Proposed Kaimai Wind Farm
Integrated Transport Assessment

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ISSUE 2, 6 JUNE 2018

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Integrated Transport Assessment

Kaimai Wind Farm

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EXECUTIVE SUMMARY

Proposal

Kaimai Wind Farm (the Applicant) is making an application to Hauraki District Council (HDC) to establish a wind farm accessed off Rawhiti Road, Te Aroha. The proposed site access is from Rawhiti Road which is located within the Matamata-Piako District. Some of the Wind Farm construction requires over-dimension and overweight loads. This assessment considers the trips associated with the over-dimension and overweight loads but the specific considerations relating to the oversize permits are dealt with by others.

Potential Effects

Construction of the proposal is likely to generate an average of approximately 121veh/day, with peaks during the construction season of up to around double the average (250 vpd). Operational traffic will be negligible. The potential adverse transportation effects include delays and crashes at the site access and at the SH26 intersections.

Traffic Aspect	Comment on Effects
Efficiency effects	There are no known efficiency problems on the surrounding network. Rawhiti Road is a low volume road carrying less than 300 vpd. Localised widening at the site access and the Rawhiti Road/SH26 intersection (to NZTA Diagram E) will ensure that there is sufficient space for through traffic to pass a vehicle turning into the site. Proposal will generate approx. 121veh/day.
Safety effects	An increase in vehicles, especially heavy vehicles, can increase the risk of conflict and potential crash severity and therefore reduce safety. There does not appear to be a crash problem in the immediate vicinity of the existing entranceway. The proximity of the one-lane bridge is likely to mean that drivers are alert. The vehicle access needs to be upgraded with localised widening to Diagram E and swept paths for over-dimension vehicles checked and confirmed. The potential effects from an increase in turning movements and heavy vehicles at the SH26 intersection should be mitigated by additional seal widening to NZTA Diagram E to allow a through vehicle to pass.
Oversize Vehicles	There is a risk that the overweight loads will exceed the permitted weight limit on the one-lane bridge on Rawhiti Road. This should be mitigated through the oversize permit process considering the axle limits and selecting the route accordingly.
Dust and Debris	There is a risk of dust and debris from the site being tracked onto the surrounding network. Ensuring the site operation is managed to avoid dust and debris from being tracked onto the surrounding network such as using a wheel wash before trucks leave site and a water cart on site to manage dust.

The potential effects can be mitigated by:

- Localised widening at the site access and the Rawhiti Road/SH26 northern intersection in accordance with NZTA Diagram E.
- Construction Management Plan including:
  - Communications strategy.
  - Temporary traffic management during construction
  - Construction traffic using the SH26 north intersection unless restricted by the weight limit on the one-lane bridge.

Conclusion

With appropriate mitigation, including conditions requiring localised widening at the vehicle access and widening at the Rawhiti Road/SH26 (north) intersection, the adverse construction effects of the proposal relating to traffic can be managed to be less than minor. The operational effects relating to traffic will be negligible.

1. INTRODUCTION

1.1. Background

Kaimai Wind Farm (the Applicant) is making an application to Hauraki District Council (HDC) to establish a wind farm accessed off Rawhiti Road, Te Aroha.

Gray Matter Ltd has been engaged to prepare an Integrated Transport Assessment (ITA) to assess the transport impacts of the proposal. The proposed site access is from Rawhiti Road which is located within the Matamata-Piako District. A portion of the wind farm construction requires over-dimension and overweight loads. This assessment considers the trips associated with the over-dimension and overweight loads but the specific considerations relating to the oversize load permits is covered by others.

1.2. Purpose and Basis of this Report

This ITA focuses on the potential safety and efficiency effects resulting from the proposed traffic associated with the construction and establishment of the wind farm and considers the relevant transportation sections and standards in the Hauraki District Plan.

For the purposes of this assessment, given the traffic disperses on the arterial network immediately at the end of Rawhiti Road, we have focused on the potential safety and efficiency impacts on Rawhiti Road and the SH26 intersections.

Other parties will provide the required over-dimension load permits.

Our report includes:

- A summary description of the site, and comments on the surrounding road network, including function, traffic volumes and crash history over the past 5 years;
- Comments on the proposal, including traffic generation and access;
- An assessment against traffic and transportation requirements of the Hauraki District Plan (HDC);
- An assessment of the transportation effects with a focus on the potential safety and efficiency effects;
- Options for mitigation of potential adverse effects recognising the relevant standards for MPDC roads; and
- Recommended conditions.

Our report is based on the following information:

- Loads and staff numbers provided by the applicant
- Information provided in the Tranzcarr Heavy Haulage Report for Land Transportation of Wind Turbine Equipment Port of Mount Maunganui to Kaimai Range Site for Ventus Energy July 2017 and updated May 2018
- Site visit to Rawhiti Road (19 December 2018)
- Traffic count and road geometry information from https://mobileroad.org

We have considered the turbine dimensions outlined in the memorandum titled Kaimai Wind Turbine Definition and dated 21 May 2018. We have considered the Kaimai Wind Farm Civil Engineering Peer Review report, May 2018 completed by Tiaki Engineering Consultants. These are in Appendix 4.

