Hinekura Road Corridor Assessment and Options Report

Project Number: 5-C4072.01

17 February 2023

CONFIDENTIAL

wsp

150 YEARS IN AOTEAROA

Contact Details

Githmi Amarasekera

WSP
L9 Majestic Centre
100 Willis Street
Wellington 6011
+64 4 471 7000
0273431603
githmi.amarasekera@wsp.com

Document Details:

Date: 17/02/23
Reference: 5-C4072.01
Status: Draft

Prepared by

Githmi Amarasekera

Reviewed by

David Stewart

Fariz Rahman

Approved for release by

Fariz Rahman

Alexei Murashev

Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
A	17/02/22	Githmi Amarasekera	Fariz Rahman David Stewart	Alexei Murashev	Final

Revision Details

Revision	Details
A	Final

Contents

List of Figures

List of Tables

Appendices

Disclaimers and Limitations

This report ('**Report**') has been prepared by WSP exclusively for the South Wairarapa District Council] ('**Client**') in relation to the alignment options for Hinekura Road ('**Purpose**') and in accordance with an emailed request to WSP from South Wairarapa District Council dated 14 November 2022. The findings in this Report are based on and are subject to the assumptions specified in the Report. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

Executive Summary

Following a significant slip event at 1673 Hinekura Road in June 2022, Hinekura Road between Longbush Road and Moeraki Road has been closed.

An alternative route was provided for the public via Admiral Hill Road. This alternative route is tortous with several winding curves. The alternative route from the north side of the slip on Hinekura Road to the south side of the slip on Hinekura Road takes approximately 1 hour and 17 minutes to traverse in a passenger vehicle. Due to the geometry of the alternative route, it is expected to take longer for heavy vehicles due to the bridges and road geometry. The total detour route is approximately 57km and the roads are predominantly unsealed, two-way, undivided carriageways. Since the main slip has occurred, WSP have provided the South Wairarapa District Council (SWDC) with several realignment options for Hinekura Road. This report assesses five shortlisted options and provides discussion of the existing characteristics of Hinekura Road and feasible route options for a long-term transport solution.

The landslide itself is 500m long and about 100m wide and moved 90m over a period of few days in June 2022. Survey monitoring of the landslide since this time has been carried out by repeat drone surveys and through a network of remote monitoring movement sensors. Data to date suggests that the main landslide has not moved significantly since the large June 2022 event. However, slope movements have been detected in the upper part of the landslide particularly after heavy rain events.

In August and September 2022, the local farmers arranged the construction of a temporary private road through their land, starting from Hikawera Road bypassing the top of the landslide and connecting back to Hinekura Road about 200m to the east of the landslide. This temporary road has steep vertical grades and has not been formally designed or constructed to public road engineering standards.

Apart from the Admiral Hill route the other shortlisted route options involve either:

- bypassing the landslide on the upslope side; via a geometrically compliant, but longer, route (option 1), or utilising and upgrading the private temporary road (option 2) or
- crossing the landslide on shorter routes; either at close to the original road level (Option 3), or near the top of the landslide (Option 4). Options 3 and 4 are higher risk due to the uncertainty of the behaviour of the landslide, but may be options in the short term if the risk can be managed (option 3) or if stable ground can be uncovered to form a stable road on (Option 4).

Hinekura Road is located on slip prone land along most of its length, hence apart from Option 5 all other options will require ongoing Council maintenance at multiple sites. Closer to the main landslide a number of smaller underslips are developing on Hinekura Road either side of the main slip. Option 1 will bypass these underslips, whereas Options 2 to 4 will not (to the same extent). As indicated by slope failures on the recently constructed temporary road, whichever new route is chosen by SWDC, slope failure risks will need to be managed.

1 Introduction

1.1 Project Description

Following a significant slip along this section of the carriageway in June 2022, Hinekura Road between Longbush Road and Moeraki Road has been closed off. An alternate route was opened via Admiral Hill Road for public use. For locals, a temporary track was constructed through private land, starting from Hikawera Road and connecting back to Hinekura Road. This report intends to provide the South Wairarapa District Council (SWDC) with a discussion of the existing characteristics of Hinekura Road and feasible route options for a long-term transport solution.

2 Background

2.1 History

Hinekura Road is located in the Wairarapa, east of Martinborough, and stretches from Todds Road to the Moeraki Road/Bush Gully Road intersection as shown in Figure 1. The majority of this road is located in a general rural zone, and has history of land erosion and landslides in severe weather events leaving the road vulnerable.

During 2020 and 2021, movement of a large landslide at 1673 Hinekura Road resulted in closure of the road for a number of days, when a 100m wide section of the landslide moved 3 to 4 m on at least three occasions following heavy rain. However during a June 2022 heavy rain event, the amount of movement of the landslide was much greater (moving about 90m downslope), destroying the road and an already compromised farm dam upslope of the road, and forcing the road to be closed off to the public.

The landslide, between Hikawera Road and the Bush Gully Road/Moeraki intersection, as shown in Figure 1 and Figure 2

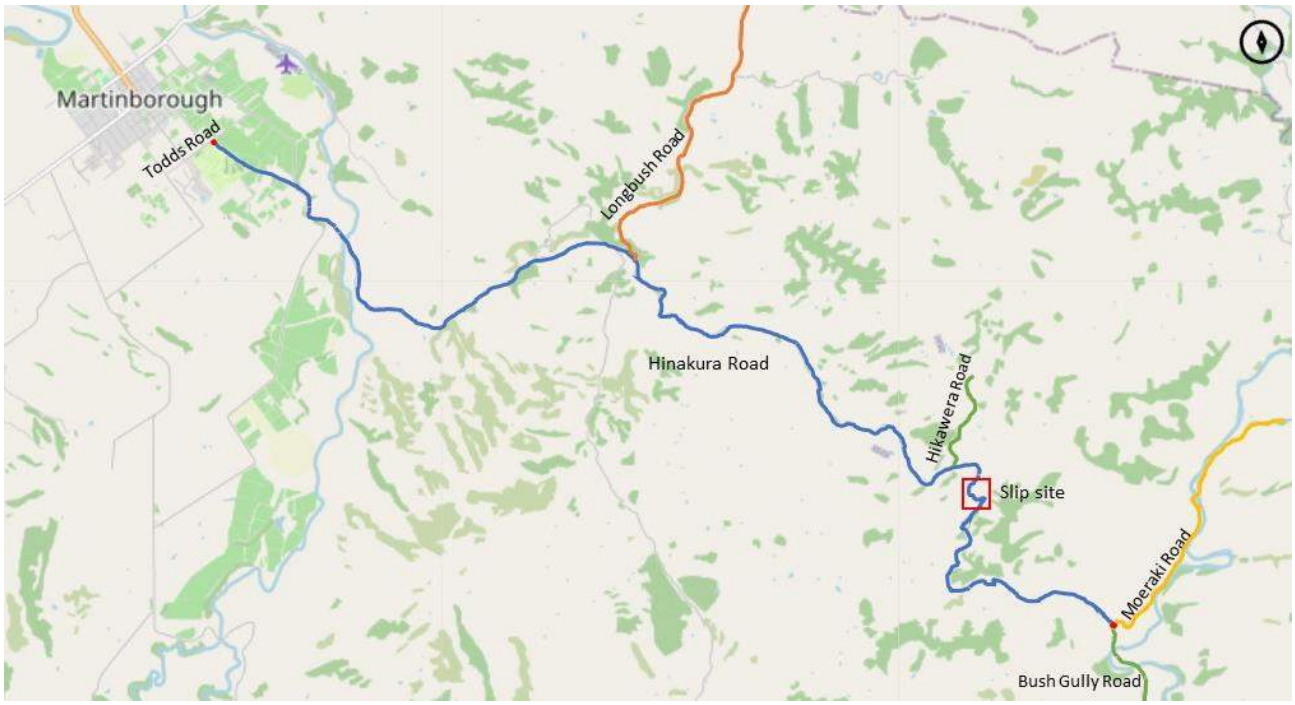


Figure 1: Hinekura Road location

Figure 2: Extent of Landslide at 1673 Hinekura Road, imagery December 2022.

Either side of the main landslide, smaller slips are present along Hinekura Road. Between Hikawera Road and the main landslide, a 35m underslip affecting about half the road has been developing since June 2022 as shown in Figure 3.

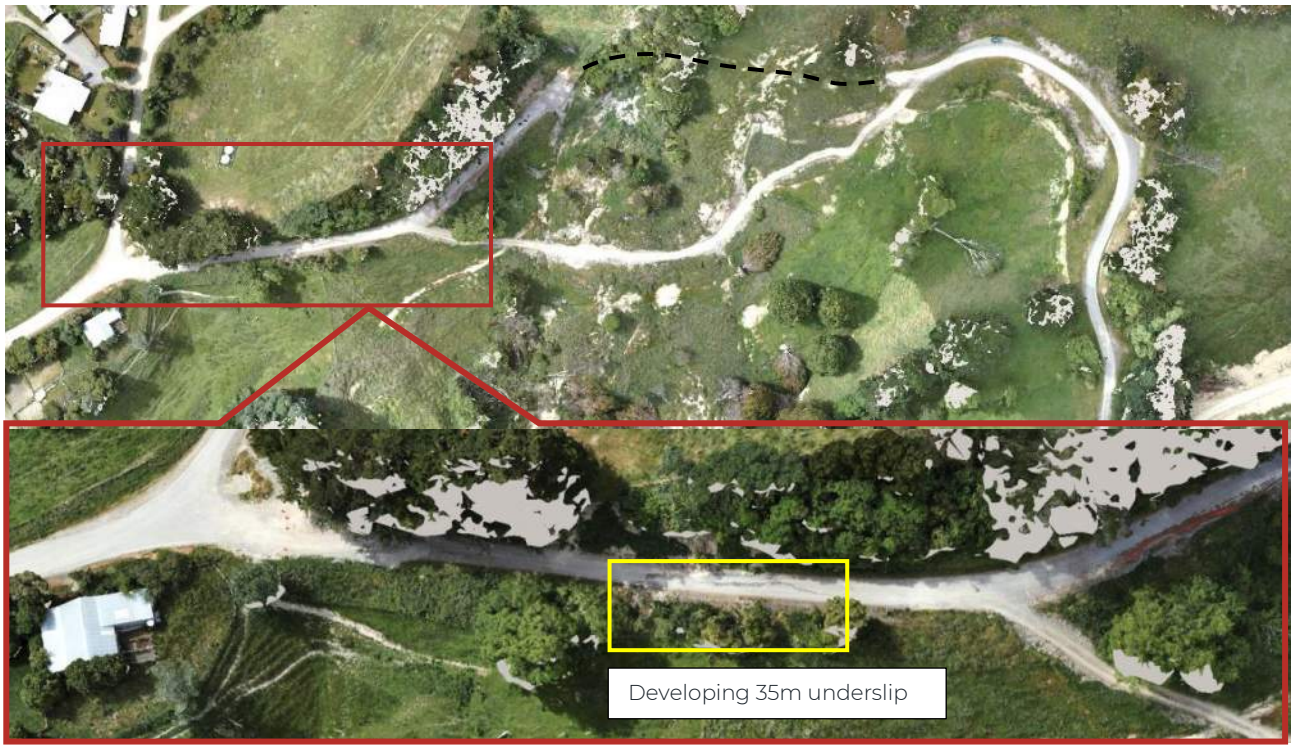


Figure 3: Underslip forming along Hinekura Road near Hikawera Road .

On the southern side of the slip on Hinekura Road, an underslip has developed. The developed underlip is show in Figure 4.

Figure 4: Developing underslip on Hinekura Road immediately upslope of southern farm dam, about 400m east of the main landslide

Since the closure of Hinekura Road, a temporary road serving only locals has been constructed by the landowners through private property as highlighted in yellow in Figure 5. The temporary road is accessed via Hikawera Road and is currently gated. The lock combinations are known only to the locals, impeding access for public road users. This temporary road has been constructed over two private farmland properties (McCreary and Hancock).

An unofficial steep track has also been constructed below the existing road partly utilising the damaged old road material, as shown in Figure 6. As seen on site, this appears to be used predominantly by quad bikes, and due to the very steep grades is unsuitable for normal vehicle traffic.

Figure 5: Temporary road constructed by landowners to bypass Hinekura Road landslide .

Figure 6: State of Hinekura Road in December 2022 with new downslope temporary track following remnants of old severely displaced carriageway.

2.2 Previous Work and Engagements

WSP was previously engaged by the SWDC to conduct inspections and Unmanned Aerial Vehicle (UAV) surveys of the landslide movement that occurred at 1673 Hinekura Road in June 2020. The output of this work was a geotechnical memorandum covering a description of the landslide, mitigation options and recommendations for the monitoring of the landslides.

In August 2021, WSP carried out an assessment following reactivation of the landslide affecting Hinekura Road, at 1673 Hinekura Road. The outcome of this assessment summarised the landslide data using the UAV surveys and provided recommendations for mitigating the risk at the site.

Following the June 2022 movement WSP carried out inspections and monitoring of the movement and provided advice to SWDC on risk management at the site. This included remote monitoring recommendations.

In July 2022, SWDC conducted maintenance works on the alternative route through Admiral Hill Road to sustain the extra traffic over a longer period. Work to smooth out sharp corners, cut back foliage for better visibility and new signage were completed. The improvement work is a continuous work programme as the road is impacted each time there is heavy rain[1].

During August and September 2022, a temporary private road was constructed for local use, from the Hinekura / Hikawera Road junction through two private farmland properties bypassing the landslide on the upslope side and re-joining Hinekura Road about 500m from Hikawera Road.

In August 2022, SWDC fast-tracked funding for realignment design plans for Hinekura Road to be completed by WSP. These plans were intended to allow the Council to apply for the required consents and legal permissions. In September 2022 WSP provided realignment options. WSP provided a range of alternate route options for review. During this time WSP also installed instrumentations to monitor and further movement of the landslide.

On 13 February 2022, WSP completed an economic assessment: Hinekura Road Realignment Option - Economic Assessment, for the option to realign Hinekura Road. The assessment concluded that the benefit of constructing the option outweighs the cost of closing Hinekura Road and directing traffic to use the longer detour or alternative route. The Benefit Cost Ratio (BCR) is 3.1.

3 Existing Environment

3.1 Corridor Characteristics

Hinekura Road is located in a general rural zone in the South Wairarapa District and is surrounded by farmland as shown in Figure 7.

Figure 7: Draft Wairarapa combined district plan

[1] https://swdc.govt.nz/hinekura-road/

Hinekura Road between Longbush Road and Moeraki Road is an undivided, two-way, two-lane carriageway with a speed limit of 100 km/h. The road has a One Network Road Classification (ONRC) of 'Access' as Hinekura Road provides connectivity to the wider road network. This road is used by both passenger vehicles and heavy vehicles such as logging trucks. The Average Daily Traffic (ADT) on this road is estimated at 225 with 8% heavy vehicles[2]. Hinekura Road has an average width of 6.0 m, with the narrowest segments of the roads having an approximate width of 4.5m and the widest segments approximately 7.4m. The carriageway lanes are not delineated with line markings, however, does have edge lines on the true left of left-hand horizontal curves and the true right of right-hand horizontal curves. Edge marker posts delineate the road on both sides of the road. There is also little to no shoulder along the road, ranging from 0 – 0.5m.

According to MegaMaps[3], the horizontal alignment of Hinekura Road from Longbush Road to Hikawera Road is described as 'winding'. A winding alignment is described as many consecutive curves and sharp curves (350-500m radius)[4]. From Hikawera Road to Moeraki Road, Hinekura Road has a horizontal alignment that is 'tortuous'. A tortuous alignment is described as numerous consecutive curves (350–500m radius) and numerous sharp curves (radii < 350m).

Hinekura Road has a posted speed limit of 100km/h, however, the safe and appropriate speed, as per MegaMaps, is 60km/h. The operating speed between Longbush Road and Hikawera Road is 67km/h and between Hikawera Road and Moeraki Road is 46km/h. The lower operating speed between Hikawera Road and Moeraki Road is likely due to the road geometry having greater horizontal curves.

3.2 Crash History

In the ten years between 2012 and 2022 (inclusive), there have been four crashes along Hinekura Road. Of the four crashes, two crashes were of serious severity, one minor severity, and one non-injury. Figure 8 shows the location of the crashes and Table 1 summarises the events of the crashes.

2 https://mobileroad.org/desktop.html
3 https://maphub.nzta.govt.nz/MegaMaps/
4 https://www.nzta.govt.nz/assets/resources/infrastructure-risk-rating-manual-road-to-zero-edition/infrastructure-risk-rating-manual-road-to-zero-edition-2022.pdf

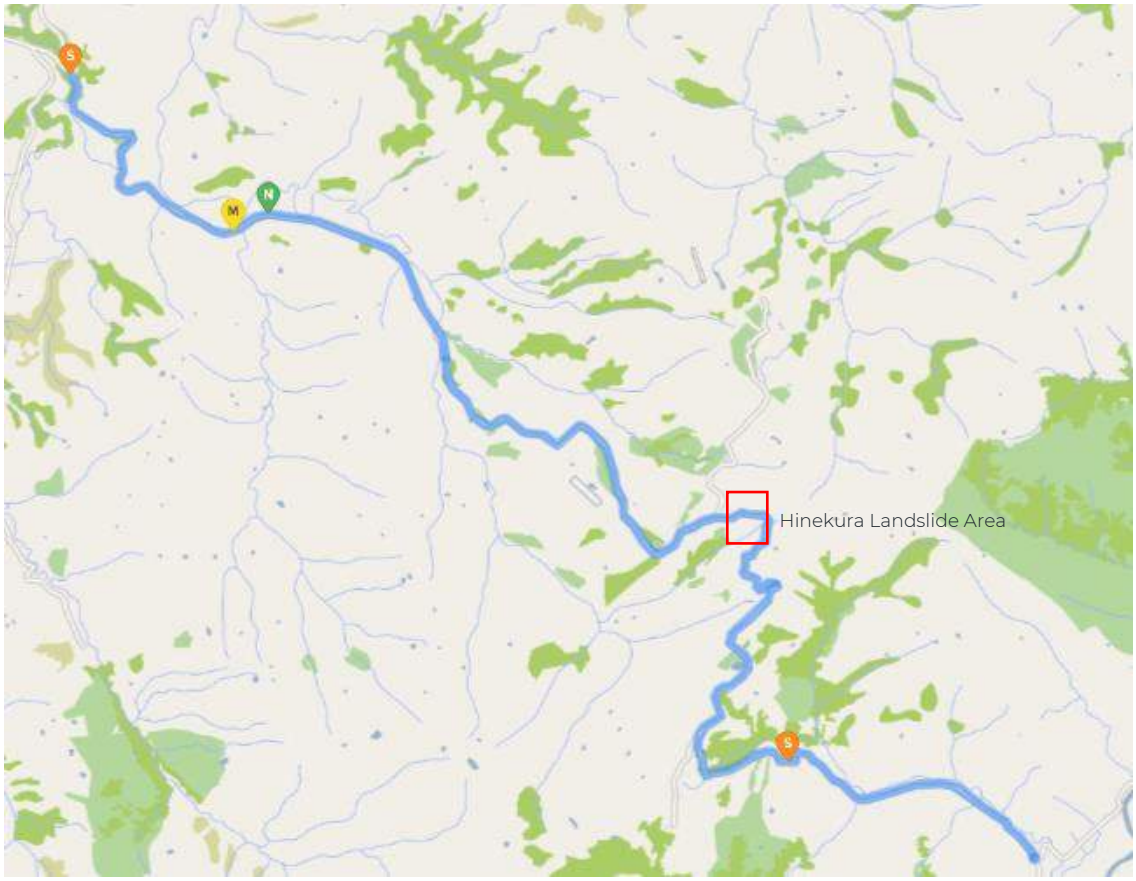


Figure 8: Crash locations.

Table 1: Crash descriptions

Date	Severity	Crash Type	Description
29/03/2012	Serious	Rear-end	Vehicle 1 slowed down at the intersection. Vehicle 2 has crashed into the rear of Vehicle 1
12/10/2013	Minor	Lost control	Vehicle 1 failed to take corner correctly and hit the gravel on the edge of the road causing the driver to overcorrect and come off the motorcycle
23/12/2016	Non-injury	Lost control	Vehicle 1 fleeing authorities have lost control on a wet road surface bend. The vehicle then lost control and rolled.
02/11/2017	Serious	Lost control	Motorcyclist has lost control going up a hill possibly due to uneven seal and going too fast for the conditions on a narrow and winding road.

3.3 Road Safety Metrics

The following road safety metrics were taken from Waka Kotahi's MegaMaps Road to Zero Edition 1[5].

The Infrastructure Risk Rating (IRR) is inherent to the road and is determined by the key roadside attributes listed below.

- land use
- road stereotype
- geometry
- carriageway width
- horizontal alignment
- roadside hazards
- intersection density
- access density
- traffic volumes.

There are five IRR risk bands: low, low medium, medium, medium-high and high. The threshold levels are established based on adjacent land use.

The IRR for Hinekura Road can be seen in Figure 9. Hinekura Road between Longbush Road and Hikawera Road has an IRR of medium high. Between Hikawera Road and Moeraki Road, near the landslide, the IRR is predominantly high. Further away from the landslide, Hinekura Road has two small sections of carriage rating at medium and medium-high, respectively.

Figure 9: Hinekura IRR rating

[5] https://maphub.nzta.govt.nz/megamaps/

The collective risk is relative to the crash history and measures of the risk density of death and serious injuries per kilometre. Collective risk is a measure of the number of fatal and serious injuries per kilometre that can be expected over the next five-year period.[6]

Similar to the collective risk, the personal risk is related to the crash history. It measures the risk of a fatal or serious injury crash for the individual. The personal risk can be thought of as the 'crash rate'. The five bands for collective risk and personal risk are shown in Table 2 below.

Table 2: Collective and personal risk bands[7]

Risk Rating	Collective risk Average annual fatal and serious injury crashes per km	Personal risk Average annual fatal and serious injury crashes per 100 million vehicle-km	Colour
Low	≤ 0.039	<4	
Low medium	0.04 ≤ 0.069	4 ≤ 4.9	
Medium	0.07 ≤ 0.10	5 ≤ 6.9	
Medium-high	0.11 ≤ 0.189	7 ≤ 8.9	
High	0.19+	9+	

The collective and personal risk of Hinekura Road is shown in Figure 10. Hinekura Road between Longbush Road and Moeraki Road has a low collective risk.

Overall, the personal risk of Hinekura road is low, except for a small section of the carriageway, which is near the landslide, with medium personal risk.

