

19 July 2024
Job No: 1016884.0001

Meridian Energy Limited
PO BOX 2128
Christchurch
Christchurch 8140

Attention: Nick Bowmar

Dear Nick

Mount Munro Wind Farm Review of alternative access options

1 Background

Tonkin & Taylor Ltd (T+T) have been engaged by Meridian to carry out a desktop review of alternative accesses to the Mount Munro windfarm site, based on issues and suggestions raised by Submitters at the Environment Court Mediation held on 18 and 19 June 2024.

2 Proposed main construction site access and internal layout

Meridian proposes to construct a windfarm of 20 wind turbines, 5 km south of Eketahuna in the Lower North Island (refer Figure 2.1 below):

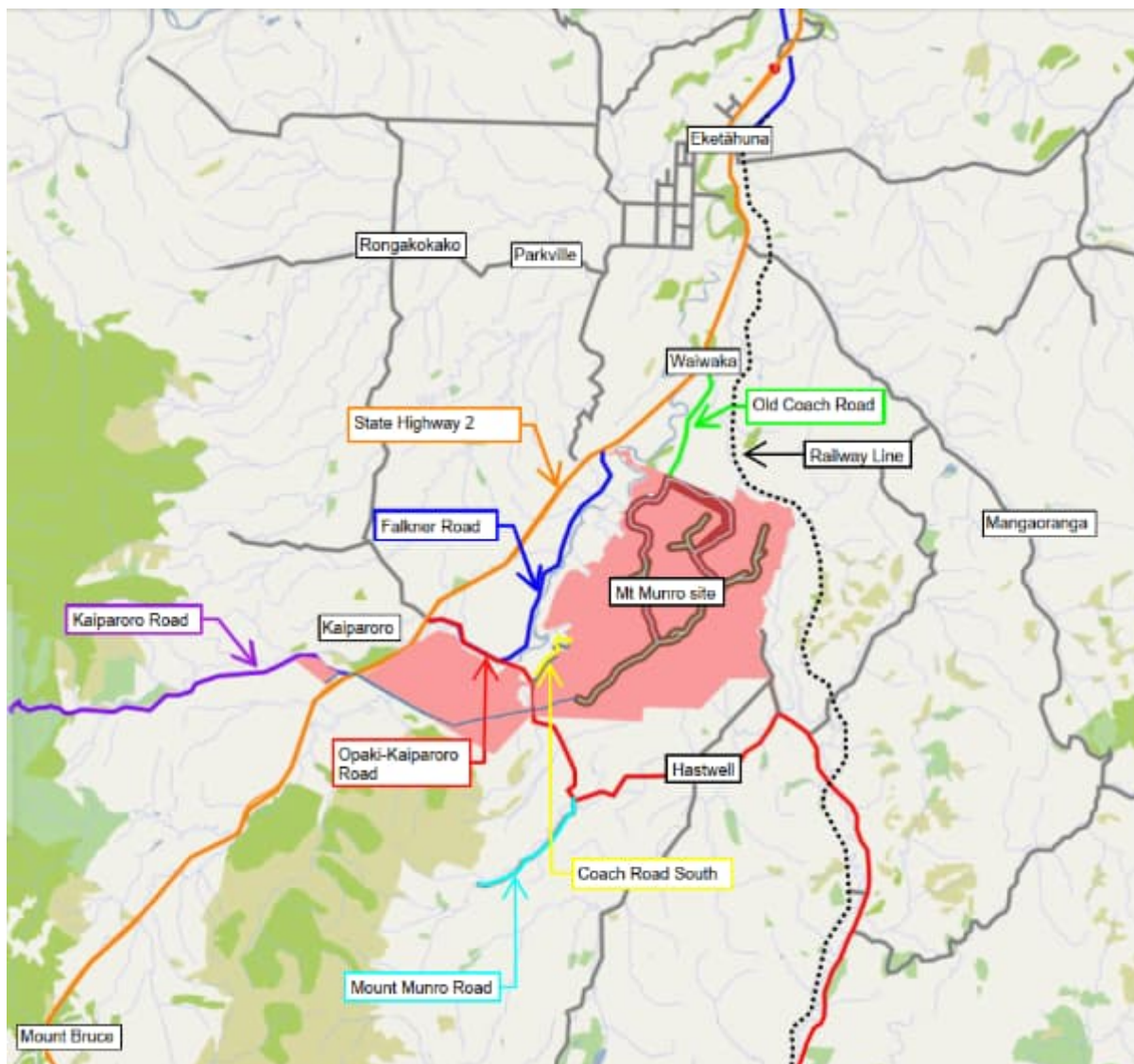


Figure 2.1: Mount Munro windfarm location.

Access to the main construction site is proposed from SH2/Old Coach Road, with the main construction site entrance located off Old Coach Road, approximately 1.7 km from its intersection with SH2. The proposed main site entrance and internal layout of both the turbine envelope zones and internal access roads is shown in Drawing Number 1016884.1000-012 Rev 2 of Appendix D Civil Engineering Report of the Mount Munro Resource Consent application (subsequently referred to as the Civil Engineering Report), and an extract of this drawing is provided in Figure 2.2 below:

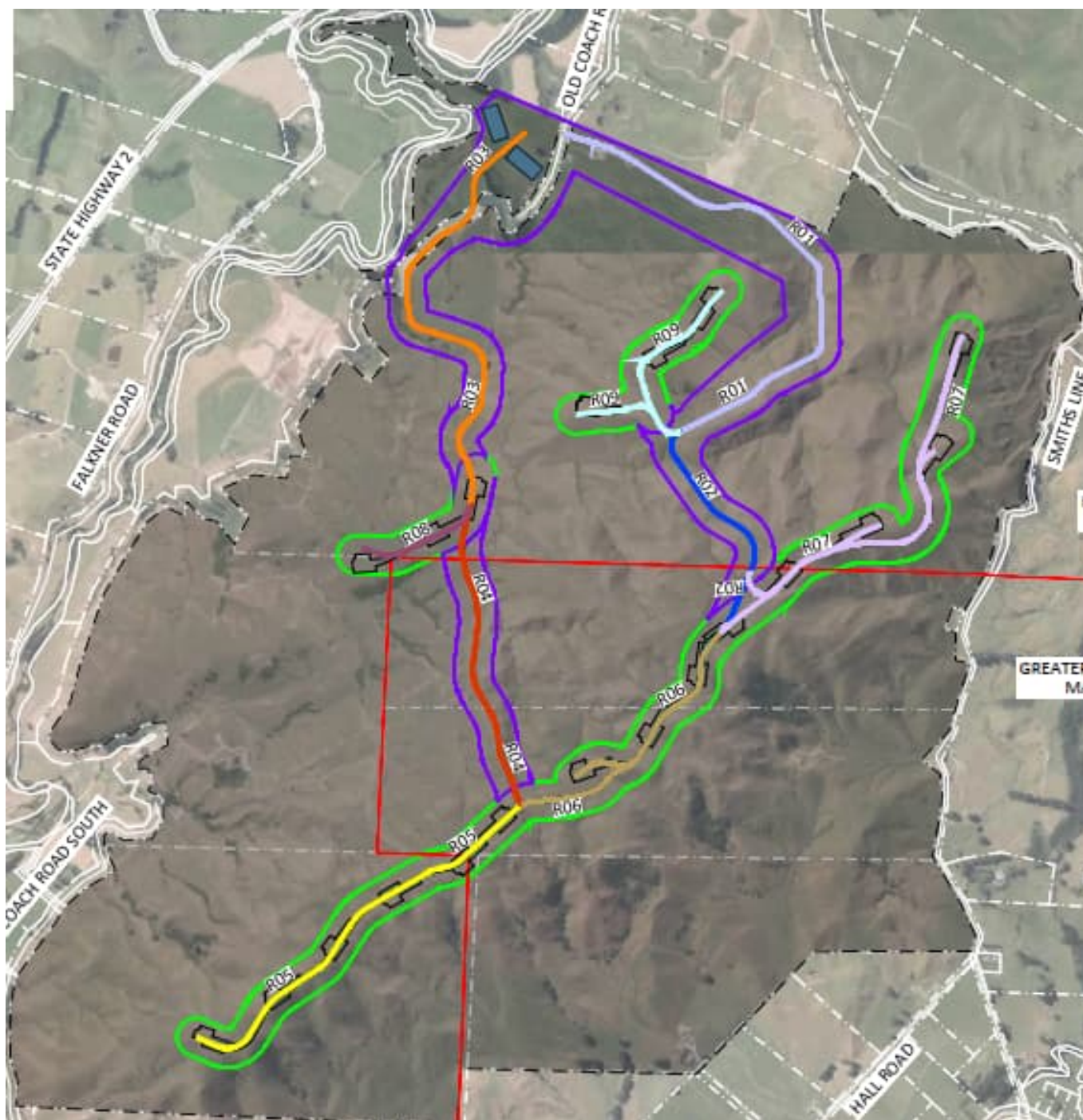


Figure 2.2: Proposed Old Coach Road Main site entrance (top of the Figure), internal road layout (shown in R0 numbers) and turbine envelope zones (shown in green).