2. SITE AND SURROUNDING NETWORK

2.1. Site Description

The site is located in a rural hilly area within the Hauraki District and is accessible from the existing site access off Rawhiti Road. Rawhiti Road is located within the Matamata-Piako District. The existing track appears to follow an unformed paper road (Wright Road on the Matamata-Piako District maps). The paper road continues into the Hauraki District and links to Rotokohu Road.

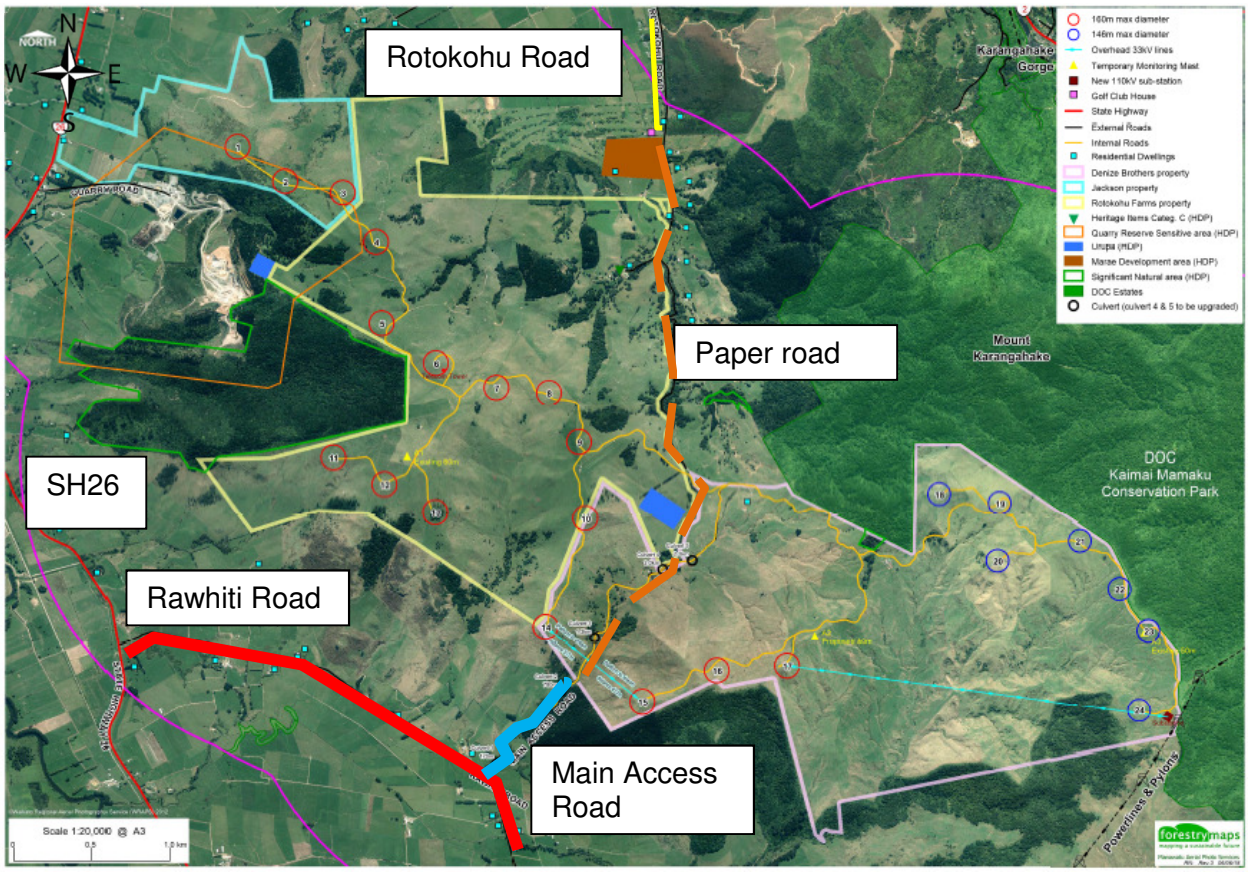

Figure 1: Site location is bounded by the purple, yellow and green boundaries. Site access is from Rawhiti Road (Rawhiti Road is shown as red line) with the main access road indicated by the blue line. SH26 is the thin red line, the paper road is the broken orange line and Rotokohu Road is the yellow line.

2.2. Transport Network

Rawhiti Road is a local road in the Matamata Piako District road hierarchy carrying 282 vpd with 9% HVs[1]. It has a carriageway width of around 6m with a marked centreline. The topography of the surrounding land is undulating and the horizontal alignment of the road relatively straight with rolling vertical alignment. It is open road (posted speed limit 100 km/hr) however we consider the speed environment to be less (70-80 km/hr) than a typical open road due to the alignment, undulations and narrow cross section.

Rawhiti Road is a loop road intersecting State Highway 26 (SH26) at both ends. The intersections are approximately 7km apart. The northern intersection is around 650m south of the boundary with Hauraki District. Both intersections are stop controlled on Rawhiti Road. There are no right turn bays on SH26.

[1] Count data from MPDC dated 1/11/2017

SH26 carries 2,253 vpd with 10% heavy vehicles[2] and is a Regional Collector in the One Network Road Classification (ONRC).

Rotokohu Road is a collector road in the Hauraki District Roading Hierarchy Map[3].

