SH1/SH29 Intersection Upgrade Project
Waka Kotahi NZ Transport Agency
Level 1
Deloitte Building
24 Anzac Parade
Hamilton 3240

8 October 2021

Michael Parsonson
Consultant Planner for Matamata-Piako District Council and
South-Waikato District Council
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Dear Michael

SH1/SH29 Intersection Upgrade Project – Response to further information request from Matamata-Piako and South Waikato District Council

South Waikato District Council: Reference ID RM210072

Matamata-Piako District Council: Reference ID 105.2021.12388

Thank you for your letter dated 20 September 2021 (and received by Waka Kotahi on the 22 September 2021) requesting further information pursuant to section 92 of the Resource Management Act 1991 (RMA) in relation to Waka Kotahi's application for resource consents for the SH1/SH29 Intersection Upgrade Project (Project).

Please find below Waka Kotahi's responses to the points raised on the following subject matters:

- Landscape and visual
- Transportation
- Noise and vibration

LANDSCAPE AND VISUAL

Request 1.
Please provide a methodology statement which confirms the accuracy of the photomontage image from Viewpoint 1 which informs the landscape assessment; and provide any required update to this image in relation to illustrating the following aspects of the proposal:

a. Existing trees that are proposed for removal;

b. The scale of any new trees that have been modelled and their estimated age in the image;

c. Deletion of any existing powerlines and power poles that are to be removed;

d. Addition of new lighting standards (indicative only if not yet designed); and

e. Confirmation that the modelled height of the road surface is accurate.

Response
Attachment A to this letter is the requested updated landscape visuals. This document provides the methodology statement for the visual simulations. It also includes an updated photomontage image from Viewpoint 1 taking into account matters (a) to (d) above. In relation to matter (e), Waka Kotahi confirms that the modelled height of the road surface is accurate.

Request 2.
Please also provide 50mm-lens single-frame images of the area of focus within the existing and proposed views, with these images being presented to the full scale of an A3-sized page (landscape orientation).

Response
The updated landscape visuals in **Attachment A** to this letter provides the requested images.

Request 3.
Please provide an updated Landscape Concept Plan drawing that includes more explicit consideration of ecological and mana whenua input; alongside a more tangible response to the site's unique location within the localised and wider landscape setting of the Waikato River environs.

Response
The draft Landscape Concept Plan (LCP) appended to the Landscape and Visual Assessment (LVA) in Appendix E of Volume 3 of the Application has been developed to illustrate preliminary design and landscaping measures. As required by proposed designation conditions 23 and 24, the draft LCP will be further developed prior to construction, and designed in collaboration with Waka Kotahi's iwi partners, Ngāti Koroki Kahukura and Ngāti Hauā, as the detailed design for the Project is progressed. Proposed condition 23 sets out a list of landscape design factors that the LCP needs to address. Amongst other things, those matters include acknowledging mana whenua's values, and biodiversity, thereby going beyond mitigation planting, which appears to be a concern of the councils' reviewer.

In certifying the LCP under condition 24, council officers will need to be satisfied that the final LCP addresses the factors listed in condition 23. Waka Kotahi intended that the LCP be prepared by a landscape architect, as a suitably qualified person, in collaboration with Ngāti Koroki Kahukura and Ngāti Hauā, and proposes a minor amendment to condition 23(a) to clarify this as shown below. The additions to the condition is in red text and underlined.

> *The Requiring Authority shall prepare in collaboration with Ngāti Koroki Kahukura and Ngāti Hauā a Landscape Concept Plan (LCP) prior to the Start of Construction. The LCP shall be prepared by a suitably qualified person. The purpose of the LCP is to establish a framework for the integration of the permanent Project into the surrounding environment.*

The LCP will be developed with iwi in a collaborative manner through detailed design, a process which is underway. Accordingly, the requested updated LCP drawing that includes more explicit consideration of ecological and mana whenua input is not available. Waka Kotahi considers that the proposed designation conditions in relation to the LCP will ensure that this Project provides an appropriate design response for this landscape and the LCP will reflect iwi values.

Request 3 continued
Additionally, please include consideration of potential alternative locations for pedestrian / cycle connections (avoiding the need for underpass routes) and for refined vehicular access to private properties.

Alternative possible locations and forms of pedestrian/cycle connections across SH1 and SH29 would have significant safety risks and would be highly undesirable.

In particular, at-grade pedestrian/cycle crossings on high speed multi-lane approaches are inherently high-risk, and should be avoided where possible. Waka Kotahi considers underpasses are necessary for the Project to provide safe separation of pedestrians and cyclists from vehicle traffic.

