

SH 73 Candys to Rock Shelter SMA

Major Impact Works Framework



Figure 1 Aerial view of Candys to Rock Shelter renewal site

West Coast Network Outcomes Contract-
63147

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SH 73 Candys to Rock Shelter SMA

Otira Gorge SH 73 Stone Mastic Asphalt Renewal 2023/24

The purpose of this document is to communicate the proposed work in accordance with Waka Kotahi Management of Major Impact Works Framework. This proposal is to deliver the renewal under a full closure. This will enable this work to be completed safely and efficiently. The team genuinely believes that this is the best option for everyone involved.

The Management of Major Impact Works Framework checklist lays out the documents to be supplied in support of any Major Impact Works as this work is considered appropriate to be delivered in accordance with this framework.

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Proposed Works

Through the forward work program and NLTP process this site has been identified for renewal due to it being at end of life.

Location: 073-0151 – 3118 to 3460

Treatment Lengths: Candy's Creek Bridge – Rock shelter – Propped Half Bridge

Pavement Treatment: 55mm AC14 - 185 tonnes

Surfacing Treatment: 50mm SMA10 - 321 tonnes

Proposed Dates: 22 January – 01 February.

Site Details

The site is located on State Highway 73 west of Arthur Pass between 'Candys Creek Bridge' and 'Rock Shelter' in the Otira Gorge. This is a steep alpine environment, with a longitudinal gradient of up to 16%. There is a rock face on the true right and a cliff down to the river on the true left. The average sealed width through this section is 8m and at the narrowest point it is 7.6m. There is no shoulder and the work is between two fixed points, (guard rail and rock face)



Figure 2-Typical site photo

Decision Making

The existing pavement was constructed in 2001 and was last resurfaced with asphalt in February 2014. This asphalt is now 9 years old and is currently 1 year beyond need of replacement. The new SMA surface has been designed to better deal with the stress and strain of heavy commercial vehicles ascending and descending the 16% gradient, with an expected life of 12 to 15 years, compared to the existing surface performance of 9 years. The SMA surface is expected to provide better skid resistance throughout its life, improving vehicle safety and reducing the need for other maintenance interventions through its life.

The road formation is cut into a rock face and traverses several structures. The Otira river is around a 60m vertical drop below. There are active rockfall sites throughout the renewal section, with regular rock falls recorded. While there are geotechnical controls to mitigate some of this risk., these are not effective at managing the risk to an acceptable level while staff are working in the area (in situ for longer periods).

It was initially proposed complete a lane-by-lane treatment with a joint on the centreline with single lane traffic management. Technical review of this methodology determined that this was not practicable, as due to the width constraints of the site it is not possible to undertake the surfacing while maintaining CoPTTM compliant single lane TTM, or more importantly, to provide a safe working site for staff. For reference Figure 3 below illustrates what a single lane operation would look like, clearly showing the space limitations.

Following this assessment, alternative delivery methodologies have been assessed.

A full road closure was requested for the 22/23 construction season. This was not approved by Waka Kotahi, as it was considered there was insufficient time for adequate consultation and notification of the closure, among other things.

Since then, the team have reassessed delivery options and undertaken limited stakeholder engagement to allow them to provide a considered methodology.

Significant optioneering has been done and several iterations of work and program options have been considered. Alternative plant options, alternative resources and alternative treatments have all been worked through. With a single lane option being discounted this leaves the only option to undertake the work through some sort of closure. While these are not all included in this document, we consider the selected plant and program to be the most effective way to deliver the work in a safe and timely manner, while providing for the best quality outcome at the lowest financial risk to all parties, and the lowest lifecycle cost.

The key decision making is now around what this closure will look like to complete the work. At the forefront of this we must ensure everyone goes home safely at the end of each day's work.

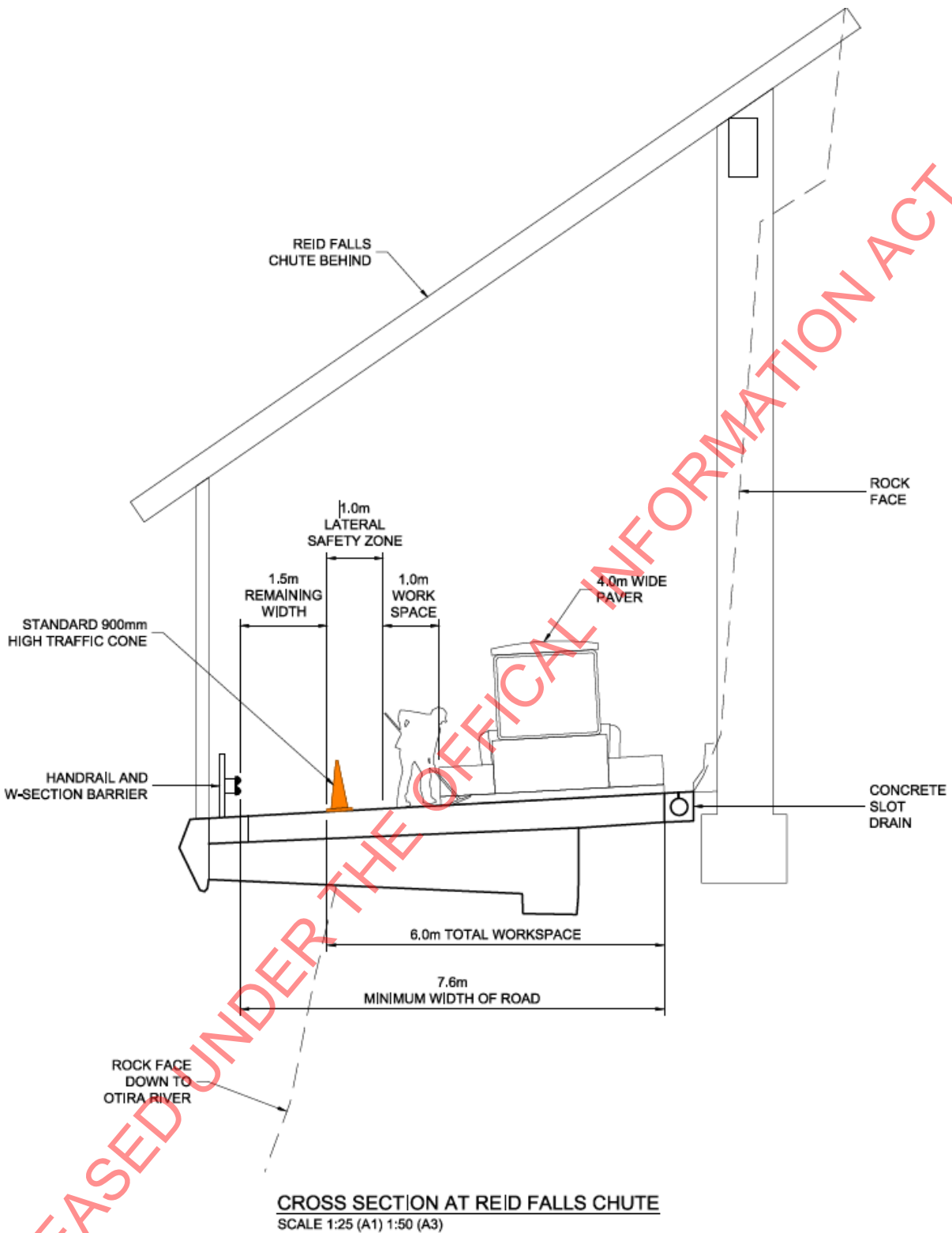


Figure 3 - Typical Cross Section



Figure 4 – Rockfall onsite

Night Closures

Night closures were initially considered but were completely ruled out for the following reasons:

- **Staff Safety:** There is insufficient space to set up adequate lighting to complete the work. There is a known rockfall risk and this cannot be managed during the hours of darkness as they cannot be seen by a spotter.
- **Low overnight temperatures due to the alpine environment:** These low overnight temperatures will affect the compaction of the asphalt and result in long-term durability issues in the surfacing,

While the quality aspect is important to consider safety must come first.

Short Duration Day Time Closures

A range of short duration day closures were considered. These were discounted for the following reasons:

- **Ability to provide safe passage through the site.** There is a high risk of loss of traction, particularly for heavy vehicles (trucks and busses) traversing a 16% gradient on unbound granular pavement. The transition across the milled edge will be upto 105mm, and would require ramps that may be difficult for some vehicles to traverse.

- Due to the size of the equipment and the physical constraints of the site, plant effectively needs to be stationary for each opening, which results in significant inefficiencies, leading to a significantly longer program, increased staff welfare concerns and increased project costs.

Full Day Time Closures

This is the preferred option. It is substantially more productive than the next alternative option and is the most efficient use of resources. It provides for the work to be completed in a minimum time of 6 days physical work and with allowance of 3 days float (weather and/or other delays) the total program of work is 9 days.

The proposed closure is between 9am and 5pm Monday to Friday for up to two weeks. It is intended that the road will be fully open with limited traffic management daily between 5pm and 9am the next day.

The work is tentatively programmed for January 2024.

While the work onsite will be carried out over 8 hours per day, the majority of staff will be working 14-hour days to deliver this work. To manage fatigue and staff safety and ensure compliance with legislation (Land Transport Rule: Work Time and Logbooks 2007) the program is to be completed over a two-week period, with the required minimum of 24 hours break in the middle.

This site is known to have significant geotechnical hazards. These cannot be eliminated, only minimised, and reducing the exposure time by minimising the duration of the program on site is one way to reduce the risk of rockfall to our team.