2.3. Existing Site Access

There is an existing vehicle crossing located at the approximate location of the main access road shown in Figure 1 above. The vehicle crossing is located at 488 Rawhiti Road on a curve at the end of a long straight a little over halfway along Rawhiti Road (closer to the northern SH26 intersection). The curve is located around 80m east of a single lane bridge (with weight restriction of 44T). Rawhiti Road has a carriageway width of around 6.3m at the existing crossing.

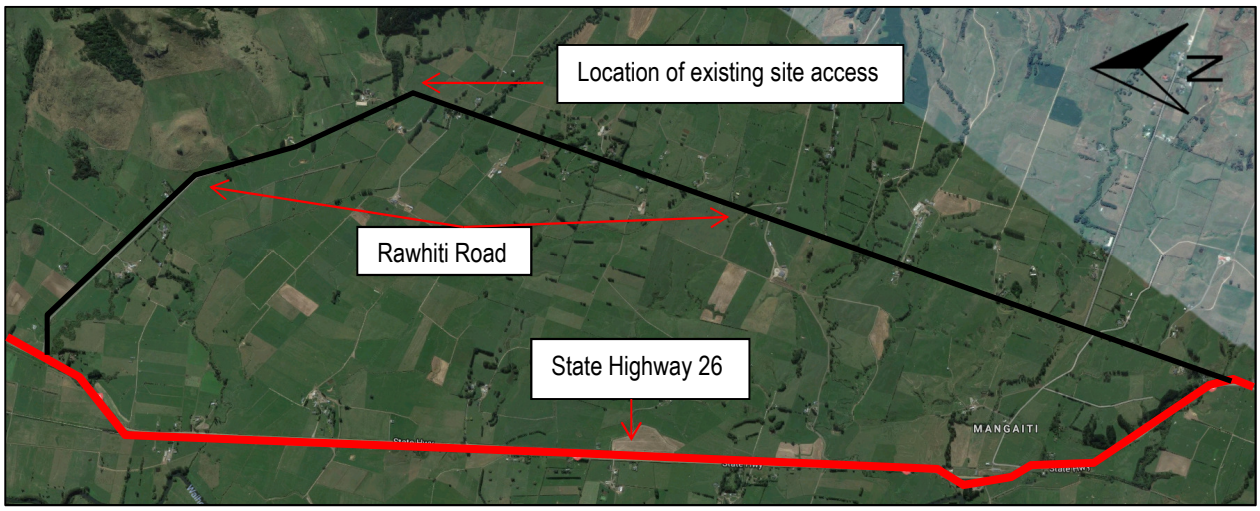

Figure 2: Aerial photograph of SH26 and Rawhiti Road showing the location of the existing vehicle crossing

There are curve warning signs in advance of the curve for both directions with advisory speed of 55 km/hr and chevron boards positioned on the curve.

[2] Mobileroad.org dated 28/12/2016
[3] For approximately 3.6km of its total length, from SH26 to Thorp Road.

Figure 3: Photograph of the existing vehicle crossing

The existing crossing has good visibility to the left, around 260m. To the right, the single lane bridge restricts visibility to around 135m (Figure 4).

Looking left from site access	Looking right from site access
	

Figure 4: Visibility at the existing vehicle crossing to the left exceeds 210m. Visibility at the existing vehicle crossing to the right is restricted by the one-way bridge ends (135m).

The Matamata-Piako District Development Manual requires 210m sight distance for operating speed of 110 km/hr[4] and 115m for the assessed speed of 80 km/hr. 135m is adequate for approximately 90 km/hr.

The Hauraki District Council Engineering Manual Table 3.4 requires a sight distance of 250m for a speed environment of 100 km/hr at an entranceway generating more than 40 vpd. 140m is the required sight distance for a 70 km/hr speed environment. The requirement for an entranceway generating less than 40 vpd is 130m for an 80 km/hr speed environment.

[4] MPDC Development Manual 2010 table 3-A

The surrounding land use is rural.

2.4. Crash History 2012-2017

We have completed a search of NZTA's crash analysis system (CAS) for crashes from 2012-2017. Figure 6 below shows the collision diagram for Rawhiti Road and the SH26 intersections. There are no crashes in the vicinity of the existing site access. Along Rawhiti Road, the crashes that have been reported include two loss of control crashes (single vehicle crashes), one where two opposing vehicles were traveling too far right (over the centreline) and the vehicles scraped as they passed and a non-injury crash resulting from a vehicle not giving way when turning across the oncoming lane into a driveway. Visibility limited by the crest of the curve is stated as a crash factor.

At the SH26 intersection with Rawhiti Road (north), there have been three crashes within 200m of the intersection. Two were loss of control crashes and the other was serious injury crash with a motorcycle colliding with a ute. The report states that the ute did not give way at the priority control (stop) and that visibility was limited by trees.

At the SH26 intersection with Rawhiti Road (south), there have been two loss of control crashes involving a single vehicle. Neither of the crash reports included the side road as a crash factor.