Vehicular access to private properties is addressed as part of Responses 6 and 7 under the Transportation heading below.

Request 4.

Please provide further detailed drawings (plans/sections/elevations) that better communicate the design of the proposed pedestrian / cycle underpasses; alongside an assessment as to whether or not Crime Prevention Through Environmental Design considerations raise any concerns with such elements. Alternatively, please provide an alternative design that avoids the need for these underpass elements, while still achieving effective and safe pedestrian and cycle access through the intersection.

Response

At this phase of the Project, there are no detailed drawings of the underpass design. The underpass design will be developed through the detailed design phase. As set out in Attachment A to this letter, the underpass design will be subject to an assessment against Crime Prevention Through Environmental Design (CPTED) and designed to take into account Waka Kotahi's "Bridging the Gap – Urban Design Guidelines". The underpass design and CPTED assessment will form part of the Outline Plan for the Project (under section 176A of the RMA). Waka Kotahi considers this design process will ensure that the underpasses provide safe and effective access for pedestrians and cyclists through the intersection.

TRANSPORTATION

Request 5

Please confirm plans for the access links following roundabout construction. i.e. will operation and maintenance be the responsibility of Waka Kotahi, the relevant local authority or private land owners? If they are to return to local authority ownership and operation, then the transport assessment should include more detail about compliance with the relevant local authority rules, future edge of designation and if a Memorandum of Understanding is proposed. Please address the matters in your response.

Response

The access link roads to the properties that front the State highways will remain the responsibility of Waka Kotahi.

Request 6.

Please provide an assessment of the access link roads against the rules of the Matamata Piako District Plan and South Waikato District Plan, including comment on sight distance and separation distance, noting that the exact location is to be confirmed.

Response

Two access link roads will provide three access points to the new SH1 alignment (A, B and C) and one access point to the new SH29 alignment (D) as shown in Figure 1 below. Each of the four access points will be formed to allow left-in-left-out access only. On approach to each of the access points, the shoulder will taper to approximately 3.5 m wide, to allow for turning vehicles to leave the through traffic lane as they decelerate.

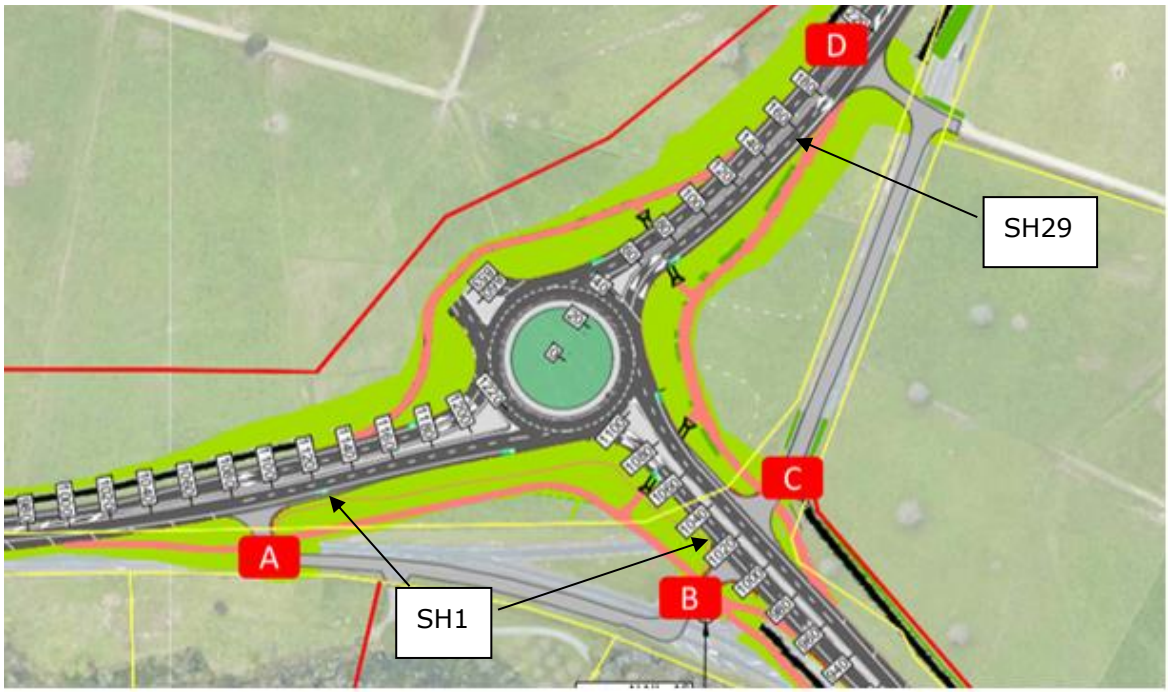


Figure 1: *Access points to the new State highway alignments*

The access points to the State highways will be the responsibility of Waka Kotahi, and will be required to comply with the Waka Kotahi Planning Policy Manual (2007) guidelines (PPM).

