Geraldine Community Board Meeting

Commencing at 7pm

on

10 April 2019

Peel Forest Cafe

Peel Forest

Timaru District Council

Notice is hereby given that a meeting of the Geraldine Community Board will be held at the Peel Forest Café, Peel Forest, on Wednesday 10 April 2019, at 7pm.

Local Authorities (Members' Interests) Act 1968

Community Board members are reminded that if you have a pecuniary interest in any item on the agenda, then you must declare this interest and refrain from discussing or voting on this item, and are advised to withdraw from the meeting table.

Bede Carran
Chief Executive

Geraldine Community Board

10 April 2019

Agenda

Geraldine Community Board

for the Meeting of 10 April 2019

Report for Agenda Item No 7

Prepared by **Joanne Brownie**
Council Secretary

Confirmation of Minutes

Minutes of the March 2019 Geraldine Community Board meeting.

Recommendation

That the minutes of the Geraldine Community Board meeting held on 6 March 2019, be confirmed as a true and correct record.

Timaru District Council

Minutes of the Meeting of the Geraldine Community Board, held in the Meeting Room, Geraldine Library / Service Centre, Talbot Street, Geraldine on Wednesday 6 March 2019 at 7.30pm

Present	Wayne O'Donnell (Chairperson), Clr Kerry Stevens, Janene Adams, Jan Finlayson, Jennine Maguire, Jarrod Marsden, and Gavin Oliver
Apologies	Proposed Janene Adams Seconded Jennine Maguire "That the apology from Clr Wills be accepted." Motion carried
In Attendance	Land Transport Manager (Andrew Dixon), Parks Liaison Officer (Gary Foster), Chief Financial Officer (David Codyre) and Environmental Services Group Executive Assistant (Amber Foden)

1. **Identification of Matters of a Minor Nature**

   The Board agreed to discuss the feedback to the NZTA CBD resurface proposal as a matter of a minor nature.

2. **Chairperson's Report**

   The Chairperson reported on meetings he had attended and duties he had carried out on behalf of the Board since the last meeting, including Timaru District Council 3 Waters meeting, Go-Geraldine, Geraldine Vintage Car and Machinery Club, Geraldine Vehicle Trust, Geraldine Licencing Trust, and Geraldine Signs meeting, discussions with Timaru District Council staff regarding Waihi Walkway, Toy Library, and numerous other issues. A letter regarding concern over the state of Waihi Walkway from Esther Paddon was read to the board.
   The Board discussed the possibility of holding a meeting at Orari, this will be considered. The next meeting will be held at Peel Forest.

3. **Confirmation of minutes**

   Proposed Jennine Maguire
   Seconded Gavin Oliver

   "That the minutes of the Geraldine Community Board meeting held on 23 January 2019, be confirmed as a true and correct record."

   Motion Carried

4. **Geraldine Central Business District Street Trees**

The Board considered a report by the Transportation Team Leader seeking the Community Board's approval for the proposed remedial works as part of the Geraldine Central Business District refresh project.

The Community Board approves Timaru District Councils recommendations with no amendments to tree numbers 1 – 18, 20 – 25, and 27 – 29.
The Community Board requests further options and advice from Timaru District Council for tree numbers 19 and 26.
The request from Barkers Property Developers to remove tree numbers 30 and 31 is supported by the Community Board as already outlined in the minute's document from the 14 November 2018 meeting.

Proposed Janene Adams
Seconded Jan Finlayson

"That the Geraldine Community Board approves the CBD street tree treatments including surrounding paver remedial works as detailed in the officer's report, with amendments as follows –

- Tree 19 wishing well, no fence but with use of resin paving
- Tree 26 telephone exchange, tree to remain
- Trees 30 and 31 Barkers development, trees to be removed."

Motion Carried

5. **Geraldine Central Business District Update**

The Board considered a report by the Transportation Team Leader to update the current status of the Geraldine Central Business District (CBD) projects. The Board asked for some theme related images and more advice from experts in order to settle on a theme for the Geraldine CBD - a 'natural environment' theme is favoured.

Proposed Kerry Stevens
Seconded Janene Adams

"That the Geraldine Community Board receives and notes the report."

Motion Carried

6. **Proposed Budget and Annual Plan for the Period 1 July 2019 to 30 June 2020**

The Board was presented a report by the Acting Group Manager Commercial and Strategy to provide the Board an opportunity to give feedback on the proposed budget for the period 1 July 2019 to 30 June 2020. The Chief Financial Officer assured the Board understands that none of the listed budget items have been passed by Council as yet, and will be considered at the next Council meeting.

Proposed	Jennine Maguire
Seconded	Jan Finlayson

"That the Geraldine Community Board strongly supports the upgrade of the Geraldine – Winchester/Coach/Tiplady Intersection Upgrade."

Motion Carried

7. **Consideration of Item of a Minor Nature**

Geraldine CBD Resurfacing

Clr Stevens updated the Board regarding contact from NZTA proposing a plan to resurface Talbot Street, and requesting the Board's feedback.

The Board advised it would be ideal to have the works completed by Easter or perhaps the school holidays, suggested a heavy traffic detour and VMS (variable message signs) on the outskirts of town prior to work commencing. Clr Stevens will provide the Board's feedback and suggestions to NZTA.

8. **Board Members' Reports**

The Board members reported on meetings they had attended and activities they had completed on behalf of the Board including attending the 3 Waters meeting, Geraldine Signs meeting, Go Geraldine, meetings regarding the Waihi Walkway, Talbot Forest meeting, attending and speaking at the opening of the Downs Defibrillator, meeting with Rangitata South Irrigation directors and liaising with Timaru District Council staff on a number of various issues. The Scout Den is considering new heating, and the Arts Council is planning shows coming up soon.

The meeting concluded at 9.26pm.

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Chairperson

Geraldine Community Board

for the Meeting of 10 April 2019

Report for Agenda Item No 8

Prepared by **Andrew Dixon**
Land Transport Manager

Kowhai Stream Access Options

Purpose of Report

1. To outline the options available to improve the level of service in regard to access for Blandswood Road residents on the western side of the Kowhai Stream.