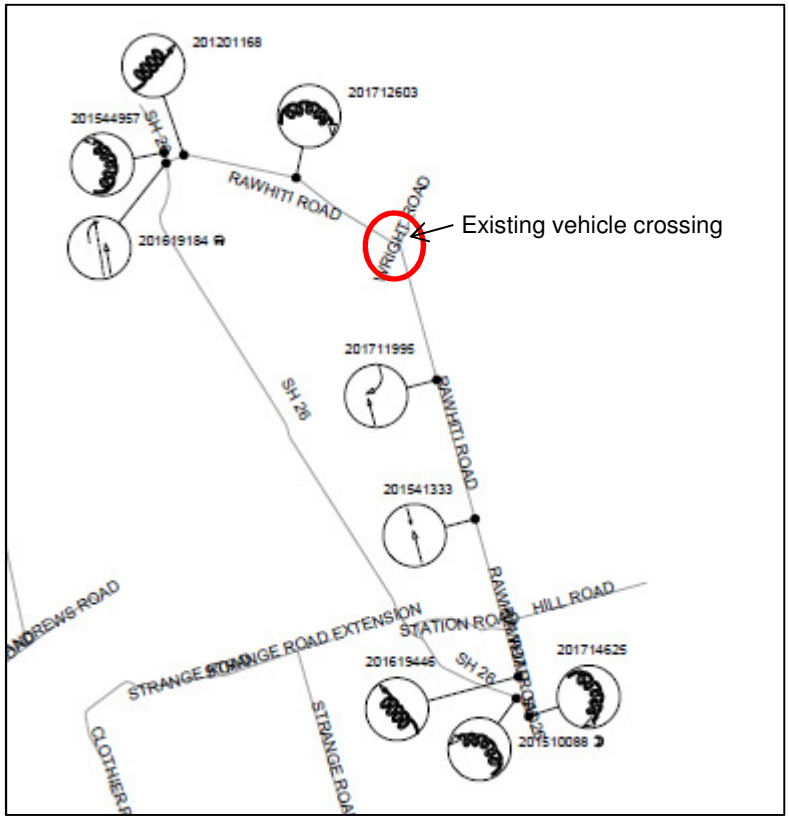

Figure 5: Collision Diagram (CAS, 2012-2017).

3. THE PROPOSAL

3.1. Description

The proposal is to develop a Wind Farm with 24 turbines on the site. It is located across several farms within the Hauraki District. Access to the site during construction is from Rawhiti Road. Rawhiti Road is located within the Matamata-Piako District.

The development is expected to be completed over 18 months with intensification during the earthworks season. Turbines and deliveries of the turbine equipment will be from the Port of Tauranga. We understand that 288 loads of turbine equipment are expected and the delivery of the nacelle, blades and tower components will be over-dimension, requiring over-dimension permissions for transport. Approximately 216 loads are expected to be over-dimension.

There will also be construction traffic associated with the delivery of smaller turbine components, construction materials (e.g. aggregate and concrete) and contracting staff. We understand that 30 staff (maximum) is expected.

3.2. Trip Generation

The applicant has provided a breakdown of the number of loads for delivery of the construction materials that they expect over the duration of construction. Our assessment is based on construction duration of 18 months with the most majority being during the two earthworks seasons[5].

Our assessment of the expected trip generation is shown in Table 1. Details provided from the applicant are included in Appendix 2.

Type	TOTAL Trips/loads	Peak daily traffic (vpd)	Average (annual) daily traffic (vpd)	Car equivalent movements (ecms)[6]
Car trips[7]	49,275 trips	190	90	190 (peak) 90 (average)
Truck trips	16,848 trips	65	31	229 (peak) 109 (average)
Over-dimension trips[8]	288 loads	1.1	0.5	5.5 (peak) 2.5 (average)
Total	66,411 trips	255	121	425 (peak) 202 (average)

Table 1: Trip Generation

Our assessment is based on the average daily traffic of 121 vpd with peaks of up to around double the average of 255vpd during the construction season for the duration of the project. We would expect ongoing operation of the wind farm is likely to result in 1-2 vpd.

3.3. Routes

3.3.1. Over-Dimension Loads

The over-dimension loads are expected to travel from the Tauranga Port. The routes are described in the Tranzcarr assessment report. Rawhiti Road directly links to the wider arterial road network at either end where it intersects with State Highway 26 (SH26).

The Tranzcarr report outlines the routes and shows that the over-dimension loads traveling from the Port of Tauranga turn right into Rawhiti Road (south intersection) from SH26. We assume that

[5]Based on 130 working days per construction season.
[6] Ecms in accordance with the Matamata-Piako District Plan 9.1.2. Assume 25% of truck trips are truck and trailers.
[7] Car trips are assumed. 30 staff 3-4 trips per staff member per day for duration of construction.
[8] An over-dimension load generates an over-dimension trip in and a truck trip leaving site

each over-dimension load generates one empty truck trip returning to the Port, turning left out of Rawhiti Road.

3.3.2. Trucks, Contractors and Light Vehicles

Given the closest main centre is Hamilton, to the west of the site, we would expect the majority of contractors, materials and deliveries to come from Hamilton, however it is also likely that there will be traffic (such as staff and contractors) generated from the local surrounding areas (eg. Te Aroha, Morrinsville, Paeroa).

3.3.3. Arterial Network

The traffic will be distributed to and from the arterial network at the Rawhiti Road – SH26 intersections. For the purposes of this assessment, we have focused on the potential safety and efficiency impacts on Rawhiti Road and at the SH26 intersections.

