



Mataura River Crossing Project

Strategic Options Assessment Report

Prepared for Gore District Council
Prepared by Beca Limited

15 March 2023



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Revision History

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Action	Name	Signed	Date
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on behalf of	Beca Limited		

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Executive Summary

This report provides a multi-criteria assessment of 13 options to construct water pipelines across the Mataura River. These pipelines are needed as part of the Mataura River Crossing Project. The goal of this project is to provide safe and reliable drinking water for the residents of Gore. The scope includes a new membrane filtration water treatment plant to serve both East and West Gore (already completed), and pipelines linking the plant to the Jacobstown Wells and Hilbre Avenue Reservoir. As the pipelines have to cross the Mataura River they need to be built either over the river (on a support structure or bridge), or under the river using either a trenched method or direction drilling.

One option is for Gore District Council (GDC) to combine the water supply infrastructure with a shared path bridge project. However this is not the only option. Alternatively, pipelines could be conveyed over the river on a simpler pipe support structure, or drilled underneath the river in which case a bridge is not needed. The 13 water pipeline configuration options are grouped into three categories as follows:

- 1. “No bridge” options; involving construction of water pipelines under the river. In the absence a new shared path bridge, rely on Waka Kotahi (“WK”) to deliver improved pedestrian and cyclist connectivity when they replace or upgrade the existing Mataura River Bridge;
- 2. “Qualifying” bridge options: Install a shared path bridge across the Mataura River at a location where it is likely to qualify for partial WK Funding; or
- 3. “Non-qualifying” bridge options: Install a shared path bridge at a location where it is unlikely to qualify for WK Active Travel funding.

All 13 options have been subject to a multicriteria analysis which incorporates social, economic, environmental and cultural considerations. The three highest ranked options identified through the multicriteria analysis are shown in the Table below.

Table 1: Top three scoring options

Criteria	Multi-Span Bridge at Surrey Street	Underbore: No Bridge	Multi-Span Bridge at Halton Street
Cultural wellbeing of people and communities	15	0	7.5
Social wellbeing of people and communities	20	-2	22
Economic wellbeing of people and communities	25	30	10
Maintain and enhance the quality of the environment and improve sustainability outcomes.	5	30	10
Total Score	65	58	49.5
Relative order of cost for comparison	\$4.45-4.55M (+ \$2-2.7M WK funding)	\$3.6-4.1M	\$5.5-5.7M (+ \$2.7-3.4M WK funding)

Shared Path Bridges at Rock, Nelson and Maitland Street round out the top 6 scoring options

The highest ranked option is a multi-span bridge at Surrey Street. This option scores comparatively well as it is the most northerly “qualifying” option and hence offers reduced pipeline length and costs while also retaining WK funding. The multi-span bridge also features lower visual impact compared to a single span structure such as the one originally proposed in 2017.

The second ranked option is an underbore at Maitland Street. This involves directional drilling of pipelines under the river. The relatively high scoring reflects the positive aspects associated with avoiding impacts to the river and also providing the most carbon efficient pipeline alignment at lower cost overall.

The third ranked option is a 225m multi-span bridge from stop bank to stop bank at Halton Street. This option features lower bridge and bridge ramp costs but suffers from higher pipeline costs due to the considerable extra length of required pipelines. As the additional pipeline costs for this option are estimated to be similar to the cost of the directionally drilled pipeline at Maitland Street, this option could potentially be decoupled from the pipeline project.

1 Introduction

Beca Ltd (“Beca”) have been engaged by Gore District Council (“GDC”) to complete a high-level review of options for GDC’s ‘Mataura River Crossing Project’. This project is to deliver water supply compliance while also considering the potential for delivering improved pedestrian and cycling connectivity.

This report summarises strategic-level and unverified information regarding each identified option and sets out a multi-criteria evaluation of options for the purpose of enabling a comparison of the likely cultural, social, economic and environmental merits of each.

This report is not intended to be exhaustive, but to be used as an input to the decision-making process for considering the next steps.

2 The Need and the Opportunity

2.1 The Origins

The project began in December 2017 with the Council’s resolution to centralise Gore’s water treatment facility at the Wentworth Street/East Gore WTP site in order to achieve compliance with Drinking Water Standards New Zealand (DWSNZ). This is also now required by the new 3 Waters regulator ‘Te Mata Arowai’.

To facilitate the required compliance and provide residents with quality water to modern standards, two pipelines crossing the Mataura River are necessary. One pipeline will convey raw water from the Council’s Jacobstown Bore Field to the East Gore Water Treatment Plant. The second pipeline will convey treated water from the East Gore treatment plant to the Hilbre Avenue Reservoir located in West Gore.

2.2 Surrey Street Bridge

By 2020 GDC had decided to pursue a single span bridge at Surrey Street on the basis that:

- The project can provide both water and active travel/connectivity improvements to the community;
- GDC can access Waka Kotahi ‘Active Travel’ funding for 55% of a bridge structure at the Surrey Street location up to their allocated budget of \$2.4M.
- An underbore solution carried cost risk; and
- A single span bridge avoided piers in the river and the associated issues resulting from displaced floodwater during flood events.

2.3 Environment Court Refusal

The decision to grant the consent for the Surrey Street Bridge was appealed to the Environment Court by an appellant group primarily comprising residents adjoining the Surrey Street location. The consent for the bridge was then refused in March 2022. Judge PA Steven, in paragraphs 145 to 147 of her decision, largely relied on Councils “*deficiencies in effects assessment, and its consideration of alternative(s)*..” in her decision to refuse consent.

The primary effects discussed were the bridge type, being a single span and therefore very tall and highly visible structure, the proximity of the bridge deck to adjoining dwellings and the lack of visual mitigation for these properties.

The alternatives discussed in the consent documentation and evidence before her (as required by the 4th Schedule of the RMA) were not assessed by Judge PA Steven as being sufficient in the context of the scale of the application.

2.4 Opportunity for Connectivity Improvement

While the need for the pipelines is essential, the opportunity to increase the scope of the project to deliver a material improvement in the connectivity of Gore by constructing a dual-purpose bridge remains. Accordingly, there are three broad options with respect to improving connectivity. We list these below:

1. **No Shared Path Bridge.** This option will involve either a pipebridge at Maitland Street or an underbore under the Mataura. In terms of an improved community connectivity objective this would rely, without any certainty, on Waka Kotahi (“WK”) to deliver improved pedestrian and cyclist connectivity when they replace the existing Mataura River Bridge. The bridge is understood to have 20–30-year life expectancy remaining, though potential “clip on” or super structure replacement could potentially be bought forward to incorporate a 3m ‘shared path’¹ at some stage.
2. **Bridge between the Mataura River Bridge and Surrey Street.** This option will provide improved active travel connectivity and therefore may qualify for WK active travel² funding. However, the option will require significantly additional pipe length.



Figure 1: Direct Connection between Urban Centres

3. **Bridge north of Surrey Street.** This option may not qualify for WK active travel funding which requires a focused outcome on providing alternatives to vehicular trips which necessitates direct alignments between urban centres. A bridge north of Surrey Street would potentially be classified as more of a recreational asset rather than one with a primary active travel function.

¹ ‘Shared Path’ means a path that is designed to accommodate both pedestrians and cyclists. A shared path has appropriate widths and grades so that potential clashes between pedestrians and cyclists are appropriately managed.

² ‘Active Travel’ refers to walking and cycling modes of travel that support transport network resilience and provide genuine transport option choice for the community.

3 Description of Options

The options and the associated relative cost information described below has been drawn from existing GDC contract information and the DC Structures Studio report titled *Longford Shared Path Bridge Options Report*, (Dec 2022), which is located in **Appendix A**. The information taken from this report has not been verified and should be treated as a non-technical comparison. The relative cost information is limited to bridge and pipeline construction rates and does not include other associated costs including design, management, offsite mitigation (ie visual screens), tie in works or legal costs etc. They are not a cost estimate – rather a relative cost comparison.

All information is high level to enable relative option comparisons and not intended for a budget setting purpose.

3.1 Bridge structures

With respect to the bridge options all proposed bridges are 3m in width in order to meet shared path standards. Two bridge types have been considered at each identified location, these are:

- A multi-span bridge which involves a bridge on piles. A multi-span bridge requires no structure above the deck level however it does have structure in the flood plain that will alter flood flows. A multi-span bridge is generally a lower cost solution than a single span bridge.
- A Single Span bridge relies on a tall structure to avoid piers in the river. A single span bridge is generally a higher cost solution.

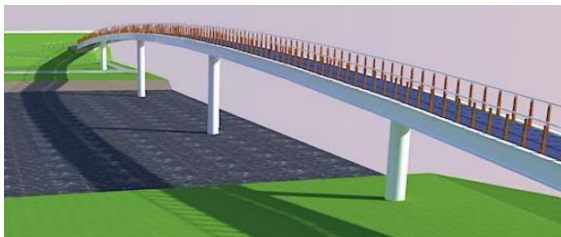


Figure 2: Multi-Span Bridge



Figure 3: Single-Span Bridge

Depending on the topography of the locations an approach embankment ramp may also be required at either end of the bridge, which are significant structures on their own.

In terms of programme, the bridge options will take approximately 2 years to complete, including consenting, design and construction.

It is assumed that Waka Kotahi (WK) funding of 59% of the cost of bridge and shared path aspects would be transferable to a shared path bridge option when located between the existing Maitake Bridge and the Surrey Street location. This is not certain – however has been taken as a key assumption as part of the relative cost exercise.

3.2 Mataura River crossing locations considered



Figure 4: Possible Mataura River Crossing Locations

The option locations are where the east west road network intersects the Mataura River. They have each been identified in the attached DC Studios Report (**Appendix A**). The location will dictate the length of the pipeline necessary to connect Jacobstown Bore Field to the East Gore Water Treatment Plant. GDC staff advise that based on recent contracts, the rate of \$834 per linear metre should be used as the basis for relative pipeline comparison. The pipeline length for a crossing at Maitland Street is approximately 1500m (\$1.3M) as compared to an approximate 3900m length at Rock Street (\$3.2M).

3.3 Pipeline Only

3.3.1 Underbore at Maitland Street

- An underbore involves drilling two pipes under the Mataura River at Maitland Street.
- This will represent the shortest pipe length between the Jacobstown Bore Field to the East Gore Water Treatment Plant of 1500m and therefore the lowest pipeline operational costs.
- There will be no need for a publicly notified consent process. It will also be the fastest option to implement and to provide drinking water compliance.
- Drilling carries risk of encountering unexpected rock. However, this risk can be reduced by completing a detailed geotechnical investigation and using a contractor familiar with drilling in the vicinity.
- Relative cost of \$3.6-4.1M (see **Appendix C**)

3.3.2 Trench through the Mataura

- Due to the volume of water, trenching through the Mataura River would require significant temporary works to create staged dry work areas. This would be challenging work and likely require temporary piling platform structures to enable sheet piling.
- Each stage would also be required to include a river channel around the work site that enabled accommodation of a minimum rainfall return period.
- Consenting this construction method would be challenging due to potential water quality, health and safety and hydraulic impacts during construction.
- The cost associated with this method will be in the significant temporary works, the relative cost for this method is unknown however we assume \$4-6M to enable relative comparison at this stage.
- Further work is required to confirm the feasibility of this option.

3.3.3 Multi-span Pipe Bridge at Maitland Street

- A 100m multi-span pipe bridge at Maitland Street
- This will represent the shortest pipe length between the Jacobstown Bore Field to the East Gore Water Treatment Plant of 1500m.
- The solution involves piers in the flood plain and the consent process will require detailed assessment of their impact on flood flows. This could impact on design and associated cost.
- The bridge is located in a position that is relatively remote from more sensitive residential areas;
- Flood or earthquake events outside design parameters will result in increased vulnerability to town water supply.
- GDC need to demonstrate how they are upholding *te mana o te wai* and engage with mana whenua in advance of any decision.
- Relative cost of \$3.6-4.1M (see **Appendix C**)

3.3.4 Pipeline on the existing SH1 Bridge

- This option has not been progressed due to the remaining life expectancy of this bridge (20-30 years) and the fact that the significant additional pipeline length (approx. 2.8km) that would be necessary to deliver this option.