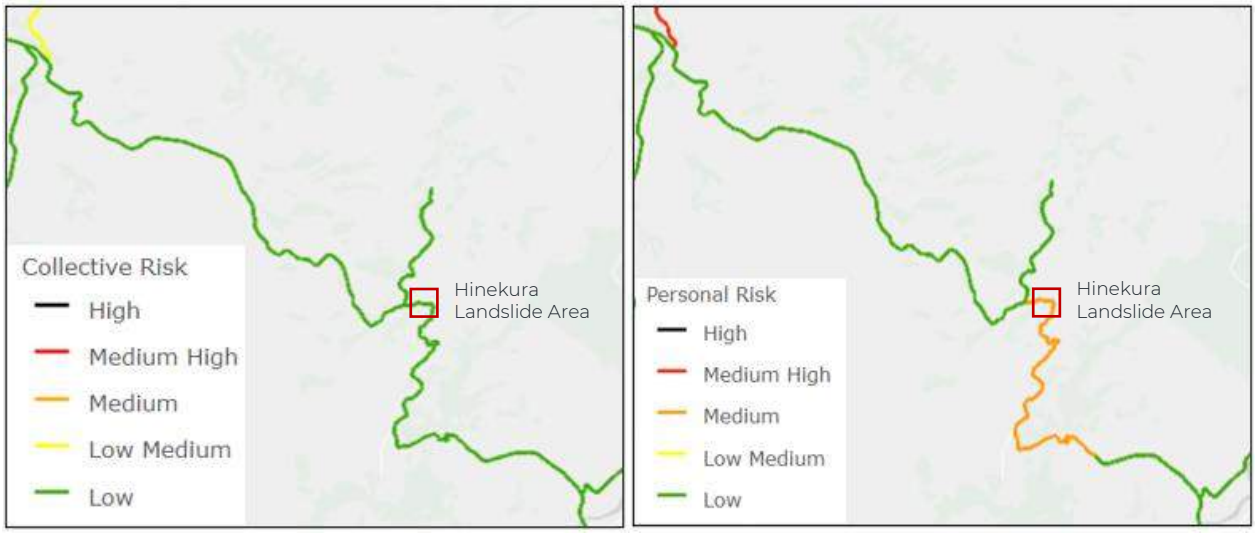


Figure 10: Hinekura Road collective risk (left) and personal risk (right).

3.4 Farm Dams

There are three farm dams located in the area assessed for local realignments, as shown in Figure 11. Before the catastrophic landslide in June 2022, ground movement was recorded in this area,

[6] https://at.govt.nz/media/1987521/101_attachment-1-proposed-speed-limits-amendment-bylaw_glossary-rp.pdf
[7] https://www.kiwirap.org.nz/presentation_risk.html

compromising the structural integrity of the northern farm dam. Prior to the June 2022 movement, WSP had conducted an analysis to provide improvement options and an alternative location for the farm dam. However, following the catastrophic June 2022 event, the northern farm dam was destroyed.

Figure 11: Farm dam locations.

3.5 Other Slips

The terrain through which Hinekura Road passes is hilly and prone to slips. In Figure 12 the brown dots indicate locations of slips mapped by GNS Science, in relation to SWDC's preferred road realignment (pink); as well as two developing underslips identified by WSP in 2022 either side of the main landslide. Figure 13 shows three large landslides in the GNS landslide database, two of which currently directly affect Hinekura Road between Hikawera Road and Moeraki Road. This shows Hinekura Road is in a slip-prone environment. If Hinekura Road is reopened for public use, SWDC will need to allow for managing existing and future landslides along this route. This will include regular maintenance to manage drainage but may involve managing development of other large disruptive landslides. Given expected more damaging storm events due to climate change more slip management is to be expected.

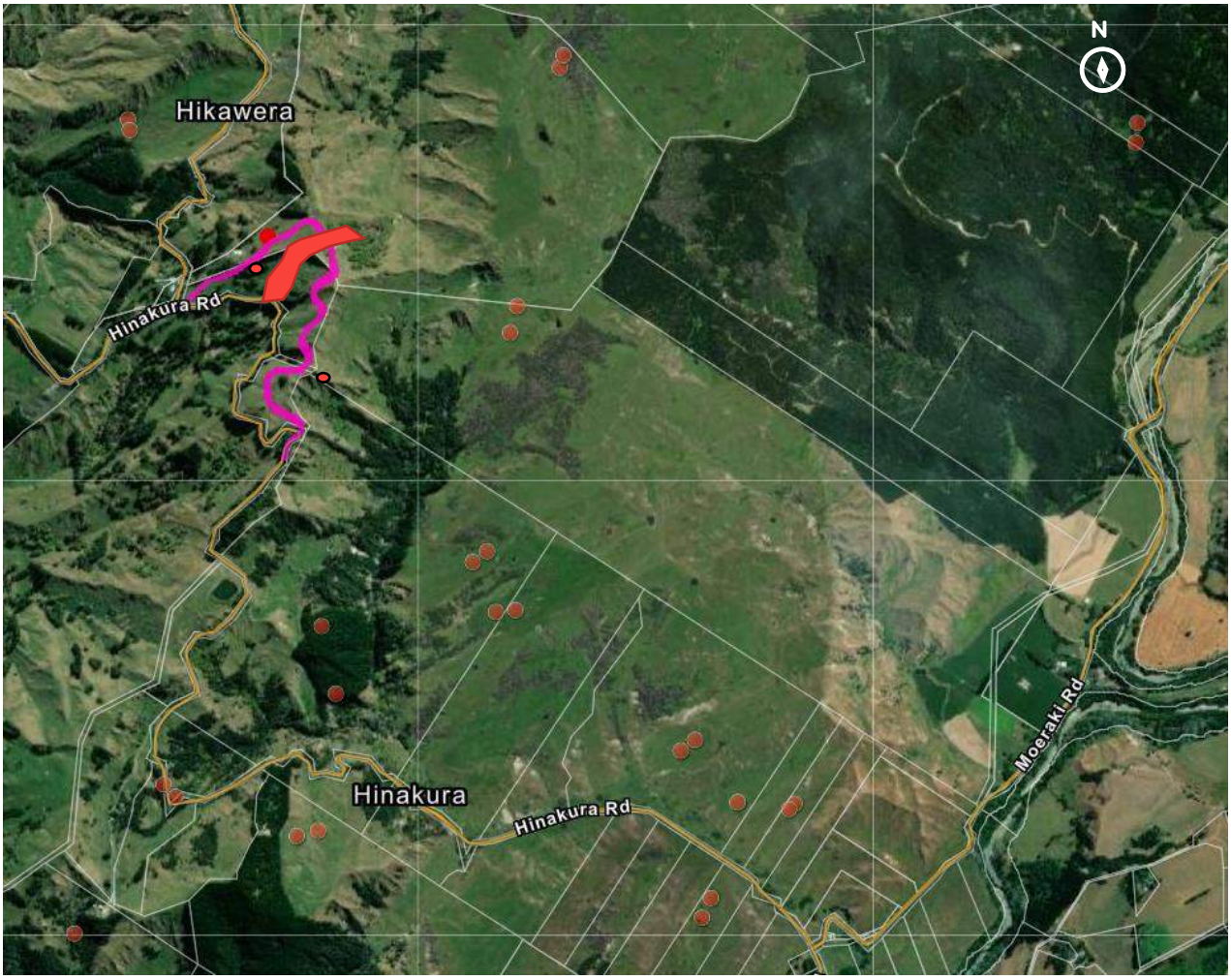


Figure 12: Slip locations near the assessment area (Brown dots are from GNS Landslide database). Red dots from the 2022 investigations

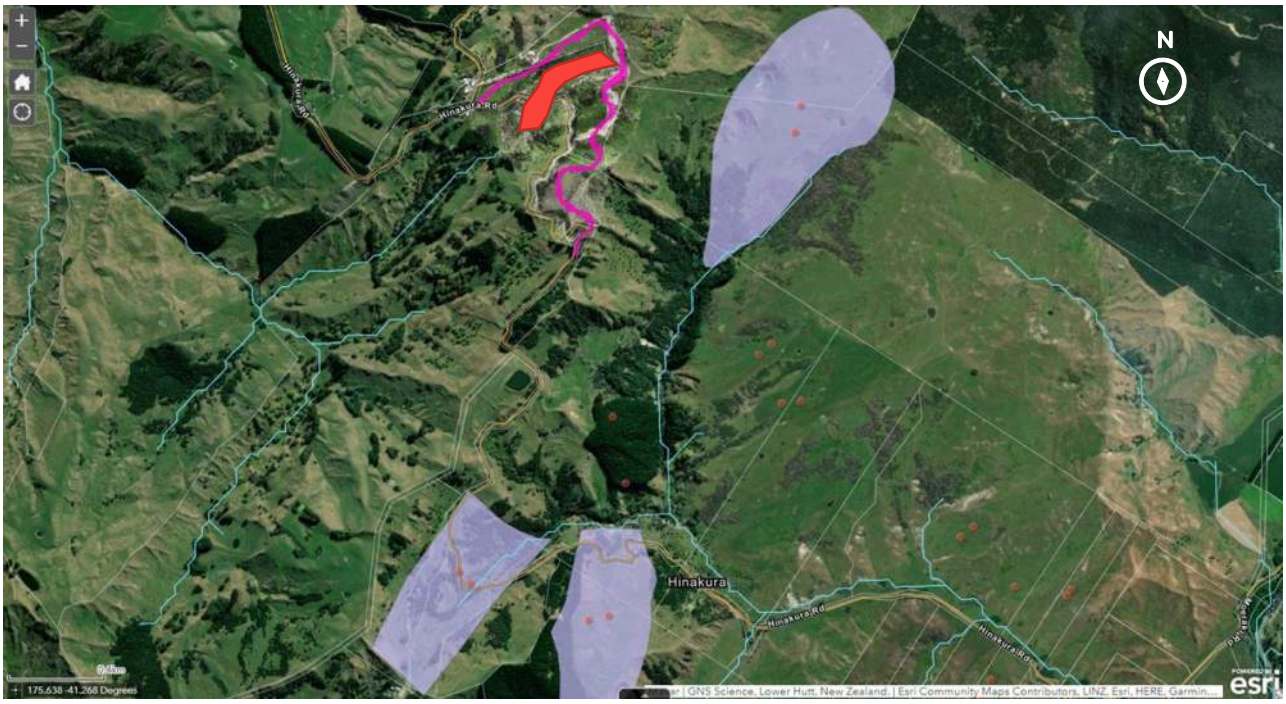


Figure 13: Large landslides in GNS landslide database in the vicinity of Hinekura Road.

4 Alternative routes

Due to the road closure of Hinekura Road, an alternate route has been provided as shown in Figure 14. This alternative route is open to all members of the public.

As Hinekura Road is closed, those travelling west towards Martinborough, unless they have access to the temporary private road bypassing the landslide, will need to travel onto Moeraki Road, Ngakonui Road, Wainuioru Road, and Clifton Grove, Admiral Road before travelling Longbush Road.

Vehicles travelling east will travel from Hinekura Road to Longbush Road onto Admiral Road, following onto Clifton Grove, Wainuioru Road, and Ngakonui Road, before travelling Moeraki Road. The detour route takes approximately 1 hour and 17 minutes to traverse in a passenger vehicle, however, it is expected to take longer for heavy vehicles due to the bridges and road geometry.

The total detour route is approximately 57km and the roads are predominantly unsealed, two-way, undivided carriageways.

Of the detour route, Longbush Road and Admiral Hill Road are sealed roads. Clifton Grove, Wainuioru Road, Ngakonui Road, and Moeraki Road are unsealed roads, spanning approximately 24 km of the total detour route (42% of the route). There are also several bridges and gates along the detour route. Admiral Hill Road itself has cattle access across it and vehicles driving through this route are required to travel through five farm gates

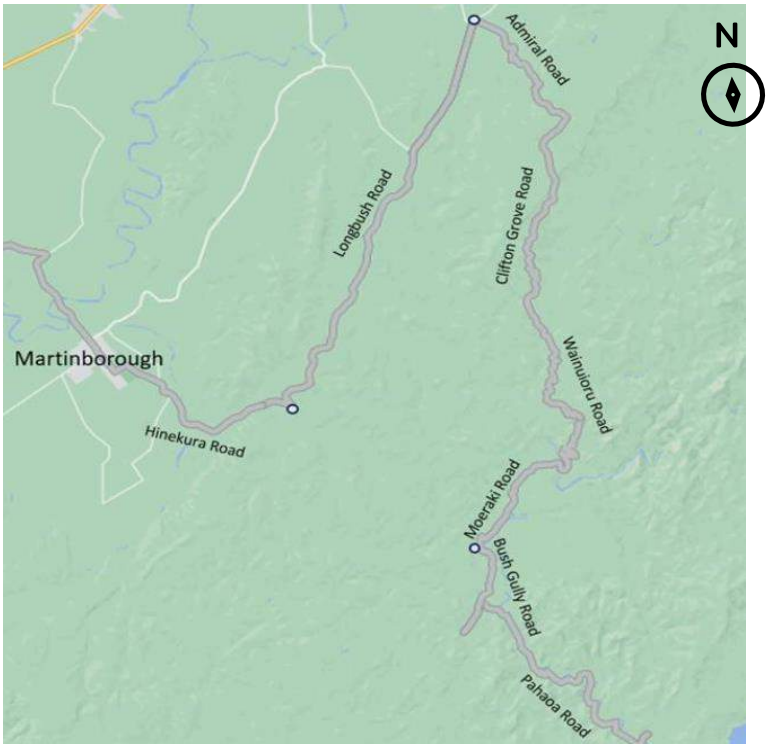


Figure 14: Detour route.

Since the provision of the detour route, the council have carried out minor maintenance work on the Admiral Hill Road access to make the route safer and accommodate increased traffic. The council has made efforts to smooth out sharp corners and cut back foliage for better visibility.

If the alternative route is to be made the permanent route, further improvements are likely to be required. These improvements would potentially include but are not limited to, enlarging corners, widening pinch points, clearing fallen trees, debris, and slips, strengthening weak shoulders and installing retaining walls to stabilise developing underslips, and installing signage and upgrades

to bridges may be required. Overall, there is approximately 3.3 km of out of context curves on the alternative route, hence, these corners should be investigated further to determine if improvements are required

4.1 Road Safety Metrics

The following road safety metrics were taken from Waka Kotahi's MegaMaps Road to Zero Edition 1[8]. Table 3 shows a summary of the average safety metrics for the detour route. As some carriageways are broken into multiple segments the table below shows the average metrics for the whole detour road.

Table 3: Safety metrics for detour route roads

Road Name	Longbush Road	Admiral Road	Clifton Grove	Wainuioru Road	Ngakonui Road	Moeraki Road
AADT Band	<1,000 veh/day (354)	<1,000 veh/day (120)	<1,000 veh/day (38)	<1,000 veh/day (15)	<1,000 veh/day (3)	<1,000 veh/day (48)
Alignment	Winding	Tortuous	Tortuous	Tortuous	Tortuous	Winding
Lane Width	3.0m-3.5m	<3.0 m – narrow	<3.0 m – narrow	3.0m-3.5m	3.0m-3.5m	3.0 m – narrow
Shoulder Width	0m-<0.5m	0m-<0.5m	0m-<0.5m	0m-<0.5m	0m-<0.5m	0m-<0.5m
Roadside Hazards	High Moderate	Severe	Severe	Severe	Severe	Severe
Infrastructure Risk Rating Band	Medium	High	High	High	High	High
Collective Risk	Low	Low	Low	Low	Low	Low
Personal Risk	Low	Medium High	Low	Low	Low	Low Medium

4.2 Bridge Inspections

The roads which make up the detour route have several bridges. Figure 15 shows the bridges in the vicinity of Hinekura Road and the detour route. Previously, WSP conducted bridge inspections in February and March 2021 as requested by the Carterton and South Wairarapa District Councils. WSP have conducted the bridge inspections for 2022 and the reporting is underway.

During the 2021 inspections and reporting, WSP inspected 15 bridges along the detour route provided for Hinekura Road. The Ruamahanga Roads Structural Inspection Report 2020/21 reported the findings of the inspected bridges and maintenance cost estimates. The inspection included but was not limited to the 15 bridges on the detour route and 2 bridges along Hinekura Road between Longbush Road and Moeraki Road as shown in Figure 15.

[8] https://maphub.nzta.govt.nz/megamaps/

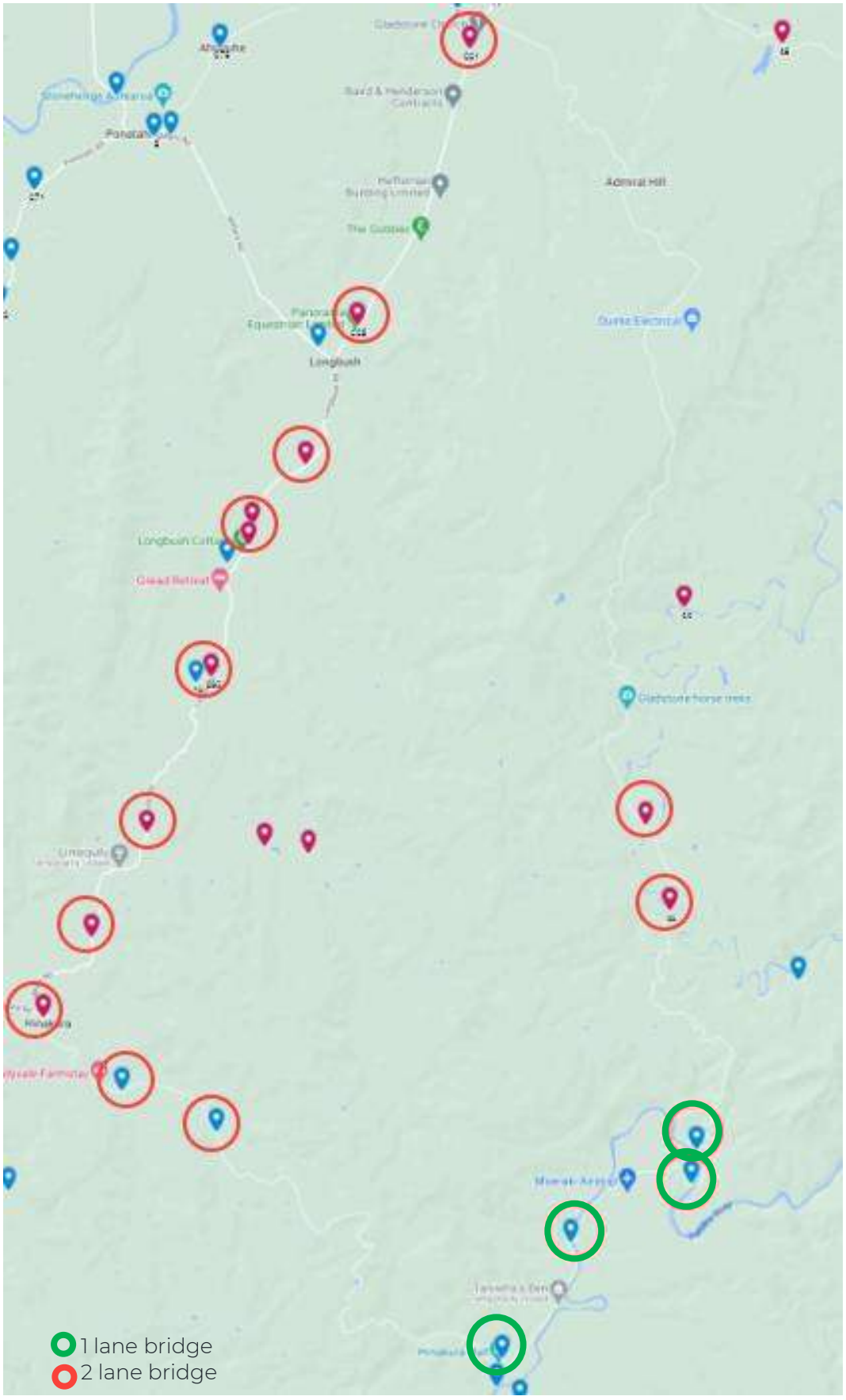


Figure 15: Bridges inspected in 2020/21 in the assessment area

The Ruamahanga Roads Structural Inspection 2020/21 Reports outlined the maintenance required for each bridge and the prioritization of this work. A maintenance item with high priority was classified as requiring attention within approximately 1 year, medium priority within approximately 5 years and low priority in the next 5+ years.

Of the two bridges on Hinekura Road, one bridge required maintenance work which was prioritized as medium and/or high. Of the 15 bridges on the alternative route, 12 bridges required maintenance work which was prioritized as medium and/or high.

It should also be noted that 4 bridges on the alternative route are one-lane bridges (circled green in Figure 15). These bridges have signage showing the heavy vehicle limits as axles 5,200 kg and gross 44,000kg. For the alternative route to be a viable permanent option, the one lane bridges will need to be upgraded to two lane bridges.

The council needs to consider the loading limitations and existing maintenance required if the detour route is to be made permanent. Live load assessments are recommended to be conducted if not already done on the load limit and/or one-way bridges to identify if strengthening would be required.

4.3 Alternative Route Slips

In December 2022 slip, a site inspection was carried out by WSP staff and Tim Langley of SWDC along the alternate route from Admiral Hill Road to Hinekura Road near the slip. During this drive over the WSP geotechnical engineer noted several under-slips and over-slips, in between Admiral Hill Road and the Moeraki Road/Hinekura Road intersection. It was noted that most of these slips were not yet compromising the integrity of the carriageway, whereas the slips on Hinekura Road between the landslide and the Moeraki intersection were recorded as affecting the carriageway. Table 4 summarises the findings during the site inspection.

Table 4: December 2022 observations

Road Name	Approximate RP Location	Comment
Clifton Road	3.6	Underslips
	4.2	Good box culvert, potentially place rip rap
	4.5 – 4.6	Underslips
	6.5 – 6.6	Underslip
	8.5 – 8.6	The road is very narrow, and potential widening needed
Wainuioru Road	4.0	Underslip
	3.92 – 3.77	Underslips. Instability detected and potential strengthening required
	3.4 – 3.3	Narrow and windy road, potential investigation for improvements
	2.75	Potential instability near the shoulder

Road Name	Approximate RP Location	Comment
	2.15	Narrow road, potential widening needed
	0.27 – 0.21	Overslip
Ngakonui Road	3.7 -3.5	Overslip
	2.35	Windy and narrow road
Moeraki Road	5.6	Overslip
	4.4 – 4.3	Overslip
Hinekura Road	19	Underslips
	18.6	Underslip
	18.1	Underslip
	17.9	Underslip
	17.8	Underslip
	17.6	Underslip

The formalisation of the alternative route as the preferred route would require works to ensure the underslips and overslips in the area can be managed and monitoring of the area may be required to determine the possibility of any large slips, particularly if earthworks associated with road widening results in undercutting of marginally stable slopes above the road or fills loading marginally stable slopes below the road. Progressively more widening and corner easing will result in a greater level of service. Costs for improving the detour route are expected to be many $Millions unless a low Level-of -Service is accepted.