The average additional traffic, at around 121 vpd is less than 10% of the SH26 daily traffic (2,253 vpd). Daily traffic typically fluctuates by around 10% from day to day and 2,000-3,000 vpd is well within the capacity of SH26 to accommodate it. Away from Rawhiti Road the extra traffic is unlikely to be noticed.

4. SITE ACCESS ARRANGEMENTS

4.1. Existing Site Access

The NZ Transport Agency's Planning Policy Manual Table 5B/4 sets out accessway types (for state highways) based on heavy vehicle use and equivalent car movements using the accessway. NZTA Diagram E is the appropriate NZTA standard for this type of accessway. This is consistent with the MPDC Development Manual (3.12.3). The Hauraki District Plan requires a Class A vehicle crossing and states that this is deemed to be adequate for a 10m long vehicle. The NZTA Diagram E is appropriate for the expected use and exceeds the Hauraki DP standards.

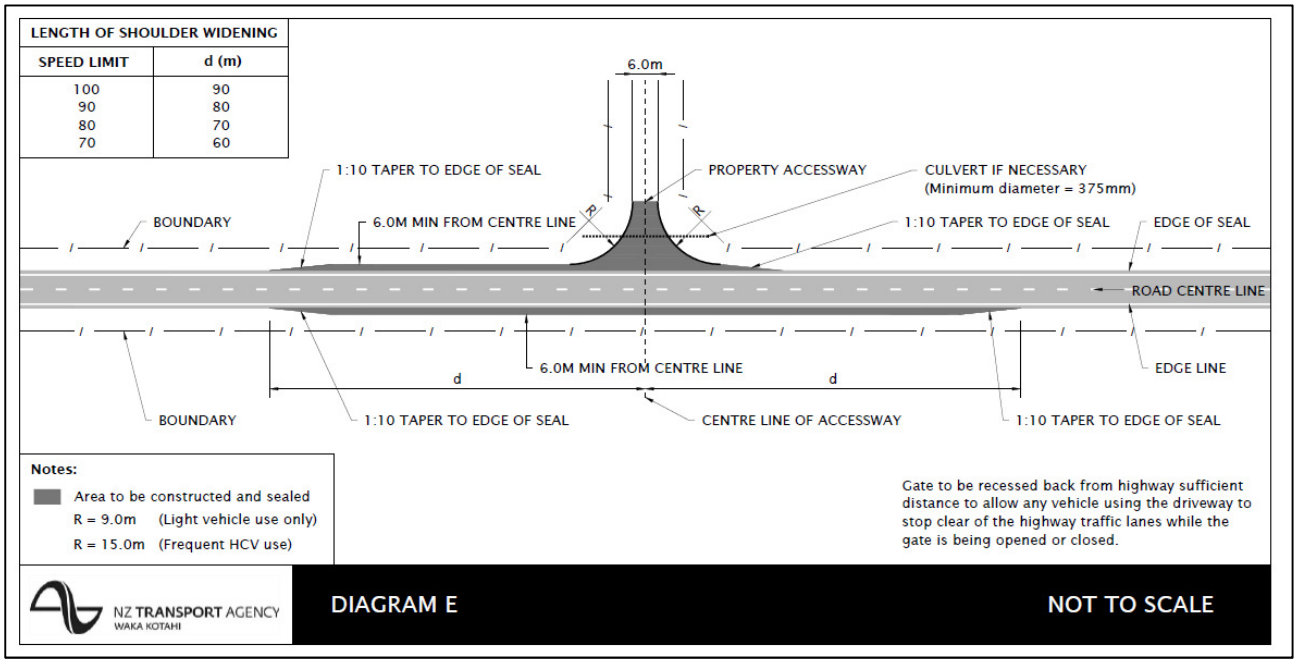

Figure 6: NZTA Planning Policy Manual Diagram E

The existing site access located off Rawhiti Road would need to be upgraded to meet Diagram E standards and dimensions. This would require an upgrade and widening of the entranceway and

seal widening opposite. Given the position on a sweeping bend and the expected over-dimension vehicles, swept paths would need to be confirmed to ensure the entranceway accommodates movements. The visibility from the existing vehicle entranceway is impeded by the bridge abutments, although this may not be as severe from a higher driver's eye height, such as a truck. The available sight distance is 135m which exceeds the minimum required sight distance of the MPDC Development Manual[9] for a 85th percentile operating speed of 80 km/hr and is close to meeting the minimum required 140m for a 90 km/hr operating speed. We would expect drivers approaching from the north to be alert due to the one-lane bridge and the speed environment to be in the order of 70-80 km/hr.

The Hauraki District Plan has longer sight distance requirement for crossings with more than 40 vpd. The available sight distance of 135m is appropriate for a speed environment of around 70 km/hr.

5. RAWHITI ROAD INTERSECTIONS

5.1. State Highway 26 (SH26)

Rawhiti Road intersects SH26 at both ends at priority T-intersections. The intersections are approximately 7km apart. Rawhiti Road is stop controlled at both intersections.

Rawhiti Road –SH26 intersection (north)	Rawhiti Road –SH26 intersection (south)
	

Figure 7: Aerial photographs of the SH26 intersections.

