



# Newcombe Road Sand Quarry

## Landscape and Visual Assessment Report

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This Landscape and Visual Assessment Report has been prepared as part of the consent application for Newcombe Road Quarry (R S Sand Ltd).

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Report Version: R2

Date: January 2023



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## INTRODUCTION

Mansergh Graham Landscape Architects Ltd (MGLA) have been engaged by the applicant to assess the landscape and visual effects of the proposed sand quarry at 77 Newcombe Road.

The application site is located on the eastern fringes of Cambridge, approximately 3km from the town centre and is comprised of 3 titles comprises of 5 lots (RT 841793 (Sec 41 SO 510550 and Sec 61 SO 510550), RT 821177 (Lot 2 DP 520523), RT 908965 (Lot 2 DP 541191 and Lot 4 DPS 86453). The total area of the site is 134.67ha. The part of the site to be quarried (27ha, consisting of a 23ha pit area and a 4ha plant area) is contained within the three western lots, (Section 61 SO 510550, Section 41 SO 510550 & Lot 2 DP 520523). No quarrying will occur within two eastern lots (Lot 2 DP 541191 and Lot 4 DPS 86453).

The following assessment examines the potential effects of the proposal on the existing landscape and visual amenity of the surrounding rural environment, within the context of relevant planning provisions.

Three main aspects are evaluated within this report. They are:

- a. The existing landscape character of the site and its place in the local and regional context.
- b. The potential landscape and visual effects of the proposal from typical viewer locations.
- c. An overview of the effects of the proposal on landscape and rural character values.

## METHODOLOGY

A standard assessment approach has been used to identify the existing landscape and natural character of the site and its surroundings and to assess the potential effect of the proposal on landscape and visual amenity.

In broad terms, the assessment consists of the:

- a. Identification of the key elements or attributes of the proposed quarry.
- b. Identification of the landscape values, natural character, key attributes, and social preferences within the context of biophysical, associative, and visual landscape interpretation; and
- c. Identification of relevant assessment criteria within the context of the relevant statutory framework.

A combination of mapping analysis and field assessment has been undertaken to identify the potential effect of the proposed quarry on the existing character and amenity values of surrounding areas. By considering the above, the likely effects of the proposal can be identified and rated.

The nature and extent of the visual effects of the proposal have been determined through a thorough analysis of how observable changes in the landscape affect the character and visual amenity derived from its aesthetic appreciation.

The effects on landscape and rural character have been considered using a broad set of parameters which include factors that influence the landscape's appearance, formative processes, and quantitative and qualitative values (whether overt or not).

The approach undertaken is consistent with the NZILA *Te Tangi a te Manu - Aotearoa New Zealand Landscape Assessment Guidelines (Draft 2021)*. A definition of the rating systems used, and a methodological flow chart is contained in the appendices.

A methodological flow chart is contained in appendix one.

## APPLICATION OVERVIEW

R S Sand Ltd is seeking consent to extract up to 400,000 tonnes of sand per year from a 27-ha site over approximately 25 years, at 77 Newcombe Road within the Waipa District. The application site is located on the upper terrace between the deeply incised Karapiro Stream gully to the north and State highway 1 to the south. The site is zoned rural and is currently used for agricultural purposes.

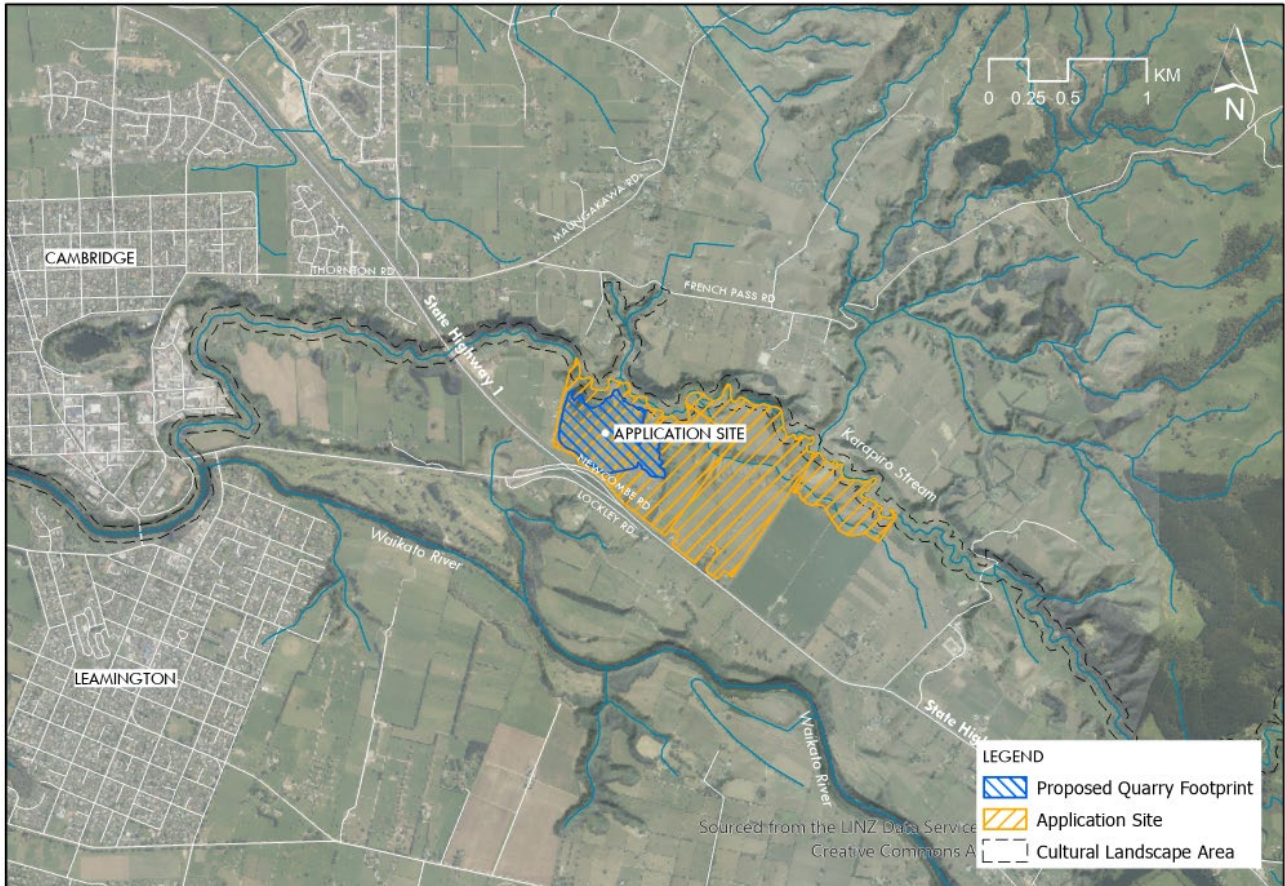


Figure 1 Context Map

## The Quarry Proposal and Processes

The sand quarry will operate in 5 stages, extracting approximately 7.4 million tonnes (up to 400,000 tonnes per year) of sand over approximately 25 years. The maximum area of an individual stage is approximately 6.6 ha (Stage 3). The total area of the proposed quarry footprint is approximately 27ha (including the 23ha pit and 3.9ha plant area). Although extraction will be carried out in stages, the rate of extraction will be influenced by product demand, meaning that the extraction of sand will be progressive, and the duration of stages may change.

## Newcombe Quarry Development Sequence

The following section provides a brief overview of the proposed quarrying process:

### Site Access

Access from Newcombe Road to the quarry will be provided via a new vehicle crossing approximately 150m to the west of the Site's existing access and 660m from the Newcombe Road – Tirua Road intersection.