Background

2. The existing Blandswood Road crossing of Kowhai Stream is an at-grade gravel ford adjacent to the Blandswood Settlement as shown on the map (attachment 1). This crossing is currently the sole road access to approximately 9 properties plus a tourist lodge on the western side of the waterway.

3. Due to the large catchment area the water level in the Kowhai Stream can increase very quickly in response to heavy rainfall events, particularly when the catchment is saturated after long wet periods. This high water level prevents vehicles crossing the stream through the ford and there is no alternative access for the properties located on the western side.

4. Anecdotally it is believed that both the frequency and intensity of rainfall events in the catchment is increasing and the number and period of ford closures have also increased as a result of this.

5. The Kowhai Stream has a very dynamic river bed with a high level of aggradation of gravel. This is due to a large landslip in the catchment and is expected to continue long term.

6. Residents have expressed concern about the level of service in accessing their properties and the potential safety risk with periods of isolation. The Geraldine Community Board requested that options be presented to improve access for residents.

7. There are a number of stakeholders involved in the Kowhai Stream and in the proximity of the Blandswood Road ford crossing. These parties are Timaru District Council responsible for the road and ford, Environment Canterbury (ECan) that has an interest in the stream management, Department of Conservation (DOC) that is a significant land owner in the catchment and Blandswood Road residents.

8. As a result of submissions to the 2018-2028 Long Term Plan process a stakeholder meeting was held at the site on 10 December 2018 and issues and potential options were discussed. There was a general understanding of the complexity of the issue and it was agreed that a report would be presented to the Geraldine Community Board.

Options

9. Five options have been considered for the Blandswood Road Crossing of Kowhai Stream, which are listed below:

    - Option A: Enhanced Status Quo. – Rock Weir/Ford Stream Crossing
    - Option B: Multi-Cell Box Culvert
    - Option C: Single Lane Vehicle Bridge
    - Option D: Concrete Ford Option
    - Option E: Pedestrian Access Bridge.

10. These options have been investigated by WSP-Opus Consultants and detailed in the attached report (attachment 2). A summary of the key points of each option and indicative costs (excluding GST) are as follows:

11. Option A – Enhanced Status Quo. The existing gravel ford crossing would be improved with a rock weir which will improve the crossing and provide some stream protection. The advantages and disadvantages of this option are:

Advantages	**Disadvantages**
Low capital cost	No improvement in access for properties on western side with ford being impassable at times due to stream water levels
Low reinstatement cost following major flood events	On-going maintenance costs and response in flood events
Can accommodate changes in river bed levels	Ford continues to be challenging for some vehicles and risk of vehicles getting stuck
No increase in risk of flooding to neighbouring properties	Emergency services access restricted at times

The rough order of cost of this option is $20,000 with on-going maintenance of $6,000 per annum.

12. Option B – Box Culvert. This option involves the installation of a multi-cell box culvert in the stream bed. The culvert would be suitable for vehicles to pass over. The advantages and disadvantages of this option are:

Advantages	Disadvantages
Increased level of service with reliable passage of vehicles across the stream at most times except in extreme weather events.	High Construction cost and similar maintenance costs to Option A
	Risk of blockage with aggradation of gravels and debris. Stream bed level changes would reduce effectiveness
	Increase in risk of flooding and inundation of surrounding properties
	Obtaining a resource consent for this option would likely be problematic and more costly, given possible concerns around performance of a floodable causeway

The rough order of cost of this option is $320,000 with on-going maintenance costs similar to the existing. The design, supervision, resource consent and road approach work is expected to cost a further $120,000. The total indicative project cost is $440,000.

13. Option C – Single Lane Vehicle Bridge. This option involves the construction of a single lane vehicle bridge across the stream. The advantages and disadvantages of this option are:

Advantages	Disadvantages
Increased level of service with reliable passage of vehicles across the stream	Very high construction costs
Less environmental impact on stream	Complex bridge approaches work for vehicles
Can accommodate changes in river bed levels	
No increase in risk of flooding to neighbouring properties	

The rough order of cost of this option is $630,000 for the bridge structure with limited on-going maintenance costs. The design, supervision, resource consent and road approach work is expected to cost a further $150,000. The total indicative project cost is $780,000.

14. Option D – Concrete Ford. This option involves the construction of a new concrete ford in the stream bed. The advantages and disadvantages of this option are:

Advantages	Disadvantages
Some improvement in quality of access for vehicles crossing the stream	Moderate construction costs
No increase in flooding risk to neighbouring land. Less environmental impact on stream	Sensitive to changes in river bed levels
Ford can be reinstated in short timeframe after flood event	More challenging to maintain in keeping clear of aggregate build-up
No increase in risk of flooding to neighbouring properties	Only minimal improvement in level of service as remains impassable during periods of high stream flows. Similar to current situation.

The rough order of cost of this option is $100,000 for the bridge structure with on-going maintenance costs similar to existing. The design, supervision, and resource consent is expected to cost a further $20,000. The total indicative project cost is $120,000.

15. Option E – Pedestrian Access Bridge. This option involves the construction of a new pedestrian bridge across the stream. The advantages and disadvantages of this option are:

Advantages	Disadvantages
Some increase in level of service with reliable passage of people and cycles across the stream	Moderate construction costs
Less environmental impact on stream	Vehicles remain restricted access during periods of high stream flow
Can accommodate changes in river bed levels	
No increase in risk of flooding to neighbouring properties	

The rough order of cost of this option is $150,000 for the bridge structure with on-going maintenance cost. The design, supervision, bridge approach works and resource consent is expected to cost a further $50,000. The total indicative project cost is $200,000.

16. A further option was an alternative stream crossing in a new location. This option was discounted as such access would cross private or DOC land and would require significant roading work to provide access to any alternative site.

Identification of Relevant Legislation, Council Policy and Plans

17. Local Government Act 1974

18. Timaru District Council Long Term Plan 2018-28

Assessment of Significance

19. This matter is not deemed significant under the Council's Significance and Engagement Policy.

Consultation

20. A stakeholder meeting was held in December 2018. Those attending were representatives of residents, Environment Canterbury, Department of Conservation and Timaru District Councillors, Community Board members and officers. If any improvements to the Kowhai stream crossing are to be pursued further consultation will be necessary particularly if a resource consent is required.