Following stakeholder feedback, the opening and closing times could be amended to accommodate the needs of some key stakeholders, e.g. 10am to 6pm to accommodate Tranz Alpine and associated coach tours. This amended timing would still be within daylight hours and would not significant alter quality risk profile or staff safety management.

Stakeholder Support

The NOC team completed preliminary engagement with a number of key stakeholders to test the impact of the proposed methodology. Initial feedback from these stakeholder's is that completing the work program with short closures over several weeks would be much more disruptive to them and having a **short and sharp program with full closures is the preferred option**. Refer to stakeholder section for further details.

Methodology

The renewal of the surfacing in the Otira gorge has been designed to ensure the stresses of the site are managed and transferred onto the structures and pavement below. The details of the design can be found in the Surfacing Options Memo dated 15/06/2022.

Due to the nature of the site (a rock cutting through the Otira gorge) there are several constraints to work with, including the interaction with multiple structures.

A mill and replace methodology will be implemented on this site as opposed to a straight overlay. This will ensure dead loadings on structures are not exceeded. Existing guard rails will maintain the same level of compliance. Existing drainage structures will remain functional, and the overhead clearances are maintained to the same level of service.

Where granular pavement exists the design treatment requires the surfacing to be removed down to 105mm below the existing surface level. Where concrete decks exist, the existing asphalt will be removed to deck level.

Milling will be undertaken in transverse sections no longer than can be reinstated to a sealed surface in a single shift. This will provide for a trafficable surface, partially on asphalt and partially on concrete bridge decks, at the end of each shift. This methodology will ensure the number of ramps is kept to a minimum in between closure times and the traveling public will not be exposed to a granular surface.

Each day following the mill and fill work, temporary asphalt ramps will be installed to manage the ~50mm transition between the structural layer and existing un-milled surfacing.

Following this, the traffic management will be altered to unattend and the crew will disestablish from site before opening the road to the public. The work will progress in this way for 4 shifts.

The final paving of SMA surfacing will be undertaken once the structural pavement layers are complete. The intent is to undertake this in one shift using two pavers. This will require twice as many trucks from the asphalt plant to supply them, and the logistics of on-site plant management are still to be finalised. This method will provide for one homogeneous surfacing treatment and will provide for the longest life expectancy, due to no cold joints.

Following the final surfacing the road will be line marked, traffic management will be removed, and the road will be returned to the public.

Program of Work

A comprehensive program of the work is attached below showing the total proposed duration of work, including float, is 270 hours.

The key dates are 22/01/2023—01/02/2023 inclusive.

The programme is based on a road closure of 8-hours from 09:00-17:00. It should be noted that this is a draft program and some minor alterations may occur.

The closure period will only be used for activities requiring full road closure, e.g. if all milling, paving, compaction and cooling is complete for the day, the road will be opened. Activities not requiring road closure, e.g. line marking will be completed with activity specific TM where not occurring concurrently with other activities.

An alternative program has been completed showing the program effects of the short duration day time closures. In this example, the program extends from 270 hours to around 600 hours. This is due to increase in overhead time.

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ID	Task Name	Duration	Start	Finish	Predecessors	February 2024													
						22 Jan '24										29 Jan '24			
						M	T	W	T	F	S	S	M	T	W	T	F		
1	Otira Gorge SAC Paving	273.63 hrs	Mon 22/01/24	Fri 2/02/24		[Gantt bar spanning from Mon 22/01/24 to Fri 2/02/24]													
2	Shift 1	11 hrs	Mon 22/01/24	Mon 22/01/24		[Gantt bar for Shift 1]													
3	Traffic Management	0.75 hrs	Mon 22/01/24	Mon 22/01/24		[Gantt bar for Traffic Management]													
4	Road Closure	0.5 hrs	Mon 22/01/24	Mon 22/01/24	3	[Gantt bar for Road Closure]													
5	Inspect with Radar	1 hr	Mon 22/01/24	Mon 22/01/24	4SS	[Gantt bar for Inspect with Radar]													
6	Milling under rock shelter down to deep lift	4 hrs	Mon 22/01/24	Mon 22/01/24		[Gantt bar for Milling under rock shelter]													
7	Paving deep lift and leveling	5.5 hrs	Mon 22/01/24	Mon 22/01/24	6SS	[Gantt bar for Paving deep lift]													
8	Site made Safe Closure opening	0.67 hrs	Mon 22/01/24	Mon 22/01/24	7	[Gantt bar for Site made Safe Closure opening]													
9	Traffic Management	0.83 hrs	Mon 22/01/24	Mon 22/01/24	8SS	[Gantt bar for Traffic Management]													
10	Shift 2	11 hrs	Tue 23/01/24	Tue 23/01/24	2	[Gantt bar for Shift 2]													
11	Traffic Management Set Up	0.75 hrs	Tue 23/01/24	Tue 23/01/24		[Gantt bar for Traffic Management Set Up]													
12	Road Closure	0.5 hrs	Tue 23/01/24	Tue 23/01/24	11	[Gantt bar for Road Closure]													
13	Milling to bridge & mill deep lift around bridge deck	4.25 hrs	Tue 23/01/24	Tue 23/01/24	12SS	[Gantt bar for Milling to bridge]													
14	Paving deep lift and leveling	5.5 hrs	Tue 23/01/24	Tue 23/01/24	13SS	[Gantt bar for Paving deep lift]													
15	Site made Safe Closure opening	0.67 hrs	Tue 23/01/24	Tue 23/01/24	14	[Gantt bar for Site made Safe Closure opening]													
16	Traffic management	0.83 hrs	Tue 23/01/24	Tue 23/01/24	15	[Gantt bar for Traffic management]													
17	Shift 3	11 hrs	Wed 24/01/24	Wed 24/01/24	10	[Gantt bar for Shift 3]													
18	Traffic Managemet	0.75 hrs	Wed 24/01/24	Wed 24/01/24		[Gantt bar for Traffic Managemet]													
19	Road Closure	0.5 hrs	Wed 24/01/24	Wed 24/01/24	18	[Gantt bar for Road Closure]													
20	Milling to deep lift	4.25 hrs	Wed 24/01/24	Wed 24/01/24	19	[Gantt bar for Milling to deep lift]													
21	Paving deep lift and leveling	5.5 hrs	Wed 24/01/24	Wed 24/01/24	20SS	[Gantt bar for Paving deep lift]													
22	Site made Safe Closure opening	0.67 hrs	Wed 24/01/24	Wed 24/01/24	21	[Gantt bar for Site made Safe Closure opening]													
23	Traffic management	0.83 hrs	Wed 24/01/24	Wed 24/01/24	22	[Gantt bar for Traffic management]													
24	Shift 4	11 hrs	Thu 25/01/24	Thu 25/01/24	17	[Gantt bar for Shift 4]													
25	Traffic Managemet	0.75 hrs	Thu 25/01/24	Thu 25/01/24		[Gantt bar for Traffic Managemet]													
26	Road Closure	0.5 hrs	Thu 25/01/24	Thu 25/01/24	25	[Gantt bar for Road Closure]													
27	Milling to bridge & mill deep lift around bridge de	4.25 hrs	Thu 25/01/24	Thu 25/01/24	26	[Gantt bar for Milling to bridge]													
28	Paving deep lift and leveling	5.5 hrs	Thu 25/01/24	Thu 25/01/24		[Gantt bar for Paving deep lift]													
29	Site made Safe Closure opening	0.67 hrs	Thu 25/01/24	Thu 25/01/24	28	[Gantt bar for Site made Safe Closure opening]													
30	Traffic management	0.83 hrs	Thu 25/01/24	Thu 25/01/24	29	[Gantt bar for Traffic management]													
31	Shift 5 Float	11 hrs	Fri 26/01/24	Fri 26/01/24	24	[Gantt bar for Shift 5 Float]													
32	Traffic Managemet	0.75 hrs	Fri 26/01/24	Fri 26/01/24		[Gantt bar for Traffic Managemet]													
33	Road Closure	0.5 hrs	Fri 26/01/24	Fri 26/01/24	32	[Gantt bar for Road Closure]													
34	Milling to deep lift	4.25 hrs	Fri 26/01/24	Fri 26/01/24	33	[Gantt bar for Milling to deep lift]													
35	Paving deep lift and leveling	5.5 hrs	Fri 26/01/24	Fri 26/01/24		[Gantt bar for Paving deep lift]													
36	Site made Safe Closure opening	0.67 hrs	Fri 26/01/24	Fri 26/01/24	35	[Gantt bar for Site made Safe Closure opening]													
37	Traffic management	0.83 hrs	Fri 26/01/24	Fri 26/01/24	36	[Gantt bar for Traffic management]													