For Stages 1–4, a 20m wide internal road will be constructed between the new vehicle crossing and the processing area. For Stage 5, the internal road will be realigned to the south to allow the sand beneath the road to be quarried.

## Vegetation Removal

The existing vegetation cover will need to be removed before overburden stripping and quarrying commences. The operation will result in the staged loss of approximately 3.37ha of terrestrial and wetland vegetation/habitat (and 23.72ha of pasture) over 25 years<sup>1</sup>.

## Topsoil and Subsoil Stripping

To expose the sand, the topsoil, and subsoils (overburden) will be progressively stripped back within the areas to be quarried using a combination of bulldozers, 30-50t excavators and 30-40t ADT dump trucks. This will be undertaken on a stage-by-stage basis as the resource is needed and will generally be undertaken during the drier months.

Approximately 50% of the material above RL 67.5 is assumed to be overburden, comprised of topsoil, sandy silts, and clays. The overburden from the plant area will be placed along the western and southern boundaries of the pit and around the eastern boundary of the processing plant area and internal access road, to form bunds 3m in height relative to existing ground level (5m above the stripped base of the plant area). The bunds will be approximately 8m wide and will be planted with vegetation capable of growing up to 2-3m high. The remaining overburden will be processed as pit sand.

A temporary bund will be created from the topsoil and some overburden from Stage 1 between the Stage 1 and Stage 2 pit, up to 5m high (relative to existing ground level) and re-grassed.

## Sand Extraction and Processing

The sand will either be excavated from the pit and transported directly to the processing area or stockpiled for later processing. The processing area will be located to the east of the pit, where the pit sand will be screened using a processing plant and stockpiled according to grade. The processing plant will be approximately 6m high and 20m wide, located within the middle of the processing area. Graded sand will be stockpiled around the plant area.

Water, to be used for washing the sand, will be pumped from a bore within the property and stored in recycling ponds in the processing area. Following processing, the turbid water will be collected and reused. Water losses to product or evaporation will be topped up from the bore. Because processing is a wet process, there is little potential for the generation of dust.

An erosion and sediment control pond will be located at least 10m from the gully's edge. The processing area will be approximately 2.0ha and will be formed before Stage 1, enabling processing to take place below the existing ground level, reducing potential noise and visual effects.

## Rehabilitation and Mitigation Plan

As excavation progresses through the stages the floor (beyond a working area of approximately 50m wide) and the faces of the pit will be progressively reinstated with overburden and topsoil and re-grassed. The eastern pit faces of Stages 2 and 3 will be temporarily re-grassed before excavation begins on Stage 5. The overburden areas and any other disturbed areas (e.g., around the quarry pits) will be shaped to emulate the surrounding landscape as much as possible.

All imported materials will comply with the District and Regional Council definitions of clean fill and will be per the requirements set out in the Quarry Management Plan.

On completion of quarrying, all the buildings associated with the sand quarry will be removed and the processing area will be reinstated (grassed). The bunds will be either re-spread to form final batter slopes

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<sup>1</sup> *Newcombe Quarry Ecological Report*. Alliance Ecology Ltd. Section 4.1.

no greater than 3:1 or left in situ. The entire quarry area will be re-grassed before the removal of the erosion and sediment controls.

1.2ha of indigenous wetland restoration planting has been proposed along the northern site boundary, to reduce adverse effects on the existing gully basin wetland, alongside the Karapiro Stream. 12.5ha of habitat restoration and enhancement will be undertaken within the Karapiro stream floodplain and gully slopes, as well as along the northern boundary of the site to enhance existing wetland gully vegetation patterns, linking two Significant Natural Areas, providing ecological connectivity, buffering and additional habitat.

### Vehicle Movements and Operation Hours

Vehicle movement will average 71 trucks per weekday (142 movements) with a maximum of 200 trucks per weekday (400 movements). Most of the movements will be trucks and trailers. Light vehicles will be approximately 30 movements per day.

The sand quarry will operate 50 weeks of the year and will be open 10 hours per day from Monday to Friday and 5 hours on Saturday.

### Office & Weighbridge

The office and weighbridge will be located along a new internal access road (to the west of the sites existing access), approximately 60m from the road frontage.

