Rockabilly Gully; and catchment B which discharges to soakage. The design approach taken for the stormwater management for both Northlake catchment A and the Hikuwai development was focused on attenuating peak flows in the large (less frequent) events, to mitigate downstream flood risk. However, this approach does not mitigate the effects of more frequent runoff, higher peak flows in small (more frequent) events, and increased runoff volume with development. This means that the development in the catchment is likely to have accelerated the erosion in the gully and observations during our site visit on 25 September 2024 support this.

Current status of erosion

Photos of the gully from our site visit on 25 September 2024 are included in the Future State Requirements workshop presentation included in Attachment 1. There are four distinct reaches or locations within the gully, as shown in the site visit photos included in the workshop presentation:

- The upper gully – Some erosion with areas of exposed outwash gravel, as well as areas of gravel which may have been imported.
- The main scour basin/drop – Significant scour hole with large vertical drop, bank failures, and fallen/dead vegetation. This is continuing to increase in size and the head of the scour basin/drop is expected to continue to 'cut back' upstream.
- The lower gully – Downstream of the main scour basin/drop the gully varies in width but is generally wide with toe scour and bank failures over sections, with associated vegetation and debris. There is some gravel in the bed which appears to have been washed down from upstream.
- The bottom of the gully – In the reach immediately upstream of the River and Outlet Track, there are some signs of erosion, but the channel has a gravel bed and appears more stable.

Contours of the gully from 2022-2023 LiDAR are shown with the aerial image in the plan included in Attachment 2 (as well as in the workshop presentation). The main scour basin/drop can be seen in these contours.

3 Future state requirements

A Future State Requirements workshop was held on 4 November 2024 via Teams, with QLDC and Beca staff. The purpose of this workshop was to discuss and agree QLDC's '*non-negotiable*' requirements and '*nice to have*' aspirations for the project. The workshop was attended by [redacted] from QLDC, and [redacted] and [redacted] from Beca.

The presentation from the workshop is included in Attachment 1 of this letter. The key outcomes of the workshop are summarised below.

Scope and key stakeholders

- The project should mitigate the erosion in the gully and the discharge of sediment to the Clutha River / Mata-Au.
- Key external stakeholders are mana whenua, ORC, DOC, and users of reserve / mountain bike community. QLDC to engage with these stakeholders as appropriate.
- Key internal QLDC stakeholders are reserves and three waters operations team. QLDC PM to engage internally with them.

In the gully and reserve

- The gully does not need to be reinstated to its pre-development form.
- Given existing natural slopes in the general area are steep or vertical in places, it is reasonable to leave gully slopes steep or vertical and it is not necessary to demonstrate a certain stability. Slope 'overhangs' should be removed where instability has occurred.
- The health and safety of track users needs to be considered, especially where tracks lead to dead ends at the eroded gully.
- Works will be needed to stabilise the main scour basin/drop in the gully where the waterway drops into it and to mitigate further cutting back of the scour basin. This will likely require rock protection or other engineered approach.
- The mitigation works in the gully should be sympathetic with the existing environment in the reserve.

- Fallen/dead kanuka and any debris should be cleared from the gully as part of the mitigation works. Where possible, the dead kanuka should be reused within the reserve (e.g. mulched or used to form barriers).
- Works in the gully should provide for a track (or tracks) crossing the gully near the main scour basin/drop.
- Planting should be carried out in the reserve to mitigate the loss of vegetation from the erosion and from any works. This may be at a different location.
- Permits and approvals will be required from DOC for works within the gully.
- Following the completion of the mitigation works, the gully should be as low maintenance as possible.
- It may be acceptable to have some erosion in the gully in larger events (e.g. 10-year event), which would require maintenance work afterwards.

Upstream of the gully

- Modifications to the existing stormwater system upstream (e.g. modifications to existing basins and/or new basins) should be part of the mitigation works.
- This should include considering opportunities for soakage.
- It is unlikely that stormwater works upstream will be able to mimic pre-development hydrology, as without large-scale soakage or reuse there will be additional runoff volume post-development compared to pre-development.
- Stormwater basins should be designed to drain down (i.e. be dry basins).
- Maintainability of stormwater assets needs to be considered as part of the design.

General

- An adaptive management approach can be considered.

4 Next steps

The next steps are:

- QLDC to engage with key external stakeholders as applicable.
- Beca to develop initial option (long-list).
- Beca and QLDC staff to attend initial (long-list) options assessment workshop on 27 November 2024.
- Project communications to continue with regular updates from Beca and a “no surprises” approach.

Yours sincerely

[redacted]

[redacted]

Technical Director - Civil Engineering

on behalf of

Beca Limited

Phone Number: [redacted]

[redacted]

Attachments

Attachment 1 – Future State Requirements workshop presentation

Attachment 2 – Rockabilly Gully LiDAR survey plan

ATTACHMENT 1

Beca

Rockabilly Gully Technical Options Assessment

Future State Requirements Workshop

4 November 2024

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Future State Requirements Workshop - Purpose

- Meeting to discuss and agree QLDC's '*non-negotiable*' requirements and '*nice to have*' aspirations for the project.

- Considerations:
  - Expected performance of the stormwater system.
  - Expected performance of erosion mitigation in the gully.
  - Acceptable maintenance for stormwater system and gully.
  - Landscape and environmental requirements.
  - Recreation requirements including for walking and mountain biking tracks.
  - Any other important requirements identified by QLDC or stakeholders.

Key project drivers

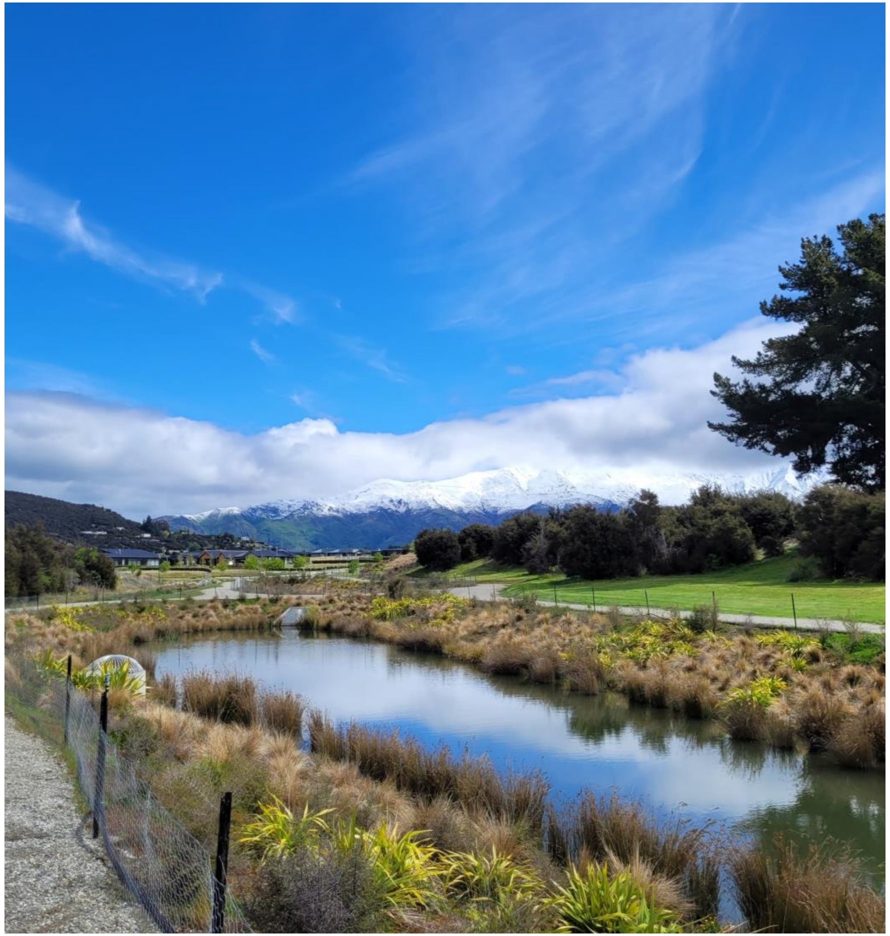
- Erosion in gully/Hikuwai Reserve
- Sediment discharge to Mata-Au/Clutha River

- From ORC abatement notice:
  - Erosion, land instability, sedimentation or property damage in Hikuwai Reserve
  - Sediment discharge to Mata-Au/Clutha River (creating colour/visual clarity change after reasonable mixing)

Rockabilly gully - site

Beca

Site visit observations



Beca

Site visit observations – upper gully

Beca

Site visit observations – upper gully

Site visit observations – main scour basin

Site visit observations – ground conditions

Site visit observations – lower gully

Site visit observations – lower gully

Site visit observations – ‘natural’ gully slopes

Beca

Site visit observations – bottom of gully

Beca

Causes of erosion and sediment discharge

- Natural gully processes
- Soils comprise outwash gravels underlain by meltwater lake deposits
  - Outwash gravels provide some resistance to erosion but are variable thickness
  - Lake deposits are highly dispersive and susceptible to erosion
- Development in catchment:
  - Increased runoff in all events
  - Stormwater systems designed for peak flow mitigation in large events*
  - No mitigation of effects in smaller events
  - Increased erosion in gully

Beca

Key stakeholders & engagement

- ORC
- DoC
- Iwi
- Mountain bike community
- Other reserve users
- Wider community

Project constraints

- Ground conditions (dispersive lake deposits)
- Topography
- Land ownership
- Existing stormwater system
- Existing natural environment
- Existing land use
- Budgets

Types of mitigations

- Gully/stream lining
  - Hard lining (e.g. concrete)
  - Rock lining – full length
  - Rock lining – targeted
  - Stream features to reduce flow velocities (e.g. rock pools, natural weirs)
- Gully reinstatement
  - Fully reinstate to pre-development conditions (~2010)
  - Trim overhang / remove slope instability debris
  - Leave as is
  - Planting
- Stormwater retention
  - Additional storage with restricted outlet/s – new basins and/or modify existing
  - Soakage

Key project objectives - review

- Erosion in gully & discharge of sediment to river
  - Satisfying ORC abatement notice
  - Restoring recreational value of gully
  - Level of gully reinstatement?
  - Land stability
  - Reducing future erosion

Beca

Questions to consider

- What project outcomes would QLDC like to achieve?
- What do you see as the biggest risks?
- What level of stakeholder input, consultation or co-design is proposed?

Questions to consider

- Would it be acceptable to have erosion (and sediment discharge) in large rainfall events?
- What frequency and type of maintenance in the gully is acceptable?
- What frequency and type of maintenance of stormwater system is acceptable?
- Would an adaptive management approach be acceptable?
- Do we need to reinstate biking/walking tracks across the gully?
- Do we need to reinstate or compensate for lost vegetation?

Questions to consider

- What level of gully reinstatement is appropriate?
- Can steep slopes be left in a manner consistent with natural slopes elsewhere in the general area?
- Can a low level of slope stability be accepted?
- What importance should be placed on achieving outcomes visually consistent with the existing natural environment?

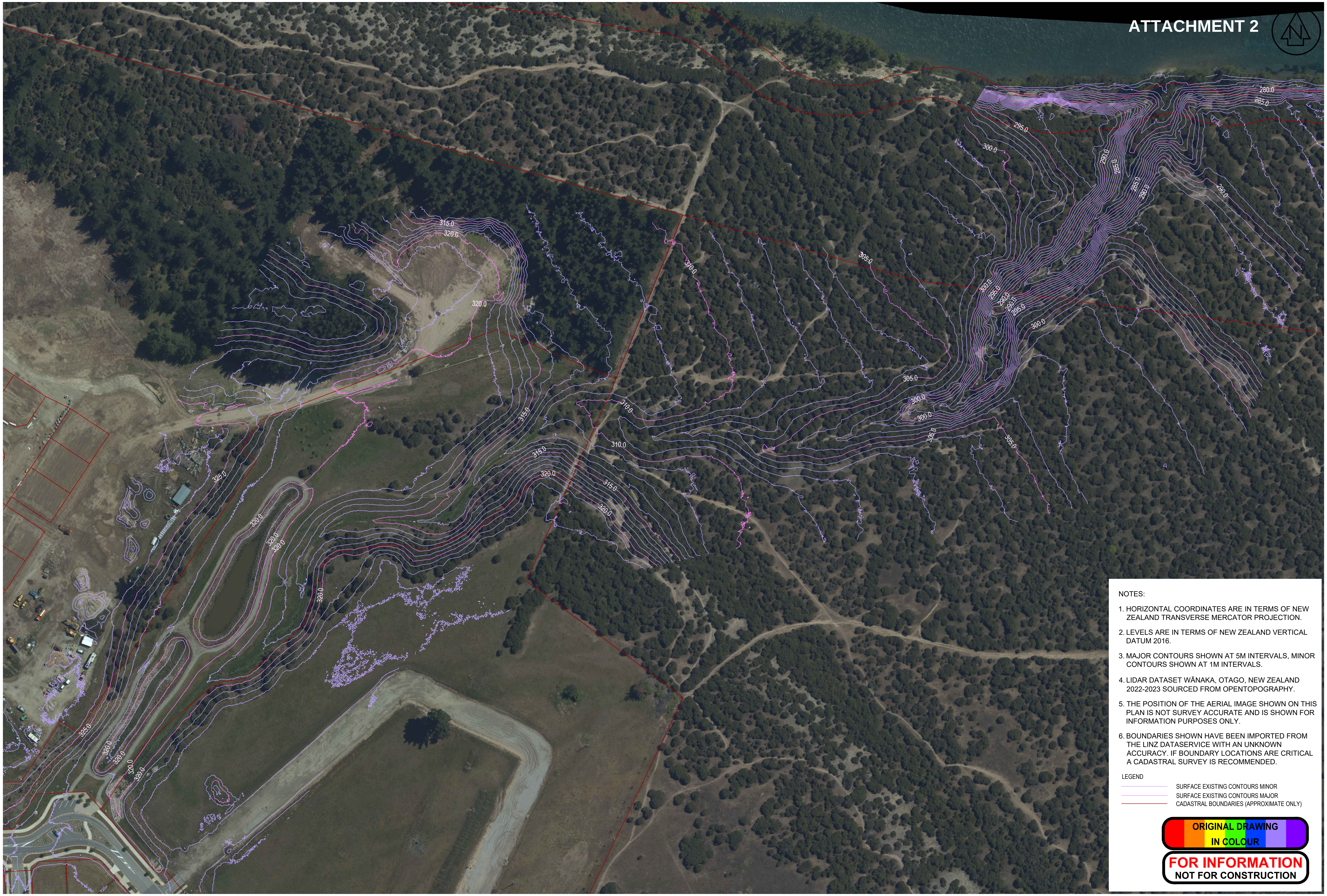
Actions

Project stages and key dates

Stage	Completion Date
~~Approval to Proceed~~	~~13 September 2024~~
~~Mobilise resources (Beca) and background information provided by QLDC~~	~~27 September 2024~~
~~1. Initiation and Information Gathering~~	~~18 October 2024~~
2. Problem Identification and Future State Requirements	~~22 October 2024~~ 6 October 2024
3. Initial Options Identification and Assessment	~~14 November 2024~~ 28 November 2024
4. Development and Assessment of Short-Listed Options	~~16 December 2024~~ 20 January 2025
5. Concept Design of Preferred Option	~~18 March 2025~~ 1 April 2025

Beca

ATTACHMENT 2



NOTES:

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6. BOUNDARIES SHOWN HAVE BEEN IMPORTED FROM THE LINZ DATASERVICE WITH AN UNKNOWN ACCURACY. IF BOUNDARY LOCATIONS ARE CRITICAL A CADASTRAL SURVEY IS RECOMMENDED.

LEGEND

SURFACE EXISTING CONTOURS MINOR
SURFACE EXISTING CONTOURS MAJOR
CADASTRAL BOUNDARIES (APPROXIMATE ONLY)

ORIGINAL DRAWING IN COLOUR

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No.	Revision	By	Chk	Appd	Date
A	FOR INFORMATION ONLY	HC	PR	PR	27.09.24

Drawing Originator: Beca

Original Scale (A1)	1:1000
Reduced Scale (A3)	1:2000

Surveyed	HC	NA
Drawn	HC	27.09.24
Verifier	PR	27.09.24
Dwg Check	PR	27.09.24

Client: QUEENSTOWN LAKES DISTRICT COUNCIL

Project: ROCKABILLY OPTIONS ASSESSMENT

Title: ROCKABILLY LIDAR SURVEY

Discipline: SURVEY

Drawing No. 3368610-WS-0001 Rev. A

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DO NOT SCALE   Source Application   IF IN DOUBT ASK

C

Appendix C – Long-List Options Workshop - Minutes and Presentation

Minutes

Notes from Long-List Options Workshop

Held 27 November at 12:30pm at Beca Queenstown office and on Teams

Attendees

[redacted]	QLDC	[redacted]	Beca
[redacted]	QLDC	[redacted]	Beca
[redacted]	QLDC	[redacted]	Beca
[redacted]	Beca	[redacted]	Beca

These notes should be read in conjunction with the Long-list Options Assessment Workshop presentation (PDF attached).

Item	Action
1 Introduction • QLDC & Beca teams were introduced. Beca cost, landscaping and sustainability team members are not involved in this workshop as options are still quite high-level – will be more involved in later stages when there is more definition/detail of the options.	
2 Future State Requirements • Future state requirements (as summarised in presentation) were confirmed. • QLDC are meeting with DOC on 11th December to share progress, get feedback. **Action: QLDC to advise project team outcomes of DOC meeting**. • A question was raised about the intent of the proposed planting. The intent of the planting is to mitigate plants lost to erosion in the gully and any removed as part of physical works, not planting for stabilisation. However, planting for stabilisation of trimmed/modified slopes will also be considered. • It is acceptable for some erosion to still occur in the gully in larger events post-mitigation – as this is a natural process. However, the acceleration of erosion should be slowed. • It is assumed that physical works will have a maintenance/defects period of 1-2 years and then will be handed over to DOC or QLDC to maintain. Long term ownership and maintenance needs to be part of discussion with DOC. **Action: QLDC to raise with DOC in meeting**. • While an adaptive management approach is an option, the big challenge with this approach is access for future works in the gully.	[redacted] [redacted]
3 Upstream Stormwater System Options • The existing Northlake basins are already filling the maximum footprint available at their sites – making them larger has been discounted. • Combing the Hikuwai and Northlake systems, in conjunction with additional storage, provides an opportunity to reconfigure the existing stormwater system. [redacted] made the comment that Hikuwai and Northlake basins may not be able to be connected together until all development is complete due to existing subdivision consents (and maybe Environment Court decisions). **Action: [redacted] to confirm with [redacted] if there are any constraints.** • Beca's proposed changes to Hikuwai ponds are enlarging existing ponds and adding a pond to the north of the existing. QLDC suggested there may be another option for parallel ponds next to the existing Hikuwai ponds. Would need to be within QLDC boundary. Extending the existing ponds would be more efficient use of space.	[redacted]

• Using pocket parks for retention would yield small additional volumes and require additional pipework in road. The park opposite Mt Nicholas Ave is reasonably sized and may offer some benefits, however, was assumed not available due to adjacent amenities (pump track, outdoor gym, skatepark) so grass area will want to be retained for public use. **Action: QLDC to confirm if this park could be used for stormwater basin.** • Modifying existing basin outlets needs to be combined with increased storage, otherwise large events will cause increased flooding. • Low level weirs in upper gully would yield small additional volumes. • Soakage would be in addition to other options, and likely to be relatively small volumes. Noted that soakage is likely to clog over time.	[redacted]
4 Upper Gully Options • Targeted rock linings could be in key locations e.g. mountain bike track crossings. • If a 'do nothing' approach is taken, this will need to be combined with upstream stormwater works to reduce future erosion risk. • Two land owners in this reach – QLDC upstream end, and then DOC. There may need to be differences in solution between QLDC land (mostly grassy area) and DOC land (generally exposed soil and more erosion).	
5 Main Scour Basin • Rock lined options would likely comprise a geofabric and bedding layer below the rock to protect subgrade soils from erosion. • Rock lined options need to consider rock sizes and sources. • Cardona village was noted by QLDC as a possible rock source. • Gabion baskets may not be suitable for DOC land – too engineered and visually not sympathetic with environment. • Concrete lined channels discounted.	
6 Lower Gully • QLDC advised that Hanleys Farm rock mattress is an example of a large scale rock mattress. • Planting should be considered for surface stability where slopes are trimmed or exposed.	
7 Reinstatement • This will be a key item for QLDC to discuss with DOC on 11 December. DOC may have a management plan or planting palette. **Action: QLDC to discuss with DOC.**	[redacted]
8 Bottom of gully & Outlet Track • QLDC advised that a culvert or bridge will likely be required at the bottom of the gully at the Outlet Track due to flows. • This may be Crown land (LINZ). **Action: QLDC to find out land ownership/who manages this area.** • DOC may have certain expectations at the track crossing. **Action: QLDC to discuss with DOC.** • Likely to be a standard selection of footbridge designs available.	[redacted] [redacted]
9 Consenting • Detailed assessment against planning provisions can't be carried out until there is some more definition/detail around the options (e.g. areas, volumes). • Initial assessment is that these are no major show stoppers for proposed options.	

• Existing stormwater system and ponds (QLDC reserves) are in the Northlake Special Zone under the Operative District Plan (ODP). The DOC land is in Rural zone under the Proposed District Plan (PDP) within the Outstanding Natural Features (ONF) landscape classification overlay. • Also need to consider ORC rules for structures in the riverbed. Ecological assessment may be required. • Need to confirm fish passage requirements. **Action: Beca to confirm fish passage requirements from planning provisions.**	[redacted]
10 Assessment Criteria • The assessment criteria as set out in the presentation were confirmed.	
11 Combined Options and Options Assessment • The proposed Beca five combined options were discussed. • It was agreed that for the proposed option in each area needs to be better defined before these can be combined options to be assessed. • The options assessment was therefore not carried out as part of the workshop. (The draft options assessment matrix slide is not included in the attached presentation, as it was discounted.)	
12 Next Steps • Beca to document the different options in each area with commentary on expected performance, for QLDC to consider. This needs to be provided to QLDC ahead of its meeting with DOC on 11 December. **Actions: Beca to provide table summarising options with commentary.** • This will then lead on to forming combined options and assessing options. • Suggested that scoring is changed from red/orange/green to numerical or similar to avoid perception that ‘red’ is ‘stop’ or doesn’t meet objectives / is ruled out.	[redacted]

Rockabilly Gully Technical Options Assessment

Long-list Options Assessment Workshop

27 November 2024

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Long-list Options Assesssment Workshop - Purpose

- Multi-disciplinary team – Beca & QLDC staff
- Work through long-list options and assess against criteria
- Outcome: Short-list of (three) options to be advanced to the next stage

Approach

- Introductions
- Recap – key project drivers, existing erosion, and future state requirements
- Mitigation options – stormwater system and different parts of gully
- Combined options
- Criteria
- Assess combined options

Key project drivers

- Erosion in gully/Hikuwai Reserve
- Sediment discharge to Mata-Au/Clutha River

- From ORC abatement notice:
  - Erosion, land instability, sedimentation or property damage in Hikuwai Reserve
  - Sediment discharge to Mata-Au/Clutha River (creating colour/visual clarity change after reasonable mixing)

Existing erosion

Beca

Causes of erosion and sediment discharge

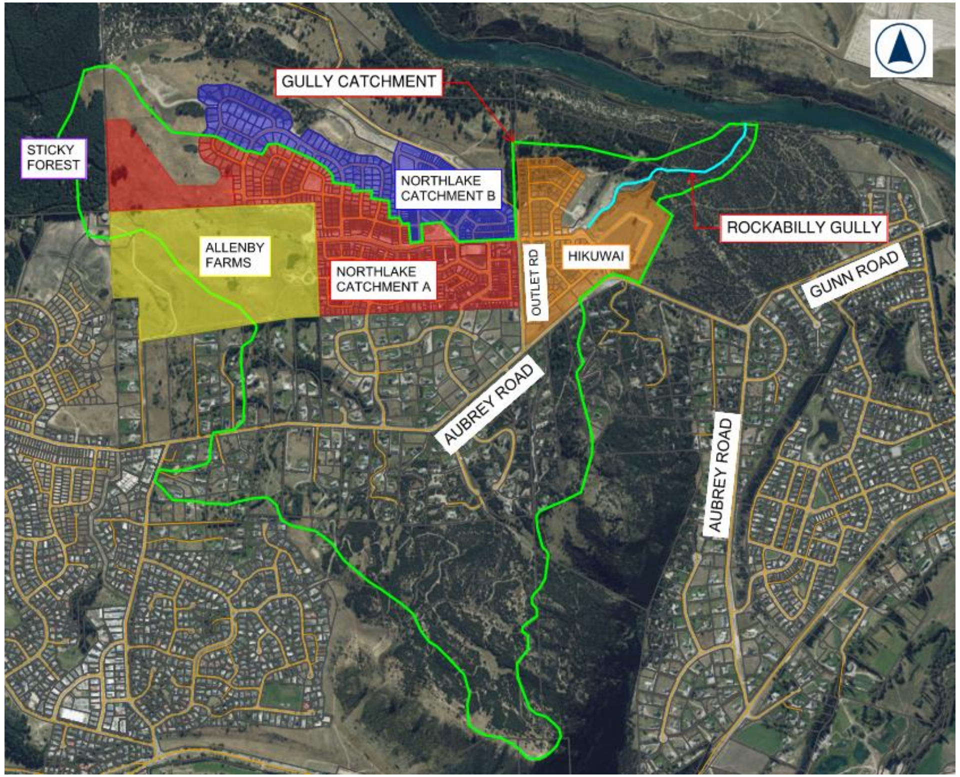
- Natural gully processes
- Soils comprise outwash gravels underlain by meltwater lake deposits
    - Outwash gravels provide some resistance to erosion but are variable thickness
    - Lake deposits are highly dispersive and susceptible to erosion

Causes of erosion and sediment discharge

Development in catchment:

- Increased frequency of runoff, and increased peak flows and volume (all events)
- Stormwater systems designed for peak flow attenuation in large events
- More frequent runoff, higher peak flows in small storms and greater volume

  → accelerated erosion



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LEGEND

- SURFACE EXISTING CONTOURS MINOR
- SURFACE EXISTING CONTOURS MAJOR
- CADASTRAL BOUNDARIES (APPROXIMATE ONLY)

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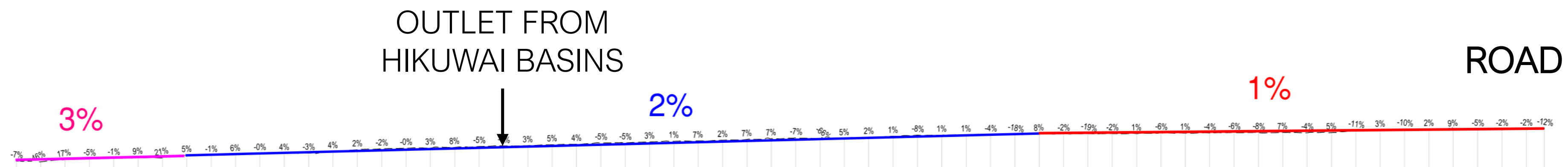

DATUM: 310.00

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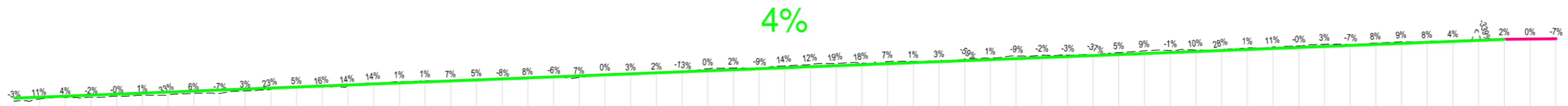
605	313.73
610	314.20
615	314.35
620	314.49
625	314.62
630	314.54
635	315.05
640	315.07
645	315.25
650	315.43
655	315.41
660	315.45
665	315.79
670	316.12
675	316.32
680	316.44
685	316.48
690	316.61
695	316.78
700	316.90
705	316.94
710	317.12
715	317.22
720	317.48
725	317.51
730	317.68
735	317.82
740	317.88
745	318.02
750	318.18
755	318.33
760	318.47
765	318.41
770	318.36
775	318.60
780	318.81
785	319.04
790	319.03
795	319.08
800	319.13
805	319.20
810	319.26
815	319.27
820	319.35
825	319.32
830	319.32
835	319.47
840	319.42
845	319.44
850	319.53
855	319.51
860	319.56
865	319.48
870	319.53
875	319.95
880	320.02
885	320.22
890	320.18
895	320.13
900	320.20
905	320.23
910	320.26
914	320.37

LONGITUDINAL SECTION: GULLY CENTRE

ORIGINAL DRAWIN
IN COLOUR



DATUM: 300.00

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305	302.57
310	302.84
315	302.88
320	303.08
325	303.27
330	303.36
335	303.63
340	303.62
345	304.08
350	304.41
355	304.73
360	304.81
365	305.02
370	305.58
375	305.83
380	305.99
385	305.96
390	306.18
395	306.22
400	306.47
405	306.70
410	306.63
415	307.24
420	307.26
425	307.42
430	307.67
435	308.22
440	308.36
445	308.29
450	308.76
455	309.03
460	309.18
465	309.29
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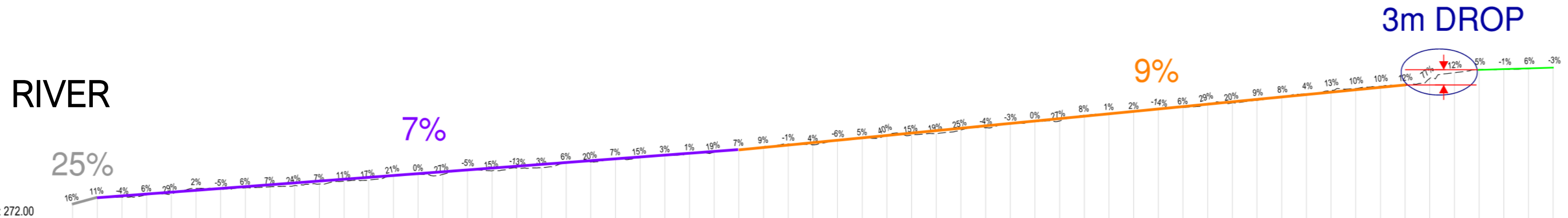
475	309.60
480	309.71
485	310.04
490	310.22
495	310.62
500	310.77
505	310.78
510	310.86
515	311.23
520	311.59
525	311.64
530	311.75
535	311.80
540	312.13
545	312.31
550	312.50
555	312.81
560	312.76
565	313.02
570	313.30
575	313.34
580	313.47
585	315.03
590	313.85
595	313.86
600	313.89

LONGITUDINAL SECTION: GULLY CENTRE



DATUM: 272.00

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10	277.05
15	277.48
20	277.62
25	278.75
30	278.59
35	278.84
40	279.05
45	279.30
50	279.61
55	280.15
60	280.37
65	281.22
70	281.48
75	281.48
80	282.45
85	282.19
90	282.71
95	282.79
100	283.71
105	283.88
110	284.54
115	284.73
120	285.11
125	285.50
130	285.79
135	286.36
140	286.93
145	287.40
150	287.24
155	288.15
160	288.45
165	289.15
170	289.10
175	289.37
180	290.12
185	290.56
190	291.33
195	291.71
200	291.87
205	293.00
210	293.34
215	293.57
220	294.22
225	294.49
230	295.29
235	295.39
240	295.88
245	296.50
250	297.14
255	297.81
260	298.20
265	298.62
270	298.79
275	300.15
280	301.26
285	301.88
290	301.89
295	302.04
300	302.17

LONGITUDINAL SECTION: GULLY CENTRE

Future state requirements

Gully & reserve

- Don’t need to reinstate gully to pre-development form
- Mitigation works need to be sympathetic with existing environment
- As a minimum, works will be needed in gully to:
    - Stabilise channel at main drop in gully.
    - Trim overhangs (but can leave steep or vertical slopes).
    - Clear fallen kanuka and debris. (Reuse dead kanuka where possible.)
    - Manage health & safety risk to track users at dead ends.
- Planting required to mitigate loss
- Low maintenance
- May be acceptable to have some erosion in larger events (e.g. 10-year event), with maintenance afterwards.