5 Road Alignment Options

5.1 Previous Work

WSP has provided the South Wairarapa District Council with the potential realignment options shown in Figure 16. During this process, the route was broken into three sections: the northern, middle, and southern sections. For all options, the carriageway was designed to be a two-way, two-lane carriageway with a width of 2.5 m and a 0.5 m berm on either side.

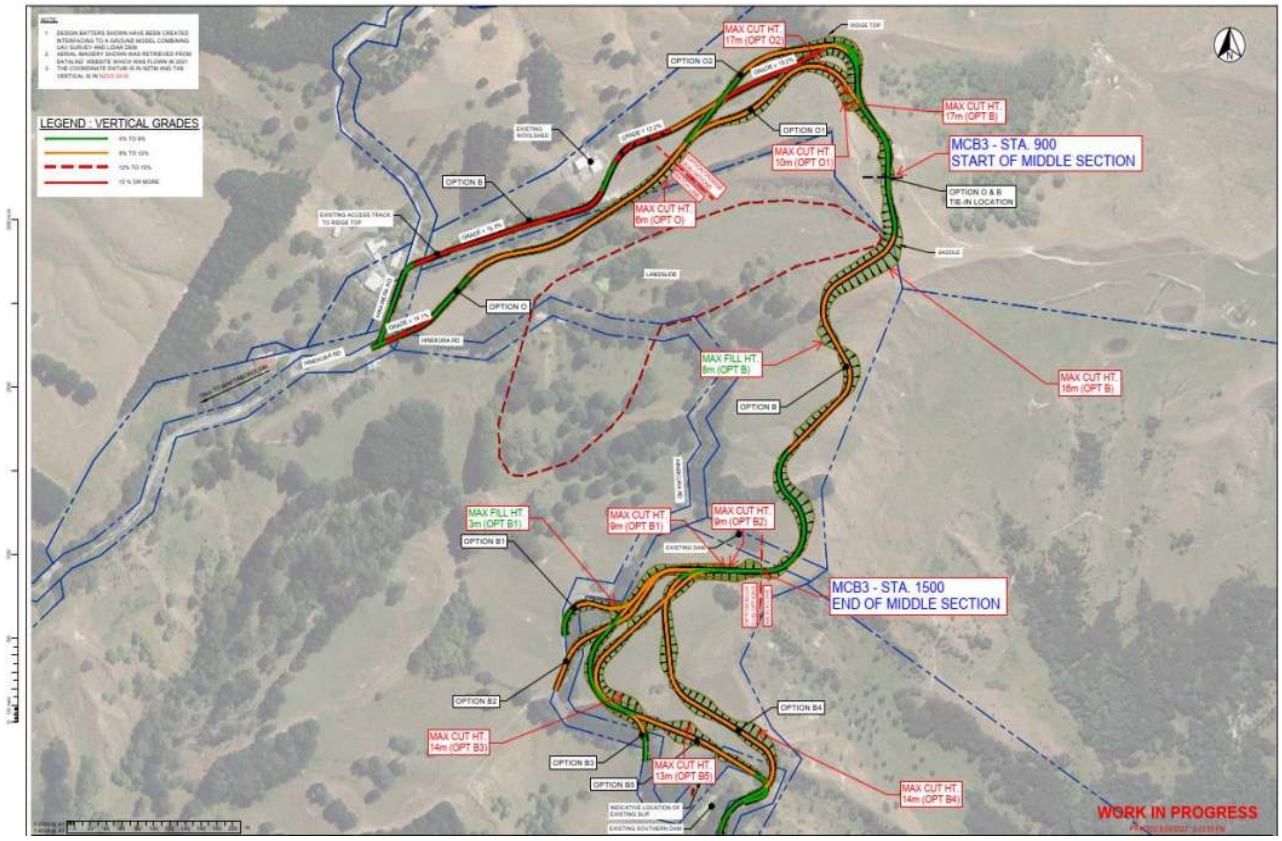


Figure 16: Realignment options and associated earthworks footprints and gradients (coloured)

Table 5 shows a summary of the provided options for each section. Please refer to Appendix A for the Hinekura Road Realignment Options – updated summary letter which details each option. This letter provides a high-level summary of the various options.

The two main options considered was the new alignment of O+O1+B+B4 and B+B+B4, which follows the alignment and profile of the exisiting farmers temporary road. SWDC preferred the route option combination of O+O1+B+B4. It is believed that this is a superior alignment due to the vertical grades, horizontal alignment, and resilience.

Table 5: Options for each section

Section	Option/ option combination	Preferred option
Northern Section	B	O+O1
	O+O1	
	O+O2	
Middle Section	B	B
Southern Section	B1	B4
	B2	
	B3	
	B4	
	B5	

Since the selection of the preferred route, further alignment options for Hinekura Road have been considered. This includes the following two options and 1 sub-option.

- Option 3: realignment through the slip, near the slip toe, option 3 in (yellow)
- Option 3A: (sub-option) realignment across the slip zone, through the un-official temporary track used by farmers, option 3A in Figure 17 (blue)
- Option 4: realignment from Hikawera Road through the upper landslide, option 4 (green).

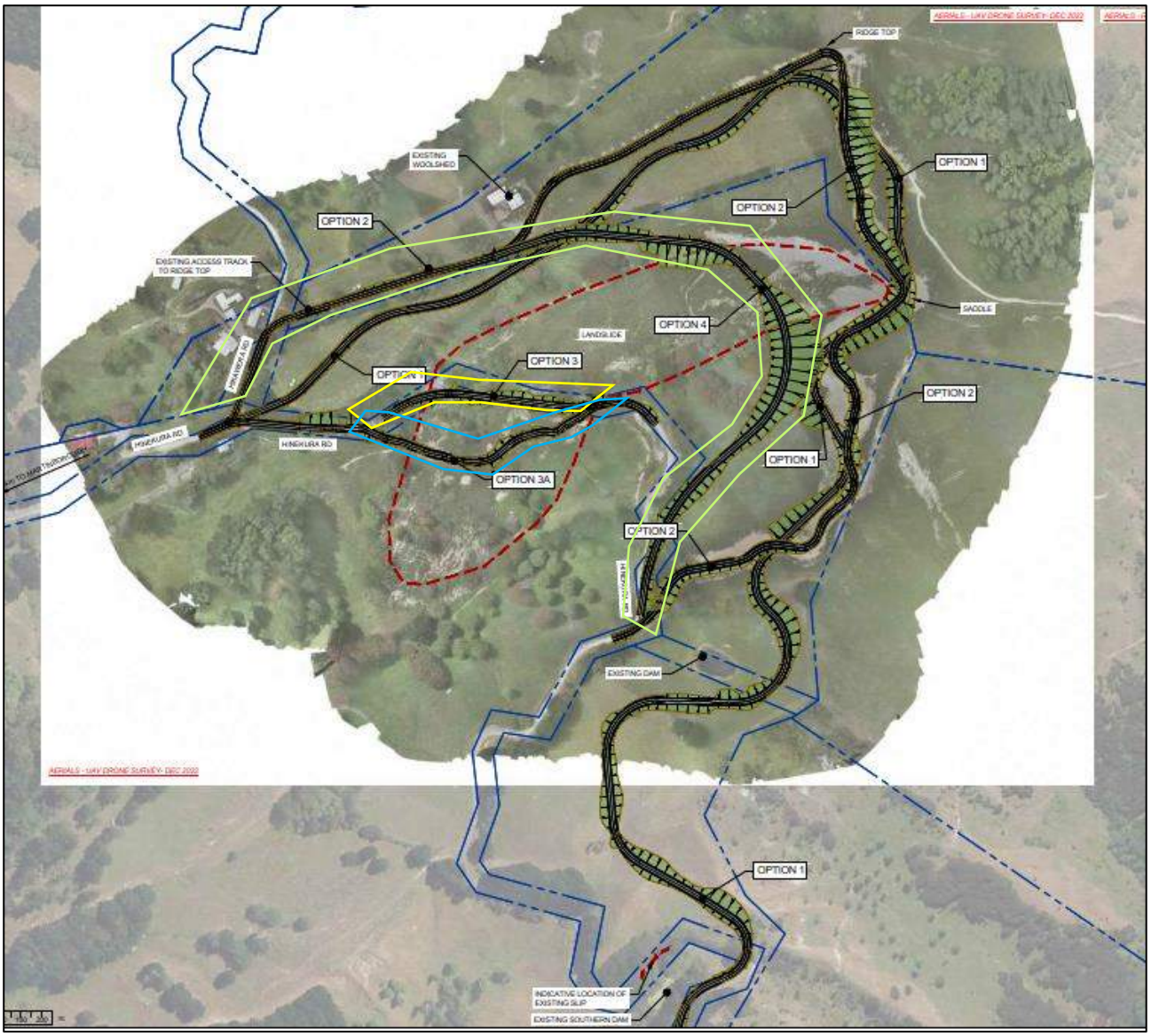


Figure 17: Further realignment options through the Hinekura Landslide

Option 3, traverses through the slip zone. The earthwork required for this alignment is less substantial compared to other options. The resilience of this option is still being explored. The resilience of option 3 is low due to its location relative to the slip zone. We believe this option is not a feasible long-term option, however, could be considered in the short term

Option 4 provides a better alignment in comparison to the current preferred option, however, this alignment is possible only if stable ground can be uncovered, either by the landslide completely failing, or by being dug out to expose stable land.

The sub-option: Option 3A, follows the alignment of the unofficial temporary track that's currently used by the local farmers for quad bikes. This alignment has not been considered as a shortlisted option due to the extremely steep vertical grades and low resilience.

For all options considered please refer to Appendix B for the long sections.

6 Shortlisted Realignment Options

Of the options explored, Table 6 summarises the five options. To determine the optimal route the horizontal alignment, vertical alignment, farm dam locations, earthworks, etc. should be considered.

Table 6: shortlist options

Option Name	Option Description
Option 1	Current preferred Realignment (O + O1 + B + B4)
Option 2	Upgrading Farmers temporary road (B+B+B4)
Option 3	New alignment through the landslide at the same level as the original road
Option 4	New alignment through the upper slip zone
Option 5	Hinekura Road closed + Upgrading alternative route

6.1 Horizontal and Vertical Alignments

The horizontal alignment of a road significantly influences the operating speed of vehicles travelling on an open road. When developing the horizontal alignment, the curve radii, and the change in speed between successive elements is important to create a safe road alignment. The NZ Forestry Road Engineering Manual describes the minimum curve radius for off-highway trucks to be greater than 18m and can typically be 40m.

Out-of-context curves (OOCC) are isolated unusually sharp curves. For this report, an out-of-context curve will be defined as a curve with a radius of less than 30m that results in a significant speed reduction from the posted speed limit. In any option, where the decrease in operating speed between successive geometric elements is expected alternative treatments including realignment or warning signs will be considered in further development stages,

The vertical alignment affects the vehicle travel speeds, especially those of heavy vehicles. A steep uphill gradient can slow heavy vehicles causing congestion issues. Steep vertical downgrades can cause increased speeds for heavy vehicles. If the vertical curves are too steep, heavy vehicles may lose control and become runaway vehicles. The NZ Forestry Road Engineering Manual describes an adequate vertical gradient to be within 8-12%.

6.2 Farm Dam Considerations

All local options may require the consideration of the farm dam locations. The northern dam is now destroyed. Some options affect some dams and not others. For example, the southern dam and associated slip above is not affected by option 1 but is for options 2 to 4. For option 1 only, the presence of the central dam will require mitigation actions such as relocation or strengthening / drainage of the slope above supporting the new road. For option 1, Figure 18 shows the preferred location for the northern farm dam.

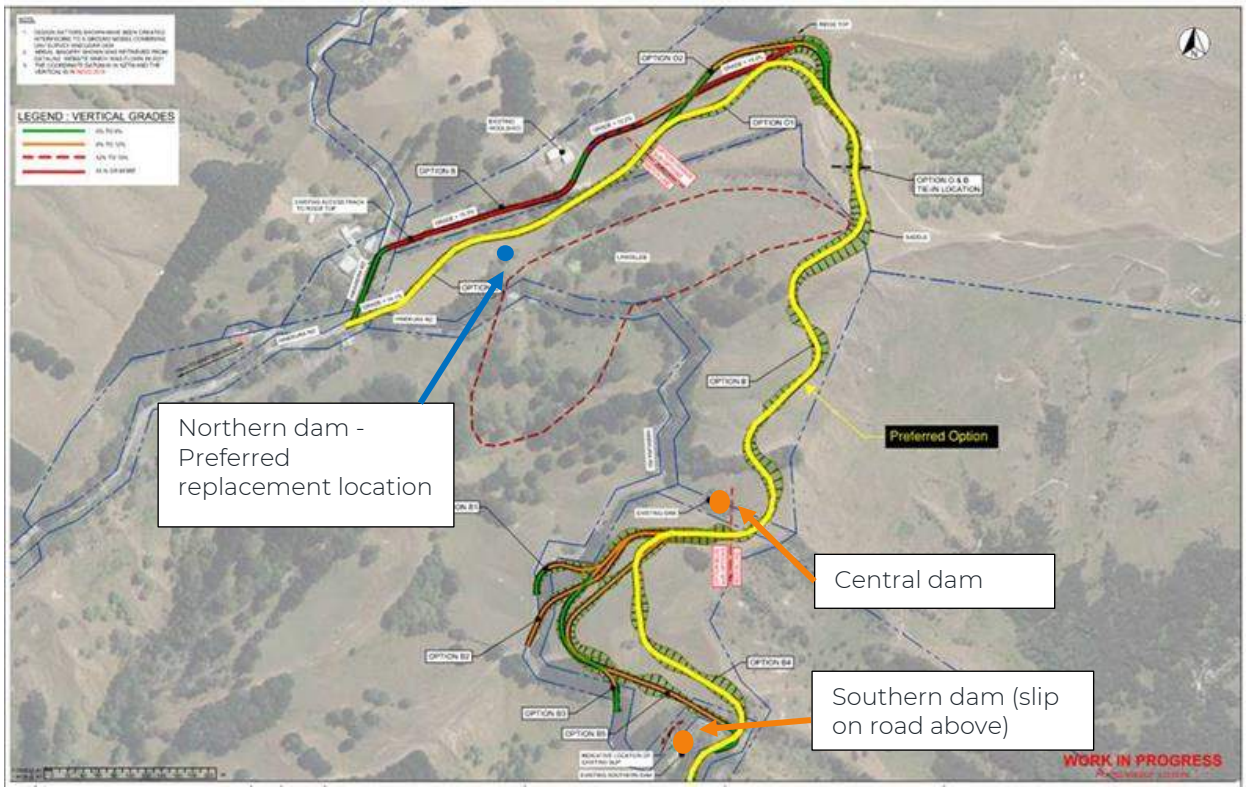


Figure 18: Farm dam locations

6.3 Earthworks and investigations

All options will require some level of earthworks to either strengthen an existing road alignment, stabilise potential slips and/ or construct a road alignment. The earthworks to develop the temporary track provided information on the ground conditions and hence may reduce the amount of ground investigations required for all options. Once a route option is selected additional investigations such as test pits and hand auger / scalar penetrometer testing is recommended. Investigation boreholes are recommended where high cuts are proposed. For options with a significant surplus of cut materials, a dump site will need to be identified.

It should be noted that only the cut and fill heights are available on the long sections for all options. As cross sections are unavailable at present, the volume of earthworks required is unable to be calculated. Therefore subjective

6.4 Slope movements

The Hinekura landslide is currently being monitored by remote movement sensors and a rain gauge and periodic drone surveys. Local movements have been recorded during heavy rain periods, however movement of the whole landslide itself has not been recorded since the June 2022 event.

The depth of movement on the upper slope is inferred to be shallow, however, a site investigation with boreholes is recommended. Figure 19 shows the remote monitoring network for the sensors at the Hinekura Road Slip.

Figure 19: Remote monitoring network at Hinekura Road Landslide

7 Shortlist Options Discussion

7.1 Option 1 - Current preferred Realignment (O + O1 + B + B4).

Option 1 is the current preferred option as highlighted in yellow in Figure 20. This option consists of a combination of the segments O + O1 + B + B4. This option bypasses the slip zone and connects back to Hinekura Road immediately east of the southern farm dam.

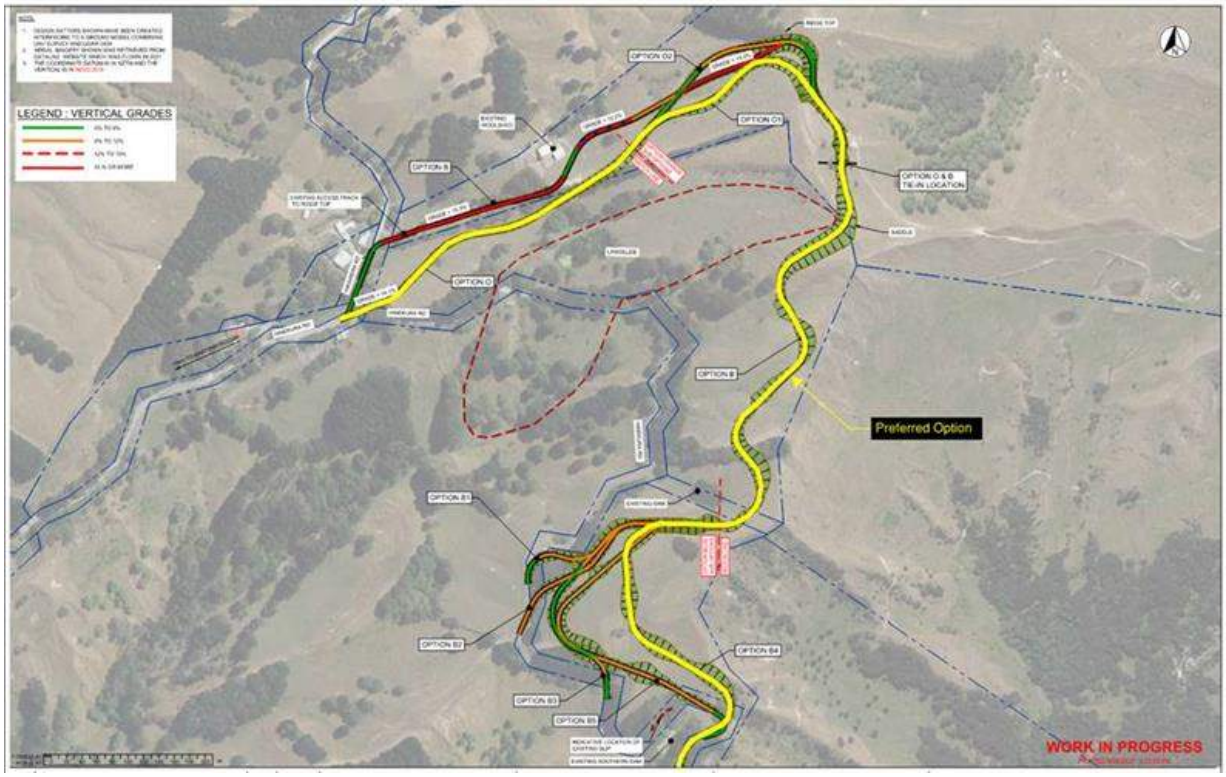


Figure 20: Option 1 – previously preferred alignment

For the plan and longitudinal section please refer to Appendix B

7.1.1 Horizontal Alignment

Overall, this option consists of 19 horizontal curves with a minimum curve radius of 32m. This option does not have out-of-context curves and provides for a smooth horizontal alignment.

7.1.2 Vertical Alignment

Overall there are 15 vertical curves in this alignment The northern section (O+O1) reaches a maximum grade of 14.15% the middle section (B) and the southern section (B4) reach a maximum of 12.0%. By the NZ Forestry Road Engineering Manual, an adequate vertical gradient is considered to be within 8-12%. All three sections have a relatively steep grade. Redesigning these sections with a lower grade and/ or widening the road may be favourable.

7.1.3 Farm dams

This option would require consideration of the farm dams. The northern (destroyed) dam is to be reinstated. The exact point of relocation is yet to be determined however the location shown in Figure 18 is favourable. Investigations will be required to determine if the proximity of the reinstated dam would have impacts on the new road alignment or vice versa.

There is potential work required for the central dam due to the proximity of the realigned road. The central dam may require relocation however this needs further investigation. If the central dam is to remain at its current location, the installation of a subsoil drain on the slopes above the dam to

have the dual function of draining the slope and tapping into the groundwater for farm use, and the storage requirement/ dam size possibly could be reduced.

7.1.4 Earthworks

This alignment has a maximum cut to a depth of 12.4m and a maximum fill of 3.3 m is required. This option predomintaly requires cutting to meet the proposed ground profile. Due to significant length of this option, it is estimated that a large amount of earthworks will be required.

7.1.5 Slips

The Option 1 route is in the vicinity of the large slip, however, does bypass the slip zone. Small amounts of movement have been recorded near the Option 1 route at the edge of the landslide during heavy rain periods. The depth of movement on the upper slope is inferred to be shallow, however, a site investigation with boreholes is recommended to confirm this.

Due to the nature of the environment, there is potential that this route may experience localized slips in the future. Therefore, it is important to ensure a robust design and consider what works may be necessary to attempt in the adverse effects on this route alignment.

7.2 Option 2 – Farmers temporary road (B+B+B4)

Option 2, as highlighted in Figure 21 is an alternative alignment to the preferred option and consists of a combination of the segments B + B + B4 (segments shown in Figure 16). This option follows the existing temporary track from Hikawera Road, reaching the ridge top before passing around the slip and reconnecting at Hinekura Road. The first section of this alignment is on a private driveway, which starts from Hinekura Road to the woolshed.