Mount Munro topography can generally be described as farm pasture on relatively steep hillsides, with several deep valleys. Figure 2.3 below is an extract of Drawing Number 1016884.1000-004 Rev 2 of the Civil Engineering Report which shows the elevation and contours across the site indicating these level differences:

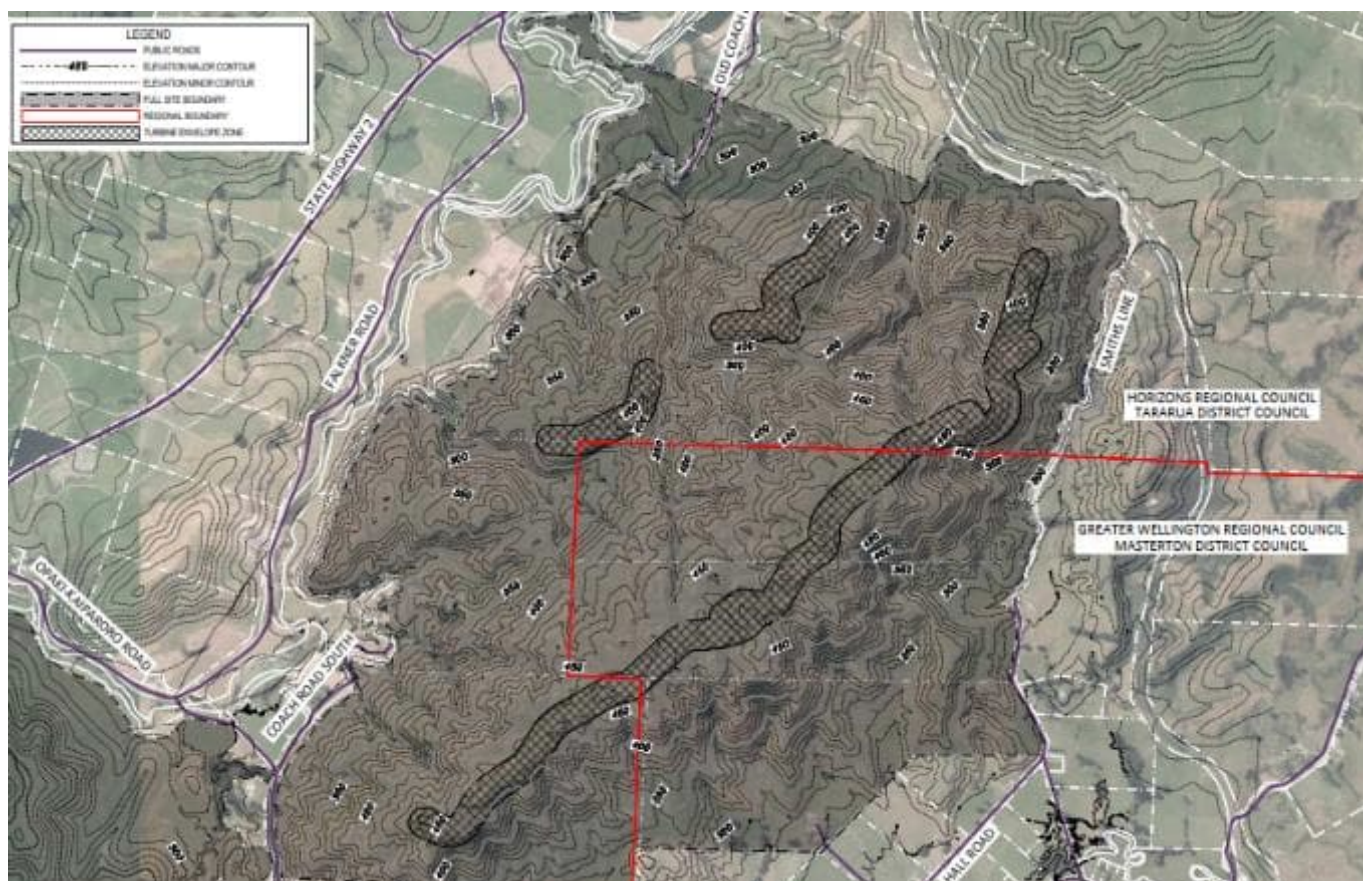


Figure 2.3: Site Contours.

Figure 2.4 below is an extract of Drawing Number 1016884.1000-005 Rev 2 of the Civil Engineering Report. This highlights the steep hillsides of 28 degrees (which equates to 53% or a 1:2 gradient) surrounding the site. The proposed turbine envelope zones and access roads have been designed to avoid, as far as possible, these steep hillsides:

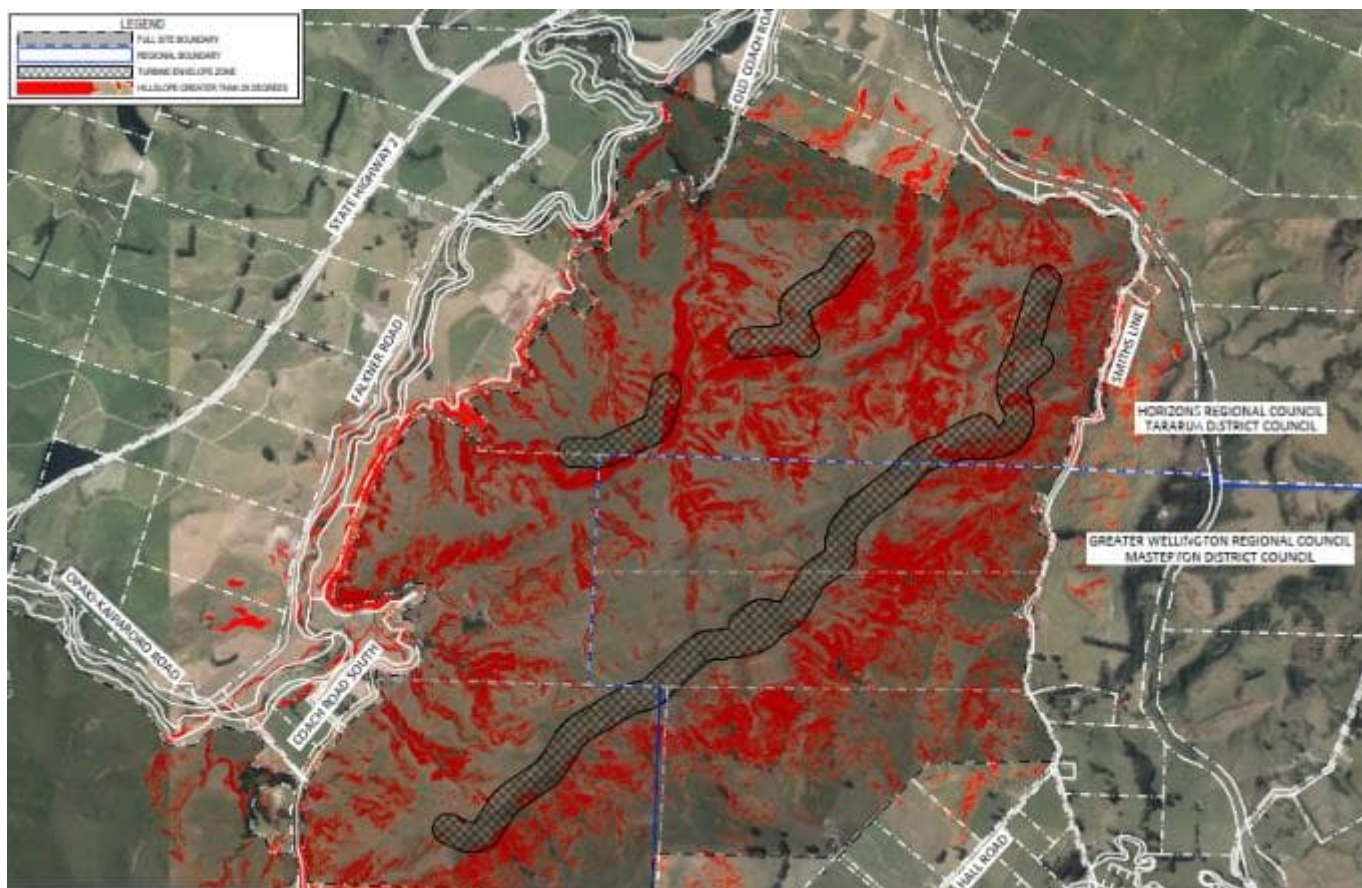


Figure 2.4: Steep hillsides shown in red.