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						22 Jan '24										29 Jan '24			
						M	T	W	T	F	S	S	M	T	W	T	F		
38	SMA Shift 1	11 hrs	Mon 29/01/24	Mon 29/01/24	31														
39	Traffic Managemet	0.75 hrs	Mon 29/01/24	Mon 29/01/24															
40	Road Closure	0.5 hrs	Mon 29/01/24	Mon 29/01/24	39														
41	Paving SMA	8.25 hrs	Mon 29/01/24	Mon 29/01/24	40														
42	Road Closure	0.67 hrs	Mon 29/01/24	Mon 29/01/24	41														
43	Traffic management	0.83 hrs	Mon 29/01/24	Mon 29/01/24	42														
44	Sma Shift 2	11 hrs	Tue 30/01/24	Tue 30/01/24	38														
45	Traffic Managemet	0.75 hrs	Tue 30/01/24	Tue 30/01/24															
46	Road Closure	0.5 hrs	Tue 30/01/24	Tue 30/01/24	45														
47	Paving SMA	8.25 hrs	Tue 30/01/24	Tue 30/01/24	46														
48	Road Closure	0.67 hrs	Tue 30/01/24	Tue 30/01/24	47														
49	Traffic management	0.83 hrs	Tue 30/01/24	Tue 30/01/24	48														
50	SMA Shift 3	11 hrs	Wed 31/01/24	Wed 31/01/24	44														
51	Traffic Managemet	0.75 hrs	Wed 31/01/24	Wed 31/01/24															
52	Road Closure	0.5 hrs	Wed 31/01/24	Wed 31/01/24	51														
53	Paving SMA	7 hrs	Wed 31/01/24	Wed 31/01/24	52														
54	Line Marking	1.25 hrs	Wed 31/01/24	Wed 31/01/24	53														
55	Road Closure	0.67 hrs	Wed 31/01/24	Wed 31/01/24	54														
56	Traffic management	0.83 hrs	Wed 31/01/24	Wed 31/01/24	55														
57	Float For Weather	9 hrs	Thu 1/02/24	Thu 1/02/24	56														
58	Float For Weather	9 hrs	Fri 2/02/24	Fri 2/02/24	57														

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Alternative Method Statement- Short Duration Day Time Closures

The alternative option is to complete the work undertaking two shorter duration daytime closure, with an opening during the middle of the day. This program will involve a 10-hour window where the road will be closed to road users between the hours of 8am to 6pm (TBC) Monday to Friday for at least four weeks. This option will allow the road to be opened for 1 hour at midday to clear queued traffic. This will require traffic to travel through a 100mm open excavation of loose gravel on 16% gradient. As previously discussed, this results in a significant risk to vehicle safety, staff safety and program delivery. There is considered to be a high likelihood of a heavy vehicle getting stuck on an unbound surface during this opening time. Operational experience in this location suggest that it will take several hours to recover the stuck vehicle and clear the backlog, resulting in a complete loss of productivity for the afternoon shift.

Traffic Management

The site is not suitable to run a single lane operation during the operation. Width restrictions mean we cannot fit a CoPTTM compliant single lane operation in this location, with the plant proposed. We consider it to be unsafe to have traffic traveling on a 16% gradient on unbound granular pavement. As such, the work method has been developed to maintain a bound surface when the road is open to the public. This will be a mixture of concrete bridge decks and asphalt.

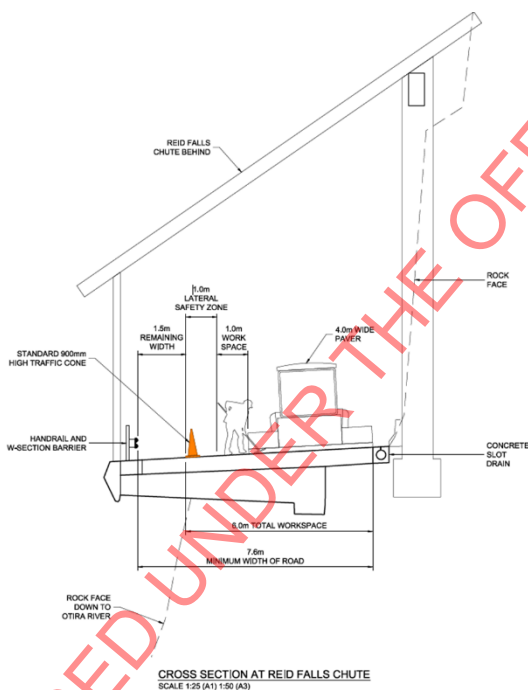


Figure 5 - Typical Cross Section insufficient space for a lane drop

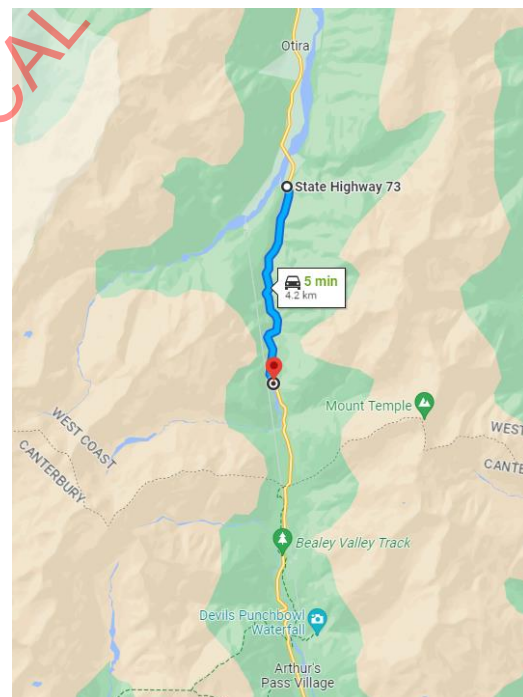


Figure 6 – Closure location

Closure Points

The road will be closed at Sulphur Point just east of the Otira River and the lay bay near the top of the Otira Viaduct.

Pre warning will be made using VMS in accordance with the approved TTMP and communications plan.

This closure will be advertised in accordance with the communications plan prepared for this work. A draft copy of this is attached.

Alternative route

It is considered there is a suitable alternative State Highway available for use during this period in SH 7 via the Lewis Pass.

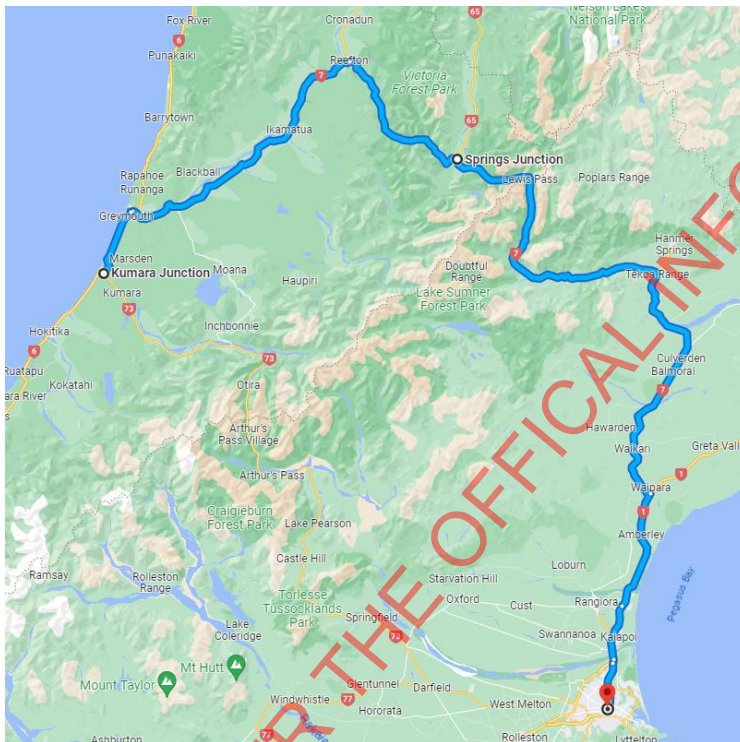


Figure 7 – Alternative Route via SH 7

This journey via SH 7 is 1 hour longer than the journey via SH 73

Mitigation Strategy for Detour

As the alternative route is part of the State Highway network it is considered that there is no need for a secondary alternative route. In the event there is an unplanned closure due to a crash or similar that affects SH 7 for an extended period (more than 4 hours) then the use of a float day will be considered. In the unlikely event that a multi day closure affects the alternative route we will discuss the possibility of delaying the work and continue at another agreed time.

Conflicting Closures

We will work with the Journey Manger to ensure there are no conflicting closures affecting the deliverability of this project on the neighbouring NOC's as we have done in past seasons.

Stakeholder and Industry Identification and Mitigations

Stakeholder List

A schedule of stakeholders and members of industry that have been identified and engaged with is attached as an appendix. The NOC team have completed some initial engagement and have asked for feedback on two program options, long program with opening, or short program with full closure.

The feedback was overwhelmingly in support of a shorter program. There has been other feedback and request for minor changes to mitigate or minimise disruption. These details have been recorded and will form part of the broader decision making. One key point to consider is advancing the program to prior to Christmas to avoid peak milk transport season.

Emergency Access

During an emergency we will make all efforts to get the road in a condition the emergency service vehicle can pass through the work site. The use of a tow vehicle will be considered in the case the road is unbound granular and the vehicle needs support. This road will only be passable for a genuine emergency. All patient transfers and the like will be required to use the alternative route.

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Draft Planned Works Communication Plan

Below is the draft communications plan for this work. It is intended there will be some minor changes to this prior to the actual work although this is the format the details will be communicated in.

63147 West Coast NOC High Impact Activities – Otira Gorge SMA

Goal

Satisfy Waka Kotahi NZ Transport Agency and Fulton Hogan desire to inform customers and help them to have reliable, safe journeys on our network – give the customers what they need to make informed decisions and assist emergency services.

Date

Daily Closures

Monday 22nd January 2024 to Wednesday 1st February 2024

Closed daily 9am to 5pm

Location

State Highway 73 – Otira Gorge



Route Affected

State Highway 73 – Arthurs Pass to Otira

Alternative Route

SH7 - Lewis Pass

Works Planned

Otira Gorge Asphaltic Concrete Renewal

Weather Dependant –

YES. The work is weather dependant closer to the time an alternative date will be made.