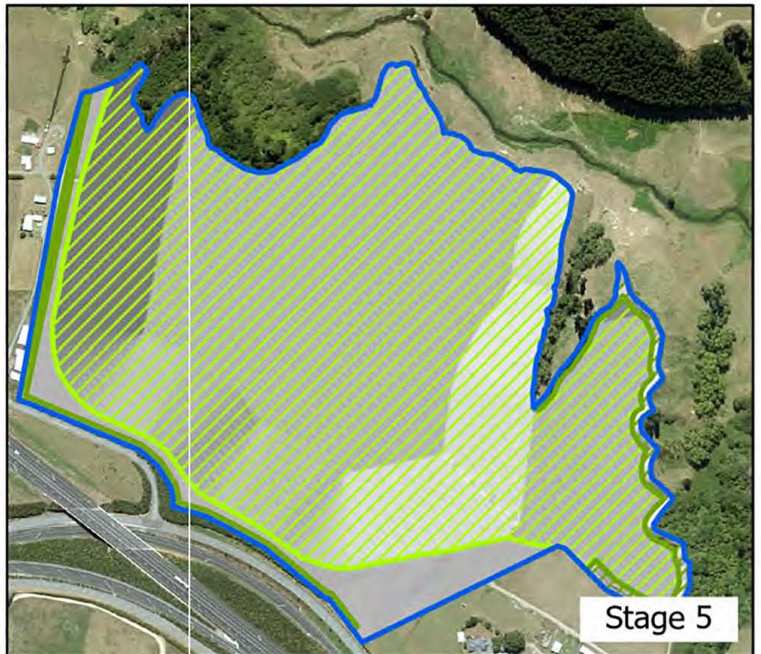
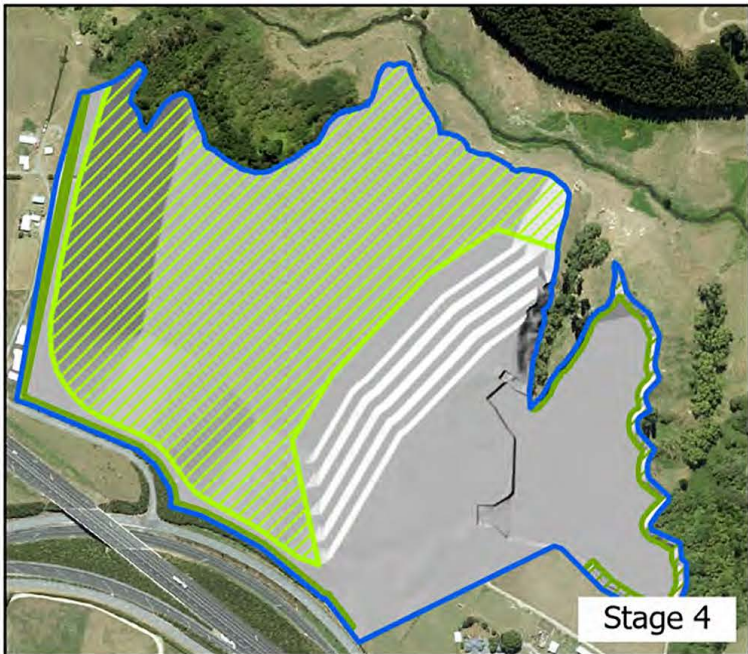
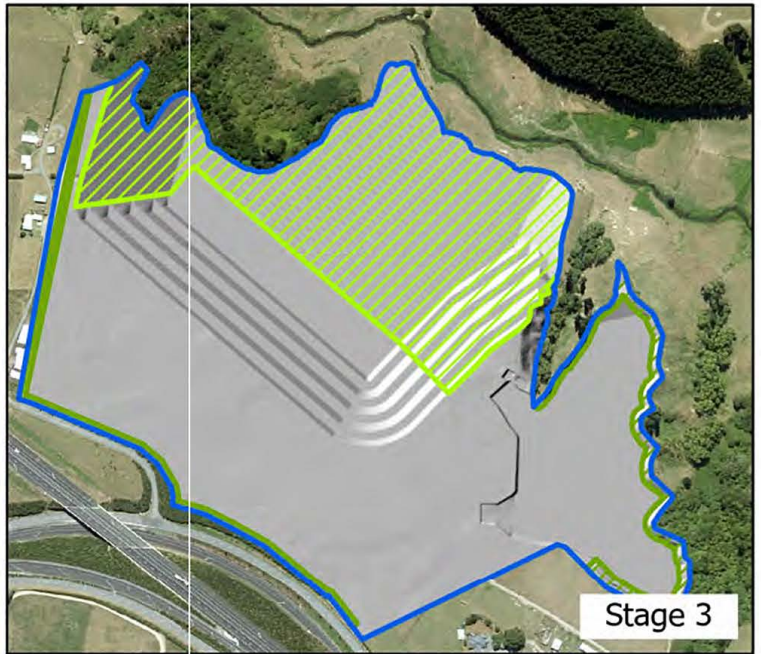
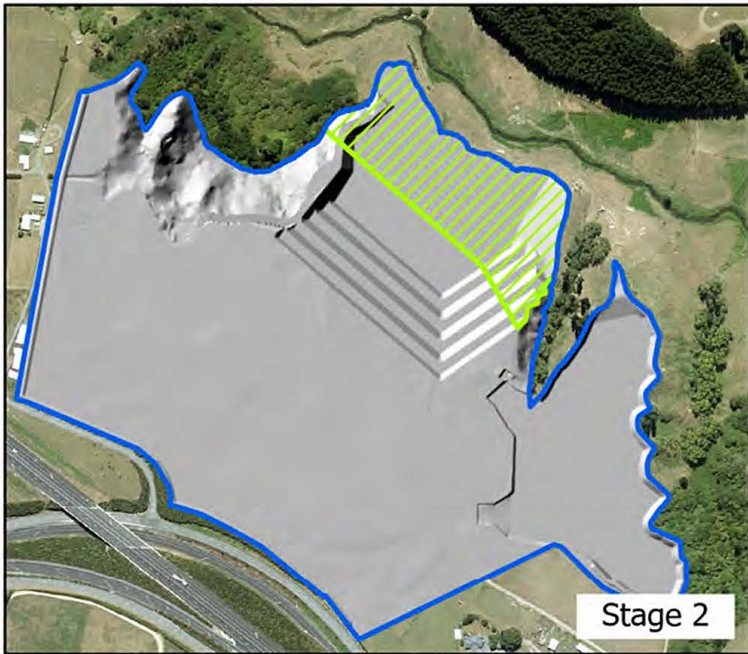
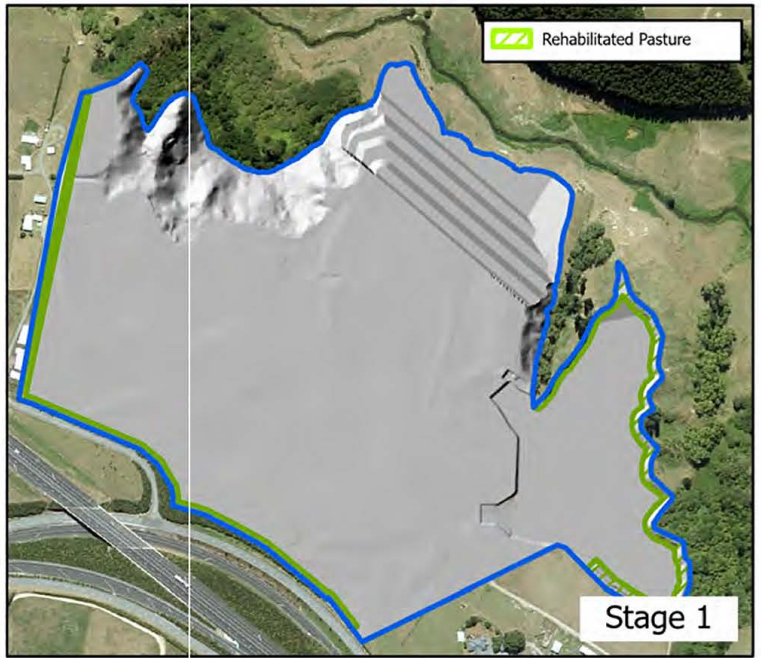
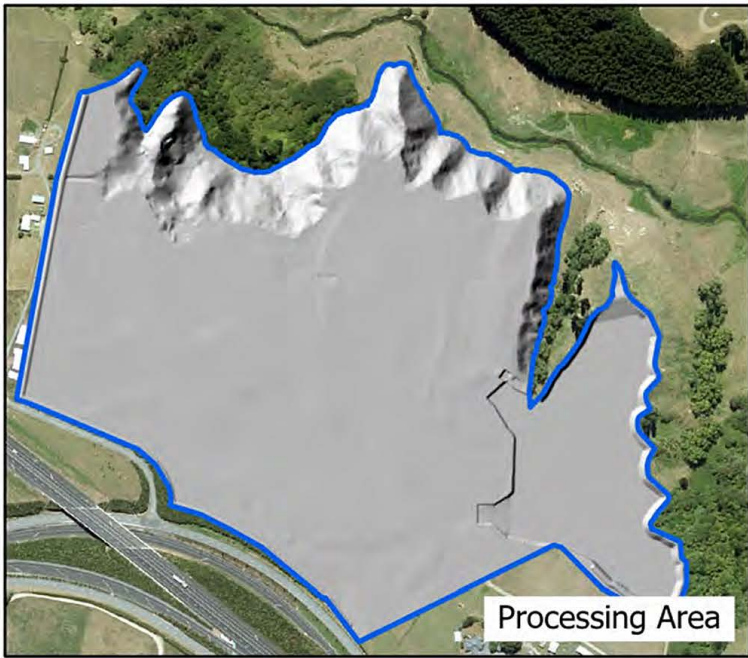
### Staging Sequence

The development of the quarry will begin with the excavation of the processing area over approximately 3 months and the formation of the noise and visual mitigation bunds. The processing area will remain open for the life of the quarry.

Extraction within the pit will occur in a north-to-south direction, starting at the edge of the Karapiro Stream gully and progressing towards Newcombe Road and State Highway 1. Work will begin at the northern end of the site, adjacent to the Karapiro Stream. Small spurs associated with the stream will be flattened and the land to be extracted (south), will be progressively battered back and terraced.

The overburden material from the plant area will be stripped and used to form an earth bund and visual screen around the processing and stockpile area (eastern boundary of the plant area and internal access road), and along the western and southern boundaries of the site. Overburden material from Stage 1 will be used to construct a temporary bund along the Stage 1 – Stage 2 boundary. As quarrying progresses, rehabilitation of the site will occur incrementally, with topsoil and overburden materials from the next stage to be quarried and used to rehabilitate those areas of the pit where the sand is exhausted. Following the completion of the final stage of extraction, materials from the earth bunds will be used to restore the soils, allowing the site to be returned to pasture.

Staging details are as per the development and rehabilitation sequence shown in Map 1.