3 Design Parameters for access roads

The overall design philosophy for the internal wind farm access roads has been to follow existing farm tracks and tops of ridges wherever possible. Locating roads along the ridgeline generally minimises the volume of excavation (and hence cost and extent of land disturbance), and extent of cut and fill (noting that the stability of cut slopes poses a significant engineering risk). It also means more favourable geotechnical conditions are likely, reduces the risk of erosion (due to these being the flatter areas) and generally avoids gullies, undisturbed watercourses and other unsuitable areas for earthworks.

As detailed in the Civil Engineering Report, key parameters used in the design of the proposed access routes to the turbines include a maximum gradient of 16%. Normally 12.5% is an assumed maximum grade beyond which haulage of the heavier turbine components (such as tower sections and nacelles), may require additional tractor units, bull dozers, or assistance by winching but only to a maximum grade of 16%.

A laydown area is required to service the wind farm site during construction and long-term operations. The proposed laydown area covers 1.4 hectares on the western side of Old Coach Road, opposite the wind farm site entrance (as shown in blue in Figure 2.2 above). During construction the main storage laydown area will be used to store turbine components transported in by road prior to being taken to the turbine pad. This area will also be used as a Meridian and contractor's establishment/ administration area. Post construction, some or all this storage laydown area will be retained for spare parts storage and workshop buildings will be established for the servicing of the turbines and as a base for the operations and maintenance teams.

4 Alternative access options assessed.

Alternative access options to the main construction site assessed include:

- Option 1 - Falkner Road.
- Options 2 to 5 starting from Opaki-Kaiparoro Road/Coach Road South intersection.
- Option 6 – Opaki-Kaiparoro Road, south of Coach Road South.
- Option 7 – One way route from Old Coach Road, Paper Road to Coach Road South.

The alternative access options considered are shown in Appendix A.

These options have been identified taking into account the available information from Figure 2.3 and Figure 2.4 above on levels and steep hill sides and hence they are considered to be the potentially viable alternative accesses to avoid the existing steep hill sides and grades.

At the Mediation, submitters queried whether the rail line to the east of the site (shown in Figure 2.1 above) could be used to transport construction materials. It should be noted that there is no existing station/rail sidings, which would need to be constructed. As shown in Figure 2.4, the north and east aspects of the site itself are characterised by steep topography and there are a series of streams and wetland features that run alongside the railway line and between it and the site. Transportation of aggregate is unlikely to be feasible since this would involve triple handling relative to road transport and also local quarries are proposed to be used which would negate against the use of rail. Furthermore, based on discussions with Meridian, KiwiRail have confirmed that wind turbine components are over-gauge for their network. On this basis the rail option is rejected and has not been considered any further.

5 Data sources and key assumptions

Data sources used for this high level assessment include:

- Appendix D of the Mount Munro Windfarm Resource Consent application - Civil Engineering Report dated May 2023 (as outlined in section 2 above).
- GIS mapping.
- Tararua District Council (TDC) District Plan and website.
- Google maps.

This report identifies whether any options are technically unfeasible or present a significant risk profile (for example where routes are unsuitable to be used to transport turbine transformers due to widths, gradients etc).

This report solely concentrates on a high-level feasibility of the alternative access options limited to transport parameters and doesn't take into account detailed engineering issues such as geotechnical conditions, earthworks required, surface water drainage options or environmental issues (e.g., ecology, heritage, noise, landscape, visual effects) or resource consent risks or potential cultural effects.

As set out in the proposed consent conditions attached to Mr Anderson's evidence, proffered in response to concerns raised by submitters, no construction access is assumed from Opaki-Kaiparoro Road south of Mount Munro Road.

Findings of the review of alternative access options 1 to 7 are outlined in the subsequent sections of this report.

6 Option 1 Falkner Road

As shown on Figure 2.4 above, Falkner Road on the western side of the site is fronted by steep hill slopes (in excess of a 50% gradient), which would make provision of access roads extremely difficult. Furthermore, the Makakahi River is located along the whole of the west side of the site and would require a new bridge crossing.

It is considered that provision of access from Falkner Road would be exceptionally challenging. Option 1 is therefore a rejected option.

Furthermore, Figure 6.1 below is an extract of Drawing Number 1016884.1000-002 Rev 2 of the Civil Engineering Report and shows Falkner Road in relation to the land ownership/agreements in place for the Mount Munro windfarm.

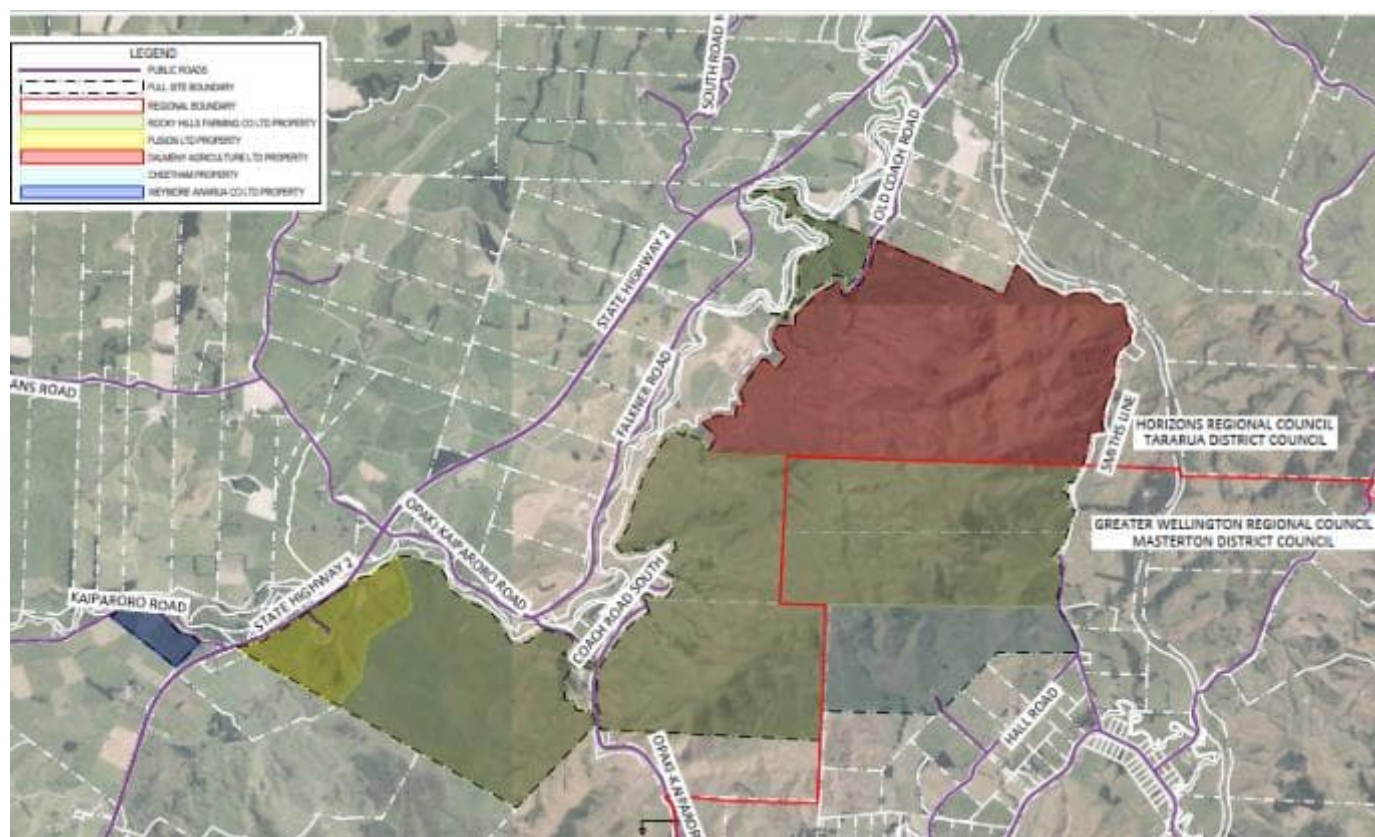


Figure 6.1: Property Plan.