3.4 Shared Path between Surrey Street and the SH1 Maitland River Bridge

3.4.1 Multi Span Bridge at Surrey Street (original 2020 location)

- Good connectivity between urban centres.
- The solution involves piers and a ramp embankment in the flood plain. The consent process will require detailed assessment of their impact on flood flows – especially any potential changes to flood flows on third party property. This could impact on design and associated cost.
- Flood or earthquake events outside design parameters will result in increased vulnerability to town water supply.
- GDC need to demonstrate how they are upholding *te mana o te wai* and engage with mana whenua in advance of any decision.
- Visual impacts to be assessed and mitigated through screening where possible.
- Consenting and community risk associated with proceeding with an alternate design at a location where a consent for a much taller single span structure has previously been refused.
- Results in doubling in length of water pipelines when compared to the Maitland Street location
- Assuming 2.4M WK funding, the option has a relative cost of \$4.45-4.55M (see **Appendix C**).

3.4.2 Multi Span Bridge at Rock Street

- This option results in a relative increase of pipeline length from 1500m to 3900m. As a result, the cost of the pipeline associated with this alignment (\$3.2M excluding contingency) is higher than the estimate for the pipeline and underbore option at Maitland Street (2.8M-3.3M excluding contingency). This will also result in additional ongoing pipeline maintenance and pumping costs.
- Good connectivity between urban centres.
- A 172m long, 5 span bridge.
- No additional connectivity from flood embankment to River Terrace.
- The solution involves piers in the flood plain and the consent process will require detailed assessment of their impact on flood flows. This could impact on design and associated cost.
- Flood or earthquake events outside design parameters will result in increased vulnerability to town water supply.
- GDC need to demonstrate how they are upholding *te mana o te wai* and engage with mana whenua in advance of any decision.
- Located in a residential area, therefore the visual impacts need to be assessed and mitigated through screening where possible.
- Assuming 2.4M WK funding, the option has a relative cost of \$5.6-5.8M (see **Appendix C**).
- Hokonui Runaka advise the site has kanakana habitat.

3.4.3 Multi Span Bridge at Nelson Street

- Same characteristics as the multi-span bridge at Rock Street, except the pipeline length is 3600m (\$3M cost) and the length of the bridge is 205m.
- Assuming 2.4M WK funding, the option has a relative cost of \$5.7-5.9M (see **Appendix C**)

3.4.4 Multi Span Bridge at Halton Street

- Same characteristics as the multi-span bridge at Rock Street, except the pipeline length is 3300m (\$2.7M cost) and the length of the bridge is 225m and there is no recorded kanakana habitat.
- Assuming 2.4M WK funding, the option has a relative cost of \$5.4-5.7M.

3.4.5 Single Span Bridges between Rock and Surrey Streets

Due to the relatively narrower width between the flood banks and proximity to the existing Maitland River Bridge a ramp embankment within the flood plain is not achievable without significant flood effects. Therefore, the bridge structure would be required to span the respective 172m, 205m and 225m lengths

between the two flood banks. The required scale renders single span structures at these locations unfeasible. Additionally, due to the environment court decision relating to a single span structure at Surrey Street this option has not been progressed.

3.5 Shared Path North of Surrey Street

3.5.1 Single Span Bridge at Maitland Street

- A 100m long single-span pipe bridge at Maitland Street
- This will represent the shortest pipe length between the Jacobstown Bore Field to the East Gore Water Treatment Plant of 1500m.
- The solution avoids piers in the flood plain, however it does include two large ramp embankments at either end of the bridge within the flood plain and the consent process will require detailed assessment of their impact on flood flows. This could impact on design and associated cost.
- The bridge is located in a position that is relatively remote from more sensitive residential areas and is therefore likely to be less sensitive to visual impacts;
- Flood or earthquake events outside design parameters will result in increased vulnerability to town water supply.
- GDC need to demonstrate how they are upholding *te mana o te wai* and engage with mana whenua in advance of any decision.
- May not receive WK funding.
- Relative cost of \$8.7-10M (see **Appendix C**).

3.5.2 Multi-Span Bridge with Piers at Maitland Street

- Same characteristics as the single-span bridge at the same location but with no above deck structure and additional piers in the river and therefore additional flood water displacement to assess.
- Relative cost of \$6.8-8M (see **Appendix C**).

3.5.3 Multi-Span Bridge with Piers at Denton Street

- Same characteristics as the multi-span bridge at Maitland except for a longer pipeline length and a slightly shorter bridge length of 90m.
- Relative cost of \$7.6-8.8M (see Appendix C)

3.5.4 Single-Span Bridge at Denton Street

- Same characteristics as the single-span bridge at Maitland except for a longer pipeline length and a slightly shorter bridge length of 90m.
- Relative cost of \$9.2-10.8M (see Appendix C)

3.5.5 Multi-Span Bridge with Piers at Lawrence Street

- Same characteristics as the multi-span bridge at Maitland except for a longer pipeline length.
- Relative cost of \$7.4-8.6 (see Appendix C)

3.5.6 Single-Span Bridge with Piers at Lawrence Street

- Same characteristics as the single-span bridge at Maitland except for a longer pipeline length.
- Relative cost of \$9.4-11.1M (see Appendix C)

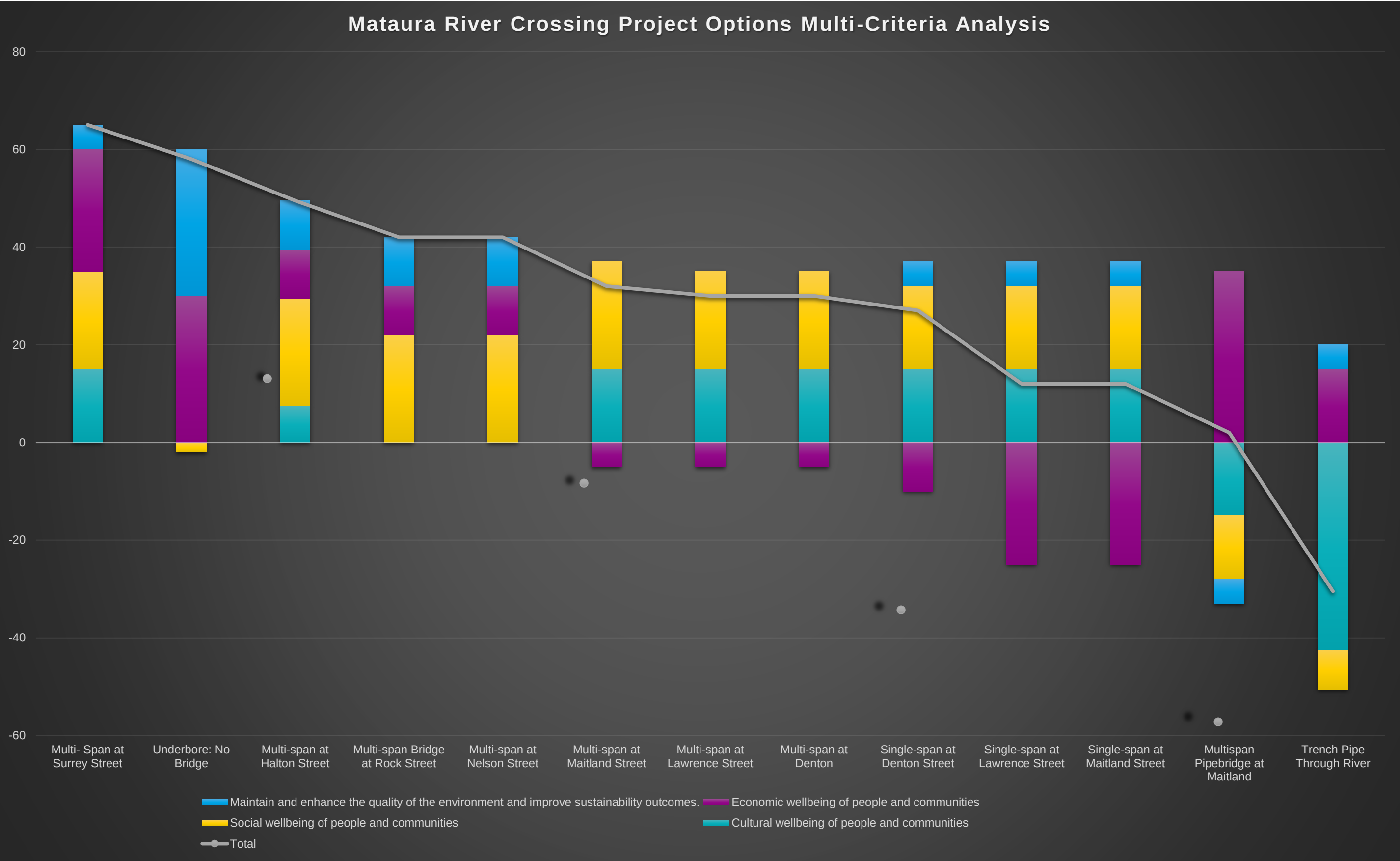
4 Multicriteria Options Analysis

Each option listed above has been assessed against the following criteria to obtain a relative score. The relative scores for each option are shown on the subsequent chart below. The detailed scoring sheet is located in **Appendix B**.

The high-level cultural wellbeing criteria and relative scores were developed together with representatives from Hokonui Runaka.

Table 2: Mataura River Crossing Assessment Criteria

Area	Criteria	Indicators (Examples)	Weighting Factor	Total
Cultural Wellbeing of people and communities	Protection of cultural values in relation to water and community improvements	Enhancement of "mauri" and "hauora" of the Mataura	10	25
		Provision of ability to practice Mahinga Kai	7.5	
		Expression of Cultural Identity	7.5	
Social wellbeing of people and communities	Construction nuisance for residents	Construction Impact (noise -disruption - traffic - visual)	2	25
	Consentability	Visual Impact	6	
		Impact to Flood flows (property)	3	
	Social Impacts	Community Perception	2	
	Travel improvements	Recreational Opportunities	6	
		Active Travel Option Improvement	6	
Economic wellbeing of people and communities	Rate Payer Capital expenditure	Level of Capital Cost	15	25
		Capital cost risk	5	
	Whole of life ratepayer costs (NPV)	Level of Operational Cost	5	
Maintain and enhance the quality of the environment and improve sustainability outcomes.	Consentability/ effects risks	Impact on water Quality during construction	5	25
		Flood Flows Impacts	5	
	Carbon Footprint	Reduction in Vehicle Trips during operation	5	
		Carbon Footprint Construction and Operation	5	
	Climate Change adaptation	Climate Change adaptation/flood consequence	5	
				100



5 Summary and Next Steps

Based on the above listed criteria and their associated weightings the top three scoring options are:

1. A multi-span bridge at the Surrey Street (original) location;
2. An underbore at Maitland Street;
3. A multi-span bridge at Halton Street.

Engagement with the community will be required, however this has not been assessed or considered as part of this report.

The next technical steps required to assess the feasibility of these options are listed below.

5.1 Next Steps for Underbore Option

- Obtain Manawhenua assessment and input to the option;
- Complete a Geotechnical Investigation of the underbore alignment;
- Re-engage with underbore contractors to identify potential program/procurement lead time information.

5.2 Next Steps for the Bridge Options

- Obtain Manawhenua assessment and input to the option;
- Obtain Waka Kotahi input regarding shared path funding for these options and clarify the pathway for confirming the funding.
- Engage a landscape visual assessment specialist to provide early assessment/mitigation for the bridge options;
- Complete a cost estimate by a suitably qualified Quantity Surveyor.
- Complete hydraulic assessment to confirm impact of proposed structure on the flood plain and external property – as well as any specific scour protection requirements.
- Determine whether the Halton Street option (or other bridge options further considered) should include the pipelines or whether these could be separately dealt with by way of underbore at Maitland Street. If they are to be separated, the relative MCA scoring of the shared path options should be revisited without the pipeline considerations.

A

Appendix A – DC Studios Longford Shared Path Bridge Options Report

Longford Shared Path Bridge Options Report

Longford Shared Path – Bridge Options Report (REF: GDC_2022/12-OR)

Prepared for

Gore District Council

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1. Project Overview

1.1. Introduction

This document summarises the bridge options available for crossing the Mataura River as part of Gore District Council's (GDC) plans to connect both the water supply infrastructure and cycleway infrastructure across the river.