## KEY COMPONENTS WHICH HAVE THE POTENTIAL TO AFFECT LANDSCAPE CHARACTER AND VISUAL AMENITY

The key components of the application that have the potential to affect the landscape and visual amenity include:

- a. The working pit.
- b. Site access and internal haul roads.
- c. Removal of vegetation.
- d. Processing plant.
- e. Stockpile areas and overburden disposal areas.
- f. Cleanfill deposition.
- g. Movement of trucks and the visual intrusion of flashing lights.
- h. Noise/earth bunds, fences, and screens.
- i. Screen planting.

## EXISTING LANDSCAPE AND VISUAL CHARACTER

The landscape and visual quality of the site is a function of a series of factors including intactness of visual and physical elements such as topography and vegetation cover, the degree of modification that has occurred, and surrounding landscape elements and attributes. Further contributing factors include juxtaposition and coherence between landscape elements within the subject site and those of the surrounding area, as well as human attributes or values assigned to an area.

### Wider Landscape Context

The key landscape features that influence the overall character of the landscape surrounding the application site include the following:

- a. The broad alluvial plains associated with the Waikato Basin.
- b. Waikato River and the tributaries such as Karapiro Stream.
- c. The hill country to the north and east including Sanatorium Hill (495m) and Te Tapui (492m) and south including Maungatautari Mountain, Sanctuary Mountain (1296m).
- d. Productive rural land, including pastoral grasslands, mixed cropping, shelterbelts, and hedgerows.
- e. Existing quarries such as Aspin Road Sand Quarry, Taotaoroa Quarries Ltd., and Whitehall Quarry (Winstone Aggregates).
- f. Tracts of production forest.
- g. Tracts of native bush, including Sanatorium Hill/Maungakawa Scenic Reserve and Maungatautari Mountain.
- h. Scattered rural buildings and dwellings including farmhouses, sheds, barns, milking sheds; and
- i. Urban development associated with Cambridge and surrounding peri-urban areas.

The relationship between the major geographical features contained within the surrounding landscape, and the human modifications that have occurred upon them, are important factors to consider when assessing how the proposal will influence existing amenity values and the rural character.

Although the wider land use is agrarian, the formative processes that created the underlying landform are still apparent, influencing the characteristics of the surrounding landscape. The underlying geology is characterised by the alluvial plains associated with the Waikato Basin and the surrounding hill country to the east.

The Waikato River valley contains volcanoclastic sediments comprising pumiceous silts, sands and gravels that fall into different age classes.

The relatively flat river terracing associated with the Waikato River is influenced by the fluvial deposition associated with the river. While some of the larger old river channels are evident in the wider surrounding landscape, many of the smaller and more subtle landforms and features associated with overland flow patterns have either been channelised or lost to productive land management practices such as agriculture, market gardening and horticulture. Spurs and ridges are legible due to pastoral landcover across much of the area.

In several places, tributaries to the Waikato River have cut down through the river terraces to form deep and incised gullies and channels. These include the Karapiro Stream, the Mangaone Stream and the Mangawhero Stream, which traverse the alluvial plains within the wider landscape surrounding the application site. The profile and paths of these streams have been progressively modified by the surrounding land use.

Key features within the wider landscape include Sanatorium Hill (495m) and Te Tapui (492m) (located to the northeast) and Maungatautari Mountain, Sanctuary Mountain (1296m) (located to the south).

Rural, lifestyle blocks and urban development have influenced the landscape and natural character of this part of the Waikato Basin. Although the landscape surrounding the application site is predominantly rural in appearance, the area also contains some small businesses and lifestyle blocks, due to its proximity to Cambridge.

The land surrounding the application site has been developed for a range of productive rural activities including mixed cropping, dairy farming, and dry stock farming. Equine activity is also common, with training tracks and stables scattered throughout the area. Farm and utility buildings are generally more scattered across the open rural landscape to the east as the topography becomes more steeply undulating.

The characteristics of the wider surrounding landscape can be seen in the following photographs:



*Figure 2 The wider surrounding landscape, photograph from Maungakawa Road (looking south-west)*



Figure 3 Deeply incised gully associated with the Karapiro Stream. Backdropped by the spurs of Sanatorium Hill (looking east).



Figure 4 State Highway 1, (looking south).

## Application Site and Immediate Surroundings

The application site is located upon a flat, open river terrace on the upper edge of the deep, and steeply incised Karapiro Stream gully.

The site is characterised by its pastoral land use and contains a mix of native and exotic vegetation, hedgerows, rural housing, clustering of farm ancillary buildings and post and wire fencing. Except for a row of tall mature specimen trees that line the main entrance into the property, most of the taller terrestrial vegetation is located on the steeper lands associated with the Karapiro Stream gully and its tributaries to the east.

The landscape and rural character of the site is further influenced by adjacent landscape features including:

- a. Karapiro Stream and the associated deeply incised gully system.
- b. Native riparian margins and pockets of native bush.
- c. The rural landscape, including pasture, shelterbelts, hedges, and farm buildings/dwellings.
- d. Rural residential and lifestyle development.
- e. State Highway 1 to the south.

The following photographs depict the landscape within the application site:



*Figure 5 Existing House and Farm ancillary sheds.*



*Figure 6 Karapiro Stream gully escarpment*



*Figure 7 Existing application site.*

## EFFECTS ON EXISTING LANDSCAPE AND RURAL CHARACTER

### Ratings

The rating system used is consistent with the recommended 7-point scale contained within *Te Tangi a te Manu - Aotearoa New Zealand Landscape Assessment Guidelines*<sup>2</sup>.

| Document  | Effect Rating   |       |                 |          |                |             |           |
|---|-----------------|-------|-----------------|----------|----------------|-------------|-----------|
| Te Tangi a te Manu - Aotearoa New Zealand Landscape Assessment Guidelines | Very Low        | Low   | Low - Moderate  | Moderate | Moderate -High | High        | Very High |
| Act/Policy  | Threshold       |       |                 |          |                |             |           |
| RMA   | Less than Minor | Minor | More than Minor |          |                | Significant |           |
| NZCPS   |                 |       |                 |          |                | Significant |           |

Where the level of effect ranges between ratings on this scale, a hyphenated rating is provided (e.g., *very low - low*).

### Effects On Landscape Character

To understand how the proposal will affect amenity values derived from existing landscape character, it is necessary to identify the attributes of the key landscape elements that influence the character of the site and its surroundings.

The application site is located within a highly modified rural landscape. Analysis of the study area has identified the key attributes of the various landscape features, which contribute to the landscape character and amenity of the site and its immediate surroundings. The effect of the proposed sand quarry on the following features has been assessed against the key landscape elements identified during site investigations, analysis of aerial photography, density analysis and other relevant background information.

|   | Landscape Type  | Scale    | Key Features & Attributes that Contribute to Existing Character   | Potential Effect  |
|---|---|----------|---|---|
| 1 | Steeply undulating terrain and hill country   | District | <ul style="list-style-type: none"> <li>Dominant ridgelines, and spurs including Maungatautari Mountain and Sanatorium Hill.</li> <li>Large and small tracts of native bush.</li> <li>Pastoral land with hedgerows, shelterbelts, post and wire fencing, and scattered rural buildings.</li> </ul>   | <p><b><u>No adverse effect</u></b></p> <p>The proposal will not directly affect the hill country that visually contains the application site to the north and south of the Waikato River Valley (including Lake Karapiro).</p> <p>The proposed development is not of sufficient scale to affect the key characteristics of this landscape feature.</p>  |
| 2 | Flat alluvial plains and river terraces associated with the Waikato River and Karapiro Stream (and associated tributaries). | Local    | <ul style="list-style-type: none"> <li>Flat to gently undulating river terrace topography.</li> <li>Deeply incised gullies and drainages.</li> <li>Rural land use and development.</li> <li>Patches of mature indigenous vegetation.</li> <li>Lifestyle blocks and rural residential developments.</li> <li>Towns (Cambridge).</li> </ul> | <p><b><u>Low</u></b> adverse effect (wider landscape).<br/><b><u>Moderate-High</u></b> adverse effect (for the duration of the activity within the site only).</p> <p>The proposal will not directly affect the flat alluvial river terraces associated with the wider landscape. The proposal will however have a more notable effect on the natural landform of the site, resulting in a noticeable change to the topography.</p> |