Other Considerations

There are no other considerations relevant to this matter.

Funding Implications

21. There is no funding available for any of the improvement options B to E in the current budget or the Draft 2019/20 Annual Plan. Funding would need Council approval or considered as part of the 2020/21 Annual Plan process.

22. It is likely that the proposed options would be eligible for NZ Transport Agency financial assistance. However financial assistance allocations have been set for the period 2018-21 so an additional project would need to require a current equivalent value project to be deferred.

Conclusion

23. Of the crossing options considered within this report, the single lane vehicle bridge provides the greatest benefits in terms of improving resilience and access for road users. The structure would be set well above the level of the stop banks so the flood risk would be low. This option also has high construction costs and involves significant road approaches works. Considering the low level of road users/traffic volume (the best estimate is between 20 and 30 vehicles per day) it would be difficult to justify from a cost perspective.

24. The multi-cell box culvert also provides an improvement to access and resilience for residents on the western side. However the culvert would be vulnerable to blockage and aggradation and would require a high level of maintenance and cost. It is also vulnerable to stream bed changes and is likely to increase the risk of flood water inundation to adjacent land if it becomes blocked. It is considered that these disbenefits outweigh the potential access benefits.

25. The concrete ford provides only some marginal improvement to access but little level of service and resilience improvement. This option is also vulnerable to future stream bed level changes.

26. A pedestrian access bridge provides a moderate improvement in the level of service, flood resilience and emergency access over the current situation, which may be adequate in the context of the small community and would be more justifiable from a cost perspective. The pedestrian bridge would be constructed above the level of the stopbank, and as such would not increase the flood risk.

27. Continuing with a rock ford is the lowest cost option, is the least intrusive and has the lowest impact on flooding risk. However access will continue to be unavailable at times of high rainfall. The closure of the ford can be for a number of days. The ford structure could be improved but the existing level of service issues would need to be accepted if the existing ford was to be retained.

Recommendation

That the Geraldine Community Board provides comments for consideration during the development of the 2021-2031 Draft Long term Plan.

Attachment 1: Blandswood Ford and Peel Forest

22nd March 2019

Adam Ward
Transport Asset Engineer
Timaru District Council
PO Box 522
Timaru 7940

Ref: 6DK411.01/130SC

KOWHAI STREAM FORD OPTIONS ASSESSMENT

Dear Adam,

1 Introduction

The existing Blandswood Road crossing of Kowhai Stream is an at-grade gravel ford adjacent to the Blandswood Settlement. This crossing is currently the sole road access to approximately 8 properties on the western side of the waterway. Timaru District Council (TDC) has engaged WSP Opus to complete an options assessment for a crossing at this site. This report details the site background, an assessment of crossing structure options, and conclusions from the assessment process for TDCs consideration.

2 Background

The ford site is located in the Kowhai Stream (NZTM BY19 582374) and is in an area identified as being a high hazard 'flash flood zone' by Environment Canterbury.

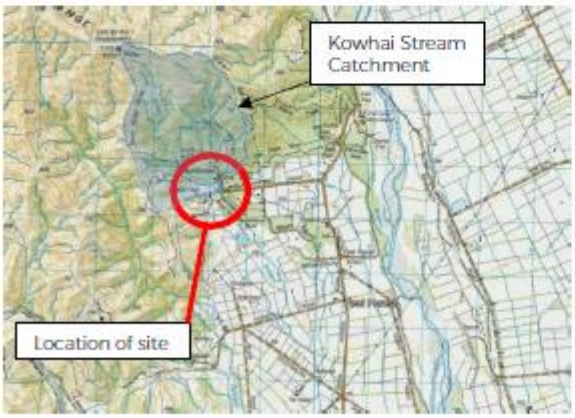


Figure 1: Site Location

Figure 2: Plan view of Site

Flooding in the stream develops very quickly in response to extreme rainfall, particularly when the catchment is saturated after long wet periods. The impacts of flooding at the site can be exacerbated by two main factors:

1. Gravel build-up in the stream bed reducing available waterway area.
2. Debris (i.e. trees) and landslips in the upper catchment blocking the steep narrow channels. These 'dams' can cause a local build-up of water until they suddenly fail releasing large volumes of water and debris, leading to dangerous flash flood conditions.

Figure 3: General view across Ford (Looking at Eastern stopbank) 2018

Figure 4: General view of Ford (Looking Upstream) 2018

Flash flooding was observed on 28th January 1975 where during a high intensity rainfall event in the catchment a series of flood surges, caused by debris/vegetation dams bursting in the upper catchment, inundated the Blandswood settlement destroying and damaging property and causing four fatalities. During this flood event, a footbridge located upstream of the existing ford site was washed away.

In 1982, following further flooding, the South Canterbury Catchment Board completed flood protection works. This included the diversion of the Kowhai Stream upstream of the Blandswood settlement, and the construction of higher stop banks on both the eastern and western banks.

Aggradation of the stream bed contributes to the flood hazard problem by significantly reducing the waterway area and effectiveness of the flood protection works. Between 1985 and 1996 Kowhai Stream had aggraded by up to 3m at the ford location prior to in stream works being carried out to restore waterway area. This is shown in Figure 5 and Figure 6 below where the rock works shown in Figure 5 are fully buried in Figure 6, showing the rate of aggradation that occurred within the channel over an 11-year period.

A timber vehicle bridge was constructed at the ford site in 1975 (after the flood), however the bridge was inundated and damaged during a flood in 1986 and was subsequently removed. This is detailed in the background information provided in Appendix A.

Figure 5: View of site on completion of protection works (1985)

Figure 6: View of site with significant aggradation (1996)

Since this time TDC have maintained an at grade gravel ford at the site to provide vehicle access across the waterway. This requires regular maintenance after high flow events. The extent of maintenance required and time the ford is inaccessible for light vehicle varies annually. For a 12-month period over 2017/18 it is understood that the ford was impassable for 18 days (5% of the year) in total.