Future state requirements

Upstream stormwater system

- Modifications of stormwater system should be part of the works
  - Modifications to existing basins and/or new basins
  - Consider soakage opportunities (but won't be able to offset additional runoff volume post-development)
- Basins designed to drain down (i.e. dry basins)
- Maintainable

General

- An adaptive management approach can be considered.

Mitigation options

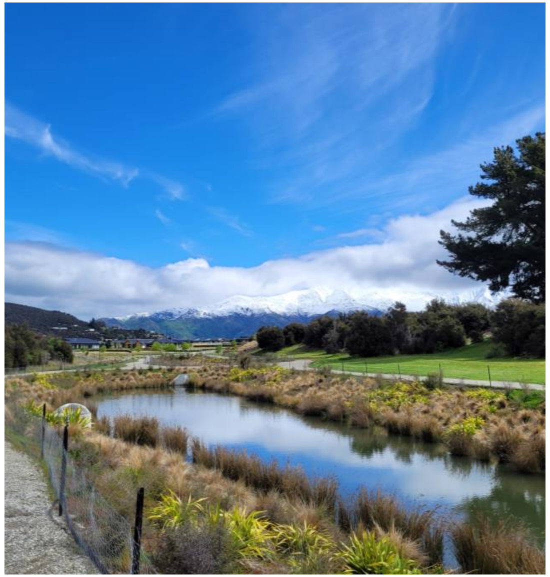
- Upstream stormwater system
- Within gully
  - Upper gully
  - At main erosion basin/drop
  - Lower gully
- Reinstatement in & around gully

Upstream stormwater system – mitigation options

Longlist options:

- Upgrade Hikuwai Basins
- Combine Northlake and Hikuwai systems
- New basins in Northlake pocket parks
- Modify existing basin outlets
- Low level weirs in upper gully
- Add soakage in some basins

- Discounted options:
  - Make Northlake basins larger

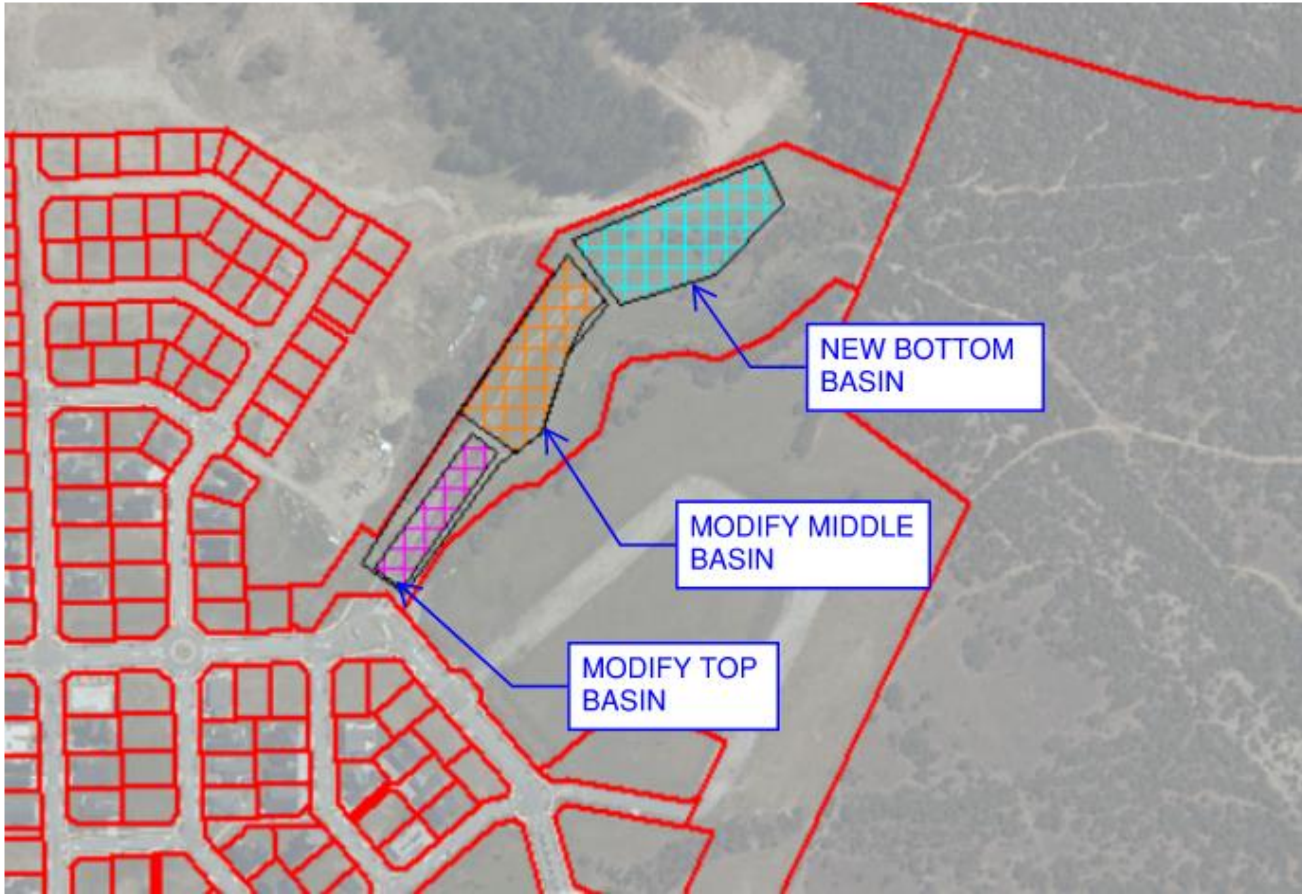


Beca

Upstream stormwater system – mitigation options

Longlist options:

- Upgrade Hikuwai Basins



Upstream stormwater system – mitigation options

Longlist options:

- Combine Northlake and Hikuwai systems

Upstream stormwater system – mitigation options

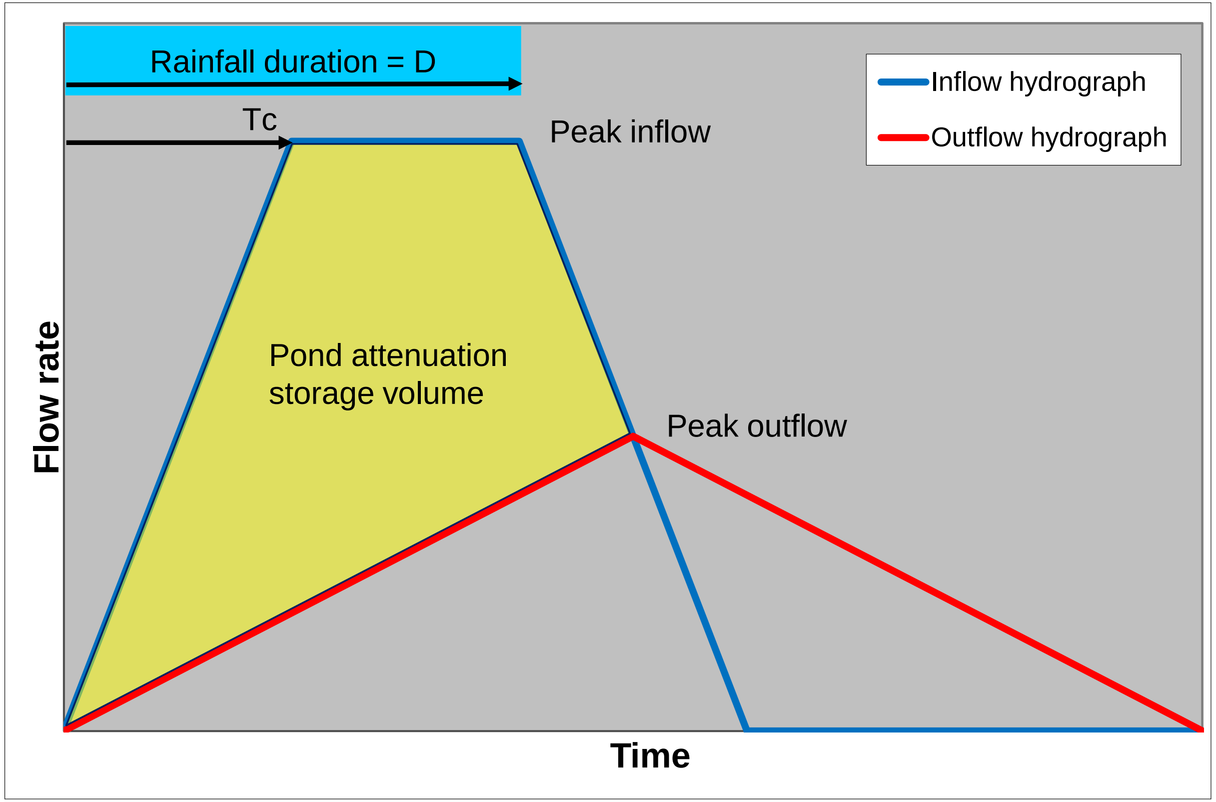
Longlist options:

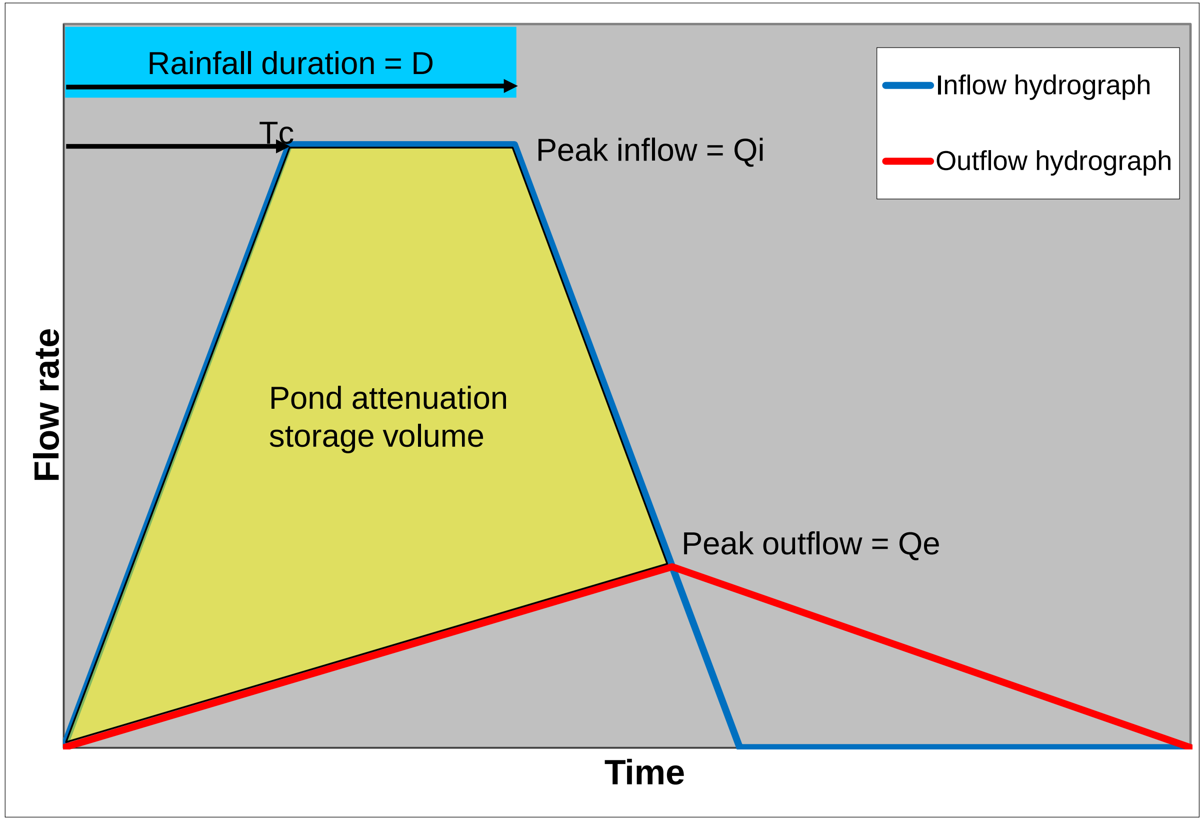
- New basins in Northlake pocket parks

Upstream stormwater system – mitigation options

Longlist options:

- Modify existing basin outlets
  - Detention of smaller events
  - Reducing outflow needs to be in conjunction with more storage
  - Inflow – outflow – pond volume relationship


Rainfall duration = D
Tc
Peak inflow
Inflow hydrograph
Outflow hydrograph
Pond attenuation
storage volume
Peak outflow
Flow rate
Time



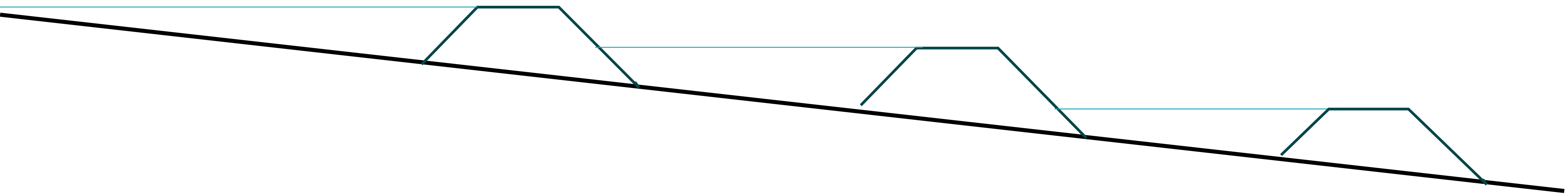
Same storm, smaller discharge
→ need greater storage volume

Upstream stormwater system – mitigation options

Longlist options:

- Low level weirs in upper gully

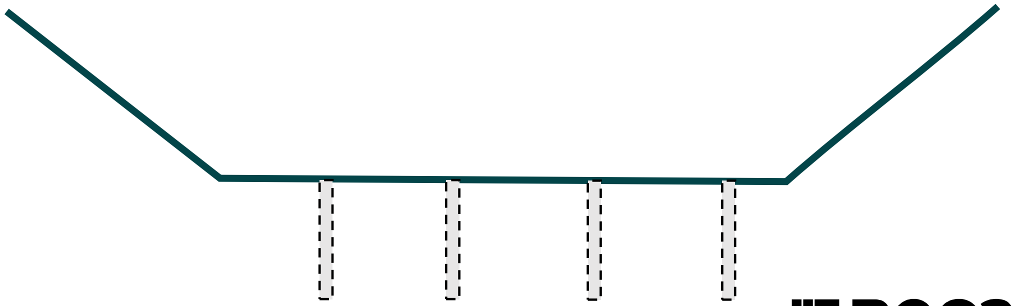
Gabion weir (Qld)



Upstream stormwater system – mitigation options

Longlist options:

- Add soakage in some basins
  - Depends on local ground conditions
  - Unlikely to achieve large high soakage rates / large volume – developers likely to have already put soakage basins in high soakage area
  - May be able achieve some soakage – basin invert or bores



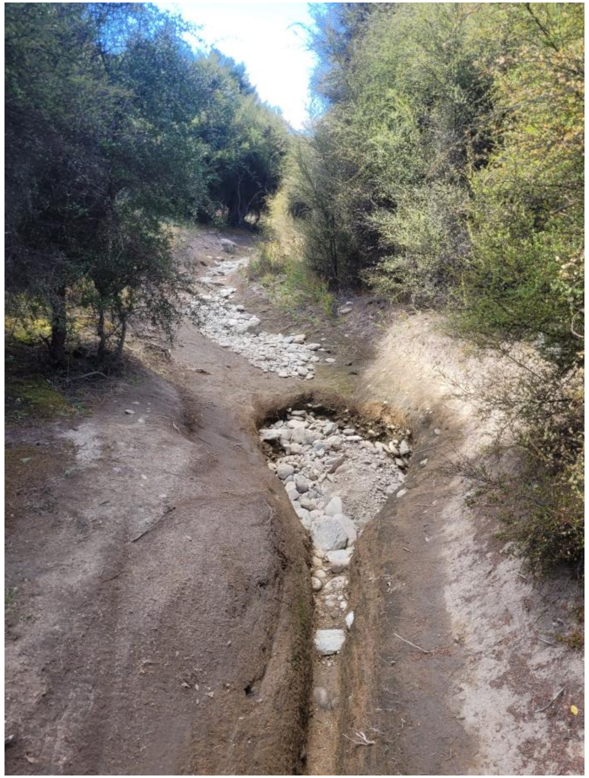
Beca

Upper gully – mitigation options

Longlist options:

- Rock lined (fully)
- Targeted rock lining
- Low rock weirs
- Do nothing

- Discounted options:
  - Concrete lined
  - Piped stream
  - Gabion baskets / reno mattress



Upper gully

Main scour basin / drop – mitigation options

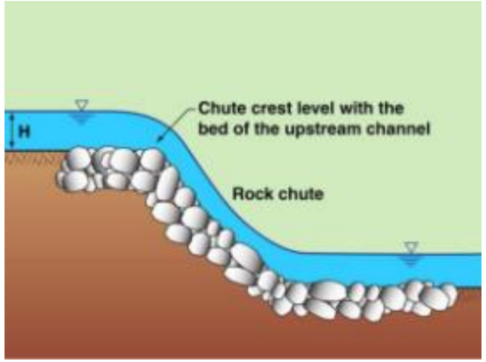
Longlist options:

- Rock lined – battered
- Rock lined – vertical drop
- Gabion baskets – vertical drop

- Discounted options:
  - Do nothing – expected to continue to cut back
  - Concrete lined
  - Reinstate to pre-development

Beca

Main scour basin / drop – mitigation options



Rock mattress chute (Qld)

Sandbag drop structure (NSW)

Stepped gabion chute (Qld)

Lower gully – mitigation options

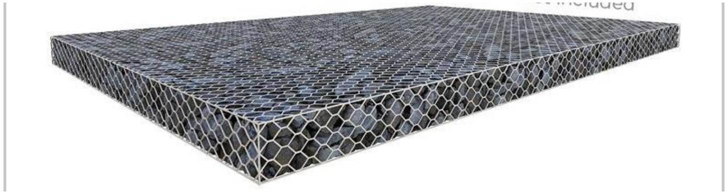
Longlist options:

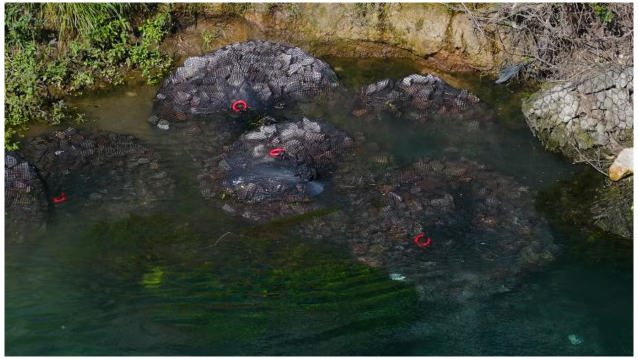
- Rock lined (fully)
- Targeted rock lining
- Reno/gabion mattress
- Low rock weirs
- Do nothing

- Discounted options:
  - Concrete lined channel
  - Piped stream
  - Concrete canvas bags
  - Rockfill bags
  - Geofabric / geo-cells
  - Retaining structures (e.g. sheet piles)

Lower gully – mitigation options

Rock mattress chute (Qld)





Lower gully

Reinstatement – options

Longlist options:

- Remove dead vegetation and debris
- Remove loose and surplus soil
- Planting battered slopes
- Planting/natural barriers
- Diverting tracks
- Blocking off dead ends of tracks
- Compensatory planting elsewhere in reserve

- Discounted options:
  - Reinstate slopes pre-development

Beca

‘Natural’ gully slopes near bottom of gully

Bottom of gully & Outlet Track

Considerations:

- Any work required at the crossing?

Combinations

No.	Description	Upstream	Upper gully	At drop	Lower gully
1	Modify basins and engineered in the gully	Modify basins	Rock lining	Rock/gabion	Rock lining
2	No basin changes and engineered in gully	Do nothing	Rock lining	Rock/gabion	Rock
3	Modify basins and less engineered in gully	Modify basins	Targeted lining	Rock	Targeted toe scour protection
4	Modify basins and minimal engineering in gully	Modify basins	Do nothing	Rock	Targeted toe scour protection
5	No basin changes and engineering at drop only in gully	Do nothing	Do nothing	Rock	Do nothing

Criteria

Criteria	Definition
Performance confidence	Expected technical performance, including risk and resilience.
Cost	Capital and operational costs.
Environmental impact	Impact on environment of works including: being sympathetic to the landscape; ecology; and recreation. Both long term and construction effects.
Community acceptability	Likely acceptability to key stakeholders and wider community.
Consenting/approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.
Operation & maintenance	Ease of inspections, operations and maintenance.
Sustainability	Relative carbon assessment

Beca

D

Appendix D – Long-List Options Comments and Preferences letter

ANZ Centre, 267 High Street,
PO Box 13960, Christchurch,
8141, New Zealand
T: +64 3 366 3521 // **F:** +64 3 366 3188
E: info@beca.com // www.beca.com

6 December 2024

Queenstown Lakes District Council
Private Bag 50072
Queenstown 9348
New Zealand

Attention: [redacted]

Dear [redacted]

Long-list Options – Initial Comments and Preferences

1 Introduction

Beca Limited (Beca) has been engaged by Queenstown Lakes District Council (QLDC) to carry out a technical options report for mitigating the erosion in Rockabilly Gully. The project includes understanding the existing erosion issue, defining the future state requirements, identifying and assessing long-list options and then short-list options, and concept design of the preferred option.

The future state requirements for the project were discussed and agreed at the Future State Requirements workshop with QLDC held on 4 November 2024. The current erosion issue and future state requirements were documented in a letter from Beca to QLDC, *Rockabilly Gully – Current Erosion and Future State Requirements*, dated 22 November 2024.

A Long-list Options workshop with QLDC was held on 27 November 2024. The purpose of this letter is to summarise:

- The options identified and discussed at the Long-list Options workshop.
- Our initial comments on these options and preferences, taking into account the project objectives, the future state requirements, and feedback received from the QLDC at the Long-list Options workshop.

We anticipate that QLDC will review this letter and provide comments, and this will feed into assessing which options will be advanced to the next stage (Short-list Options).

2 Mitigation Options

Options have been identified in five different areas:

- Upstream stormwater system.
- Within the gully, including:
  - Upper gully.
  - At main erosion basin/drop.
  - Lower gully.
- Reinstatement in and around the gully.

The upstream stormwater system options are located in QLDC land (existing reserves or roads). The upper gully area is part in QLDC land (reserve) and part in Department of Conservation (DOC) managed reserve.

make everyday better.

While we have treated the upper gully as a single area for this long-list stage, it may be necessary to separate later depending on the short-listed solutions. The remainder of the gully including the main erosion basin/drop and lower gully are in DOC managed reserve, except the final reach of the gully where it crosses the Outlet Track and discharges with the Clutha River which may be Crown land managed by LINZ (to be confirmed by QLDC).

For each of these areas, possible options as discussed at the Long-list Options Workshop have been identified, and key advantages, disadvantages, and risks have been summarised in a table. Within each table:

- The options which we recommend are considered as part of the next stage (Short-listed Options) are shaded in green.
- The options which we recommend are discounted are shaded in red.

Options which have been previously identified but discounted are listed below each table with a description of why they were discounted.

The stream crossing at the Outlet Track is being considered separately for the long-list assessment process. We expect that QLDC's interaction with DOC will guide the decisions at this location.

2.1 Upstream stormwater system

The erosion in the gully has likely been accelerated by the development in the catchment. The developers' design approach to the stormwater management for Northlake catchment A and the Hikuwai development was focused on attenuating peak flows in the large (less frequent) events, to mitigate downstream flood risk. However, this approach does not mitigate the effects of more frequent runoff, higher peak flows in small (more frequent) events, and increased runoff volume with development, which contribute to erosion.

Works in the upstream stormwater system would be designed to reduce the rate of discharge from the upstream stormwater system in small storms (to reduce the risk of accelerated erosion), by providing additional storage and limiting outflow, but still maintain attenuation of peak flows in larger storms (to manage flood risk). Works could also reduce the volume of discharge via soakage if possible (which would also assist with reducing the risk of accelerated erosion).

Table 1: Upstream stormwater system options

Option	Advantages	Disadvantages	Risks
Upgrade Hikuwai Basins	▪ Land available within existing QLDC reserve. ▪ Could involve reconfiguring existing basins (including modifying the outlets) to add volume and adding a new basin within the existing reserve. ▪ Can obtain significant additional volume within the existing reserve. ▪ Limits area of disruption during construction.	▪ Does not mitigate Northlake discharge unless systems are combined.	▪ Reconfigured system will need careful design over all events.
Combine Northlake and Hikuwai systems	▪ Could be in conjunction with upgrading the Hikuwai Basins.	▪ Philosophical change - requires reconfiguration of system.	▪ Reconfigured system will need careful design over all events. ▪ May be requirements from the land development process to keep the two systems separate.
Modify existing basin outlets (to reduce discharge)	▪ Integral to both options above.	▪ Cannot be in isolation – need to add storage volume to the system.	▪ Could increase flood risk in larger events if not designed appropriately.
Add soakage in some basins	▪ May be able achieve some soakage – basin invert or bores – reducing volume discharged. ▪ Only option for reducing volume.	▪ Unlikely to achieve large high soakage rates / large volume – developers likely to have already put soakage basins in high soakage areas. ▪ Would need to be combined with other options.	▪ Depends on local ground conditions. ▪ May clog over time.
Low level weirs in upper gully	▪ Work could be within QLDC reserve. ▪ Creates storage in upper gully.	▪ Work may also need to be in DOC reserve. ▪ Relatively small volumes. ▪ Would need to be combined with other options.	▪ Need to be designed to overtop in larger events - potential local scour risk.

Option	Advantages	Disadvantages	Risks
New basins in Northlake pocket parks	▪ Creates additional storage in other existing QLDC reserves.	▪ Relatively small volumes. ▪ Would need to be combined with other options. ▪ Additional works required at multiple locations. ▪ New pipework required in road to connect. ▪ Creates multiple assets for QLDC to maintain.	▪ May not be well received by the community due to multiple areas of disruption and loss of 'green' space.
Do nothing	▪ No cost now.	▪ Does not alter existing flow regime. ▪ Means all mitigation works are in the gully, which has a higher environmental impact. ▪ Likely to be unpopular with community.	▪ Higher flows and velocities in smaller events than other options.

In preparing the longlist options, we discounted the following mitigation options in the upstream stormwater system for the reasons noted:

- Make Northlake basins larger – We have discounted this option as the existing basins already occupy the full site space available.

The recommended way forward for the upstream stormwater system is a combination of upgrading the Hikuwai Basins, combining the Northlake and Hikuwai stormwater systems, and modifying the existing basin outlets. Soakage could also be included in some basins (as this is the only option to reduce volume). There could be different sub-options within this. Options would be designed to capture and slowly release runoff from small/frequent events to reduce the erosion risk compared to the current situation and still attenuate peak flows in large/less frequent event to match pre-development to mitigate the flood risk.

2.2 Upper gully

Currently in the upper gully there are discrete areas of erosion, which is not as significant as the erosion further downstream (below the main erosion basin/drop). There are areas of exposed outwash gravel, as well as areas of gravel which may have been imported. Mountain bike tracks cross the upper gully in a number of locations.

Works in the upper gully would be designed to reduce the potential for further scour by covering and protecting the soils and reducing the water velocity. We note that there are two separate landowners for this section of the gully: QLDC (upstream end); and then DOC. There may be differences in the solutions between QLDC land (mostly grassy area) and DOC land (generally exposed soil and more erosion). For the purposes of this letter, both areas were still considered together.

Table 2: Upper gully options

Option	Advantages	Disadvantages	Risks
Rock lined (fully)	▪ Covers and protects dispersive soils from ongoing erosion. ▪ Slight reduction in velocity of flows. ▪ Can be combined with low rock weirs.	▪ Large scale of work and area of disruption within the gully.	▪ Erosion under rock – can be mitigated by use of filter between rock and underlying soils.
Targeted rock lining	▪ Covers and protects targeted areas from ongoing erosion – e.g. worst areas of existing erosion and track crossings. ▪ Limits scale of work and disruption during construction compared to full lining. ▪ Slight reduction in velocity of flows. ▪ Can be combined with low rock weirs.	▪ Leaves unlined areas at risk of erosion.	▪ Scour risk heavily influenced by extent and thickness of outwash gravels which is uncertain. ▪ Erosion under rock – can be mitigated by use of filter and bedding between rock and underlying soils. ▪ Where erosion continues then dispersive soils could still be transported to river as sediment.
Low rock weirs	▪ Reduces velocity of flows. ▪ Could be combined with either rock lining option.	▪ Would be best to combine with other options.	▪ Local scour risk immediately downstream of weir – need to detail appropriately. ▪ Could infill over time and become ineffective if not maintained.
Do nothing	▪ No cost now.	▪ Would need to implement more extensive stormwater works upstream to mitigate future erosion. ▪ Erosion could continue. ▪ Likely to be unpopular with community.	▪ Scour risk heavily influenced by extent and thickness of outwash gravels which is uncertain. ▪ Erosion continues and dispersive soils continue to flow into the river.

In preparing the long-list options, we discounted the following mitigation options in the upper gully for the reasons noted:

- Concrete lined channel – We have discounted this option as it is not considered sympathetic to the existing natural environment, and will likely be poorly received by DOC and the community. Concrete lining is also not flexible and therefore not as resilient to future changes as rock.
- Piped stream – We have discounted this option as it is not considered sympathetic with the existing natural environment. Also, the hydraulic capacity would be limited by the pipe size, and would be lower than an open channel.
- Gabion basket / reno mattress – We have discounted this option as this option is considered heavily engineered and not commensurate with the perceived scour risk for the upper gully, particularly if upstream stormwater measures are adopted to reduce stream flows/velocities.

The recommended way forward for the upper gully is to use targeted rock lining. This will help reduce the erosion of dispersive soils within the upper gully, targeting key locations. There is also the potential for combining this option with low rock weirs to reduce velocities and create some storage in the upper gully.