<sup>2</sup> Final version set for release 26 August 2022.

|   | Landscape Type  | Scale | Key Features & Attributes that Contribute to Existing Character   | Potential Effect   |
|---|---|-------|---|--|
|   |   |       |   | <p><u>Mitigation</u><br/>Post-extraction contouring of the site to emulate the terrace landforms associated with the Waikato River is required.</p> <p>Post mitigation effect rating = <b>Low</b>.</p>   |
| 3 | Waikato River and its tributaries (including riparian margins). | Local | <ul style="list-style-type: none"> <li>Deeply incised gullies and valleys associated with the Waikato River trench and the Karapiro Stream; and</li> <li>Associated riparian planting (native bush and exotics).</li> </ul> | <p><b>Low</b> adverse effect (wider landscape).<br/><b>Moderate-High</b> adverse effect (for the duration of the activity within the site only)</p> <p>Although the proposal will not directly affect the Waikato River it will affect the valley and riparian margins of the Karapiro Stream.</p> <p>The edge of the valley will recede as sand is extracted in Stage 1. The finished level will be a maximum depth of 35m (RL 75-40 on the Updated Quarry Plan and Plant Area, dated 18/01/2021).</p> <p>Approximately 3.4ha of vegetation (exotic pine/scrubland/forest and native wetland species) will be removed because of the proposed sand quarry. <sup>3</sup></p> <p><u>Mitigation</u><br/>Post-extraction contouring of the site to emulate the terrace landforms associated with the Waikato River is required.</p> <p>Planting of the remnant gully slopes is required to mitigate the landscape and rural character effects associated with the loss of existing vegetation.</p> <p>Post mitigation effect rating = <b>Low</b>.</p> |

As the site is located within a highly modified area, where the application site and adjacent river have already seen land change and adverse effects in the past, the effects of the proposal are rated against the existing physical environment. Due to the low-lying nature of the quarry and the visual containment afforded by dense vegetation, the proposal has a reasonably small visual catchment and is not likely to adversely affect wider landscape features. When considered within the context of the wider landscape, the proposal will have no effect – **low** adverse effect on the key attributes of the surrounding landscape which influence the existing wider landscape and rural character.

When considered within the context of the site and its immediate surroundings, the early stage of the proposal is likely to have a **moderate-high** effect on the existing landscape and rural character associated with the loss of existing vegetation from within the site (gullies) and modification to the existing river terrace landform within the site. As quarrying progresses, with mitigation in the form of post-extraction contouring to emulate a river terrace, and the reestablishment of planting on the gully slopes, adverse effect levels (within the context of the site and its immediate surroundings) adverse effects will eventually drop to **Low**, post-closure.

<sup>3</sup> Newcombe Road Sand Quarry: Ecology Report. Alliance Ecology.

## ASSESSMENT OF VISUAL EFFECTS

The following factors were evaluated during the visual assessment.

### Visual Catchment

As part of the initial investigations into the potential visibility of the quarry, a Zone of Theoretical Visibility (ZTV) analysis was carried out to identify areas from where the quarry would potentially be visible. The ZTV analysis used a digital elevation model (DEM) derived from a combination of the 2008 lidar data set and site-specific survey data attained in 2020. The ZTV maps identify the areas from where the proposed quarry would be potentially visible (above-ground features are not included, therefore ZTV maps identify as a “worst-case scenario”).

A site visit was carried out on the 22<sup>nd</sup> of October 2020 to verify the findings of the ZTV analysis and to assess the effects of the quarry from view locations representative of the range and types of views available from within the surrounding landscape. Representative view locations have been identified and have been assessed within this report. Except for the effects of the application on the dwelling at 41 Newcombe Road, the effects of the proposed quarry on the landscape and visual amenity values enjoyed from surrounding properties (private), on the south side of the gully are not likely to be affected due to their location relative to the pit and intervening vegetation. Field verification from private property on the north side of the gully has not been undertaken.

A series of ZTV maps were produced, one at each stage, to identify the extent of change in the ZTV throughout the life of the proposed quarry. It should be noted that not all areas of the quarry will necessarily be visible at any one time, with different parts of the working faces becoming visible in different locations over time as the extraction occurs.

In general, due to a combination of the nature and location of the proposed quarry, the surrounding existing topography and vegetation will ensure that the visual catchment from which the quarry will be seen will be largely restricted to:

- a. Surrounding property and dwellings within the immediate rural landscape.
- b. Locations to the south along Newcombe Road and State Highway 1.

The key findings from the ZTV analysis and site investigation include:

- a. Intervening vegetation in combination with the gently undulating to flat terrain means that the application site and the proposed sand quarry are reasonably contained within a small visual catchment (within 1km).
- b. Although theoretically visible from elevated locations to the north and west including Sanitorium Hill/Maungakawa Scenic Reserve (approximately 4km), parts of Leamington to the southwest, and parts of Cambridge to the north-west, a combination of intervening vegetation, which will largely obscure views of the site, and the large separation distances mean that the proposed sand quarry will not be easily discernible (if visible at all) from these locations.
- c. The proposed quarry will be visible from locations directly west and south-west of the application site, along State Highway 1.
- d. The application site may be viewed from locations along French Pass Road, through gaps in roadside vegetation.

The ZTV maps show that as quarrying progresses, the quarry (as a whole) becomes less visible as the pit depth increases. This is because views into the pit are crested by the upper (undisturbed) edges of the quarry. Further screening is facilitated by the earth bund around the outside of the extraction area. Levels of disturbance to the original land surface (i.e., the extent of change caused by the quarry when compared



to the original landscape) will remain relatively constant within each stage. ZTV comparison between the existing landform and the proposed quarry landform takes the preceding stage of excavation into account.

The ZTV analysis maps are included in appendix four, showing the visibility at each stage, from beginning to completion.

### Viewing Audience

The potential viewing audience was identified and likely to comprise:

- a. Residents of the surrounding neighbouring houses.
- b. Neighbouring farm workers & service vehicles.
- c. Motorists travelling along State Highway 1; and
- d. Motorists travelling along the local road network (including Newcombe Road, French pass Road and Maungakawa Road).

### Visual Absorption Capability

One of the main factors that will influence a development's visual effect, is the visual absorption capability of the surrounding landscape. This is the landscape's ability to integrate a development, or feature, into its existing visual character without significant change.

Each view location has been rated in terms of its visual absorption capability (VAC). Factors considered in determining the sites VAC rating include:

- The extent to which the quarry is visible.
- Visual and physical links with other similar elements or activities in the landscape.
- The level of modification to the surrounding landscape (short and long term).
- Appropriateness of the size and scale of the quarry.
- Distance.
- Backdrop; and
- Atmospheric conditions (fog, sun angle, haze, cloud cover etc).

The combination of the wider river terrace landscape associated with the formation of the Waikato River trench and the gully tributaries associated with the Karapiro Stream are well suited, from a VAC perspective, for this type of activity. While the agrarian characteristics of the site will be lost during the operational phase of the quarry, as the pastoral landscape is stripped away to expose the sand which lies below, the result will be the creation of a new landform that will be similar in appearance to other naturally occurring terrace landforms in the wider landscape (with some mitigation). This new landform will be able to be returned to pasture (and vegetation within the Karapiro Stream gully), restoring the existing rural characteristics of the application site.