Impact (at location)

Daily closures Monday to Friday 9am to 5pm

Groups Affected

1. Freight transport operations and tankers
2. Self-drive tourists
3. NZ business travellers
4. NZ private travellers
5. Emergency services

Best Means of Communicating with These Groups

1. Freight transport operations and tankers
 - a. Email and SMS messaging
 - b. TREIS – road condition website
 - c. Radio adverts
 - d. Media Release – Waka Kotahi (WTOC social media)
 - e. VMS (Kumara Junction, Arthurs Pass, Springfield) – WTOC
2. Self-drive tourists
 - a. TREIS – road condition website
 - b. Radio adverts
 - c. Media Release – Waka Kotahi (WTOC social media)
 - d. VMS (Kumara Junction, Arthurs Pass, Springfield) – WTOC
3. NZ business travellers
 - a. TREIS – road condition website
 - b. SMS messaging
 - c. Radio adverts
 - d. Media Release (Media Release – Waka Kotahi (WTOC social media)
 - e. VMS (Kumara Junction, Arthurs Pass, Springfield) – WTOC
4. NZ private travellers
 - a. TREIS – road condition website
 - b. Radio adverts
 - c. Media Release (Media Release – Waka Kotahi (WTOC social media)
 - d. VMS (Kumara Junction, Arthurs Pass, Springfield) – WTOC
5. Emergency services
 - a. Direct contact (email)
 - b. Email and SMS messaging

- c. TREIS – road condition website
- d. Radio adverts
- e. Media Release – Waka Kotahi (WTOC social media)

Emergency Services Access

In the case of an emergency the route is available notice should be given to Kodi Schroder 027 568 2121 with the

Messages used

TREIS – “State Highway 73 between Arthurs Pass and Otira will be closing daily 9am to 5pm from Monday 22 January to Friday 26 January and Monday 29 January to Thursday 1 February. The road will be open 24 hours Saturday and Sunday 27-28 January. These closures are to allow contractors to replace the asphalt in the Otira Gorge. This work is weather dependent and may be rescheduled. Plan your journey accordingly”.

Detour route – SH7 Lewis Pass

SMS 1 – “SH73 - Arthurs Pass to Otira - OPEN - Road will close daily 9am-5pm from Mon 22 Jan to Fri 26 Jan. Detour via Lewis Pass. FH __/__/__ 00:00”

SMS 2 – “SH73 - Arthurs Pass to Otira - OPEN - Road will close daily 9am-5pm from Mon 29 Jan to Thurs 1 Feb. Detour via Lewis Pass. FH __/__/__ 00:00”

Radio – “Waka Kotahi NZ Transport Agency wishes to advise that State Highway 73 between Arthurs Pass and Otira will be closing from daily, 9am to 5pm from Monday 22 January 2024 to Friday 26 and Mondy 29 to Thursday 1 February 2024. These closures are to allow contractors to replace the asphalt in the Otira Gorge. This work is weather dependent and may be rescheduled. A detour is available via Lewis Pass. Access to Arthurs Pass from Christchurch is available at all times. Check [journeys.nzta.govt.nz](https://www.journeys.nzta.govt.nz) for up-to-date information. Waka Kotahi apologises for any inconvenience this may cause”.

Media Release – Waka Kotahi

Permanent VMS – WTOC - Yaldhurst (?), Springfield, Arthurs Pass (East & West), Otira, Kumara Junction, Stillwater

Renewal Quality Plan- Contact List

The below is the contact list from the Draft Renewal Quality Plan

Role and Responsibility	Personnel	Contact Number		
ASPHALT				
Surfacing Manager	s 9(2)(a)			
Operations Manager / Site Engineer				
Technical Support				
TRAFFIC MANAGEMENT				
STMS -TBC				
STMS -TBC				
Traffic Management Plan Designer				
TMC & Safety Engineer				
MECHANIC				
Afterhours Workshop Greymouth				
Afterhours specialists for paver breakdowns				
NOC MANAGEMENT				
Waka Kotahi Contract Manager	Moira Whinham	s 9(2)(a)		
Waka Kotahi Journey Manager	Tresca Forrester	s 9(2)(a)		
Contract Manager	s 9(2)(a)			
Professional Services Manager				
Asset Manager				
(DCM) Operations Manager				
Operations Engineer				
Quality Manager				
Customer & Stakeholder Communications Manager				

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Supporting information

Justification for full daytime closure

With a paving width of 4m when allowing for a 1m working space outside the edge of the paver and then 1m lateral safety zone only provides for around 1.5m of remaining space, and insufficient to provide a lane width.

Figures 3 and 10 show examples of the screed hand, working beside the paver to manage the edge. This shows it is impossible to achieve the required lateral safety zone on a site like this.

This site has had significant rockfalls in the past and is identified as an ongoing rockfall hazard. There is no practical way to fully avoid exposure to this hazard while completing this task.

A spotter will be used to assist with mitigating the possible effects of rockfall on site. Being able to communicate to the entire site over radio and warn of incoming rockfall and take cover to a safe place identified on the risk control plan. Effective spotting for falling rocks will require the work to be undertaken during daylight hours. There is typically a very short period before a rockfall where a spotter could forewarn staff onsite this can only be done during daylight. At night there is insufficient lighting to do this in an effective way.

Spotting will assist to manage this risk, but the best method is to minimise our risk is to minimise our exposure time to this hazard. Undertaking night works is not a practical option nor extending the closure times by decreasing productive time onsite. These options will increase the exposure to this risk. To achieve this work and get the required safety outcomes a daytime closure critical.

The downslope side of the job has a drop off to the riverbed of around 60m vertical. While this is protected by guard and handrails adding moving traffic to this site without any escape routes will put staff further at risk.

We have experienced and competent staff to operate all the machinery onsite none the less this is still a hazardous task. The steep grades of this site add additional complexity and risk to the work. Having a mechanical failure while working on a steep grade can result in plant run away. An effective control to this is being able to see everyone during the day and having the site clear from other traffic lessens the other risks if something goes wrong.

Our network knowledge and other records show there are up to 5 truck and trailers, along with other vehicles, stuck on this route per month. Details are anecdotal from staff directly involved in recovery operations during these events. The primary cause seems to be change in surface often when there is even minor spillage or build-up of road grime followed by rain. A secondary issue is driver experience. New drivers that haven't travelled the route often can make poor gear selections or even incorrectly load the truck. Once traction is broken there is no starting again without additional support. Trucks will often burn holes in the asphalt attempting to get going again.



Figure 8 Burn marks from tyres

Another major cause of incident on this section of road is mechanical failure. This occurs in two ways, uphill breakdowns and downhill runaways. The former results in an immobilised vehicle, the latter results in a serious crash.

Even experienced drivers have mechanical failures and often trucks will have mechanical failure trying to get going on the steep grade again.

The below photo shows the result of just some of the downhill run aways that have occurred due to various factors. Vehicle runaway is an extreme risk to our staff and the best way of controlling this is a closure.

Having vehicles getting stuck or crash on this section of road during the resurfacing operations will cause significant hazard, delay and disruption to everyone involved. The site has minimal space to manoeuvre and tow a breakdown or stuck vehicle, and any accident that could occur poses a significant hazard to our staff.

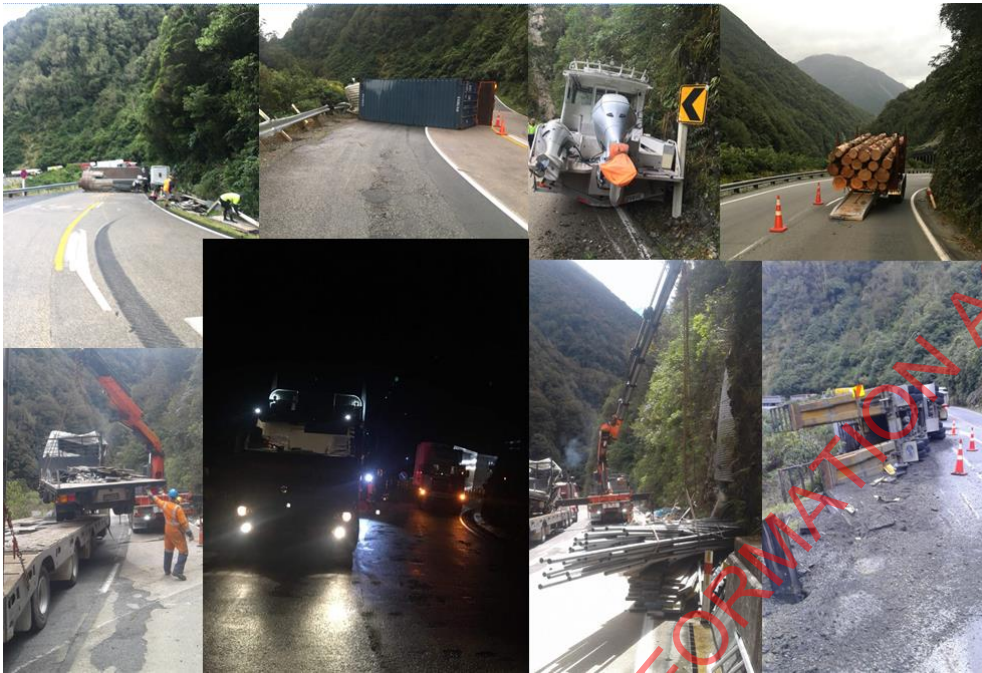


Figure 9 Multiple incidents Otira Gorge

The successful laying of Asphalt and SMA require 10°C and rising without wind chill. Weather data shows that the optimum time of year for this site is January and February. Daytime temperature during this time of the year is the most favourable to achieve a quality surfacing outcome.