1.2. Background

A detailed bridge design was completed for GDC by DC Structures Studio (Architecture and structure) and Riley Consultants Ltd. (Geotechnical design and hydrology) in 2019 to 2020. This work was successfully peer reviewed by Beca Limited and then tendered to the market. This bridge was a 90m free spanning cable-stayed cycle bridge with no piers in the river. The bridge was also designed to carry two 350 diameter watermains and two additional future service ducts. The bridge passed its initial application for a resource consent with subsequent Planning Hearing in 2020/2021 but was later successfully appealed by local residents in Environment Court owing to complaints relating to visual impact in 2022.

During design and tendering of the previous bridge a significant amount of work and site-specific experience was gained relating to suitable structural forms, flood design methodologies, and expected industry construction costs for crossing the Mataura River. We also worked closely with Environment Southland and forged strong understanding of their expectation for connecting to both the local flood-banks and constructing large earthwork embankments within the Mataura River flood plains. This experience has formed a baseline to inform concepts and pricing within this report (referred to as "original location" or "2020 option" from herein).

1.3. Scope

The overall scope is to come up with feasible bridge options and likely prices for various bridge locations along the Mataura River so that options and costs are better understood for feeding into a wider multi criteria analysis (MCA) of these options. It is expected that this Report will form an addendum to the Multi-Criteria Analysis Report (being prepared by Beca Ltd.).

In looking at the options, and based on previous work discussed in Section 1.2, it is assumed that all bridge options will adopt/include the following:

Design Basis:

1. Designed to the New Zealand Transport Agency Bridge Manual v3.4 (NZTABM).
2. Minimum bridge width = 3.0m measured at the deck surface. This was a requirement for Waka Kotahi Funding.
3. Cycleway barriers at 1.4m high.
4. Carry two 350mm diameter watermains.

5. Carry two additional 160 OD HDPE ducts for future services.
6. Stormwater run-off will be allowed to pass directly into the waterway.
7. No requirement for bridge lighting.
8. Design life for bridge is 100 years.
9. ≥ 40 years to first maintenance for all steelwork protective coatings.
10. Connecting pathway alignments and geometrics will be designed in accordance with recommendations made in Austroads Design Guide Part 6A. Cost of connecting pathways not considered herein.

Waterway Assumptions:

11. The hydraulic conditions observed at the original location are assumed similar at the alternative sites. This would need to be confirmed by detailed hydrological modelling if any alternative is progressed further.
12. Basis for waterway design to be NZTABM Section 2.3 with reference to AS5100.2-2017.
13. Recommended freeboard above SLS2 event is 1200mm as per NZTABM v3.3 cl 2.3.4. This assumes large logging and tree debris is possible upstream.
14. Adopted design flood levels:
 - a. 1/50 year event + climate change = 75.8mRL at East and 75.5m RL at west (linear change);
 - b. 1/500 year event = 76.7m RL (limited to existing eastern stop-bank level);
15. The flood-plain either side of the main river channel is generally consistent with the original design at a level of circa 72.4mRL, but varies slightly across the options. This can be clarified by further survey if required.
16. The eastern flood-bank is generally consistent with the original design at a level of circa 76.6mRL, albeit future raising is proposed that would increase this. This can be clarified by further survey if required.
17. As per AS5100.2 2004 cl 15.5.3 debris forces will only be applied to superstructure where soffit level is less than 1/500 year event (ULS) + 600mm = 77.3m RL.

Geotechnical Assumptions

18. Geotechnical conditions at the alternative sites are assumed consistent with the preferred location. This would need to be confirmed by detailed geotechnical investigation if any alternative is progressed further.
19. For the purposes of structural design, the site is assessed as subsoil category Class B – Rock, in accordance with NZS1170 – Structural Design Actions based on the shallow depth to rock observed in boreholes.
20. Bridges will be supported on a series of bored concrete piles socketed into the rock.
21. No liquefaction is predicted for either serviceability limit state (SLS) nor ultimate limit states (ULS).

Further Technical Work

22. Prior to construction, all bridges are assumed subject to detailed design by suitability qualified and experienced chartered professional engineers (CPEng) for 1) Structural, 2) Geotechnical, and 3) Hydrological design (as per the original 2020 bridge submission).

23. An independent technical peer review process shall also be carried out for all of the above (as per the original 2020 bridge submission).

1.4. Exclusions

No technical work has been performed in preparing this Report. The views and opinions contained in this report are intended to help comparative evaluation of different bridge locations. The work contained herein should not be relied upon (in isolation) for funding and/or construction purposes. DC Structures Studio accepts no liability whatsoever relating to how information contained in this report is used by GDC.

Once a credible location and bridge type is identified by the overarching multi-criteria analysis (MCA), a full Concept Design phase (and potentially Preliminary Design phase) should be performed involving bridge engineers, geotechnical engineers, hydrologists and quantity surveyors to confirm actual geometry, details, quantities, consentability, and cost estimation. For the previous project this was a function that DC Structures Studio provided in combination with our specialist subconsultants. If two locations and/or bridge forms are close in their MCA assessment scores it might be beneficial to run Concept Design on two options in parallel to further refine the MCA outcomes.

2. Option Locations

The locations assumed for the assessment are separated into 2 regions: 1) South of Surrey Street and North of Surrey Street (including Surrey Street). Surrey Street is the location of the original 2020 design. These options are summarised as follows:

Southern Options:

1. Rock Street
2. Nelson Street
3. Halton Street
4. Northern Options

Northern options:

5. Surrey Street (original 2020 option)
6. Denton Street
7. Lawrence Street
8. Maitland Street

The main difference between these regions is the distance between the flood banks. The southern region has a floodbank-to-floodbank length under 250m and options are thus considered for a full length of bridge without any approach ramps built within the flood plain (earthworks bund or structural ramp). All options north of Surrey Street (including the Surrey Street option) will require at least one approach ramp erected upon the flood plain.

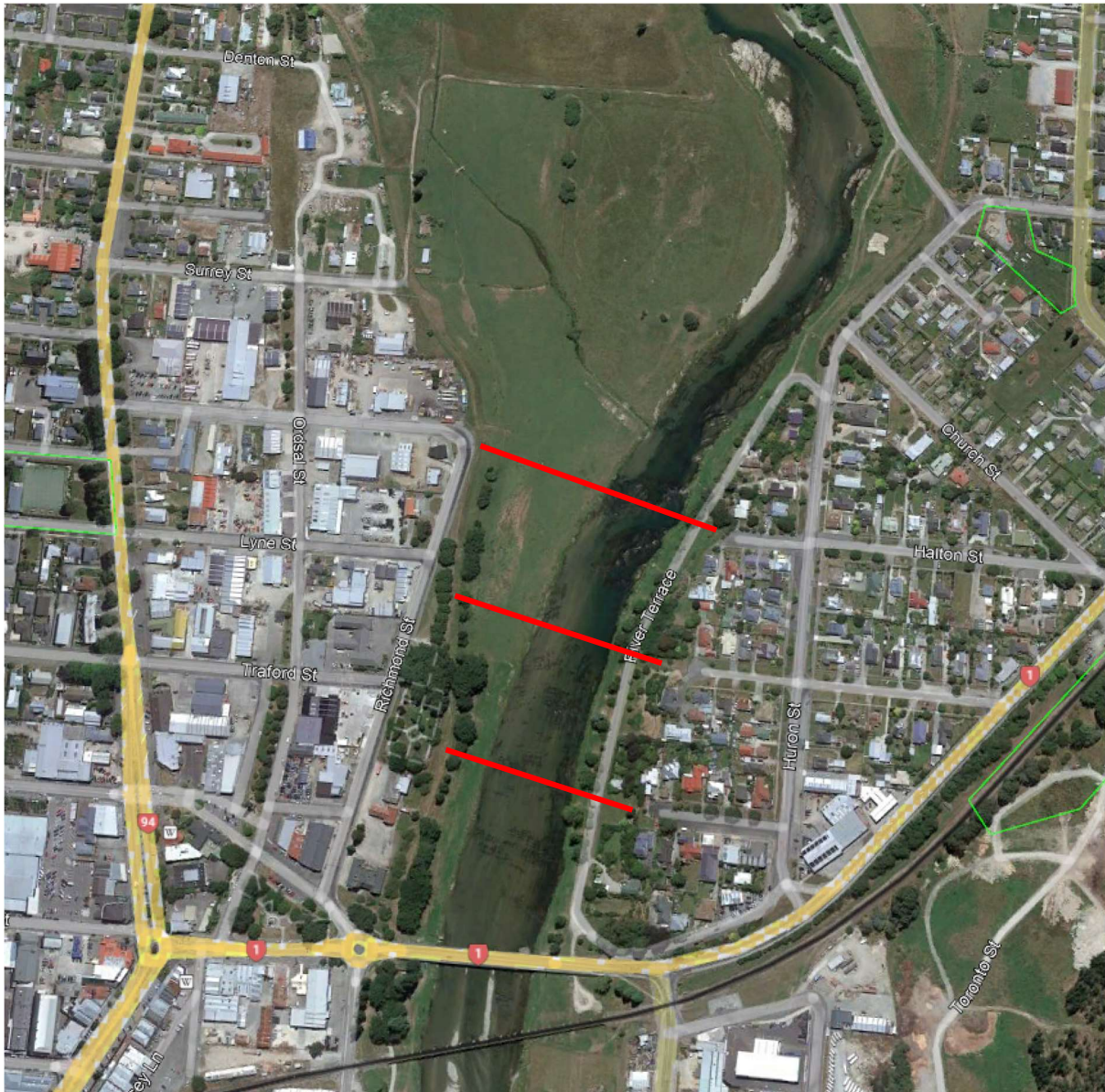


Figure 2-1 Southern Region Bridge Options. From South to North: 1) Rock Street 2) Nelson Street 3) Halton Street. Bridge options connecting directly to floodbank on both western and eastern ends.



Figure 2-2 Northern Region Bridge Options. From South to North: 1) Surrey Street (2021 option) 2) Denton Street 3) Lawrence Street 4) Maitland Street. Bridge options requiring at least one approach ramp constructed on the flood plain.

3. Bridge Elements

Each of the locations is expected to have either a multi-span bridge arrangement with medium spans in the order of <40m or a long span option with spans >60m (or a combination of these). In the northern region where we cannot connect directly to flood-banks we will need approach ramps that enable users and water infrastructure to ascend the circa 6m vertical clearance over the river.

3.1. Medium Bridge Span Options (<40m)

Where we promote the use of multi-span structures these are likely to have permanent piers (bridge columns) erected in the river. It is likely that these options would be two parallel steel girders supporting steel cross beams (or similar). Between the cross beams there will be either concrete, steel, or fibre reinforced polymer (FRP) decking panels. See an example below. Although these options are expected to be cheaper and easier to erect than a long-span option, they will need complex and detailed flood modelling to confirm acceptability of piers in the main channel with

Environment Southland (but we suspect they will be acceptable with proper consultation & reporting).