Recently, larger service and postal vehicles have refused to use the ford to access the properties on the western side of the stream in all weather and conditions. As the ford has been maintained for the last 30 years in a similar state, it is believed that this is likely related to changes in health and safety policies of the respective service providers, rather than reflecting a deteriorating ford condition. As such, we do not believe this constitutes a reduction in the level of service of the ford.

3 Key Factors Affecting Replacement Options

3.1 Waterway

Kowhai Stream flows from a steep, forested catchment on the south eastern face of Little Mt Peel. The catchment area upstream of the site is approximately 4.5 km^2. Aerial photos show evidence of active slope failures in the upper catchment which, as noted previously, can form obstructions in the catchment's narrow gorges, leading to debris flows and flash flood events.

At the ford site the channel is braided, gravel lined and relatively flat. There is a sharp reduction in stream gradient near the ford site which reduces the bed load transport capacity of the stream, meaning that larger sediment tends to settle in the lower reach of the stream, resulting in the observed aggradation.

An assessment of the hydrology for the site using the Rational Method gave the following discharges at different return period thresholds. An indication of the flood flow depths in the channel have also been calculated using nominal upstream channel parameters.

Table 1: Kowhai Stream Discharge Thresholds

Return Period of Flood Event	Peak Flow (m^3/s)	Open Channel Flow Depth
20 year	27	0.46m
50 year	35	0.54m
100 year	43	0.61m

As shown by the open channel flow column of the above table, flood flows are generally confined to the main channel during high flows, however the existing protection works and channel could be overwhelmed during a 'flash flood'. The frequency of these flash floods is very difficult to predict; however, it is understood that four such events have occurred at Blandswood in the last 250 years.

Flash flood flows are significantly greater, deeper and faster than any typical design level flood and are influenced by debris dam breaches in the catchment as described above and can add lateral demand to the structure from debris rafts and high flow velocities. For context on peak flows, the 1975 event was estimated at 500m^3/sec (>10 times the flow volume calculated for a 1:100-year event) with a depth of 3.5 metres and sufficient velocity to destroy a house (as noted in Appendix A). As such, flash flood flows and the risk associated with this type of event will influence the design of the crossing and will have an impact on construction cost.

3.2 Aggradation

As typical for braided gravel waterway systems, high debris load (transport of coarse alluvium) is expected in flood events. Given the mobile nature of the bed, scour and abrasion damage would be critical for any replacement structure. The level of aggradation at the site has been described in Section 2. As the level of aggradation is high, on-going instream works will be required for any replacement structure to manage flood risks at the site.

3.3 Road Alignment

The vertical alignment of the road, particularly on the eastern approach, is poor. There is a sharp rise as the road meets the stop bank, which obstructs vehicle sight distance. Site intervisibility is better on the western approach to the ford where the approach is on a downhill slope with a clear view across the ford.

As shown in Figure 2, the eastern approach is complicated by the Lookout Road junction. Lookout Road branches north from Blandswood Road where it meets the stopbank. Improving the vertical alignment of Blandswood Road would also require significant work to the Lookout Road alignment. This is further complicated by the private property on the eastern side of Lookout Road, which could constrain geometric improvement of the roadway/intersection alignment without encroachment into this property, and would need to be considered in design, consenting and with the possible need for land acquisition.

4 Options Considered

Five options have been considered for the Blandswood Road Crossing of Kowhai Stream, which are listed below.

Option A: Do Minimum – Rock Weir/Ford Stream Crossing

Option B: Multi-Cell Box Culvert

Option C: Single Lane Vehicle Bridge

Option D: Upgraded Concrete Ford

Option E: Pedestrian Access Bridge

Cost estimates have been prepared for each option. These cost estimates are rough order preliminary estimates, and exclude professional fees, resource consent and building consent fees, contingencies and GST.

4.1 Do Minimum – Rock Weir/Ford Stream Crossing(Option A)

The current approach has been to provide a crossing with a ford constructed of rip rap. This structure acts as a rock weir, spreading out the stream flows to prevent localisation of the channel, helping to maintain the profile of the crossing. Given the dynamic nature of the bed

and channel and the performance of the current stream crossing, continuing to maintain the existing at-grade ford and river protection remains a suitable option for providing a stream crossing. It has been observed that the ford is currently constructed of large rip rap, all of a similar size. The ford could be improved by supplementing the existing rip rap with smaller rocks to improve the size distribution. This would increase the rock interlock, making the ford more robust, and improve the overall running surface and ride quality. The ford has been maintained in a similar way for the past 30+ years, and so costs and performance are well understood. The ford is not a permanent structure, and is flexible to changes in the bed level over time.

Another advantage of this option is that (subject to ongoing stream management) there is no increase in the risk of flooding to the community upstream and to the east of the ford if the current regime is maintained, which is understood to have performed suitably since its implementation. This is significant given the aggressive nature of the catchment, and the likelihood of flash flooding.

The primary disadvantage of maintaining the ford, is that it does not provide any improvement in the level of service for vehicle access at the site, with only a minor improvement in the vehicle running surface if the rock size distribution is improved. The ford would still be subject to periods where it is impassable due to floodwater inundation and degraded service due to flood damage. However, with active management the period for each closure would be minimised by prioritising the deployment of maintenance resources.

Maintaining the existing ford is the most cost-effective option for providing access across the stream. Further to this, a ford can be readily repaired and reinstated following damage from flash flooding or debris flows, which is inexpensive to implement and can be undertaken within a relatively short period.

The cost for reconfiguration of the ford rock would be in the order of $20,000 to complete. TDC have advised that the current level of spending associated with the ford maintenance is roughly $6,000 per annum.

A summary of the relative advantages and disadvantages of this option is listed below:

Advantages

- Minimal capital costs.
- Low cost to reinstate the ford following high flow/flash flood events.
- No increase in the existing flooding risk to the community where channel is maintained.
- Flows drop quickly, and ford can be reinstated in relatively short timeframe.
- Not a permanent structure.
- Rock structure can accommodate changes in bed level.