Figure 10- Screenshot hand working beside paver at SH73 Peg Leg

The timing of the proposed closure is Monday to Friday 9am-5pm. These times have been specifically considered to maximise the route availability for business and travel purposes.

If traveling from Greymouth or Hokitika this means an 8am start time for people to get to site ahead of the closure, being 50-60 minutes travel from these locations. Freight that travels from Christchurch to Greymouth daily will be able to get ahead of the closure by leaving Christchurch before 6am. At the end of the day the opening time has been planned to match with traffic traveling at the end of the business day along with daily evening freight such as the post truck and bread truck that will be unaffected by having the road open at 5pm.

Having short sharp closures will allow the program of work to be minimised. This in turn reduces the ongoing delay and effects on the public. Having closures with mid-day openings will extend the program of work and will significantly decrease productivity, provide for more days of extended delays, along with more opportunity for people to get disrupted by the work.

Delay calculations have been undertaken and are shown as below. Providing for a mid-day opening and making assumptions that 50% of people will travel the alternative route, the best case scenario is we will have traffic traveling for one hour to clear the tail backs. NB this is the best case scenario. Experience during other similar closure events has shown clearing traffic can take much longer in this location due to the low speed of the trucks traveling uphill and downhill. If trucks get stuck on the unbound surface this will take several hours to clear. This has the potential to create a complete loss for afternoon work period, creating a program backlog.

Vehicles that are trying to time their travel to make the openings have been witnessed taking significant risks on the road in order to meet the closure time because they have been delayed. If a vehicle just misses an opening time this can cause significant stress and aggravation. This method exposes the staff member on that roadblock to risk of aggression from the road user.

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Queue Delay Calculation for Alternating Flows

Parameters:	Length of Alternating Flow (c)	4000 m
	Average Traffic Speed past site (a)	20 kph
	Time between flow changeover (e)	20 minutes
	Space between vehicles passing site (h)	15 m
	Space between vehicles in queue (q)	8 m
Estimate of Hourly Capacity of Site	Time for 1 vehicle to pass site	
	Traffic speed through closure kph (a) =	20 kph
	Traffic speed metres/minute (b) = (a x 1000/60)	333.3333 metres/minute
	Length of alternating flow (c) =	4000 metres
	Time for 1 vehicle to pass site (d) = (c/b)	12 minutes
	Time between flow changeover (e) =	18 minutes
	Total Flow Time (f) = (d+e)	30 minutes
	No of vehicles in one flow	
	Distance traveled by 1st vehicle (g) = (b x e)	6000 metres
	Vehicle spacing passing site (h) =	15 metres
	No of vehicles passing site in 1 flow (i) = (g/h)	400 vehicles
	Hourly Capacity of Site (j) = (i x 60/f)	800 vehicles
Hour 1		
No. of Vehicles Delayed	Estimated Hourly Flow (k) =	1024 vehicles/hour
	Vehicles delayed (l) = (k - j)	224 No.
Queue length	Queue Length (m) = (l x q)	1792 metres
Delay Factor	Delay to last vehicle in hour (n) = (l/i) x f	17 minutes

Figure 11 Delay Calculation

The more closures and openings we have there is the more risk to public disruption of being late on opening times due to unforeseen circumstances. In short to minimise negative feedback and potential customer aggravation a well advertised full closure is the best option we have to complete the work efficiently and with minimal disruption.

Methodology Details

The site consists of a structural component being AC14 and a surfacing component being SMA10.

Initially the site will be split into four distinct areas and the work will proceed on a mill and fill per shift basis for the structural component. This will allow for one day of float on the week, providing for weather delays, any breakdowns or other unanticipated productivity loss.

When the final SMA10 surfacing is undertaken the intent is we will have two pavers onsite and the work will be completed with a hot joint on the centreline. This will create a homogeneous surface

and will provide the longest life expectancy of all the considered methodologies for this product. If we encounter issues with concurrent paver laying, we will split the length into three distinct areas. This will result in a full width fill per shift will be undertaken removing the longitudinal joints and minimising the transverse joints.

The physical works time for key tasks is six working days with an additional three days of float making a total program of nine days.

Traffic Management – Closures at the top of the viaduct and the bottom of the Otira Gorge will be installed at the agreed closure time. Closing at these locations will ensure there isn't excessive stacking of traffic within Arthur's pass and Otira. It will also provide for sufficient space to undertake turning manoeuvres for any traffic that want to turn around. Multiple VMS boards will be used to promote the messaging and avoid this occurring.

Set up TM signs prior to 9am ready for 9am hard closure to go in. STMS will close one side of site and follow the last car through the closure likewise in the other direction. At the end of the day the STMS will delineate the centre line prior to opening, make sure site is safe and prepare to open site with reduced speeds through site until the next closure.

Sub Surface Risk Control - On the first day we will have GPR radar onsite to search for anything under the ground, bridge tie backs and the rough extents of the bridges- This will mitigate the risk of potential strikes on anything sitting shallow underground. This work will be completed concurrent with the initial milling operation. The milling work will begin under the rock shelter where there is no existing sub surface risk in this location as the primary the sub surface risk exists where above the rock shelter at the half bridges.

Milling - we will use our Wirtgen 130CFI mill (24.6t), a bobcat S185 (3t), a Hitachi excavator (5t) with a set of buckets, ripper and hydraulic hammer attachment.

Transport trucks will cart the millings to stockpile area and then be re loaded as required to backload the millings to Christchurch at end of shift and paving trucks on return cart.

Competent & experienced operator that has milled bridges, will be accompanied with ground staff (spotter) behind the mole board checking depths and finished surface condition. The spotter and operator in constant headset communication. The delineation between the asphalt wearing course and bridge deck is done by averaging the visible depths of the existing asphalt.

Milling will start slightly higher than the existing asphalt and once the mill is moving slowly tap down the height for the drum to hover above concrete deck. The mole board scraping the remaining existing asphalt off. The level will be controlled audibly by the mill operator listening to the difference of pitch from milling asphalt to concrete bridge deck. This is also verified by visual spotter behind the mole board ensuring we mill above bridge deck tolerance. Areas of the bridge deck that cannot be milled will be removed by excavator with attachments assisted by the bobcat.

A structural inspector from the bridging team available on site to inspect the decks prior to installing the final surfacing.

Areas without bridge decks will have been scanned using ground penetrating radar to ensure no bridge tie backs or any other potential conflicting items in the way. We will mill 110mm depth off

one cut. The bobcat will be working behind the mill cleaning up any loose debris getting the area ready for the next cut.

Paving Structural AC - Following milling we will use a PTR on the gravel surface prior to paving to compact and lock up the surface. Paving will move their plant into position to start paving keeping clear of the milling operation. This methodology is to keep the working crews and minimum staff on the ground. Paving will have a Voegelé 1803-3 Paver (18t), Hamm DV 90 roller (9.5t), Sakai double steel roller (3t), GW750 PTR (9t), along with a crew truck and foreman's ute. The paving crew will also have a laboratory technician with testing trailer for cores and nuclear densities.

The paving crew will pave the first layer to the same extent as has been milled. This will fill any open holes to the same nominal level as the bridge decks. They will pave both lanes and once rolling is completed make asphalt ramps for traffic flow through from opening time till the next closure. The deep lift will be 40- 60mm lower than existing surfacing. This will be the methodology for the first week if weather and efficiencies are maintained.

Paving SMA - Traffic Management will be undertaken as above. This process requires near perfect conditions particularly in an alpine environment. The methodology is still being finalised; however we intend one of two methods for this work primarily will complete this work in one day using two pavers. Paving uphill with a staggered start to the two pavers will be fed by a fleet of trucks each. This will allow for a hot joint on the centreline removing all transverse joints from the job

Alternatively, we will use one paver and pave the road in thirds as full width blocks full width transverse joints. By paving full width daily will avoid a cold joint along the centre of site and will not leave any longitudinal lips to be trafficked overnight.

Carting SMA from Miners Road Asphalt Plant in Christchurch to Otira is at the limit of what can be achieved with this product. As soon as mix arrives onsite to avoid having any mix waiting long periods of time it will be paved immediately. All trucks supplying mix will do one load each day as the carting time is so long. Trucks will be staggered to lessen the grouping of trucks that can occur during transport.

Line Marking - Following the completion of final paving run the joints will be bandaged and line marking installed. If time does not allow this work will be completed the following day under traffic control as required.

After Care Plans

At the completion of each shift (milling, paving and compaction, and cooling) the road will be setup and opened while the equipment is being moved offsite the road will be marked and open to the public. Temporary traffic management will be employed to support the fresh surfacing and ensure the site remains safe overnight.

Most of the equipment must be moved offsite to keep it safe and ensure it is functional and available for work the next day. Securing the plant offsite daily includes protection from vandalism and protection from wildlife (Kea) see figure 12 below.



Figure 12- Kea damage equipment near Arthurs Pass

Considerations and alternatives

Supply chain criticality - We are carting AC and SMA from Miners Road Asphalt Plant in Christchurch to Otira. This length of cart is at the limit of what can be achieved for SMA. We will be using ~15 trucks with hot boxes carting ~10t loads of asphalt to the paver at a time. This needs to be well managed and staged timed to ensure asphalt is not sitting around onsite going cold. The key risk we have with carting this far is having minor delays and missing the critical path times such as a mid-day opening. This will add significant complexity to the job and risk the productivity. Minor delays in the supply chain may cause us to not meet the opening deadlines and as such the less openings we have the better. We will work with the neighbouring NOC area to ensure any other delays are minimised to maintain the supply chain.