2.3 At main erosion basin / drop

At this location there is a significant scour hole with large vertical drop, bank failures, and fallen/dead vegetation. This is continuing to increase in size and the head of the scour basin / drop is expected to continue to 'cut back' upstream.

Works at the main erosion basin / drop would be designed to stabilise the waterway channel at this location, to reduce the potential for further cutting back and scour by installing rock protection and energy dissipation. For all options, loose material and overhanging banks would be removed and rerouting of tracks would need to be considered.

Table 3: Main erosion basin / drop options

Option	Advantages	Disadvantages	Risks
Rock lined - battered	▪ Covers and protects dispersive soils. ▪ Can provide energy dissipation at the bottom. ▪ Could be more natural looking than stepped structure. ▪ Likely to be more resilient – will move as a flexible mass. ▪ Gentler slopes allow for easier access and potential track crossings.	▪ Requires more significant earthworks in the gully and disruption. ▪ Transport and accessibility with large rocks may be difficult.	▪ Erosion under rock – can be mitigated by use of filter between rock and underlying soils. ▪ High energy at bottom.
Stepped drop structure	▪ Can be rock, concrete bags or gabions (see below). ▪ Covers and protects dispersive soils. ▪ Less earthworks required than battered option. ▪ Provides energy dissipation at steps.	▪ Transport and accessibility with large rocks may be difficult. ▪ Higher engineered structure may not be considered sympathetic with environment. ▪ Likely to be less resilient than a battered slope – has the potential to separate if movement occurs.	▪ Higher risk of instability than battered. ▪ Erosion under rock – can be mitigated by use of filter between rock and underlying soils.
Gabion baskets	▪ Covers and protects dispersive soils. ▪ Common and understood retaining solution. ▪ Relatively robust solution.	▪ Considered a harder engineered solution which DOC and the community may receive negatively. ▪ Not visually sympathetic with the existing natural environment. ▪ Excavation required to fit in baskets. ▪ Transport and accessibility with large rocks may be difficult.	▪ Settlement gabion structure. ▪ Erosion under gabions – can be mitigated by use of filter between rock and underlying soils.

In preparing the long-list options, we discounted the following mitigation options in the main erosion basin / drop for the reasons noted:

- Do nothing – We have discounted this as an option as the erosion basin is expected to continue to cut back.
- Concrete lined – We have discounted this option as it is not considered sympathetic to the existing environment, and will likely be poorly received by the DOC and the community, and has a high carbon cost. Concrete lining is also not flexible and therefore not as resilient to future changes as rock or gabions.
- Piped stream – We have discounted this option as it is not considered sympathetic with the existing natural environment. Also, the hydraulic capacity would be limited by the pipe size and would be lower than an open channel.
- Reinstate to pre-developed – We have discounted this as an option as the goal is to be sympathetic with the existing natural environment, limit earthworks and gully scour is considered a natural process.

The recommended way forward for the main erosion basin / drop is to consider options for lining the waterway channel with a battered rock lined slope.

2.4 Lower gully

Downstream of the main scour basin / drop the gully varies in width but is generally wide with toe scour and bank failures over reaches, with associated vegetation and debris. There is some gravel in the bed which appears to have been placed or washed down from upstream (although not confirmed).

Works in the lower gully would be designed to reduce the potential for further scour by installing protective barriers over the soils and/or reducing the water velocity.

Table 4: Lower gully options

Option	Advantages	Disadvantages	Risks
Rock lined (fully)	▪ Can be easily combined with low rock weirs. ▪ Covers dispersive soils. ▪ Reduces velocity of flows.	▪ Large area of disruption within the gully. ▪ Transport and accessibility with large rocks may be difficult.	▪ Material from the slope above the works slips into the stream and sediment flows to river.
Targeted rock lining	▪ Limits area of disruption during construction. ▪ Covers some dispersive soils. ▪ Reduces velocity of flows.	▪ Leaves unlined areas open to erosion. ▪ Transport and accessibility with large rocks may be difficult.	▪ Erosion could continue in those areas not treated. ▪ The stream alignment changes over time resulting in the lining become less effective or causing scour in an area not treated. ▪ Material from the slope above the works slips into the stream and sediment flows to river. ▪ Depending on the local conditions in the lower gully, there is the risk that the required rock lining could be extensive.
Reno/gabion mattress	▪ Covers dispersive soils. ▪ Reduces velocity of flows.	▪ Considered a harder engineered solution which the community may receive negatively. ▪ Not visually sympathetic with the environment. ▪ Transport and accessibility with large rocks may be difficult. ▪ Requires contouring of slopes prior to placement.	▪ Material from the slope above the works slips into the stream and sediment flows to river.

Option	Advantages	Disadvantages	Risks
Rock lined (fully)	▪ Can be easily combined with low rock weirs. ▪ Covers dispersive soils. ▪ Reduces velocity of flows.	▪ Large area of disruption within the gully. ▪ Transport and accessibility with large rocks may be difficult.	▪ Material from the slope above the works slips into the stream and sediment flows to river.
Targeted rock lining	▪ Limits area of disruption during construction. ▪ Covers some dispersive soils. ▪ Reduces velocity of flows.	▪ Leaves unlined areas open to erosion. ▪ Transport and accessibility with large rocks may be difficult.	▪ Erosion could continue in those areas not treated. ▪ The stream alignment changes over time resulting in the lining become less effective or causing scour in an area not treated. ▪ Material from the slope above the works slips into the stream and sediment flows to river. ▪ Depending on the local conditions in the lower gully, there is the risk that the required rock lining could be extensive.
Low rock weirs	▪ Work could be within QLDC reserve. ▪ Creates storage in upper gully. ▪ Allows for settlement of fines. ▪ Reduces velocity of flows.	▪ Provides relatively small volumes. ▪ Would need to be combined with other options.	▪ Can fill during large events and become ineffective if not maintained.
Do nothing	▪ No cost now.	▪ Would need to implement stormwater works upstream to mitigate future erosion.	▪ Erosion continues and dispersive soils continue to flow into the river.

In preparing the longlist options, we discounted the following mitigation options in the lower gully for the reasons noted:

- Concrete lined channel – We have discounted this option as it is not considered sympathetic to the existing environment, will likely be poorly received by the community, and has a high carbon cost. It may also not be very resilient if there is future movement or erosion underneath it.
- Piped stream – We have discounted this option as it is not considered sympathetic with the existing natural environment. Also, the hydraulic capacity would be limited by the pipe size and would be lower than an open channel.
- Concrete canvas bags – We have discounted this option as it is not considered sympathetic to the existing environment and will likely be poorly received by the community.

The recommended way forward for the lower gully is targeted rock lining to provide bed and toe scour protection and to also consider adding low rock weirs in targeted areas. These approaches would reduce the scour in the channel including scour at the toe of the adjacent slopes and subsequent slope failures.

The extent of rock lining will be developed during later stages.

2.5 Reinstatement

Reinstatement works will likely be a combination of the items listed below. The reinstatement works are to remove debris and mitigate the effects of the works on the landscape.

Table 5: Reinstatement options

Option	Advantages	Disadvantages	Risks
Removing dead vegetation and debris	▪ Reduces the risk of blockages. ▪ Increases available channel cross-sectional area. ▪ Tidies area and improves landscape.	▪ Will need to consider where this could be reused on site.	▪ May destabilise existing slopes/ exposing more dispersive soils to erosion.
Remove loose and surplus soil	▪ Can be used to help contour slopes. ▪ Allows for improved track access.	▪ Will need to dispose of material.	▪ Potential for exposing more dispersive soils to erosion. This will need to be considered further & may require measures to limit erosion.
Planting battered slopes	▪ Sympathetic with the existing natural environment.	▪ Maintenance required for establishment of vegetation. ▪ Doesn't change the soil structure (dispersive soils remain near the surface).	▪ May be difficult to establish planting. ▪ Benefit of planting to stabilise slope does not occur until planting well established.
Planting/natural barriers	▪ Sympathetic with the existing natural environment. ▪ Improves safety of reserve/track users.	▪ Maintenance required for establishment of vegetation. ▪ Doesn't change the soil structure (dispersive soils remain near the surface).	▪ May be difficult to establish planting.
Diverting tracks	▪ Maintains or reinstates ability to use existing tracks.	▪ Requires formation of a new part of track.	▪ Diverted tracks may not meet needs to users.
Blocking off dead ends of tracks	▪ Low cost. ▪ Less work required than to reroute tracks.	▪ Reduces available tracks and accessibility of lower tracks. ▪ Requires some safety considerations. ▪ May see pushback from the local community.	▪ Dead ends are removed or ignored.

In preparing the long-list options, we discounted the following mitigation options for reinstatement for the reasons noted:

- Reinstate slopes to pre-development – We have discounted this option as is would require extensive works, may not be feasible, and is not sympathetic with the natural environment/natural gully processes.

Recommendations for reinstatement options should be discussed with the DOC and other stakeholders. A combination of the methods above could be used throughout the gully to be sympathetic with the existing landscape of each section. For example, planting options may be considered more suitable for the upper gully as there is more existing vegetation in that section than others.

3 Conclusions and Next Steps

Based on the agreed future state requirements and discussions during the Long-list Options workshop, there are several options for the various sections of the gully and upstream of the gully to remediate the current erosion and help mitigate accelerated erosion from development.

We recommend that the options shaded in green above are worked into short-listed options.

The next steps are:

- QLDC are to meet with DOC and discuss and seek feedback on:
  - The potential options for the portions of the gully on DOC land.
  - The Outlet Track crossing.
  - Reinstatement options along the gully.
  - Maintenance of the works.
- QLDC to provide Beca with feedback on the options set out above and its discussions with DOC.
- Beca and QLDC to work together to develop short-listed options to be advanced to the next stage.

Yours sincerely

[redacted]

[redacted]

Technical Director - Civil Engineering

on behalf of

Beca Limited

Phone Number: [redacted]
[redacted]

E

Appendix E – Long-List Options Review Meeting Minutes and Presentation

Minutes

Long List Review

Held 23 January at 1:00pm at QLDC office and on Teams

Attendees

[redacted]	QLDC	[redacted]	Beca
[redacted]	QLDC	[redacted]	Beca
[redacted]	DOC		
[redacted]	Beca		

These notes should be read in conjunction with the Long-list Options Summary presentation (PDF attached).

Item	Action
1 Background • A general background of the project was provided along with progress to date. • Purpose of meeting is to go through the Long List Options, key advantages, disadvantages, and risks and preferences for options to be advanced, as summarised in the Beca letter to QLDC in December 2024. • The options tables included in the presentation are copied from the December 2024 letter.	
2 December 2024 Letter • A summary of the breakdown of options from the Long List Options Letter (upstream stormwater system, upper gully, main scour basin/drop, lower gully, and reinstatement) was provided.	
3 Upstream Stormwater System • The recommended option is a combination of upgrading the Hikuwai Basins, combining the Northlake and Hikuwai stormwater systems, and modifying the existing basin outlets. • Soakage could also be included in some basins to reduce runoff volumes. • QLDC raised concerns that soakage may require more maintenance. **Action : As part of the next stage, Beca to consider the cost-benefit of the volume that could be discharged to ground via soakage versus the works required to install and maintain soakage.**	Beca
4 Upper Gully Options • The recommended option is targeted rock lining. • This could also be combined with the use of low rock weirs. • QLDC and Beca agreed that the upper grassed area (likely QLDC land) will not need any rock lining as it does not show signs of scour. • Targeted rock lining will be for locations where scour is identified. • QLDC asked about the use of a geotextile fabric beneath the rock lining, noting that they have concerns about it becoming exposed later on. QLDC would prefer to avoid the use of a geotextile if possible. • Beca to consider the option of using a well graded rock mix or other alternatives instead of a geotextile fabric, but this may depend on material availability. **Action: As part of next stage, Beca to reach out to suppliers on options for filters if a geotextile fabric is not used with the rock lining.**	Beca

5 Main Scour Basin • The recommended option is lining the waterway channel with a battered rock lined slope. • DOC would like to know what the extent of the rock battered slope would be. This will be developed in the next stage. • QLDC noted that they would like the overhanging areas to be cut back. • It was noted that this would likely be a bit wider than the width of the waterway channel. In the next stage of work, a concept sketch using the LiDAR data will give a better idea the extent/scale of the solution. • QLDC would like to see it clearly noted that toe scour protection is included in the solution.	
6 Lower Gully • The recommended option is targeted rock lining to provide bed and toe scour protection. • The general tidy-up of the lower gully was discussed. • DOC would like to see upright dead trees to remain in place to help with stabilisation but agreed that other fallen dead trees/debris can be removed/repurposed. Noted that a minimal approach is preferred when it comes to clearing. **Action: DOC to confirm with their biodiversity team if they would prefer keeping natural materials onsite or if removal is OK.** • DOC is looking into the presence of the protected Hikuwai flower and if any considerations need to be made. **Action: DOC to confirm with their biodiversity team if the Hikuwai flower is present and any considerations that need to be made.**	DOC DOC
7 Reinstatement • It was agreed that QLDC would need to discuss the options provided with DOC and stakeholders. • A photo of an overhanging area was shown and it was noted that rock lining in these areas likely would not address the sediment released when the overhang falls. • QLDC noted that they would like to remove overhangs at risk of falling. • DOC noted that a site visit to agree on the removal extents and any reinstatement would be needed. Their biodiversity team will want to see the areas considered to provide input. • DOC noted that the Hikuwai flowers prefer loose soils (which is what would likely be removed when addressing overhangs). • The next stage of works may include outlining a proposed approach for reinstatement options (e.g. as bullet points or a flow chart). • DOC noted that they will be meeting with Bike Wanaka next week to discuss the bike tracks including any signage needed. **Action: DOC to provide an update on the outcomes of their meeting with Bike Wanaka.** • The current understanding is that any useable track crossings will need to be maintained and any dead end tracks will be blocked off and/or have signage. • DOC noted their understanding is that erosion remediation takes precedence and the tracks will need to work around this.	DOC
8 Bottom of gully & Outlet Track • It was noted that any work at the outlet track crossing would need to be discussed by QLDC and DOC. **Action: QLDC to discuss the track crossing at the bottom of the gully with DOC.**	QLDC

9 Conclusions • QLDC noted they are happy with the short-listed options presented. **Action: DOC to confirm they are also happy with the short-listed options.**	DOC
10 Other (after [redacted]/DOC left the meeting) • QLDC noted that water level monitors were installed in the two manholes at the outlets of the Northlake and Hikuwai stormwater systems as requested. **Action: [redacted] to provide [redacted] and [redacted] access to the water level data from QLDC.** • QLDC asked about the cameras that had been installed and if they were useful to keep. It was decided that while they do not provide useful data, they do provide useful visualisation context. • It was asked if fish passage was required for the gully. QLDC agreed that a freshwater ecologist needed to determine this. QLDC noted that historically the gully has been dry (without consistent flows). • Fish passage has not yet been discussed with DOC and QLDC does not have a freshwater ecologist on staff.	QLDC
11 Next Steps • The next step in the proposal was to develop the short-listed options and assess them using Multi-Criteria Analysis (MCA). It was discussed that this may look different now that the options have been narrowed down. This would include looking at options for the upstream stormwater system modifications and in the gully whether we use rock weirs or not, or where the targeted lining is implemented. **Action: Beca to provide QLDC with a proposed approach and updated programme.** • QLDC noted a check on the costs vs benefits of options seems like a sensible approach. ***Post Meeting **Action: DOC to confirm if fish passage needs to be considered.**	Beca DOC

Long-list Options Summary

Long-list Options Review Meeting
23/01/2025

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Background

- Beca has been engaged by QLDC to carry out a technical options report for mitigating the erosion in Rockabilly Gully.
- Long-list workshop held in late November 2024.
- December 2024 Beca sent QLDC a letter summarising:
  - The options identified and discussed at the Long-list Options workshop.
  - Our initial comments on these options and preferences, taking into account the project objectives, the future state requirements, and feedback received from the QLDC at the Long-list Options workshop.
- This meeting is to go through the key points of that letter.

December 2024 letter

Options were split into five different areas:

- Upstream stormwater system.
- Within the gully, including:
  - Upper gully.
  - At main erosion basin/drop.
  - Lower gully.
- Reinstatement in and around the gully.

For each area, possible options as discussed at the Long-list Options Workshop were identified, and key advantages, disadvantages, and risks were summarised in a table.

Upstream stormwater system

Upstream stormwater system

Option	Advantages	Disadvantages	Risks
Upgrade Hikuwai Basins	▪ Land available within existing QLDC reserve. ▪ Could involve reconfiguring existing basins (including modifying the outlets) to add volume and adding a new basin within the existing reserve. ▪ Can obtain significant additional volume within the existing reserve. ▪ Limits area of disruption during construction.	▪ Does not mitigate Northlake discharge unless systems are combined.	▪ Reconfigured system will need careful design over all events.
Combine Northlake and Hikuwai systems	▪ Could be in conjunction with upgrading the Hikuwai Basins.	▪ Philosophical change - requires reconfiguration of system.	▪ Reconfigured system will need careful design over all events. ▪ May be requirements from the land development process to keep the two systems separate.
Modify existing basin outlets (to reduce discharge)	▪ Integral to both options above.	▪ Cannot be in isolation – need to add storage volume to the system.	▪ Could increase flood risk in larger events if not designed appropriately.
Add soakage in some basins	▪ May be able achieve some soakage – basin invert or bores – reducing volume discharged. ▪ Only option for reducing volume.	▪ Unlikely to achieve large high soakage rates / large volume – developers likely to have already put soakage basins in high soakage areas. ▪ Would need to be combined with other options.	▪ Depends on local ground conditions. ▪ May clog over time.

Upstream stormwater system - continued

Option	Advantages	Disadvantages	Risks
Low level weirs in upper gully	▪ Work could be within QLDC reserve. ▪ Creates storage in upper gully.	▪ Work may also need to be in DOC reserve. ▪ Relatively small volumes. ▪ Would need to be combined with other options	▪ Need to be designed to overtop in larger events - potential local scour risk.
New basins in Northlake pocket parks	▪ Creates additional storage in other existing QLDC reserves.	▪ Relatively small volumes. ▪ Would need to be combined with other options. ▪ Additional works required at multiple locations. ▪ New pipework required in road to connect. ▪ Creates multiple assets for QLDC to maintain.	▪ May not be well received by the community due to multiple areas of disruption and loss of 'green' space.
Do nothing	▪ No cost now.	▪ Does not alter existing flow regime. ▪ Means all mitigation works are in the gully, which has a higher environmental impact. ▪ Likely to be unpopular with community.	▪ Higher flows and velocities in smaller events than other options.

- Discounted options:
  - Make Northlake basins larger – Existing basins already occupy the full site space available.

Upstream stormwater system - continued

Recommended way forward: Combination of upgrading the Hikuwai Basins, combining the Northlake and Hikuwai stormwater systems, and modifying the existing basin outlets. Soakage could also be included in some basins.

Upper gully

Upper gully

Option	Advantages	Disadvantages	Risks
Rock lined (fully)	▪ Covers and protects dispersive soils from ongoing erosion. ▪ Slight reduction in velocity of flows. ▪ Can be combined with low rock weirs.	▪ Large scale of work and area of disruption within the gully.	▪ Erosion under rock – can be mitigated by use of filter between rock and underlying soils.
Targeted rock lining	▪ Covers and protects targeted areas from ongoing erosion – e.g. worst areas of existing erosion and track crossings. ▪ Limits scale of work and disruption during construction compared to full lining. ▪ Slight reduction in velocity of flows. ▪ Can be combined with low rock weirs.	▪ Leaves unlined areas at risk of erosion.	▪ Scour risk heavily influenced by extent and thickness of outwash gravels which is uncertain. ▪ Erosion under rock – can be mitigated by use of filter and bedding between rock and underlying soils. ▪ Where erosion continues then dispersive soils could still be transported to river as sediment.
Low rock weirs	▪ Reduces velocity of flows. ▪ Could be combined with either rock lining option.	▪ Would be best to combine with other options.	▪ Local scour risk immediately downstream of weir – need to detail appropriately. ▪ Could infill over time and become ineffective if not maintained.
Do nothing	▪ No cost now.	▪ Would need to implement more extensive stormwater works upstream to mitigate future erosion. ▪ Erosion could continue. ▪ Likely to be unpopular with community.	▪ Scour risk heavily influenced by extent and thickness of outwash gravels which is uncertain. ▪ Erosion continues and dispersive soils continue to flow into the river.

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Upper gully - continued

- Discounted options:
  - Concrete lined channel – Not considered sympathetic to the existing natural environment, and will likely be poorly received by DOC and the community. Concrete lining is also not flexible and therefore not as resilient to future changes as rock.
  - Piped stream – Not considered sympathetic with the existing natural environment. Also, the hydraulic capacity would be limited by the pipe size and lower than an open channel.
  - Gabion basket / reno mattress – Considered heavily engineered and not commensurate with the perceived scour risk for the upper gully, particularly if upstream stormwater measures are adopted to reduce stream flows/velocities.

Recommended way forward: Targeted rock lining. Could also combine with low rock weirs.

Main scour basin / drop

Main erosion basin / drop

Option	Advantages	Disadvantages	Risks
Rock lined - battered	▪ Covers and protects dispersive soils. ▪ Can provide energy dissipation at the bottom. ▪ Could be more natural looking than stepped structure. ▪ Likely to be more resilient – will move as a flexible mass. ▪ Gentler slopes allow for easier access and potential track crossings.	▪ Requires more significant earthworks in the gully and disruption. ▪ Transport and accessibility with large rocks may be difficult.	▪ Erosion under rock – can be mitigated by use of filter between rock and underlying soils. ▪ High energy at bottom.
Stepped drop structure	▪ Can be rock, concrete bags or gabions (see below). ▪ Covers and protects dispersive soils. ▪ Less earthworks required than battered option. ▪ Provides energy dissipation at steps.	▪ Transport and accessibility with large rocks may be difficult. ▪ Higher engineered structure may not be considered sympathetic with environment. ▪ Likely to be less resilient than a battered slope – has the potential to separate if movement occurs.	▪ Higher risk of instability than battered. ▪ Erosion under rock – can be mitigated by use of filter between rock and underlying soils.
Gabion baskets	▪ Covers and protects dispersive soils. ▪ Common and understood retaining solution. ▪ Relatively robust solution.	▪ Considered a harder engineered solution which DOC and the community may receive negatively. ▪ Not visually sympathetic with the existing natural environment. ▪ Excavation required to fit in baskets. ▪ Transport and accessibility with large rocks may be difficult.	▪ Settlement gabion structure. ▪ Erosion under gabions – can be mitigated by use of filter between rock and underlying soils.

Main erosion basin / drop - continued

- Discounted options:
  - Do nothing – Erosion basin is expected to continue to cut back.
  - Concrete lined – Not considered sympathetic to the existing environment, will likely be poorly received by the DOC and the community, and has a high carbon cost.
    Concrete lining is also not flexible and therefore not as resilient to future changes as rock or gabions.
  - Piped stream – Not considered sympathetic with the existing natural environment. Also, hydraulic capacity would be limited by the pipe size and lower than open channel.
  - Reinstate to pre-developed – Goal is to be sympathetic with the existing natural environment and limit earthworks. Gully scour is considered a natural process.

- Recommended way forward: Consider options for **lining the waterway channel with a battered rock lined slope**.

Lower gully

Lower gully

Option	Advantages	Disadvantages	Risks
Rock lined (fully)	▪ Can be easily combined with low rock weirs. ▪ Covers dispersive soils. ▪ Reduces velocity of flows.	▪ Large area of disruption within the gully. ▪ Transport and accessibility with large rocks may be difficult.	▪ Material from the slope above the works slips into the stream and sediment flows to river.
Targeted rock lining	▪ Limits area of disruption during construction. ▪ Covers some dispersive soils. ▪ Reduces velocity of flows.	▪ Leaves unlined areas open to erosion. ▪ Transport and accessibility with large rocks may be difficult.	▪ Erosion could continue in those areas not treated. ▪ The stream alignment changes over time resulting in the lining become less effective or causing scour in an area not treated. ▪ Material from the slope above the works slips into the stream and sediment flows to river. ▪ Depending on the local conditions in the lower gully, there is the risk that the required rock lining could be extensive.
Low rock weirs	▪ Work could be within QLDC reserve. ▪ Creates storage in upper gully. ▪ Allows for settlement of fines. ▪ Reduces velocity of flows.	▪ Provides relatively small volumes. ▪ Would need to be combined with other options.	▪ Can fill during large events and become ineffective if not maintained.

Lower gully - continued

Option	Advantages	Disadvantages	Risks
Reno/gabion mattress	▪ Covers dispersive soils. ▪ Reduces velocity of flows.	▪ Considered a harder engineered solution which the community may receive negatively. ▪ Not visually sympathetic with the environment. ▪ Transport and accessibility with large rocks may be difficult. ▪ Requires contouring of slopes prior to placement.	▪ Material from the slope above the works slips into the stream and sediment flows to river.
Do nothing	▪ No cost now.	▪ Would need to implement stormwater works upstream to mitigate future erosion.	▪ Erosion continues and dispersive soils continue to flow into the river.

Discounted options:

- Concrete lined channel – Not considered sympathetic to the existing environment, will likely be poorly received by the community, and has a high carbon cost. It may also not be very resilient if there is future movement or erosion underneath it.
- Piped stream – Not considered sympathetic with the existing natural environment. Also, the hydraulic capacity would be limited by the pipe size and lower than an open channel.
- Concrete canvas bags – Not considered sympathetic to the existing environment and will likely be poorly received by the community.

Lower gully - continued

Recommended way forward: **Targeted rock lining to provide bed and toe scour protection.** Consider adding low rock weirs in targeted areas.

Reinstatement

Reinstatement

Option	Advantages	Disadvantages	Risks
Removing dead vegetation and debris	▪ Reduces the risk of blockages. ▪ Increases available channel cross-sectional area. ▪ Tidies area and improves landscape.	▪ Will need to consider where this could be reused on site.	▪ May destabilise existing slopes/ exposing more dispersive soils to erosion.
Remove loose and surplus soil	▪ Can be used to help contour slopes. ▪ Allows for improved track access.	▪ Will need to dispose of material.	▪ Potential for exposing more dispersive soils to erosion. This will need to be considered further & may require measures to limit erosion.
Planting battered slopes	▪ Sympathetic with the existing natural environment.	▪ Maintenance required for establishment of vegetation. ▪ Doesn't change the soil structure (dispersive soils remain near the surface).	▪ May be difficult to establish planting. ▪ Benefit of planting to stabilise slope does not occur until planting well established.
Planting/natural barriers	▪ Sympathetic with the existing natural environment. ▪ Improves safety of reserve/track users.	▪ Maintenance required for establishment of vegetation. ▪ Doesn't change the soil structure (dispersive soils remain near the surface).	▪ May be difficult to establish planting.
Diverting tracks	▪ Maintains or reinstates ability to use existing tracks.	▪ Requires formation of a new part of track.	▪ Diverted tracks may not meet needs to users.
Blocking off dead ends of tracks	▪ Low cost. ▪ Less work required than to reroute tracks.	▪ Reduces available tracks and accessibility of lower tracks. ▪ Requires some safety considerations. ▪ May see pushback from the local community.	▪ Dead ends are removed or ignored.

Reinstatement - continued

- Discounted options:
  - Reinstate slopes to pre-development – Requires extensive works, may not be feasible, and is not sympathetic with the natural environment/natural gully processes.

- Recommended way forward: QLDC discuss with DOC and other stakeholders. Likely to be a combination of the above options.

Recommended Short-Listed Options

- Upstream stormwater system:
  Combination of
  - Upgrading the Hikuwai Basins. (Could include soakage.)
  - Combining the Northlake and Hikuwai stormwater systems.
  - Modifying the existing basin outlets.
- Upper gully:
  - Targeted rock lining. (Could also combine with low rock weirs.)
- Main erosion basin / drop:
  - Lining the waterway channel with a battered rock lined slope.
- Lower gully:
  - Targeted rock lining to provide bed and toe scour protection. (Consider adding low rock weirs in targeted areas.)
- Reinstatement:
  - TBC - QLDC discussions with DOC and other stakeholders

F

Appendix F – Short-List MCA Workshop Minutes and Presentation

Minutes

Short List MCA Workshop

Held 14 March 2025 at 10:00am at QLDC office and on Teams

Attendees

[redacted]	QLDC	[redacted]	Beca
[redacted]	QLDC	[redacted]	Beca
[redacted]	QLDC	[redacted]	Beca
[redacted]	DOC	[redacted]	Beca
[redacted]	Beca		

These notes should be read in conjunction with the Short-list Options Workshop presentation (PDF attached).

Item	Action
1 Background • QLDC & Beca teams were introduced. • Purpose of this workshop is to determine a preferred option to take into a concept design. • Agenda was agreed. • Brief overview of agreed “future state requirements” and options determined to date to address erosion in the gully/reserve and sediment discharge (options for the upstream stormwater system, upper gully, drop, and lower gully).	
2 Recent Observations • [redacted] noted that there was dirty water coming from the upstream Northlake development outlet to the gully when he was on site approximately 1hr following a moderate rain event and showed photos of this. • It was agreed that this sediment discharge is likely from the active construction of the new developments. **Action: QLDC to determine if any action is needed regarding the erosion and sediment control on the upstream construction sites.**	QLDC
3 Planning Context • Anything on the river side of the brown line on the Proposed District Plan is within the Outstanding Natural Feature (ONF) zone. • Noted that the existing ponds site is outside of the ONF. • The site is located within the Clutha Mata-Au Rohe. • Noted that there is a draft Regional Plan which has been paused that could restrict activities allowed, but it is unclear when this could be enacted. • QLDC has a global earthworks consent in place for works related to stormwater (issued under the ODP not PDP). Only applicable to QLDC land. • Although NES-F was discussed with respect to wetlands. The NES-F also covers structures in river beds such as weirs. Depending on the design of any weir structures consent may be required under the NES-F. It is also noted that DOC has provided advice that fish passage does not need to be considered in the gorge and this would need to be provided to ORC. • The Wildlife Act 1953 was discussed in the context a permit may be required from DOC. It is noted that recent case law from 10 March 2025 *Environmental Law Initiative v Director-General of the Department of Conservation & Ors* has found DOC’s approach to issuing permits unlawful (broadly speaking nothing can be killed unless it is diseased or there is over-population or similar). It is yet to see how this case law will be responded to.	

4 Cost estimates
• The cost estimates to date are capital cost estimates based on the high-level concept design for each area (i.e. approximate only).
• Construction estimates:
  ○ For each area estimates are based on high-level concept design quantities (e.g. for excavation, rock, aggregate, pipework).
  ○ For General works (i.e. not area specific) Provisional Sums used for aspects difficult to quantify at this stage of design (e.g. temporary construction access).
  ○ P&G allowance.
  ○ 30% Contingency
• Fees and client costs are added as a % to get Total Estimate.	