Disadvantages

- Only minor level of service improvement from existing structure with improvement in rock size distribution.
- Site Intervisibility from east not improved.
- Ford will continue to require periodic flood damage maintenance
- Ongoing risk of vehicles getting stuck in the ford
- Regular unscheduled periods in which the ford is impassable due to floodwaters
- No reduction in annual maintenance costs
- Emergency service access may be restricted for periods of time whilst the ford is impassable

4.2 Multi-Cell Box Culvert (Option B)

A Multi-Cell Box Culvert would comprise a five-cell reinforced concrete box culvert, constructed of 3.0m x 2.5m reinforced concrete box culvert units extending across the full width of the channel on the alignment of the existing ford, similar to the example shown in Figure 9, below. The structure would be constructed at or below the level of the existing stop banks, requiring no significant roadway realignment or tie-in works.

The new structure would have a waterway area of 30m^2, capable of readily passing about a 100-year return period flood and operating as a floodable causeway in higher flow or flash flood events. With a depth of 2.5m, the box culverts would allow clearance for a small excavator to remove flood debris and aggregate. Cut off walls, wingwalls and a concrete apron would be constructed at the upstream and downstream extents of the culvert to protect the structure from undermining and scour. The new structure would have a trafficable width between kerbs of 3.5 m (two barrels wide with a 400mm stitch joint), with timber kerbs to provide wheel stoppage.

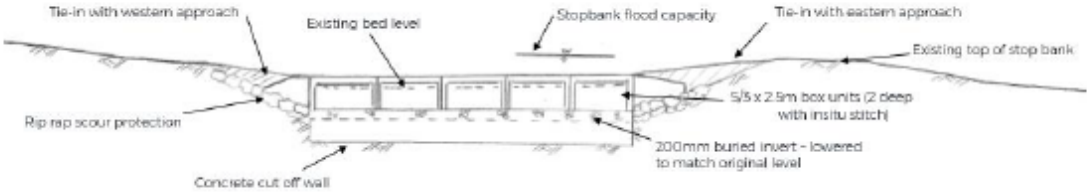


Figure 7: Sketch Long Section on crossing showing indicative Multi Cell Box Culvert

Though this type of structure would initially provide an improvement in the level of service to road users, aggradation and debris blockage may become problematic for its capacity to accommodate flood flows, requiring extensive regular maintenance. This may be difficult to complete due to machine clearance requirements. Reduced capacity may also cause a flooding backwater effect, impacting the performance of the stopbanks and increasing flooding risks. Without appropriate maintenance, the structure would eventually become inundated by gravels further impacting on flood performance.

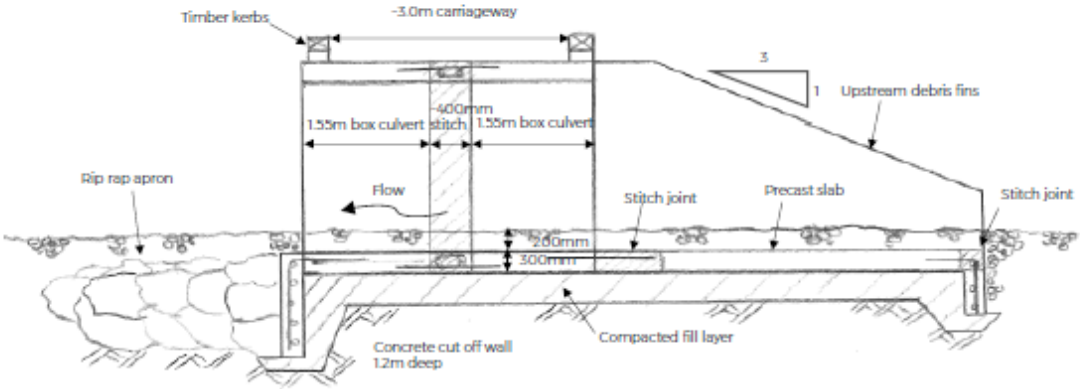


Figure 8: Sketch cross section showing indicative Multicell culvert details

It is also noted, that though the waterway is currently aggrading, there may be a period where degradation of the bed occurs. As the level of the structure is fixed, bed degradation may lead to the structure becoming perched above the bed, leading to issues with structure stability. Additionally, the channel may require clearance prior to construction to allow the box units to be installed at the original channel bed level, as invert level of the structure locks in the bed level and future flood performance.

The Rough Order Cost (ROC) to construct a multi-cell culvert structure would be in the order of $320,000.

A summary of the relative advantages and disadvantages of this option is listed below:

Advantages

- Capable of HN-72 legal highway loading.
- Increased level of service to traffic.
- Low level crossing avoids significant approach tie-in works.
- Remove ford maintenance requirement, but stream bed and flood capacity management remains.

Disadvantages

- High construction cost.
- Similar maintenance costs to ford.
- Potential for blockage from debris and aggradation.
- Potential for increased damage from inundation during flash flood events.
- Open structure, but more impact on waterway than a bridge option.
- Bed level may change if degradation occurs, leading to a perched structure (unlikely).
- Obtaining a resource consent for this option would likely be problematic and more costly, given possible concerns around performance of a floodable causeway.
- May lead to requirement to increase height of stopbank to offset loss of channel capacity, increasing scope of works.

Figure 9: Example of Multicell Box Culvert

4.3 Single Lane Vehicle Bridge (Option C)

A bridge option at this site would comprise a two span, single lane bridge spanning approximately 32m, constructed of precast concrete deck units. The bridge would have a piled

central pier and piled spill through abutments. The bridge soffit would be positioned 1.0-1.2m above the level of the existing stop banks. A new bridge would have a 100-year design life and provide a sufficient clearance for stream maintenance, nominally 2.5-3.0m above the current bed level, giving it some resilience against surge flows and capacity to pass a 100-year return period flood with appropriate freeboard. The new structure would have a trafficable width between kerbs of 3.2 m, with timber handrails constructed to provide fall restraint.

To provide an appropriate transition to the raised structure and adequate site intervisibility, the alignment of Blandswood Road and Lookout Road would need to be altered significantly as described in section 3 above, and as indicated in Figure 10 below. Alternatively, a steep ramp off the structure could be provided, however this would further reduce site intervisibility from the current ford, and possibly increase vehicle conflicts though it is noted that this is likely to be relatively infrequent with the low traffic volume in the area.