Quality- The planned program has been setup to achieve the best quality outcomes. Completing the work in good daytime temperatures and limiting the number of cold surfacing and pavement joints will achieve this. Getting the best quality outcome will assist to extend the life of the surfacing treatment and in turn will create better whole of life cost for the asset owner and disruption less often for the traveling public.

Productivity - The planned program is an efficient and effective use of resources to undertake the proposed work while balancing the connectivity of the community. Changes to the program will have significant negative effects on daily productivity. Milling and filling smaller areas to reduce the closure times significantly affects the total program length.

Risk - The planned work is being delivered as part of the annual renewals program for the West Coast Network Outcomes Contract- 63147. As such the work is being delivered under contractual specifications and has an applicable contract risk profile. This work involves commercial risk for both the contractor and client.

Quality - from the contractor's perspective, failure to comply with the required contractual specifications has the "most realistic potential outcome" to be a "severe risk". For the contractor this is an unacceptable level of commercial risk and must be managed. At a local level we have discussed with the CMT the specific risk transfer of the roughness specification as not achievable on this site regardless of the delivery timeframe. Further transfer of risk to the client will be required if we need to move the delivery outside of the contract construction period. This is due to the increased likelihood the other specifications and life expectancy will not be met.

Safety - Working in this location is challenging in the best conditions and limiting our time on site is part of the safety in planning for this renewal. As mentioned, several times throughout, having staff interacting with traffic to recover them when they become immobilised during a daytime opening is not appropriate when we have more effective ways to manage this work.

Community & Reputational – having openings during the day has the potential to create a significant reputational risk for both the contractor and client. The potential for organised widespread opposition to a long-protracted closure is a reality, as such we want to reduce this by limiting the disruption to the minimum number of days possible.

Paving deep lift - The deep lift area must be reinstated back to deck level each day. Leaving traffic to travel on a section of -55mm of pre milled to deck level and one section of reinstated deep lift area each day. This mitigates the risk of multiple uneven surfaces and leaving traffic traveling on a gravel surface on a slope of up to 16%.

Lane by Lane treatment - Consideration has been made to doing lane by lane treatment. This has been discounted primarily due to the lack of width to provide for a lateral safety zone, along with the safety aspect of the lane height differential between milling and paving. The complexity of the sub surface means there will be significant challenges achieving compaction. By just milling one lane there will likely be rework and material wastage having to re mill previous day paved AC to fit the paver in or to achieve compaction with minimum widths for roller and paver. Paving one lane and stopping work for periods to allow traffic to flow will not provide for minimum widths and will require a temporary traffic management engineering exception decision (EED). We consider this to be in direct conflict with one of Fulton Hogans Life Saving Rules "We always have an effective plan to manage traffic, cyclists and pedestrians". The width of the site precludes any lane shift to the shoulder as other sites may allow for. This means there is no way to achieve the lateral safety zone away from the equipment and staff are onsite. This is in direct conflict with Waka Kotahi expectations and CoPTTM.

Night Works - Significant consideration has been made to undertake this work at night as this would be the normal way you could do this work and get a closure. Without daylight we cannot provide any sort of effective spotting for rockfalls. This is a key issue with the site. There is a continuous risk of rockfall at this site and the only way to manage this is to put a spotter in place.

The site conditions also mean there is little to no space to setup and maintain any site lighting

The successful laying of Asphalt and SMA require 10°C and rising without wind chill. Weather data shows that there is risk these temperatures will not be achieved overnight.

Due to the nature of the site that has so many challenges with cliff faces, rockfall hazards, steep grades and drop offs into the gorge, keeping 25 people safe in the dark on this site is a significant risk to mitigate.

We consider the multiple risks to quality and safety are too high to treat with effective controls and then proceed. For these reasons we have discounted night shift as an option.

Hour or half day closures - This has been discounted due the nature and width of the site, along with the logistics involved in the project. With a lack of space to move away from the traffic within a 1m lateral safety zone and clear the traffic. The asphalt is being transported 1.5-2hours to site any hold ups could result in the asphalt going cold in the trucks or hopper. Half day closures will take the program from 270hours work to over 600 hours work providing significant additional disruption to the traveling public and will push the program into some significant event dates. The longer we are onsite the greater the risk of disruption due to weather. Stopping and starting for at least an hour at a time to let traffic past the equipment will significantly increase the number of cold joints within the mat and risks the supply chain timing every time we open/close. If the paving crew needs to retract the paver to make the road wide enough lane for traffic to get past, this will dramatically reduce the productive time achieved onsite. We will have to stop laying AC to accommodate this, but also because we will have to allow additional time to roll of the AC mat to enable to receive traffic. This can take more than an hour from when the paver stops laying AC to when it is sufficiently compacted and cooled. Notwithstanding the above each time, we stop the joint will be cold and this will result in at least double the number of cold joints throughout the site, this will affect the life expectancy of the site.

Bridge Deck Complexity - The below figure 3 shows an example of the challenges of the site and the complexity of the differing levels.

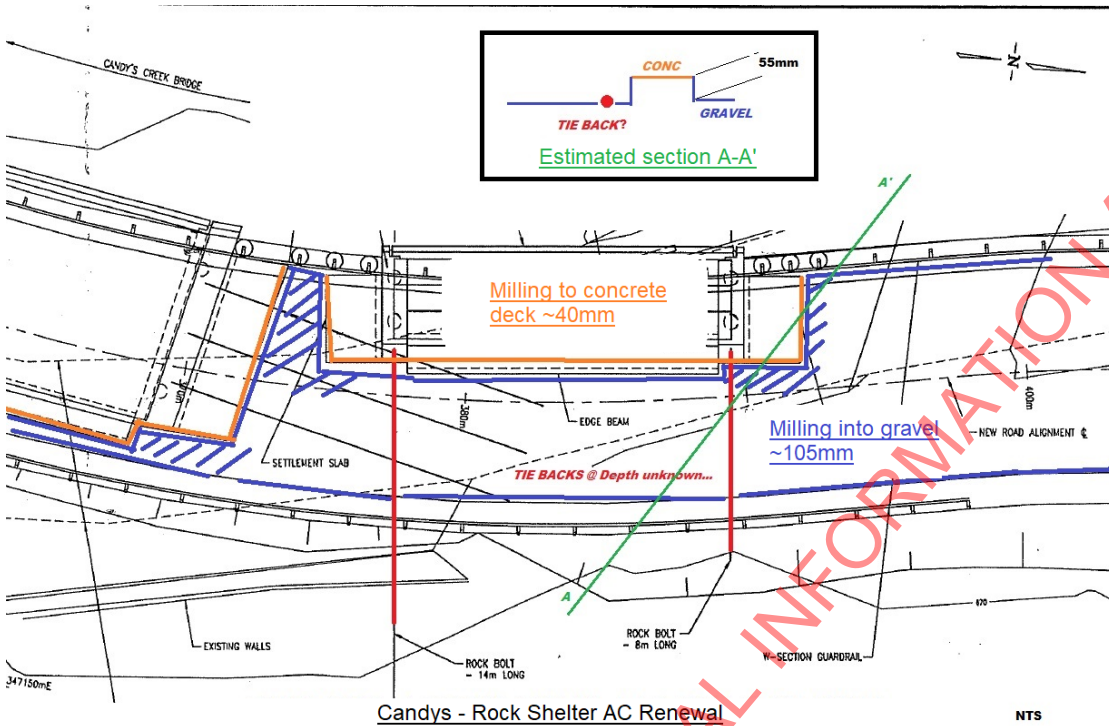


Figure 13- Bridge deck complexity

Detour Availability - Detour is via Lewis Pass SH7 which is a State Highway capable of carrying all expected traffic. Due to the detour length, it is expected that people will delay any non-essential journey instead of taking the detour. We consider the proposed closure timings to work well with maintaining network connectivity. Without making drastic changes to your travel plans you will be able to travel there and back the same day. For example, you can travel before the closure and back via the alternative route or travel via the alternative route and travel back after the closure.

Stakeholder Identifications and Mitigations - For life-threatening situations, emergency services have right of passage, and work is to stop onsite once the site has been made safe, so emergency services can pass through. The NOC Stakeholder Manager is working through notifications required. Where local school bus services are present, we will work with them to enable them to travel through the closure. Following feedback from some stakeholders considerations are being made to moving the closure times to later in the morning to allow for specific traffic to pass in the morning.

Communication - VMS and other media will be employed to notify of the closure in line with the communications plan.

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Decision Points - TTM will be pre laid on 20th of January ready for the work to commence on the 23rd of January. From the 16th of January the weather reports coming out via the media will be watched closely to make sure we have a clear working window.

A call will be made on the evening of the **19th of January** whether we are starting the project on the 22nd with respect to weather. This call will be made from Fulton Hogan Canterbury Surfacing Team in discussion with NOC Management Team.

Onsite the team will have radio communication for all employees, a satellite phone will be onsite for the duration of the works as there is limited cell phone reception at the site – this will mainly be used for emergencies if they arise.

A daily report sent to the NOC team with what was achieved onsite, any issues arisen and how we are going to rectify the issues the next shift.

Contingency plans - For the duration of the works, a backup paver will be parked near Porters Pass to collect if any mechanical fault occurs with the paver onsite. We will also have a loader onsite with suitable towing strop in case there is a need for towing equipment up the hill. We have a workshop team on standby to respond immediately in the event of a breakdown. Full details are contained within the renewal quality plan.

Risk Control Plan - below is the draft risk control plan for this job it is a work in progress and will be finalised as the work proceeds.