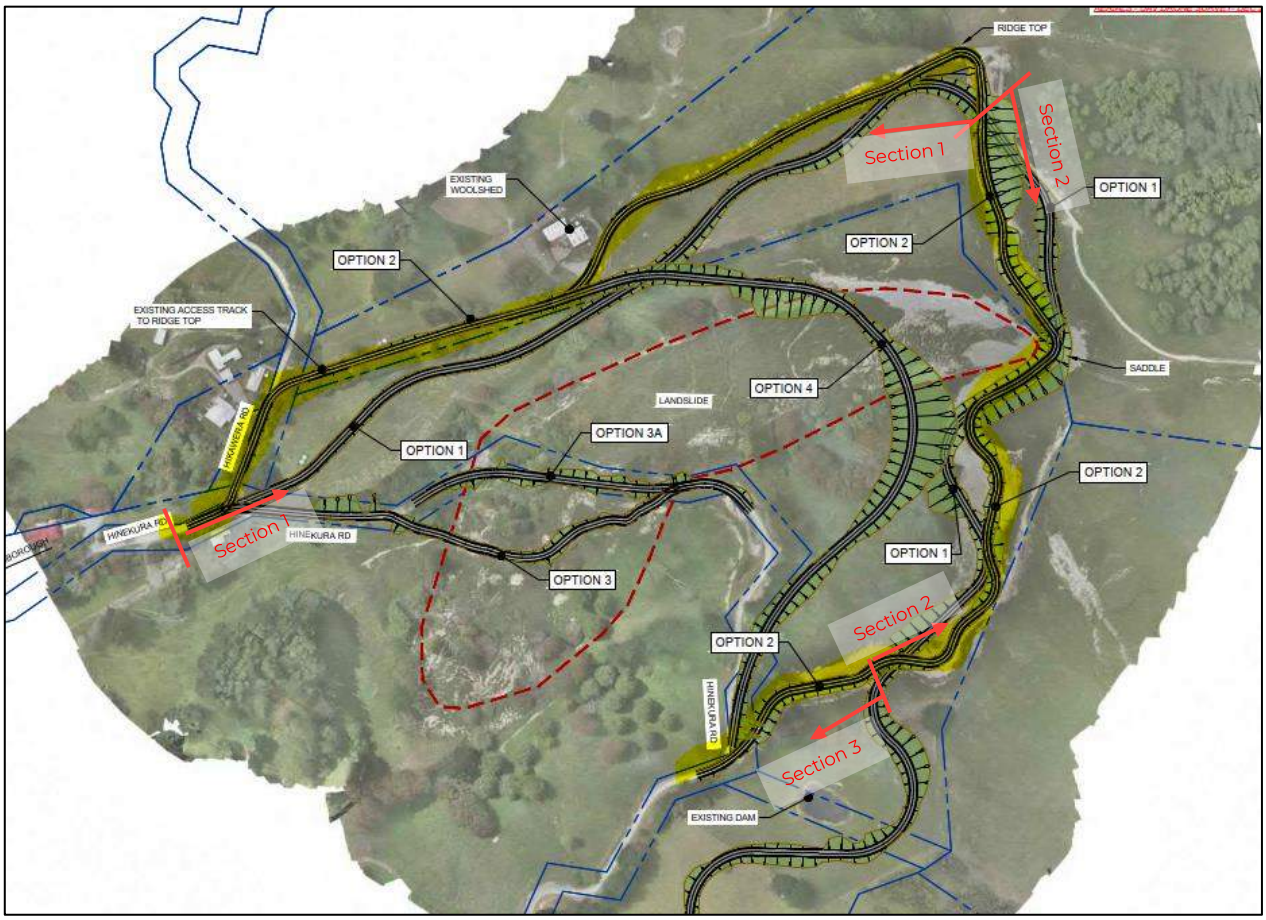


Figure 21: Option 2 – Upgrading farmers temporary road (B + B +B4)

For the plan and longitudinal section please refer to Appendix B

7.2.1 Horizontal Alignment

The option 2 realignment consists of 28 horizontal curves with the smallest curve radius being 15m. Of the 29 curves, 7 curves have a radius of less than 30m and for this assessment, these 7 curves would be considered out-of-context curves. These curves are highlighted in Appendix B. Overall, this option has the windiest horizontal alignment

7.2.2 Vertical Alignment

This alignment has 11 vertical curves. The vertical alignment in section 1, towards the ridge top, reaches a grade of approximately 15%. In section 2 the maximum grade reaches 15% over approximately 200m in two locations (one uphill grade and one downhill grade). In section 3, the maximum gradient is a steep 19% grade which is experienced over 80m. Although the design speed for this option is 40 km/h, the steep uphill and downhill gradients may affect the speed of heavy vehicles. If this option is selected further engineering to reduce the steep grades may be required to meet the heavy vehicle design standards.

7.2.3 Farm dams

The northern dam would require reinstatement and further investigation will be required to determine its location.

The alignment bypasses the central dam with sufficient space there so it is likely this dam will not require relocation. It would still be recommended to investigate the structural strength of the dam and if this dam would have any effect on the new alignment or vice versa.

The southern dam is causing an underslip on the road above which compromises the continuation of this option and hence requires consideration.

Due to the nature of the environment, there is potential that this route may experience localized slips in the future. Therefore, it is important to ensure a robust design and consider what works may be necessary to attempt in the adverse effects on this route alignment.

7.2.1 Earthworks

For this alignment, a maximum cut to a depth of 13.56m and a maximum fill of 6.50 m is required. If it is decided to conduct further work on this alignment (i.e., reduce steep grades) further earthworks may be required.

7.2.2 Slips

This option is in the vicinity of the large slip. This option, however, deviates the furthest from the main slip zone. If more slope movement occurs, the potential effect on this alignment may be less.

This option connects to Hinekura Road south of the main slip. Hence consideration for treatments for the developed underslip on Hinekura Road south of the main landslide will be required.

Due to the nature of the environment, there is potential that this route may experience pngoing localized slips in the future (Refer Figure 22 below). Therefore, it is important to ensure a robust design and consider what works may be necessary to attempt in the adverse effects on this route alignment.

Figure 22: Moderate sized overslip developing above recent temporary road

7.3 Option 3 – New Road near the toe of the landslide

Option 3, as highlighted yellow in Figure 23 is to construct a road through the slip, closely imitating what was existing on Hinekura Road. This option has the shortest alignment length compared to all options.

For the plan and longitudinal section please refer to Appendix B.

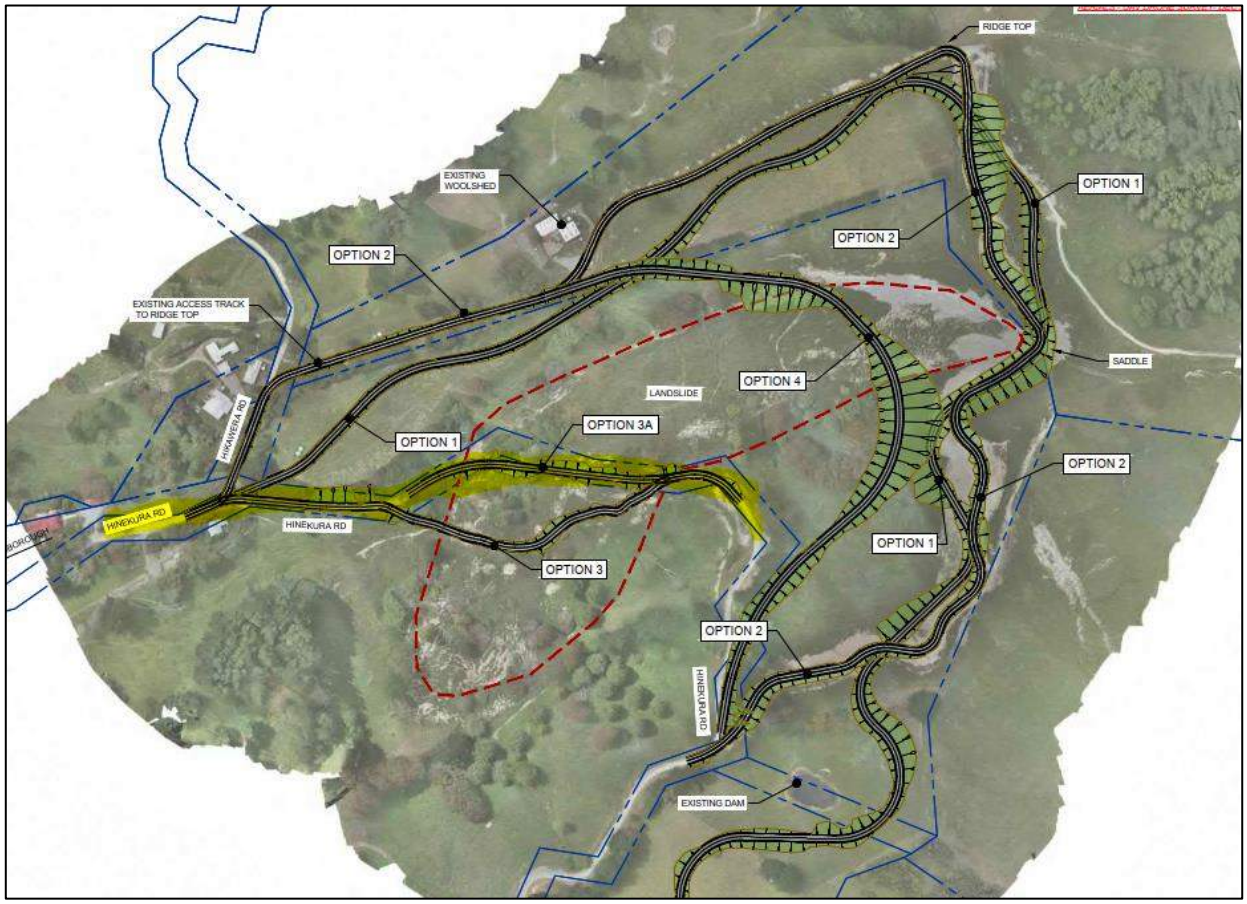


Figure 23: New road near the toe of the slip

7.3.1 Horizontal Alignment

This option provides an alignment that consists of only two horizontal curves, very similar to the previous alignment. These curves have radii of greater than 100m, and therefore this alignment does not have any out-of-context curves.

7.3.1 Vertical Alignment

This vertical alignment of this option is less severe as compared to option 1 and option 2. However, there is a large incline of 12% experienced over 42 metres. Of the 5 vertical curves present only one vertical curve has a grade of 12% with all other grades less than or equal to 8%. This option provides a comfortable vertical alignment for both passenger and heavy haulage vehicles.

7.3.2 Earthworks

For this alignment, a maximum cut to a depth of 2m and a maximum fill of 2.5 m is required. It is estimated that the earthworks required for this option will be a medium amount. This is estimated based on the short alignment length and due to the option traversing through the current landslide.

7.3.3 Slips

This option traverses directly through the landslide slip zone, hence, carries more risk than Option 1 and option 2. If movement of the main landslide reactivates this route will be translated downslope as has occurred on a number of occasions since 2020. In addition, smaller movements of the landslide may induce under-slips and over-slips.

Severe weather events are likely to result in further movement of the two existing under slips on Hinekura Road either side of the landslide.

Therefore, regular monitoring and possibly stabilisation works will be required to attempt the prevention of adverse effects on this route alignment. Hence this option is considered to be a high risk option but could be considered for the short term.

7.4 Option 4 – New alignment through the upper slip zone

Option 4 as highlighted yellow in Figure 24 is to construct a road through the upper part of the slip. This alignment follows the northern section of option 2 (section B) before deviating through the slip and joining back on Hinekura Road before the central dam.

For the plan and longitudinal section please refer to Appendix B.

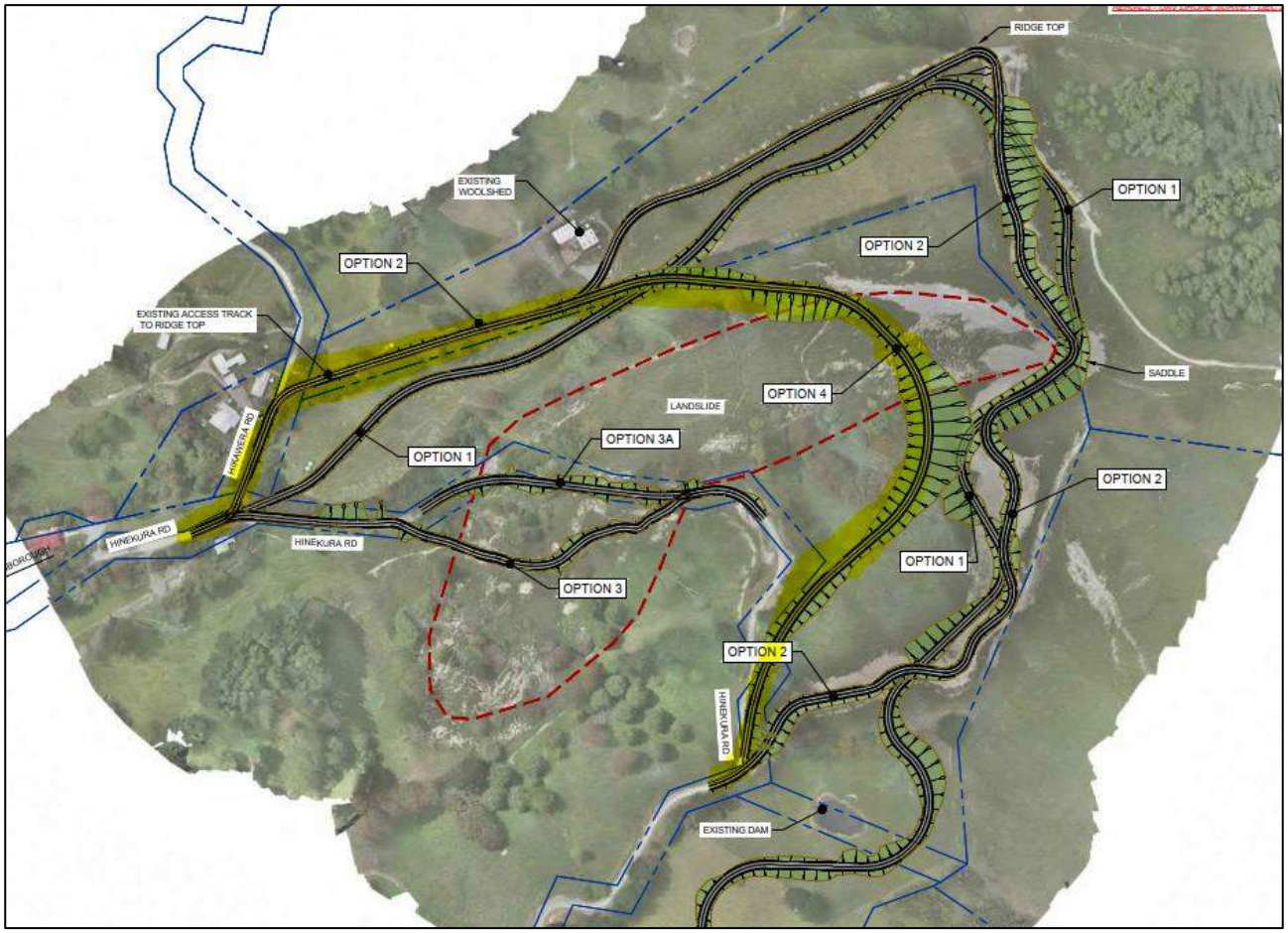


Figure 24: Option 4 – New alignment through upper slip zone

7.4.1 Horizontal Alignment

This option provides an alignment that consists of four horizontal curves. These curves have radii of greater than 80m, and therefore this alignment does not have any out-of-context curves. The curves on this alignment have a relatively large radius, therefore, provide a more comfortable driving experience

7.4.2 Vertical Alignment

This option has three vertical curves with a maximum gradient of 12%. Two out of three curves have a vertical grade of 12%, (one uphill grade and one downhill grade). These two 12 % downhill grade is experienced over a significant length of the alignment, covering 330m. This option provides a moderate vertical alignment for both passenger and heavy haulage vehicles.

7.4.3 Earthworks

This alignment has a maximum cut depth of 17m and a maximum fill of 5.5 m. In addition, cutting out of the upper landslide (if shallow enough) and forming a stable embankment are likely to be required for this option. It is estimated that a medium amount of earthworks will be required for this option.

7.4.1 Slips

This option traverses directly through the slip zone, hence, potentially carries more risk than Options 1 and 2 but less than Option 3. As the route is in the upper part of the landslide there is the possibility that if stable ground can be located at a relatively shallow depth, a stable route may be able to be economically established. The best-case scenario is that another large movement of the main landslide occurs which exposes stable ground in this area.

This option connects to Hinekura Road south of the main slip. Hence consideration for treatments for the developed underslip on Hinekura Road south of the main landslide will be required.

Therefore, ground investigations and survey monitoring will be required to assess the feasibility of this option.

7.5 Option 5 – Closure of Hinekura Road and divert to alternative routes

Option 5 involves the permanent closure of Hinekura Road to the public and diverting to the alternative route. The alternative route is defined as Longbush Road, Admiral Road, Clifton Grove, Wainuioru Road, Ngakonui Road and, Moeraki Road as shown in Figure 25.

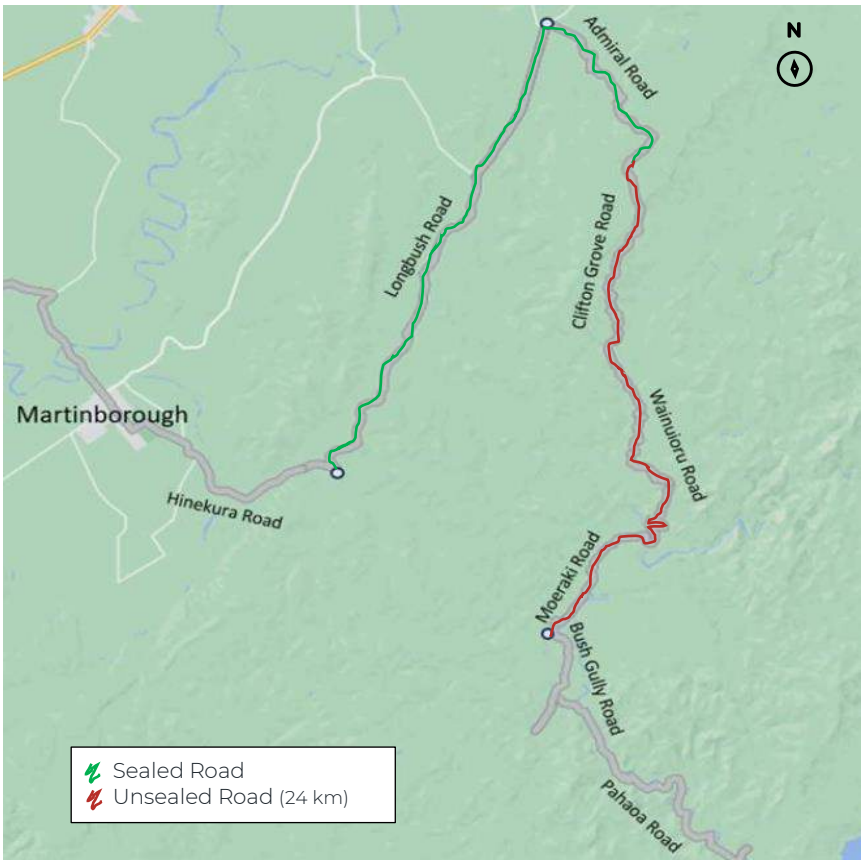


Figure 25: Alternative Route

The detour route is approximately 57 km in length and takes approximately 1 hour and 17 minutes to traverse in a passenger vehicle. The detour route likely takes longer for heavy vehicles due to their constraints. This route is also predominantly unsealed, an element that may also add to the

travel time. It would be ideal for this route to be sealed however, this is a large area to cover and even with the additional traffic from Hinekura Road the traffic volumes are relatively low. As compared to resealing the road, leaving the route unsealed means the work to improve the alternate route will be cheaper (no design work required, no change to drainage, no physical works, no temporary traffic management) and have a lower carbon footprint.

7.5.1 Horizontal Alignment

The horizontal alignment of the alternative route is torturous, with several narrow winding curves. The posted speed limit of the alternative routes is 100 km/h, however, the safe and appropriate speed for all roads is 60 km/h except for Longbush Road with a safe and appropriate speed of 80km/h.

The alternate route also has several out-of-context curves. For this assessment, an out-of-context curve has been classified as a curve of radius less than 30m (matching the preferred option design standard). A desktop exercise was conducted to approximate the curve radii on the alternative route. Although for this report an OOCC is recognised as a curve with a radius less than 30m, any curve measured between a radius of 30-35m during this exercise has been considered an out-of-context curve to account for any discrepancies.

Table 7 summarises the out-of-context curves along the alternative routes and shows that Wainuioru Road and Ngakonui Road have the highest density of OOCC.

Table 7: OOCC on the alternative route

Road Name	Approximate Road Length	Number of OOCC	Curve radii (m)	Min Radius
Longbush Road	20.7 km	No OOCC noted	NA	
Admiral Grove	12.0 km	10	33.5, 26.9, 32.0, 22.9, 17.2, 26.6, 28.6, 34.3, 30.5, 31.5	17.2 m
Clifton Grove	9.4 km	14	35.2, 28.0, 27.4, 23.2, 27.2, 23.9, 27.3, 30.4, 25.7, 23.4, 15.0, 19.9, 13.3, 24.2	13.3 m
Wainuioru Road	4.4 km	27	29.6, 28.4, 13.6, 24.6, 19.4, 32.7, 29.6, 27.2, 17.8, 26.7, 25.5, 33.9, 24.8, 34.1, 32.9, 9.2, 29.6, 22.5, 20.0, 22.8, 16.8, 32.1, 19.7, 30.5, 22.4, 26.3, 14.9	9.2 m
Ngakonui Road	4.4 km	30	29.4, 18.0, 32.1, 33.4, 23.4, 31.6, 24.0, 23.0, 21.9, 11.2, 20.4, 25.7, 16.9, 30.0, 17.5, 17.7, 21.4, 24.6, 27.9, 23.3, 16.1, 29.6, 15.8, 31.1, 23.1, 10.0, 10.9, 13.6, 31.8, 31.2	10.0 m
Moeraki Road	6.0 km	1	27.0	27.0 m

*Disclaimer the number of curve radii and measurement of radii are approximations only and should not be taken as exact

The visibility on the approach to and at the tight corners is limited due to the road geometry and environment. Foliage trimming and road widening may be required in areas to allow for large vehicles to pass one another safely. Overall, there is approximately 3.3 km of out of context curves of the alternative route. These corners should be investigated further to determine if improvements are required

7.5.2 Vertical Alignment

It is important to note that the alternative route is in a mountainous environment however the vertical alignment is not as severe as the horizontal alignment. During the site inspection, it was noticed that the vertical alignment was comfortable with only gradual inclines and declines. Vertical alignment effects on vehicle speeds are typically greater for heavy vehicles. For heavy vehicles, the vertical alignment of the alternate route proves beneficial as there is less potential to experience high downhill speeds and low uphill speeds.