This indicates that access from Falkner Road would be outside the Meridian land ownership/ agreements area and would require additional land purchase/ agreements with third parties which may not be forthcoming. Likewise, any lay down area would also require land purchase/agreements with third parties, which may not be forthcoming.

7 Access via SH2 and Opaki-Kaiparoro Road for Options 2 to 7

7.1 Background

In order to access Options 2 to 7 to the south, construction traffic is required to use the SH2/Opaki - Kaiparoro Road intersection and then travel south east on Opaki-Kaiparoro Road.

In considering the feasibility of alternative access from the south, we have firstly assessed the SH2/Opaki-Kaiparoro Road intersection and then Opaki-Kaiparoro Road south eastwards to accommodate the proposed construction vehicles.

7.2 SH2/Opaki-Kaiparoro Road intersection

7.2.1 Sight distance checks

The sight distances at the SH2/Opaki-Kaiparoro Road intersection were reported within the Mount Munro Integrated Transport Assessment (ITA). SH2, viewed from the intersection with Opaki-Kaiparoro Road, looking north and south, is shown in Figure 7.1 and Figure 7.2 below.



Figure 7.1: Sight distance from Opaki-Kaiparoro Road, looking north.



Figure 7.2: Sight distance from Opaki-Kaiparoro Road, looking south.

The sight lines are shown in Figure 7.3 below, which indicates clear sightlines to the south. These exceed the required (248 m) Austroads Safe Intersection Sight Distance (SISD) requirement. However, the sight distances looking north are slightly obstructed by the curve of the road, vegetation and the cut slope. It is anticipated that some vegetation clearance could be required, and this can be completed within the road reserve. This clearance is included within the proposed consent conditions attached to Mr Anderson's evidence.



Figure 7.3: SH2/Opaki-Kaiparoro Road sight distances.

7.2.2 Vehicle tracking

Vehicle tracking at the SH2/Opaki-Kaiparoro Road intersection for the following vehicles has been carried out:

- Truck and trailer.
- Transporter for a 67 m wind turbine blade.

The vehicle tracking is shown in Drawing Numbers 1016884.1000-C500 to 503 in Appendix B. The vehicle tracking shows that a truck trailer can turn in and out of Opaki-Kaiparoro Road without the need for any intersection improvements.

A significant upgrade of the intersection would be required to enable the transporter to use the intersection. The changes required include:

- Large volume of fill required on the north eastern corner of the intersection due to large level difference.
- Relocation of an existing fence.
- Temporary widening of the intersection on the north western and north eastern corners of the intersection.

These changes can all be constructed within the existing road reserve. With these upgrades in place this intersection would be suitable for the use being assessed.

7.3 Opaki-Kaiparoro Road

7.3.1 Vehicle tracking

Vehicle tracking has been carried out on Opaki-Kaiparoro Road between the SH2 intersection and Coach Road South for both the truck and trailer and the turbine transporter. These are included in Appendix B specifically for the existing bridge over the Makakahi River, as shown in Figure 7.4 below:



Figure 7.4: Opaki-Kaiparoro Road bridge over the Makakahi River.

The bridge is located 30 m from the intersection of Opaki-Kaiparoro Road and Falkner Road, 1.2 km south east of the intersection with SH2.

Drawing Number 1016884.1000-C602 in Appendix B indicates that the truck and trailer unit can manoeuvre within the existing road and bridge.

The tracking does indicate that widening of Opaki-Kaiparoro Road would be required (within the road reserve) for approximately 400 m between SH2 and Coach Road South to accommodate the transporter movements.

Drawing Numbers 1016884.1000-C600 and 601 in Appendix B indicate that there is insufficient width on the bridge to accommodate the turbine transporter and, as such, the bridge would need to be replaced or widened to facilitate alternative access Options 2 to 7. No information on the weight loading of the bridge is publicly available. Given the age of the bridge, it is considered likely that the bridge would either require strengthening or replacement given the weight of the large wind turbine components. Taking these factors together, it is considered that bridge replacement would be required. Replacement of the bridge would have significant cost implications which are envisaged to be a greater cost than that to widen Old Coach Road which is the proposed construction vehicle access. Furthermore, construction of a new bridge is likely to require closure of this section of Opaki-Kaiparoro Road for a period of time which would result in a significant lengthening of trips for vehicles to re-route to the southern SH2/Opaki-Kaiparoro Road intersection which would also increase traffic through Mauriceville and the school. Other factors such as environmental impacts would also need to be considered.

This is considered to be a major constraint and a fatal flaw. Options 2 to 7 are therefore considered to be rejected options.

Notwithstanding this bridge constraint, further assessments have been carried out to determine whether access directly from Options 2 to 7 is feasible. This is summarised in the following sections.

8 Option 2 assessment

The proposed route of Option 2 is shown in red on the plan in Appendix A. Option 2 commences at the intersection of Coach Road South and Opaki-Kaiparoro Road approximately 1.8 km along Opaki-Kaiparoro Road from SH2. This route provides a short and relatively direct route access from the south.

As indicated in Appendix A, a potential site laydown area (a 1.4 Ha area of flat land) is shown (which is also applicable for Options 3, 4 and 5) as a red hatched area west of Coach Road South. It is understood that this area is within the ownership of one of the land owners for which Meridian has an agreement. However, as shown in Figure 6.1, this particular parcel of land is not currently secured and hence would require further land purchase/agreement.

The approximate topography of Option 2 access route is shown in Figure 8.1 below.

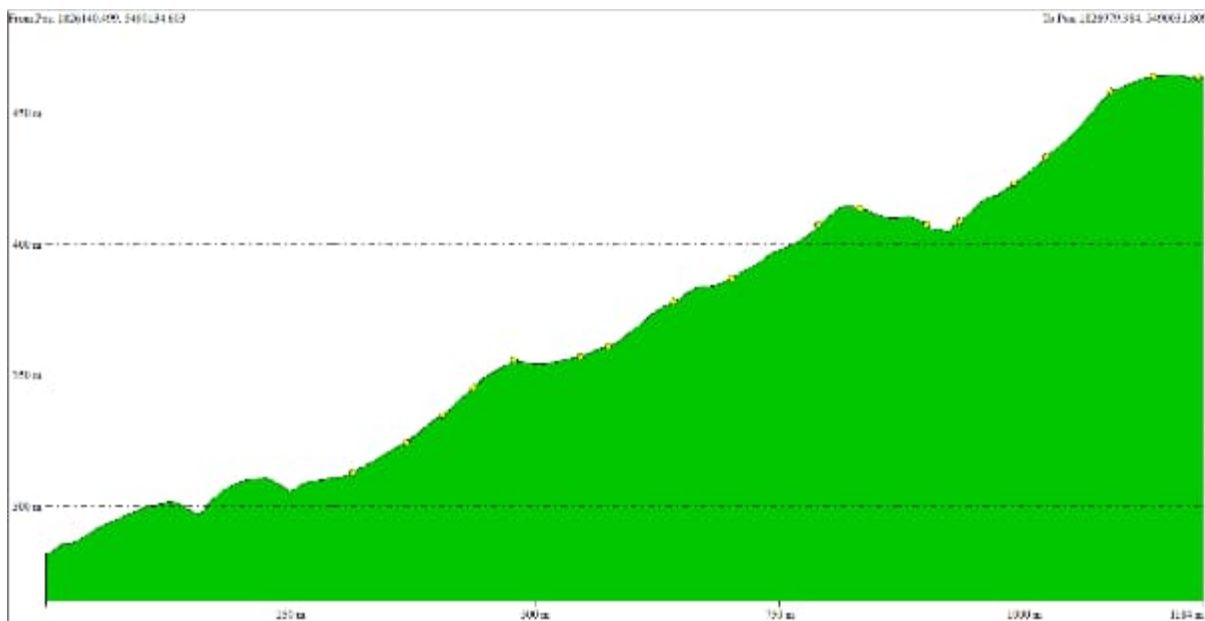


Figure 8.1: Option 2 access route approximate topography.

Most of the route will require large cuts, and at several points along the route, tight bends are required. It is anticipated that the access route option can be designed to run straight for approximately 380 m at a grade of between 8% to 10% before beginning a series of tight curves and straight sections to the summit. Over the curved sections the grade is anticipated to be 15% while on the straight sections the grade is anticipated to be 20%.

In addition to the fatal flaw at the Opaki-Kaiparoro Road bridge, the gradients of up to 20% on the access route are another fatal flaw and Option 2 is rejected.