Key dates

The proposed program avoids the below dates to minimise disruption to the traveling public during key times.

School Term 1 starts between Monday 30 January and Tuesday 7 February

Coast to Coast and Buller Gorge Marathon -Friday 10 & Saturday 11 February 2024

Waitangi Weekend Monday 6 February 2024

University Semester 1 starts ~20 February

Wild Foods Festival March 11, 2024

Risk Control Plan- (Draft)



Risk Control Plan

For standard activities this must be: ✓ Reviewed daily or when tasks or activities change



More complex higher risk sites and unique tasks, may require additional risk management – check with the foreman / supervisor or responsible manager

Site Information	
Date: TYPE SITE INFO	Client: Waka Kotahi (WTC NOC Project)
Job number:	Person in charge: s 9(2)(a)
TMP number:	STMS:
Site location: Otira Gorge	
Have all subcontractors been inducted to site? Y / N: PLEASE STATE * If NO, induct them before they start work.	
All subcontracted and hired plant is inducted and stickered? Y / N: PLEASE STATE * If NO, do not use and check with the person in charge.	

Medical, fires, spills and emergency	
Emergency contact: 111 & s 9(2)(a)	Fire equipment location: Utes and Crew Cabs
First aid kit location: Utes and Crew Cabs	Spill kit location: Utes and Crew Cabs
Hospital / clinic location: Greymouth 1hr10min	Assembly point: Otira Lookout
First aider(s): Full Crew	
Other Information: Sat Phone in supervisors ute	

Permit type	Expiry date
Digging and excavation	ADD DATE
Working at height	
Confined space entry	
Tree felling	
Rail (external permit via KiwiRail)	
Hot work (and hazardous atmospheres)	
Bitumen hot and cold work	
Asbestos (3 different permits)	
Close Proximity (gas and electrical)	
Other PLEASE STATE	
Other PLEASE STATE	

Production targets, quality and environment requirements
4 shifts of Mill and Fill
1 shift of SMA - Separate RCP with two pavers onsite and twice as many staff

Resolving issues	
What issues did we have yesterday?	How will we fix them today?
TYPE INFO	

Plan for the day
Set up Traffic Management according to the TMP (Road Closure)
Mill 110mm deep along the bridge deck
Paver lay Structural layer of AC14
Insert ramps before re opening the road



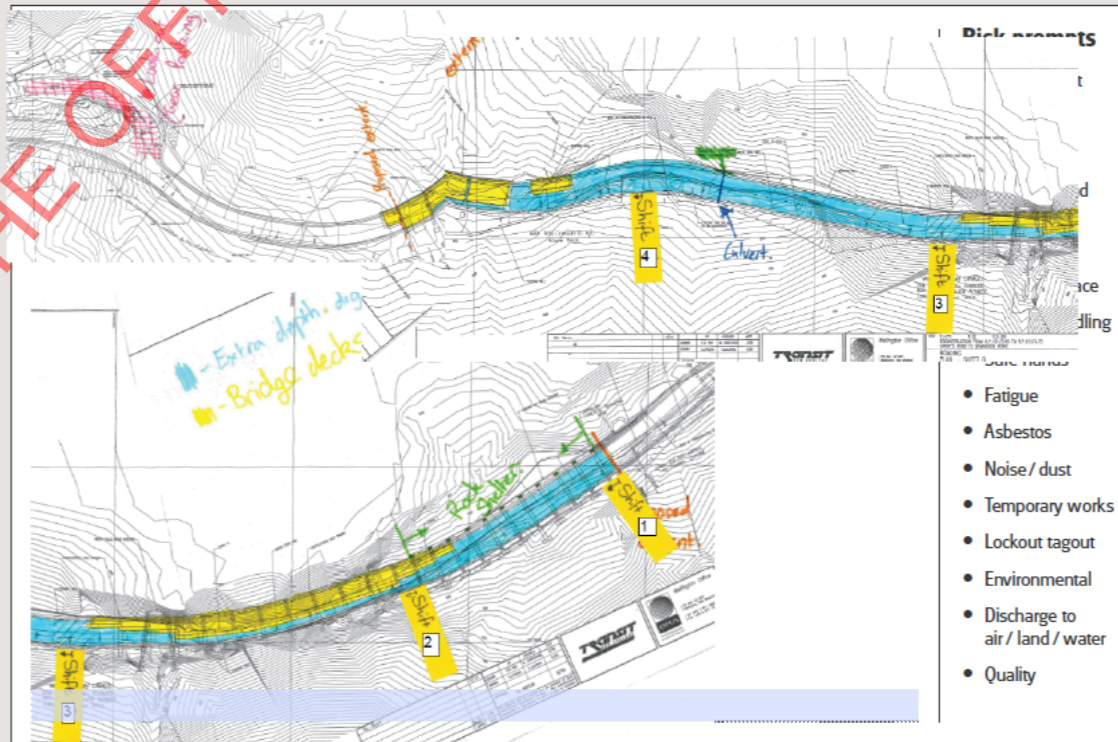
Subbie and FH Employee induction video. Scan or click here



KnowHow videos, guides and other info (minimum requirements). Scan or click here



Subcontracted and hired in plant. Scan or click here





Risk Control Plan

For standard activities this must be: Reviewed daily or when tasks or activities change



Tasks... what am I doing?	Risks... what could go wrong?	HSW	Q&I	E&S	Controls... how can I do it safely?
Walking around site	Uneven surfaces, slips trips & falls possible	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Be aware of potentially slippery surfaces Housekeeping/tidying of site. Sturdy Boots
Hand lay and paver lay AC - moving plant	Reversing trucks / struck by moving plant, crush injury	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ROPs, Follow LSM:8.1 guidelines, Always wear seatbelts, Competent Operators only, Never enter crush Zone
Moving Plant on SH73	Plant vs people, plant vs plant, plant vs public	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Be aware of surroundings, utilise spotters if required, keep away at safe distances, pilot vehicle
Handling hot asphalt product - tack / AC	Burns / injury / fatigue, runoff into environment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Appropriate PPE for task. ie long sleeves / pants, gloves, masks + goggles for hand spraying, Manage spills
Unloading / Loading Plant	Plant coming off trailer /crush injury /roll over	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Keep trailers on flat ground, licensed and competent operators only, Spotters required and other staff keep a safe distance away
Working in unfamiliar environment	Falling Debris, Steep gradient, Unpredictable Weather	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Correct PPE, Work within the Barrier, Daily weather risk management forecasting and monitoring
	No cellphone Coverage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Clear coms from truck drivers coming to site, Sat Phone available on and operating at identified safe place
Loading the paver with asphalt under rock shelter	trucks with hoist up may strike shelter	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Careful planning what trucks to use under shelter, Trout river, experienced operators and spotter as required
Long cart of asphalt on SH 73	Product could go cold before it is compacted	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Keep communicating about where trucks are at on the RT's. trucks to keep order don't rush. Pre planning with other network operators regarding timing of adjacent work on supply chain route (SH73)
Work in National Park	Wildlife could interfere with operation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DONT FEED KEA on-site. Spotter to chase away Kea as required, and engage with DOC plant off site at night
ROCKFALL	Rock vs Plant Rock vs People	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Working during the day. use of a spotter- Comms protocol -Emergency Emergency Emergency Rockfall ...
WEATHER	Tums cold	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Decision making around carry on or stop work as road must be opened at deadline
MECHANICAL	Break down of essential plant	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Reference the RQP and the standby staff we have and standby equipment
QUALITY MANAGEMENT	Deliver a product that does not meet specifications	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Onsite quality manager RQP and inspection and test plans

Final Risk Rating	Tick	L	M	H
	Are all the controls in place and working?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Minimum site and task based PPE

If our clients require a higher PPE standard it must be followed

Mandatory on all sites. High-vis vests, shirts or overalls. Worn done up

Mandatory on all sites. **Unless** doing so reduces visibility and increases risk.

Mandatory on all sites. Steel or composite capped lace up boots.

Steel capped gumboots instead of boots (in wet conditions).

Everyone on operational sites can communicate by radio.

Manual handling tasks. Handling hazardous materials. Do not wear if risk entanglement.

When required by client. Protect against heat and/or chemical burns.

When required by client. When lifting machinery is on site. Something could fall on you or you could fall.

When exposed to dust or fumes not controlled by other means.

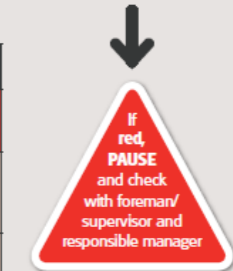
Worn when voice need to be heard by someone 1m away.