Further, notable views of the subject site are generally restricted to within 1 km of the site due to intervening vegetation. Views of the quarry attainable from locations such as Sanitorium Hill/Maungakawa Scenic Reserve, located 4km north of the site diminish to the point where the quarry becomes less notable within the wider view (from a character and amenity effects perspective) or where views of the quarry are less frequent due to intervening features and the cresting effect that occurs as the pit floor is lowered below the top of the surrounding terrace landform. The application site is not likely to be visible from locations to the south of State Highway 1.

The development will not be seen within the same visual catchment as the existing quarries that exist in the wider surrounding landscape, such as Aspin Road Sand Quarry, Taotaoroa Quarries Ltd. and Whitehall Quarry (Winstone Aggregates), all of which are located 5-10 or more kilometres away. As such these do not influence the visual characteristics of the surrounding landscape to a notable extent or provide a relevant contextual which would assist the proposed sand quarry to integrate into the local landscape. The location of the existing surrounding quarries can be seen in the following image:



Figure 8 Existing Quarries in the surrounding landscape

The site's ability to visually absorb the change associated with the proposal is therefore considered to range between Poor-Neutral and Very Good.

Very Good and Neutral ratings were typically recorded for view locations where intervening topography and/or vegetation will prevent clear views of the proposed sand quarry.

Poor-Neutral ratings were typically recorded for locations with more open views, from nearby locations.

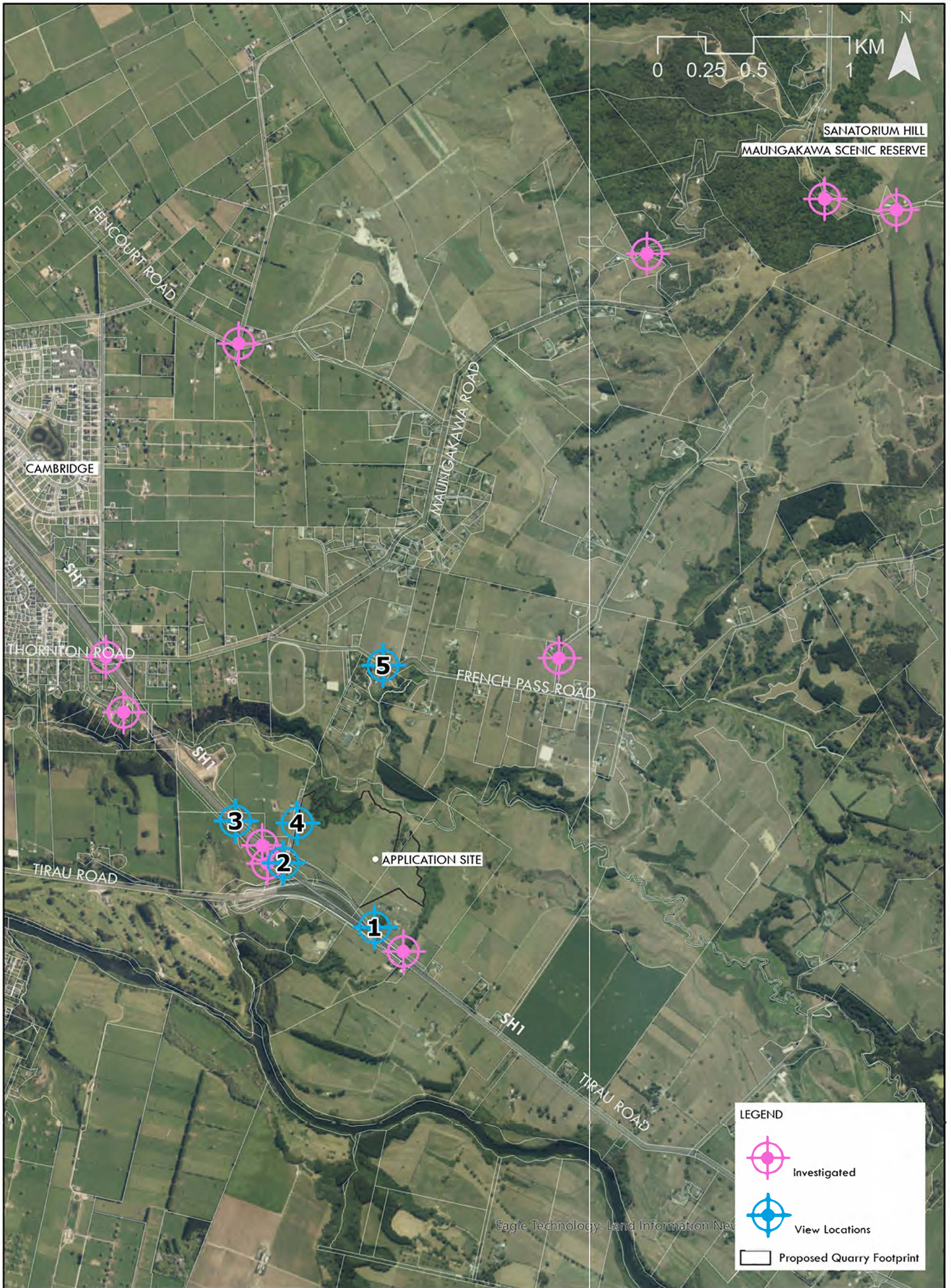
Visual absorption capability (VAC) rating definitions and VAC ratings for all view locations are contained within appendix three and seven, respectively.

## Analysis of Visual Effects from Identified View Locations

Five representative view locations (VL) were selected from locations within the ZTV for assessment, based on existing views, viewing frequency, viewer types, availability of the view from public property, viewer distance and the viewing time and framework available at the time of the study. The view from each VL was analysed within the methodological framework (appendix one) and rated using a standardised rating system (appendix two). A rating summary table is appended to this report as appendix seven.

Some view locations have been grouped for analysis, based on location and/or similarity. It should be noted that different locations may affect different viewer types or sensitivities.

View Location 1 is representative of the few opportunities to view the site from Newcombe Road and the south. View Locations 2 & 3 are representative of transient views from motorists travelling along State Highway 1. View location 4 is representative of the neighbouring dwelling to the northwest of the application site. View Location 5 is representative of transient views from motorists and neighbouring residents along French Pass Road.



## [View Location 1 – Newcombe Road](#)

View Location 1 is representative of one of the few opportunities to view the application site from Newcombe Road and is located at the entrance to the application site. It is representative of the view attainable by visitors to the site and people travelling along Newcombe Road (which is a dead-end road, terminating approximately 350m to the east). Few opportunities exist along Newcombe Road to view the application site due to the screening afforded by existing vegetation.

The view is typical of those able to be attained from the wider surrounding rural landscape and is characterised by the flat to gently undulating pastoral farmland interspersed with shelter belts, hedge rows, post and wire fencing, farmhouses, and ancillary buildings. From this location the steep gully systems associated with the Karapiro Stream and its minor tributaries that dissect this otherwise flat landscape are not visible, crested by their upper edge. Views beyond the gullies are largely screened by the dense vegetation growing along the upper edge of the gullies within the site, or the exotic and production pine growing on and above the Karapiro Stream Gully on its northern side. Beyond the site and upper terrace lands to the north, the view is backdropped by the Maungakawa hills.

From this location visual amenity is derived from a relatively uncluttered rural vista with few buildings visible. The regular appearance of the pastoral landscape in the foreground is juxtaposed against the Maungakawa hills in the background, which draws the viewers' attention towards its high point. The view is relatively intimate and compartmentalised, with views beyond the site restricted by the existing pine trees in the middle distance.