9 Option 3 assessment

The proposed route of Option 3 is shown in orange on the plan in Appendix A. Like Option 2, this option begins at the intersection of Coach Road South and Opaki-Kaiparoro Road, approximately 1.8 km along Opaki-Kaiparoro Road from SH2.

The approximate topography of Option 3 access route is shown in Figure 9.1 below.

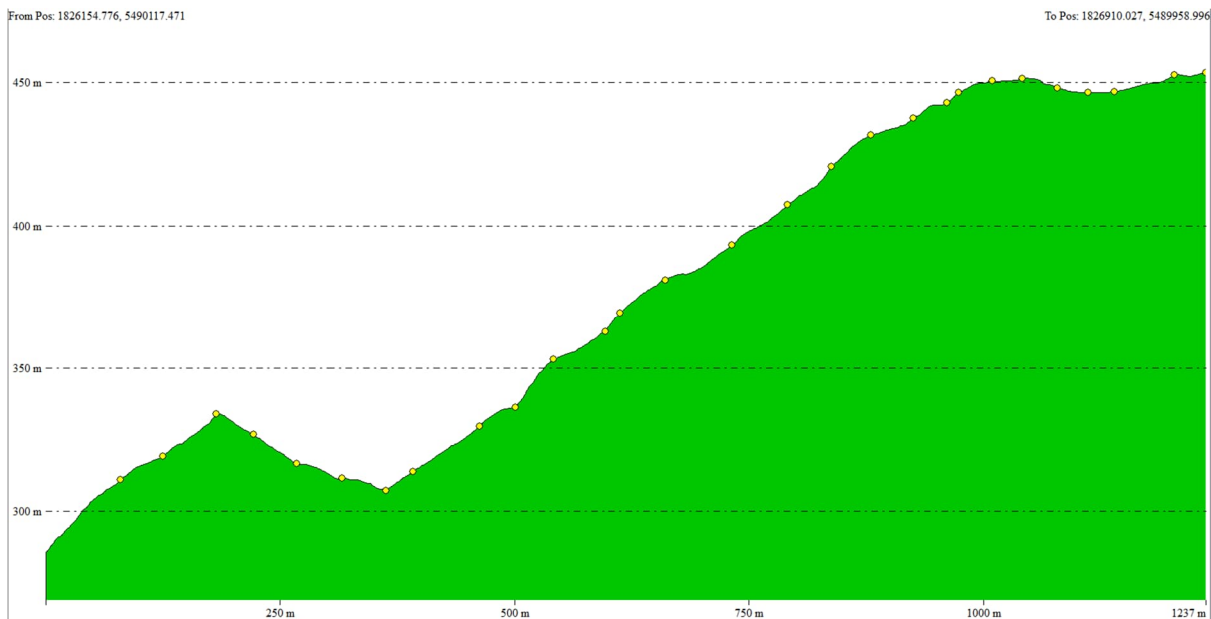


Figure 9.1: Option 3 access route approximate topography.

Most of the route is likely to require large cuts. Due to the tight bends at several locations, the road would have to be widened for tracking of the transporters and turbine components within the cuts. It is anticipated that the access route option can be designed for the first 450 m with a climb at 15% comprising two bends until a straight section at a 20% grade. The route then tracks into tight bends at a 15% grade.

In addition to the fatal flaw at the Opaki-Kaiparoro Road bridge, the gradients of up to 20% on the access route are another fatal flaw and Option 3 is rejected.

10 Option 4 assessment

The proposed route of Option 4 is shown in yellow dash on the plan in Appendix A. Option 4 utilises the existing southern section of Coach Road South, a metalled access road beginning approximately 1.8 km along Opaki-Kaiparoro Road from SH2. This route is essentially an upgrade of the existing farm track and also forms part of Option 7.

The approximate topography of Option 4 access route is shown in Figure 10.1 below.



Figure 10.1: Option 4 access route approximate topography.

Coach Road South would have to be upgraded and widened to allow for the size and weight of the construction traffic. This route is initially relatively flat along Coach Road South and then steeply rises. This access route option will require large cuts, involves several valley crossings and will involve long sections of gradients between 15% and 20%.

In addition to the fatal flaw at the Opaki-Kaiparoro Road bridge, the gradients of up to 20% on the access route are another fatal flaw and option 4 is rejected.

11 Option 5 assessment

The proposed route of Option 5 is shown in dark green on the plan in Appendix A.

The approximate topography of Option 5 access route is shown in Figure 11.1 below.

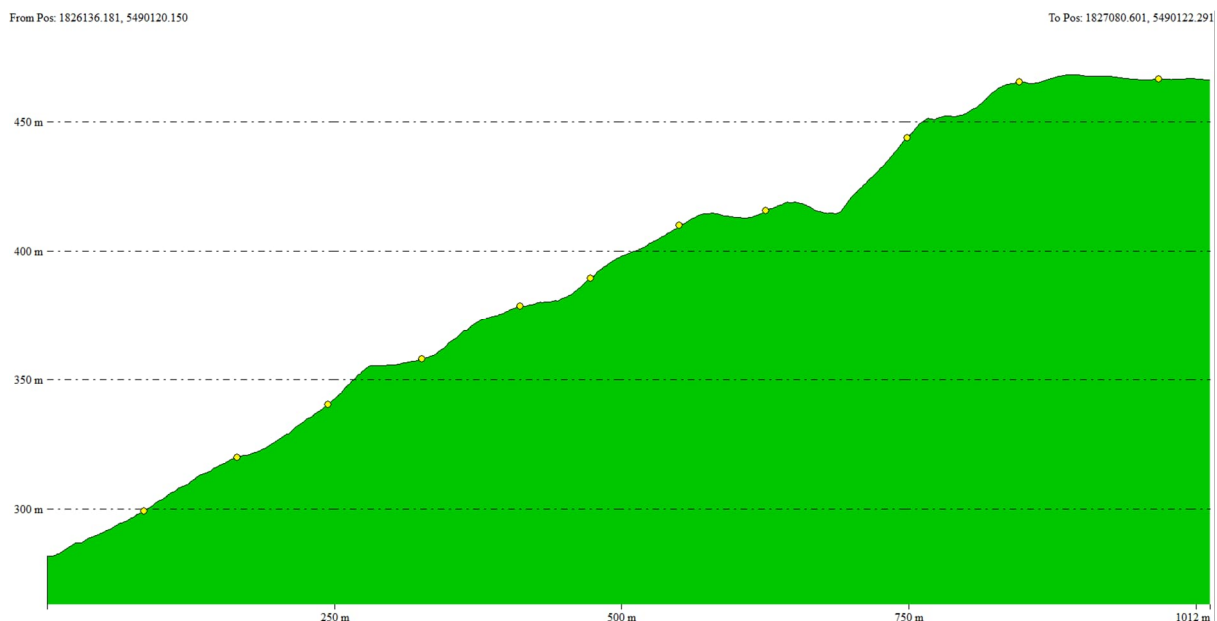


Figure 11.1: Option 5 access route approximate topography.

Option 5 access route follows a similar alignment to Option 2 for the first 380 m and would be at a grade of between 8% to 10%. From this point the access route deviates from Option 2 and continues in a northeast direction across three valley crossings in fill before climbing in a deep cut to the ridgeline resulting in a maximum gradient of up to 20%.

In addition to the fatal flaw at the Opaki-Kaiparoro Road bridge, the gradients of up to 20% on the access route are another fatal flaw and Option 5 is rejected.

12 Option 6 assessment

The proposed route of Option 6 is shown in light green on the plan in Appendix A. Option 6 commences from the existing quarry at Opaki-Kaiparoro Road approximately 2.5 km from the SH2/Opaki-Kaiparoro Road intersection and 0.7 km from the Opaki-Kaiparoro Road/Coach Road South intersection. When compared to Figure 6.1 this option is outside of Meridian land ownership/agreements and would require land purchase/agreements with third parties. Likewise, any lay down area would also require land purchase/agreements with third parties.

The approximate topography of Option 6 access route is shown in Figure 12.1 below.