RT Radio Channel

Other PPE required:

Risk Matrix	Most realistic potential outcome		
	Low Potential event	Medium Potential event	High Potential event
Health & Safety	<ul style="list-style-type: none"> Proactive intervention No treatment First aid 	<ul style="list-style-type: none"> MTI or LTI resulting in up to 3 days off work 	<ul style="list-style-type: none"> Admitted to hospital Life changing injury Loss of function (e.g. hearing)
Quality	<ul style="list-style-type: none"> Remediation cost <\$50k Processes mainly followed 	<ul style="list-style-type: none"> Remediation cost 50k-\$100k Minor process failings 	<ul style="list-style-type: none"> Remediation cost >\$100k Major process failings
Environment & Sustainability	<ul style="list-style-type: none"> Able to be contained and cleaned up on site 	<ul style="list-style-type: none"> Impact off site Council/regulator notified Region/project able to contain and clean up 	<ul style="list-style-type: none"> Visible impact off site Council/regulator attends External clean up support
Plant & Property Damage	<ul style="list-style-type: none"> Repair cost <\$50k 	<ul style="list-style-type: none"> Repair cost \$50k-\$100k 	<ul style="list-style-type: none"> Repair cost >\$100k

Risks Reviewed						
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
TYPE HERE	TYPE HERE	TYPE HERE	TYPE HERE	TYPE HERE	TYPE HERE	TYPE HERE



Risk Register. Scan or click here

Risk and opportunity table

Closure Option:	Full road closure - 8 hour working window	Full road closure - 6 hour working window	Road closure - 2 x 4 hours w/1 hour opening
Project Duration:	5 - 8 working days	13 - 15 working days	16 - 20 working days
Project Programme Conflicts:	Tail end of Xmas holiday traffic, eg. Brunner CHCH traffic Woodstock motorcycle rally School holidays, so no school bus traffic No public holidays scheduled Minimal event conflict	Tail end of Xmas holiday traffic, eg. Brunner CHCH traffic This program will run into the school year having potential disruption to school traffic Woodstock motorcycle rally Waitangi weekend	Tail end of Xmas holiday traffic, eg. Brunner CHCH traffic This program will run into the school year having potential disruption to School traffic Woodstock motorcycle rally Waitangi weekend Coast to Coast Buller Marathon
Project Est Cost:	Latest tender price Most productive use of resources Lowest cost option for customer Lowest opportunity cost for resources	Increased delivery cost based on additional working shifts, multiple establishments, additional material wastage Indicative estimate cost would be x 2 of tender price	Significant increased delivery cost based on additional working shifts, multiple establishments, additional material wastage Indicative estimate cost would be x 3-4 of tender price Highest opportunity cost for resources
FH Safety Risks:	On site task specific risks for FH staff only Public interface is managed at closure points	Extending the program increases exposure to all onsite risks to staff On site task specific risks for FH staff only Public interface is managed at closure points	Extending the program increases exposure to all onsite risks to staff Extended pressure on staff having to meet multiple opening deadlines High risk site while traffic traveling on unbound surface Longest term inconvenience for road users Highest level of disruption to wider public during multiple large local events
Public Safety Risks:	Site will be safely trafficable by end of closure each night with no unbound surface	More time unattended at night during project works Site will be safely trafficable by end of closure each night with no unbound surface	Ascending and descending on a 16% grade unbound pavement multiple uneven surfaces Drop offs from milled edges up to 100mm Negotiating around a tight working area higher likelihood of loss control or traction. Risk of run away vehicles, specifically heavy transport High risk site while traffic on unbound surface More time unattended at night during project works Poor driving decisions from public around missing closure cut off times or rushing to meet them (speeding to make close off times)
Quality Risks	Minimal number of joins in structural AC Maximum of one transverse join in the SMA wearing course Best quality ride Lowest chance of water ingress into underlying pavement long term Shortest time onsite exposes the construction to the least chance of weather-related risks.	At least double the number of joins in structural AC 50% more joins in the SMA wearing course Reduced quality ride due to transitions Reduced surfacing lifespan More chance of water ingress into underlying pavement long term Higher chance of product variability due to having more construction stages Higher chance of weather variability creating risk.	The site is an alpine environment with high rainfall. having triple the amount of joins in structural AC will increase potential failure. At least double joins in the SMA wearing course Reduced quality ride due to transitions Highest chance of water ingress into underlying pavement long term Reduced surfacing lifespan SMA compaction due to weather variability risk Most chance of product variability due to having the most construction stages High chance that being onsite this long the project will be further delayed due to adverse weather conditions.

Carbon cost	Minimised wastage due to efficiencies, around 30T of AC 'wastage' Lowest possible carbon output	Approx 60T wasted product from end of runs and staging ramps between existing and structural AC Higher carbon output due to more machine time, increased establishments and increased wastage.	Up to 100T wasted product from end of runs and staging, temporary ramps between existing and structural AC Highest carbon output due to increased machine time and wastage
Public	Public don't understand why a closure is required just to 'reseal a road' Delay to Public for up to 8 days Minimal duration and least time disruption Short term surgical delivery Minimal interface between public and FH team - Increased safety for all Shortest inconvenience for some users Alternate route available	More disruption long term due to reduced working windows Longer term inconvenience for some users More disruption to wider public during large local events Increased overall disrupted duration for the road user Delay to Public for up to 15 days Minimal interface between public and FH team - increased safety Less time disrupted during each day for the road user Larger window for public to travel over the pass due to reduced working hours	Highest level of disruption long term due to vastly reduced working windows Longest term inconvenience for some users Highest risk of bad press due to the multiple delays that are likely Highest level of disruption to wider public during multiple large local events Risk of breakdowns or long que lengths causing total loss for afternoon shift Increased overall disrupted duration for the road user Delay to public for up to 20 days More options to travel over the Pass due to midday opening Local commercial business may be more supportive of this option Potentially less disrupted time during the day for the road user
Closure Option:	Full road closure - 8 hours	Full road closure - 6 hours	Road closure - 2x 4 hours w/1 hour opening
Bold Considered Opportunity Otherwise Considered Risk			

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Stakeholder engagement record

Emergency Services List								
Organisation	Contact Person	Position	Phone Number	Email Address	Emailed	Called	Comments	Approached by:
NZ Police West Coast	Sgt Mark Kirkwood	Road Policing Sergeant	s 9(2)(a)	MKG887@police.govt.nz				
	Sgt Justin Newman			justin.newman@police.govt.nz				
Nz Police - Tasman District	Simon Burberry	Tasman Crash Investigation & Crime Scene Forensic Mapping		simon.burberry@police.govt.nz				
	Hamish Chapman			hamis.chapman@police.govt.nz				
St John Ambulance	s 9(2)(a)			s 9(2)(a)				
		s 9(2)(a)						
		s 9(2)(a)						
		s 9(2)(a)						
NZ Fire Service	Atila de Oliveira	Group Manager West Coast		atila.oliveira@fireandemergency.nz				
	Trevor O'dea	Buller, Blackball and Runanga Manager		trevor.odea@fireandemergency				
Civil Defence	Claire Brown	Welfare Co-Ordinator		claire.brown@wrc.govt.nz				
		Duty number		cdemduty@wrc.govt.nz				
West Coast District Health Board	Imogen Squires	Senior Communications Advisor		imogen.squires@wcdhb.health.nz				

Businesses List								
Organisation	Contact Person	Position	Phone Number	Email Address	Emailed	Called	Comments	Approached by:
AA	s 9(2)(a)		s 9(2)(a)	s 9(2)(a)				
Cycle Advocay NZ								

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Road Transport Association	s 9(2)(a) s 9(2)(a) s 9(2)(a)					
Development West Coast						
The Road Safety Committee						
The Lifelines Group						
NZ Trucking Association				11/09 - Called, didn't pick up	FD	
T Croft Ltd			11/09 - Awaiting response	11/09 - Discussed closure options and sent email for feedback. Wants short closure option	Will be milk and cartage and general cartage mainly. Up to 20 movements a day. Is strongly opposed to trafficking a granular excavation.	FD
KiwiRail (TranzAlpine)			25/09/2023	25/09/2023	Prefer outside of summer period, but if in summer prefer December – Prefer work between 10:30 and 18:30	MW
Bus and Coach Associan			22/09/2023		Prefer off season, but if not December and shortest possible program.	TF
Westland Milk Products			11/09 - Awaiting response	11/09 - Discussed closure options and sent email for feedback. Wants short closure option	Biggest season to date for milk cartage coming up over the Pass, peaking in January	FD
Harkerss Busses			11/09 - Awaiting response	11/09 - Discussed closure options and sent email for feedback. Wants short closure option	Thinks she wont be massively affected by this in tems os school busses, but is President of the Tour Coach Association too	FD

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Pacific Tourways	s 9(2)(a)	s 9(2)(a)	s 9(2)(a)	11/09 - Awaiting response	11/09 - Discussed closure options and sent email for feedback. Wants short closure option	Cart tourists from Arthurs to Coast etc, peak tourist season	FD
Hilton Haulage				12/09 - Awaiting response	12/09 - Discussed closure options and sent email for feedback. Leaning towards the short closure option	Have just acquired Johnstones Trucking ex-Coast. Milk, and freezing works. 50 truck movements over the Pass daily.	FD
Aratuna				11/09 - Awaiting response	11/09 - Discussed closure options and sent email for feedback. Wants short closure option	Cart fuel and milk for Westland. They also run the Mainfreight and Aramax courier contracts for the West Coast	FD
Summerland Transport				-			FD
Southway Movers				11/09 - Awaiting response	11/09 - Discussed closure options and sent email for feedback. Wants short closure option	Daily trips over the hill carting appliances and general goods.	FD
TOLL				-			
Courier Post				-			
Frews				-			
East West Coaches				-			
Ahaura Transport				-			

Arthur's Pass Village Bussiness								
Organisation	Contact Person	Position	Phone Number	Email Address	Emailed	Called	Comment	Approached by:
Challenge Arthur's Pass Cafe and Store	s 9(2)(a)	s 9(2)(a)	s 9(2)(a)	s 9(2)(a)				
The Sanctuary								

Arthurs Pass Motel and Lodge			s 9(2)(a)				
Wobbly Kea			s 9(2)(a)				
Arthurs Pass Outdoor Education Centre							
Mountain House							
Arthur's Pass National Park Visitor				arthurspassvc@doc.govt.nz			
Kennedy Lodge Canterbury Mountaineering Club	s 9(2)(a)			s 9(2)(a)			
Arthur's Pass Alpine Motel							

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