Rule 11.3.4(c) of the South Waikato District Plan and Rule 9.1.2(iii)(a)(i) of the Matamata-Piako District Plan require an access point to a state highway to be constructed to Waka Kotahi Standards. The proposed access points have therefore been assessed against the PPM, which contains the relevant standards and guidelines.

Assessment under the Appendix 5B Accessway standards and guidelines, PPM
An assessment of the access points against the criteria in *Table App5B/4*: *Accessway types* of the PPM provides that all four access points are required to be constructed to a Diagram D standard. The following is an assessment of relevant assessment matters in the PPM in relation to the formation and location of the access points.

Tapers
On approach to each of the access points, the shoulders will taper to approximately 3.5m wide to allow for turning vehicles to leave the through traffic lane as they decelerate. The taper lengths into the access points are: A: 46m, B: 70m, C: 42m, D: 60m. Diagram D illustrates a shoulder taper of 1:10 to a width of 2.5m on both sides of the roadway and an accessway width of 6m.

The access points are formed so that the shoulder tapers to 3.5m wide at a rate lower than 1:10; providing more width for turning vehicles to leave the though traffic lane and a longer deceleration length than described in the PPM.

As the access points are left-in-left-out only and the road is separated by a central median barrier, there is no need to provide additional shoulder width on the opposite side of the road to allow vehicles to wait to perform a right turn. We consider that the formation of the access points will allow sufficient opportunity for turning vehicles to leave the through traffic lane and decelerate prior to completing the turning manoeuvre.

Width

A Diagram D access point formation requires the access point to have a minimum width of 6m. The widths of the accessways are between 6.0 – 7.5 m.

Access point spacings

Table App5B/3: Guidelines for minimum accessway spacings of the PPM provides the distance recommended between each access point between a local road and an access point, and an access point and an intersection (the roundabout in this case). The recommended minimum distance is determined by the posted speed limit and the 85th percentile operating speed.

Although the posted speed limit on SH1 and SH29 at the roundabout will be 100 km/h, it is expected that operating speeds in the vicinity of the roundabout will be lower, as the design speed of the roundabout is 60km/h. Vehicles will slow down on approach to the roundabout and vehicles exiting the roundabout will travel at a lower speed as they have just traversed the roundabout. As such, an operating speed of 70 km/h has been assumed for this assessment.

Column 6 of Table App5B/3 also provides desirable spacings between accessways and between intersections and accessways on state highways carrying over 10,000 vpd. SH1 carries over 10,000 vpd and SH29 carries less than 10,000 vpd. Table 1 below provides the distance between the proposed access points and the roundabout.

Table 1: *Access point spacings to the roundabout*

Accessway	Table App5B/3 spacing required	Distance to the roundabout
A	220 m	~140 m
B	220 m	~90 m
C	220 m	~80 m
D	30 m	~160 m

Access point D complies with the required separation distance. The remaining accessways (A, B and C) are closer to the roundabout than specified in the PPM guidelines for an accessway onto a state highway with greater than 10,000 vpd. However, as these access points only allow a left-in-left-out movement, we consider that safety for vehicles entering and / or exiting the accessways will be improved by the Project compared to the existing situation. Waka Kotahi will undertake a safety audit of the access points as part of the detailed design process.

In relation to the distance between the access points and other access points, all access points comply. There is no local road near the proposed access points that warrants assessment under the PPM.

Access point sight distances
Table 2 below provides an assessment of the criteria in Table App5B/1.

Table 2: *Sight distance assessment*

Accessway	Table App5B/1 guidelines	Sight distance to approaching vehicles
A	140 m	~140 m
B	140 m	>140 m
C	140 m	~80 m
D	140 m	>140 m

Access points A, B and D meet or exceed the sight distance standards specified in the PPM. Although the sight distance at access point C does not meet the PPM sight distance standard, there is unobstructed visibility from the access point to the roundabout, so vehicles exiting the access point will be able to see other vehicles travelling through the intersection. As the access point only allows a left-in-left-out movement, we consider that safety for vehicles entering and / or exiting the access points will be improved by the Project compared to the existing situation. In addition, Waka Kotahi will undertake a safety audit as part of the design process.