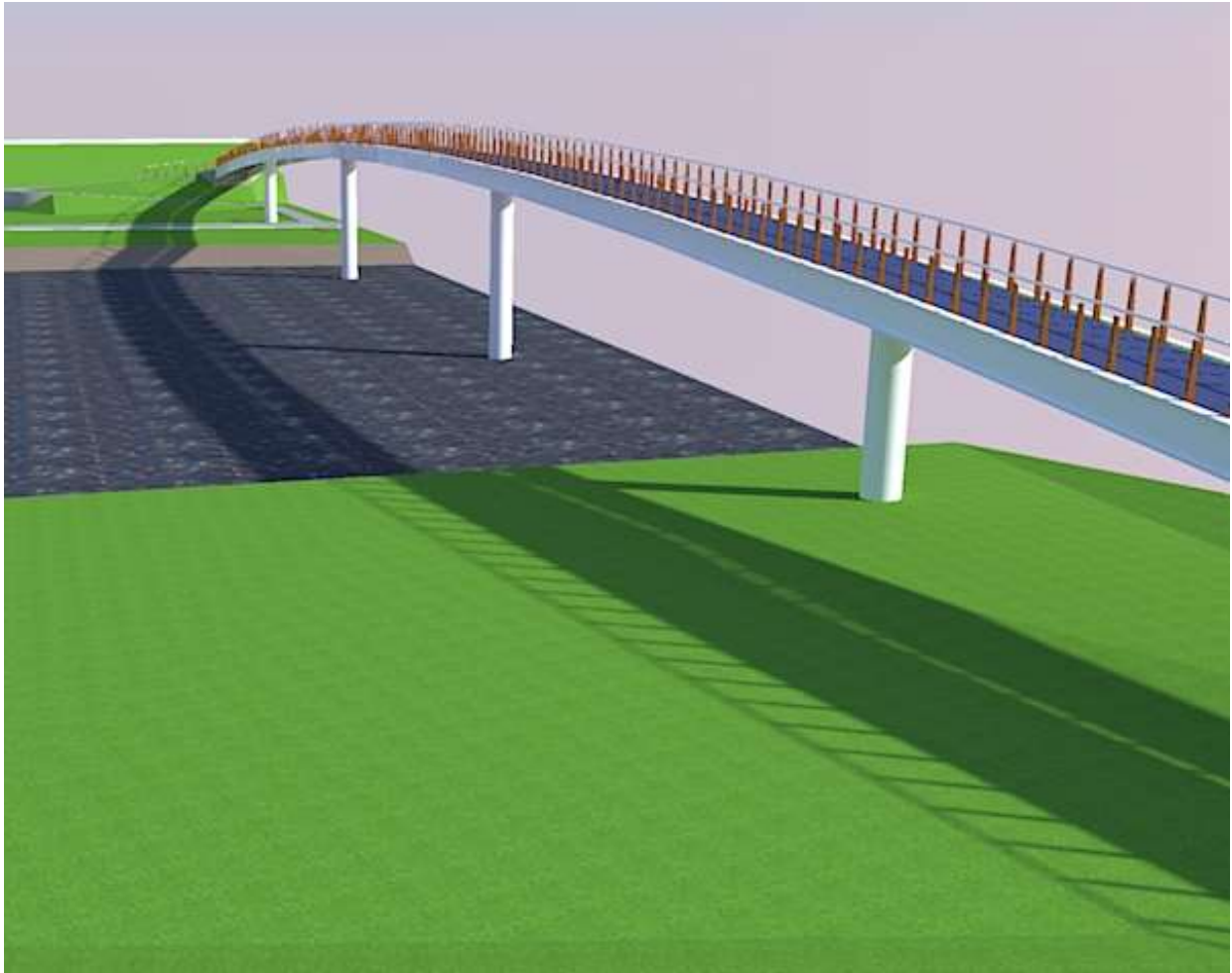


Figure 3.1-1 Example of multi-span configuration using small or medium spans (<40m)

3.2. Long Bridge Span Options (>60m)

Where the clear span exceeds 60m we are expecting bespoke bridge configurations involving above deck support systems such as large arches, cable stayed masts, and/or a suspension bridge arrangements. See some examples below.



Figure 3.2-1 Example of cable stayed bridge for longer span (>60m)



Figure 3.2-2 Example of suspension bridge for longer span (>60m)

During the original 2020 design a large embankment was placed in the flood plain to enable pedestrian and water infrastructure to get up to the bridge height. The bridge surface is circa 6m above the flood plain as required to clear the ultimate design event flood envelope. We worked with Environment Southland to confirm the orientation and shape of this embankment to mitigate impediment to the existing flood flow and impact to flood heights adjacent to stop-banks. A large factor in the success of this was the massive cross-sectional width of the flood plain (circa 450m) at the Surrey Street location that made the footprint of the large embankment relatively small in the context of the overall flood plain. This is deemed to be equally applicable to options north of Surrey Street but not South where the flood-banks are much closer (circa 250m apart). It is assumed that an embankment similar to the original 2020 proposal can be used to achieve a similar acceptable outcome for the northern options.

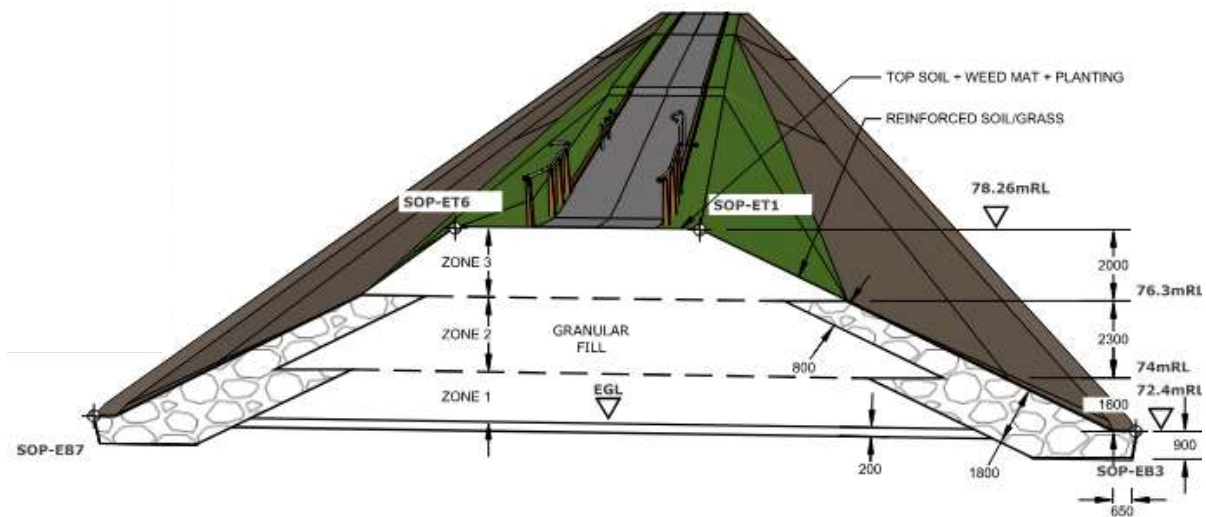


Figure 3.3-1 Isometric of earthwork approach embankment taken from 2020 design

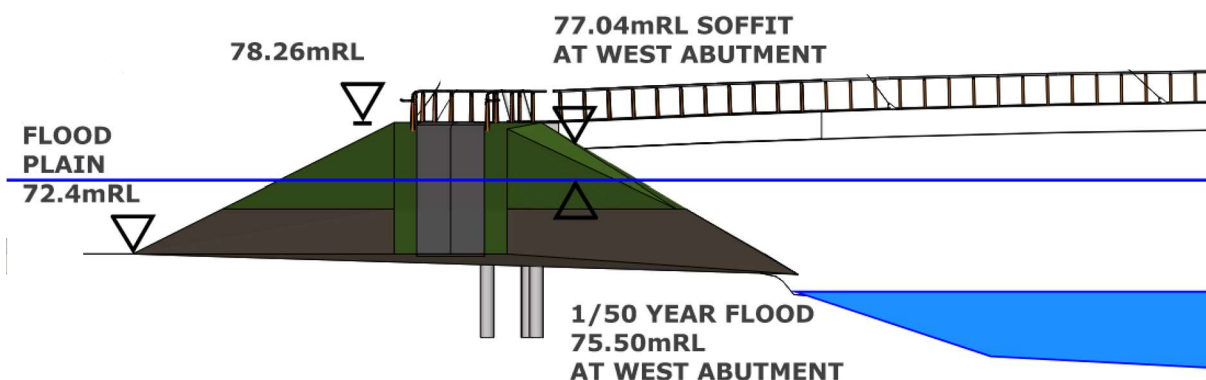


Figure 3.3-2 Elevation of earthwork approach embankment taken from 2020 design

3.4. Structural Approach Ramps

It may be possible during further concept design development to use a lightweight structural ramp system rather than large earthworks for the approach ramps. However, such an approach will be heavily dependent upon the ability to design such ramps to withstand the massive debris impact forces that can accumulate against the side of the ramp as it reduced in height within 600mm of the extreme flood level. This extensive impact force might require a separate protection structure and/or substantially more robust design elements that could significantly inflate price and might prove challenging to make aesthetically pleasing. For the purposes of this report, we have assumed all options requiring an approach ramp will have an earthwork embankment rather than a structural ramp for consistency with previous Environment Southland discussions.

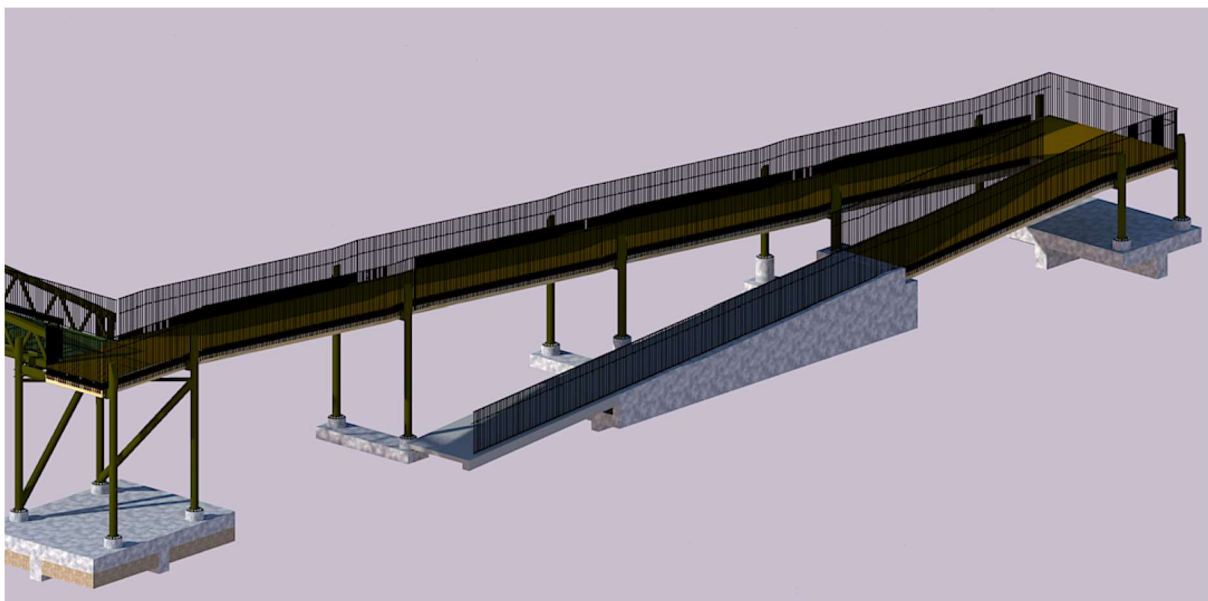


Figure 3.4-1 Example of a typical structural approach ramp

4. Bridge Costs

We have relied upon the 2020 Engineer's Estimate for the original 90m bridge at Surrey Street to help estimate bridge costs for comparison purposes. The 2020 bridge design had a capital cost estimate of circa \$2.5M for the bridge and circa \$1M for the western approach embankment. We note that where bridge spans reduce to less than 40m the cost per linear metre is expected to greatly reduce. On this basis the following has been assumed for a 3m wide bridge and approach ramp:

1. <40m span bridge cost = \$15,000 per m of bridge.
2. >60m span bridge cost = \$30,000 per m of bridge span.
3. Approach embankment = \$1.2M each.

Notes:

- All costs are assumed accurate to +/-30% and include for design and construction.
- Estimates are provided for comparison purposes only and should not be relied upon for funding purposes.
- Estimates do not include for internal Council related costs and/or resource consenting where the application is appealed (e.g. exclude and preparation for Planning Hearings and/or Environment Court).
- Items 1 and 2 are for a 3m wide bridge. Alternative widths can be assumed as a direct factor of this price. Factoring of width is not applicable to approach embankments.
- Item 3 includes for a bank high enough to elevate the bridge to achieve normal NZTA flood design requirements. This also includes provision of adequate scour protection measures and pedestrian approach grades and allows for hydrological design and assessment.
- In item 3 the approach embankments have a large volume as a result of requiring shallow approach 1V:14H pathway grades consistent with “accessible access” and have 1m side berms and maximum side batters of 1V:2H to reduce cyclist related hazards. Safety was assessed in 2020 using the NZTA Road Safety Audit process. Any reduction in these assumptions could result in cost savings that GDC might want to consider but the subsequent reductions in cyclist and user safety would need to be subject to an updated Road Safety Road Audit.
- Item 3 can be replaced by a structural ramp system (as discussed in Section 3.4) assumed to have a cost in the order of +/-25% of the embankment option. This can be clarified with Concept Design of approach ramps.

5. Bridge Options & Costings

5.1. Option 1 - Rock Street

Option 1 at Rock Street is approximately 140m north of the existing SH1 road bridge (refer Figure below). It is assumed to start at the end of the existing Rock Street and cross toward the flood-bank to the west. Total length to connect from Rock Street to flood bank is 172m. The main channel width at this alignment is 85m.



Figure 5.1-1: Option 1 (Rock Street).