5 MCA Approach • MCA approach (criteria, scoring of -2 to +2, and no weighting) has been previously discussed with QLDC. • MCA approach was agreed.	
6 Upstream Stormwater System • Currently, there are two separate stormwater systems for Northlake and Hikuwai designed to attenuate the large events, but not designed for retention/detention in smaller events. To address this more storage is needed along with outlet changes to store and release the water more slowly in small events. • Noted that there are options for keeping the Hikuwai and Northlake system separately or to combine them. • Expansions to the Hikuwai basins would require removal of the access track along one side of each basin. • There is space to the north-east to construct a new pond for additional volume. This could be used in either if keeping the Hikuwai and Northlake system separate or if combining them. • For maintenance purposes there needs to be access for a digger/truck into the pond. **Action: For the concept design Beca will need to consider what the maintenance access would look like for the ponds.** • [redacted] asked if there is a cut to fill balance. **Action: As part of the concept design, Beca to consider whether cut for the basins can be used for bunds/fill and whether a cut-fill balance can be achieved (i.e. limit material disposal).** • QLDC noted that they do not like the idea of a long pipeline required to keep the Northlake/Hikuwai ponds separate. **Action: QLDC to confirm if they need to keep the ponds separate.** • It was discussed that both the Northlake and Hikuwai were designed for large events. The main difference being that because there is dead storage in the first Hikuwai basin with the outlet above the basin invert and in between rainfall events, evaporation and infiltration causes the water level to drop below the outlet level, creating small detention volume. The Northlake system does not have this. • QLDC has concerns about the maintenance of soakage systems with a history of clogging. Noted that there are better options to avoid this, but they are expensive. • [redacted] noted that from a maintenance perspective the base of the basin should be something that can be easily scraped out. It was agreed that a good approach	Beca Beca QLDC

is grass that be mowed with a forebay with a gravel surface (e.g. river run) that can be cleaned out. • Noted that there is a soakage system in Hawea that is similar to the proposed system of manhole risers into the ground with subsoil drains and that system seems to be working well. • Noted that soakage would need some hydrogeological investigations at detailed design. Depending on the soils soakage may be worth considering. **Planning Assessment** • Earthworks may trigger the requirement of a discretionary consent from QLDC. • Will need to consider regional permitted activities. **Cost Estimate** • ~$0.8m – $1.7m depending on the pipework needed and if soakage is included or not. • This assumes that the existing systems work as they were designed. **MCA Scoring** • Having a forebay is more favourable than not. • Adding a pipe to keep the storage separate adds construction complexity. • Notes about scoring were added to the scoring spreadsheet.	
7 Upper Gully Options • Discussed the uncertainty around what areas will erode if the gully is left as is. • Main option presented was continuous rock lining from where the grass cover within the gully ends. • Noted that the rock weirs do not seem to add a lot of value based on average grades but could provide benefit in locally steep areas. This is still an option but has not been considered for this workshop. • An average section was used to determine the rock sizing, velocities, and cost estimate. • Noted that removal of live kanuka is not an option from DOC's perspective. • DOC noted that they would prefer the upper gully remain untouched. Their concerns are more about the main drop area. • Agreed that some more targeted lining of smaller areas may be OK but not 9m wide as shown in the cross section. • It was noted that with minimal rock lining there will still be some erosion of the area in the future. This is acceptable to DOC. This approach would mean a higher risk that maintenance or placing of additional rock lining would be required in the future. • DOC noted that Bike Wanaka does not have any issues with the current track crossings. • A filter layer is needed between the rock and the existing dispersive soils. This can be a Bidim geotextile or a granular aggregate layer that is thicker. **Action: QLDC to confirm their preference between a Bidim geotextile or granular aggregate layer for rock lined areas.**	QLDC

Planning Assessment • Earthworks and vegetation removal are the key activities which may trigger the need for a resource consent from QLDC as a restricted discretionary activity. • Noted that in the Otago Regional Plan, rock lining is considered a structure and in the RMA the gully is considered a river. Structures in rivers require resource consent from ORC. • Construction methodology will be essential in understanding effects particularly in regard to visual/landscape and ecological. • Environmental Management Plan, Traffic Management Plan, Landscape and Visual Assessment, Ecological Assessment, & Hydrological Assessment are all likely to be required. • Will need to determine the presence of any endangered species as part of the process. • Noted that Te Ao Marama and Aukaha involvement should be considered. **Action: QLDC to consider Te Ao Marama and Aukaha involvement.** **Cost Estimate** • Cost estimate of $1.1m assuming a long length and wide cross section. This would reduce with less lining. **MCA Scoring** • Based on DOC's feedback that the upper gully should remain largely untouched two additional options "Do nothing" and "Do minimal – targeted locations, low level intervention (e.g. 10%) were scored in addition to the "Long length of rock lining" option. • For the "do minimal" option the 10% was a guesstimate and further work would be required to establish the locations and extents and therefore proportion of the upper gully that would require targeted rock lining.	 QLDC
8 Main Erosion Basin / Drop • Agreed that a more natural looking stepped option is a possibility but would need to extend up and protect the side slopes which could be difficult to design and construct. • Noted the intent is not to make the scour basin itself any bigger but would require some excavation for the installation of the rock and battering back the slope to a grade where rock will be stable. • Considering use of a steeper slope for the chute to minimize excavation or a stepped natural-looking drop using large rocks. **Action: Beca to look at calculations using a steeper slope to minimize excavation and look at option of a stepped more natural looking drop.** • QLDC will look to use Early Contractor Involvement (ECI) to get a view on the best approach to access the site and carry out the work. **Action: QLDC to start planning to engage a contractor for ECI after concept design is complete.** **Planning Assessment** • The PDP and Otago Regional Plan would apply. The rock chute and riprap basin would likely be considered a structure being constructed in the waterway.	 Beca QLDC

Cost Estimate • Agreed that the $0.1m estimate looks light and does not include temporary access for construction or reinstatement of this. **MCA Scoring** • In addition to the "Rock lined, battered" option a "Rock lined, steeper drop/natural stepped" option was also assessed. • Agreed that doing nothing is not an option for the drop.	
9 Lower Gully • The current lower gully has a large portion of unstable steep banks with loose material. It was previously agreed that doing nothing for this area is not an option. • Generally agreed that the existing lower gully has some areas with rock in the bottom that may look similar to the proposed cross-section (albeit the existing rock diameters are smaller) but the existing rock does not extend up the sides and protect the toe of the existing slopes. • Agreed that lining a smaller portion of the length would be preferred over lining the whole length. • QLDC questioned if there was any potential to reinstate a track along the gully. It was agreed that a track would not work well in the area, and the rock along the base would be too large for a walking path. • It was questioned if building up rock on top of the existing gully base was feasible instead of digging out the base. Noted that this would constrain the cross-section, which is not preferable. • DOC would like to know what the erosion may look like in 5-10 years. Noted that the toe of the banks will continue to erode, and banks /vegetation will fail causing sediment to wash out into the river. **Action: Beca to provide DOC with information on the erosion mechanism (i.e. toe scour and bank failures) which would occur where rock lining with toe protection was not provided.**	Beca
• Suggested that [redacted]/QLDC go with DOC staff on a site visit to the gully to discuss locations where toe scour could lead to further erosion and bank failure and therefore mitigation is recommended. **Action: Arrange a site visit with Beca ([redacted]), QLDC, and DOC.**	Beca/QLDC
Planning Assessment • Similar requirements to the main erosion basin/drop. **Cost Estimate** • $1.4m was assuming the full length of the gully. Partial lining instead would reduce cost. • $1.4m cost estimate did not include creating a temporary access (or removing the temporary access and reinstating it). **MCA Scoring** • In addition to the "Full length of rock lining with toe scour protection" option, two other options "Partial rock lining with toe scour protection e.g. 50%" and "Partial rock lining with toe scour protection e.g. 80%" were assessed. The 50% and 80% were somewhat arbitrary and for comparison purposes.	

• Further work will be required to establish what locations and extents and therefore proportion of the lower gully would need to be lined for a partial lining option to be effective.	
10 Reinstatement • Agreed that this project does not need to worry about the bike tracks (blocking off, signage, etc), Bike Wanaka will take care of this. • Agreed that any foreign debris can be removed. • Agreed that dead vegetation could be removed from the gully where it could impede flow or lead to erosion but kept within the reserve place along/near the gully, noting that it should be kept whole as possible (for habitat and to be in keeping with the natural landscape) rather than mulched. **Planning Assessment** • Noted that restoration works would be required as part of the Ecological Management Plan. **Cost Estimate** • Noted that the amount for Reinstatement in the cost estimate is a Provisional Sum as there is no design for this yet – extent to works to be agreed later.	
11 Next Steps **Actions (in addition to above):** • **Beca will send out workshop minutes and MCA scoring with comments.** • **Whole project team to review MCA scoring and comments provide any feedback.** • **Beca team to provide a brief outline of the expected erosion mechanism in the lower gully for DOC/QLDC.** • **Beca to identify any additional high-level design work required.** • **Decide on a preferred combined option to take into Concept Design.**	 Beca All Beca Beca All

Short-List Options Workshop

Friday 14 March 2025

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Agenda

- Introductions
- Project overview & scene setting
- Overview of planning context
- Confirm MCA approach – criteria, scoring & weighting
- For each of the five areas:
  - Developed short-listed option/s
  - Planning assessment
  - Cost estimate
  - Assess against MCA criteria
- Agree actions and next steps

Project overview

- Technical options assessment for mitigating erosion in Rockabilly Gully
- Key drivers:
  - Erosion in gully/Hikuwai Reserve
  - Sediment discharge to Mata-Au/Clutha River (*from erosion)*
- Project stages:
  - Existing status and Future state requirements
  - Develop long-list options
  - Long-list Options Workshop → Short-list
  - Develop short-listed options and consider against key criteria
  - Short-list Options Workshop → Preferred option
  - Concept design of preferred option

Beca

Recent site observations – sediment dicharge

Recap - Future state requirements (page 1)

Gully & reserve

- Don’t need to reinstate gully to pre-development form
- Mitigation works need to be sympathetic with existing environment
- As a minimum, works will be needed in gully to:
  - Stabilise channel at main drop in gully.
  - Trim overhangs (but can leave steep or vertical slopes).
  - Clear fallen kanuka and debris. (Reuse dead kanuka where possible.)
  - Manage health & safety risk to track users at dead ends.
- Planting required to mitigate loss
- Low maintenance
- May be acceptable to have some erosion in larger events (e.g. 10-year event), with maintenance afterwards.

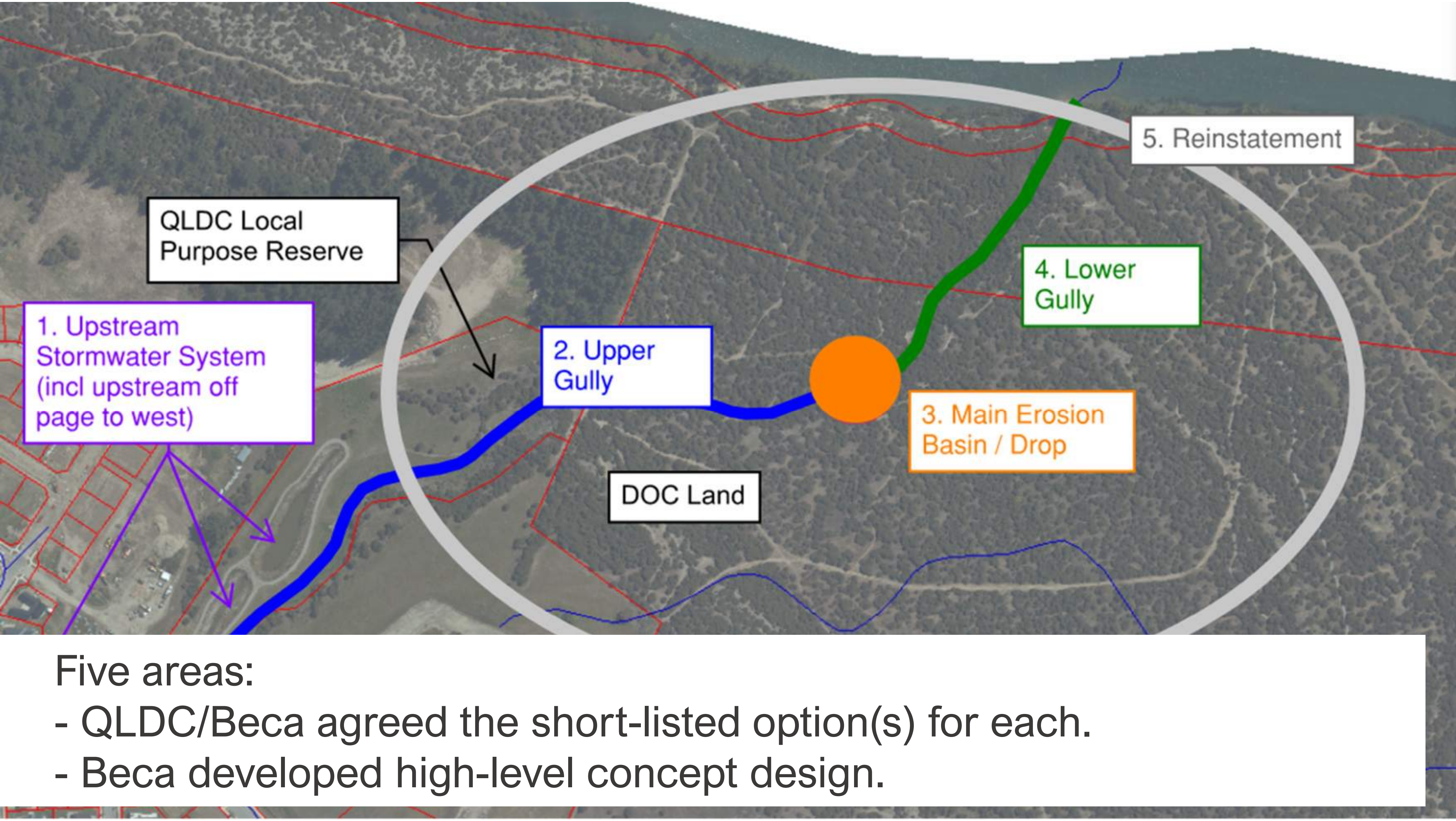
Recap - Future state requirements (page 2)

Upstream stormwater system

- Modifications of stormwater system should be part of the works
  - Modifications to existing basins and/or new basins
  - Consider soakage opportunities (but won't be able to offset additional runoff volume post-development)
- Basins designed to drain down (i.e. dry basins)
- Maintainable

General

- An adaptive management approach can be considered.



Five areas:

- QLDC/Beca agreed the short-listed option(s) for each.
- Beca developed high-level concept design.

NOTES:

1. HORIZONTAL COORDINATES ARE IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR PROJECTION.
2. LEVELS ARE IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016.
3. MAJOR CONTOURS SHOWN AT 5M INTERVALS, MINOR CONTOURS SHOWN AT 1M INTERVALS.
4. LIDAR DATASET WĀNAKA, OTAGO, NEW ZEALAND 2022-2023 SOURCED FROM OPENTOPOGRAPHY.
5. THE POSITION OF THE AERIAL IMAGE SHOWN ON THIS PLAN IS NOT SURVEY ACCURATE AND IS SHOWN FOR INFORMATION PURPOSES ONLY.
6. BOUNDARIES SHOWN HAVE BEEN IMPORTED FROM THE LINZ DATASERVICE WITH AN UNKNOWN ACCURACY. IF BOUNDARY LOCATIONS ARE CRITICAL A CADASTRAL SURVEY IS RECOMMENDED.

LEGEND

SURFACE EXISTING CONTOURS MINOR
SURFACE EXISTING CONTOURS MAJOR
CADASTRAL BOUNDARIES (APPROXIMATE ONLY)

ORIGINAL DRAWING IN COLOUR

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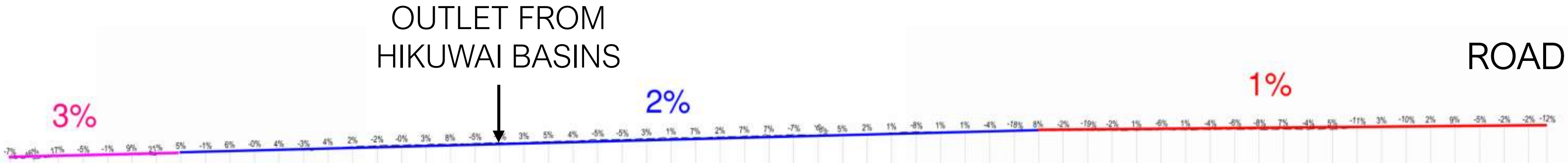
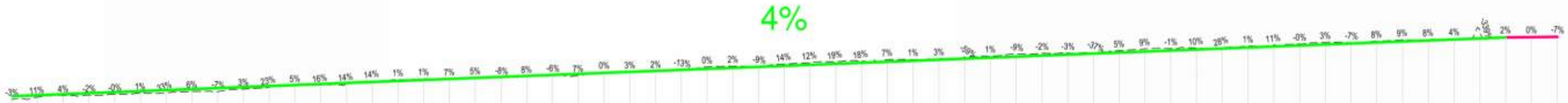


DATUM: 310.00

CHAINAGE (m)	EXISTING LEVELS (m)
600	313.89
605	313.73
610	314.20
615	314.35
620	314.49
625	314.62
630	314.54
635	315.05
640	315.07
645	315.25
650	315.43
655	315.41
660	315.45
665	315.79
670	316.12
675	316.32
680	316.44
685	316.48
690	316.61
695	316.78
700	316.90
705	316.94
710	317.12
715	317.22
720	317.48
725	317.51
730	317.68
735	317.82
740	317.88
745	318.02
750	318.18
755	318.33
760	318.47
765	318.41
770	318.36
775	318.60
780	318.81
785	319.04
790	319.03
795	319.08
800	319.13
805	319.20
810	319.26
815	319.27
820	319.35
825	319.32
830	319.32
835	319.47
840	319.42
845	319.44
850	319.53
855	319.51
860	319.56
865	319.48
870	319.53
875	319.95
880	320.02
885	320.22
890	320.18
895	320.13
900	320.20
905	320.23
910	320.26
914	320.37

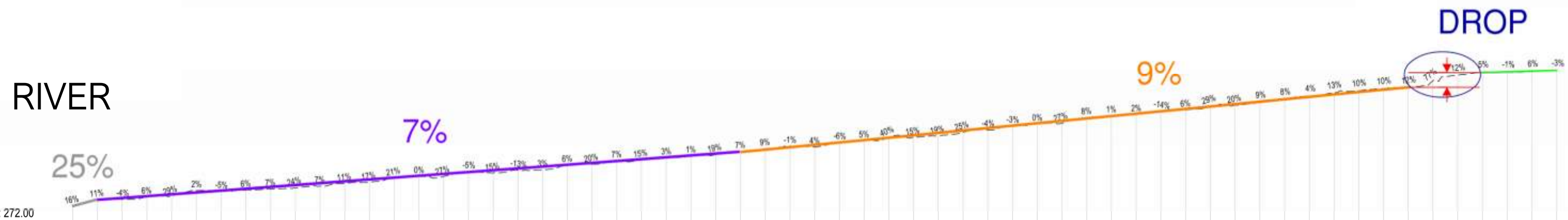
LONGITUDINAL SECTION: GULLY CENTRE



DATUM: 300.00

CHAINAGE (m)	EXISTING LEVELS (m)
300	302.17
305	302.57
310	302.84
315	302.88
320	303.08
325	303.27
330	303.36
335	303.63
340	303.62
345	304.08
350	304.41
355	304.73
360	304.81
365	305.02
370	305.58
375	305.83
380	305.99
385	305.96
390	306.18
395	306.22
400	306.47
405	306.70
410	306.63
415	307.24
420	307.26
425	307.42
430	307.67
435	308.22
440	308.36
445	308.29
450	308.76
455	309.03
460	309.18
465	309.29
470	309.56
475	309.60
480	309.71
485	310.04
490	310.22
495	310.62
500	310.77
505	310.78
510	310.86
515	311.23
520	311.59
525	311.64
530	311.75
535	311.80
540	312.13
545	312.31
550	312.50
555	312.81
560	312.76
565	313.02
570	313.30
575	313.34
580	313.47
585	315.03
590	313.85
595	313.86
600	313.89

LONGITUDINAL SECTION: GULLY CENTRE



DATUM: 272.00

CHAINAGE (m)	EXISTING LEVELS (m)
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5	276.99
10	277.05
15	277.48
20	277.62
25	278.75
30	278.59
35	278.84
40	279.05
45	279.30
50	279.61
55	280.15
60	280.37
65	281.22
70	281.48
75	281.48
80	282.45
85	282.19
90	282.71
95	282.79
100	283.71
105	283.88
110	284.54
115	284.73
120	285.11
125	285.50
130	285.79
135	286.36
140	286.93
145	287.40
150	287.24
155	288.15
160	288.45
165	289.15
170	289.10
175	289.37
180	290.12
185	290.56
190	291.33
195	291.71
200	291.87
205	293.00
210	293.34
215	293.57
220	294.22
225	294.49
230	295.29
235	295.39
240	295.88
245	296.50
250	297.14
255	297.81
260	298.20
265	298.62
270	298.79
275	300.15
280	301.26
285	301.88
290	301.89
295	302.04
300	302.17

LONGITUDINAL SECTION: GULLY CENTRE

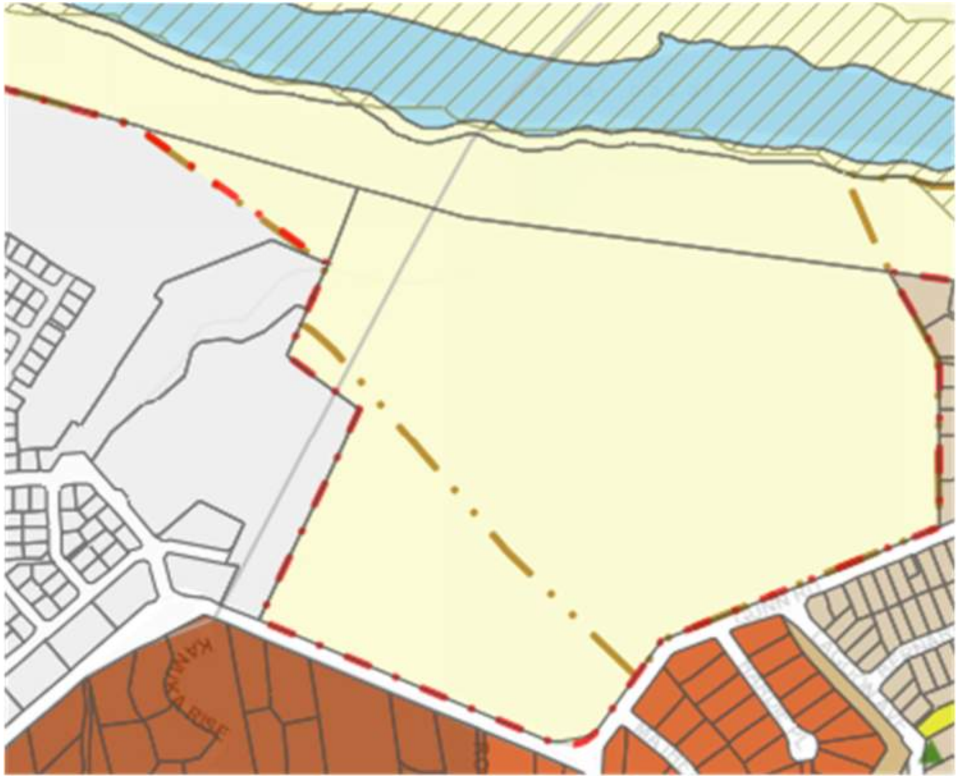
Overview of planning context

Operative District Plan (ODP)

The site traverses two zones in the ODP, which follow the boundary line of the QLDC land and the DoC land. The ODP is relevant in respect to the QLDC land.

Under the ODP part of the site is zoned Northlake Special Zone (lime green) and part of the site is zoned Rural General (green) as shown below.

Overview of planning context (Cont.)



Proposed District Plan (PDP)

- The QLDC land within the Northlake Special Zone in the ODP is not zoned in the PDP and relies on the ODP zoning.
- The DoC land is zoned Rural under the PDP and is shown as yellow.

PDP Overlays

- Threatened Environments Classifications 2012 (across entire site – criteria less than 10% indigenous cover left)
- Aurora Distribution Lines (Grey line)
- Outstanding Natural Feature (ONF - Brown dashed line) through DoC land.

Schedule 21.22.25 Mata-au Clutha River: Schedule of Landscape Values:

- *Landscape capacity – **Earthworks – limited** landscape capacity for earthworks and additional trails that protect naturalness and expressiveness attributes and values and are sympathetically designed to integrate with existing natural landform patterns. Some landscape capacity for additional earthworks to manage erosion hazards in the vicinity of Albert Town that are sympathetically designed to integrate with existing natural landform patterns*

- Urban growth boundary (red dashed line)

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Overview of planning context (Cont.)

The Regional Plan: Water for Otago (RPW)

The Regional Plan: Water for Otago (RPW) and Otago Regional Maps depict the following overlays relevant to the site:

- The site is located within the C Series Aquifers and Schedule 16B Water Quality Areas overlays.
- The site is located within the Clutha Mata-Au Rohe.

The draft Otago Land and Water Regional Plan

- The government is currently working on a review and replacement of the National Policy Statement for Freshwater Management (NPS-FM). As a result, the Otago Land and Water Regional Plan (Regional Plan) which was due to be notified in 2024 has been paused. The draft Regional Plan was moving away from stormwater network discharges being permitted activities.
- Once the new direction for an amended NPS-FM is known there will be more clarity in terms of the implication this will have on the new Regional Plan and specifically in relation to stormwater discharges.

Overview of planning context (Cont.)

The following global consents are held by QLDC.

- Otago Regional Council
- RM20.017.01 – Land Use Consent – To construct bores for the purpose of dewatering a construction site, and to drill over and into an aquifer for installing piezometers for geotechnical and water quality investigations associated with 3-Water infrastructure.
- RM20.017.02 – Water Permit – Water Permit to temporarily take groundwater for the purpose of site dewatering associated with construction activities for 3-Water infrastructure.
- RM20.017.03 – Discharge Permit – Discharge Permit to discharge water and contaminants from site dewatering into land and into water.
- RM20.017.04 – Discharge Permit – Discharge Permit to discharge runoff from disturbed land and contaminants onto land and into water.
- QLDC
- RM200341 – A global consent to undertake earthworks for the purposes of replacement, upgrading and new stormwater, wastewater and potable infrastructure (only applies to QLDC and granted under PDP rules).

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Overview of planning context (Cont.)

National Environmental Standards:

- National Environmental Standard - Freshwater
- National Environmental Standard – Contaminated Soil

Other Legislation:

- Wildlife Act 1953
- Conservation Act 1987
- Archaeological Authority

Overview of cost estimates to date

- Developed high-level concept design for each area
- Capital cost estimate based on this design
- Construction Estimate:
  - Approximate estimates based on quantities for excavation, rock, aggregate and sand, pipework, etc.
  - Provisional Sums used for aspects difficult to quantify (e.g access road into site, temporary yard / hardstand, and reinstatement of these.)
  - P&G allowance
  - 30% Contingency
- Plus % for fees and client costs to get Total Estimate

MCA Approach

- Criteria
- Scoring
- No weighting

- Different to most MCAs - we're not comparing complete / end-to-end options, and picking one winner.
- Instead we're assessing option/s for each area, and picking a preferred way forward for each area.
- Still a useful process - considering options against criteria and highlighting issues.