7.5.3 Slips

The alternate route is in a relatively slip-prone area. As stated in the report above, several slips and developing slips were identified along this route were noted. Routine maintenance for slips may already be regularly occurring, however, for this option, there may be the potential for proactive remedial works to mitigate any large future slips.

7.5.4 Infrastructure

There are 15 bridges located on the alternative route, with four of these bridges being one-way bridges.

The majority of bridges have signage showing the heavy vehicle limits as axles 5,200 kg and gross 44,000kg. This loading limitation may not be accurate hence live load assessments would be recommended for accuracy and safety. This will help to identify if bridges require strengthening works to sustain the increased traffic demand and loadings.

The four one-way bridges may potentially require upgrading to two-lane bridges to minimise any congestion near the bridges, providing greater connectivity and accessibility for passenger and freight vehicles. Upgrading, strengthening and regular maintenance of this bridge are costly.

During the residents' meetings, residents acquired about the provision of line markings along the route to improve delineation. Due to the route being unsealed, delineation improvements could include the installation of edge marker posts and/or side rails where possible.

8 Economic Analysis

Please refer to the WSP Hinekura Road Realignment Option - Economic Assessment Report dated 13 February 2023.

9 Summary

Following the significant slip in June 2022, Hinekura Road between Longbush Road and Moeraki Road has been closed off. Since then, an alternative route was provided for public use. For locals a temporary road was constructed through private land, starting from Hikawera Road and connecting back to Hinekura Road.

Since the construction of the temporary road, WSP have provided the SWDC with realignment options for Hinekura Road. This report assesses and summarises the realignment options to provide SWDC with high level information on the five shortlisted options.

Table 8 summaries the aspects of each alignment option, colour-coded to assist comparison (red = less favourable, green = more favourable, orange is intermediate). It is important to note that these parameters are not weighted equivalently and therefore judgement cannot be based solely on the colour coding.

Table 8: Summary of options

Aspect		Option 1	Option 2	Option 3	Option 4	Option 5
Length		2.03 km	1.53 km	0.23* km	0.65 km	57 km
Horizontal Alignment	No. curves	19	28	2	4	Approximately 74 OOCC on the alternate route. Investigations required to identify if treatments are required and if so treatment type.
	% Of OCC	0%	25%	0%	0%	
	Min curve radius	32 m	15 m	100 m	80 m	
Vertical Alignment	No. of vertical curves	15	11	5	3	Site inspection it was noticed that the vertical alignment was comfortable with only gradual inclines and declines.
	% Of vertical grades ≥12%	33.3%	54.5%	20%	33.3%	
	Maximum Grade	14.15%	19.12%	12.0%	12.0%	
Farm Dams	Northern dam	Potentially reinstate northern dam	Council may decide to reinstate northern dam	Council may decide to reinstate northern dam	Council may decide to reinstate northern dam	Council may decide to reinstate northern dam
	Central dam	Central dam investigated to determine if relocation is necessary. Investigation to determine dam effect on road alignment and vice versa. Potential works necessary if to remain in current location	No Effect	No Effect	No Effect	No Effect
	Southern dam	Southern dam investigated to determine if relocation is necessary.	No Effect	No Effect	No Effect	No Effect

		Investigation to determine dam effect on road alignment and vice versa. Potential works necessary if to remain in current location				
Earthworks	Predicted amount	Large amount	Earthworks may be required to bring the road to standard	Medium amount	Medium amount	Undefined amount
Slips/ Resilience		By passes the slip zone. Investigation and stabilisation work likely required	By passes the slip zone. Investigation and stabilisation work likely required	Traverses through current slip zone Stabilisation work will be required Underlips and over slips forming at the start of Hinekura Road so will require work there to stabilise	Traverses through the upper slip, if the landslide can be dug out to achieve stable ground	Various over slips and under slips and developing slips were identified during the site visit, however it was noted that these slips are not yet affecting the carriageway.
Infrastructure		Sealed road	Sealed road	Sealed road	Sealed road	24km of unsealed road 15 bridges which may require live load assessments Four one-way bridges that may need to be upgraded to two-way bridges

Assumptions and Inclusions

- The ranking and rating of the individual items are objective.
- The aspects are not weighted equivalently i.e., cannot conclude that an option is more suitable due to having more green
- Not all aspects have been considered in this report and table i.e., barriers, delineation, resource consenting, land use

Appendix A
Heading

Hinekura Road Realignment Options – updated summary letter

17 February 2023

Tim Langley
Roading Manager
South Wairarapa District Council
19 Kitchener St
Martinborough

Hinekura Road Realignment Options – updated summary

5-C4072.01

Dear Tim,

This letter presents a summary of the various options for realigning Hinekura Road, to assist SWDC to choose a preferred option to take to detailed design, consenting, and construction. This update includes stormwater, consenting

The realignment route options bypass the large active landslide on the property of 1673 Hinekura Road (John and Liz Hancock), which moved dramatically in June of this year.

In September WSP has carried out:

- Geological inspection of the ground exposed as part of the newly completed earthworks for the temporary access vehicle track through the McCreary and Hancock properties.
- Discussions with John and Liz Hancock regarding their three dams and water sources and requirements in the vicinity of the realignment route options.
- An updated drone survey of the full site on 20 September and preparation of 3D survey model of site
- Upgrading of the monitoring system on the main landslide on 20 September 2022

The various realignment route options are shown on Figure 1. Attached to the covering email is a digital version of this figure which also shows cross sections for each route option.

The colours on the various routes represent the gradient (steepness) of that section of the route – with solid red being steepest (>15.0%), red dashed 12-15%, orange (8-12%), and green least steep (<8.0%).

For convenience we have split the route up into three sections, as follows:

1. Northern section (Table 1) – two main options – Option B (the original blue route) utilises McCreary's original access road past the woolshed and Option O (the original orange route) runs through the sloping paddocks above McCrearys access road to the south; with two sub options (O1 and O2) on the upper slope to the ridge line.

2. Middle section (Table 2) – from the ridgetop to Hancock's middle farm dam. Options are limited here hence only one option is presented; however, adjustments to this may be made during the design stage and/or following the assessment of the effect of the new temporary access road and the middle dam. Given the need to drain slopes to

WSP
Wellington
L9 Majestic Centre
100 Willis Street
Wellington 6011, New Zealand
+64 4 471 7000
wsp.com/nz

improve stability for the new road, this intercepted groundwater can be utilised for farm water requirements and result in reducing farm water storage volumes.

3. Southern Section – 5 options (B1 to B5) are outlined in Table 3. The longer two of these bypasses some unstable or substandard sections of the existing road, which are likely to need repair/stabilisation soon. The options have varying earthworks implications with provisional cut slope heights up to 14 m for the longer 3 options.

A high-level comparison of the various options is presented in the Tables. To assist comparison of the options, where applicable the cells have been colour-coded: red being less favourable, green more favourable, and orange intermediate between red and green.

All options have a large surplus of cut material for which dump sites will need to be identified.

The new temporary road earthworks provide very useful information on the ground conditions in the middle section of the site and reduces the amount of ground investigations required to provide a robust design. Additional investigations involving excavator test pits and hand auger / scala penetrometer testing are recommended once the preferred route is chosen. Investigation boreholes are recommended for sections with proposed high cuts in the southern area and possibly the saddle above the main landslide. The earlier these are done the more certainty can be provided in the design.

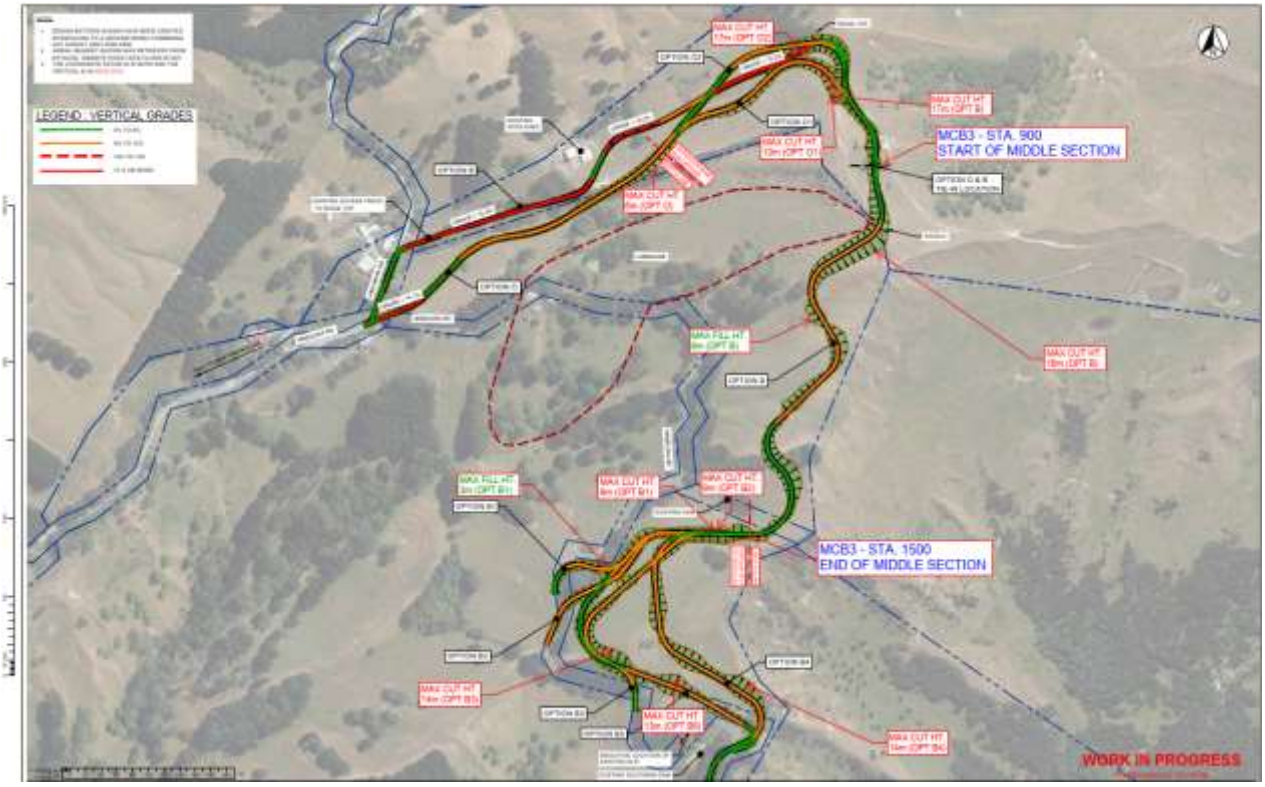


Figure 1: Realignment Options and associated earthworks footprints and gradients (coloured)

Option	Landowner	Overall comments	Length of alignment	Max Cut Height	Max Grade	Earthwork Volumes	Geotech Observations	Geotech investigations	Stormwater	Consenting	Farm Dams
B	McCreary: access for existing private road affected if upgrading	Utilises McCreary's existing access road from Hikawera Road past the woolshed and up to the ridgetop	900	17m	15.30%	Cut:- 10870 m3 Fill:- 920 m3	A temporary road was cut along an existing track ("Middle Track"). The cut slopes show very unstable material of highly weathered and deformed thin layers of alternating sandstone and mudstone. Exposed to the elements it appears that they are easily susceptible to erosion and can flake, block or be washed off the cuts which are relatively steep. Natural drainage of these cuts seems to be ok. Risk of soil horizon eroding off the tops or being undercut. Cuts made in the landslide part of the slope (i.e., between the Ridgetop and the Saddle) are likely to require good stabilisation.	Hand/auger scalas	Upgrade existing – relatively steep gradients	More favourable as pre-existing road, but requires same level of technical information	consider relocating north dam to saddle above (north of) current destroyed dam
O + O1	Hancock, McCreary paddocks	Farm paddock option off-line from McCreary's access road; route will be close to the preferred location for replacement for Hancocks original (destroyed) farm dam	842	10m	14.10%	Cut:- 15470 m3 Fill:- 750 m3		1. Ground investigation (~4 test pits, auger/scalas) required to determine the depth of soils	'Green fields'	slightly more comprehensive technical information required	
O + O2	Hancock, McCreary paddocks		893	17m	14.10%	Cut:- 18470 m3 Fill:- 740 m3			'Green fields'		

Table 1: Northern Section options, colour-coded to assist comparison (red = less favourable, green = more favourable, orange is intermediate)

Option	Landowner	Overall comments	Length of alignment	Max Cut Height	Max Grade	Earthwork Volumes	Geotech Observations	Geotech investigations	Farm Dams
B	McCreary, Hancock, locally close to Maori land (which McCreary leases)	This section following the previous blue (B) route is constrained by the saddle above the landslide and Hancock's central dam (which is located in SWDC land – on a 'paper road'?). At the saddle, the road needs to be cut about 10m deep. The slopes above the central dam are creeping and either need to be drained by removing (relocating?) the dam or stabilizing /strengthening the slopes.	600	16m	12.00%	Cut:- 35020 m3 Fill :- 3170 m3	Route at the saddle is close to the top (eastern-most point) of the landslide. Cuts made in the landslide part of the slope (i.e., between the Ridgetop and the saddle) are likely to require some stabilisation. Some risk of landslide enlargement (widening to the south) to be considered/addressed in detailed design. If failure is shallow this should be able to be cut out in construction. Areas of poor drainage and soft subsurface in the gullies. Soft substrate overlying Papa in the hollows/gullies is quite soft, wet, and prone to saturation. Erosion of these cut slopes is likely. Observation of subsurface water flowing freely at a shallow benched cut. Fines easily wash out as fine mud at the base of the cut slope and channelling towards the drainage. These cut slopes may dry out in the summer and may have poor resilience to take up sudden water deposits on dry surfaces or are prone to erosion with ongoing (e.g., winter) rains. Papa when in a large/thick unit seems to hold up alright as a cut slope. Fails in small blocks/chips at exposed cuts rather than a muddy erosion as the overlying material does. Moderate to steep cuts into Papa observed on the temporary road. Gully below the middle dam: subsurface seems fully saturated and has a considerable amount of water in the drain at that point.	1. Ground investigation (test pits, augers) is required to determine the depth of active slope in the section between the Ridge Top and the Saddle 2. Ground investigation is required to determine the depth and extent of activity from the main landslide at the Saddle 3. Ground investigations are required to assess the depth of active slope, soil depth, moisture levels, and possible location of springs/seepages in the slopes around the dam and the slope south of the Saddle	Install subsoil drainage on slopes above middle dam to have dual function of draining slope and tapping into groundwater for farm use; which will reduce the required storage requirement/dam size. Reduce the size of the middle dam.

Table 2: Middle Section preferred option (B)

WSP
Wellington
L9 Majestic Centre
100 Willis Street
Wellington 6011, New Zealand
+64 4 471 7000
wsp.com/nz

Option	Length of alignment	Max Cut Height	Max Grade	Earthwork Volumes	Geotech Observations	Resilience	Geotech investigations	Stormwater	Consenting	Farm Dams	Rough Order Cost
B1	292	9m	12.00%	Cut:- 7110 m3 Fill :- 1580 m3	Incorporates section of original Hinakura road with hairpin bend and portions of observed instability. Observed instability in form of tension cracking downslope towards the existing southern dam.		1. Soil moisture assessment and ~4-6 test pits to determine soil depth 2. Assessment and possible realigning/resurfacing sections of road that have tension cracking	Shorter but may need to upgrade existing	New route less environmental obstacles to address in supporting application than options B3 to B5. Option to remove southern dam may require environmental consideration	Consider decommissioning the southern Hancock dam (for options B1, B2, and B3 only)	
B2	328	9m	12.00%	Cut:- 8400 m3 Fill :- 800 m3	Incorporates section of original Hinakura road with hairpin bend and portions of observed instability. Observed instability in form of tension cracking downslope towards the existing southern dam		1. Soil moisture assessment and ~4-6 test pits to determine soil depth 2. Assessment and possible realigning/resurfacing sections of road that have tension cracking	Shorter but may need upgrade existing	New route less environmental obstacles to address in supporting application than options B3 to B5 Option to remove southern dam may require environmental consideration		
B3	392	14m	12.00%	Cut:- 11860 m3 Fill :- 1500 m3	Incorporates section of original Hinakura road with hairpin bend and portions of observed instability; Observed subsidence of the downslope lane directly above the southern Hancock dam; stabilisation of this developing underslip is required with a combination of tree planting, drainage improvements, and retaining wall/ground improvement. Potential for cut slopes of greater than 14m if cut slope angles need to be flattened		1. Soil moisture assessment and ~4-6 test pits to determine soil depth 2. Assessment and possible realigning/resurfacing sections of road that have tension cracking	Shorter but may need upgrade existing	B3 intermediate in terms of issues to be addressed compared with B1/B2 and B4/B5. Option to remove southern dam may require environmental consideration		
B4	558	14m	12.00%	Cut:- 19030 m3 Fill :- 650 m3	Skips the section of Hinakura Rd with hairpin bend and observed instability Loops around the north of the existing southern dam	Uncertainty of ground conditions	1. Ground investigations are required to assess the depth of active slope, soil depth, moisture levels, and possible location of springs/seepages in the slopes around the toe of the slope's upslope of the southern dam 2. Assessment and possible realigning/resurfacing sections of road that have tension cracking 3. Soil moisture assessment and ~4-6 test pits to determine soil depth	Deeper gullies to traverse for culverts / scour issues?	Intersecting the most gullies (compared to B1 to B3). Highest visual impact	The southern dam has very limited affect	
B5	588	13m	12.00%	Cut:- 10200 m3 Fill :- 4600 m3	Skips the section of Hinakura Rd with hairpin bend and observed instability Loops around the north of the existing southern dam. The section of the existing road south and east of the southern dam is in good condition without any indication of subsidence on the downslope side, or movement in the cut slope on the upslope side of the carriageway. The downslope side of the carriageway appears to be well stabilised by mature trees.	Uncertainty of ground conditions		Deeper gullies to traverse for culverts/ scour issues?	Intersecting the most gullies (compared to B1 to B3). Second highest visual impact	The southern dam has a minor affect	

Table 3: Southern Section summary of options

Assumptions and Notes for the preliminary geometric design:

1 Geometric design is based on a design speed of 40kph
2 Design vehicle - 11.5m Truck (swept path is checked against the full road width)
3 Curve widening and maximum grades will be based on NZ Forest Road Engineering Manual
4 Cut and fill batter slope angles are assumed and shall be confirmed once the geotechnical investigations / assessment is completed
5 All options will require Resource Consent as greater than 3000m3 of earthworks
6 Pavement layer design will be undertaken once test pits are completed
7 For developing these options, we have not considered barrier treatment design. These will be investigated during detailed design.

8 Geotechnical site investigations will be required to verify whether existing ground material is suitable to build the road on.

9 The proposed preliminary cross-section configuration is:
Carriageway - 2 x 2.50 m
Berm - 2 x 0.5 m
Cut - 1V :1H
Fill - 1V :1.5H /2H
Widening - TBC "

10 Stormwater design or farm dam impacts have not been assessed as part of this optioneering stage.

If you have any questions, please get in touch.

We would be happy to present the findings of this report in a meeting or workshop if this would be helpful.

Regards

David Stewart
Technical Principal - Geotechnical

WSP
Wellington
L9 Majestic Centre
100 Willis Street
Wellington 6011, New Zealand
+64 4 471 7000
wsp.com/nz

Appendix B

Plan and Long Sections of Progressive Options

NOTE:

1. DESIGN BATTERS SHOWN HAVE BEEN CREATED INTERFACING TO A GROUND MODEL COMBINING UAV SURVEY AND LIDAR DEM
2. AERIAL IMAGERY SHOWN WAS CAPTURED DURING UAV SURVEY UNDERTAKEN BY WSP IN DEC 2022.
3. AERIAL IMAGERY SHOWN FOR OUTER EXTENT WAS RETRIEVED FROM DATALINZ WEBSITE WHICH WAS FLOWN IN 2021.
4. FOR OPTION 1, 2, 3,3A & 4 PLAN AND LONGITUDINAL SECTION REFER TO SHEET SK11-SK13, SK21-SK23, SK31, SK3A, SK41.
5. THE COORDINATE DATUM IS IN NZTM AND THE VERTICAL IS IN NZVD 2016.