Key observations

- (a) The main river channel width at this location is 85m.
- (b) The bridge would need to span River Terrace Road (between the Maitai River and Rock Street) to prevent closure of this road.
- (c) Ground levels on the Rock Street side are approximately 8m higher than the preferred design's eastern landing and is elevated well above the flood-bank level.

This option could therefore add significant complexities when striving to fit a code compliant accessible pathway gradient of 1V:14H. Given the space constraints between the edge of River Terrace Road and the end of Rock Street, the design is likely to require some form of winding pathway and/or ramp system up or down the existing bank. Further survey and concept design could clarify this matter if required.

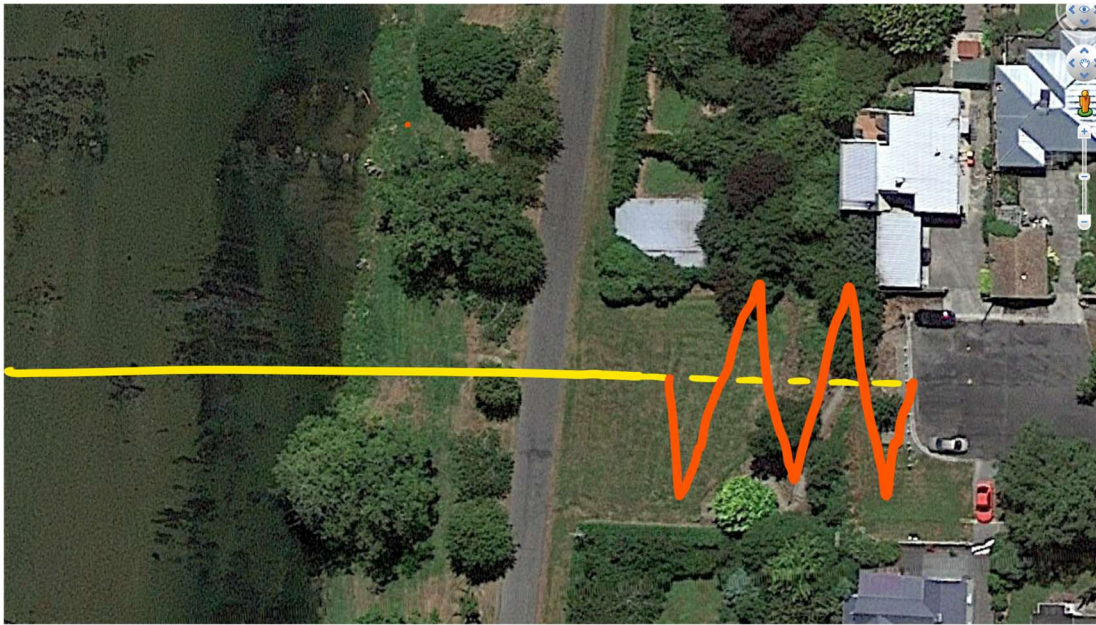


Figure 5.1-2: Option 1 Rock Street Connection: Yellow = assumed for pricing assessment purposes, Orange = likely zig-zag footpath style for an "accessible" gradient tie into Rock Street.

- (d) The total floodplain width at this location is estimated at circa 185m which is significantly narrower than the 405m at the preferred location. From earlier discussions with Eli Maynard (Hydrologist), the impact of having a smaller channel width from hydrological perspective is as follows:
 - (i) Constructing an embankment here will have a larger impact on reducing the channels capacity in flood thereby increasing flood potential. Initial estimates are that the flow area will be reduced by around 10% which is more than double the effect at the at the original location (around 5%).
 - (ii) Average flow depths and velocities are greater, increasing debris forces and scour potential, and the need for more robust scour protection measures (i.e. larger diameter riprap to an earthworks embankment).
 - (iii) The proximity of Rock Street to the SH1 and railway bridges means that the effects mentioned above are more significant because the natural river system has already been affected by the cumulative effects of two other bridges.

- (e) Noting the above, unless the bridge is designed to fully span the river (no large earthwork embankments), hydrological effects at this option will be more severe than any of the other options considered. On this basis an earthwork embankment (similar to the original proposal) has been ruled out for any bridge south of the original proposal.
- (f) The span required is estimated to be in the order of 32m (on the western side) + 85m (over the water) + 30m (over River Terrace Road) + 25m (to connect to Rock Street) = 172m.
- (g) A 172m clear span structure is a magnitude of order more complex than the original 90m spanning option and is deemed to be uneconomical/unfeasible without a more thorough concept design phase being undertaken. This decision could be reviewed in more detail if Environment Southland determine that piers in the river are not acceptable.
- (h) A 172mm long bridge with piers in the river and flood plain would be the most economical. A 5-span configuration of 30m / 37.4m / 37.4m / 37.4m / 30m would be a reasonable starting point for concept design purposes. See example of this below. Key to getting this configuration approved would be hydrological modelling to confirm no detrimental impact to existing downstream road bridge or neighboring properties.

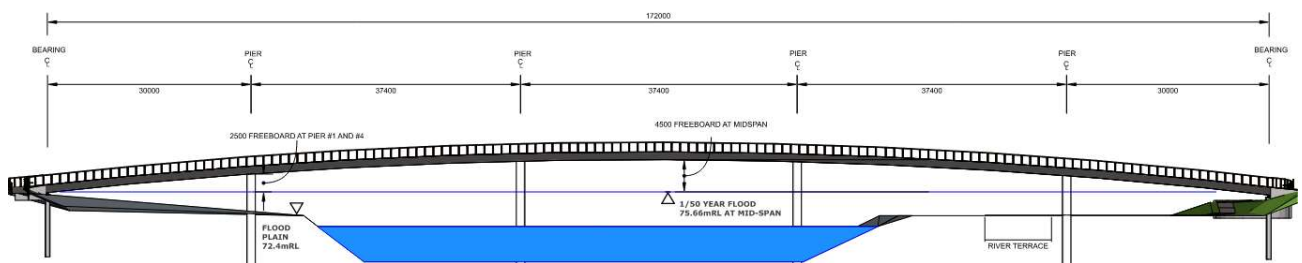


Figure 5.1-3 Option 1 Rock Street Span Configuration 30m / 37.4m / 37.4m / 37.4m / 30m

- (i) Estimated cost (multi-span option) $\approx 172\text{m} \times \$15,000/\text{m}$ (bridge) + \$100K (eastern Path tie-in) = \$2.7M +/-30%.

5.2. Option 2 - Nelson Street

Option 2 at Nelson Street is approximately 275m north of the existing SH1 road bridge (refer figure below). It is assumed to start at the end of the existing Nelson Street and cross toward the floodbank to the west. Total length to connect from Nelson Street to flood bank is 205m. The main channel width at this alignment is 75m.

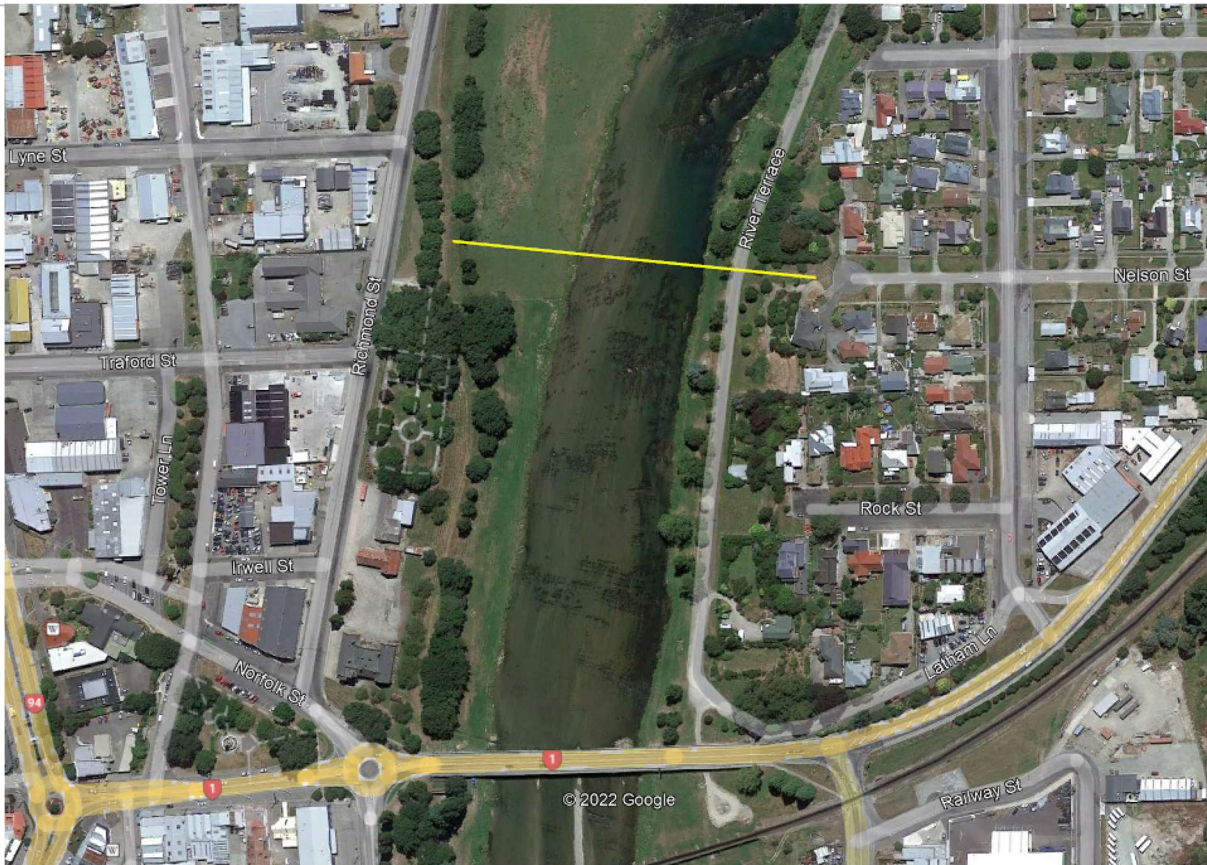


Figure 5.2-1: Option 2 (Nelson Street).

Key observations

- (a) Generally consistent with the option described above for Rock Street adjusted for total length and river width.
- (b) Estimated cost (multi-span option) $\approx 205\text{m} \times \$15,000/\text{m}$ (bridge) + \$100K (eastern Path tie-in) = \$3.2M +/-30%.

5.3. Option 3 - Halton Street

Option 3 at Halton Street is approximately 405m north of the existing SH1 road bridge (refer figure below). It is assumed to start at the end of the existing Halton Street and cross toward the floodbank to the west. Total length to connect from Halton Street to flood bank is 225m. The main channel width at this alignment is 75m.