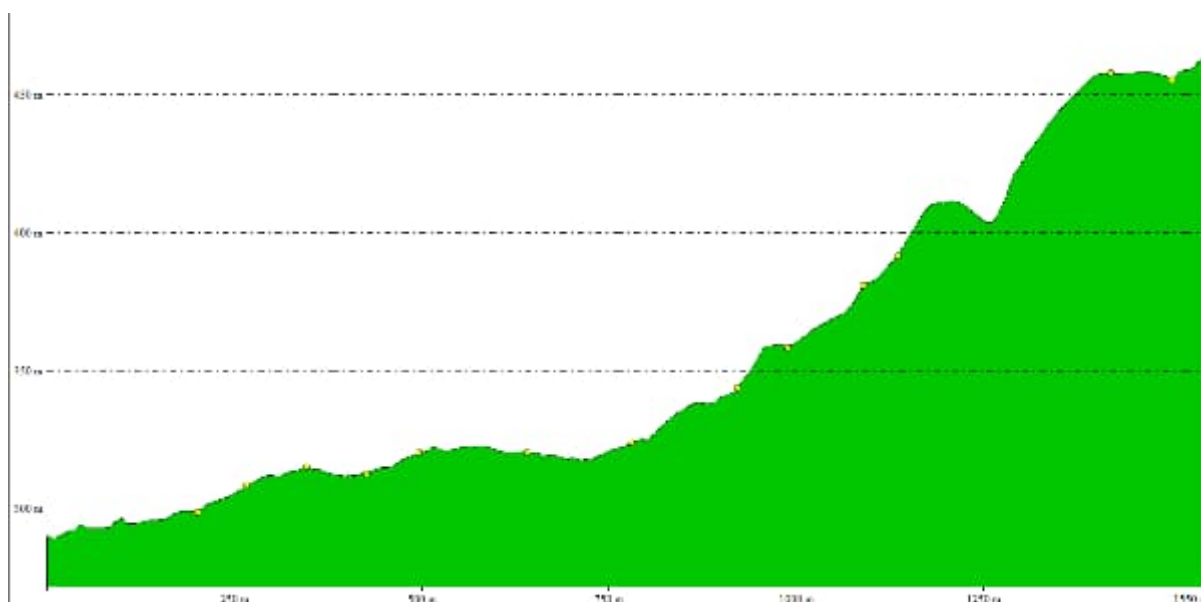


Figure 12.1: Option 6 access route approximate topography.

Option 6 access route starts an ascent from the lower valley flanks of a steep escarpment, climbing up to the escarpment ridge in several deep cuts including a climb of approximately 150 m across a steep escarpment face with gradients of up to 23%.

In addition to the fatal flaw at the Opaki-Kaiparoro Road bridge, the gradients of up to 23% are another fatal flaw and Option 6 is rejected.

13 Option 7 assessment

The proposed route of Option 7 is shown in pink on the plan in Appendix A.

Meridian was requested to consider a one way route in from Old Coach Road and out from Coach Road South. As such, Option 7 enters at the site access and lay down area on Old Coach Road, uses the proposed access roads R03 and R08 (shown on Figure 2.2) and then utilises the alignment of the existing Paper Road that connects Old Coach Road and Coach Road South (and also forms part of Option 4) to reach Coach Road South.

The approximate topography of Option 7 access route is shown in Figure 13.1 below.



Figure 13.1: Option 7 access route approximate topography.

This option would involve improvement works on a long section of route covering both Old Coach Road, the internal access route/Paper Road and Coach Road South. The option does not appear to offer much benefit in effects terms once Old Coach Road has been upgraded (which upgrade will be required in any event).

This access route option will require large cuts, several valley crossings resulting in long sections of gradients between 14% and 20%. Coach Road South would have to be upgraded and widened to allow for the size and weight of the construction traffic.

In addition to the fatal flaw at the Opaki-Kaiparoro Road bridge, the gradients of up to 20% are another fatal flaw and option 7 is a rejected option.

14 Conclusions

Based on our assessment of seven potential alternative access route options from west and south of the Mount Munro windfarm site, the following is concluded from a transport perspective:

- Option 1 access from Falkner Road - Falkner Road on the west side of the site is fronted by steep hillsides (in excess of a 50% gradient), which would make provision of access roads extremely difficult to provide. Furthermore, the Makakahi River is located along the whole of the west side of the site and would require a bridge crossing within the steep hill sides. It is considered that provision of access from Falkner Road would be exceptionally challenging, is considered to be fatally flawed and Option 1 is rejected.
- Options 2 to 7 access from Coach Road South and Opaki-Kaiparoro Road. These accesses would require all construction vehicles to route using the Opaki-Kaiparoro Road bridge over the Makakahi River. There is insufficient width on the bridge to accommodate the turbine transporter and it is likely to be unable to carry the loads required. As such, the bridge would need to be replaced. This is a major constraint and considered a fatal flaw, meaning Options 2 to 7 are rejected. Furthermore, the access routes from Options 2 and 7 to the Windfarm turbine envelope zones all involve gradients of 20% to 23%, which exceeds the maximum feasible grade of 16% for transporting turbine components. This is another fatal flaw for Options 2 to 7.
- Alternative access routes to that proposed from Old Coach Road, have been assessed as not viable or deliverable options.
- Use of the rail line is not possible since KiwiRail have confirmed that wind turbine components are over-gauge for their network and transportation of aggregate is unlikely to be feasible since this would involve triple handling relative to road transport.

15 Applicability

This report has been prepared for the exclusive use of our client Meridian Energy Limited, with respect to the particular brief given to us. We also understand and agree that our client will submit this report as part of the application for resource consent and that Tararua District Council, Masterton District Council, Greater Wellington Regional Council and Greater Wellington Regional Council as the consenting authorities will use this report for the purpose of assessing that application. This report may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement

Tonkin & Taylor Ltd

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Reviewed by:



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Senior Transport Planner

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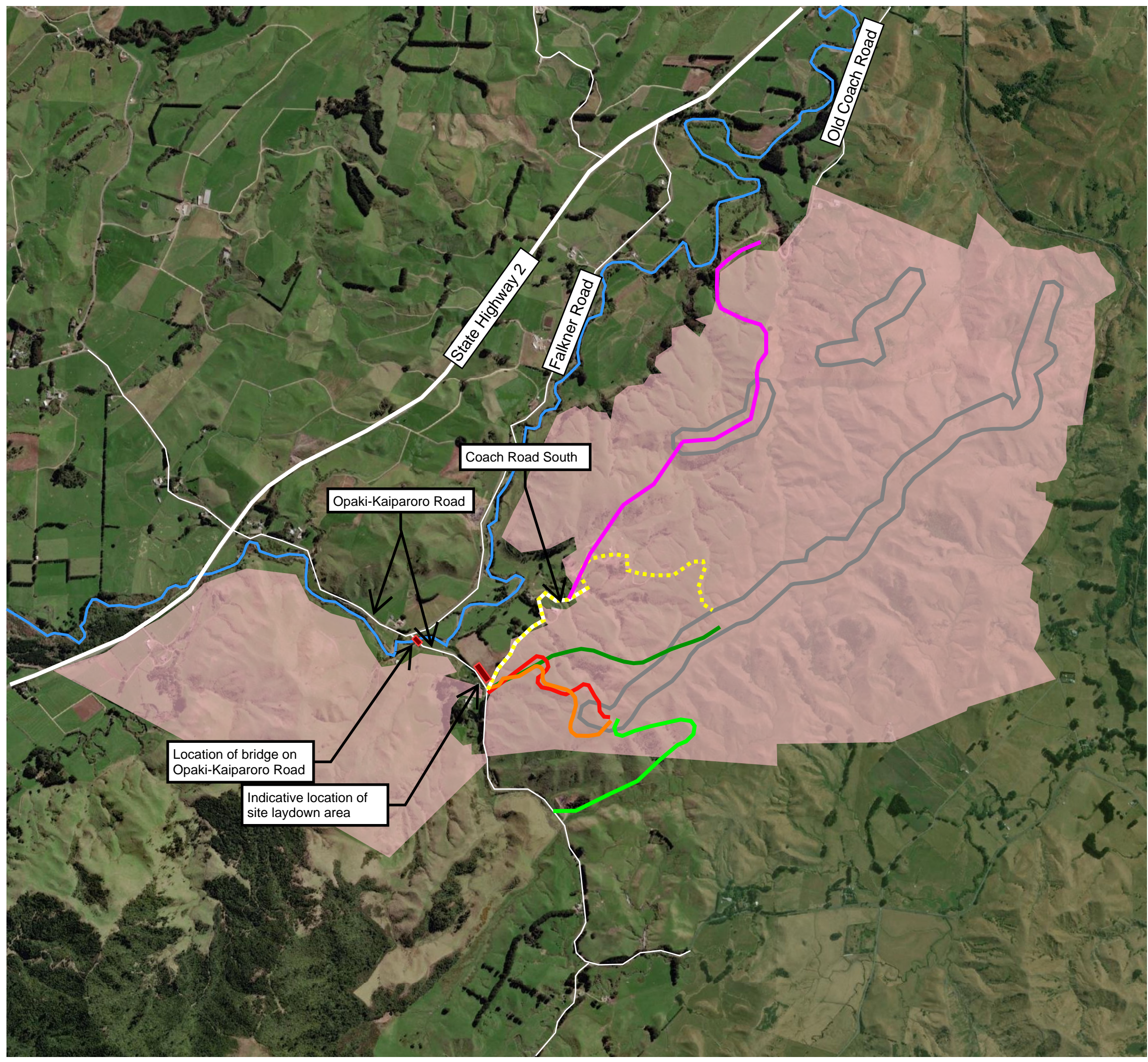