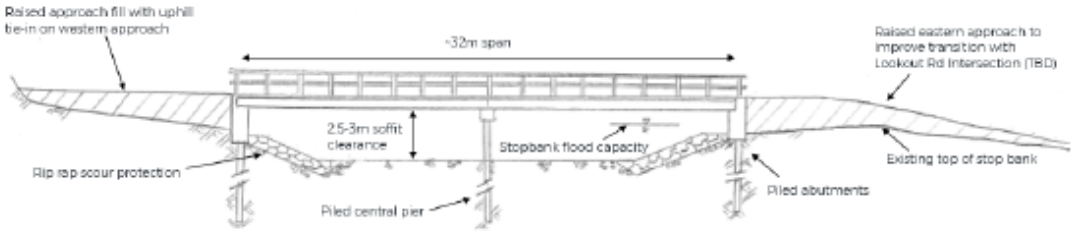


Figure 10: Sketch Long Section on crossing showing proposed Vehicle Bridge

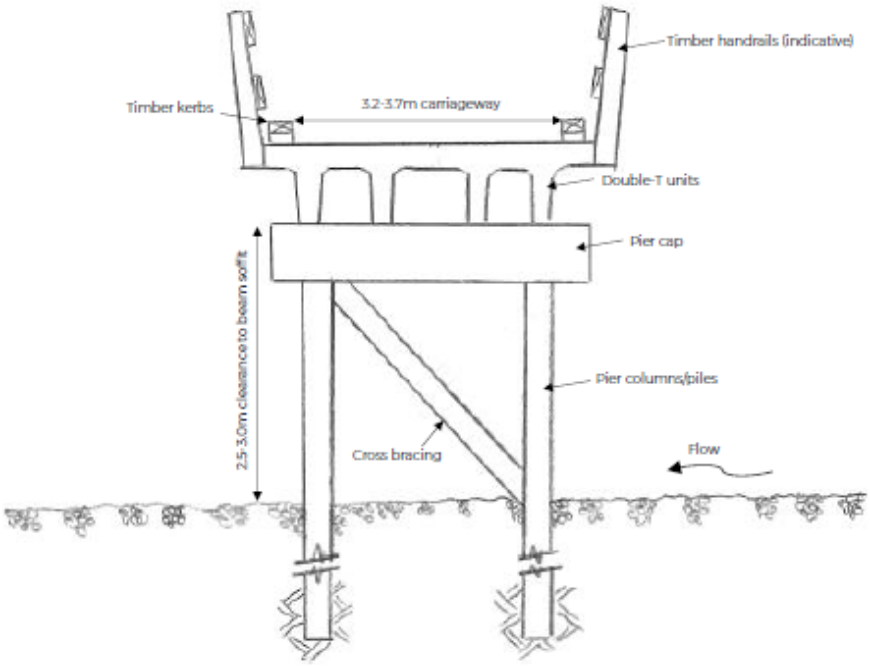


Figure 11: Sketch Cross Section showing indicative Single Lane Bridge details (at midspan)

The bridge option would still require regular in-stream works to maintain the flood protection measures and bed aggradation. The Rough Order Cost (ROC) for constructing a new bridge is in the order of $630,000, including a nominal estimate for road re-alignment costs. As noted above, this option still requires on-going management of the bed to maintain flood capacity and protection. Stream aggradation clearance needs to be undertaken periodically, likely every 2-5 years or following events. It is anticipated the cost this maintenance would be no more expensive

than the current regime, nominally estimated to be in the order of $6,000 per annum, however a reduction would be expected with ford maintenance no longer required.

A summary of the relative advantages and disadvantages of this option is listed below:

Advantages

- Capable of HN-72 legal highway loading
- Increase in level of service for road users
- Reduced potential for blockage compared with a multi-cell culvert alternative.
- No significant change to flooding risk profile for upstream community.
- Increased access and flood resilience.
- Obtaining Resource Consent for this option would likely be less problematic as the bridge would be able to accommodate bed level changes.
- Less environmental disturbance during construction and in service in comparison to culvert option.
- Reduced stream maintenance to just periodically addressing aggradation for maintaining waterway flood capacity.
- Open waterway and capacity for flash floods and debris flows, with significantly reduced potential for damage and impact on flood performance.

Disadvantages

- High Construction Costs.
- Complex and extensive approach works to the north and east, with associated impact on private property (not fully assessed at this time).
- Potential for vehicle conflicts on the eastern approach with constrained site intervisibility, which would need to be resolved through design.

Figure 12: Example of Single Lane Vehicle Bridge

4.4 Upgraded Concrete Ford (Option D)

An upgraded concrete ford would comprise a 3.6m wide reinforced concrete slab, nominally 200mm thick, keyed into the stream bed with upstream and downstream cut-off walls. The ford would span across the channel and run part way up the stop banks, with an approximate length of 35m. This option would continue to use the existing road alignment, as works would be localised within the bed.

Figure 13: An example ford following final construction

Figure 14: View of same ford approximately 6 months after construction, showing gravels accumulating on running surface

The concrete ford would perform similarly to the current gravel ford in flood conditions, operating as an open channel. The concrete ford would provide an improvement in the running surface across the waterway, however as with the gravel ford it would be unserviceable for a time following debris flows and aggradation, with gravel and debris requiring clearance from the running surface. As such, the costs associated with maintaining the ford would be relatively similar to the existing maintenance regime. As with the existing ford, this option would not increase the risk from flooding to the community upstream and to the east of the ford as the current regime is maintained.

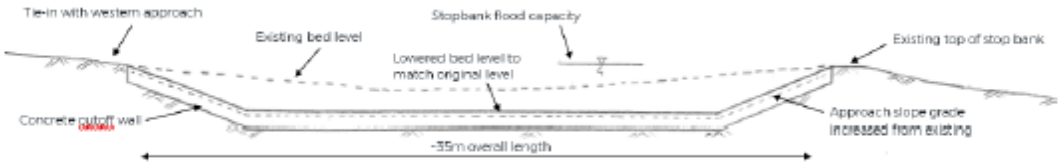


Figure 15: Sketch Long section on crossing showing indicative concrete ford option

As with the multi-cell culvert, constructing a concrete ford requires a stable bed level to remain serviceable. If the bed aggrades, as is currently occurring, regular maintenance is required to ensure that the ford does not become inundated and unserviceable. However, if in the future the bed begins to degrade, the structure may be undermined by flows and could become perched above the bed, leading to a loss of foundation and possible structural issues.