Request 7.
Please provide outline plans for the farm gates that currently have access to the state highway network.

Currently there are two farm gates onto the existing state highway alignment. One provides access to the land at 85 State Highway 29. The other provides access to land at 36 State Highway 1. The future of these two farm gates will be addressed through discussions with the relevant landowner and as part of land acquisition processes under the Public Works Act 1981.

Request 8.
Please confirm if there are any local authority consents in or around the site and comment on what implications the proposal may have on undertaking the consented activities.

Two resource consents have been granted within the South Waikato District in the vicinity of the SH1/SH29 intersection; one for a property on SH1 (south of the intersection) and one for a property on Horahora Road. The consent for the property on SH1, was for the importation of and placement of fill, which expired in 2010. The consent for the property on Horahora Road, granted in 2019, authorises subdivision of the property into four allotments.

One resource consent has been granted within the Matamata Piako District in the vicinity of the SH1/SH29 intersection for a property situated at 1829F SH1 (approximately 500m from the intersection). This consent is for the operation of a Bed and Breakfast facility catering for a maximum of 12 guests, granted in 2010.

Waka Kotahi considers that the Project will have no adverse effects on activities authorised by these consents.

Request 9.

Please confirm whether there have been any relevant meetings with MPDC and SWDC as road controlling authorities and provide any outcomes from discussions.

A meeting was held between Waka Kotahi and its consultants, South Waikato District Council, and Matamata Piako District Council (in their road controlling authority capacities) on 7 July 2021 regarding the proposed access link roads. The Councils indicated at that meeting that they did not wish to own or be responsible for the access link roads and Waka Kotahi agreed to retain responsibility for these access roads.

NOISE AND VIBRATION

Request 10.

Table B-1 lists the road traffic and surface characteristics for the various sections of road. Please explain why the table lists different surface corrections (in decibels) for the same paving surface type, and how these different figures have been derived. It would also be helpful if the different sections of paving surface could be marked up on a plan as the references in the first column are difficult to reconcile.

The different surface corrections arise because, although surface type remains the same, the traffic mix (%HCV) and speed differ, and these both influence the tyre/road noise emission of the surfaces.

The derivation follows the Waka Kotahi (2014) "Guide to state highway road traffic noise" (Guide). The Guide provides different correction values for light and heavy vehicles. We have combined those with the traffic mix and traffic speed information, following Section 2.8 of the Guide, to derive the corrections for each section of road (including the NZ Adjustment).

Table B-1 of the Assessment of Noise and Vibration effects (Noise and Vibration Assessment) in Appendix B of Volume 3 of the Application provides traffic mix, traffic speed, and surface type for each road section (defined by route position), which is the data that was used to derive the surface corrections following the process in the Guide.

Request 11.

The detail provided in respect of the vibration measurements is helpful, but relatively light. Please explain how the vehicle pass-by selections were made, how many pass-bys were used to calculate the Vw95, what type of vehicles they were and, (if relevant) which lane they were in.

The Vw95 measurements provided in the Noise and Vibration Assessment were made in accordance with clauses 6.4.2, 6.5 and 7 of Norwegian Standard NS 8176.E:2005 "*Vibration and shock: Measurement of vibration in buildings from land based transport and guidance to evaluation of its effects on human beings*."

These clauses specify that the statistical maximum value at each measurement position is calculated from at least 15 measured single passings of heavy road vehicles with a total weight greater than 3,500 kg i.e. lorries, busses, dump trucks and similar vehicles.

Specifically, the Vw95 values provided in the Noise and Vibration Assessment for location ID V1 and V2 were derived from the 20 heavy commercial vehicle passings that generated the highest vibration levels on 9 March 2021 over the time periods 10:11am to 11:18am for location ID V1, and 8:59am to 9:47am for location ID V2. Norwegian Standard NS 8176.E:2005 does not require measurements to be separated between the nearside or far side lanes, and therefore, identifying the lanes these vehicles were in is not provided as part of this response.

Request 12.

Ambient noise measurements – Appendix A sets out the methods for the ambient noise measurements used to validate the computer noise model. The description notes that there was strong westerly winds for some of the measurement period and that some measurements had to be repeated due to wind conditions. The aerial photos show that several of the measurement positions were in very close proximity to mature trees. It is expected that the noise of the wind in these trees would have contributed to the ambient noise measurements. Please assess the effect that wind-induced noise in foliage may have had on the ambient measurements described and provide a detailed assessment of the procedures used to remove this influence.