Nick Peters
Project Director

19-Jul-24

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Appendix A Alternative Access Options Plan



LEGEND

	OPTION 1
	OPTION 2
	OPTION 3
	OPTION 4
	OPTION 5
	OPTION 6
	OPTION 7
	MOUNT MUNRO SITE
	TURBINE ENVELOPE ZONE
	MAKAKAHI RIVER

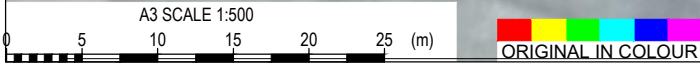
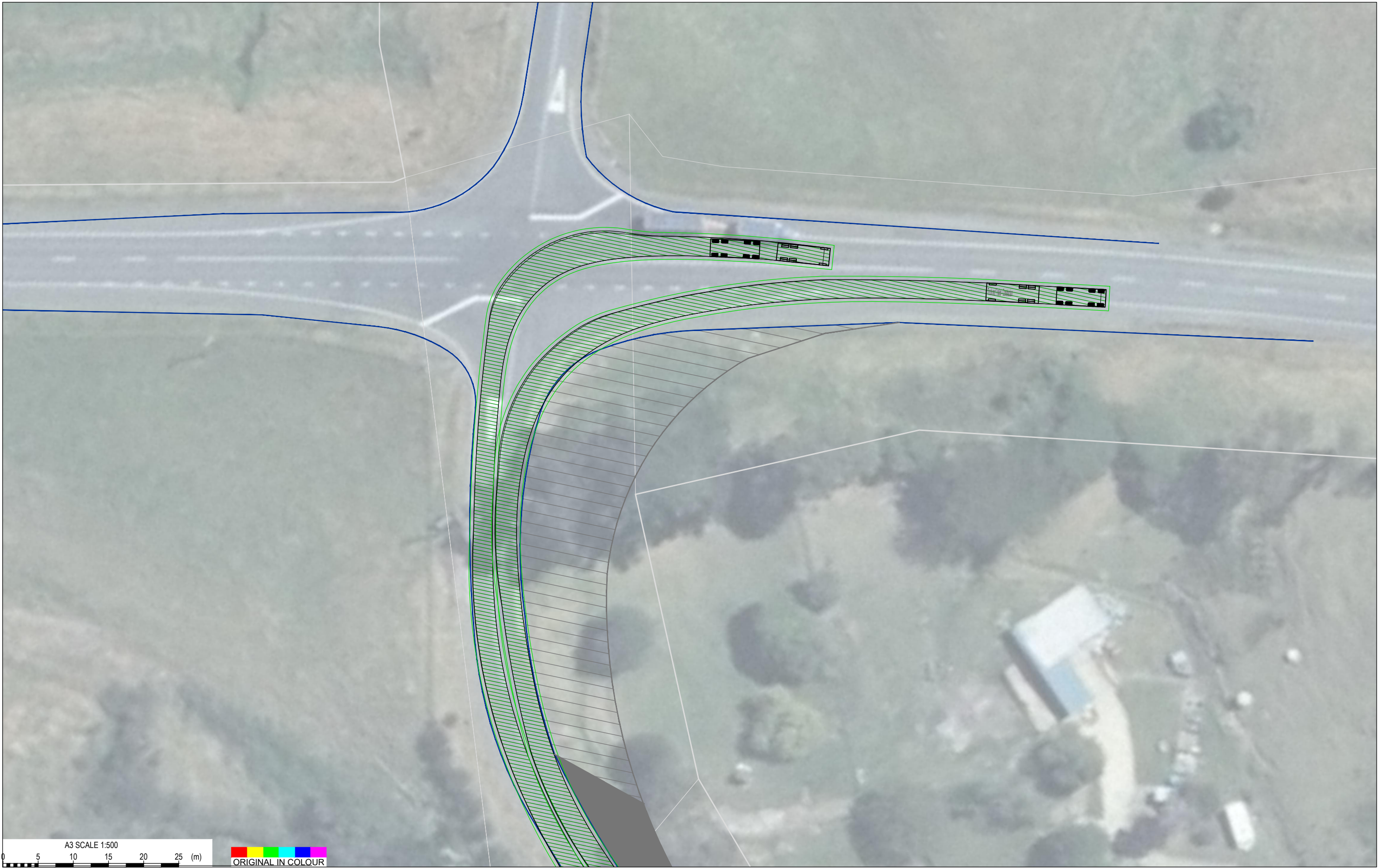
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1. World Imagery Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Created By:	HBarakat	
Approved By:		
TT Proj Ref:	1016884	
TT Map Ref:	TTMAPREF1433463001.902	