AERIALS - UAV DRONE SURVEY- DEC 2022

AERIALS - RETRIEVED FROM DATALINZ - FLOWN IN 2021

RIDGE TOP
EXISTING WOOLSHED
OPTION 1
OPTION 2
OPTION 2
EXISTING ACCESS TRACK TO RIDGE TOP
SADDLE
OPTION 4
LANDSLIDE
OPTION 3
OPTION 1
HIKAWERA RD
OPTION 2
HINEKURA RD
HINEKURA RD
19km TO MARTINBOROUGH
OPTION 1
OPTION 3A
OPTION 2
HINEKURA RD
EXISTING DAM
OPTION 1
INDICATIVE LOCATION OF EXISTING SLIP
EXISTING SOUTHERN DAM

AERIALS - RETRIEVED FROM DATALINZ - FLOWN IN 2021

AERIALS - UAV DRONE SURVEY- DEC 2022

N

300 mm
200
100
50
0 10 mm

1:2000 @ A1
1:4000 @ A3
0 20 40 60 80 100 120 140 160 180 200 m

WORK IN PROGRESS
PRINTED 16/02/2023 3:39:28 PM

REVISION	AMENDMENT	APPROVED	DATE
UR*	UNDER REVISION		

Wellington Office
+64 4 471 7000
PO Box 12-003
Wellington 6144
New Zealand

SOUTH WAIRARAPA DISTRICT COUNCIL

SCALES: 1:2000(A1) , 1:4000(A3)
ORIGINAL SIZE: A1

DRAWN	DESIGNED	APPROVED
N.M	N.M	APPROVER

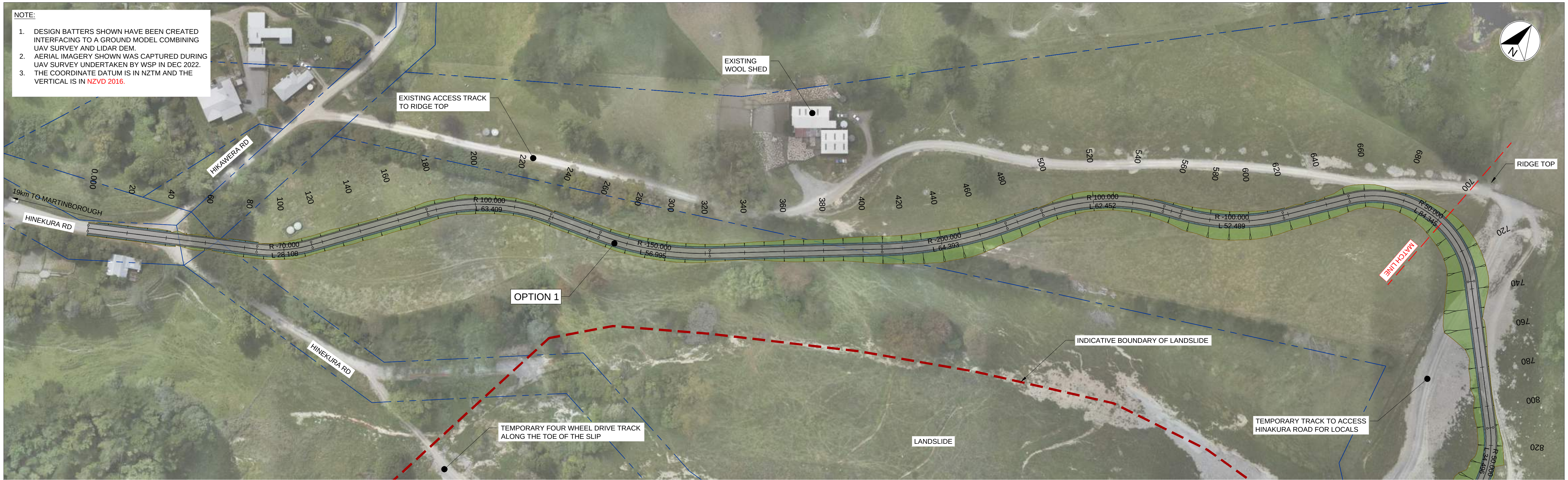
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
VERIFIER	VERIFIER	YYYY-MM-DD

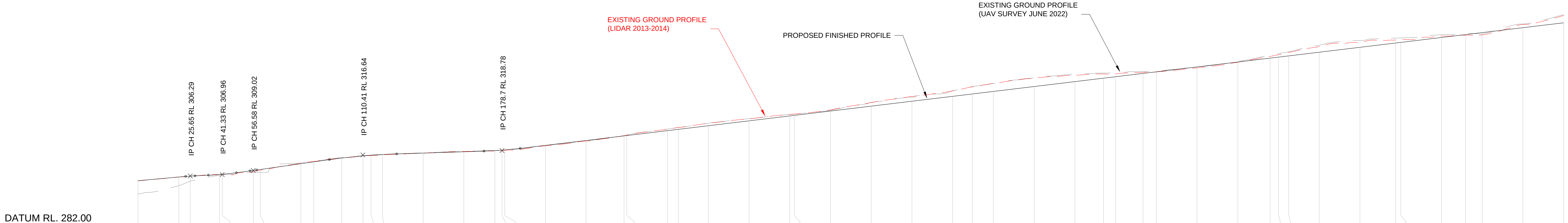
PRELIMINARY

PROJECT
SOUTH WAIRARAPA DISTRICT COUNCIL
HINEKURA ROAD
ROAD REALIGNMENT

TITLE
REALIGNMENT OPTIONS
OVERVIEW PLAN

WSP PROJECT NO. (SUB-PROJECT): 5-C4072.01
SHEET NO.: SK00
REVISION: UR*





DATUM RL. 282.00

VERTICAL ALIGNMENT: L=23.37m G=8.89% | K=1 L=4.57m | L=6.53m G=4.33% | K=1.5 L=13.73m | L=6.72m G=13.48% | K=5 L=3.33m | L=35.67m G=14.15% | K=3 L=33.01m | L=42.92m G=3.14% | K=2 L=17.71m | L=521.35m G=12%

HORIZONTAL ALIGNMENT: L=86.29m | L=28.11m R=-70.00m | L=60.83m | L=63.41m R=100.00m | L=26.65m | L=57.00m R=-150.00m | L=87.39m | L=64.39m R=-200.00m | L=19.35m | L=62.45m R=100.00m | L=9.11m | L=52.49m R=-100.00m | L=34.41m | L=84.34m R=50.00m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
0.00	6.50	304.005	297.50
20.00	4.22	305.784	301.56
25.65	2.52	306.261	303.75
40.00	0.38	307.010	306.63
41.33	0.26	307.122	306.86
56.58	0.94	309.023	308.09
60.00	1.42	309.505	308.09
80.00	-0.37	312.334	312.70
86.29	-0.32	313.224	313.55
100.00	-0.21	315.101	315.31
110.41	-0.09	316.182	316.27
114.40	0.08	316.500	316.42
120.00	0.14	316.857	316.72
140.00	-0.08	317.565	317.64
160.00	-0.39	318.194	318.58
175.23	0.01	318.745	318.73
178.70	0.15	318.977	318.82
180.00	0.13	319.080	318.95
200.00	0.12	321.337	321.22
220.00	0.21	323.737	323.52
238.64	-0.22	325.974	326.19
240.00	-0.31	326.136	326.45
260.00	-0.72	328.536	329.26
265.30	-0.90	329.172	330.08
280.00	-1.20	330.936	332.14
300.00	-1.03	333.336	334.37
320.00	-0.73	335.735	336.47
322.29	-0.63	336.010	336.64
340.00	-0.35	338.135	338.49
360.00	-1.85	340.535	342.38
380.00	-2.03	342.935	344.96
400.00	-2.71	345.334	348.05
409.68	-3.57	346.496	350.06
420.00	-3.81	347.734	351.54
440.00	-4.28	350.134	354.41
460.00	-3.70	352.533	356.23
474.08	-2.54	354.223	356.76
480.00	-1.94	354.933	356.87
493.43	-0.98	356.545	357.52
500.00	-0.34	357.333	357.68
520.00	0.05	359.733	359.69
540.00	-0.29	362.132	362.42
555.88	-1.28	364.038	365.32
560.00	-1.60	364.532	366.13
564.99	-2.02	365.131	367.15
580.00	-3.42	366.932	370.35
600.00	-3.30	369.331	372.63
617.48	-2.41	371.429	373.84
620.00	-2.19	371.731	373.93
640.00	-1.42	374.131	375.55
651.89	-0.48	375.557	376.04
660.00	0.63	376.531	375.90
680.00	-1.84	378.930	380.77
700.00	-3.98	381.330	385.31

LONGITUDINAL SECTION - MC10

HORZ 1:1000 VERT 1:1000

LONG SECTION - CH 0m - 700m

SCALE: 1:1000 (A1)

WORK IN PROGRESS

PRINTED 7/02/2023 10:05:27 PM

REVISION	AMENDMENT	APPROVED	DATE
UR*	UNDER REVISION		

wsp
Wellington Office
+64 4 471 7000
PO Box 12-003
Wellington 6144
New Zealand

SOUTH WAIRARAPA DISTRICT COUNCIL

SCALES: 1:1000(A1) , 1:2000(A3) ORIGINAL SIZE: A1

DRAWN: N.M DESIGNED: N.M APPROVED: APPROVER

DRAWING VERIFIED: VERIFIER DESIGN VERIFIED: VERIFIER APPROVED DATE: YYYY-MM-DD

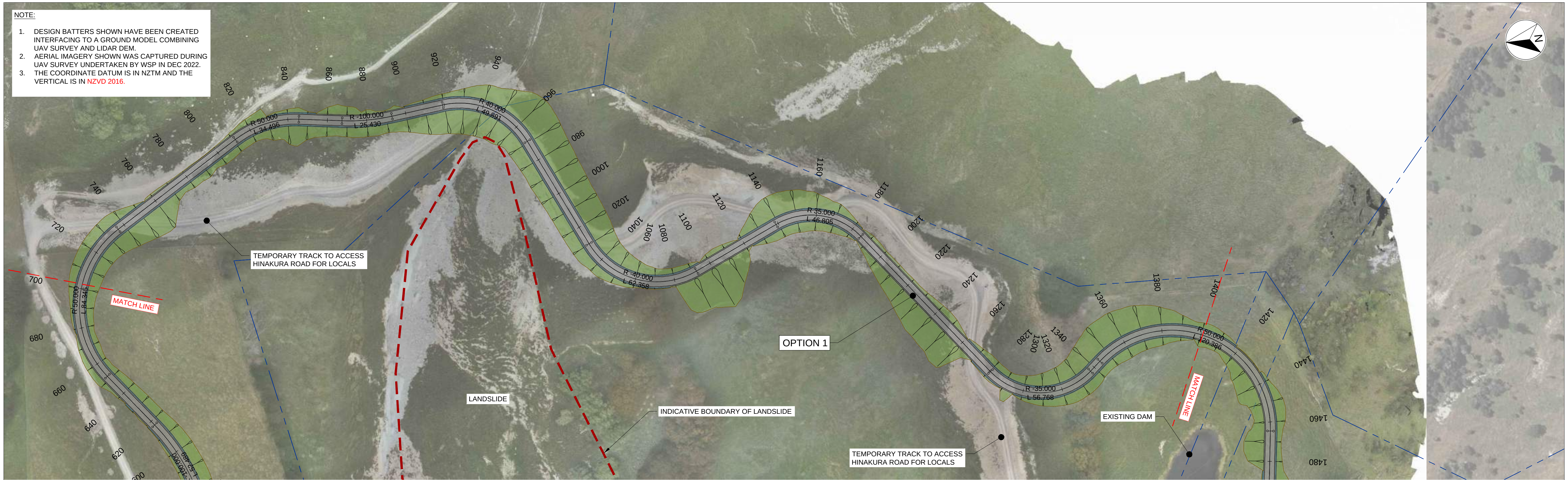
PRELIMINARY

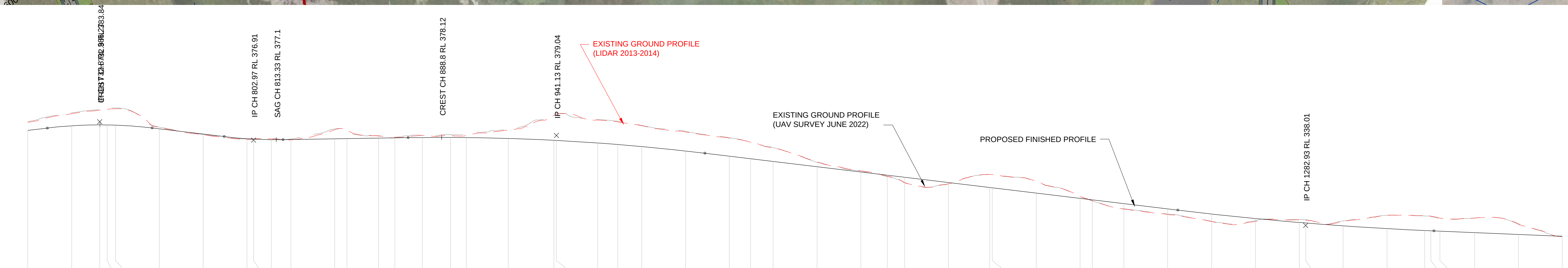
PROJECT: SOUTH WAIRARAPA DISTRICT COUNCIL HINEKURA ROAD ROAD REALIGNMENT

TITLE: OPTION 1 - PLAN LAYOUT & LONGITUDINAL SECTION SHEET 1 OF 3

WSP PROJECT NO. (SUB-PROJECT): 5-C4072.01 SHEET NO.: SK11 REVISION: UR*

Original sheet size A1 (841x594) Plot Date 2023-02-07 at 10:05:27 PM PLAN_LS U:\ProjectsNZ\5c\5-C4072.01 HineKura Rd Landslide\Home\1673 Hinekura Road Landslide\800 Drawings\03 CAD\5-C4072.01(1) SK11-SK13_SK21-SK23_SK31_SK3A_OPTIONS.dwg SK11 -OPT1





DATUM RL. 317.00

VERTICAL ALIGNMENT: L=521.35m G=12% | K=2 L=47.8m | L=32.82m G=-11.9% | K=2 L=26.89m | L=57m G=1.54% | K=10 L=135.44m | L=215.67m G=-12.01% | K=15 L=116.81m | L=143.64m G=-4.22%

HORIZONTAL ALIGNMENT: L=84.34m R=50.00m | L=74.82m | L=34.50m R=50.00m | L=21.89m | L=25.43m R=-100.00m | L=26.32m | L=49.89m R=40.00m | L=60.63m | L=62.36m R=-40.00m | L=46.68m | L=46.81m R=35.00m | L=94.94m | L=56.77m R=-35.00m | L=6.94m | L=120.39m R=50.00m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
700.00	-3.98	381.330	385.31
720.00	-5.88	383.422	389.30
732.80	-7.09	383.838	390.92
736.23	-7.50	383.810	391.31
740.00	-7.84	383.712	391.56
760.00	-0.82	382.029	382.85
780.00	0.19	379.648	379.46
800.00	0.16	377.542	377.39
802.97	-0.15	377.366	377.52
811.06	-0.44	377.110	377.55
820.00	-0.27	377.176	377.44
840.00	-4.53	377.484	382.02
845.55	-3.40	377.570	380.97
860.00	-0.91	377.792	378.70
867.44	-0.39	377.906	378.29
880.00	-1.07	378.078	379.14
892.87	-1.24	378.108	379.35
900.00	-1.51	378.054	379.57
919.19	-3.91	377.655	381.56
940.00	-12.07	376.806	388.88
941.13	-12.40	376.748	389.15
960.00	-10.75	375.582	386.33
969.09	-10.60	374.894	385.49
980.00	-9.67	373.958	383.63
1000.00	-8.87	371.934	380.80
1020.00	-8.41	369.572	377.98
1029.72	-7.78	368.406	376.19
1040.00	-6.25	367.171	373.42
1060.00	-2.00	364.770	366.77
1080.00	-0.48	362.369	362.85
1092.07	0.67	360.920	360.25
1100.00	2.53	359.968	357.44
1120.00	0.41	357.567	357.15
1138.76	-5.87	355.315	361.18
1140.00	-5.94	355.166	361.11
1160.00	-5.27	352.765	358.04
1180.00	-0.69	350.364	351.05
1185.56	0.44	349.696	349.26
1200.00	2.32	347.963	345.64
1220.00	2.36	345.562	343.20
1240.00	3.32	343.241	339.92
1260.00	0.95	341.179	340.23
1280.00	-1.31	339.384	340.70
1282.93	-1.42	339.144	340.56
1300.00	-2.17	337.856	340.03
1320.00	-6.09	336.595	342.69
1337.27	-6.63	335.720	342.35
1340.00	-6.52	335.600	342.12
1344.21	-5.79	335.422	341.21
1360.00	-6.66	334.756	341.42
1380.00	-4.61	333.912	338.52
1400.00	-0.14	333.069	333.21

LONGITUDINAL SECTION - MC10

HORZ 1:1000 VERT 1:1000

LONG SECTION - CH 700m - 1400m

SCALE: 1:1000 (A1)

WORK IN PROGRESS

PRINTED 7/02/2023 10:08:28 PM

REVISION	AMENDMENT	APPROVED	DATE
UR*	UNDER REVISION		

wsp
Wellington Office
+64 4 471 7000
PO Box 12-003
Wellington 6144
New Zealand

SOUTH WAIRARAPA DISTRICT COUNCIL

SCALES: 1:1000(A1) , 1:2000(A3) — ORIGINAL SIZE: A1

DRAWN: N.M — DESIGNED: N.M — APPROVED: APPROVER

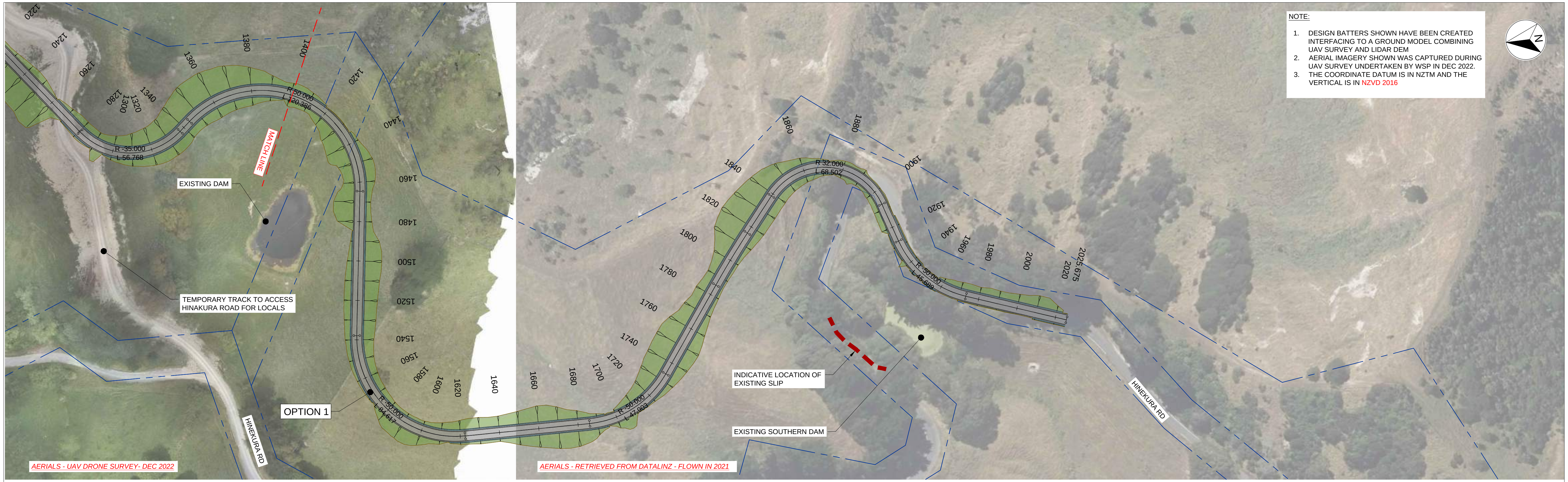
DRAWING VERIFIED: VERIFIER — DESIGN VERIFIED: VERIFIER — APPROVED DATE: YYYY-MM-DD

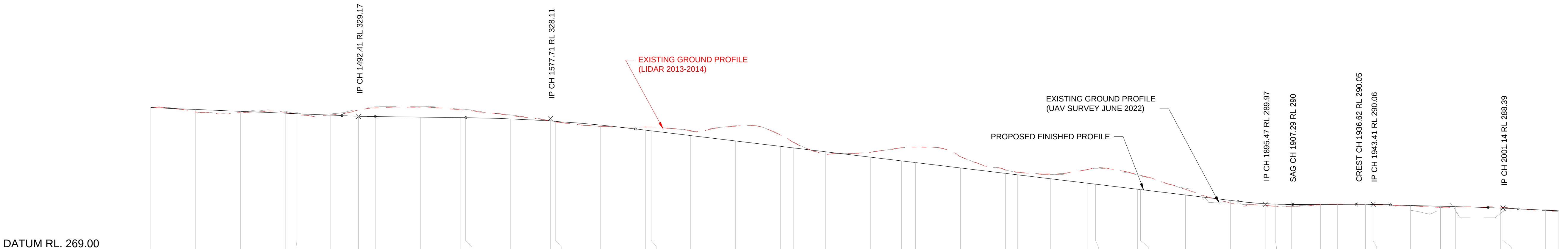
PRELIMINARY

PROJECT: SOUTH WAIRARAPA DISTRICT COUNCIL
HINEKURA ROAD
ROAD REALIGNMENT

TITLE: OPTION 1 - PLAN LAYOUT & LONGITUDINAL SECTION
SHEET 2 OF 3

WSP PROJECT NO. (SUB-PROJECT): 5-C4072.01 — SHEET NO.: SK12 — REVISION: UR*





VERTICAL ALIGNMENT: L=143.64m G=-4.22% | K=5 L=14.87m | L=40.21m G=-1.24% | K=7 L=75.31m | L=267.92m G=-12% | K=2 L=24.36m | L=28.07m G=0.18% | K=5 L=15.39m | L=43.38m G=-2.9% | K=7 L=13.3m | L=17.88m G=-4.8%

HORIZONTAL ALIGNMENT: L=120.39m R=50.00m | L=73.28m | L=84.62m R=-50.00m | L=63.37m | L=47.90m R=-50.00m | L=51.68m | L=30.86m R=500.00m | L=22.37m | L=68.50m R=32.00m | L=20.47m | L=45.69m R=-50.00m | L=52.33m

CHAINAGE	EXISTING SURFACE LEVEL	DESIGN SURFACE LEVEL	LEVEL DIFFERENCE CUT - / FILL +
1400.00	333.21	333.069	-0.14
1420.00	331.17	332.225	1.05
1440.00	331.07	331.382	0.31
1460.00	331.42	330.538	-0.88
1464.59	330.76	330.344	-0.42
1480.00	330.25	329.694	-0.56
1492.41	332.57	329.226	-3.35
1500.00	333.40	329.076	-4.33
1520.00	333.67	328.828	-4.85
1537.88	332.39	328.605	-3.79
1540.00	332.24	328.579	-3.66
1560.00	329.78	328.046	-1.73
1577.71	327.17	327.097	-0.08
1580.00	326.84	326.942	0.10
1600.00	324.77	325.266	0.50
1620.00	324.44	323.035	-1.40
1622.49	324.39	322.736	-1.66
1640.00	322.61	320.634	-1.97
1660.00	325.03	318.234	-6.79
1680.00	320.57	315.834	-4.74
1685.86	317.52	315.130	-2.39
1700.00	312.36	313.433	1.08
1720.00	313.10	311.033	-2.07
1733.76	315.18	309.381	-5.79
1740.00	315.56	308.633	-6.93
1760.00	311.27	306.232	-5.04
1780.00	305.25	303.832	-1.41
1785.44	304.22	303.179	-1.04
1800.00	303.38	301.432	-1.95
1816.31	305.47	299.475	-6.00
1820.00	306.08	299.031	-7.05
1838.68	303.15	296.789	-6.36
1840.00	302.93	296.631	-6.30
1860.00	297.29	294.231	-3.06
1880.00	290.63	291.830	1.20
1895.47	289.68	290.345	0.67
1900.00	289.17	290.128	0.96
1907.18	289.31	289.996	0.68
1920.00	290.03	290.018	-0.01
1927.66	290.21	290.032	-0.18
1940.00	289.98	290.036	0.05
1943.41	289.91	290.001	0.10
1960.00	287.46	289.580	2.11
1973.34	287.93	289.193	1.26
1980.00	287.34	289.000	1.66
2000.00	286.08	288.399	2.32
2001.14	286.88	288.355	1.48
2020.00	287.57	287.482	-0.09
2025.67	286.86	287.210	0.35

LONGITUDINAL SECTION - MC10

HORZ 1:1000 VERT 1:1000

LONG SECTION - CH 1400m - 2025m

SCALE: 1:1000 (A1)