The reference to a "strong westerly wind" on the afternoon of 8 March 2021 was in the context of the meteorological window permitted by NZS 6801:2008. While higher than ideal, the average wind speed was within the permitted meteorological window, but there were occasional gusts.

The assessment of the contribution from foliage noise was made subjectively on site, and it was not considered to be significant in terms of its effect on the overall LAeq noise level during any attended measurement.

Nonetheless, out of an abundance of caution, a noise measurement was repeated at location N4 in calmer conditions the following day, 9 March 2021. On that day, a slightly higher noise level than the 8 March 2021 measurement was recorded, contrary to what would be expected if foliage noise had been dominant. This objective evidence corroborated the subjective assessments, and it was concluded that foliage noise has had little or no effect on this set of ambient noise measurements. Consequently, it is considered that correction of noise levels for foliage noise is not required for any site.

The remaining two sites visited during the windier conditions on 8 March 2021 were N1 and N2. Measurements N3 and N5 on 9 March 2021 took place under calmer conditions. N1 occurred at a distance from significant foliage and was subjectively dominated by traffic noise. N2 was subjectively dominated by traffic noise rather than foliage noise. Neither necessitated remeasurement or correction.

We note that the purpose of the measurements is to provide a broad validation of the noise model outputs (NZS 6806:2010). The measurements themselves do not directly affect the noise assessment.

Request 13.

The construction noise and vibration assessment does not take into account the need for construction laydown areas or yards. Please update the assessment or provide an additional assessment to include the predicted noise that will be generated within the yard(s). Please include the possible locations for the yard(s) and the specifications for any mitigation that should be employed to mitigate the noise levels if the assessment deems mitigation to be beneficial / appropriate.

The requirement for construction laydown areas or yards or staging areas has been taken into account in the high-level assessment, although we acknowledge this is not explicitly stated in the Noise and Vibration Assessment. The information in Section 7 of the Noise and Vibration Assessment is based on our experience of 'typical' highway projects of similar scope.

The location of construction laydown areas, yards, and staging areas will be determined as part of detailed design. The approach taken in the construction noise assessment was to identify set-back distances from sensitive receivers in order to identify where noisy construction activities should not occur, using the NZS 6803:1999 long-duration noise limits. A critical distance of 70 metres was identified, based on those noise limits.

Proposed designation condition 8 requires the construction noise limits in NZS 6803:1999 to be met, as far as practicable. As no dwellings are within 70 metres of the main area of works, it is expected that construction noise will be within those noise limits for most activities. Waka Kotahi will prepare an Outline Plan for the Project (as required by the RMA), which will include the location/design of construction areas/yards, information regarding construction equipment and duration/staging of the construction works.

In terms of mitigation of the effects of construction noise and vibration, good on-site management and communication of with residents will be required as part of the Construction Noise and Vibration Management plan (CNVMP) (see proposed designation condition 7). There are a low number of dwellings that may be affected, which means Waka Kotahi's contractor will be able to engage specifically with those residents, particularly where exceedances of construction noise limits are anticipated. Any additional Best Practicable Option mitigation measures that might be required will be included as part of the Outline Plan.

Request 14.

Please clarify the situations for justifying construction work at night. Is it limited to situations where works require partial road closures or where significant effects on traffic flow will arise that can only safely be carried out at night when traffic flows are much lower?

Whilst night works will be limited as far as practicable, some night works may still be required. We expect that construction work may need to be conducted at night primarily where works require partial road closures or where significant effects on traffic flow will arise that can only safely be carried out at night when traffic flows are much lower. An example of this is construction of tie-ins with the existing network.

As night works have the potential to result in noise levels that do not comply with NZS6803, this would be addressed in the CNVMP noise and vibration management schedules (designation condition 10). The schedules will identify the Best Practicable Option to manage and mitigate noise for specific sites and activities.

Request 15.

Section 7 of the WSP report provides a very brief assessment of construction noise levels. The effects are not described. Please update the report or provide comment to describe the nature of the construction noise effects that are likely to be experienced at the PPFs assessed throughout the report.

With the implementation of the certified CNVMP, construction noise will still be audible to residents of nearby sensitive receivers but effects are expected to be minor and not at an unreasonable level.

The main factors that affect noise level and contribute to noise annoyance in a given location vary over time. For example, changes in noise generated by the activity, changes in the proximity of the activity to the receiver, and the direction and speed of the wind.