Appendix B Vehicle Tracking Opaki-Kaiparoro Road



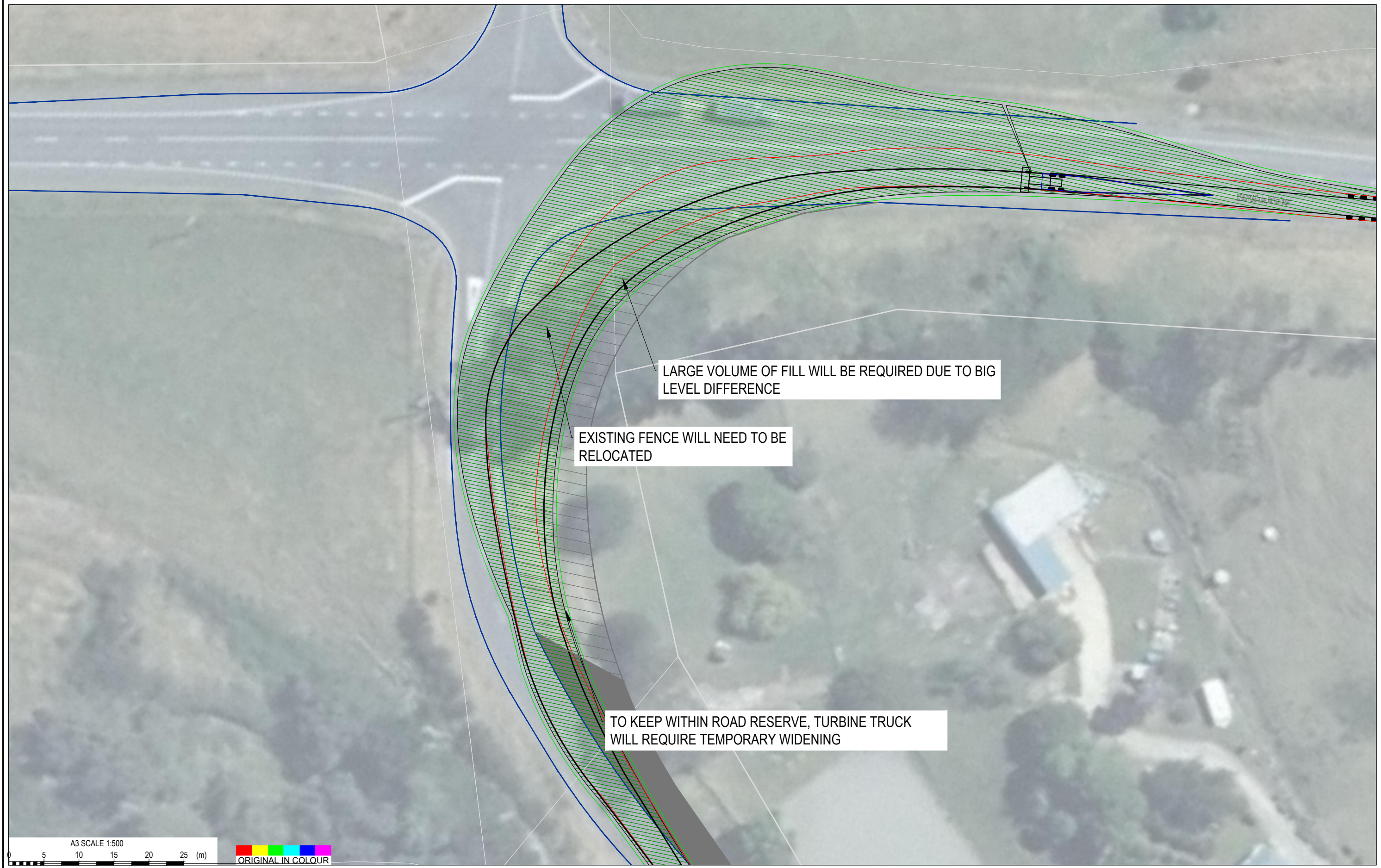



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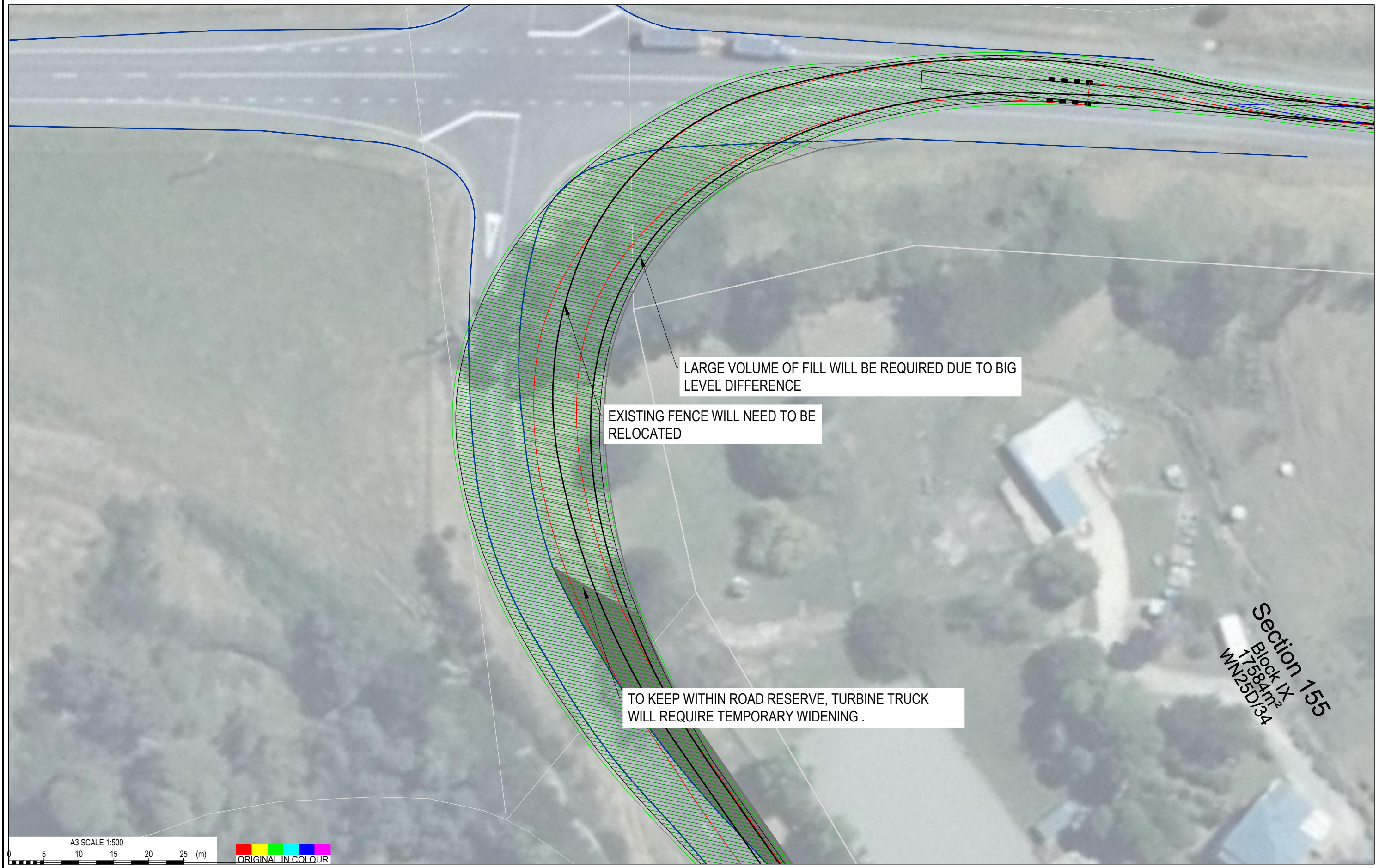
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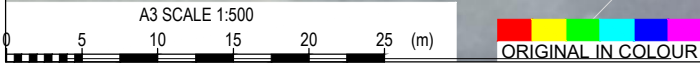


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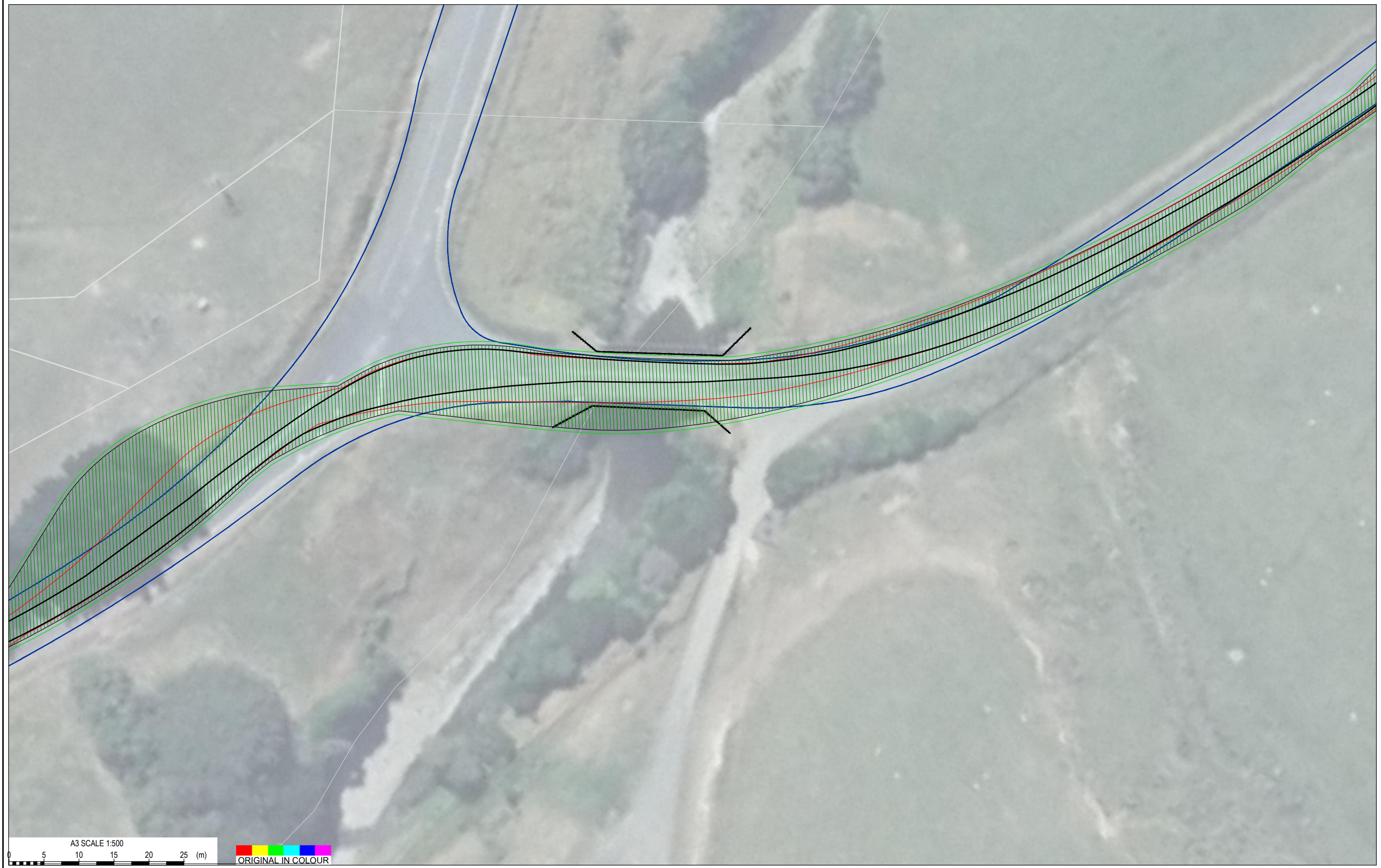
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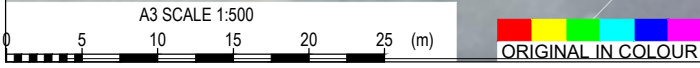
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