5.1.1. SH26 –Rawhiti Road (north)

SH26 has two traffic lanes and narrow shoulders with a total seal width of around 8m. There is a widened unsealed shoulder on SH26 on the opposite side of SH26 just south of the intersection but the seal width is consistent 8m with no localised shoulder widening to accommodate turning vehicles. There is stop control on Rawhiti Road. Visibility from the stop limit line is good in both directions, exceeding 290m to the north and around 260m to the south.

[9] Table 3-4: Minimum Sight Distance Standards at Vehicle Crossings

Looking left along SH26 from Rawhiti Road Stop limit line (north)	Looking right along SH26 from Rawhiti Road Stop limit line (north)
	

Figure 8: Views to the left and to the right from the drivers position at the Rawhiti Road north intersection.

To the south of the intersection on SH26 there is a right hand curve (around 260m from the side road). It is signed with advance warning PW17 sign (85 km/hr) and chevron signs around the curve traveling in the southbound direction but there is no signage for traffic traveling in a northbound direction. Further south, there is an 'S' curve which has advanced warning PW20 (65 km/hr) and chevron signage for both directions of travel.

Given the presence of these curves, we would expect the operating speed of northbound vehicles approaching the Rawhiti Road side road intersection to be less than is typical for a 100 km/hr speed limit.

5.1.2. SH26 –Rawhiti Road (south)

Rawhiti Road intersects SH26 on the outside of a sweeping left hand bend. For northbound traffic, there is an advanced warning sign, PW12 with supplementary 95 km/hr advisory speed and "concealed" plates. SH26 has a total width of around 11.5m, consisting of two traffic lanes and shoulders. Visibility from the limit line to the left is good, in the order of 250m. To the right, the visibility is restricted by the curve on SH26, to around 190m.

Looking left along SH26 from Rawhiti Road Stop limit line (south)	Looking right along SH26 from Rawhiti Road Stop limit Line (north)
	

Figure 9: Views to the left and to the right from the drivers position at the Rawhiti Road south intersection

5.2. Auxiliary Lane Warrants- Austroads Turn Warrants

Austroads Guide to Road Design Part 4 provides guidance on warrants for turning treatments.

The peak hourly traffic on SH26 is likely to be around 220- 250 vph (10-11% of the daily traffic). The worst case is likely to be if all the traffic turned right into Rawhiti Road at one of the intersections only. We have assumed 10% of the daily traffic generated will be turning right in during the morning peak.

Scenario	Turning volume (Q_R)
Proposed traffic - peak	26 vph
Proposed traffic - average	12 vph

Table 2: Peak period right turning scenarios and volumes

Figure 10 shows the average and peak traffic scenarios (Q_M=250vph). Both the scenarios warrant a CHR(S) treatment. The CHR(S) treatment is a short right turn bay and this is not generally accepted in NZ. Localised shoulder widening to accommodate passing through-vehicles is preferred in NZ, generally in accordance with NZTA Diagram E.