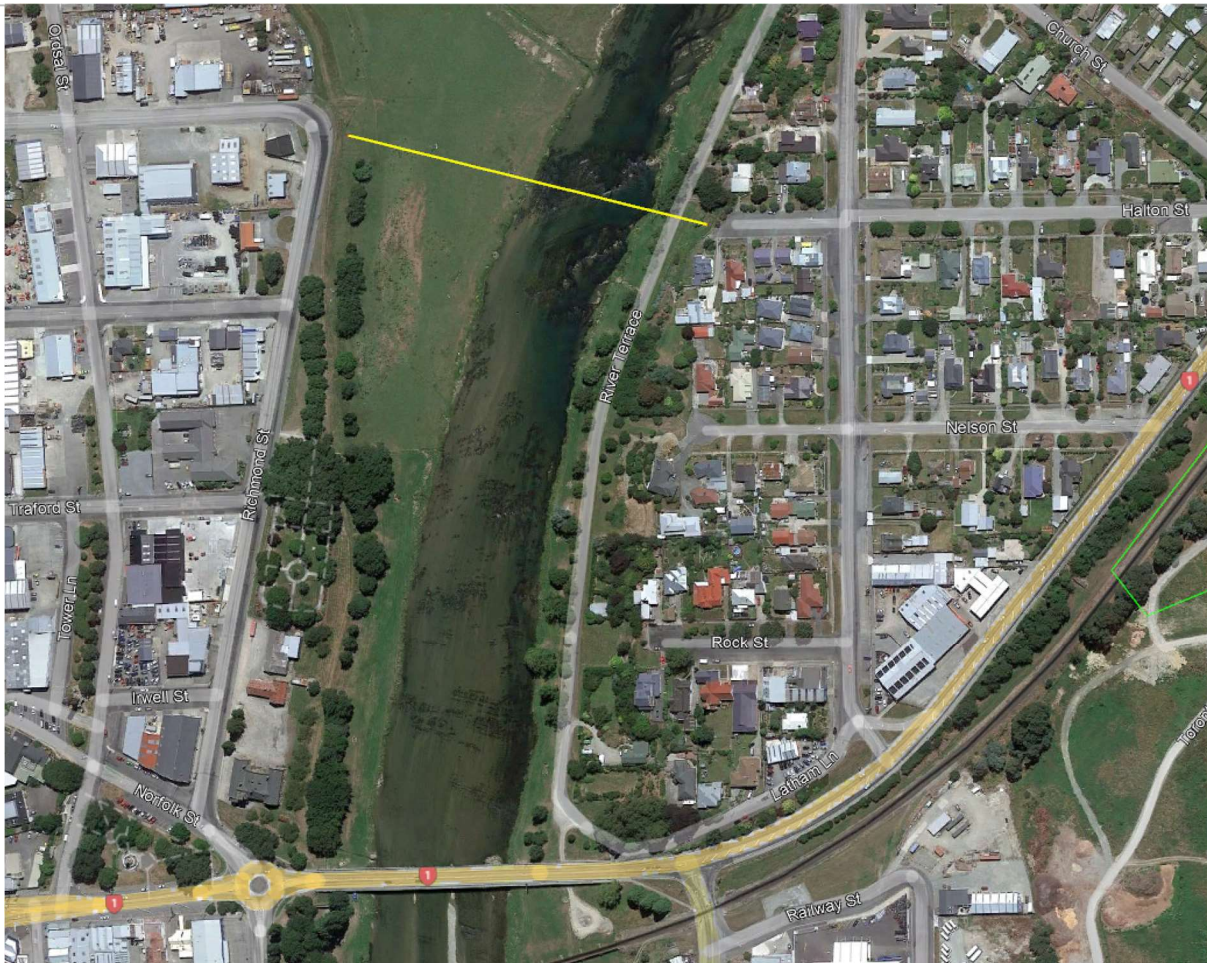


Figure 5.3-1: Option 3 (Halton Street).

Key observations

- (a) Generally consistent with the option described above for Rock Street adjusted for total length and river width.
- (b) Estimated cost (multi-span option) $\approx 225\text{m} \times \$15,000/\text{m}$ (bridge) + \$100K (eastern Path tie-in) = \$3.5M +/-30%.

5.4. Option 4 - Surrey Street

Option 4 at Surrey Street is the option taken to detailed design and construction tender in 2020 but later successfully appealed by local residents at Environment Court in 2022. It is approximately 600m north of the existing SH1 road bridge (refer figure below). It is assumed to start at the flood-bank adjacent to Huron Street between Church Street and River Terrace Road junctions. This option requires a western approach embankment erected in the flood plain since the clear distance between eastern and western flood-banks is circa 405m.



Figure 5.4-1: Option 4 (Surrey Street). This is the 2021 Option taken to detailed design and construction tender.

Key observations

- (a) Single span configuration already subjected to detailed design and independent peer review.
- (b) Earth embankment in this location already subjected to detailed hydrological assessment and accepted by Environment Southland.
- (c) Likely to be a challenge to consent a single span option with a large visual footprint noting it has already been declined planning permission.
- (d) Noting the above, this location is only considered for a multi-span option. Assume 3-span configuration of 30m / 30m / 30m with piers in the river.
- (e) Piers in the river will need to be added to the existing detailed hydrological model to confirm no detrimental impact to overall flooding.
- (f) Estimated cost (multi-span option) $\approx 90\text{m} \times \$15,000/\text{m}$ (bridge) + \$1.2M embankment = \$2.4M

5.5. Option 5 - Denton Street

Option 5 at Denton Street is approximately 900m upstream of the existing SH1 road bridge. The river is contained within a 580m wide floodplain (floodbank to floodbank), with the eastern floodbank around 120m away across Woolwhich Street and the western 390m near Denton Street. Therefore, it is assumed that two embankments, both similar to the western embankment of the 2020 design will be required. The main channel width at this alignment is 70m.

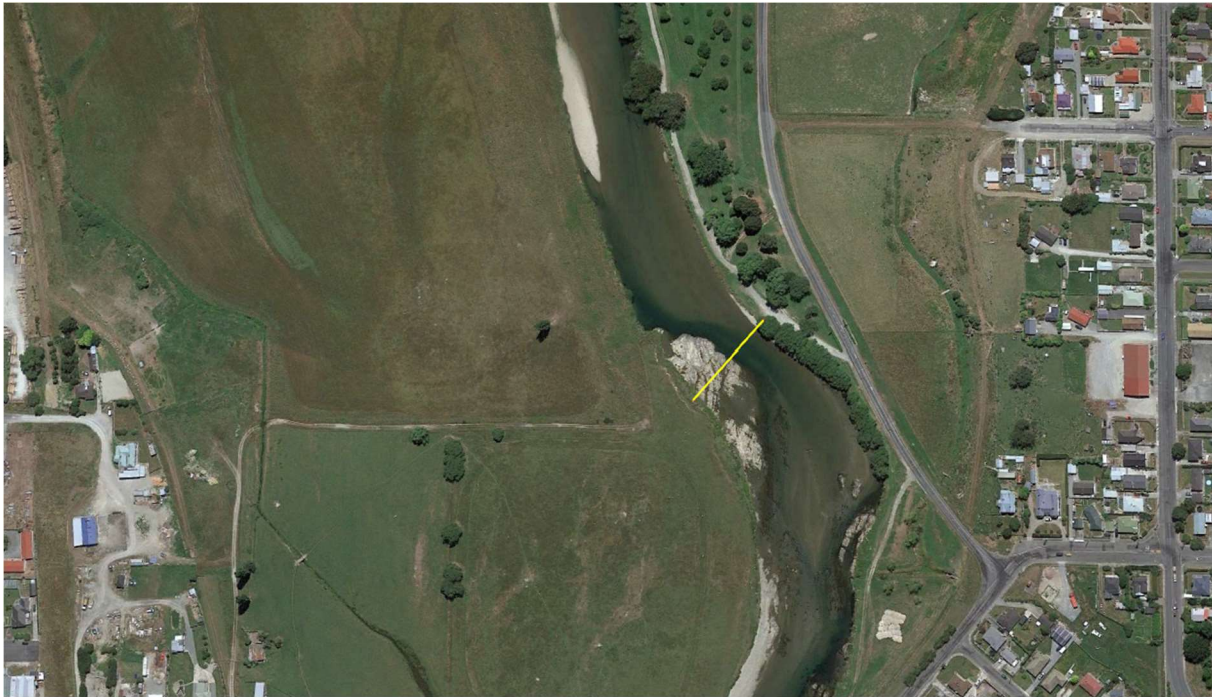


Figure 5.5-1: Option 5 (Denton Street).

Key observations are as follows:

- (a) The main river channel at this location is at least 70m wide.
- (b) By adopting an approach embankment on both sides of the river the required span is estimated to be in the order of 10m (on the western side) + 70m (over the water) + 10m (on the eastern side) = 90m.
- (c) Span is the same as the 2020 design and therefore it is assumed the same single span bridge design would remain appropriate (to be confirmed by detailed review).
- (d) This location is further north when compared to the original 2020 design and is therefore expected to attract less residential opposition since this location is adjacent to existing trees (to be confirmed by visual assessment). It might even be possible to rotate the bridge 180 degrees and place the tall pylon on the eastern side amongst existing trees for further screening.

- (e) Using the existing design could save GDC significant upfront design costs since the design would only need to be reassessed for a new location.
- (f) A multi-span option with a configuration of 30m / 30m / 30m could also be applicable at this location.
- (g) The addition of the eastern embankment would add approximately \$1.2M to the cost of the original 2020 design.
- (h) The total flood plain width at this location is estimated at circa 580m which is only 43% wider than the 405m cross section used in the 2020 location. However, since there are now two embankments of equal size to be erected, there is potential for a worsened hydrological effect when compared to the original Surrey Street location. Initial Hydrological assessment of the Denton Street Option made by the Hydrologist during the planning hearing evidence process suggested that this location could be shown to be acceptable to Environment Southland subject to updating and assessing the existing detailed model (as used at the Surrey Street location) to suitably demonstrate and quantify the change.



Figure 5.5-2 Original 2020 design could be used at the Denton Street location.

- (i) Estimated cost (single-span option) $\approx 90\text{m} \times \$30,000/\text{m}$ (bridge) + 2 x \$1.2M (x2 embankments) = \$5.1M
- (j) Estimated cost (multi-span option) $\approx 90\text{m} \times \$15,000/\text{m}$ (bridge) + 2 x \$1.2M embankment = \$3.75M

5.6. Option 6 - Lawrence Street

Option 6 at Lawrence Street is approximately 1050m upstream of the existing SH1 road bridge. The river is contained within a 675m wide floodplain (floodbank to floodbank), with the eastern floodbank around 215m away and the western 400m near Wolsley Street. Therefore, it is assumed that two embankments, both similar to the western embankment of the 2020 design will be required. The main channel width at this alignment is 80m.



Figure 5.6-1: Option 6 (Lawrence Street).

Key observations

- (a) Generally consistent with the option described above for Denton Street adjusted for total length and river width.
- (b) Noted that the bridge would be located within a park environment on the eastern side and would be screened from residents by the surrounding trees. Visual impact to residents is unlikely to be an issue in this location.
- (c) The total flood plain width at this location is estimated at circa 675m which is only 67% wider than the 405m cross section used in the 2020 location. Further hydrological assessment would be required to quantify impact and confirm acceptability of erecting two approach embankments in the flood plain.

- (d) Estimated cost (single-span option) $\approx 100\text{m} \times \$30,000/\text{m}$ (bridge) + $2 \times \$1.2\text{M}$ (x2 embankments) = \$5.4M
- (e) Estimated cost (multi-span option) $\approx 100\text{m} \times \$15,000/\text{m}$ (bridge) + $2 \times \$1.2\text{M}$ embankment = \$3.9M

5.7. Option 7 – Maitland Street

Option 7 at Maitland Street is approximately 1500m upstream of the existing SH1 road bridge. The river is contained within a 825m wide floodplain (floodbank to floodbank), with the eastern floodbank around 400m away and the western 350m away. Therefore, it is assumed that two embankments, both similar to the western embankment of the 2020 design will be required. The main channel width at this alignment is 80m.

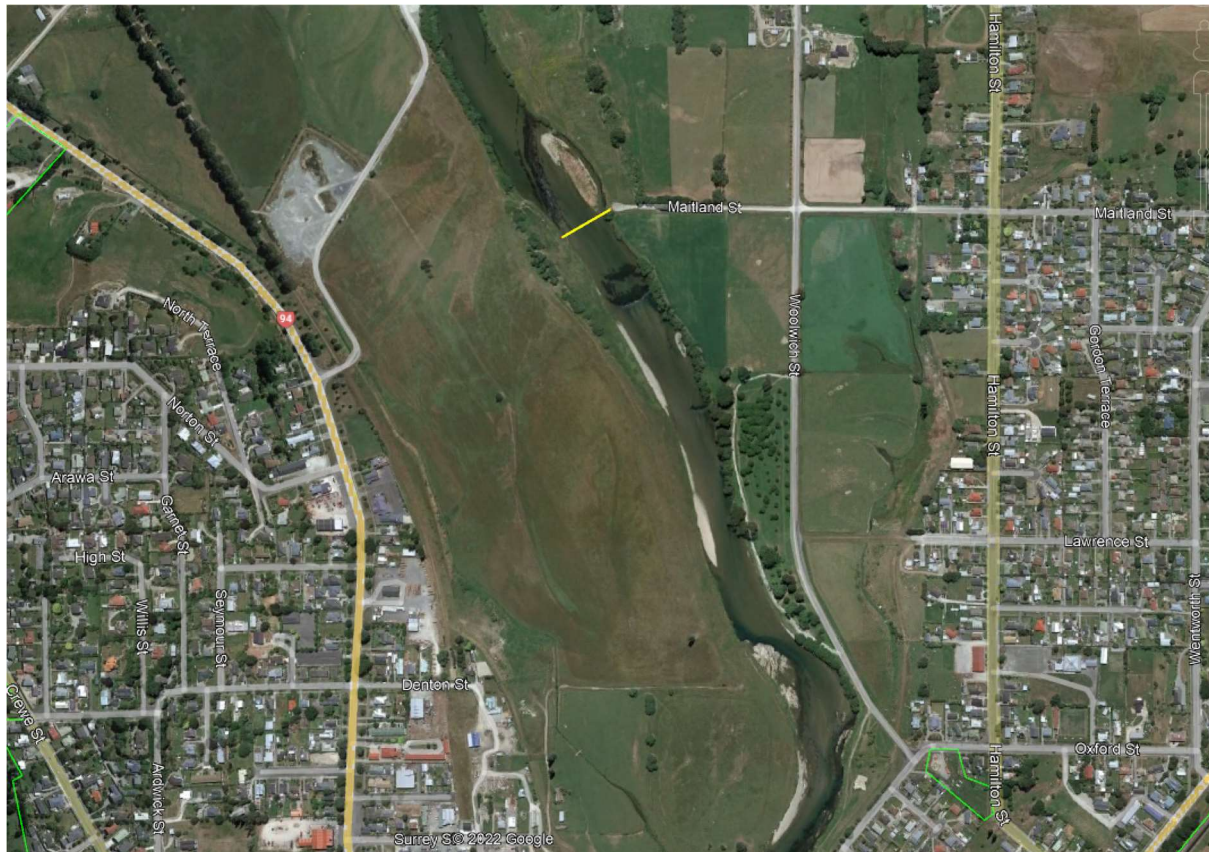


Figure 5.7-1: Option 7 (Maitland Street).