This view does not have high public amenity value.

Initially works associated with the creation of the site entranceway, construction of the weigh bridges and offices, Stage 1 overburden stripping, creation of the earth bunding, the temporary Stage 1 screen bund and the initial (shallow) excavations will be visible. The movement of excavation equipment and machinery will draw attention to activity within the site, differentiating its use from normal farming activity.

As the Stage 1 pit and processing and stockpile areas are lowered into the landscape, activity within the site will become increasingly difficult to see from this location until the floor of the extraction area and stockpile area are completely crested by the leading edge of the working face. In and around the processing and stockpile area a bund up to 5m high (from the floor stockpile and processing area at RL70) will be created, increasing the height of the gully edge by approximately 2m. This will partially obscure existing views across the landscape beyond.

Before the Stage 2 extraction, the temporary screen bunding on the southern side of Stage 1 will be removed and used to rehabilitate the floor of the worked pit. As this occurs the opposite side of the Karapiro Gully will be exposed to view.

As excavation progresses towards the view location, workings associated with the leading edge of the pit will become increasingly visible with proximity, however, this view will be seen predominantly by viewers entering the site. As the pit expands to the west, the existing pine growing northeast part of the site will be lost, opening views to the landscape beyond.

The tops of the stockpiles and the washing and processing plant may be visible above the surrounding natural landform.

Although the proposed sand quarry will be visible from some locations along Newcombe Road, the road only services one other property past the site entrance. Due to the generous amount of visual screening along Newcombe Road, there are minimal opportunities to view the site from Newcombe Road and State Highway 1, or the dwelling at the end of the road.

Following the initial topsoil and overburden stripping associated with the plant area, the creation of the earth bund along the eastern and southern site boundaries will screen views into the site and restrict views of the rural landscape beyond the site from this viewer location. The bunding will further compartmentalise the landscape surrounding the site by restricting the open views across it. The compartmentalisation of the open pastoral landscape through earth bunds/planting/shelterbelts is occasionally experienced within the wider surrounding rural environment such as along the Hamilton Expressway (SH1). While the proposal will result in a change from an open pastoral landscape to a landscape compartmentalised by planted earth bunds along the application site boundaries, the landscape character will remain rural.

As such the proposed development is unlikely to intrude into existing views of the landscape in such a way as to change the overall rural character of the view or result in a loss of visual amenity.

The proposed sand quarry will therefore have a **Low** adverse effect on the surrounding landscape visual and amenity values from this location during its operation.

Following completion, the restored landform will have a **Very Low** adverse effect on landscape visual and amenity values.

#### [View Location 2 & 3 – State Highway 1](#)

View Locations 2 & 3 represent transient views attainable from State Highway 1. View location 2 is located directly south of the application site and represents the most direct and clear view of the application site attainable from the surrounding public locations. View Location 3 is representative of the views first attained when travelling from the north along State Highway 1. Both views are slightly elevated.

Most of the viewing audience from these locations are expected to be transient viewers. When considered from the perspective of a moving vehicle along SH1, a combination of vehicle travel speed and the ability to view the application site (in terms of extent, orientation, and depth) will mean that only fleeting views of the site will be afforded.

Like the view from VL 1, these views are typical of the wider surrounding rural landscape, characterised by the flat to gently undulating pastoral farmland interspersed with shelter belts, hedge rows, post and wire fencing, farmhouses, and ancillary buildings. From this location the steep gully systems associated with the Karapiro Stream and its minor tributaries that dissect this otherwise flat landscape are not visible, crested by their upper edge. Views beyond the gullies are largely screened by the dense vegetation growing along the upper edge of the gullies within the site, or the exotic and production pine growing on and above the Karapiro Stream Gully on its northern side. Beyond the site and upper terrace lands to the north, the view is backdropped by the Maungakawa hills.

From these locations, visual amenity is derived from a rapidly changing series of views and vistas across the rural landscape from a moving vehicle. The variety of landscape features in the foreground are juxtaposed against the constant backdrop of the hill country beyond, which draws the viewer's attention towards the skyline ridge. These views do not have particularly high public amenity value.

From these locations, initial works associated with the creation of Stage 1 overburden stripping, the creation of the earth bund, the temporary Stage 1 screen bund and the initial (shallow) excavations will be visible, fleetingly, from vehicles travelling south along SH1. Again, the movement of excavation equipment and machinery will draw attention to activity within the site, differentiating its use from a normal farming activity until the earth bund is completed.

Once the earth bund along the western and southern boundaries of the site are progressively constructed, views into the site will be screened (with only the top of the processing plant likely to be glimpsed) and views over the rural landscape and hills beyond the site will be restricted. The bunding will further compartmentalise the landscape surrounding the site by restricting the open views across it. The compartmentalisation of the open pastoral landscape through earth bunds/planting/shelterbelts is

occasionally experienced within the wider surrounding rural environment such as along the Hamilton Expressway (SH1). While the proposal will result in a change from an open pastoral landscape to a landscape compartmentalised by planted earth bunds along the application site boundaries, the landscape character will remain rural.

As such the proposed development is unlikely to intrude into existing views of the landscape in such a way as to change the overall rural character of the view or result in a loss of visual amenity.

The proposed sand quarry will have a **Low-Moderate** adverse effect from VL2 and a **Low** to **Low-Moderate** adverse effect from VL3 (due to the larger separation distance) on the surrounding landscape visual and amenity values from these locations. Following completion, the restored landform will have a **Very Low** adverse effect on the landscape and visual amenity values.

#### [View Location 4 – 41 Newcombe Road \(Neighbouring dwelling to the west of the application site\)](#)

View Location 4 is representative of the views from the two dwellings at 41 Newcombe Road, which are located adjacent to the western boundary of the application site. One of the dwellings is located approximately 20m from the application site boundary, the other dwelling is located further to the west and effects are likely to be lower.

From the dwelling closest to the application site boundary, occupants of the house are expected to be able to obtain panoramic views across the open pastoral landscape from Maungatautari Mountain (in the south) to the hill country to the south of French Pass (north). Views of Maungakawa are currently screened by the existing pine plantation in the western gully within the site.

From this location, visual amenity associated with the existing rural character is largely derived from the available views towards the hill country which forms the backdrop to the east; and the open nature of pastoral grassland in the fore-midground of the view.

While work associated with the Stage 1 topsoil and overburden stripping will be visible from this location, once the 3m high earth bund is constructed along the western boundary of the site, views into the quarry will be completely screened from view.

Loss of visual amenity is likely to occur during the construction of the bund, with large machinery operating within 20m of the dwelling and, upon completion the bund will also intrude into the existing viewshed to the east, partially obstructing the views across the open rural landscape towards Maungatautari Mountain and the hill country around French Pass (although the peaks/high points of these features will remain visible). The bund is also likely to shade the dwelling (and its adjacent service court), creating adverse effects on existing amenity values.

The compartmentalisation of the open pastoral landscape through earth bunds/planting/shelterbelts is a common occurrence within the wider surrounding rural environment. While the proposal will result in a change from an open pastoral landscape to a landscape compartmentalised by the planted earth bunds along the western site boundary, the landscape character will remain rural.

While, at 3m high, the bund will prevent expansive views across the immediate landscape to the east, it will not be high enough to visually dominate the dwelling or create a sense of containment to the extent that perceptions of open space, commonly associated with the rural environment, are lost. Planted, the effect will be similar to that that may occur if a hedge or shelter belt were to be established along the boundary.

Following the establishment of the bund and planting, the occupants of this dwelling are unlikely to be able to see the working faces of the pit or the pit floor. The bund will be removed at the end of the extraction process.