WORK IN PROGRESS

PRINTED 7/02/2023 10:34:57 PM

REVISION	AMENDMENT	APPROVED	DATE
UR*	UNDER REVISION		

wsp
Wellington Office
+64 4 471 7000
PO Box 12-003
Wellington 6144
New Zealand

SOUTH WAIRARAPA DISTRICT COUNCIL

SCALES: 1:1000(A1) , 1:2000(A3) — ORIGINAL SIZE: A1

DRAWN: N.M — DESIGNED: N.M — APPROVED: APPROVER

DRAWING VERIFIED: VERIFIER — DESIGN VERIFIED: VERIFIER — APPROVED DATE: YYYY-MM-DD

PRELIMINARY

PROJECT: SOUTH WAIRARAPA DISTRICT COUNCIL HINEKURA ROAD ROAD REALIGNMENT

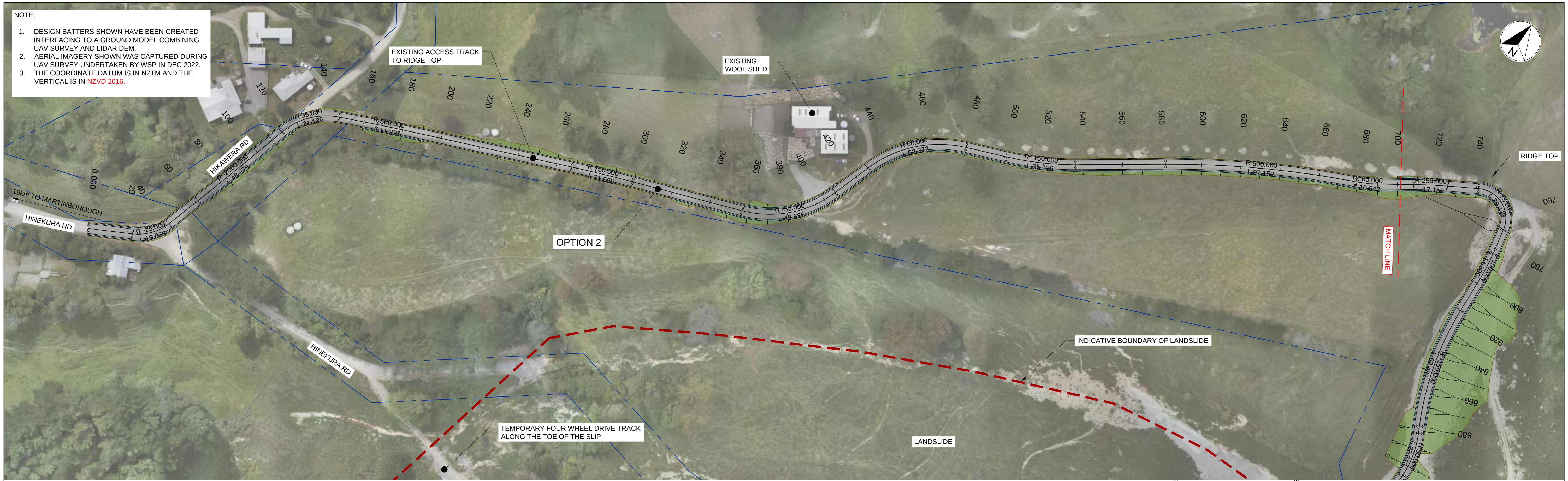
TITLE: OPTION 1 - PLAN LAYOUT & LONGITUDINAL SECTION SHEET 3 OF 3

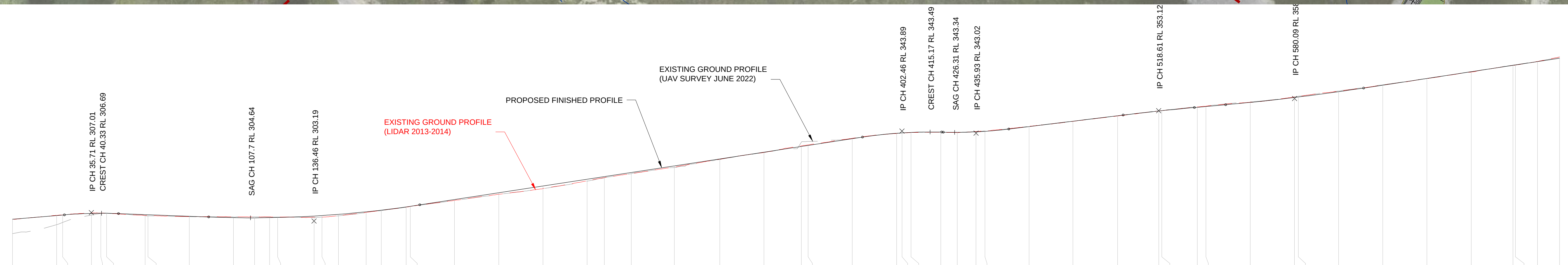
WSP PROJECT NO. (SUB-PROJECT): 5-C4072.01 — SHEET NO.: SK13 — REVISION: UR*

Original sheet size A1 (841x594) Plot Date 2023-02-07 at 10:34:57 PM PLAN_LS U:\ProjectsNZ\5c\5-C4072.01 HineKura Rd Landslide\Home\1673 Hinekura Road Landslide\800 Drawings\03 CAD\5-C4072.01(1) SK11-SK13_SK21-SK23_SK31_SK3A_OPTIONS.dwg SK13 -OPT1

NOTE:

1. DESIGN BATTERS SHOWN HAVE BEEN CREATED INTERFACING TO A GROUND MODEL COMBINING UAV SURVEY AND LIDAR DEM.
2. AERIAL IMAGERY SHOWN WAS CAPTURED DURING UAV SURVEY UNDERTAKEN BY WSP IN DEC 2022.
3. THE COORDINATE DATUM IS IN NZTM AND THE VERTICAL IS IN NZVD 2016.





DATUM RL. 282.00

VERTICAL ALIGNMENT: L=23.49m G=8.42% | K=2 L=24.43m | L=40.81m G=-3.79% | K=5 L=95.47m | L=200.36m G=15.3% | K=2 L=35.79m | L=0.76m G=-2.6% | K=2 L=29.62m | L=51.72m G=12.21% | K=10 L=32.3m | L=14.14m G=8.99% | K=10 L=62.39m | L=179.52m G=15.22%

HORIZONTAL ALIGNMENT: L=22.73m | L=19.86m R=-25.00m | L=18.71m | L=48.28m R=-2000.00m | L=6.73m | L=31.14m R=35.00m | L=19.39m | L=11.32m R=500.00m | L=89.64m | L=31.66m R=750.00m | L=57.44m | L=49.63m R=-55.00m | L=20.91m | L=52.37m R=60.00m | L=21.15m | L=35.14m R=-150.00m | L=45.67m | L=97.15m R=500.00m | L=0.42m | L=10.64m R=-60.00m | L=18.27m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
0.00	6.50	304.005	297.50
20.00	4.13	305.689	301.56
22.73	3.36	305.919	302.56
35.71	0.76	306.639	305.88
40.00	0.05	306.692	306.64
42.59	-0.09	306.679	306.77
60.00	0.46	306.090	305.63
61.30	0.54	306.041	305.50
80.00	0.17	305.331	305.16
100.00	-0.36	304.699	305.06
109.58	-0.45	304.644	305.09
116.31	-0.33	304.714	305.05
120.00	-0.23	304.792	305.02
136.46	0.65	305.468	304.82
140.00	0.77	305.684	304.91
147.45	0.66	306.220	305.56
160.00	0.38	307.376	306.99
166.84	0.24	308.138	307.90
178.16	0.18	309.606	309.42
180.00	0.18	309.868	309.69
200.00	0.42	312.910	312.49
220.00	0.76	315.970	315.21
240.00	1.19	319.031	317.84
260.00	0.84	322.091	321.25
267.80	0.48	323.285	322.80
280.00	0.53	325.151	324.62
299.46	0.70	328.128	327.43
320.00	0.23	331.271	331.04
340.00	0.10	334.331	334.23
356.90	-1.95	336.917	338.86
360.00	-1.80	337.391	339.19
380.00	-0.15	340.451	340.60
400.00	0.03	342.916	342.89
402.46	0.02	343.087	343.07
406.53	0.03	343.304	343.27
420.00	-0.04	343.432	343.48
427.44	-0.01	343.339	343.35
435.93	-0.15	343.568	343.72
440.00	-0.20	343.805	344.00
460.00	-0.09	345.959	346.05
479.81	-0.03	348.379	348.41
500.00	-0.04	350.845	350.88
518.61	-0.15	352.988	353.14
520.00	-0.14	353.134	353.27
536.10	-0.27	354.690	354.96
540.00	-0.32	355.040	355.36
560.00	-0.23	356.899	357.13
580.00	-0.31	359.118	359.43
581.77	-0.34	359.334	359.67
600.00	-0.35	361.737	362.08
620.00	-0.16	364.718	364.88
640.00	0.01	367.763	367.75
660.00	-0.05	370.808	370.86
678.92	-0.10	373.689	373.79
680.00	-0.09	373.853	373.94
689.98	-0.11	375.372	375.48
700.00	-0.53	376.898	377.43

LONGITUDINAL SECTION - MC20

HORZ 1:1000 VERT 1:1000

LONG SECTION - CH 0m - 700m

SCALE: 1:1000 (A1)

WORK IN PROGRESS

PRINTED 7/02/2023 10:48:00 PM

REVISION	AMENDMENT	APPROVED	DATE
UR*	UNDER REVISION		

wsp
Wellington Office
+64 4 471 7000
PO Box 12-003
Wellington 6144
New Zealand

SOUTH WAIRARAPA DISTRICT COUNCIL

SCALES: 1:1000(A1) , 1:2000(A3)
ORIGINAL SIZE: A1
DRAWN: N.M
DESIGNED: N.M
APPROVED: APPROVER
DRAWING VERIFIED: VERIFIER
DESIGN VERIFIED: VERIFIER
APPROVED DATE: YYYY-MM-DD

PRELIMINARY

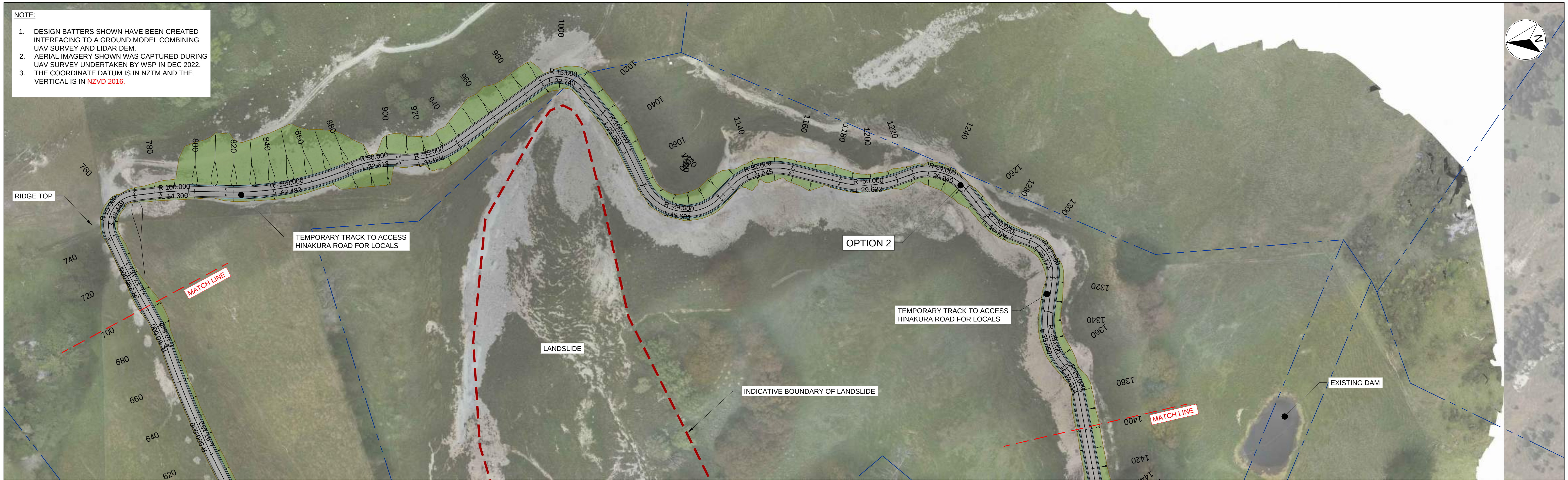
PROJECT: SOUTH WAIRARAPA DISTRICT COUNCIL
HINEKURA ROAD
ROAD REALIGNMENT

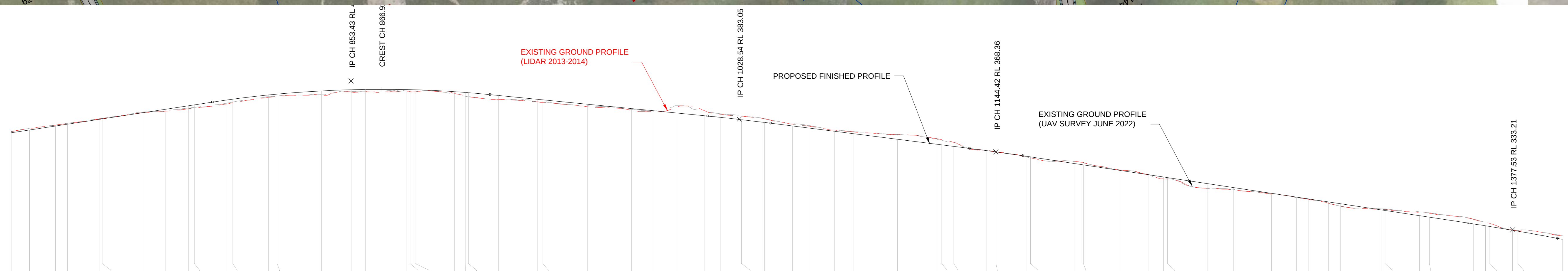
TITLE: OPTION 2 - PLAN LAYOUT & LONGITUDINAL SECTION
SHEET 1 OF 3

WSP PROJECT NO. (SUB-PROJECT): 5-C4072.01
SHEET NO.: SK21
REVISION: UR*

NOTE:

1. DESIGN BATTERS SHOWN HAVE BEEN CREATED INTERFACING TO A GROUND MODEL COMBINING UAV SURVEY AND LIDAR DEM.
2. AERIAL IMAGERY SHOWN WAS CAPTURED DURING UAV SURVEY UNDERTAKEN BY WSP IN DEC 2022.
3. THE COORDINATE DATUM IS IN NZTM AND THE VERTICAL IS IN NZVD 2016.





DATUM RL. 313.00

VERTICAL ALIGNMENT: L=179.52m G=15.22% | K=5 L=125.25m | L=98.24m G=-9.83% | K=10 L=28.5m | L=89.63m G=-12.68% | K=10 L=24.01m | L=200.91m G=-15.08% | K=10 L=40.39m | L=82.29m G=-19.12%

HORIZONTAL ALIGNMENT: L=18.27m | L=17.15m R=250.00m | L=15.72m | L=28.45m R=15.00m | L=13.12m | L=14.31m R=100.00m | L=19.13m | L=62.48m R=-150.00m | L=3.71m | L=22.61m R=50.00m | L=1.43m | L=31.07m R=-45.00m | L=52.63m | L=22.74m R=15.00m | L=16.79m | L=23.09m R=100.00m | L=18.95m | L=45.68m R=-24.00m | L=8.06m | L=33.05m R=32.00m | L=25.43m | L=29.62m R=-50.00m | L=8.31m | L=29.94m R=24.00m | L=17.05m | L=16.78m R=-30.00m | L=8.96m | L=23.77m R=17.50m | L=17.33m | L=29.67m R=-35.00m | L=1.69m | L=13.21m R=25.00m | L=47.68m

CHAINAGE	EXISTING SURFACE LEVEL	DESIGN SURFACE LEVEL	LEVEL DIFFERENCE CUT - / FILL +
700.00	377.43	376.898	-0.53
708.25	378.95	378.154	-0.79
720.00	380.43	379.942	-0.49
725.40	381.19	380.765	-0.43
740.00	383.32	382.987	-0.33
741.12	383.49	383.158	-0.33
760.00	386.28	386.032	-0.25
769.57	386.92	387.489	0.57
780.00	388.04	389.077	1.04
782.69	388.33	389.486	1.16
796.99	390.19	391.625	1.43
800.00	390.76	392.037	1.27
816.12	393.19	393.935	0.74
820.00	393.50	394.314	0.82
840.00	394.04	395.791	1.75
853.43	395.47	396.333	0.86
860.00	395.61	396.467	0.86
878.60	396.27	396.379	0.10
880.00	396.26	396.344	0.08
882.31	396.23	396.278	0.05
900.00	394.32	395.421	1.10
904.93	393.37	395.071	1.70
906.36	393.13	394.960	1.83
920.00	392.12	393.713	1.59
937.43	391.33	392.000	0.67
940.00	391.05	391.748	0.70
960.00	389.11	389.783	0.67
980.00	387.41	387.818	0.41
990.06	386.66	386.829	0.17
1000.00	389.09	385.852	-3.24
1012.80	386.49	384.594	-1.90
1020.00	385.49	383.871	-1.62
1028.54	384.82	382.946	-1.87
1029.59	384.71	382.828	-1.88
1040.00	383.29	381.592	-1.70
1052.68	380.99	379.988	-1.01
1060.00	380.13	379.060	-1.07
1071.63	378.26	377.586	-0.67
1080.00	377.42	376.525	-0.89
1100.00	376.16	373.990	-2.17
1117.31	374.16	371.795	-2.36
1120.00	373.56	371.455	-2.11
1125.38	372.23	370.773	-1.45
1140.00	369.08	368.891	-0.19
1144.42	368.22	368.287	0.07
1158.42	365.96	366.248	0.28
1160.00	365.58	366.011	0.43
1180.00	364.06	362.995	-1.06
1183.85	363.38	362.414	-0.96
1200.00	360.10	359.980	-0.12
1213.48	358.04	357.948	-0.09
1220.00	356.21	356.964	0.76
1221.78	356.19	356.695	0.50
1240.00	352.04	353.949	1.91
1251.72	351.42	352.182	0.76
1260.00	350.46	350.934	0.47
1268.77	349.51	349.611	0.11
1280.00	347.73	347.918	0.19
1285.55	346.93	347.081	0.16
1294.51	345.06	345.731	0.67
1300.00	343.81	344.903	1.10
1318.28	342.67	342.147	-0.52
1320.00	342.64	341.888	-0.75
1335.61	341.29	339.534	-1.75
1340.00	340.88	338.872	-2.01
1360.00	337.99	335.853	-2.14
1365.28	336.61	335.029	-1.58
1366.97	336.25	334.759	-1.49
1377.53	333.23	333.010	-0.22
1380.00	333.08	332.585	-0.50
1400.00	330.65	328.919	-1.73

LONGITUDINAL SECTION - MC20

HORZ 1:1000 VERT 1:1000

LONG SECTION - CH 700m - 1400m

SCALE: 1:1000 (A1)

WORK IN PROGRESS

PRINTED 7/02/2023 10:52:17 PM

REVISION	AMENDMENT	APPROVED	DATE
UR*	UNDER REVISION		

wsp
Wellington Office
+64 4 471 7000
PO Box 12-003
Wellington 6144
New Zealand

SOUTH WAIRARAPA DISTRICT COUNCIL

SCALES: 1:1000(A1) , 1:2000(A3) — ORIGINAL SIZE: A1

DRAWN: N.M — DESIGNED: N.M — APPROVED: APPROVER

DRAWING VERIFIED: VERIFIER — DESIGN VERIFIED: VERIFIER — APPROVED DATE: YYYY-MM-DD

PRELIMINARY

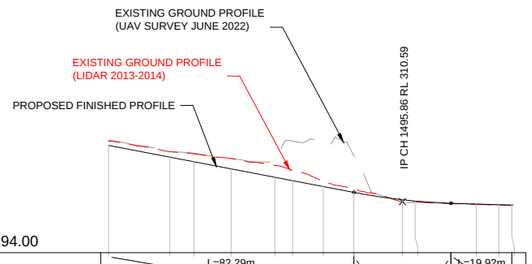
PROJECT: SOUTH WAIRARAPA DISTRICT COUNCIL
HINEKURA ROAD
ROAD REALIGNMENT

TITLE: OPTION 2 - PLAN LAYOUT & LONGITUDINAL SECTION
SHEET 2 OF 3

WSP PROJECT NO. (SUB-PROJECT): 5-C4072.01 — SHEET NO.: SK22 — REVISION: UR*

NOTE:

1. DESIGN BATTERS SHOWN HAVE BEEN CREATED INTERFACING TO A GROUND MODEL COMBINING UAV SURVEY AND LIDAR DEM.
2. AERIAL IMAGERY SHOWN WAS CAPTURED DURING UAV SURVEY UNDERTAKEN BY WSP IN DEC 2022.
3. THE COORDINATE DATUM IS IN NZTM AND THE VERTICAL IS IN NZVD 2016.