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MCA Approach - Criteria

Criteria	Definition
Performance confidence	Expected technical performance, including risk and resilience.
Constructability	Complexity of construction and risk
Cost	Capital and operational costs.
Environmental impact	Impact on environment of works including: being sympathetic to the landscape; ecology; and recreation. Both long term and construction effects.
Community acceptability	Likely acceptability to key stakeholders and wider community.
Consenting/approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.
Operation & maintenance	Ease of inspections, operations and maintenance.
Sustainability	Relative carbon assessment

MCA Approach - Scoring

Colour	Rating	Level of Criteria	
	-2	Very unfavourable	Alternative absolutely less favourable than others on this criterion
	-1	Unfavourable	Alternative less favourable than others on this criterion
	0	Neutral	Alternative average, unquantifiable or not applicable
	1	Favourable	Alternative more favourable than others on this criterion
	2	Very favourable	Alternative absolutely more favourable that others on this criterion

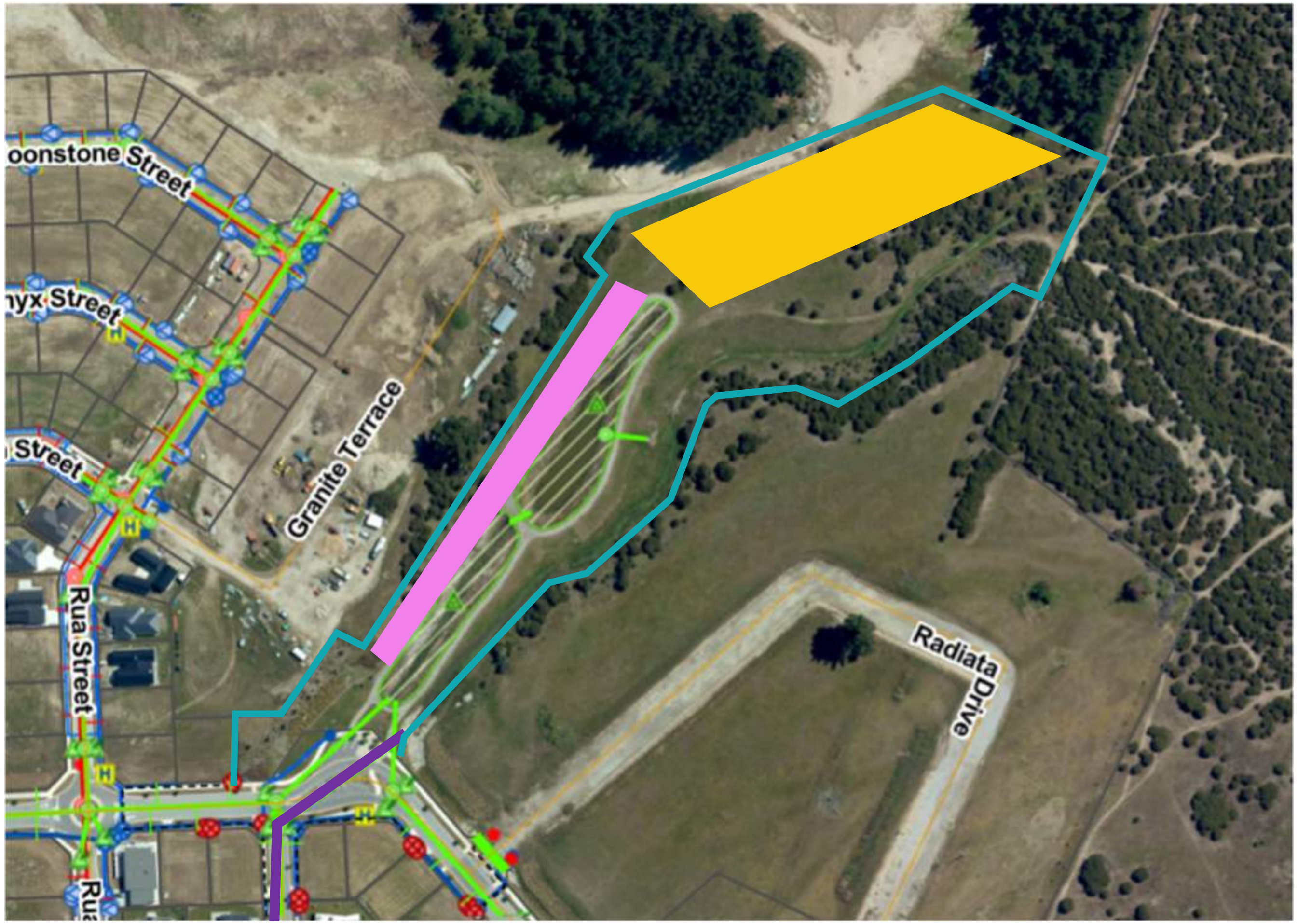
Upstream stormwater system

Upstream stormwater system

- Two stormwater separate systems: Northlake & Hikuwai.
- Both designed to attenuate peak flows in larger events but not for retention or detention in smaller events.
  - Need to add storage volume and change the way the systems work in smaller events.
- Short-listed option: Upgrading storage in both systems (separately or by combining them) including modifying the outlets, plus consider adding soakage.
  - QLDC owned land adjacent to Hikuwai

Sensitivity: General

Upstream stormwater system - Space



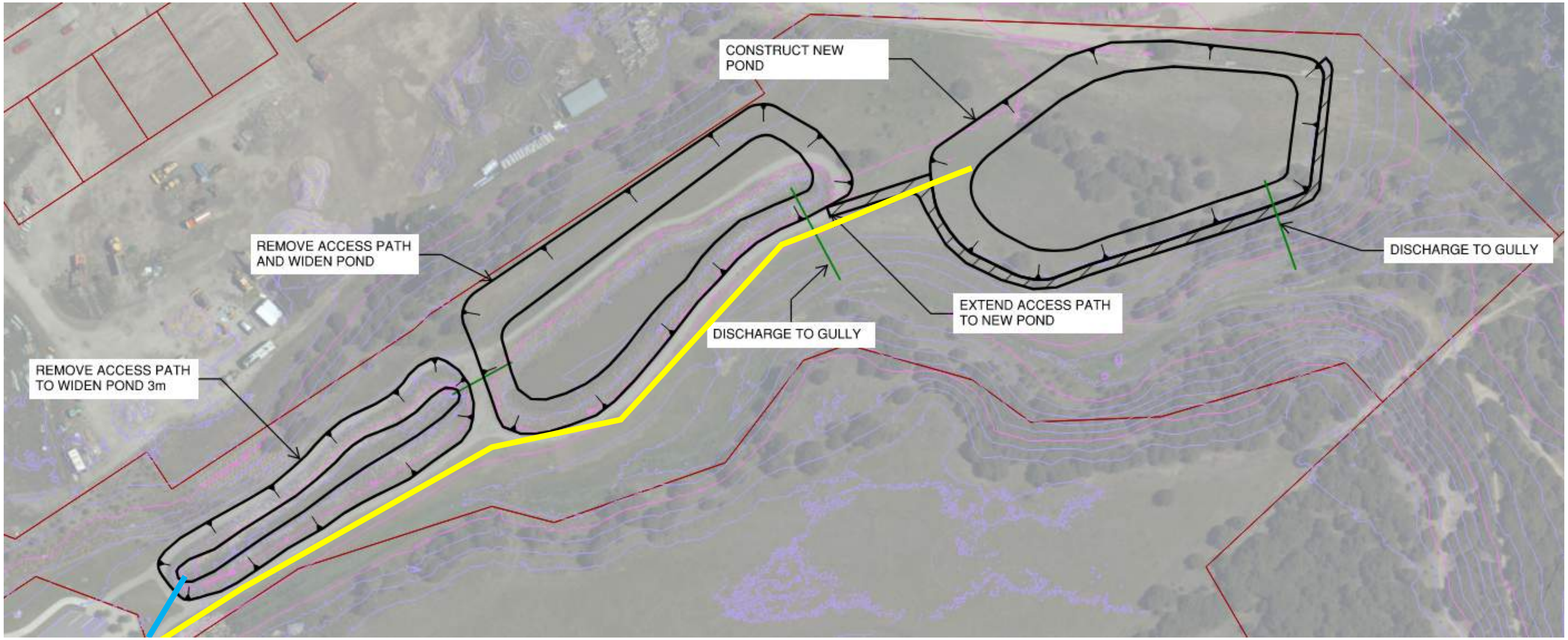
Beca

Upstream stormwater system – Add storage

- Expand existing Hikuwai Basins
- Add a new basin to north-east (bottom)
- Options for additional storage configuration:
  - Keep Hikuwai and Northlake separate - top & middle basin are part of Hikuwai system; bottom basin Northlake
  - Combine systems – all three basins work together

Upstream stormwater system – Add storage

- Widen existing basins
- Add new basin
- New pipework, new outlet and changes to existing outlets



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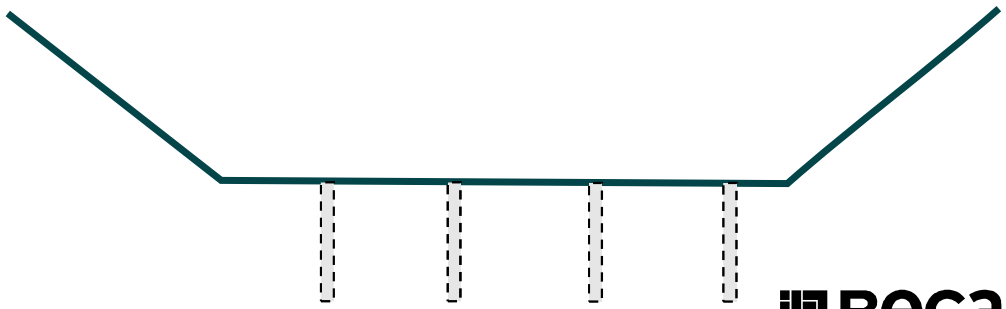
Sensitivity: General

Upstream stormwater system – Add soakage

- Target areas with high permeability soils – middle basin
- Options:
  - Replace topsoil with sandy material
  - Install manhole risers (with core drilled holes) into ground
- Either or both



Upstream stormwater system – Planning assessment

The upstream stormwater system is within the Northlake Special Zone (ODP).

Earthworks would be required to upgrading the Hikuwai Basins, combining the Northlake and Hikuwai stormwater systems and modifying the existing basin outlets.

To carry out these works it is likely some or all of the following would be exceeded:

- Earthworks exceeding 200m3
- Average depth greater than 0.5m exceeding 400m2
- Earthworks within 7m of a waterbody exceeding 20m3
- Maximum height of cut exceeding 2.4m

If the above rules are triggered a discretionary consent is required from QLDC.

Upstream stormwater system – Planning assessment (Cont.)

Soakage could also be included in some basins

Rule 12.B.1.8 The discharge of stormwater from a reticulated stormwater system to water, or onto or into land in circumstances where it may enter water, is a **permitted activity**, providing:

- (a) Where the system is lawfully installed, or extended, after 28 February 1998:

(i) The discharge is not to any Regionally Significant Wetland; and

(ii) Provision is made for the interception and removal of any contaminant which would give rise to the effects identified in Condition (d) of this rule; and

- (b) The discharge does not contain any human sewage; and
- (c) The discharge does not cause flooding of any other person's property, erosion, land instability, sedimentation or property damage; and
- (d) The stormwater discharged, after reasonable mixing, does not give rise to all or any of the following effects in the receiving water:

(i) The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; or

(ii) Any conspicuous change in the colour or visual clarity; or

(iii) Any emission of objectionable odour; or (iv) The rendering of fresh water unsuitable for consumption by farm animals; or

(v) Any significant adverse effects on aquatic life

Upstream stormwater system – Cost estimates

- Provisional Sum - Temporary works – drain down existing basins
- Excavation to extend existing basins
- Excavation to create new basin
- New pipework and outlet structure to new basin*
- Provisional Sum - Modify existing outlet structures
- Reinstatement
- $0.8m - $1.7m

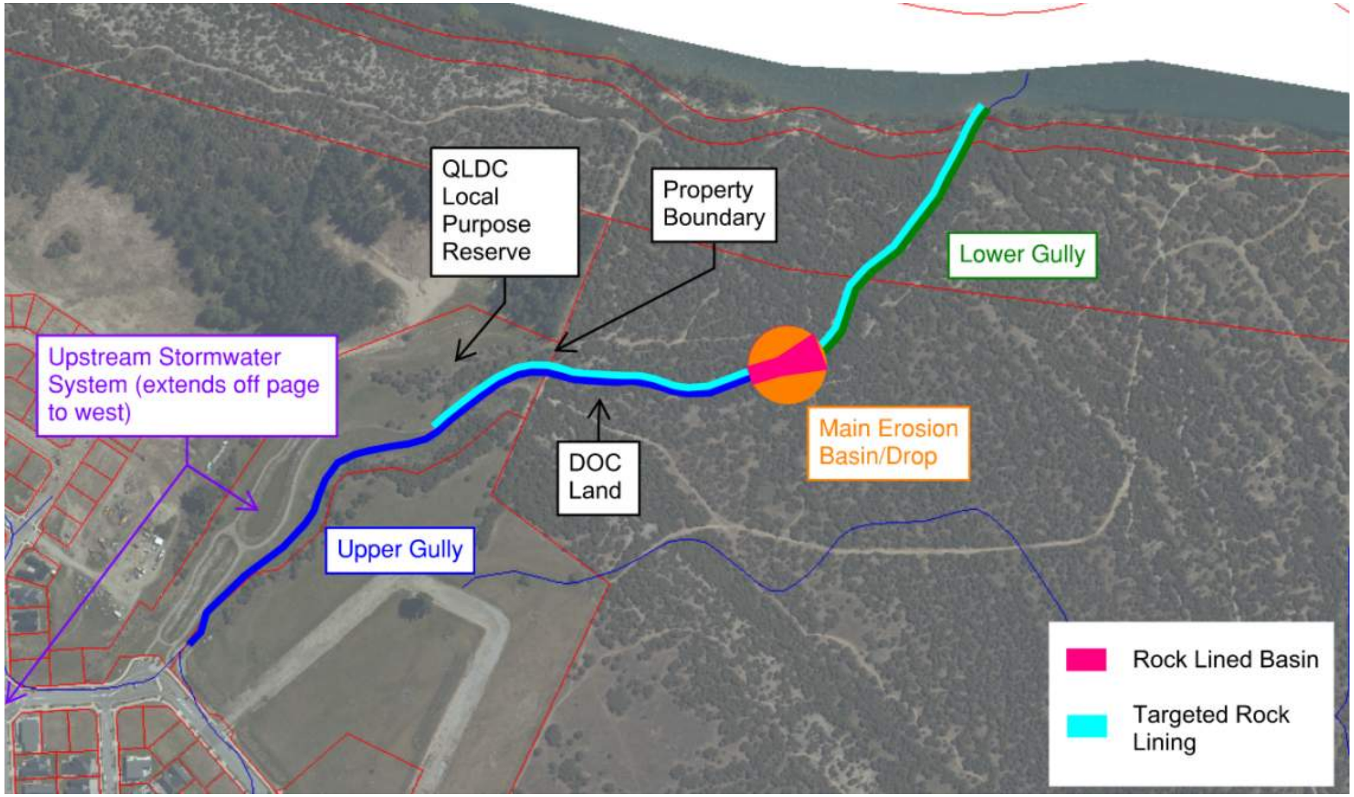
Upstream stormwater system - Scoring

Criteria	Definition	Upgrade - keep Hikuwai & Northlake separate	Upgrade - combine Hikuwai & Northlake	Plus soakage
Performance confidence	Expected technical performance, including risk and resilience.			
Constructability	Complexity of construction and risk			
Cost	Capital and operational costs.			
Environmental impact	Impact on environment of works including: landscape; ecology; and recreation. Both long term and construction effects.			
Community acceptability	Likely acceptability to key stakeholders and wider community.			
Consenting/approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.			
Operation & maintenance	Ease of inspections, operations and maintenance.			
Sustainability	Relative carbon assessment			

Upper gully

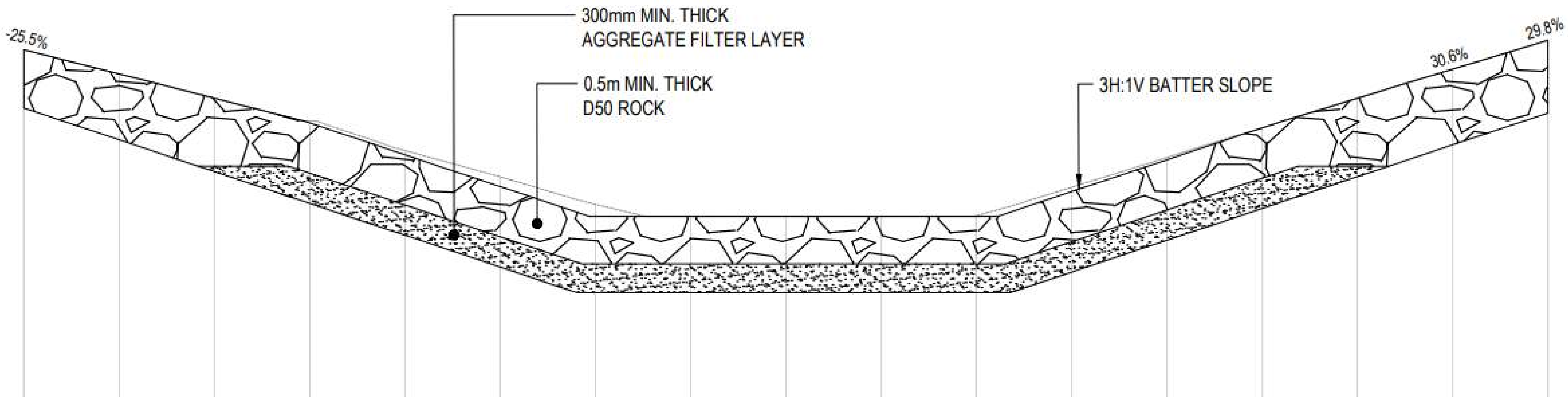
Upper gully

- Short-listed option: Targeted rock lining, plus consider adding rock weirs



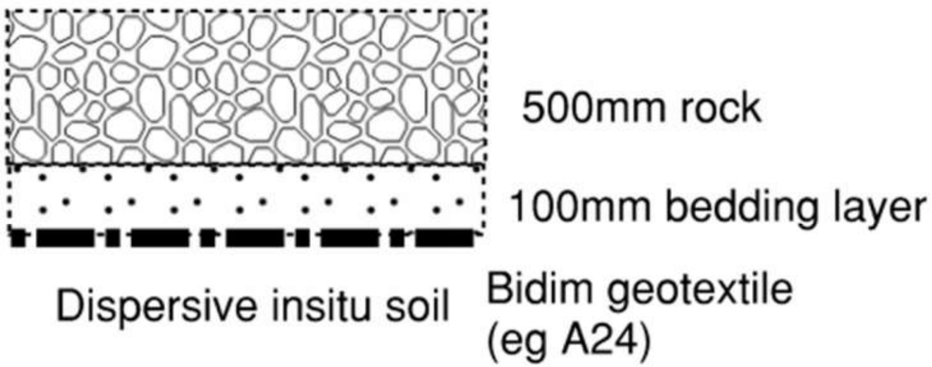
Upper gully

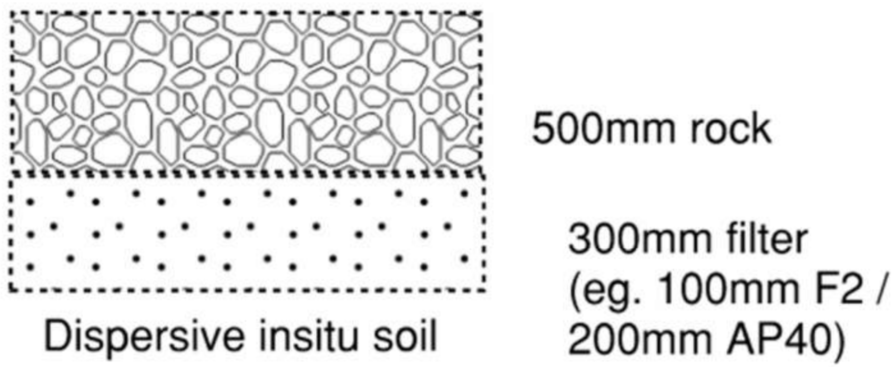
- 2%-4% longitudinal grade
- 3m wide base, 3H;1V batter slope
- Rock D50=250mm, 500mm thick



Upper gully

- Rock D50=250mm, 500mm thick
- Filter: 100mm F2 sand, 200mm A40; or Geotextile, 200mm AP40





Upper gully – Planning assessment

Targeted rock lining plus consider adding rock weirs. This will require earthworks and vegetation clearance.

- Queenstown Lakes District Plan
- The Upper gully crosses both the Northlake Zone and the Rural Zone. The rules referred to in the upstream works apply to any works for the Upper gully within the Northlake Zone area.

PDP Rules (earthworks):

- Earthworks within the Rural zone exceeding 1000m3 (in combination across all areas)
- Earthworks in ONF exceeding 10m3
- Earthworks over a contiguous area of land shall not exceed the following areas:
- - 2,500m2 where the slope is 10° or greater
- - 10,000m2 where the slope is less than 10°

Upper gully – Planning assessment (Cont.)

- PDP Rules (earthworks) continued…
- Earthworks greater than 0.5 metres in height or depth shall be set back from the site boundary the following minimum distances:

  Earthworks not supported by retaining walls:

  a distance at least equal to the maximum height of the fill, as measured from the toe of the fill, with a maximum batter slope angle of 1:3 (vertical: horizontal); or

  300mm plus a batter slope angle of a maximum of 1:3 (vertical: horizontal), as measured from the crest of the cut.
- Earthworks within 10m of the bed of any water body maximum 5m3 in total volume, within any consecutive 12-month period.
- Cleanfill transported by road to or from an area subject to earthworks maximum 300m3

If any of the above rules are not met resource consent is required as a **restricted discretionary** activity.

Upper gully – Planning assessment (Cont.)

PDP Rules (indigenous vegetation biodiversity).

- Any clearance of vegetation within 20m of the bed of a water body, riverbed or wetland. (**Discretionary** Activity)
- The 'clearance of vegetation' is defined as *'the removal, trimming, felling, or modification of any vegetation and includes cutting, crushing, cultivation, soil disturbance including direct drilling, spraying with herbicide or burning'.*
- The clearance of indigenous vegetation of more than 50m2 in any five year where certain criteria are met including;

indigenous forest or regenerating forest greater than 3m high, or

diverse indigenous shrubland, where 'diverse' means three or more species of indigenous shrub or vine

rocky habitats including rock outcrops and associated talus and boulderfield habitat, and

indigenous vegetation containing (but not limited to) any one of matai, kahikatea, weeping mapou, melicope simplex, mountain ribbonwood, bog pine, celery pine, hall's totara, kowhai, kanuka, hebe, and native brooms. (**Restricted** discretionary Activity).

Upper gully – Planning assessment (Cont.)

- Otago Regional Plan (Water)
- Rule 13.2.3.1 Placement of structures in the bed of a river is a **discretionary** activity.

low rock weirs and targeted rock lining

Structure:

Means any building, equipment, device, or other facility made by people and which is fixed to land; and includes any raft.

The definition of "river" in the Part 1 of the Resource Management Act 1991 is as follows:

- *River means a continually or intermittently flowing body of fresh water; and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal).*

- The construction methodology will confirm whether any rules are triggered in respect to disturbance or diversion of a river bed, however, it is likely the permitted rules can be met.

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Upper gully – Planning assessment (Cont.)

Summary –

- It is likely that the proposed earthworks and vegetation clearance associated with the Upper gully works will not meet all of the relevant rules and resource consent will be required from QLDC for a discretionary activity.
- The structures in the river bed would require resource consent from ORC as a discretionary activity.
- A number of specialist reports will likely be required in support of the works. These would include:
    - Environmental Management Plan (Including erosion and sediment control during construction)
    - Traffic Management Plan
    - Landscape and Visual Assessment (part of site in ONF)
    - Ecological Assessment (Ecological Management Plan – with specified information)
    - Hydrological assessment
- Stakeholders – DoC (also landowner and likely considered affected party), Upper Clutha Trails Trust, Te Ao Marama Inc and Aukaha.

Upper gully – Cost estimates

- Assumed 280m lined
- Rock, D50 = 250mm
- Aggregate filter between insitu ground and rock, two layers:
  - 100mm F2 sand
  - 200mm AP40
- Excavation
- Access for construction not allowed for in this item (Provisional Sum elsewhere in estimate)
- $1.1m

Upper gully - Scoring

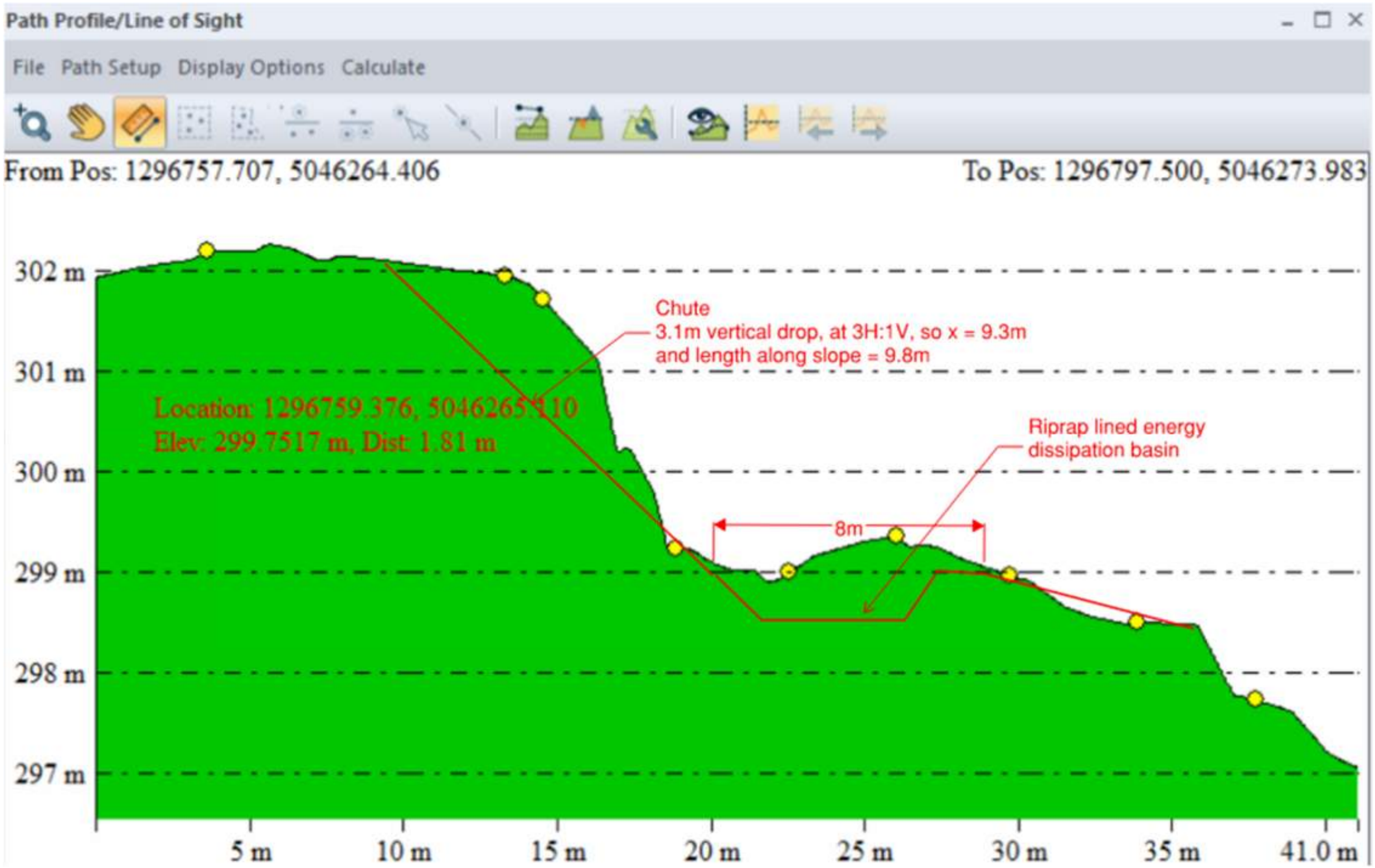
Criteria	Definition	Targeted rock lining
Performance confidence	Expected technical performance, including risk and resilience.	
Constructability	Complexity of construction and risk	
Cost	Capital and operational costs.	
Environmental impact	Impact on environment of works including: landscape; ecology; and recreation. Both long term and construction effects.	
Community acceptability	Likely acceptability to key stakeholders and wider community.	
Consenting/approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.	
Operation & maintenance	Ease of inspections, operations and maintenance.	
Sustainability	Relative carbon assessment	

Main scour basin / drop

Sensitivity: General

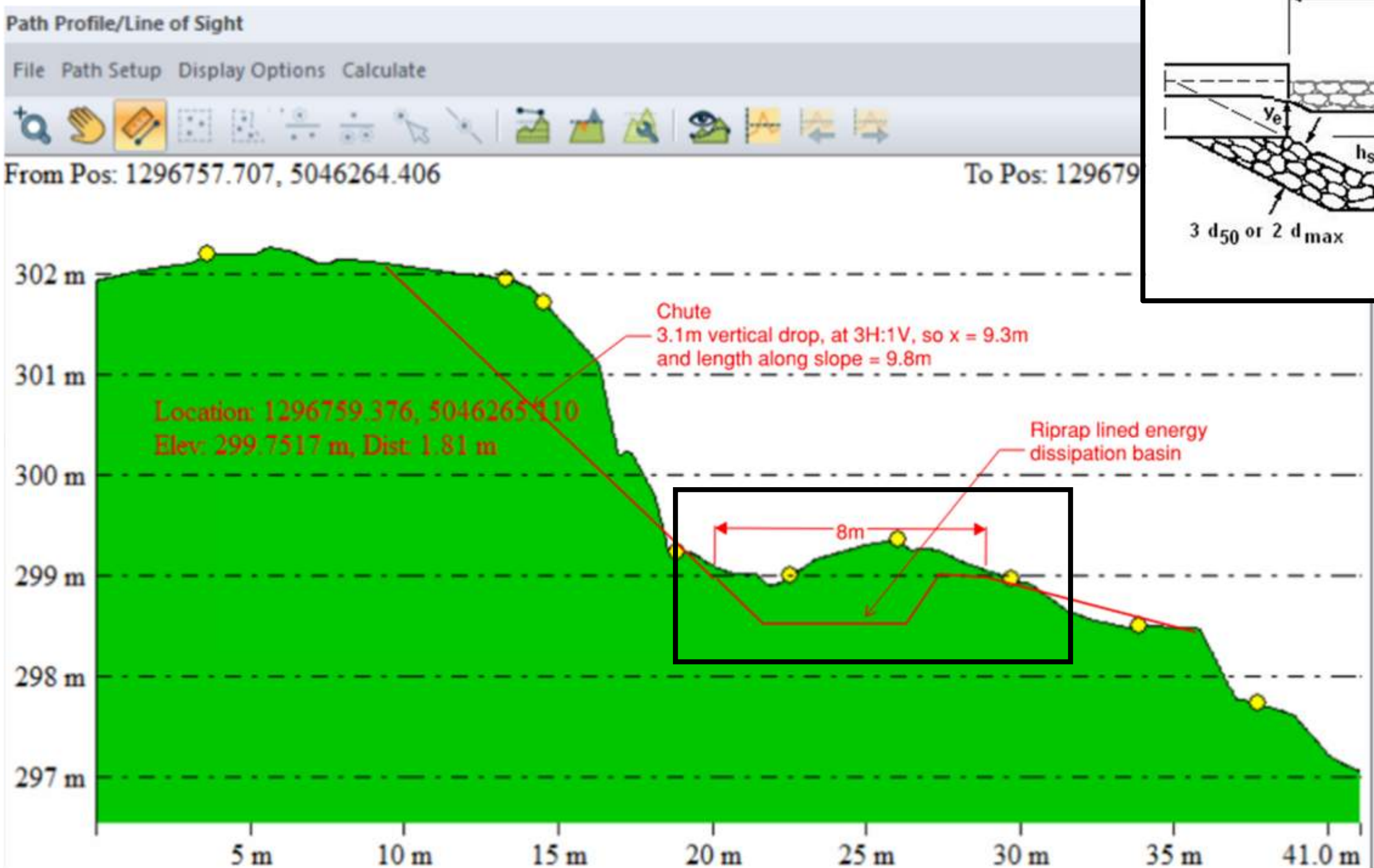
Main scour basin / drop

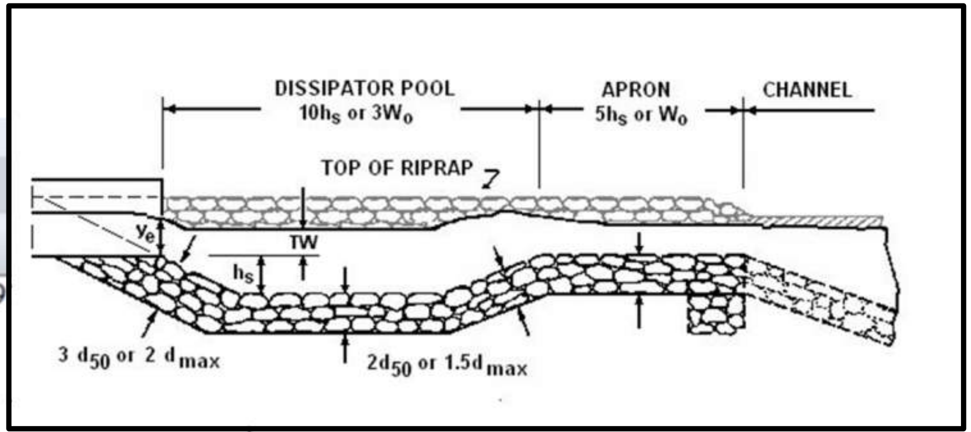
- Rock-lined, battered



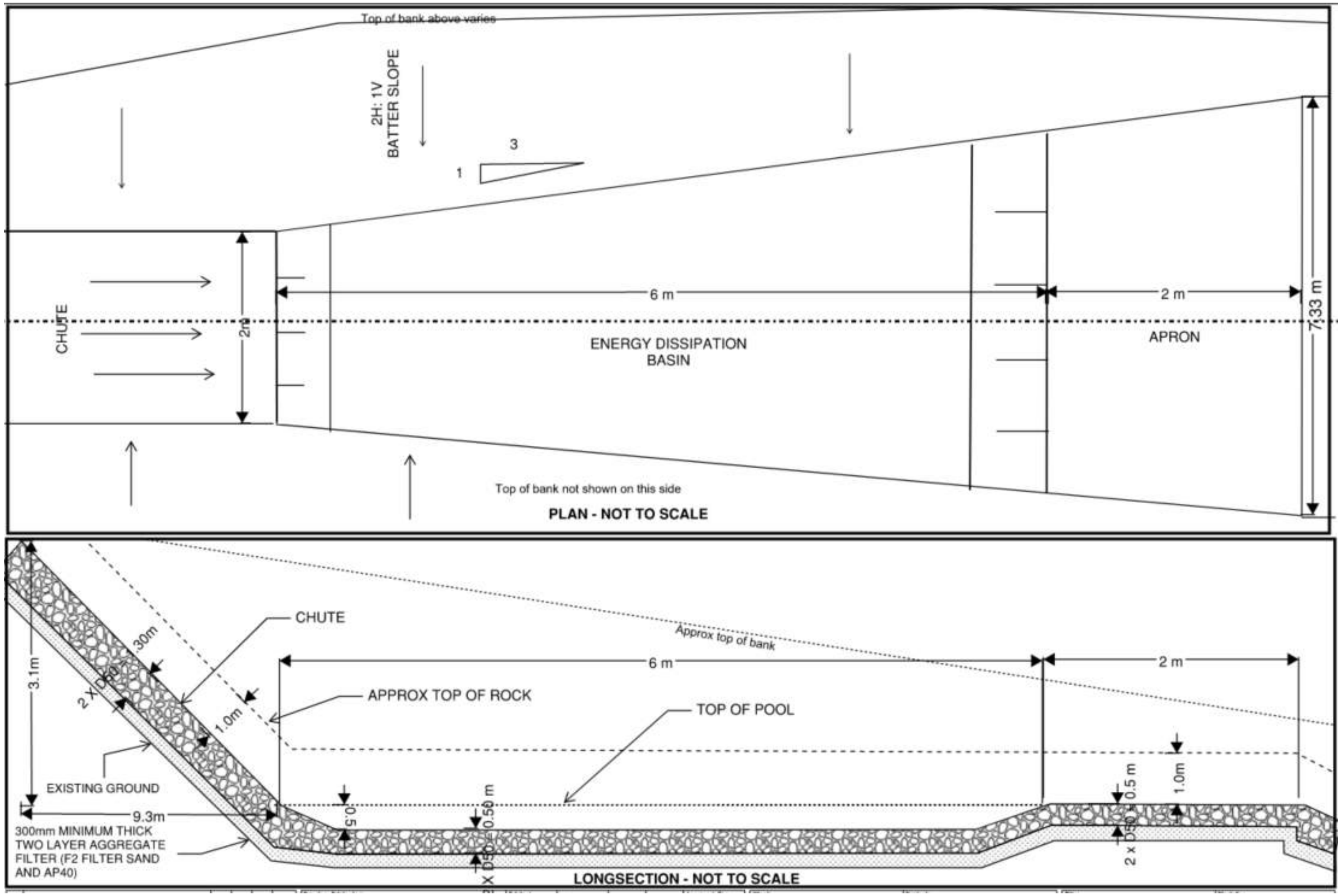
Main scour basin / drop

- Rock-lined, battered



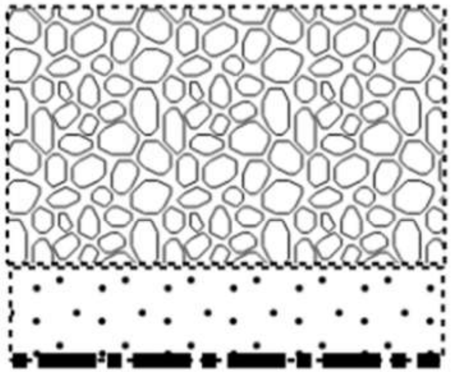


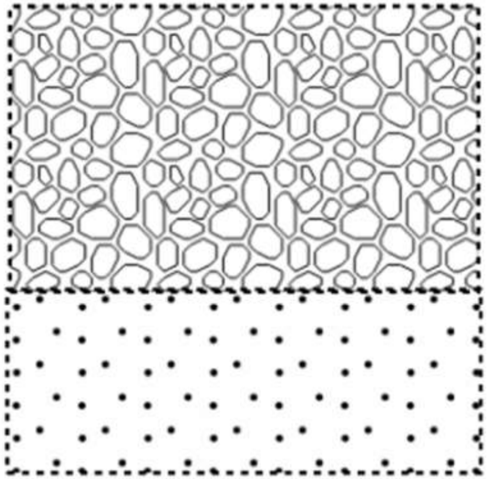
Main scour basin / drop



Main scour basin / drop

Chute





Main scour basin / drop – Planning assessment

Main erosion basin/drop - lining the waterway channel with a battered rock lined slope.