Key observations

- (a) Generally consistent with the option described above for Denton Street adjusted for total length and river width.
- (b) Noted that the bridge would be located a substantial distance away from residential properties. Visual impact to residents is unlikely to be an issue in this location.

- (c) The total flood plain width at this location is estimated at circa 825m which is twice the 405m width used in the 2020 location. On this basis it is assumed that two embankments can be accommodated with hydrological outcomes consistent with the 2020 design as already accepted by Environment Southland. This is to be confirmed by further Hydrological Assessment.
- (d) Estimated cost (single-span option) $\approx 100\text{m} \times \$30,000/\text{m}$ (bridge) + 2 x \$1.2M (x2 embankments) = \$5.4M
- (e) Estimated cost (multi-span option) $\approx 100\text{m} \times \$15,000/\text{m}$ (bridge) + 2 x \$1.2M embankment = \$3.9M

B

Appendix B – Multi Criteria Analysis

Weighted Scores for the Maitura River Crossing Project Options													
Criteria	Multi- Span at Surrey Street	Underbore: No Bridge	Multi-span at Halton Street	Multi-span Bridge at Rock Street	Multi-span at Nelson Street	Multi-span at Maitland Street	Multi-span at Lawrence Street	Multi-span at Denton	Single-span at Denton Street	Single-span at Lawrence Street	Single-span at Maitland Street	Multispan Pipebridge at Maitland	Trench Pipe Through River
Cultural wellbeing of people and communities	15.0	0.0	7.5	0.0	0.0	15.0	15.0	15.0	15.0	15.0	15.0	-15.0	-42.5
Social wellbeing of people and communities	20.0	-2.0	22.0	22.0	22.0	22.0	20.0	20.0	17.0	17.0	17.0	-13.0	-8.0
Economic wellbeing of people and communities	25.0	30.0	10.0	10.0	10.0	-5.0	-5.0	-5.0	-10.0	-25.0	-25.0	35.0	15.0
Maintain and enhance the quality of the environment and improve sustainability outcomes.	5.0	30.0	10.0	10.0	10.0	0.0	0.0	0.0	5.0	5.0	5.0	-5.0	5.0
Total	65.0	58.0	49.5	42.0	42.0	32.0	30.0	30.0	27.0	12.0	12.0	2.0	-30.5

Mataura River Crossing Project

Option Number	Option Title	Value Score - All Factors						
		Criteria	Raw Score	Weighting	Weighted score	weighted score	total score	
1	Underbore: No Bridge	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	0	10	0.0	0.0	58.0
			Provision of ability to practice Mahinga Kai	2	7.5	15.0		
			Expression of Cultural Identity	-2	7.5	-15.0		
		Social wellbeing of people and communities	Construction Impact	2	2	4.0	-2.0	
			Visual Impact	2	6	12.0		
			Impact to Flood Flows (property)	2	3	6.0		
			Community Perception	0	2	0.0		
			Recreational Opportunities	-2	6	-12.0		
			Active Travel Option Improvement	-2	6	-12.0		
		Economic wellbeing of people and communities	Level of Capital Cost	2	15	30.0	30.0	
			Capital Cost Risk	-2	5	-10.0		
			Level of Operational Cost	2	5	10.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	2	5	10.0	30.0	
			Flood Flow Impacts	2	5	10.0		
			Carbon Foorprint Construction and Operation	2	5	10.0		
			Reduction in vehicle trips during operation	-2	5	-10.0		
			Climate Change Adaptation	2	5	10.0		
2	Trench Pipe Through River	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	-2	10	-20.0	-42.5	-30.5
			Provision of ability to practice Mahinga Kai	-1	7.5	-7.5		
			Expression of Cultural Identity	-2	7.5	-15.0		
		Social wellbeing of people and communities	Construction Impact	-1	2	-2.0	-8.0	
			Visual Impact	2	6	12.0		
			Impact to Flood Flows (property)	2	3	6.0		
			Community Perception	0	2	0.0		
			Recreational Opportunities	-2	6	-12.0		
			Active Travel Option Improvement	-2	6	-12.0		
		Economic wellbeing of people and communities	Level of Capital Cost	1	15	15.0	15.0	
			Capital Cost Risk	-2	5	-10.0		
			Level of Operational Cost	2	5	10.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	-2	5	-10.0	5.0	
			Flood Flow Impacts	2	5	10.0		
			Carbon Foorprint Construction and Operation	2	5	10.0		
			Reduction in vehicle trips during operation	-2	5	-10.0		
			Climate Change Adaptation	1	5	5.0		
3	Multi- Span at Surrey Street	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	0	10	0.0	15.0	65.0
			Provision of ability to practice Mahinga Kai	1	7.5	7.5		
			Expression of Cultural Identity	1	7.5	7.5		
		Social wellbeing of people and communities	Construction Impact	1	2	2.0	20.0	
			Visual Impact	-1	6	-6.0		
			Impact to Flood Flows (property)	0	3	0.0		
			Community Perception	0	2	0.0		
			Recreational Opportunities	2	6	12.0		
			Active Travel Option Improvement	2	6	12.0		
		Economic wellbeing of people and communities	Level of Capital Cost	2	15	30.0	25.0	
			Capital Cost Risk	0	5	0.0		
			Level of Operational Cost	-1	5	-5.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	1	5	5.0	5.0	
			Flood Flow Impacts	0	5	0.0		
			Carbon Foorprint Construction and Operation	-1	5	-5.0		
			Reduction in vehicle trips during operation	2	5	10.0		
			Climate Change Adaptation	-1	5	-5.0		
4	Multi-span Bridge at Rock Street	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	0	10	0.0	0.0	42.0
			Provision of ability to practice Mahinga Kai	-1	7.5	-7.5		
			Expression of Cultural Identity	1	7.5	7.5		
		Social wellbeing of people and communities	Construction Impact	1	2	2.0	22.0	
			Visual Impact	-1	6	-6.0		
			Impact to Flood Flows (property)	0	3	0.0		
			Community Perception	1	2	2.0		
			Recreational Opportunities	2	6	12.0		
			Active Travel Option Improvement	2	6	12.0		
		Economic wellbeing of people and communities	Level of Capital Cost	1	15	15.0	10.0	
			Capital Cost Risk	0	5	0.0		
			Level of Operational Cost	-1	5	-5.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	1	5	5.0	10.0	
			Flood Flow Impacts	0	5	0.0		
			Carbon Foorprint Construction and Operation	-1	5	-5.0		
			Reduction in vehicle trips during operation	2	5	10.0		
			Climate Change Adaptation	0	5	0.0		
5	Multi-span at Maitland Street	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	0	10	0.0	15.0	32.0
			Provision of ability to practice Mahinga Kai	1	7.5	7.5		
			Expression of Cultural Identity	1	7.5	7.5		
		Social wellbeing of people and communities	Construction Impact	1	2	2.0	22.0	
			Visual Impact	1	6	6.0		
			Impact to Flood Flows (property)	0	3	0.0		
			Community Perception	1	2	2.0		
			Recreational Opportunities	2	6	12.0		
			Active Travel Option Improvement	2	6	0.0		
		Economic wellbeing of people and communities	Level of Capital Cost	-1	15	-15.0	-5.0	
			Capital Cost Risk	1	5	5.0		
			Level of Operational Cost	1	5	5.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	1	5	5.0	0.0	
			Flood Flow Impacts	0	5	0.0		
			Carbon Foorprint Construction and Operation	0	5	0.0		
			Reduction in vehicle trips during operation	0	5	0.0		
			Climate Change Adaptation	-1	5	-5.0		
6	Multispan Pipebridge at Maitland	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	0	10	0.0	-15.0	2.0
			Provision of ability to practice Mahinga Kai	0	7.5	0.0		
			Expression of Cultural Identity	-2	7.5	-15.0		
		Social wellbeing of people and communities	Construction Impact	1	2	2.0	-13.0	
			Visual Impact	1	6	6.0		
			Impact to Flood Flows (property)	1	3	3.0		
			Community Perception	0	2	0.0		
			Recreational Opportunities	-2	6	-12.0		
			Active Travel Option Improvement	-2	6	-12.0		
		Economic wellbeing of people and communities	Level of Capital Cost	2	15	30.0	35.0	
			Capital Cost Risk	1	5	5.0		
			Level of Operational Cost	0	5	0.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	1	5	5.0	-5.0	
			Flood Flow Impacts	0	5	0.0		
			Carbon Foorprint Construction and Operation	1	5	5.0		
			Reduction in vehicle trips during operation	-2	5	-10.0		
			Climate Change Adaptation	-1	5	-5.0		
7	Multi-span at Nelson Street	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	0	10	0.0	0.0	42.0
			Provision of ability to practice Mahinga Kai	-1	7.5	-7.5		
			Expression of Cultural Identity	1	7.5	7.5		
		Social wellbeing of people and communities	Construction Impact	1	2	2.0	22.0	
			Visual Impact	-1	6	-6.0		
			Impact to Flood Flows (property)	0	3	0.0		
			Community Perception	1	2	2.0		
			Recreational Opportunities	2	6	12.0		
			Active Travel Option Improvement	2	6	12.0		
		Economic wellbeing of people and communities	Level of Capital Cost	1	15	15.0	10.0	
			Capital Cost Risk	0	5	0.0		
			Level of Operational Cost	-1	5	-5.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	1	5	5.0	10.0	
			Flood Flow Impacts	0	5	0.0		
			Carbon Foorprint Construction and Operation	-1	5	-5.0		