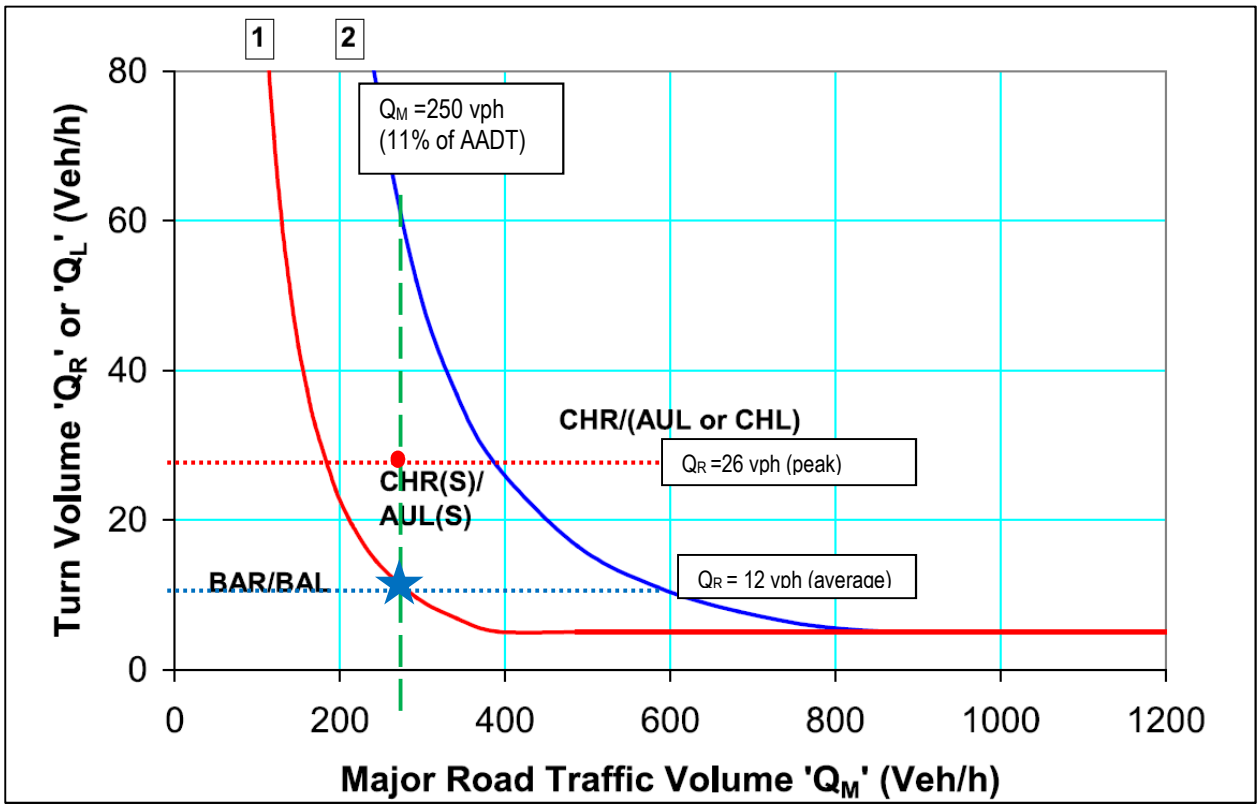

Figure 10: Figure A10 Turning Lane Warrants[10] for right turning traffic from Rawhiti Road

It would be prudent to allow enough space for a through vehicle to pass a slowing right turning truck.

[10] Austroads Guide to Road Design Part 4:Intersections and Crossings-General, Figure A10 Turning Lane Warrants. Commentary 6 states that right turn treatment warrants are based on 10 year design life and BCR=1. Given the wind farm development is for 18 months, the actual benefits would be less (around 25%).

6. DISCUSSION

6.1. State Highway 26 Intersection

For traffic approaching from the south, using the SH26 intersection (south) is the shortest route (6.1km compared to 8.2km for the northern intersection), although there is a longer section of Rawhiti Road to travel (4.9km compared to 2.6km if using the SH26 north intersection). The visibility at the Rawhiti Road (south) intersection is restricted to the north, to around 190m which is less than the minimum SISD[11] for a 110 km/hr design speed. 190m corresponds with a design speed of around 80 km/hr.

Because of the alignment of SH26, adequate visibility at the intersection and shorter distance along Rawhiti Road to the site, it would be preferable to use the northern intersection for the wind farm development traffic. Although there is an additional distance of 7km to travel along SH26 when approaching from the south, the alignment of Rawhiti Road is better (straighter with fewer crests) along the shorter length from the SH26 (north) intersection compared to the section from the SH26 (south) intersection.

Seal widening at the SH26 (north) intersection would be desirable in accordance with Diagram E to allow a through vehicle to pass a slowing/turning vehicle more easily.

6.2. Rawhiti Road

Traffic using the SH26 (north) intersection would need to cross the one way bridge located approximately 80m west of the existing access. The bridge is 9.5m long and has a 44T weight restriction. Rawhiti Road is around 6m wide and meets the MPDC carriageway width for a local road (table 3.1 of the Development Manual).

Figure 11: One lane bridge on Rawhiti Road west of the site access.

[11] Safe Intersection Sight Distance (SISD) refer to Austroads Guide to Road Design Part 4A: UInsignalised and Signalised Intersections Table 3.2

6.3. Matamata-Piako District Council

We spoke to MPDC staff who suggested that access from the northern intersection would be preferred and that the over-dimension loads would need to be considered due to the need to cross the one way bridge (44T weight restriction).

7. ASSESSMENT AGAINST THE HAURAKI DISTRICT PLAN TRANSPORTATION RULES

7.1. Assessment of Transportation Rules of the Hauraki District Plan (8.4 Vehicle Parking, Loading and Access)

Our assessment of the proposal against the traffic related aspects of the Hauraki District Plan are included in Appendix 3.

The proposal is expected to comply with all aspects except for:

- Entranceway sight distance and separation distance (8.4.3.3).
- Internal accessway is longer than 1000m (8.4.8.3 and 8.4.9.3).

The entranceway sight distance does not meet the requirement for an entranceway generating more than 40vpd based on the posted speed of 100 km/hr. However, given the presence of the single lane bridge, drivers are expected to be alert, the through traffic volume is very low and the operating speed expected to be 70-80 km/hr. The available sight distance is adequate for the operating conditions and meets the MPDC standards. The entranceway sight distance of 135m meets the HDC requirement for a speed environment of 80 km/hr (at an entranceway generating less than 40 vpd). The separation distance to other entranceways is less than the required 200m. The entranceway is existing and there is no known crash issues. The existing internal accessway is longer than 1000m and is a paper road. There are no adverse effects relating to transportation from this departure from standards.

8. EVALUATION OF TRAFFIC EFFECTS

8.1. Summary of Traffic Effects

The traffic related effects of the wind farm development relate to safety and efficiency from an increase in vehicle movements. We have not considered the consequential effects of traffic such as visual effects and noise effects. We expect over-dimension loads to be dealt with through the overweight/oversize permits.

The following table comments on the key traffic aspects and effects, focussing on safety and efficiency effects.