The rules in the PDP and Otago Regional Plan (Water) outlined in respect to the Upper gully would equally apply to this option.

In addition, the following would be applicable:

- maximum depth of any cut 2.4m
- maximum height of any fill 2m

Main scour basin / drop – Cost estimates

- Rock – chute D50= 650mm and scour basin D50=250mm
- Aggregate filter: F2 sand and AP40
- Excavation
- Access for construction not allowed for (Provisional Sum elsewhere in estimate)
- $0.1m

Main scour basin / drop - Scoring

Criteria	Definition	Rock-lined, battered
Performance confidence	Expected technical performance, including risk and resilience.	
Constructability	Complexity of construction and risk	
Cost	Capital and operational costs.	
Environmental impact	Impact on environment of works including: landscape; ecology; and recreation. Both long term and construction effects.	
Community acceptability	Likely acceptability to key stakeholders and wider community.	
Consenting/approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.	
Operation & maintenance	Ease of inspections, operations and maintenance.	
Sustainability	Relative carbon assessment	

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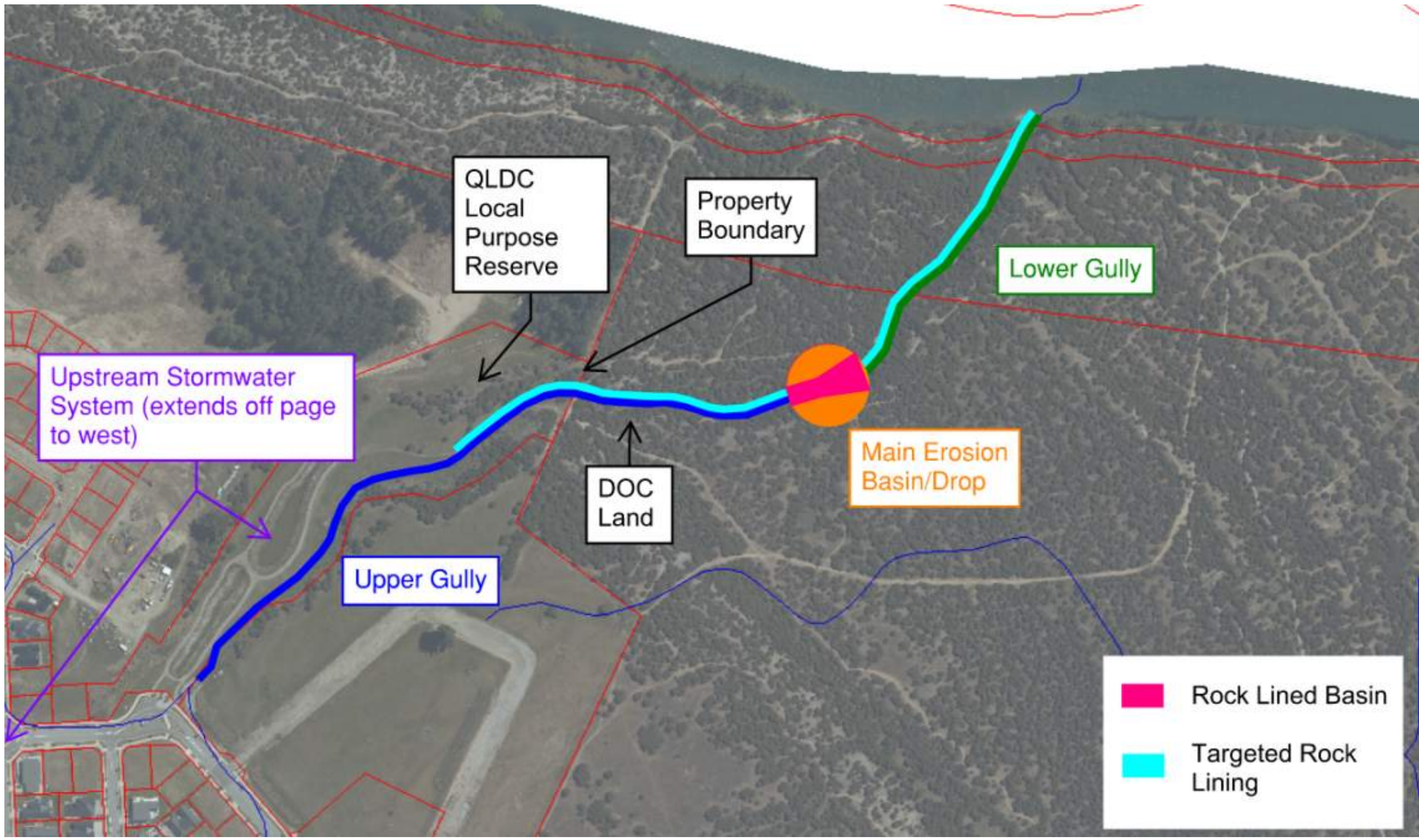
Lower gully

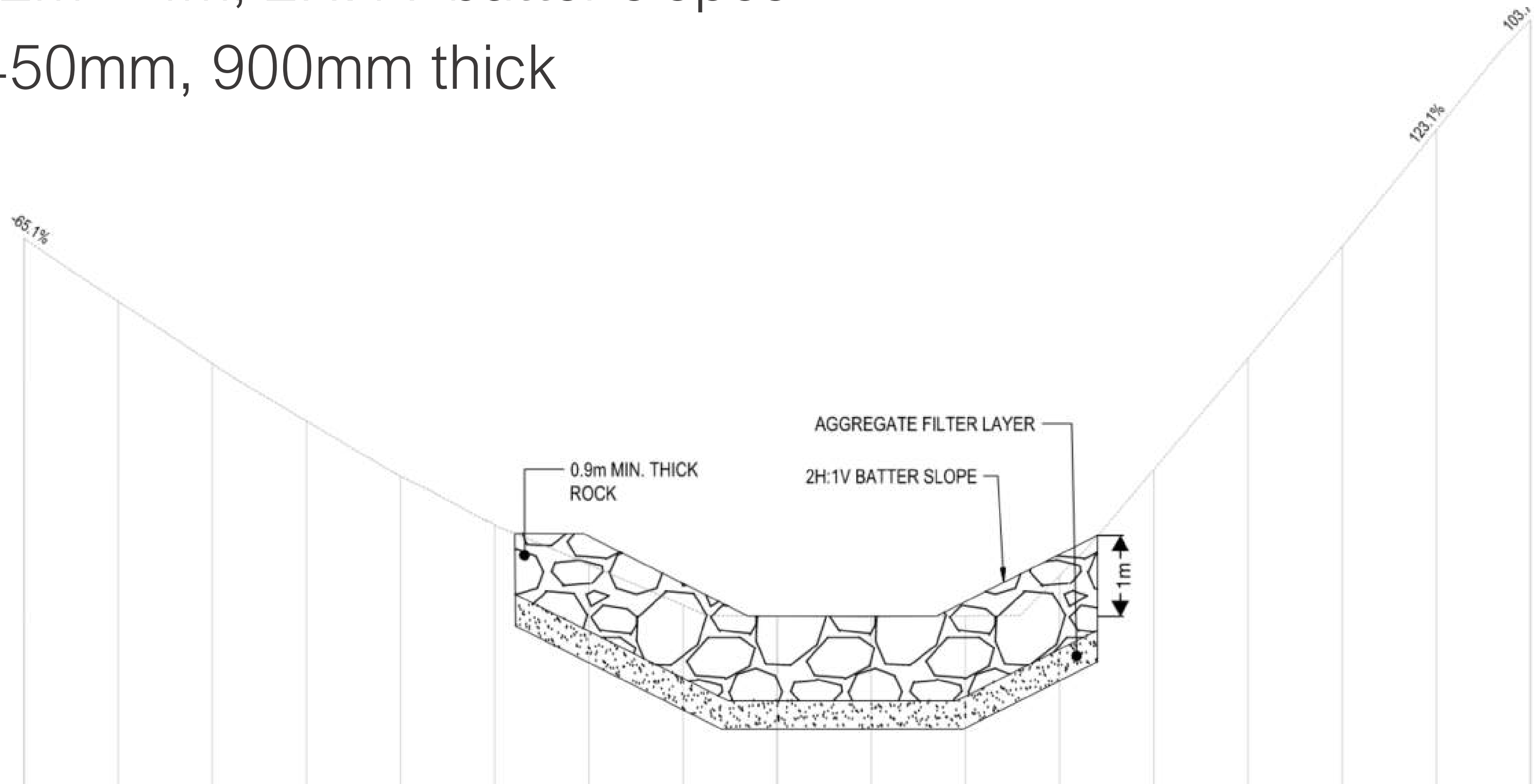
Lower gully

- Short-listed option/s: Targeted rock lining to provide bed and toe scour protection, plus consider adding low rock weirs in targeted areas.
- 265m long
- 7%-9% longitudinal grade (steeper than upper gully)



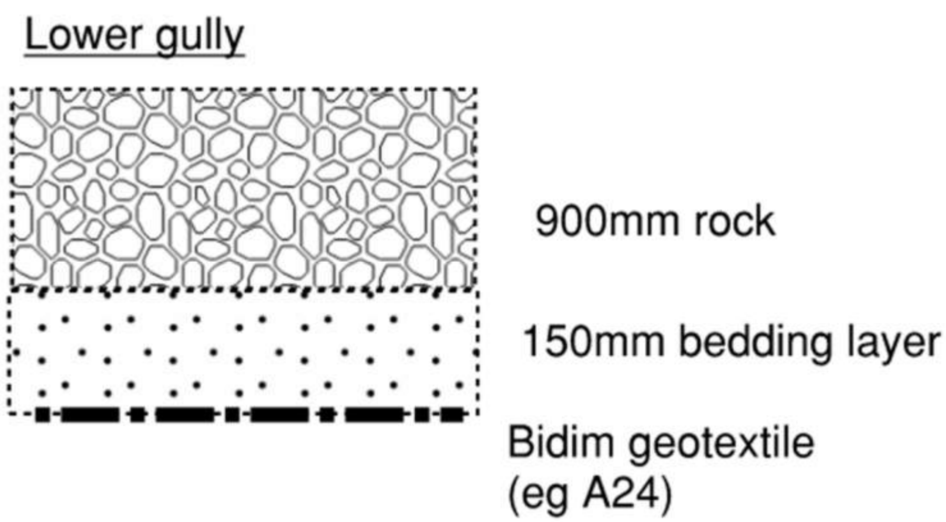
Lower gully

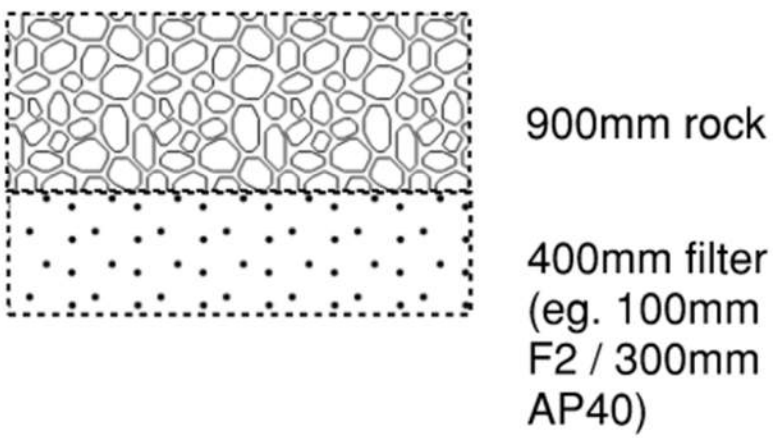
- Base varies 2m – 4m, 2H:1V batter slopes
- Rock D50=450mm, 900mm thick



Lower gully

- Rock D50 = 450mm, 900mm thick
- Filter: 100mm F2 sand, 300mm A40; or
  Geotextile, 150mm AP40





Lower gully – Areas with existing rock

Lower gully – Planning assessment

- Targeted rock lining to provide bed and toe scour protection. Also consider adding low rock weirs in targeted areas.
- The rules in the PDP and Otago Regional Plan (Water) outlined in respect to the Upper gully would equally apply to this option.

Lower gully – Cost estimates

- Assumed full 265m length lined
- Rock D50=450mm
- Aggregate filter: F2 sand and AP40
- Excavation
- Access for construction not allowed for in this item (Provisional Sum elsewhere in estimate)
- $1.4m

Lower gully- Scoring

Criteria	Definition	Targeted rock lining with toe scour protection
Performance confidence	Expected technical performance, including risk and resilience.	
Constructability	Complexity of construction and risk	
Cost	Capital and operational costs.	
Environmental impact	Impact on environment of works including: landscape; ecology; and recreation. Both long term and construction effects.	
Community acceptability	Likely acceptability to key stakeholders and wider community.	
Consenting/approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.	
Operation & maintenance	Ease of inspections, operations and maintenance.	
Sustainability	Relative carbon assessment	

Reinstatement

Reinstatement in Gully

Short-listed options:

- Move dead vegetation from gully but keep close by (don’t mulch)
- Remove foreign debris
- Remove loose and surplus soil
- Planting battered slopes
- ~~Planting/natural barriers~~
- ~~Diverting tracks~~
- ~~Blocking off dead ends of tracks~~

Combination of above. Scope to be determined on-site in conjunction with DOC.

Reinstatement in Gully – Planning assessment

- Combination of removing dead vegetation and debris, removal of loose and surplus soil, planting battered slopes, planting/natural barriers, blocking off dead end tracks.
- Earthworks rules may be triggered.
- Restoration works would be required as part of the information requirements for Ecological Management Plan.

Reinstatement in Gully – Cost estimates

- Difficult to quantify at this stage
- Provisional Sum only
- Access for construction not allowed for in this item (Provisional Sum elsewhere in estimate)
- $0.1m

Reinstatement in Gully - Scoring

Criteria	Definition	Removing dead vegetation & debris, loose soil, and battering slopes
Performance confidence	Expected technical performance, including risk and resilience.	
Constructability	Complexity of construction and risk	
Cost	Capital and operational costs.	
Environmental impact	Impact on environment of works including: landscape; ecology; and recreation. Both long term and construction effects.	
Community acceptability	Likely acceptability to key stakeholders and wider community.	
Consenting/approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.	
Operation & maintenance	Ease of inspections, operations and maintenance.	
Sustainability	Relative carbon assessment	

Beca

Actions and next steps

- Beca team to write-up minutes from workshop and MCA scoring
- Project team to review MCA scoring
- Beca team to provide bullet points on expected erosion mechanism in lower gully for DOC
- Identify if additional high-level design work required
- Preferred option to move to Concept Design

Total Cost Estimate

Description		Cost Estimate
General		$ 1,118,815
Upgrade Stormwater System		$ 1,406,500
Optional Soakage		$ 252,500
Upper Gully		$ 1,012,700
Main Scour Basin / Drop		$ 129,125
Lower Gully		$ 1,424,610
Reinstatement in Gully		$ 100,000
Subtotal		$ 5,444,250
Contingency	30%	$ 1,633,275
Construction Total		$ 7,077,525
Professional Fees	8%	$ 566,202
Client Costs	4%	$ 283,101
Consenting	2%	$ 141,551
Property Costs (N/A)	0%	$ -
Total Estimate (rounded)		$ 8,070,000

G

Appendix G – Short-List Options High-Level Concept Design Estimate

Code	Description	Quantity	Unit	Rate	Total
1.0	General				1,118,617
2.0	Upstream Stormwater System				1,406,500
3.0	Optional Additional Soakage (in Middle Basin)				252,500
4.0	Upper Gully				1,011,375
5.0	Drop - Rock lined Chute and Energy Dissipation Basin				129,125
6.0	Lower Gully				1,424,610
7.0	Remediate and Tidy the Gully				100,000
	Physical Works Costs incl. P&G				**5,442,727**
	Contingency	30.00	%	5,442,727	1,632,818
	Construction Budget				**7,075,544**
	Professional Fees	8.00	%	7,075,544	566,044
	Client Costs	4.00	%	7,075,544	283,022
	Consenting	2.00	%	7,075,544	141,511
	Property costs				excluded
	Rounding	1	LS	3,879	3,879
	Total Expected Estimate				**8,070,000**
	Cost Estimate Clarifications				0

Code	Description	Quantity	Unit	Rate	Total
1.0	**General**				
1.01	Create temporary access tracks into gully and drop through Hikuwai reserve – assumed access off Joe Brown Drive and Gunn Road	1	PS	200,000	200,000
1.02	P&G – Including creating working area/site yard in reserve and reinstatement	15	%	4,324,110	648,617
1.03	Consenting and Professional services				measured below
	Reinstatement of temporary works areas:				
1.04	Remove temporary access tracks	1	PS	50,000	50,000
1.05	Remove site yard/hardstand areas	1	PS	20,000	20,000
1.06	Reinstate previous cover to access track and yard/hardstand - grass or planting	1	PS	200,000	200,000
				Total General	**1,118,617**

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Code	Description	Quantity	Unit	Rate	Total
2.0	**Upstream Stormwater System**				
	Modifications to existing stormwater basins:		Note		
2.01	Temporary works to drain down existing basins. Provisional Sum.	1	PS	50,000	50,000
2.02	Modify existing basin to increase size – excavation	1,000	m3	71	71,000
2.03	Create new basin – excavation	5,000	m3	71	355,000
2.04	New outlet structure for new basin - assume 1 x 1800mm diameter manhole with stainless steel orifice plate	1	ea	32,000	32,000
2.05	Modify existing basin outlet structures	1	LS	5,000	5,000
2.06	New pipework – assume 1050mm diameter pipe	250	m	2,950	737,500
2.07	Reinstatement for new basin and modifications to existing – topsoil and grass	4,000	m2	39	156,000
				Total Upstream Stormwater System	**1,406,500**

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Version: 5, Version Date: 02/04/2026

Code	Description	Quantity	Unit	Rate	Total
3.0	**Optional Additional Soakage (in Middle Basin)**				
3.01	Remove existing topsoil on basin invert (to stockpile and reuse elsewhere in job) and retrofit sandy invert for infiltration over basin base area. Assume 2A sand or concrete sand or equivalent, spread 300mm thick over 2,500m2 base.	750	m3	260	195,000
3.02	Infiltration risers constructed into higher permeability ground beneath. Assume 2m long 1050mm diameter riser with holes core drilled, scruffy dome lid at basin invert level.	5	ea	11,500	57,500
	Total Optional Additional Soakage (in Middle Basin)				**252,500**

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Code	Description	Quantity	Unit	Rate	Total
4.0	**Upper Gully**				
	Targeted rock lining of existing channel (approx. trapezoidal). Assumed a total of 280m length is lined.		Note		
4.01	Excavate existing material (to waste) and place aggregate filter layer 1, assume F2 filter sand 100mm thick	261	m3	350	91,350
4.02	Excavate existing material (to waste) and place aggregate filter 2, assume AP40 200mm thick	522	m3	325	169,650
4.03	Excavate existing material (to waste) and place rock riprap lining, rock D50 = 250mm	1,305	m3	575	750,375
				Total Upper Gully	**1,011,375**

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Code	Description	Quantity	Unit	Rate	Total
5.0	**Drop - Rock lined Chute and Energy Dissipation Basin**				
	Rock-lined chute into rock energy dissipation basin. Assumed 3.5m drop at 2H:1V = 9.8m chute length.		Note		
5.01	Trim and shape banks above	1	LS	25,000	25,000
5.02	Excavate existing material (to waste) and place aggregate filter layer 1 under chute, assume F2 filter sand 100mm thick	6	m3	350	2,100
5.03	Excavate existing material (to waste) and place aggregate filter layer 2 under chute, assume AP40 350mm thick	22	m3	325	7,150
5.04	Excavate existing material (to waste) and place aggregate filter layer 1 under energy dissipation basin, assume F2 filter sand 100mm thick	8	m3	350	2,800
5.05	Excavate existing material (to waste) and place aggregate filter layer 2 under energy dissipation basin, assume AP40 200mm thick	16	m3	325	5,200
5.06	Excavate existing material (to waste) and place rock in chute, rock D50 = 650mm	82	m3	800	65,600
5.07	Excavate existing material (to waste) and place rock in energy dissipation basin, rock D50=250mm	37	m3	575	21,275
	Total Drop - Rock lined Chute and Energy Dissipation Basin				**129,125**

Code	Description	Quantity	Unit	Rate	Total
6.0	**Lower Gully**				
	Rock lining of existing channel (approx. trapezoidal). Assumed a total of 265m length is lined.		Note		
6.01	Excavate existing material (to waste) and place aggregate filter layer 1, assume F2 filter sand 100mm thick	198	m3	370	73,260
6.02	Excavate existing material (to waste) and place aggregate filter, assume AP40 300mm thick	594	m3	340	201,960
6.03	Excavate existing material (to waste) and place rock riprap lining, rock D50 = 450mm	1,782	m3	645	1,149,390
				Total Lower Gully	**1,424,610**

Code	Description	Quantity	Unit	Rate	Total
7.0	**Remediate and Tidy the Gully**				
7.01	Trimming overhanging banks	1	PS	30,000	30,000
7.02	Clear dead vegetation and debris	1	PS	40,000	40,000
7.03	Planting kanuka	1	PS	30,000	30,000
	Total Remediate and Tidy the Gully				**100,000**

Code	Description	Quantity	Unit	Rate	Total

Cost Estimate Clarifications

Assumptions

0.01 The estimate is based on high-level concept design information prepared by the Beca design team.

0.02 We assume that all of the work will be undertaken by a single ‘Main Contractor’ through a single contract for the project.

0.03 We assume that a competitive tendering process will be followed as part of the agreed procurement process.

0.04 We assume that all works are carried out during normal daytime working hours.

0.05 We assume that all of the work will be carried out in a single phase. No allowance for cost associated with phasing or staging of the works e.g. additional demobilisation, standby, and remobilisation costs.

0.06 The estimate assumes continuity of work and unobstructed access to site.

0.07 Quantities and measures are approximate and subject to design development.

0.08 The estimates assume that the proposed work can be consented.

0.09 Contingency allowance has been included at 30% for feasibility-level design. This allowance is intended to cover the risk of cost increase due to design development, estimating risk, and for unforeseen costs arising during the construction phase.

0.10 Detailed risk analysis has not been carried out. Please note that the above contingency allowances exclude Client-driven scope changes and we recommend that the Client hold a separate project contingency budget for this if this risk is deemed likely.

0.11 The allowance for Professional Fees includes for the cost of engineering and design, construction monitoring and providing technical support during the construction phase. Please note that the allowances for Professional Fees in the estimates are typical allowances included for comparative purposes - a work breakdown or fee estimate has not been prepared.

0.12 The estimate is based on rates and prices current as of March 2025 and no allowance has been included for increases in the costs of labour, materials, or plant beyond this date.

0.13 Elements of cost included within this estimate are based on costs from similar projects and other Beca cost benchmarks.

Project Specific Exclusions

0.14 Ground improvement.

0.15 Breaking up and excavating hard and in situ rock. The excavation allowances in the estimate allow to excavate site soil and loose disturbed material due to erosion.

0.16 Costs for any landscaping other than what is measured.

0.17 Costs for managing contaminated soil and hazardous materials (e.g.. asbestos cement pipe etc.) unless specifically stated and measured.

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Code	Description	Quantity	Unit	Rate	Total
0.18	No allowance for property costs including land purchase, easements, and access agreements.				
0.19	No allowance has been made for the impacts of extraordinary global events (such as the recent COVID-19 outbreak) within the base estimate.				
	General Estimate Exclusions				
0.20	Goods and Services Tax (GST).				
0.21	Incurred costs to date.				
0.22	Cost escalation beyond the date of the report.				
0.23	Fast track / accelerated programme.				
0.24	Work outside normal working hours.				
0.25	Routine or deferred maintenance to existing assets other than what is measured.				
	Cost Estimate Risks				
	Risks with a potential cost effect include:				
0.26	Design development.				
0.27	Resource consent conditions and the impact on scheme design.				
0.28	Access costs and reinstatement costs.				
0.29	Contaminated soil and groundwater, and other hazardous materials found on site.				
0.30	Temporary management of pedestrians and cyclists using tracks crossing the works.				
0.31	Working around existing services.				
0.32	Local market conditions and contractor resource availability.				
0.33	Cost escalation and foreign exchange rates. The long-term inflation rate has typically been around 2-3% p.a. However in recent years inflation has been considerably higher.				
0.34	Costs of impacts associated with extraordinary global events (such as the recent COVID-19 outbreak).				
0.35	There may be other risks - and opportunities - which are not listed above. We recommend that further risk analysis and cost estimating be carried out at the next stage of the project.				
	Expected Estimate Range				
0.36	Estimate range is an indication of the degree to which the final cost outcome for a given project will vary from the estimated cost – it is not an additional Contingency. Range is expressed as a +/- percentage range around the point of estimate after the application of contingency, with a stated level of confidence that the actual cost outcome would fall within this range. As the level of project definition increases and the tender date draws nearer, the expected range of the estimate tends to improve, as indicated by a tighter +/- range.				