Option Number	Option Title	Value Score - All Factors						
		Criteria	Raw Score	Weighting	Weighted score	weighted score	total score	
			Reduction in vehicle trips during operation	2	5	10.0		
			Climate Change Adaptation	0	5	0.0		
8	Multi-span at Halton Street	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	0	10	0.0	7.5	49.5
			Provision of ability to practice Mahinga Kai	0	7.5	0.0		
			Expression of Cultural Identity	1	7.5	7.5		
		Social wellbeing of people and communities	Construction Impact	1	2	2.0	22.0	
			Visual Impact	-1	6	-6.0		
			Impact to Flood Flows (property)	0	3	0.0		
			Community Perception	1	2	2.0		
			Recreational Opportunities	2	6	12.0		
			Active Travel Option Improvement	2	6	12.0		
		Economic wellbeing of people and communities	Level of Capital Cost	1	15	15.0	10.0	
			Capital Cost Risk	0	5	0.0		
			Level of Operational Cost	-1	5	-5.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	1	5	5.0	10.0	
			Flood Flow Impacts	0	5	0.0		
			Carbon Foorprint Construction and Operation	-1	5	-5.0		
			Reduction in vehicle trips during operation	2	5	10.0		
			Climate Change Adaptation	0	5	0.0		
9	Multi-span at Lawrence Street	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	0	10	0.0	15.0	30.0
			Provision of ability to practice Mahinga Kai	1	7.5	7.5		
			Expression of Cultural Identity	1	7.5	7.5		
		Social wellbeing of people and communities	Construction Impact	1	2	2.0	20.0	
			Visual Impact	0	6	0.0		
			Impact to Flood Flows (property)	0	3	0.0		
			Community Perception	0	2	0.0		
			Recreational Opportunities	2	6	12.0		
			Active Travel Option Improvement	1	6	6.0		
		Economic wellbeing of people and communities	Level of Capital Cost	-1	15	-15.0	-5.0	
			Capital Cost Risk	1	5	5.0		
			Level of Operational Cost	1	5	5.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	1	5	5.0	0.0	
			Flood Flow Impacts	-1	5	-5.0		
			Carbon Foorprint Construction and Operation	0	5	0.0		
			Reduction in vehicle trips during operation	1	5	5.0		
			Climate Change Adaptation	-1	5	-5.0		
10	Multi-span at Denton	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	0	10	0.0	15.0	30.0
			Provision of ability to practice Mahinga Kai	1	7.5	7.5		
			Expression of Cultural Identity	1	7.5	7.5		
		Social wellbeing of people and communities	Construction Impact	1	2	2.0	20.0	
			Visual Impact	0	6	0.0		
			Impact to Flood Flows (property)	0	3	0.0		
			Community Perception	0	2	0.0		
			Recreational Opportunities	2	6	12.0		
			Active Travel Option Improvement	1	6	6.0		
		Economic wellbeing of people and communities	Level of Capital Cost	-1	15	-15.0	-5.0	
			Capital Cost Risk	1	5	5.0		
			Level of Operational Cost	1	5	5.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	1	5	5.0	0.0	
			Flood Flow Impacts	-1	5	-5.0		
			Carbon Foorprint Construction and Operation	0	5	0.0		
			Reduction in vehicle trips during operation	1	5	5.0		
			Climate Change Adaptation	-1	5	-5.0		
11	Single-span at Maitland Street	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	0	10	0.0	15.0	12.0
			Provision of ability to practice Mahinga Kai	1	7.5	7.5		
			Expression of Cultural Identity	1	7.5	7.5		
		Social wellbeing of people and communities	Construction Impact	1	2	2.0	17.0	
			Visual Impact	0	6	0.0		
			Impact to Flood Flows (property)	1	3	3.0		
			Community Perception	0	2	0.0		
			Recreational Opportunities	2	6	12.0		
			Active Travel Option Improvement	0	6	0.0		
		Economic wellbeing of people and communities	Level of Capital Cost	-2	15	-30.0	-25.0	
			Capital Cost Risk	0	5	0.0		
			Level of Operational Cost	1	5	5.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	1	5	5.0	5.0	
			Flood Flow Impacts	0	5	0.0		
			Carbon Foorprint Construction and Operation	1	5	5.0		
			Reduction in vehicle trips during operation	0	5	0.0		
			Climate Change Adaptation	-1	5	-5.0		
12	Single-span at Denton Street	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	0	10	0.0	15.0	27.0
			Provision of ability to practice Mahinga Kai	1	7.5	7.5		
			Expression of Cultural Identity	1	7.5	7.5		
		Social wellbeing of people and communities	Construction Impact	1	2	2.0	17.0	
			Visual Impact	0	6	0.0		
			Impact to Flood Flows (property)	1	3	3.0		
			Community Perception	0	2	0.0		
			Recreational Opportunities	2	6	12.0		
			Active Travel Option Improvement	0	6	0.0		
		Economic wellbeing of people and communities	Level of Capital Cost	-1	15	-15.0	-10.0	
			Capital Cost Risk	0	5	0.0		
			Level of Operational Cost	1	5	5.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	1	5	5.0	5.0	
			Flood Flow Impacts	0	5	0.0		
			Carbon Foorprint Construction and Operation	0	5	0.0		
			Reduction in vehicle trips during operation	1	5	5.0		
			Climate Change Adaptation	-1	5	-5.0		
13	Single-span at Lawrence Street	Cultural wellbeing of people and communities	Enhancement of "mauri" and "hauora" of the Mataura	0	10	0.0	15.0	12.0
			Provision of ability to practice Mahinga Kai	1	7.5	7.5		
			Expression of Cultural Identity	1	7.5	7.5		
		Social wellbeing of people and communities	Construction Impact	1	2	2.0	17.0	
			Visual Impact	0	6	0.0		
			Impact to Flood Flows (property)	1	3	3.0		
			Community Perception	0	2	0.0		
			Recreational Opportunities	2	6	12.0		
			Active Travel Option Improvement	0	6	0.0		
		Economic wellbeing of people and communities	Level of Capital Cost	-2	15	-30.0	-25.0	
			Capital Cost Risk	0	5	0.0		
			Level of Operational Cost	1	5	5.0		
		Maintain and enhance the quality of the environment and improve sustainability outcomes.	Impact on Water Quality during construction	1	5	5.0	5.0	
			Flood Flow Impacts	0	5	0.0		
			Carbon Foorprint Construction and Operation	0	5	0.0		
			Reduction in vehicle trips during operation	1	5	5.0		
			Climate Change Adaptation	-1	5	-5.0		



Appendix C – Relative Cost Information Summary



The relative cost information recorded in the tables below is limited to bridge and pipeline construction rates and does not include other associated costs including design, management, offsite mitigation (ie visual screens), tie in works or legal costs etc. They are not a cost estimate – rather a relative cost comparison.

All information is high level to enable relative option comparisons and not intended for a budget setting purpose.

5.3.1 Underbore at Maitland Street

Summary of relative cost estimate from DC Studios report and GDC Staff Contract Rates:

Item	Quantity	Relative Unit Cost	Relative Cost (\$)
Dual pipeline	1500m	\$834/m (GDC rates)	\$1.3M
Two Drill Shots	1	\$1.5-2M (GDC Rates)	\$1.5-2M
Contingency	30%	\$0.8M	\$0.8M
Total			\$3.6-4.1M

5.3.2 Multi-span Pipe Bridge at Maitland Street

Summary of relative cost estimate from DC Studios report and GDC Staff Contract Rates:

Item	Quantity	Relative Unit Cost	Relative Cost (\$)
Dual pipeline	1500m	\$834/m (GDC rates)	\$1.3M
Pipe Bridge	1	\$1.5-2M (DC Studios)	\$1.5-2M
Contingency	30%	\$0.8M	\$0.8M
Total			\$3.6-4.1M

5.3.3 Multi Span Bridge at Surrey Street (original 2020 location)

Summary of relative cost estimate from DC Studios report and GDC Staff Contract Rates:

Item	Quantity	Relative Unit Cost	Relative Cost (\$)
Dual pipeline	2950m	\$834/m (GDC rates)	\$2.4M
Single Span Bridge	1	\$1.35-1.75M (DC Studios)	\$1.35-1.75M
Ramp Embankment	1	\$1.2-1.6M (DC Studios)	\$1.2-1.6M
Contingency	30% of top range relative cost	30%	\$1.5M
Total			\$6.45-7.25M
Less possible WK funding	59% of bridge + Ramp + 30% contingency	\$2-2.7M	-\$2-2.7M
GDC cost			\$4.45-4.55M

5.3.4 Multi Span Bridge at Rock Street

Summary of relative cost estimate from DC Studios report and GDC Staff Contract Rates:

Item	Quantity	Relative Unit Cost	Relative Cost (\$)
Dual pipeline	3900m	\$834/m (GDC rates)	\$3.2M
Multi Span Bridge	1	\$2.7-\$3.5 (DC Studios)	\$2.7-\$3.5
Contingency	30% of top range relative cost	30%	\$1.8M
Total			\$7.7-8.5M
Less possible WK funding	59% of bridge + 30% contingency.	\$2.1-2.7M	-\$2.1-2.7M
GDC cost			\$5.6-5.8M

5.3.5 Multi Span Bridge at Nelson Street

Summary of relative cost estimate from DC Studios report and GDC Staff Contract Rates:

Item	Quantity	Relative Unit Cost	Relative Cost (\$)
Dual pipeline	3600m	\$834/m (GDC rates)	\$3M
Multi Span Bridge	1	\$3.2-4.2M (DC Studios)	\$3.2-4.2M
Contingency	30% of top range relative cost	30%	\$1.9M
Total			\$8.1-9.1M
Less possible WK funding	59% of bridge + 30% contingency.	\$2.4-3.2M	-\$2.4-3.2M
GDC cost			\$5.7-5.9M

5.3.6 Multi Span Bridge at Halton Street

Summary of relative cost estimate from DC Studios report and GDC Staff Contract Rates:

Item	Quantity	Relative Unit Cost	Relative Cost (\$)
Dual pipeline	3300m	\$834/m (GDC rates)	\$2.7M
Multi Span Bridge	1	\$3.5-4.5M (DC Studios)	\$3.5-4.5M
Contingency	30% of top range relative cost	30%	\$1.9M
Total			\$8.1-9.1M
Less possible WK funding	59% of bridge + 30% contingency.	\$2.7-3.4M	-\$2.7-3.4M
GDC cost			\$5.4-5.7M

5.3.7 Single Span Bridge at Maitland Street

Summary of relative cost estimate from DC Studios report and GDC Staff Contract Rates:

Item	Quantity	Relative Unit Cost	Relative Cost (\$)
Dual pipeline	1500m	\$834/m (GDC rates)	\$1.3M
Single Span Bridge	1	\$3-3.9M (DC Studios)	\$3-3.9M
Ramp Embankments	2	\$1.2-1.6M (DC Studios)	\$2.4-3.2
Contingency	30%	\$2M	\$2M
Total			\$8.7-10M

5.3.8 Multi-Span Bridge with Piers at Maitland Street

Summary of relative cost estimate from DC Studios report and GDC Staff Contract Rates:

Item	Quantity	Relative Unit Cost	Relative Cost (\$)
Dual pipeline	1500m	\$834/m (GDC rates)	\$1.3M
Multi-span Span Bridge	1	\$1.5-1.9M (DC Studios)	\$1.5-1.9M
Ramp Embankments	2	\$1.2-1.6M (DC Studios)	\$2.4-3.2
Contingency	30%	\$1.6M	\$1.6M
Total			\$6.8-8M

5.3.9

5.3.10 Multi-Span Bridge with Piers at Denton Street

Summary of relative cost estimate from DC Studios report and GDC Staff Contract Rates:

Item	Quantity	Relative Unit Cost	Relative Cost (\$)
Dual pipeline	2500m	\$834/m (GDC rates)	\$2M
Multi-span Span Bridge	1	\$1.35-1.75M (DC Studios)	\$1.35-1.75M
Ramp Embankments	2	\$1.2-1.6M (DC Studios)	\$2.4-3.2M
Contingency	30%	\$2.1M	\$2.1M
Total			\$7.6-8.8M

5.3.11 Single-Span Bridge at Denton Street

Summary of relative cost estimate from DC Studios report and GDC Staff Contract Rates:

Item	Quantity	Relative Unit Cost	Relative Cost (\$)
Dual pipeline	2500m	\$834/m (GDC rates)	\$2M
Single Span Bridge	1	\$2.7-3.5M (DC Studios)	\$2.7-3.5M
Ramp Embankments	2	\$1.2-1.6M (DC Studios)	\$2.4-3.2M
Contingency	30%	\$1.6M	\$2.1M
Total			\$9.2-10.8M

5.3.12 Multi-Span Bridge with Piers at Lawrence Street

Summary of relative cost estimate from DC Studios report and GDC Staff Contract Rates:

Item	Quantity	Relative Unit Cost	Relative Cost (\$)
Dual pipeline	2200m	\$834/m (GDC rates)	\$1.8M
Multi-span Span Bridge	1	\$1.5-1.9M (DC Studios)	\$1.5-1.9M
Ramp Embankments	2	\$1.2-1.6M (DC Studios)	\$2.4-3.2
Contingency	30%	\$1.6M	\$1.7M
Total			\$7.4-8.6M

5.3.13 Single-Span Bridge with Piers at Lawrence Street

Summary of relative cost estimate from DC Studios report and GDC Staff Contract Rates:

Item	Quantity	Relative Unit Cost	Relative Cost (\$)
Dual pipeline	2200m	\$834/m (GDC rates)	\$1.8M
Multi-span Span Bridge	1	\$3-3.9M (DC Studios)	\$3-3.9M
Ramp Embankments	2	\$1.2-1.6M (DC Studios)	\$2.4-3.2
Contingency	30%	\$1.6M	\$2.2M
Total			\$9.4-11.1M