A concrete ford also locks in the level of the bed, and the flood performance of the channel, therefore it would likely need to be constructed at a depth below the current bed level and the channel cleared of aggraded materials to restore the original channel profile for this solution to be practical. It is noted that lowering the bed level would introduce geometric issues with the approaches from the stop banks.

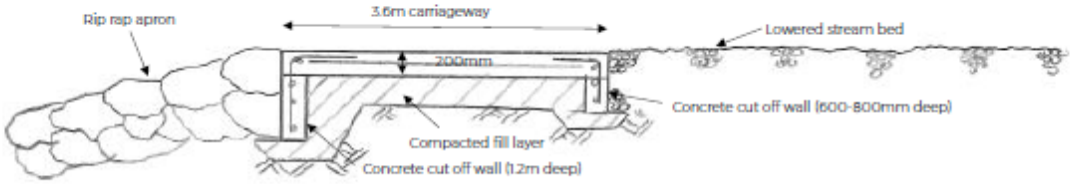


Figure 16: Sketch Cross section of concrete ford showing indicative details

The Rough Order Cost (ROC) for constructing a concrete ford is in the order of $100,000. As noted above, this option still requires on-going management, similar to the current regime and is nominally estimated to be in the order of $6,000 per annum. A summary of the relative advantages and disadvantages of this option is listed below:

Advantages

- Low cost to reinstate the ford following high flow/ flash flood events.
- No increase in the existing flooding risk to the community where channel is maintained.
- Flows drop quickly, and ford can be reinstated in relatively short timeframe.
- Avoids channelization of stream flows, impacting on ford running surface.
- Improvement to running surface provided bed is maintained.

Disadvantages

- Moderate capital costs.
- Fixes level for maintaining bed and channel moving forward (forced maintenance to remain serviceable).
- Only moderate level of service improvement from existing structure.
- No significant reduction in annual maintenance costs expected, with possible cost reductions associated with lower flow events as surface more easily reinstated.
- Site intervisibility from east not improved.
- Ford will continue to require periodic flood damage maintenance
- Ongoing risk of vehicles getting stuck in the ford following larger events with aggradation.

- Risk of ford becoming perched if bed degrades in future.
- Obtaining a resource consent for this option would likely be problematic and more costly, given possible concerns around future bed movement, flood protection and environmental considerations.
- Regular unscheduled periods in which the ford is impassable due to floodwaters
- Emergency service access may be restricted for periods of time whilst the ford is impassable

4.5 Pedestrian Access Bridge (Option E)

A pedestrian access bridge at this site would likely take the form of a multi-span (likely two or three span) structure with piled central piers providing a foundation resilient to debris raft loading. The structure could take several forms, however a lightweight steel superstructure with a timber deck and handrails would be a suitable and relatively cost-effective option for the site. Due to the limited space available on the true right bank on the downstream side of the existing ford, the bridge would be best positioned upstream of the existing ford. The structure could be detailed to allow quad bike traffic, with approach ramps constructed on the stop bank to enable access.

A single span truss structure could be considered as an alternative to a multi-span structure. The option to construct a suspension bridge at this site has been suggested. This option requires a relatively large footprint due to the requirement for suspension cable anchorage off the structure and, given the site constraints would likely be challenging to accommodate.

The bridge soffit would be set at a level approximately 1.0-1.5m above the top of the stopbanks to avoid flood risks and allow clearance for debris and stream bed maintenance. The structure would have a ramped pedestrian approach to the top of the bank, with minor works to create pedestrian paths along the top of the bank would also be required.

Figure 17: Example of lightweight steel superstructure (single span shown)

Figure 18: Recently Constructed pedestrian suspension bridge (Centennial Park)

This option would continue to utilise the existing at-grade ford for providing vehicle access to the true right bank. As such, the existing ford and stream aggradation management would still be required. While this bridge would provide access for pedestrians (or quad bikes) when the stream is in high flow and while the ford is unserviceable to vehicles, it is expected that use under these

conditions would be relatively limited. Importantly, it is noted that a pedestrian structure does not improve vehicle access, as such this would alleviate not service provider access issues currently experienced, however it would allow some level of emergency service access during high water conditions.

The rough order cost estimate for a pedestrian bridge would be in the order of $150,000, with existing annual costs to maintain the ford and stream the same as the current regime at approximately $6,000 per annum.

A summary of the relative advantages and disadvantages of this option is listed below:

Advantages

- Moderately improved flood resilience by providing pedestrian access, particularly during high water periods.
- Some level of emergency access across the waterway during high flows.
- No change to flooding risk profile for upstream community.

Disadvantages

- Moderate Construction Costs.
- No increase in level of service for road users providing pedestrian access only (possibly quad bikes also).
- Ford and bed maintenance costs remain the same.

5 Summary & Conclusions

Of the crossing options considered within this report, the single lane vehicle bridge provides the greatest benefits in terms of improving resilience and access for road users. As the soffit of the structure would be set well above the level of the stop banks, the impact on the community flood risk would be low (provided appropriate bed management is carried out). However, this option would require significant road realignment works, which would likely be intrusive and constrained. This option also has high construction costs (ROC $630,000) and considering the low level of road users/traffic volume, would be difficult to justify from a cost perspective.

The multi-cell box culvert (ROC $320,000) and concrete ford (ROC $100,000) options both provide an improvement in the running surface for road users and may alleviate some of the concerns around road service levels, however the benefits of these options are far outweighed by the disbenefits. While the culvert option provides a raised running surface and has capacity to pass flood flows at a similar level to the current channel, the multicell culvert would be vulnerable to blockage and aggradation. This would require regular maintenance to ensure capacity, as flood risk would increase if not actively managed. The concrete ford would also improve the running surface when clear of aggregates, however, it provides limited service and resilience improvements in comparison with the existing ford for a comparatively high cost and little change in maintenance requirements. Both of these options also require a stable bed level, as they lock in the level of the bed at time of construction, and would be vulnerable if degradation of the stream bed were to occur in future.