There will be some times during construction when several of these factors align and noise causes annoyance – residents might close windows, or find that relaxing outside is not very relaxing. Waka Kotahi's noise expert considers that some of this annoyance will be tempered by the knowledge that it is temporary noise, both in the sense that next week particular noisy equipment might be on a different site, and that the overall construction project will eventually be completed.

At many other times, the construction noise will just be part of the background, amongst the traffic and rural activities, and probably easily ignored.

Community engagement will be crucial throughout the construction period, so that residents' expectations are managed. If, at any stage of construction, the noise impact is considered unreasonable by residents, then the complaints process outlined in proposed designation condition 5 will be available.

Request 16.

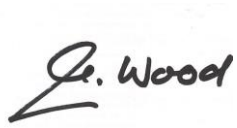
Please confirm whether the possibility of a straight-through lane for traffic heading northbound on SH1 been considered, and reasons for adopting / not adopting such an arrangement. A straight-through lane would reduce the noise generated by deceleration and acceleration, particularly for the PPFs to the west.

Waka Kotahi considered a straight-through lane for northbound traffic in an earlier stage of design. Waka Kotahi's traffic engineer has advised that a straight-through lane for northbound traffic is undesirable for safety reasons, particularly at the merge point, where faster cars on the left would merge with slower cars on the right (counter to a typical merge).

Although a straight-through northbound land would result in fewer vehicles decelerating and accelerating on the lane, it would only remove a proportion of that type of noise (due to slowing traffic on other lanes), so is considered to have a limited benefit. Also, a straight-through lane would move through traffic significantly closer to PPFs to the south, and the traffic speed would also be much higher, resulting in higher noise levels for those PPFs. Accordingly, Waka Kotahi's noise expert does not consider that a straight-through northbound lane would provide a net benefit for noise, and considers that it could increase noise for some PPFs.

If you have any queries regarding this response, then please contact Mike Wood on 09 928 8756 or mike.wood@nzta.govt.nz in the first instance.

Yours sincerely



Mike Wood
Principal Planner
Environmental Planning – Transport Services
Waka Kotahi NZ Transport Agency

Attachments

Attachment A Landscape methodology and visualisations

STATE HIGHWAY 1 AND STATE HIGHWAY 29 INTERSECTION UPGRADE

ATTACHMENT A: LANDSCAPE AND VISUAL ASSESSMENT ATTACHMENTS TO RESPOND TO RFI

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PLAN LEGEND:

① Underpass

② Underpass

③ Opportunity for any potential future expressway extension from Cambridge to Piarere

④ Cycleways

*** Note: all images are for indicative purposes only. Concept to be updated following engagement with māna whenua.*

Guardrail and lighting information to be confirmed.

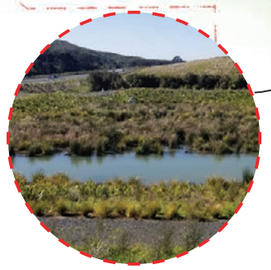
Fast-growing exotic specimen trees along the cycleways to provide shade and bat habitat

Mounded native planting and low growing groundcovers -form to be finalised with Iwi engagement

Sides surrounding the outside of the roundabout will be planted - mostly native plant species

Opportunity to incorporate cultural pattern on underpass wing walls

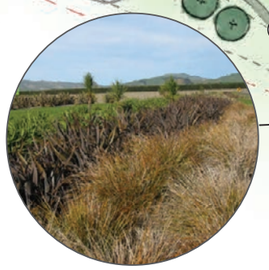
Opportunity to incorporate cultural painting on underpass tunnel walls



Wetland Pond
***Location and size subject to change based on stormwater modeling*

Water treatment plants such as Oioi surrounded by mounded native planting. Opportunity for iwi art work or sculpture to capture the Wai / Awa narrative .

Opportunity to incorporate iwi Wai / Awa inspired art work at roundabout apron



Vegetative swales will help filtrate the water before discharging to wetlands

Transpower Powerlines

Channel diversion

Vegetative swales

TOWARDS MATAMATA

NORTH

Existing SH29 road corridor

Proposed designation

Planted slopes

PROPOSED PROPERTY ACCESS

Proposed designation

Vegetative swales

TOWARDS KARAPIRO

Existing SH1 road corridor

Proposed designation

Existing SH29 road corridor

PROPOSED PROPERTY ACCESS

Wetland Swale

TOWARDS TIRAU

Existing SH1 road corridor

LEGEND

- Viewpoints / Photo Locations
- Photo locations
- Trees to be removed
- Planted stormwater treatment swales
- Shared Path