Traffic Aspect	Comment on Effects
Efficiency effects	There are no known efficiency problems on the surrounding network. Rawhiti Road is a low volume road carrying less than 300 vpd. Localised widening at the site access and the Rawhiti Road/SH26 intersection (to NZTA Diagram E) will ensure that there is sufficient space for through traffic to pass a vehicle turning into the site. Proposal will generate approx. 121veh/day.
Safety effects	An increase in vehicles, especially heavy vehicles, can increase the risk of conflict and potential crash severity and therefore reduce safety. There does not appear to be a crash problem in the immediate vicinity of the existing entranceway. The proximity of the one-lane bridge is likely to mean that drivers are alert. The vehicle access needs to be upgraded to Diagram E and swept paths for over-dimension vehicles checked and confirmed. The potential effects from an increase in turning movements and heavy vehicles at the SH26 intersection should be mitigated by additional seal widening to allow a through vehicle to pass.
Oversize Vehicles	There is a risk that the overweight loads will exceed the permitted weight limit on the one-lane bridge on Rawhiti Road. This should be mitigated through the oversize permit process considering the axle limits.
Dust and Debris	There is a risk of dust and debris from the site being tracked onto the surrounding network. Ensuring the site operation is managed to avoid dust and debris from being tracked onto the surrounding network such as using a wheel wash before trucks leave site and a water cart on site to manage dust.

Table 3: Transport Effects

8.2. Options for Mitigation

With appropriate conditions, the potential adverse effects of the development could be mitigated to be less than minor. Options to mitigate the above adverse effects include:

- Upgrade the SH26 – Rawhiti Road (north) intersection to Diagram E;
- Directing all proposal traffic to use the SH26 – Rawhiti Road (north) intersection;
- Detailed design approval by MPDC and NZ Transport Agency;
- Upgrade of the existing site access to Diagram E standard, including checking swept paths to confirm suitability for the over-dimension loads expected.;
- Confirming that oversize loads meet the maximum axle load to cross the restricted weight bridge on Rawhiti Road. This is expected to be part of the over-dimension permits process.
- Installation of trucks crossing signs on Rawhiti Road along the southern approach to the site access.
- Installation of PW11 sign on the northern approach to the SH26 – Rawhiti Road intersection
- Temporary traffic management to manage construction effects; and

- Construction Management plan including a communications strategy for communicating with the neighbouring property occupiers during the construction including for coordinating /advising of transport of the oversize loads.

8.3. Proposed Conditions of Consent

We suggest that conditions of consent should allow for:

- Detailed design review and approval for the site access by MPDC and NZ Transport Agency.
- That the SH26 – Rawhiti Road (north) intersection be upgraded in accordance with NZ Transport Agency Planning Policy Manual, Diagram E.
- Construction Traffic Management Plan, including:
    - communications strategy with the local surrounding occupiers
    - method for directing all contractors and staff to the site to use the northern SH26 intersection
    - confirmation of overweight vehicles that may require to use the south intersection of Rawhiti Road/SH26 to avoid the bridge.

9. CONCLUSION

9.1. Potential Effects

The proposal is likely to generate approximately 121veh/day with peaks up to around double (250vpd), for a short duration of 18 months while the wind farm is developed. The potential adverse transportation effects include crashes at the site access and at the SH26 intersection. The potential effects can be mitigated by:

- Localised widening at the site access and the Rawhiti Road/SH26 northern intersection in accordance with NZTA Diagram E.
- Construction Management Plan including:
    - Communications strategy.
    - Temporary traffic management during construction
    - Construction traffic using the SH26 north intersection unless restricted by the weight limit on the one-lane bridge.

9.2. Conclusion

Operational traffic will be negligible. The traffic flows are well within the capacity of the road network to accommodate them. It would be desirable to minimise the effects on people by using the northern access to Rawhiti Road. The construction effects will be temporary. The benefits from localised widening will continue.

With appropriate mitigation, including conditions requiring localised widening at the vehicle access and widening at the Rawhiti Road/SH26 (north) intersection, the adverse construction effects of the proposal relating to traffic can be managed to be less than minor and the operational effects will be negligible.

APPENDICES

Appendix 1: Proposed Wind Farm Plan

NORTH

ROTOKOHU ROAD

QUARRY ROAD

STATE HIGHWAY 26

MAIN ACCESS ROAD

RAWHITI ROAD

Karangahake Gorge

Mount Karangahake

DOC Kaimai Mamaku Conservation Park

Powerlines & Pylons

Telecom Tower

A1 Existing 60m

A2 Proposed 80m

A3 Existing 50m

Substation

Culvert 1 170m

Culvert 2 780m

Culvert 3 1.3km

Culvert 4 2.0km

Culvert 5 2.2km

Platform to stream distance 41m

Platform to stream distance 47m

- 160m max diameter
- 146m max diameter
- Overhead 33kV lines
- Temporary Monitoring Mast
- New 110kV sub-station
- Golf Club House
- State Highway
- External Roads
- Internal Roads
- Residential Dwellings
- Denize Brothers property
- Jackson property
- Rotokohu Farms property
- Heritage Items Categ. C (HDP)
- Quarry Reserve Sensitive area (HDP)
- Urupa (HDP)
- Marae Development area (HDP)
- Significant Natural area (HDP)
- DOC Estates
- Culvert (culvert 4 & 5 to be upgraded)

Scale 1:20,000 @ A3

0 0.5 1.0 km

forestrymaps
mapping a sustainable future

Manawatu Aerial Photo Services
RN: Rev.3 06/06/18