A pedestrian access bridge (ROC $150,000) does not improve the level of service for road traffic, however it does offer a moderate improvement in the level of service, flood resilience and emergency access over the current scenario (rock weir/ford), which would seem adequate in the context of the small community and would be more justifiable from a cost perspective. The pedestrian bridge would be constructed with its soffit above the level of the stopbank, and as such would not increase the flood risk, assuming appropriate stream bed management is carried out.

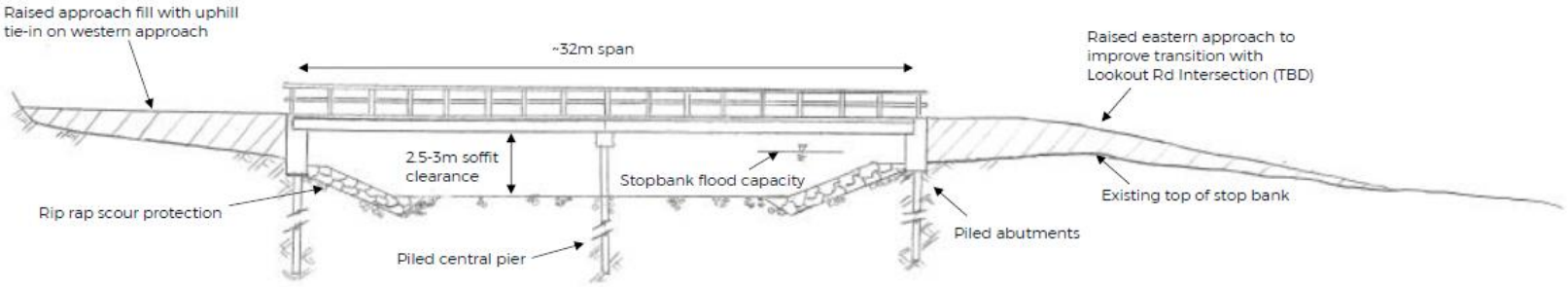
Continuing with a rock ford is the lowest cost option, is the least intrusive and has the lowest impact on flooding risk. The ford structure could be improved by incorporating smaller sized rock to improve the grading and the interlock for a minimal cost (ROC $20,000), and with an appropriate maintenance regime the existing ford can provide adequate access under normal

conditions, and the period for reduced service can be managed with prioritised response following high flows and flood events. However, the existing flood resilience, emergency service access and level of service issues would need to be accepted if the existing ford were to be retained.

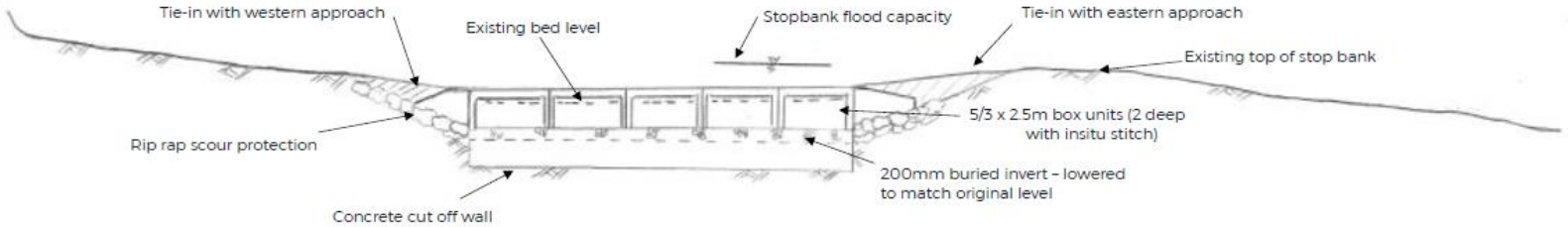
Should TDC need any further information or support in consideration of the options for the stream crossing please do not hesitate to contact us.

Regards

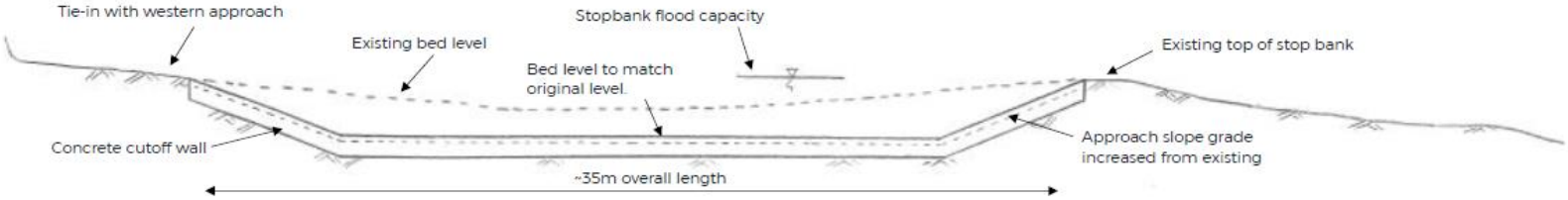
Ben Baty
Senior Bridge & Civil Structures Engineer



Option C: Single Lane Vehicle Bridge



Option B: Multi Cell Box Culvert



Option D: Concrete Ford

Geraldine Community Board

for the Meeting of 10 April 2019

Report for Agenda Item No 13

Exclusion of the Public

Recommendation

That the Board resolves to exclude the public on the grounds contained in Section 48(1) of the Local Government Official Information and Meetings Act:

Confirmation of Minutes

Clause	LGOIMA wording	Plain English reason
Section 7(2)(b)(ii)	To protect information where the making available of the information would be likely unreasonably to prejudice the commercial position of the person who supplied, or who was the subject of, the information.	Commercial sensitivity
Section 7(2)(i)	The withholding of the information is necessary to enable the Council to carry out, without prejudice or disadvantage, negotiations (including commercial and industrial negotiations)	To enable commercial or industrial negotiations