SCALE: 1:8000 @A3

OVERVIEW PLAN

SH1 / SH29 INTERSECTION UPGRADE - LANDSCAPE & VISUAL ASSESSMENT

DATE: October 2021 PROJECT NUMBER: 2-A0012.04

Viewpoint 1: Existing situation

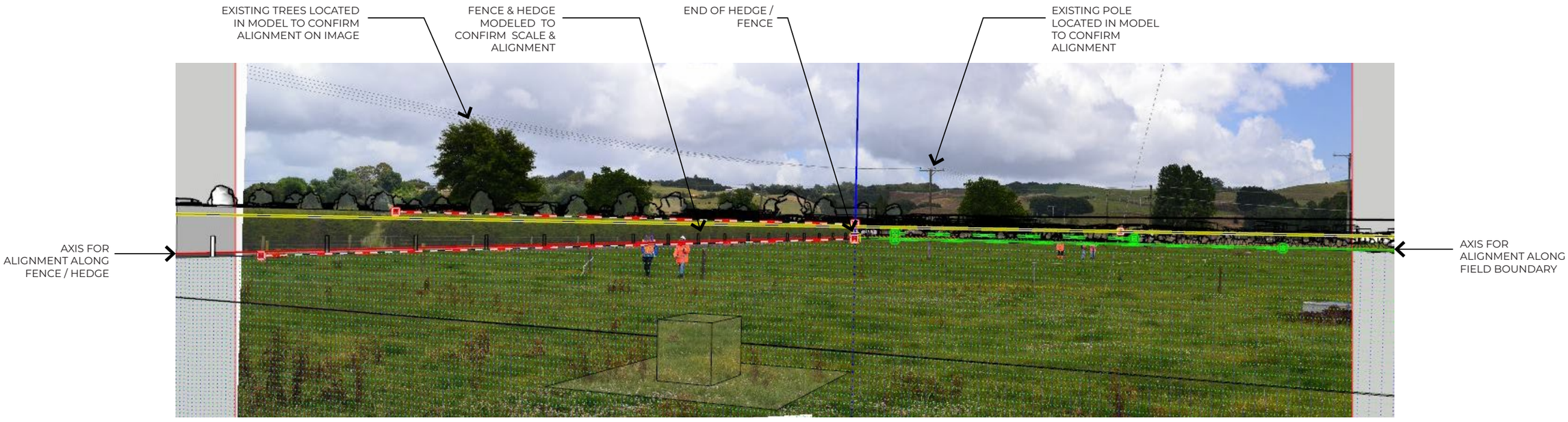
Viewpoint 1: Visualisation of Proposal

VIEWPOINT 1 IMAGE 1: Image taken 19.01.2021 by David McKenzie, 55mm focal length (jpeg/NEF raw), here at A3, 300 dpi

VIEWPOINT 1 IMAGE 2: Image taken 19.01.2021 by David McKenzie, 55mm focal length (jpeg/NEF raw), shown at A3, 300 dpi

Viewpoint 1: Stitch of 2 images taken 19.01.2021 by David McKenzie, 55mm focal length (jpeg/NEF raw)

Viewpoint 1: Stitch of 55mm focal length images with third image added to better approximate a human field of view



Viewpoint 1: Sketchup model using match points to line up key markers (including the hedge), trees modelled at randomised heights for naturalness, at 7.5-9 m to represent 5-10 years growth

Platanus acerifolia
London plane
A very large, rapidly growing round headed tree. Bark flakes in patches on older branches and the trunk leaving a dappled surface. Maple-like palmate leaves 20-25cm, deep green & glossy with a white felt underneath.Tolerates most soils. Hardy
DECIDUOUS – SHADE - APX 15+m

Example of fast growing non native Tree: London Plane (Platanus x acerifolia)
Information source: https://blackbridgenurseries.co.nz/

INTRODUCTION

The visual simulations were prepared by Lawrence Elliott and Meg Back, using best visualisation practices[1]. The photographs were taken by David McKenzie, Technical Principal, Landscape Architecture. All three are Registered Landscape Architects currently employed by WSP.

METHODOLOGY

Viewpoint locations were decided, and marked so as to be located later in the civil engineering design CAD model (includes road and roundabout design). Existing elements in the landscape such as hedges, trees, fence lines and field boundaries were identified and carefully located to later aid in alignment of the model to the photo.s.