Code	Description	Quantity	Unit	Rate	Total
0.37	This estimate is based on concept-level design information. The estimate is deemed to be a Class 4 estimate in terms of the AACE Cost Estimate Classification System guidelines. The expected estimate accuracy range is circa -20% to +50%.				
	General Considerations and Limitations				
0.38	This estimate is solely for our Client's use for the purpose for which it was intended in accordance with the agreed scope of work. It may not be disclosed to any person other than the Client and any use or reliance by any person contrary to the above, to which Beca has not given its prior written consent, is at that person's own risk.				
0.39	While Beca believes that the use of the assumptions in the report are reasonable for the purposes of this study, Beca makes no assurances with respect to the accuracy of such assumptions and some may vary significantly due to unforeseen events and circumstances.				
0.40	In preparing these estimates, Beca has relied on the accuracy, completeness and currency of the information provided, therefore is not responsible for the information provided, and has not sought to independently verify it. To the extent that the information is inaccurate or incomplete, the opinions expressed by Beca may no longer be valid and should be reviewed.				
				Total Cost Estimate Clarifications	**0**

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H

Appendix H – Short-List MCA Tables – Post-Workshop Update

Scoring

Colour	Rating	Level of Criteria	
	-2	Very unfavourable	Alternative absolutely less favourable than others on this criterion
	-1	Unfavourable	Alternative less favourable than others on this criterion
	0	Neutral	Alternative average, unquantifiable or not applicable
	1	Favourable	Alternative more favourable than others on this criterion
	2	Very favourable	Alternative absolutely more favourable that others on this criterion

Upstream Stormwater System

Criteria	Definition	Upgrade storage, keep Hikuwai & Northlake separate	Upgrade storage, combine Hikuwai & Northlake	Upgrade storage, keep Hikuwai & Northlake separate, plus soakage if soils suitable	Upgrade storage, combine Hikuwai & Northlake, plus soakage if soils suitable	Comments
Performance confidence	Expected technical performance, including risk and resilience.	0	1	1	2	Combining basins provides opportunity to use top basin as forebay. Adding soakage options scored on the basis that they provide additional benefit.
Constructability	Complexity of construction and risk.	-1	1	-1	0	Keeping systems separate option includes long length of large pipe. Adding soakage adds complexity to construction.
Cost	Capital costs.	$1.4m	$0.8m	$1.7m	$1.1m	Adding soaking increases cost by $0.3m (estimate for sandy base and soakage manholes). Note: Cost estimates do not include P&G.
Environmental impact	Impact on environment of works including: landscape; ecology; and recreation. Both long term and construction effects.	0	0	0	0	All options involve works within existing QLDC local purpose reserve. Difference in environmental impact between options is considered insignificant.
Community acceptability	Likely acceptability to key stakeholders and wider community.	0	0	0	0	All options are to reduce flows and future erosion in gully, by construction in the QLDC local purpose reserve. All options have likely similar acceptability.
Consenting / approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.	0	0	0	0	All options are consentable. Difference in effects is considered to be insignificant between options.
Operation & maintenance	Ease of inspections, operations and maintenance.	0	1	-2	-1	Combining basins provides opportunity to use top basin as forebay. Soakage adds maintenance.
Sustainability	Relative carbon assessment	-1	0	-1	0	Long length of concrete pipe in options for keeping systems separate would likely have higher carbon impact. Similar earthworks volumes across options.

Upper Gully

Criteria	Definition	Do nothing	Do minimal - targeted locations, low level intervention e.g. 10%	Long length rock lining	Comments
Performance confidence	Expected technical performance, including risk and resilience.	-1	-1	2	Scour would continue with no or minimal mitigation, but damage and discharge of sediment would not be as significant as in the lower gully. Do minimal and do nothing solutions may require further works in future.
Constructability	Complexity of construction and risk.	0	0	-1	Longer length of lining would require importing more rock and more clearing and excavation, but not complex construction.
Cost	Capital costs.	-	$0.1m	$1.0m	Note: Cost estimates do not include access track or temporary working area or P&G.
Environmental impact	Impact on environment of works including: landscape; ecology; and recreation. Both long term and construction effects.	0	0	-2	Any rock lining within the reserve would require clearing of vegetation which would have an environmental impact. Access track will be required for construction. A long length of wide rock channel would require extensive clearing of vegetation and would affect the landscape within the reserve. Do nothing and do minimal could also have a negative environmental impact from scour and discharge of sediment.
Community acceptability	Likely acceptability to key stakeholders and wider community.	0	0	-2	Some rock lining is likely to be acceptable to the community. A long length of wide rock channel and associated extensive clearing of vegetation would be unacceptable to DOC and likely be unpopular with the community.
Consenting / approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.	0	0	-2	All options have a consenting pathway. Affected party approval would be required from DOC. DOC unlikely to give approval for extensive rock lining in upper gully.
Operation & maintenance	Ease of inspections, operations and maintenance.	0	0	-1	Do nothing or minimal option may require future work. Rock lining installed would need inspection but is assumed to have minimal maintenance.
Sustainability	Relative carbon assessment	0	0	-1	Excavating and importing and placing a greater volume/length of rock would have higher carbon impact.

Main Scour Basin / Drop

Criteria	Definition	Rock lined, steeper drop/natural stepped	Rock-lined, battered	Comments
Performance confidence	Expected technical performance, including risk and resilience.	2	2	Appropriately designed and constructed rock lined drop is expected to mitigate on-going scour and cutting back at main scour basin/drop.
Constructability	Complexity of construction and risk.	-2	-2	Construction will involve earthworks and imported large rock. Shaping and placement of rock in chute and energy dissipation basin is complex/specialist work especially with constraints on equipment size that can be used due to site constraints.
Cost	Capital costs.	>$0.1m*	$0.1m	*No estimate has been carried out for stepped/more natural looking drop, but would likely have similar volumes of rock. May have some larger rocks, and more complex construction, so assumed that cost would be greater. Note: Cost estimates do not include access track or temporary working area or P&G.
Environmental impact	Impact on environment of works including: landscape; ecology; and recreation. Both long term and construction effects.	0	-1	Rock lining of channel within area of existing drop/scour hole, so minimal live vegetation clearance at scour hole site. Access track will be required for construction. Impact on landscape may be able to be reduced by more natural-looking stepped rock drop option rather than rock-line trapezoidal chute.
Community acceptability	Likely acceptability to key stakeholders and wider community.	1	1	Community expected to be on-board with mitigating ongoing erosion at main scour basin/drop site. Limited vegetation clearance proposed at main scour basin/drop site, although vegetation clearance will be required for the access track.
Consenting / approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.	-1	-1	All options have a consenting pathway. Works are in bed of stream and relatively large-scale. Also access track required.
Operation & maintenance	Ease of inspections, operations and maintenance.	-1	-1	Large rock-work would be difficult to modify if maintenance was required, but maintenance is expected to be infrequent.
Sustainability	Relative carbon assessment	-1	-1	Carbon impact of importing and placing large rock - same for both options.

Lower Gully

Criteria	Definition	Partial length rock lining with toe scour protection e.g. 50%	Partial length rock lining with toe scour protection e.g. 80%	Full length rock lining with toe scour protection	Comments
Performance confidence	Expected technical performance, including risk and resilience.	-1	1	2	Options with only partial coverage would need to be developed and refined to target the highest risk areas. Greater length of rock lining would provide greater confidence in mitigating toe scour.
Constructability	Complexity of construction and risk.	-1	-2	-2	All options involve some clearing, excavation, and importing and placing rock. Complex construction especially with constraints on equipment size that can be used due to site constraints. More extensive rock lining will be more difficult to construct.
Cost	Capital costs.	$0.7m	$1.1m	$1.4m	Note: Cost estimates do not include access track or temporary working area or P&G.
Environmental impact	Impact on environment of works including: landscape; ecology; and recreation. Both long term and construction effects.	0	-1	-2	**Construction works:** More extensive the rock lining the greater the environmental impact. Access track will be required for construction and similar for all options. **Ongoing toe scour and discharge of sediment:** Less extensive rock lining will mean increased risk of ongoing toe scour, slope instability and sediment discharge. *This has been given less weight than the construction effects in scoring this item.*
Community acceptability	Likely acceptability to key stakeholders and wider community.	0	-1	-1	More extensive rock lining likely to be less acceptable to the community.
Consenting / approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.	0	-1	-1	All options have a consenting pathway. More extensive rock is likely to have greater impact.
Operation & maintenance	Ease of inspections, operations and maintenance.	-1	0	0	Full length of lower gully will require inspection and maintenance, both where there is rock and where there isn't. Less protection would mean on-going scour and therefore more maintenance required in the future.
Sustainability	Relative carbon assessment	0	-1	-1	Importing and placing a greater volume/length of rock would have higher carbon impact.

Reinstatement

Criteria	Definition	Removing dead vegetation, foreign debris and loose soils in gully. Battering overhanging slopes. Planting.	Comments
Performance confidence	Expected technical performance, including risk and resilience.	0	Works should tidy up around existing damage.
Constructability	Complexity of construction and risk.	-1	Requires plant working in a constrained area and trimming banks.
Cost	Capital costs.	$0.1m	Provisional Sum only as works not scoped. Note: Cost estimates do not include: planting; access track; temporary working area; P&G.
Environmental impact	Impact on environment of works including: landscape; ecology; and recreation. Both long term and construction effects.	-1	Would likely to require some earthworks (trimming/shaping) and loss of vegetation.
Community acceptability	Likely acceptability to key stakeholders and wider community.	0	Expected to be acceptable to community due to wider project purpose. DOC wants any dead vegetation which is removed to be kept within reserve, near gully and not mulched.
Consenting / approvals	Complexity, timeframes, and risks of obtaining relevant consent and approvals.	0	Consenting pathway available.
Operation & maintenance	Ease of inspections, operations and maintenance.	0	Vegetation establishment will be required. Otherwise minimal ongoing maintenance expected for reinstatement works.
Sustainability	Relative carbon assessment	0	Will likely include planting so scored neutral.

Appendix I – April 2025 Post-Workshop Site Visit Notes

Minutes

April 2025 Site Visit with QLDC and HEB

Held 09 April 2025 at Rockabilly Gully

Attendees

[redacted]	QLDC	[redacted]	Beca
[redacted]	QLDC	[redacted]	Beca
[redacted]	HEB		

Item	Action
1 Basins	
• Questioned whether ponds 2 & 3 should be normally dry (assumed yes). *[Post-meeting response from Beca ([redacted] Yes.]*	
• Assumed that the existing swale from the Northlake subdivision will be retained for overland flow.	
• QLDC questioned whether the swale include weirs to help retain some flow Would this have significant effect?	Beca
• Alternatively, could the bottom of the swale (adjacent to new pond 3 before entering upper gully) have a bund with pipe and spillway?	Beca
• Is there an option/benefit in having a second forebay operating in parallel with pond 1 for maintenance, etc.?	Beca
• Earthworks for new pond was discussed. [redacted] noted that this would be done with normal earthworks plant (e.g. 20 tonne digger, dumper etc) and easily accessed from Joe Brown Drive using pedestrian tracks.	
• Consideration could be given to whether cut from the new basin could be reused on site for bunding, etc.	
2 Upper Gully – QLDC Land	
• In the top part of the gully, waterway is generally grassed and only local erosion/scour holes observed. Proposing to only carry out mitigation in areas of scour where grass is not present and accept risk of possible erosion, noting that maintenance access is considered relatively easy within QLDC land. Will carry out localised filling with select fill and endeavour to re-grass.	
• Discussed possible use a geocell type engineered product but noted risk of fill being washed out, preferential scour around the edges and appearance of geocells if exposed. QLDC preference is to not use geocells but endeavour to re-grass and accept risk of future erosion.	
3 Upper Gully – DOC land	
• Discussed proposal of providing limited rock lining in the upper gully to meet DOC preference of limited vegetation clearance, allowing it to act like a 'natural gravel waterway' (i.e. gravel will shift under moderate to large flows) and accepting risk of erosion. This would be a reduced width of rock lining from previously discussed. [redacted] noted preference for rock lining would include those areas of ground that is bare/unvegetated.	
• A section of mountain bike track was observed where water from the stream has broken out and created a new flow path that has subsequently scoured the track (refer image below). For this section of track the proposal discussed was to use gravel fill to return track to a usable condition (at least in the short term, although it was noted that bikers may now be using alternative track) but not to undertake works to try and 'train' the waterway back into the main channel and accept that further erosion may occur in the future. This is to let	

the waterway follow its natural path and the works required to 'train' the waterway away from the track were not considered consistent with approach of a reduced rock lining.

- [redacted] noted that using a screening bucket on the basin excavation may provide some suitable rock material, though noted from exposed gravels it is likely only smaller rock sizes.
- Large rocks that have been imported previously and buried below the waterway at track crossings appear to have withstood effects of increased flow/erosion well (refer image below). Proposing to use similar large rocks at all track crossings and accepting track crossings will generally be similar to existing.

- [redacted] noted motorised wheelbarrows on the existing tracks would likely be best for this area to import small volumes of rock, and should be acceptable to DOC as is same as what they use. It was noted some kanuka will have to be trimmed. If any kanuka are required to be removed then consideration could be given to trying to re-locate trees (but accepting that some may not survive).

4 Main Drop

- Discussed options of using a chute (perhaps laid back at approx. 3H:1V) or a more stepped structure potentially using large rock (perhaps closer to 1H:1V if using stepped rock). Gabions have been discounted.
- Both options will require vegetation and kanuka removal above the drop.
- MSE walls suggested by CH, which could be vegetated, but noted that these would scour so unlikely to be an acceptable technical solution.
- [redacted] noted that moderately large earthworks equipment would likely be needed at the main drop. A possible access track was sighted that ran from one the properties (not yet developed) off Radiata Drive and down close to the drop. Approval would need to be arranged from the landowner by QLDC and some vegetation and kanuka removal would be required near the drop (elsewhere

	vegetation trimming required). A relatively short length of new track would need to be formed for from this track access to the drop. • It was noted that this same track could be used to provide access for maintenance to the main drop and the gully below. • If the new length of track has zig-zags this could make it visually less obvious and DOC may be happy for track to become permanent for ongoing maintenance. After construction, track could be blocked off with large rocks to reduce visibility and likelihood of public access • Discussed option to use helicopter for some materials, but likely to be cost prohibitive. • Existing slumped earth is to remain as far as possible although it was noted that there will likely be a surplus of cut material that will come out when forming the basin that will need to be disposed of onsite. • For the sides of the main drop (away from the waterway) proposal is to trim overhang but limit vegetation removal and accept risk of slumping in the future.	
5	**Lower Gully** • Additional rock needs to be added to the bed and toe scour protection needs to be provided at the toes of the slopes. It was discussed that this rock lining would need to extend part way up the side slopes to provide the toe protection during higher flows. When adding rock, sufficient waterway cross-section also needs to be maintained. • Temporary works concerns of digging back into the bank for installing toe scour protection discussed. Preference to fill with rock 'in front' of slope toe where possible (e.g. where gully width permits). • Option to use gabion baskets to provide toe protection discussed. It was noted that this may be the best option where there is insufficient gully width to provide normal rock lining toe scour protection. It was noted that this may not be acceptable to DOC in all areas but could be used in inaccessible/low visibility areas – it was noted that QLDC would need to discuss this with DOC if taken forward given previous comments from DOC. • Removal of some vegetation and slumped material will be needed in the gully. [redacted] noted 5 tonne digger could be used in lower gully and using the waterway as the 'access track'. Lower gully waterway would be accessed from a ramp at/near the drop, tracked down the waterway and then work backwards from the Outlet Track reinstating as you undertake the works. • It was noted that there was a number of trees located within the waterway which could potentially become 'islands' if rock lining waterway around these. It would be best in the long term to remove these trees otherwise will likely die-off in the long term. Could try replanting within the gully although it was noted that kanuka are hard to re-plant and it would need to be accepted that some may not survive. • Aim would be to provide a meandering bed towards Clutha to provide capacity and reduce to reasonable velocities. • [redacted] and [redacted] discussed that works would be best documented for construction by creating a series of typical details for the lower gully works (e.g. right hand bend, left hand bend, transition) rather than detailed sections, long-sections, plans etc. This is because the works are expected to vary over short distances, an accurate survey is not available, and the site could continue to change over time. • It was discussed to limit works in the waterway near the Outlet Track as it would be highly visible to track users, existing erosion is minor in this section and there is no steep slopes near the waterway. No work is proposed where the Outlet Track crosses the waterway.	

• The works would be confirmed on site following clearing and cleaning up of the waterway (i.e. removal of slumped material impeding flows and removal of dead vegetation). • It was noted that toe protection works would be focused in areas where there were relatively high slopes above which, if they scoured, could result in soil slumping into the waterway and this material being washed down the gully discharging sediment into the Clutha. Where there is no slope above, then proposing to provide little toe protection. • It was noted that the works now preferred through this lower gully is less than originally proposed, and QLDC would accept risk of additional erosion and maintenance in the future.	
6 Construction Season • Jan-Feb will typically be driest but also likely to be dusty. Winter season may assist in mitigating dust risk. • However, no significant seasonal constraints were noted that would influencing timing of the works.	
7 Risk of Further Erosion & Acceptability of Works • With the current proposal of reduced rock lining in the upper and lower gully there will still be a risk of additional erosion and/or sediment being discharged in the future (albeit significantly less than if no work was undertaken). • Given the need to balance the impact of works vs expected performance, it was recommended that QLDC discuss and agree this with DOC and ORC to check their expectations align with expected performance of works.	

J

Appendix J – Rockabilly Gully Works Philosophy, Updated May 2025

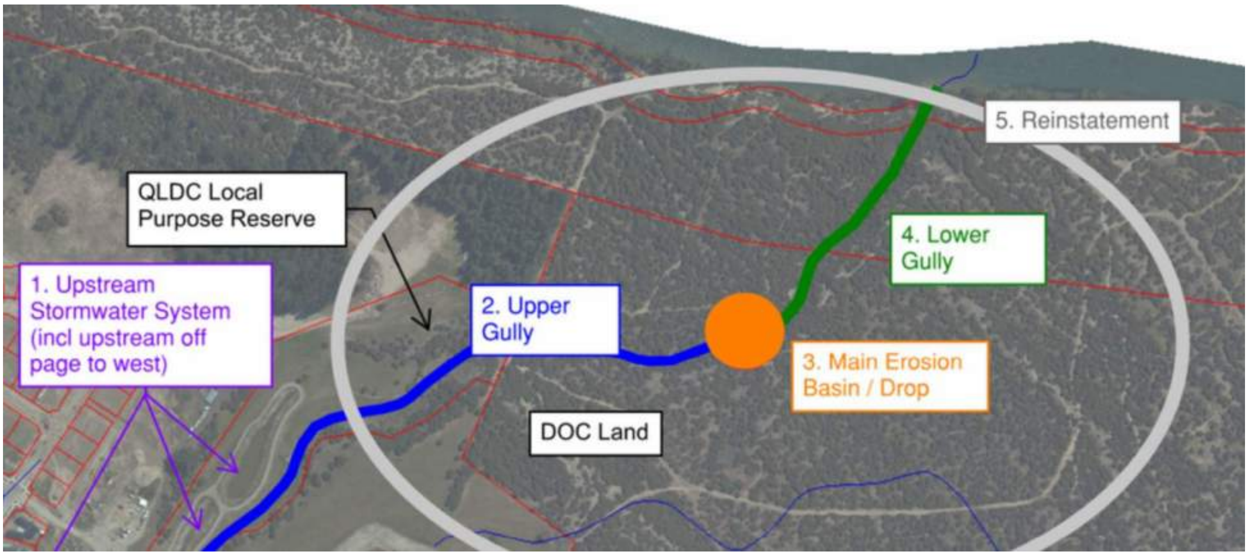
Rockabilly Gully - Proposed Philosophy for Erosion Mitigation Works Within Gully

As discussed during 9 April 2025 Site Visit.

This document summarises the proposed philosophy for the erosion mitigation works for the different areas of the gully as identified on the figure below.

To describe the proposed approach for each area, photos of typical locations are provided and marked-up along with commentary about the proposed approach. Note that these photos do not show the full extent of the proposed works, but rather provide typical examples to illustrate the proposed philosophy.

At the next stage of the project, Concept Design, plans will be produced showing the extents of work, as well as typical details and typical cross-sections showing the design intent.



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Upper Gully (Within QLDC Local Purpose Reserve) - Adjacent to Existing Stormwater Ponds

For the section of waterway adjacent to the existing stormwater ponds, no erosion protection works for the channel are proposed. Over this section of waterway the channel is grassed and there is negligible evidence of erosion observed to date.

If erosion did occur in the future and mitigation works were required, then it is assumed that access would be relatively straightforward.

Upper Gully (Within QLDC Local Purpose Reserve) - Below Stormwater Ponds

Provide graded fill in targeted areas of existing erosion and endeavour to re-establish grass.

Given erosion observed to date, it is expected that other local areas of erosion within the waterway will occur in the future. These could be left untreated or periodicity repaired noting that the grassed section of waterway is within QLDC land.

Consideration could be given to the use of an erosion mitigation product such as 'geocells' (refer image to the left) to assist in establishing grass and providing some protection. With geocell type products there is a risk of preferential scour around the edges and also a risk that if it is scoured-out the plastic geocell product could be washed downstream into the receiving environment. For these reasons, use of geocell type products has been discounted at this time.

Upper Gully (Within DOC Land)

Add additional rock to provide a more consistent gravel bed waterway and allow it to to act like a natural gravel waterway. Some minor increase in width of existing waterway proposed but with the intent of avoiding significant removal of established vegetation.
Some excavation of site soil will be required. Where possible this will be retained near the site of excavation.

The above approach is based on DOC feedback re limited rock lining requested by DOC in upper gully and limit removal of vegetation. With this approach, it would be accepted that the rock would move and local erosion is acceptable.

Over a section of the waterway it is noted that the waterway has broken out of its channel during higher flows and also flowed along an existing mountain bike track which has scoured (as evidenced by the two photos below).

Local breakout of waterway during rain events causes flows to follow mountain bike track and erode.

It is not considered possible to avoid break-out of flows from main waterway channel while still limiting the works in the waterway and meeting DOC expectations. During high flows the water will tend to follow the lowest possible flow path.

At this location, it is proposed to add gravel / rock bed to the track locally (as illustrated on the photo to the left) rather than attempting to train the waterway and keep flows within the main waterway channel. With this approach it is accepted that flows could break out and run down the track in the future and while the works would reinstate the track to a more usable surface in the short term, erosion could still occur further in the future.

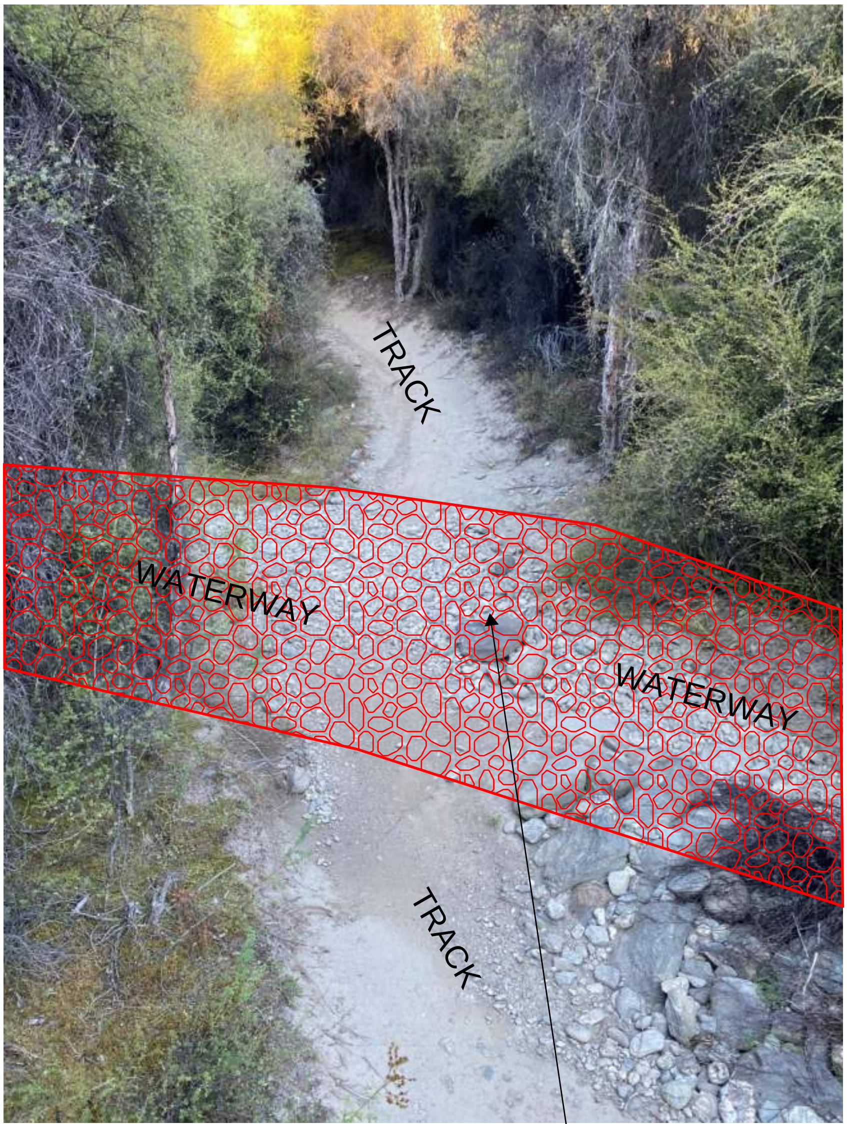
To reduce the risk of track erosion in the future, some large buried rocks will be provided at selected locations to provide some local grade control as previously used near track crossings across the existing stream.

Other options that were considered and discounted included:
1) Shift mountain bike track and raise it further above the waterway. This was discounted as it was assumed that any new track alignment would result in removal of vegetation.
2) Leave mountain bike track 'as is' and accept it will continue to erode. This was assumed to not be acceptable to stakeholders.
3) Disestablish this section of track. This was assumed to not be acceptable to stakeholders.

Add gravel / rock bed to existing mountain bike track where erosion has occurred and formed to provide functional track. This would involve excavation of some site soil to bench-in new gravel / rock bed and provide a minimum thickness of gravel / rock.

Add additional rock and allow it to act like a natural gravel bed. Widen gravel bed to cover area of exposed soil but with the intent of avoiding significant removal of established vegetation.

As noted earlier, this approach accepts that the gravel rock would move and accepts that some areas of future erosion will still occur.

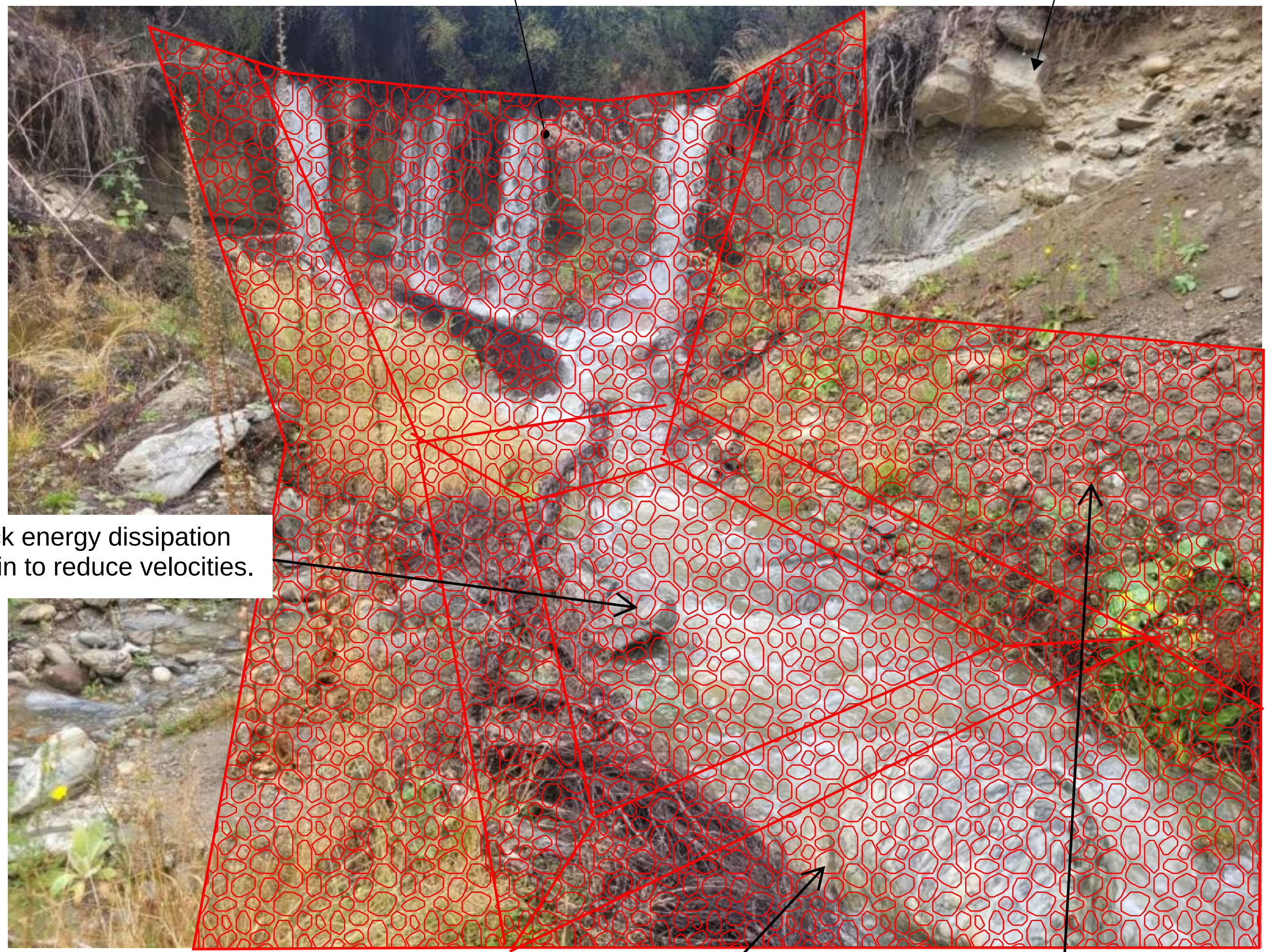


At track crossings of waterway provide some grade control using large rock. Crossings will be of a similar form/function to other existing examples and likely require some ongoing maintenance after significant high flow events.

Main Erosion Basin / Drop (Within DOC Land)

Trimming of overhanging material/ground as required.

Chute/stepped rock to be formed - likely to extend over the width of the 'drop' that currently has water flowing over. Waterway works will be required above drop to channelise flow towards drop and will require vegetation removal.



Rock energy dissipation basin to reduce velocities.

Flatter rocklined channel immediately downstream, transitioning to existing channel shape and grade

Rock lining to provide scour protection to toe of slope.

While the intention will be to remove overhanging material/ground on the slope above, the slopes will largely be left steep and exposed to limit the amount of earthworks and vegetation removal consistent with DOC feedback.
There is the potential for future scour/slumping of these slopes but to fully mitigate this risk would require significant works which would not in keeping with the environment. Note that elsewhere within the gully and local area, there are existing natural steep slopes in similar material.

Options to plant native species around the drop to offset some of the loss of vegetation in the reserve and improve landscape values and stability will be investigated during design.

Possible Construction Access to Main Erosion Basin / Drop and Gully Upstream and Downstream (DOC Land)

As discussed during 9 April 2025 site visit. Final access route will be subject to consenting, constructability and discussions with stakeholders.

Access route to generally follow existing track with some local trimming of vegetation required.
As the track approaches the main erosion basin/drop, removal of established vegetation will be required to form track for machinery access.

Main Erosion Basin / Drop.
It is assumed that access to the gully above and below the basin will primarily be achieved by tracking along the base of the gully within and adjacent to the existing stream bed as indicated by the arrows.

Local removal of fence required for access and reinstated post construction.

Alternative access routes

Lower Gully (Within DOC Land)

Endeavour to keep trees where possible however there are likely to be some existing trees that will need to be removed when trimming precarious slope debris material that is at high risk of slumping.
In endeavouring to limit tree removal, there will inevitably be some trees that are left in place but will have a reasonably high risk of being undermined in the future and slope failure/falling into the stream.
Options to plant native species to offset some of the loss of vegetation in the reserve and improve landscape values and stability will be investigated during design.

Slope to be trimmed to remove overhanging ground/vegetation

Toppled trees and vegetation to be removed out of waterway but left at a location in the wider area agreed with DOC.