DATUM RL. 294.00

VERTICAL ALIGNMENT	L=82.29m G=-19.12%						K=2 L=31.68m		L=19.92m G=-3.27%				
HORIZONTAL ALIGNMENT	L=47.68m		L=26.43m R=-30.00m		L=15.76m		L=57.33m R=75.00m				L=4.23m		
LEVEL DIFFERENCE CUT - / FILL +	-1.73	-2.02	-2.78	-3.46	-5.53	-12.89	-13.56	-12.03	0.64	0.32	0.05	0.02	0.00
DESIGN SURFACE LEVEL	328.919	325.095	323.592	321.272	318.539	317.449	315.527	313.626	311.222	310.801	309.804	309.562	309.424
EXISTING SURFACE LEVEL	330.65	327.11	326.37	324.73	324.07	330.34	329.09	325.65	310.59	310.48	309.75	309.55	309.42
CHAINAGE	1400.00	1420.00	1427.87	1440.00	1454.30	1460.00	1470.05	1480.00	1495.86	1500.00	1520.00	1527.38	1531.61

LONGITUDINAL SECTION - MC20

HORZ 1:1000 VERT 1:1000

LONG SECTION - CH 1400m - 1531m

SCALE: 1:1000 (A1)

WORK IN PROGRESS

PRINTED 7/02/2023 11:01:16 PM

REVISION	AMENDMENT	APPROVED	DATE
UR*	UNDER REVISION		

Wellington Office
+64 4 471 7000

PO Box 12-003
Wellington 6144
New Zealand

SOUTH WAIRARAPA DISTRICT COUNCIL

SCALES: 1:1000(A1) , 1:2000(A3) | ORIGINAL SIZE: A1

DRAWN	DESIGNED	APPROVED
N.M	N.M	APPROVER

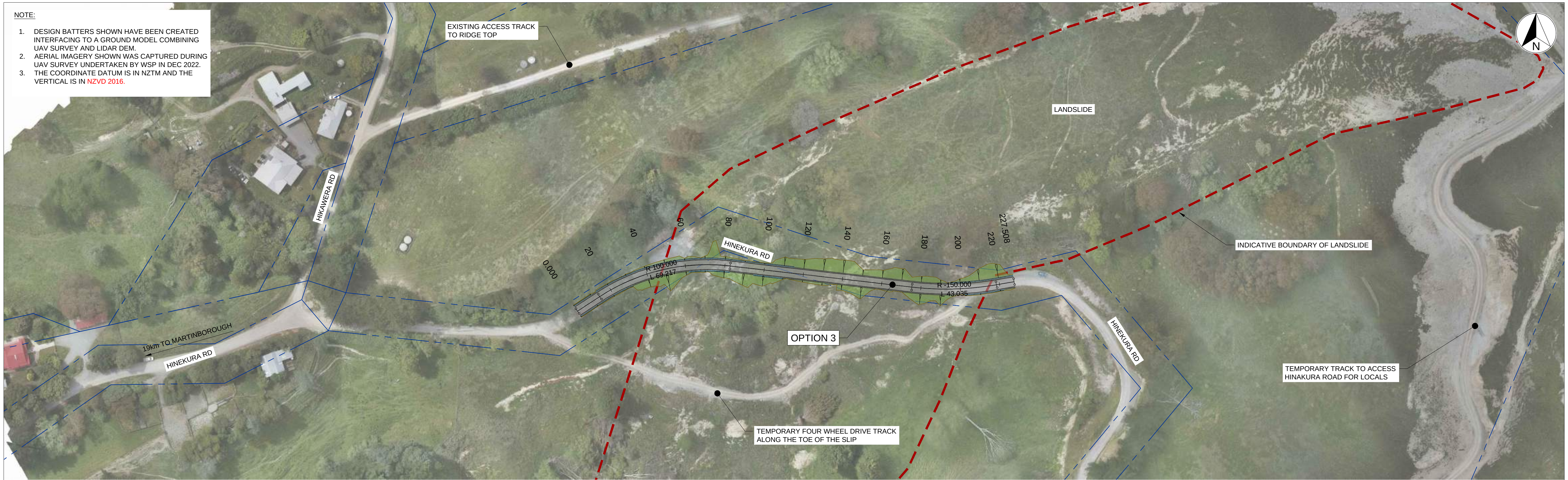
DRAWING VERIFIED	DESIGN VERIFIED	APPROVED DATE
VERIFIER	VERIFIER	YYYY-MM-DD

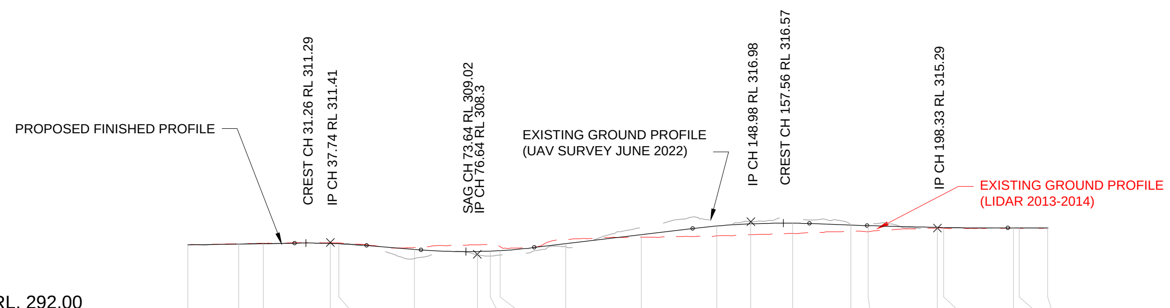
PRELIMINARY

PROJECT: SOUTH WAIRARAPA DISTRICT COUNCIL
HINEKURA ROAD
ROAD REALIGNMENT

TITLE: OPTION 2 - PLAN LAYOUT & LONGITUDINAL SECTION
SHEET 3 OF 3

WSP PROJECT NO. (SUB-PROJECT)	SHEET NO.	REVISION
5-C4072.01	SK23	UR*





DATUM RL. 292.00

VERTICAL ALIGNMENT: L=28.21m G=1.53% | K=2 L=19.05m | L=14.38m G=-8% | K=1.5 L=30m | L=41.92m G=12% | K=2 L=30.84m | L=15.32m G=-3.42% | K=11 L=37.21m | L=10.58m G=-0.04%

HORIZONTAL ALIGNMENT: L=13.46m | L=69.22m R=100.00m | L=92.73m | L=43.03m R=-150.00m | L=9.06m

CHAINAGE	EXISTING SURFACE LEVEL	DESIGN SURFACE LEVEL	LEVEL DIFFERENCE CUT - / FILL +
0.00	310.81	310.839	0.03
13.46	311.08	311.044	-0.03
20.00	311.24	311.144	-0.10
37.74	311.27	311.188	-0.08
40.00	311.22	311.102	-0.12
60.00	307.21	309.634	2.42
76.64	308.16	309.053	0.89
80.00	307.83	309.157	1.32
82.68	308.13	309.295	1.16
100.00	310.36	311.106	0.74
120.00	315.45	313.506	-1.95
140.00	317.31	315.802	-1.51
148.98	316.94	316.388	-0.55
160.00	317.51	316.557	-0.95
175.42	316.38	316.078	-0.30
180.00	316.24	315.921	-0.32
198.33	315.23	315.451	0.23
200.00	315.26	315.424	0.17
218.45	315.32	315.286	-0.03
220.00	315.32	315.285	-0.03
227.51	315.27	315.282	0.01

LONGITUDINAL SECTION - MC3A

HORZ 1:1000 VERT 1:1000

LONG SECTION - CH 0m - 227m

SCALE: 1:1000 (A1)

WORK IN PROGRESS

PRINTED 16/02/2023 3:42:12 PM

REVISION	AMENDMENT	APPROVED	DATE
UR*	UNDER REVISION		

wsp
Wellington Office
+64 4 471 7000
PO Box 12-003
Wellington 6144
New Zealand

SOUTH WAIRARAPA DISTRICT COUNCIL

SCALES: 1:1000(A1) , 1:2000(A3)
ORIGINAL SIZE: A1
DRAWN: N.M
DESIGNED: N.M
APPROVED: APPROVER
DRAWING VERIFIED: VERIFIER
DESIGN VERIFIED: VERIFIER
APPROVED DATE: YYYY-MM-DD

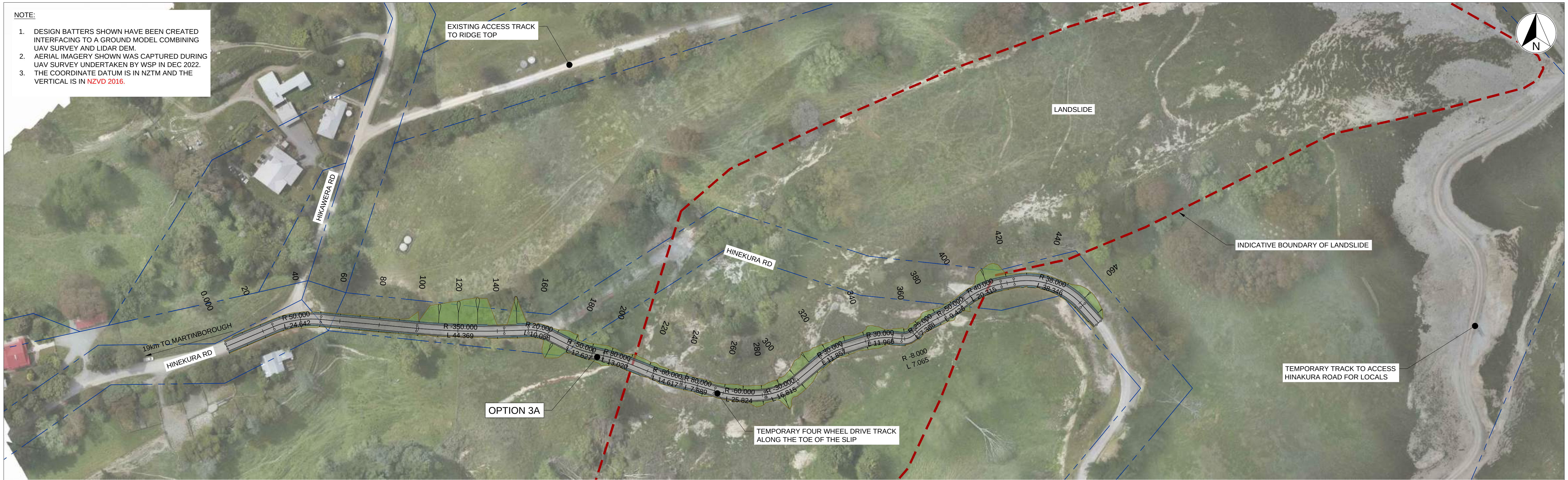
PRELIMINARY

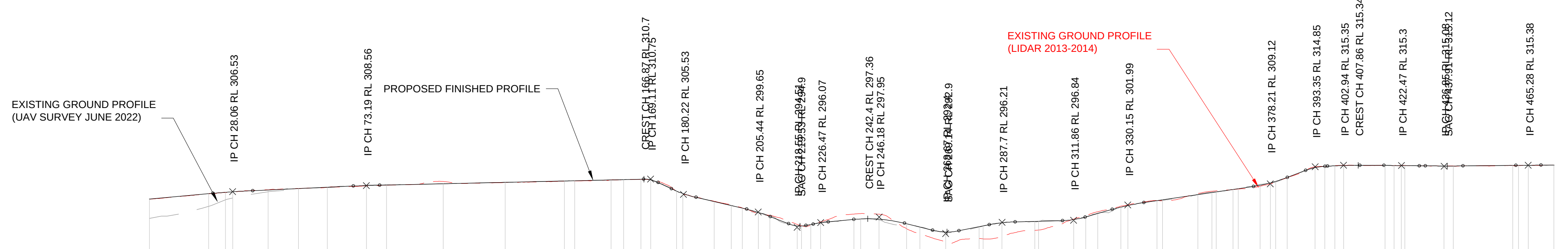
PROJECT: SOUTH WAIRARAPA DISTRICT COUNCIL
HINEKURA ROAD
ROAD REALIGNMENT

TITLE: OPTION 3 - PLAN LAYOUT & LONGITUDINAL SECTION
SHEET 1 OF 1

WSP PROJECT NO. (SUB-PROJECT): 5-C4072.01
SHEET NO.: SK31
REVISION: UR*

Original sheet size A1 (841x594) Plot Date 2023-02-16 at 3:42:12 PM PLAN_LS U:\ProjectsNZ\5c\5-C4072.01 HineKura Rd Landslide\Home\1673 Hinekura Road Landslide\800 Drawings\03 CAD\5-C4072.01(1) SK11-SK13_SK21-SK23_SK31_SK3A_SK41_OPTIONS.dwg SK31 -OPT1





DATUM RL. 273.00

VERTICAL ALIGNMENT: L=21.3m G=9.01%; K=3 L=13.52m; L=33.93m G=4.5%; K=4 L=8.88m; L=89.02m G=2.28%; L=4.51m K=0.1 L=4.93m K=0.35 L=8.29m G=-46.99%; L=17.09m G=-23.3%; K=0.5 L=7.97m; L=6.18m; K=0.1 L=5.89m; L=2.44m K=0.5 L=5.07m; G=-39.23%; G=19.60%; G=9.55%; L=8.62m; K=0.5 L=17.12m; L=9.46m G=-24.68%; K=0.2 L=8.93m; L=10.22m G=19.98%; K=0.5 L=8.68m; L=15.98m G=2.62%; K=0.3 L=7.66m; L=9.14m G=28.16%; K=0.8 L=10.65m; L=36.98m G=14.85%; K=0.5 L=11.5m; L=6.12m G=37.85%; K=0.2 L=6.53m; L=0.83m K=2 L=10.98m G=5.21%; L=8.07m G=-0.28%; K=10 L=11.95m; L=2.07m G=-1.48%; K=5 L=12.67m; L=17.86m G=1.06%; K=10 L=8.45m; L=4.44m G=0.21%

HORIZONTAL ALIGNMENT: L=25.66m; L=24.64m R=50.00m; L=48.79m; L=44.37m R=-350.00m; L=12.30m; L=10.06m R=20.00m; L=12.09m; L=12.63m R=-50.00m; L=5.81m; L=13.02m R=80.00m; L=13.76m; L=14.62m R=-80.00m; L=0.76m; L=7.89m R=80.00m; L=9.06m; L=25.82m R=-60.00m; L=0.65m; L=16.82m R=-30.00m; L=17.16m; L=11.86m R=30.00m; L=14.05m; L=11.97m R=30.00m; L=4.77m; L=7.01m R=-8.00m; L=1.84m; L=7.37m R=25.00m; L=9.07m; L=9.43m R=-50.00m; L=3.29m; L=20.32m R=40.00m; L=6.67m; L=38.35m R=38.00m; L=11.99m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
0.00	6.50	304.005	297.50
20.00	4.24	305.806	301.56
25.66	2.54	306.284	303.75
28.06	2.10	306.456	304.36
40.00	0.58	307.070	306.49
50.30	-0.03	307.533	307.56
60.00	0.04	307.970	307.93
73.19	-0.12	308.539	308.66
80.00	-0.09	308.719	308.81
99.09	-0.02	309.154	309.17
120.00	-0.02	309.631	309.65
140.00	-0.04	310.088	310.12
143.46	-0.02	310.167	310.18
155.75	0.03	310.447	310.42
160.00	0.01	310.544	310.54
165.81	-0.06	310.677	310.74
169.11	-0.23	310.448	310.68
177.90	-0.04	306.668	306.71
180.00	0.12	305.853	305.74
190.53	-0.07	303.128	303.20
196.34	-0.04	301.774	301.82
200.00	0.12	300.921	300.80
205.44	0.09	299.495	299.40
209.36	-0.29	298.116	298.41
218.55	0.35	294.944	294.60
220.00	0.09	294.907	294.82
223.12	-0.01	295.409	295.41
226.47	-0.08	296.004	296.09
237.74	-0.11	297.145	297.26
240.00	-0.00	297.305	297.31
246.18	0.26	297.220	296.96
255.45	0.12	295.665	295.55
260.00	-0.07	294.543	294.62
268.67	0.15	292.901	292.75
280.00	0.10	294.666	294.57
281.28	-0.00	294.921	294.92
287.70	-0.02	296.017	296.03
298.75	0.10	296.494	296.40
300.00	0.13	296.527	296.40
311.86	0.21	297.082	296.87
315.91	0.13	297.977	297.85
320.00	-0.11	299.130	299.24
327.76	-0.06	301.262	301.32
330.15	-0.10	301.811	301.91
340.00	0.01	303.451	303.44
341.81	0.17	303.720	303.55
353.78	-0.11	305.496	305.61
358.55	-0.12	306.204	306.33
360.00	-0.01	306.420	306.43
365.61	0.06	307.253	307.19
367.45	-0.03	307.526	307.56
374.82	-0.28	308.676	308.95
378.21	0.11	309.455	309.35
380.00	0.22	309.957	309.74
383.90	-0.04	311.275	311.31
393.32	-0.20	314.580	314.78
396.62	0.01	315.022	315.02
400.00	-0.04	315.182	315.22
402.94	-0.07	315.276	315.35
416.93	-0.00	315.311	315.31
420.00	0.01	315.297	315.29
422.47	-0.01	315.278	315.29
423.60	-0.01	315.267	315.27
436.85	-0.01	315.123	315.13
440.00	0.02	315.127	315.10
460.00	-0.00	315.327	315.33
461.95	-0.01	315.348	315.36
465.28	0.00	315.374	315.37
473.94	0.00	315.401	315.40

LONGITUDINAL SECTION - MC30

HORZ 1:1000 VERT 1:1000

LONG SECTION - CH 0m - 473m

SCALE: 1:1000 (A1)

WORK IN PROGRESS

PRINTED 16/02/2023 3:43:21 PM

REVISION	AMENDMENT	APPROVED	DATE
UR*	UNDER REVISION		

Wellington Office
+64 4 471 7000
PO Box 12-003
Wellington 6144
New Zealand

SOUTH WAIRARAPA DISTRICT COUNCIL

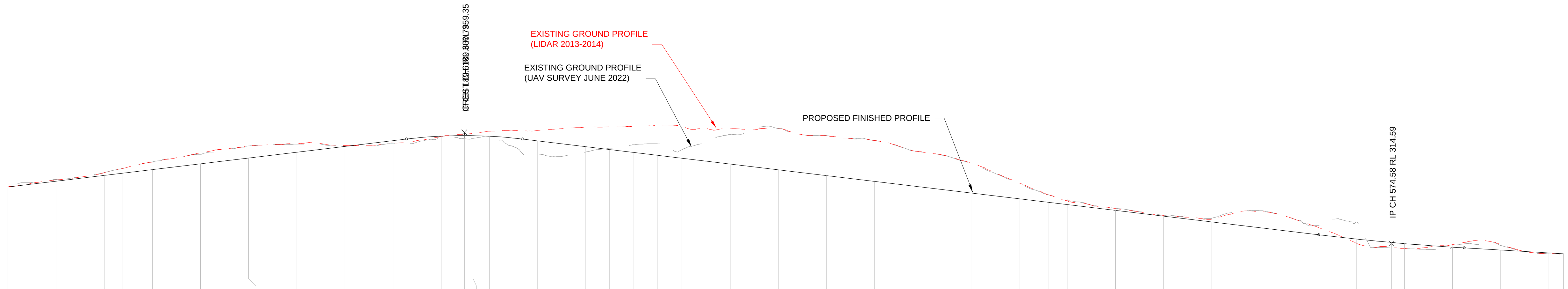
PRELIMINARY

SCALES: 1:1000(A1) , 1:2000(A3)
ORIGINAL SIZE: A1
DRAWN: N.M
DESIGNED: N.M
APPROVED: APPROVER
DRAWING VERIFIED: VERIFIER
DESIGN VERIFIED: VERIFIER
APPROVED DATE: YYYY-MM-DD

PROJECT: SOUTH WAIRARAPA DISTRICT COUNCIL
HINEKURA ROAD
ROAD REALIGNMENT

TITLE: OPTION 3A - PLAN LAYOUT & LONGITUDINAL SECTION
SHEET 1 OF 1

WSP PROJECT NO. (SUB-PROJECT): 5-C4072.01
SHEET NO.: SK3A
REVISION: UR*



DATUM RL. 295.00

VERTICAL ALIGNMENT: L=165.6m G=12% | K=2 L=48m | L=330.78m G=-12% | K=10 L=60.4m | L=41.23m G=-5.96%

HORIZONTAL ALIGNMENT: L=47.73m | L=50.29m R=120.00m | L=95.14m | L=56.79m R=80.00m | L=19.77m | L=162.68m R=100.00m | L=48.07m | L=139.40m R=-200.00m | L=26.15m

CHAINAGE	LEVEL DIFFERENCE CUT - / FILL +	DESIGN SURFACE LEVEL	EXISTING SURFACE LEVEL
0.00	-1.22	338.040	339.26
20.00	-0.75	340.440	341.19
40.00	-1.13	342.840	343.97
47.73	-1.97	343.767	345.74
60.00	-3.22	345.240	348.46
80.00	-3.91	347.640	351.55
98.02	-4.73	349.802	354.53
100.00	-5.04	350.040	355.08
120.00	-3.37	352.440	355.81
140.00	-0.12	354.840	354.96
160.00	1.31	357.240	355.93
180.00	0.74	359.122	358.38
189.60	1.30	359.352	358.05
193.16	1.12	359.320	358.20
200.00	0.61	359.082	358.47
220.00	5.54	357.144	351.60
240.00	2.20	354.744	352.54
249.95	-0.58	353.550	354.13
260.00	-3.21	352.344	355.56
269.72	-4.76	351.178	355.94
280.00	-3.60	349.944	353.55
300.00	-12.23	347.544	359.78
320.00	-17.15	345.144	362.29
340.00	-16.58	342.743	359.32
360.00	-16.99	340.343	357.34
380.00	-14.48	337.943	352.42
400.00	-12.34	335.543	347.88
420.00	-6.22	333.143	339.36
432.39	-3.08	331.656	334.73
440.00	-2.03	330.743	332.78
460.00	-0.89	328.343	329.24
480.00	-0.40	325.943	326.34
500.00	-1.49	323.543	325.03
520.00	-7.06	321.143	328.20
540.00	-3.33	318.743	322.08
560.00	-7.02	316.464	323.48
574.58	2.24	315.049	312.80
580.00	2.12	314.577	312.45
600.00	-0.47	313.089	313.56
619.86	-1.90	311.894	313.80
640.00	0.33	310.693	310.37
646.01	0.01	310.335	310.33

LONGITUDINAL SECTION - MC40

HORZ 1:1000 VERT 1:1000

LONG SECTION - CH 0m - 646m

SCALE: 1:1000 (A1)

WORK IN PROGRESS

PRINTED 8/02/2023 11:27:27 AM

REVISION	AMENDMENT	APPROVED	DATE
UR*	UNDER REVISION		

wsp
Wellington Office
+64 4 471 7000
PO Box 12-003
Wellington 6144
New Zealand

SOUTH WAIRARAPA DISTRICT COUNCIL

SCALES: 1:1000(A1) , 1:2000(A3) — ORIGINAL SIZE: A1

DRAWN: N.M — DESIGNED: N.M — APPROVED: APPROVER

DRAWING VERIFIED: VERIFIER — DESIGN VERIFIED: VERIFIER — APPROVED DATE: YYYY-MM-DD

PRELIMINARY

PROJECT: SOUTH WAIRARAPA DISTRICT COUNCIL
HINEKURA ROAD
ROAD REALIGNMENT

TITLE: OPTION 4 - PLAN LAYOUT & LONGITUDINAL SECTION
SHEET 1 OF 1

WSP PROJECT NO. (SUB-PROJECT): 5-C4072.01 — SHEET NO.: SK41 — REVISION: UR*

Original sheet size A1 (841x594) Plot Date 2023-02-08 at 11:27:27 AM PLAN_LS U:\ProjectsNZ\5c\5-C4072.01 HineKura Rd Landslide\Home\1673 Hinekura Road Landslide\800 Drawings\03 CAD\5-C4072.01(1) SK11-SK13_SK21-SK23_SK31_SK3A_OPTIONS.dwg SK41-OPT4

wsp.com/nz