Photographs have been taken using a DSLR camera (Nikon D3100) with a 50-55 mm focal length which was used consistently for all the photographs taken. A 50 mm focal length is typically used as this produces a reasonable representation of what is seen by the human eye. This is especially in terms of compression, ensuring objects in the image remain the same size and distance away as would be seen by the human eye. By comparison, using a 'wide' lens such as with a 17 – 35 mm focal length will enlarge the foreground while making objects in the distance further away and smaller. A 'telephoto' lens such as those 80mm and above has the effect of making objects in the distance appear both closer to the viewer and larger in size.

As a wide field of view was required to best represent particular components of the Project over a relatively wide area of view, each view was made up of a series of photographs tiled together to form a panorama with the individual images 'stitched' or digitally merged in Adobe Photoshop.

A computer model was created in Autodesk Civil3D using topographical data where the new elements including re-aligned road and roundabout were designed for the Project. This 3D surface was then imported into Sketchup and was used as the base model for illustrating the components of the Project as depicted in the visualisations.

The viewpoint position, height and focal length of the lens of the original photo images were used to define a representative camera setting in the Sketchup model at the same position, height and focal length. The software has camera matching capability and by using the photo panorama image as a background and by employing utilities within the programme, the model was orientated, sized and positioned to best represent how each component of the Project will look within the panorama. Key points and existing landmarks were used as checks and balances to ensure the viewpoint was correctly placed, prior to the production of rendered images of the new development in Enscape. Proposed trees and shrub planting were also added in Sketchup.

The rendered image of the model alone was then brought into "Adobe Photoshop" as a unique layer and overlaid on the base photo panorama. Tree removal was generated via the use of Adobe Photoshop to alter the base image. Using Adobe Photoshop effects and tools, the Landscape Architect then combined render and base images and additional elements (e.g. planting) to produce then enhance the resulting image. For instance, foreground objects may be brought back to the front, background objects that would be hidden or removed (as part of the proposal) were adjusted, and visual representation added of indicative landscape mitigation measures. Further digital manipulation has been carried out to provide "realistic" effects to the modeled simulation and rendered materials.

1 NZILA Best Practice Guide: Visual Simulations BPG 10.2 as retrieved from https://nzila.co.nz/media/uploads/2017_01/vissim_bpg102_lowfinal.pdf

CONCLUSION

The visualisations provided show the Project's components digitally placed into photo backgrounds. These are in proportion to landforms and objects in the same location. The changes to the scene have been manipulated in an attempt to produce a "realistic" impression and they should be treated as artist's impressions only. Trees have been shown at an age of approximately 5 – 10 years.

INTRODUCTION

Future cycleway connections through proposed underpasses provide an opportunity to create useful links and apply cultural interpretation. Pedestrian / cyclist underpasses are included in the future SH1/SH29 roundabout to link into the existing cycling network of the Waikato River Trails, Hauraki Rail Trails, Te Awa (Cambridge to Ngaruawahia) in the vicinity.

KEY DESIGN CONSIDERATIONS FOR THE UNDERPASSES

It is important that underpasses are well designed to ensure they are safe, attractive and welcoming. The Project in general will observe the principles as outlined in Waka Kotahi's 'Bridging the Gap' urban design guidelines[1] as well as CPTED guidelines[2].

The following guidance will inform the design of underpasses:

- Underpasses will be integrated with the wider cycling network;
- Underpasses will be integrated with the earthworks, structures, stormwater, landscape and art work;
- The walls of the underpasses will be continous and not feature recesses where litter might accumulate or someone might hide;
- The underpasses will be straight with straight approaches, for as long as practically possible to ensure that the far end of the underpass and anyone approaching beyond this point is readily visible as early as possible;
- The underpasses will have a minimum height of 2.5m;
- The underpasses will safely accommodate cyclists and pedestrians;
- The underpasses will be at grade with the surrounding land where possible and for as far as possible to provide for clear visibility;
- The planting around the underpass entrance will not be located, or of a height when mature that will obscure sight lines to and from the underpasses;
- Effective lighting inside and at the entrances of the underpasses will be considered;
- Materials used will include robust, long-lived, vandal proof materials;
- Murals, art, feature paving, lighting and surface treatments will be considered and used where possible to create an attractive environment; and
- To enable a high chance of planting success - species used will not be drought sensitive and will have vigorous growth where they will be less likely to be overtaken by weeds.

1 Bridging the gap: NZTA urban design guidelines (2013) As retrieved from: https://www.nzta.govt.nz/resources/bridging-the-gap/

2 Ministry of Justice (2005) Crime Prevention Through Environmental Design. as retrieved from https://www.justice.govt.nz/assets/Documents/Publications/cpted-part-1.pdf & https://www.justice.govt.nz/assets/Documents/Publications/cpted-part-2.pdf

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