Rock lining of base of waterway. Where existing rock is present in the base of the waterway, we propose to add to the existing rock to reduce the imported rock volume.
Large rock used in bed at selected locations to provide some grade control particularly where existing gully constrains flow.
Intention will generally be to provide a rock lined channel with a base width of approximately 2-4m.

Toe protection works with rock lining extending part way up lower part of slope to reduce future toe erosion and slopes slumping intro waterway.

For narrow sections of gully with potential for toe scour, but insufficient space to construct battered rock lining, consideration should be given to the use of gabions.

Trimming of superficial slope material that appears precarious otherwise there is a high risk that it will slip into the waterway and contribute to sediment discharge. Trimming of slope material will be limited however, so there will still be residual risk of some material slipping in.

Rock lining required to reduce risk of future toe scour.

To limit vegetation removal (including the tree within the middle of the cloud), rock lining of this area could be reduced or omitted on the assumption that, should future erosion occur, there is a limited height of slope above and therefore slope failure unlikely to contribute significant sediment.

Options to plant native species to offset some of the loss of vegetation in the reserve and improve landscape values and stability will be investigated during design.

Add to rock in base of waterway, including keying-in of rock lining on sides.

Lower Gully (Within DOC Land) - near the confluence with the Clutha River

Generally no works proposed for this lower gully section near the confluence with the Clutha River given the visibility of this section of the gully from the Outlet Track and the large number of established Kanuka trees that are intended to be left in place.
Some ongoing local erosion should be expected, however, based on historic observed erosion it is anticipated that this section is expected to contribute less sediment relative to other sections of the gully.
Consideration could be given to some large rock at certain locations to provide some grade control.

K

Appendix K – Preferred Option Cost Estimate

Code	Description	Quantity	Unit	Rate	Total
1.0	General				684,527
2.0	Upstream Stormwater System				724,998
3.0	Upper gully - QLDC land - Below Stormwater Ponds				1,705
4.0	Upper gully - DOC land - Waterway channel				24,977
5.0	Upper gully - DOC land - Mountain bike track breakout channel				25,018
6.0	Drop- i.e. rock lined chute and energy dissipation basin				309,422
7.0	Lower Gully (DOC land) - Waterway channel general				20,963
8.0	Lower Gully (DOC land) - Grade control at discrete points				5,250
9.0	Lower Gully (DOC land) - Quarried rock lining where toe scour could occur				112,273
10.0	Lower Gully (DOC land) - Remediate and tidy gully				30,000
11.0	At Outlet Track crossing				3,500
	Physical Works Costs incl. P&G				**1,942,633**
	Contingency	30.00	%	1,942,633	582,790
	Construction Budget				**2,525,423**
	Professional Fees	20.00	%	2,525,423	505,085
	Client Costs	4.00	%	2,525,423	101,017
	Consenting	2.00	%	2,525,423	50,508
	Property costs				excluded
	Rounding	1	LS	-2,033	-2,033
	Total Expected Estimate				**3,180,000**
	Cost Estimate Clarifications				0

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Code	Description	Quantity	Unit	Rate	Total
1.0	**General**				
1.01	Extending existing tracks, create temporary access tracks into gully and drop through DOC reserve – assumed access from QLDC reserve or off Joe Brown Drive	1	PS	200,000	200,000
1.02	P&G – Including creating working area/site yard in QLDC land plus small staging area in DOC land and reinstatement	25	%	1,258,106	314,527
1.03	Consenting and Professional services				measured elsewhere
	Reinstatement of temporary works areas:				
1.04	Remove temporary access tracks	1	PS	50,000	50,000
1.05	Remove site yard/hardstand areas	1	PS	20,000	20,000
1.06	Reinstate previous cover to access track and yard/hardstand - grass or planting	1	PS	100,000	100,000
				Total General	**684,527**

Code	Description	Quantity	Unit	Rate	Total
2.0	**Upstream Stormwater System**				
	Modifications to existing stormwater basins:				
2.01	Temporary works to drain down existing basins.	1	LS	50,000	50,000
2.02	Remove existing plants at lower basin. Assume plants are removed to waste.	1	LS	20,000	20,000
2.03	Modify existing lower basin to increase size – excavation (to stockpile in QLDC reserve).	9,000	m3	15	138,288
2.04	Form bund on downstream end of lower basin using stockpiled material.	950	m3	19	18,050
2.05	Install geosynthetic clay liner (GCL) to internal basin side slopes adjacent to waterway.	1,600	m2	39	62,400
2.06	Extra over to supply and place 300mm cover layer over GCL (reuse screened excavated soil from stockpile).	480	m3	32	15,360
2.07	New outlet structure for basin - assume 1 x 1800mm diameter manhole with stainless steel orifice plate.	1	ea	32,000	32,000
2.08	1050mm diameter RCRRJ pipe from basin outlet structure into Rockabilly Gully stream.	18	m	2,950	53,100
2.09	DN1050 Precast Concrete Wing Wall and rip rap at discharge into basin and discharge to Rockabilly Gully.	2	ea	8,400	16,800
2.10	New 1050mm diameter RCRRJ pipework for catchment discharge into basin.	20	m	2,950	59,000
2.11	DN1800 Manhole for diversion of 1050mm diameter pipe into basin.	1	ea	30,000	30,000
2.12	Remove concrete apron and level spreader, install new pipe between basins (assume 300mm diameter) with Wagate gate valve or similar and reinstate level spreader below footbridge 300 mm lower than existing.	1	LS	35,000	35,000
2.13	Forebay in pond formed from gabion basket bund, 0.5m height x 24 m length.	1	LS	15,000	15,000
2.14	Reinstatement for new basin and modifications to existing – assume 100mm thick topsoil and grass reinstatement.	10,000	m2	18	180,000
				Total Upstream Stormwater System	**724,998**

Code	Description	Quantity	Unit	Rate	Total
3.0	**Upper gully - QLDC land - Below Stormwater Ponds**				
	Infill existing				
3.01	Infill existing scour holes, 200mm thick AP40.	2	m3	230	460
3.02	Infill existing scour holes 100mm thick topsoil over AP40 (scheduled separately).	1	m3	245	245
3.03	Reinstate grass (hydroseed). Allow for multiple applications.	1	LS	1,000	1,000
				Total Upper gully - QLDC land - Below Stormwater Ponds	**1,705**

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Code	Description	Quantity	Unit	Rate	Total
4.0	**Upper gully - DOC land - Waterway channel**				
4.01	Strip existing natural gravel to adjacent stockpile, assumed 200mm thick.	26	m3	52	1,352
4.02	Excavate / shape channel, assumed average 200mm thick trim (cart to stockpile in QLDC reserve).	26	m3	120	3,120
4.03	Supply rounded river gravels, 50-300mm size (and stockpile in QLDC reserve).	31	m3	180	5,580
4.04	Place natural river gravel from stockpile and imported river gravels, assumed 300mm thick and 80% imported.	39	m3	235	9,165
	Grade control at discrete points				
4.05	Excavate existing material (cart to stockpile in QLDC reserve) for grade control point.	8	m3	145	1,160
4.06	Import and place quarried rock at grade control locations. D50 = 250mm, 500mm thick, assumed each 3m wide by 1m long.	8	m3	575	4,600
	Total Upper gully - DOC land - Waterway channel				**24,977**

Code	Description	Quantity	Unit	Rate	Total
5.0	**Upper gully - DOC land - Mountain bike track breakout channel**				
5.01	Strip existing natural gravel to adjacent stockpile, assumed 200mm thick.	24	m3	52	1,248
5.02	Excavate / shape channel, assumed average 350mm thick trim (cart to stockpile in QLDC reserve).	42	m3	165	6,930
5.03	Supply rounded river gravels, 50-150mm size (and stockpile in QLDC reserve).	29	m3	140	4,060
5.04	Place natural river gravel from stockpile and imported river gravels, assumed 300mm thick and 80% imported.	36	m3	235	8,460
	Grade control at discrete points				
5.05	Excavate existing material (cart to stockpile in QLDC reserve) for grade control point.	6	m3	145	870
5.06	Import and place quarried rock at grade control locations. D50 = 250mm, 500mm thick, assumed each 3m wide by 1m long.	6	m3	575	3,450
				Total Upper gully - DOC land - Mountain bike track breakout channel	**25,018**

Code	Description	Quantity	Unit	Rate	Total
6.0	**Drop- i.e. rock lined chute and energy dissipation basin**				
6.01	Strip natural gravels to stockpile adjacent, reuse in lower gully.	41	m3	52	2,132
6.02	Excavation and cart to stockpile in QLDC reserve.	750	m3	110	82,500
6.03	Import and place aggregate filter layer 1, F2 filter sand 100mm thick.	35	m3	320	11,200
6.04	Import and place aggregate filter layer 2, assume AP40 300mm thick.	92	m3	295	27,140
6.05	Import and place quarried rock, D50 = 500mm (erosion basin).	174	m3	670	116,580
6.06	Import and place quarried rock, D50 = 650mm (chute).	102	m3	685	69,870
	Total Drop- i.e. rock lined chute and energy dissipation basin				**309,422**

Code	Description	Quantity	Unit	Rate	Total
7.0	**Lower Gully (DOC land) - Waterway channel general**				
7.01	Trim/clear vegetation debris and place within DOC reserve.	3	m2	83	249
7.02	Strip existing natural gravel to adjacent stockpile, assumed 200mm thick.	27	m3	52	1,404
7.03	Excavate / shape channel, assumed average 200mm thick trim (to stockpile in QLDC reserve).	27	m3	145	3,915
7.04	Supply rounded river gravels, 50-300mm size.	32	m3	180	5,760
7.05	Place natural river gravel from stockpile and imported river gravels, assumed 300mm thick and 80% imported.	41	m3	235	9,635
	Total Lower Gully (DOC land) - Waterway channel general				**20,963**

Code	Description	Quantity	Unit	Rate	Total
8.0	**Lower Gully (DOC land) - Grade control at discrete points**				
8.01	Excavate existing material (to stockpile in QLDC reserve) for grade control point.	6	m3	180	1,080
8.02	Import and place quarried rock at grade control locations. D50 = 250mm, 500mm thick, assumed each 3m wide by 1m long.	6	m3	695	4,170
	Total Lower Gully (DOC land) - Grade control at discrete points				**5,250**

Code	Description	Quantity	Unit	Rate	Total
9.0	**Lower Gully (DOC land) - Quarried rock lining where toe scour could**				
9.01	Strip existing gravels, assumed 200mm thick to local stockpile (for reuse in other sections)	14	m3	52	728
9.02	Excavation and trimming to remove overhanging/unstable banks.	60	m3	104	6,240
9.03	Excavate existing channel (to stockpile in QLDC reserve).	152	m3	170	25,840
9.04	Import and place aggregate filter layer 1, assume F2 filter sand 100mm thick	20	m3	320	6,400
9.05	Import and place aggregate filter layer 2, assume AP40 300mm thick	41	m3	295	12,095
9.06	Import and place rock riprap lining, rock D50 = 450mm	91	m3	670	60,970
	Total Lower Gully (DOC land) - Quarried rock lining where toe scour could occur				**112,273**

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Code	Description	Quantity	Unit	Rate	Total
10.0	**Lower Gully (DOC land) - Remediate and tidy gully**				
10.01	Planting kanuka. Provisional Sum. Design and number of new trees TBC.	1	PS	30,000	30,000
	Total Lower Gully (DOC land) - Remediate and tidy gully				**30,000**

Code	Description	Quantity	Unit	Rate	Total
11.0	**At Outlet Track crossing**				
	Grade control at discrete points				
11.01	Excavate existing material (to stockpile in QLDC reserve) for grade control point.	4	m3	180	720
11.02	Import and place quarried rock at grade control locations. D50 = 250mm, 500mm thick, assumed each 1m long.	4	m3	695	2,780
				Total At Outlet Track crossing	**3,500**

Code	Description	Quantity	Unit	Rate	Total

Cost Estimate Clarifications

Assumptions

0.01	The estimate is based on high-level pre-concept design information prepared by the Beca design team and received 17/07/2025.				
0.02	We assume that all of the work will be undertaken by a single 'Main Contractor' through a single contract for the project.				
0.03	We assume that a competitive tendering process will be followed as part of the agreed procurement process.				
0.04	We assume that all works are carried out during normal daytime working hours.				
0.05	We assume that all of the work will be carried out in a single phase. No allowance for cost associated with phasing or staging of the works e.g. additional demobilisation, standby, and remobilisation costs.				
0.06	The estimate assumes continuity of work and unobstructed access to site.				
0.07	Access to some of the work faces along the gully is expected to be challenging. We assume small plant and equipment will be able to access the sites from multiple discrete locations. We assume that the Client will agree access and restoration requirements with the land owner(s) prior to the start of construction.				
0.08	Quantities and measures are approximate and subject to design development.				
0.09	The estimates assume that the proposed work can be consented.				
0.10	Contingency allowance has been included at 30% for pre-concept level design. This allowance is intended to cover the risk of cost increase due to design development, estimating risk, and for unforeseen costs arising during the construction phase.				
0.11	Detailed risk analysis has not been carried out. Please note that the above contingency allowances exclude Client-driven scope changes and we recommend that the Client hold a separate project contingency budget for this if this risk is deemed likely.				
0.12	The allowance for Professional Fees includes for the cost of engineering and design, construction monitoring and providing technical support during the construction phase. Please note that the allowances for Professional Fees in the estimates are typical allowances included for comparative purposes - a work breakdown or fee estimate has not been prepared.				
0.13	The estimate is based on rates and prices current as of July 2025 and no allowance has been included for increases in the costs of labour, materials, or plant beyond this date.				
0.14	Elements of cost included within this estimate are based on costs from similar projects and other Beca cost benchmarks.				

Project Specific Exclusions

0.15	Ground improvement.				

Code	Description	Quantity	Unit	Rate	Total
0.16	Breaking up and excavating hard and in situ rock. The excavation allowances in the estimate allow to excavate site soil and loose disturbed material due to erosion.				
0.17	Costs for any landscaping other than what is measured.				
0.18	Costs for managing contaminated soil and hazardous materials (e.g.. asbestos cement pipe etc.) unless specifically stated and measured.				
0.19	No allowance for property costs including land purchase, easements, and access agreements.				
0.20	No allowance has been made for the impacts of extraordinary global events (such as the recent COVID-19 outbreak) within the base estimate.				
	General Estimate Exclusions				
0.21	Goods and Services Tax (GST).				
0.22	Incurred costs to date.				
0.23	Cost escalation beyond the date of the report.				
0.24	Fast track / accelerated programme.				
0.25	Work outside normal working hours.				
0.26	Routine or deferred maintenance to existing assets other than what is measured.				
	Cost Estimate Risks				
	Risks with a potential cost effect include:				
0.27	Design development.				
0.28	Resource consent conditions and the impact on scheme design.				
0.29	Access costs and reinstatement costs.				
0.30	Temporary management of pedestrians and cyclists using tracks crossing the works.				
0.31	Working around existing services.				
0.32	Availability of quarried rock and distance to cart.				
0.33	Contaminated soil and groundwater, and other hazardous materials found on site.				
0.34	Local market conditions and contractor resource availability.				
0.35	Cost escalation and foreign exchange rates. The long-term inflation rate has typically been around 2-3% p.a. However in recent years inflation has been considerably higher.				
0.36	Costs of impacts associated with extraordinary global events (such as the recent COVID-19 outbreak).				
0.37	There may be other risks - and opportunities - which are not listed above. We recommend that further risk analysis and cost estimating be carried out at the next stage of the project.				

Code	Description	Quantity	Unit	Rate	Total
	Expected Estimate Range				
0.38	Estimate range is an indication of the degree to which the final cost outcome for a given project will vary from the estimated cost – it is not an additional Contingency. Range is expressed as a +/- percentage range around the point of estimate after the application of contingency, with a stated level of confidence that the actual cost outcome would fall within this range. As the level of project definition increases and the tender date draws nearer, the expected range of the estimate tends to improve, as indicated by a tighter +/- range.				
0.39	This estimate is based on high-level pre-concept-level design information. The estimate is deemed to be a Class 4 estimate in terms of the AACE Cost Estimate Classification System guidelines. The expected estimate accuracy range is circa -20% to +50%.				
	General Considerations and Limitations				
0.40	This estimate is solely for our Client's use for the purpose for which it was intended in accordance with the agreed scope of work. It may not be disclosed to any person other than the Client and any use or reliance by any person contrary to the above, to which Beca has not given its prior written consent, is at that person's own risk.				
0.41	While Beca believes that the use of the assumptions in the report are reasonable for the purposes of this study, Beca makes no assurances with respect to the accuracy of such assumptions and some may vary significantly due to unforeseen events and circumstances.				
0.42	In preparing these estimates, Beca has relied on the accuracy, completeness and currency of the information provided, therefore is not responsible for the information provided, and has not sought to independently verify it. To the extent that the information is inaccurate or incomplete, the opinions expressed by Beca may no longer be valid and should be reviewed.				
	Total Cost Estimate Clarifications				**0**

Document Set ID: 9494015
Version: 5, Version Date: 02/04/2026

Code	Description	Quantity	Unit	Rate	Total
1.0	General				757,303
2.0	Upstream Stormwater System				724,998
3.0	Upper gully - QLDC land - Below Stormwater Ponds				4,295
4.0	Upper gully - DOC land - Waterway channel				66,471
5.0	Upper gully - DOC land - Mountain bike track breakout channel				64,924
6.0	Drop- i.e. rock lined chute and energy dissipation basin				336,922
7.0	Lower Gully (DOC land) - Waterway channel general				56,206
8.0	Lower Gully (DOC land) - Grade control at discrete points				13,125
9.0	Lower Gully (DOC land) - Quarried rock lining where toe scour could occur				248,772
10.0	Lower Gully (DOC land) - Remediate and tidy gully				30,000
11.0	At Outlet Track crossing				3,500
	Physical Works Costs incl. P&G				**2,306,517**
	Contingency	30.00	%	2,306,517	691,955
	Construction Budget				**2,998,472**
	Professional Fees	20.00	%	2,998,472	599,694
	Client Costs	4.00	%	2,998,472	119,939
	Consenting	2.00	%	2,998,472	59,969
	Property costs				excluded
	Rounding	1	LS	1,925	1,925
	Total Expected Estimate				**3,780,000**
	Cost Estimate Clarifications				0

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Code	Description	Quantity	Unit	Rate	Total
<u>1.0</u>	**<u>General</u>**				
1.01	Extending existing tracks, create temporary access tracks into gully and drop through DOC reserve – assumed access from QLDC reserve or off Joe Brown Drive	1	PS	200,000	200,000
1.02	P&G – Including creating working area/site yard in QLDC land plus small staging area in DOC land and reinstatement	25	%	1,549,213	387,303
1.03	Consenting and Professional services				measured elsewhere
	Reinstatement of temporary works areas:				
1.04	Remove temporary access tracks	1	PS	50,000	50,000
1.05	Remove site yard/hardstand areas	1	PS	20,000	20,000
1.06	Reinstate previous cover to access track and yard/hardstand - grass or planting	1	PS	100,000	100,000
				Total General	**757,303**

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Code	Description	Quantity	Unit	Rate	Total
2.0	**Upstream Stormwater System**				
	Modifications to existing stormwater basins:				
2.01	Temporary works to drain down existing basins.	1	LS	50,000	50,000
2.02	Remove existing plants at lower basin.	1	LS	20,000	20,000
2.03	Modify existing lower basin to increase size – excavation (to stockpile in QLDC reserve).	9,000	m3	15	138,288
2.04	Form bund on downstream end of lower basin using stockpiled material.	950	m3	19	18,050
2.05	Install geosynthetic clay liner (GCL) to internal basin side slopes adjacent to waterway.	1,600	m2	39	62,400
2.06	Extra over for 300mm cover layer (reuse screened excavated soil from stockpile).	480	m3	32	15,360
2.07	New outlet structure for basin - assume 1 x 1800mm diameter manhole with stainless steel orifice plate.	1	ea	32,000	32,000
2.08	1050mm diameter RCRRJ pipe from basin outlet structure into Rockabilly Gully stream.	18	m	2,950	53,100
2.09	DN1050 Precast Concrete Wing Wall and rip rap at discharge into basin and discharge to Rockabilly Gully.	2	ea	8,400	16,800
2.10	New 1050mm diameter RCRRJ pipework for catchment discharge into basin.	20	m	2,950	59,000
2.11	DN1800 Manhole for diversion of 1050mm diameter pipe into basin.	1	ea	30,000	30,000
2.12	Remove concrete apron and level spreader, install new pipe between basins (assume 300mm diameter) with Wagate gate valve or similar and reinstate level spreader below footbridge 300 mm lower than existing.	1	LS	35,000	35,000
2.13	Forebay in pond formed from gabion basket bund, 0.5m height x 24 m length.	1	LS	15,000	15,000
2.14	Reinstatement for new basin and modifications to existing – assume 100mm thick topsoil and grass reinstatement.	10,000	m2	18	180,000
				Total Upstream Stormwater System	**724,998**

Code	Description	Quantity	Unit	Rate	Total
3.0	**Upper gully - QLDC land - Below Stormwater Ponds**				
	Infill existing				
3.01	Infill existing scour holes, 200mm thick AP40.	9	m3	230	2,070
3.02	Infill existing scour holes 100mm thick topsoil over AP40 (scheduled separately).	5	m3	245	1,225
3.03	Reinstate grass (hydroseed). Allow for multiple applications.	1	LS	1,000	1,000
	Total Upper gully - QLDC land - Below Stormwater Ponds				**4,295**

Code	Description	Quantity	Unit	Rate	Total
4.0	**Upper gully - DOC land - Waterway channel**				
4.01	Strip existing natural gravel to adjacent stockpile, assumed 200mm thick.	78	m3	52	4,056
4.02	Excavate / shape channel, assumed average 200mm thick trim (cart to stockpile in QLDC reserve).	78	m3	120	9,360
4.03	Supply rounded river gravels, 50-300mm size (and stockpile in QLDC reserve).	94	m3	180	16,920
4.04	Place natural river gravel from stockpile and imported river gravels, assumed 300mm thick and 80% imported.	117	m3	235	27,495
	Grade control at discrete points				
4.05	Excavate existing material (cart to stockpile in QLDC reserve) for grade control point.	12	m3	145	1,740
4.06	Import and place quarried rock at grade control locations. D50 = 250mm, 500mm thick, assumed each 3m wide by 1m long.	12	m3	575	6,900
				Total Upper gully - DOC land - Waterway channel	**66,471**

Code	Description	Quantity	Unit	Rate	Total
5.0	**Upper gully - DOC land - Mountain bike track breakout channel**				
5.01	Strip existing natural gravel to adjacent stockpile, assumed 200mm thick.	72	m3	52	3,744
5.02	Excavate / shape channel, assumed average 350mm thick trim (cart to stockpile in QLDC reserve).	126	m3	120	15,120
5.03	Supply rounded river gravels, 50-150mm size (and stockpile in QLDC reserve).	86	m3	140	12,040
5.04	Place natural river gravel from stockpile and imported river gravels, assumed 300mm thick and 80% imported.	108	m3	235	25,380
	Grade control at discrete points				
5.05	Excavate existing material (cart to stockpile in QLDC reserve) for grade control point.	12	m3	145	1,740
5.06	Import and place quarried rock at grade control locations. D50 = 250mm, 500mm thick, assumed each 3m wide by 1m long.	12	m3	575	6,900
	Total Upper gully - DOC land - Mountain bike track breakout channel				**64,924**

Code	Description	Quantity	Unit	Rate	Total
6.0	**Drop- i.e. rock lined chute and energy dissipation basin**				
6.01	Strip natural gravels to stockpile adjacent, reuse in lower gully.	41	m3	52	2,132
6.02	Excavation and cart to stockpile in QLDC reserve.	1,000	m3	110	110,000
6.03	Import and place aggregate filter layer 1, F2 filter sand 100mm thick.	35	m3	320	11,200
6.04	Import and place aggregate filter layer 2, assume AP40 300mm thick.	92	m3	295	27,140
6.05	Import and place quarried rock, D50 = 500mm (erosion basin).	174	m3	670	116,580
6.06	Import and place quarried rock, D50 = 650mm (chute).	102	m3	685	69,870
	Total Drop- i.e. rock lined chute and energy dissipation basin				**336,922**

Code	Description	Quantity	Unit	Rate	Total
7.0	**Lower Gully (DOC land) - Waterway channel general**				
7.01	Trim/clear vegetation debris and place within DOC reserve.	14	m2	83	1,162
7.02	Strip existing natural gravel to adjacent stockpile, assumed 200mm thick.	72	m3	52	3,744
7.03	Excavate / shape channel, assumed average 200mm thick trim (to stockpile in QLDC reserve).	72	m3	145	10,440
7.04	Supply rounded river gravels, 50-300mm size.	86	m3	180	15,480
7.05	Place natural river gravel from stockpile and imported river gravels, assumed 300mm thick and 80% imported.	108	m3	235	25,380
	Total Lower Gully (DOC land) - Waterway channel general				**56,206**

Code	Description	Quantity	Unit	Rate	Total
8.0	**Lower Gully (DOC land) - Grade control at discrete points**				
8.01	Excavate existing material (to stockpile in QLDC reserve) for grade control point.	15	m3	180	2,700
8.02	Import and place quarried rock at grade control locations. D50 = 250mm, 500mm thick, assumed each 3m wide by 1m long.	15	m3	695	10,425
	Total Lower Gully (DOC land) - Grade control at discrete points				**13,125**

Code	Description	Quantity	Unit	Rate	Total
9.0	**Lower Gully (DOC land) - Quarried rock lining where toe scour could**				
9.01	Strip existing gravels, assumed 200mm thick to local stockpile (for reuse in other sections)	36	m3	52	1,872
9.02	Excavation and trimming to remove overhanging/unstable banks.	120	m3	104	12,480
9.03	Excavate existing channel (to stockpile in QLDC reserve).	338	m3	170	57,460
9.04	Import and place aggregate filter layer 1, assume F2 filter sand 100mm thick	45	m3	320	14,400
9.05	Import and place aggregate filter layer 2, assume AP40 300mm thick	90	m3	295	26,550
9.06	Import and place rock riprap lining, rock D50 = 450mm	203	m3	670	136,010
	Total Lower Gully (DOC land) - Quarried rock lining where toe scour could occur				**248,772**

Code	Description	Quantity	Unit	Rate	Total
10.0	**Lower Gully (DOC land) - Remediate and tidy gully**				
10.01	Planting kanuka. Provisional Sum. Design and number of new trees TBC.	1	PS	30,000	30,000
	Total Lower Gully (DOC land) - Remediate and tidy gully				**30,000**

Code	Description	Quantity	Unit	Rate	Total
11.0	**At Outlet Track crossing**				
	Grade control at discrete points				
11.01	Excavate existing material (to stockpile in QLDC reserve) for grade control point.	4	m3	180	720
11.02	Import and place quarried rock at grade control locations. D50 = 250mm, 500mm thick, assumed each 1m long.	4	m3	695	2,780
				Total At Outlet Track crossing	**3,500**

Code	Description	Quantity	Unit	Rate	Total

Cost Estimate Clarifications

Assumptions

Code	Description
0.01	The estimate is based on high-level pre-concept design information prepared by the Beca design team and received 17/07/2025.
0.02	We assume that all of the work will be undertaken by a single 'Main Contractor' through a single contract for the project.
0.03	We assume that a competitive tendering process will be followed as part of the agreed procurement process.
0.04	We assume that all works are carried out during normal daytime working hours.
0.05	We assume that all of the work will be carried out in a single phase. No allowance for cost associated with phasing or staging of the works e.g. additional demobilisation, standby, and remobilisation costs.
0.06	The estimate assumes continuity of work and unobstructed access to site.
0.07	Access to some of the work faces along the gully is expected to be challenging. We assume small plant and equipment will be able to access the sites from multiple discrete locations. We assume that the Client will agree access and restoration requirements with the land owner(s) prior to the start of construction.
0.08	Quantities and measures are approximate and subject to design development.
0.09	The estimates assume that the proposed work can be consented.
0.10	Contingency allowance has been included at 30% for pre-concept level design. This allowance is intended to cover the risk of cost increase due to design development, estimating risk, and for unforeseen costs arising during the construction phase.
0.11	Detailed risk analysis has not been carried out. Please note that the above contingency allowances exclude Client-driven scope changes and we recommend that the Client hold a separate project contingency budget for this if this risk is deemed likely.
0.12	The allowance for Professional Fees includes for the cost of engineering and design, construction monitoring and providing technical support during the construction phase. Please note that the allowances for Professional Fees in the estimates are typical allowances included for comparative purposes - a work breakdown or fee estimate has not been prepared.
0.13	The estimate is based on rates and prices current as of July 2025 and no allowance has been included for increases in the costs of labour, materials, or plant beyond this date.
0.14	Elements of cost included within this estimate are based on costs from similar projects and other Beca cost benchmarks.

Project Specific Exclusions

Code	Description
0.15	Ground improvement.

Code	Description	Quantity	Unit	Rate	Total
0.16	Breaking up and excavating hard and in situ rock. The excavation allowances in the estimate allow to excavate site soil and loose disturbed material due to erosion.				
0.17	Costs for any landscaping other than what is measured.				
0.18	Costs for managing contaminated soil and hazardous materials (e.g.. asbestos cement pipe etc.) unless specifically stated and measured.				
0.19	No allowance for property costs including land purchase, easements, and access agreements.				
0.20	No allowance has been made for the impacts of extraordinary global events (such as the recent COVID-19 outbreak) within the base estimate.				
	General Estimate Exclusions				
0.21	Goods and Services Tax (GST).				
0.22	Incurred costs to date.				
0.23	Cost escalation beyond the date of the report.				
0.24	Fast track / accelerated programme.				
0.25	Work outside normal working hours.				
0.26	Routine or deferred maintenance to existing assets other than what is measured.				
	Cost Estimate Risks				
	Risks with a potential cost effect include:				
0.27	Design development.				
0.28	Resource consent conditions and the impact on scheme design.				
0.29	Access costs and reinstatement costs.				
0.30	Temporary management of pedestrians and cyclists using tracks crossing the works.				
0.31	Working around existing services.				
0.32	Availability of quarried rock and distance to cart.				
0.33	Contaminated soil and groundwater, and other hazardous materials found on site.				
0.34	Local market conditions and contractor resource availability.				
0.35	Cost escalation and foreign exchange rates. The long-term inflation rate has typically been around 2-3% p.a. However in recent years inflation has been considerably higher.				
0.36	Costs of impacts associated with extraordinary global events (such as the recent COVID-19 outbreak).				
0.37	There may be other risks - and opportunities - which are not listed above. We recommend that further risk analysis and cost estimating be carried out at the next stage of the project.				

Code	Description	Quantity	Unit	Rate	Total
	Expected Estimate Range				
0.38	Estimate range is an indication of the degree to which the final cost outcome for a given project will vary from the estimated cost – it is not an additional Contingency. Range is expressed as a +/- percentage range around the point of estimate after the application of contingency, with a stated level of confidence that the actual cost outcome would fall within this range. As the level of project definition increases and the tender date draws nearer, the expected range of the estimate tends to improve, as indicated by a tighter +/- range.				
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				Total Cost Estimate Clarifications	**0**

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