From this location, the visual and landscape effects associated with the proposed earth bund mitigation are likely to result in a **Low- Moderate** to **Moderate** level of adverse effect from the dwelling closest to the site, reducing to **low** to **low-moderate** for the dwelling further to the west (depending on the design and configuration of the earth bund and planting). It should be noted that any increase in the overall height of the bund is likely to increase the magnitude of the effect on this dwelling.

Note: Assessment undertaken from within the application site adjacent to the dwelling.

Following completion, the restored landform will have a **Very Low** adverse effect on the landscape and visual amenity values.

#### [View Location 5 – French Pass Road](#)

View Location 5 represents one of the few publicly accessible views attainable from French Pass Road to the northeast of the application site. It is representative of the view attainable by road users and adjacent residents.

From this location, only a small part of the application site is visible between the foreground vegetation when looking along a deeply incised gully to the north of the Karapiro Stream, the remainder of the site is screened from view by the terrace landform in the foreground, which crests views of the gully and the site beyond. From here visual amenity is derived from directed views across the rural landscape. This view does not have particularly high public amenity value.

It should be noted that clear views of the application site may be obtained from private property and dwellings along French Pass Road, particularly those located near the northern edge of the Karapiro Stream gully.

Unlike the views from the locations to the south, the working faces and the floor of the pit will be visible from this viewer location, as will the machinery within it. As extraction occurs, the working faces with the pit will progressively recede to the south, towards State Highway 1. The rehabilitation of the floor of the pit, following the completion of the first stage of extraction, will reduce the amount of the open pit visible, reducing the extent to which the pit sand is seen in contrast to the surrounding pastoral and vegetation. Once completed and revegetated, the rehabilitated landform will not appear out of place within the context of the surrounding river terraces.

When considered from the perspective of a transient viewer in a moving vehicle travelling along French Pass Road, a combination of vehicle travel speed and the ability to view the application site (in terms of extent, orientation, and depth) will mean that only glimpsed views or fleeting views of the proposal will be afforded. With visual amenity being drawn from the experience of passing through the wider rural landscape, the proposed sand quarry will be seen in the context of similar land-use activities.

The proposed sand quarry will have a **Low** adverse effect on the surrounding landscape visual and amenity values from this location. Following completion, the restored landform will have a **Very Low** adverse effect on the landscape and visual amenity values.

A view location map is included above (page 19 of this report) and photographs from each identified VL are included in appendix five. Images Generated from the 3D Interactive Model from each identified VL are included in appendix six.



## VIEWS FROM ADJACENT PRIVATE PROPERTY TO THE NORTH

Potential exists to see the proposed development from elevated locations along the northern site of the Karapiro Stream gully.

In most cases, it is expected that effects on views from the dwellings located between the road and the application site, will be like those from the road, particularly where existing vegetation prevents, or the northern edge of the gully escarpment blocks views towards the site.

However, a review of the site and aerial photography suggests that views of the proposed development may be attained from some locations within these properties.

### 3D Interactive Model and Views

Because access to these properties was not attained to assess the effects on landscape and visual amenity, a 3D interactive computer model has been developed to illustrate the changes likely to occur at a broad level.

The model simulates the spatial relationship between the application site and the surrounding rural environment and shows how the landscape is expected to change at each stage of development.

Surrounding buildings have been generated automatically from footprints derived from aerial photography, meaning that these features may differ from reality. Critical features display a higher degree of accuracy within the context of the model<sup>4</sup>.

The change that will be seen from each view location (within the extent of the model) can be seen by clicking on the relevant shortcut at the bottom of the screen. Changes in the landscape from the selected view location can be seen by changing the stage selection at the top of the screen. Each view can be panned, using the mouse.

The 3D interactive views can be found at the following link:

<https://mgla.maps.arcgis.com/apps/360vr/index.html?id=99def319ac6442fbb4b87071f8d94003>

#### Private View Locations to the north

Because an offer to visit the private property on the northern side of the Karapiro Stream to assess the visual effects was declined, the assessment of effects from these private view locations has been undertaken remotely, using aerial photography, ground inspection from surrounding public locations, reverse sighting from the application site and the use of the analytical and the 3D interactive digital models and simulations.

The locations assessed are identified in figure 9 below and were selected because they are located within the visual catchment identified by the ZTV analysis.

No dwellings have been identified (from the aerial photography or model) as having a direct view into the proposed quarry from an identifiable living court or living area. Views of the quarry will be attainable from some locations within each property.

A digital simulation, showing the changes that will occur within the site from location A (refer to figure 9 below), on the northern escarpment of the Karapiro Stream gully, can be found in Appendix Six. The other locations identified can be viewed in the model and represent views from the various private access and farm tracks into the gully, where views are not likely to be obscured by vegetation.

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<sup>4</sup> The web browser compatible model can only be viewed in Google Chrome 20 or higher, Firefox 16 or higher or Safari 5 or higher (with WebGL enabled).

From these locations, the processing area will be screened from view by the surrounding bund, with only the tops of the processing plant and tops of the sand stockpiles potentially visible.

The working faces and the floor of the pit will likely be visible from elevated locations along the northern side of the gully but hidden from view from locations within the gully floor by the crest at the edge of the pit. As extraction occurs, the working faces within the pit will progressively recede to the south, towards State Highway 1. The rehabilitation of the floor of the pit, following the completion of each stage of extraction, will reduce the amount of the open pit visible, reducing the extent to which the pit sand is seen in contrast to the surrounding pastoral and vegetation. Once completed and grassed, the rehabilitated landform will not appear out of place within the context of the surrounding river terraces.

The effects of the proposal from these locations along the top of the escarpment and within the gully, where direct views of the site are available, will likely range between **Low-Moderate** and **Moderate**<sup>5</sup> during the operational stages of the quarry. **Moderate** levels of adverse effects are likely to occur during the early stages of the quarry's development (Stages 1, 2 & 3) when the working benches are open and closer to the view locations. **Moderate-High** temporary effects will occur at the beginning of Stage 1 before the temporary bund is constructed and grassed. As quarrying proceeds south, and the eastern walls and floor of these stages are rehabilitated<sup>6</sup>, effects on landscape and visual amenity will decrease to **Low-Moderate** for Stages 4 and 5 (until Stage 5 is rehabilitated).

Following completion, the restored landform will have a **Very Low** adverse effect on the landscape and visual amenity values.



Figure 9 Model Simulation Points

<sup>5</sup> These ratings are preliminary only and are subject to on site verification. No ground truthing has occurred for these locations.

<sup>6</sup> The rehabilitation of each stage will occur progressively. The cumulative extent of the rehabilitation to occur by the end of each stage is shown on Map 1.

## RELEVANT PLANNING MATTERS

Planning documents that have been taken into consideration include the Resource Management Act and subsequent amendments (RMA), the Waikato Regional Policy Statement (WRPS), the Operative Waipa District Plan (WDP) with regard to the Waikato River and Vision and Strategy and the Proposed Waipa District Plan (PWDP).

Only the key issues contained within the relevant planning framework, relating to landscape, visual and amenity matters have been considered.

### Resource Management Act 1991 (RMA)

While relevant objectives and policies of the various statutory documents give effect to Part 2 of the Act and are addressed later in this document, for completeness, consideration to the following sections of Part 2 of the Act in the event the Councils considers that these need to be specifically considered in this case:

#### *Section 6 Matters of national importance*

*(a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:*

In terms of natural character, the application site and the surrounding landscape are a part of a highly modified environment. The Karapiro Stream will not be directly affected and will be preserved, however, the gully edge associated with the stream will be altered by lowering the ground level as sand is extracted in Stage 1 of the proposed activity (refer to the ecological report).

#### *Section 7 Other Matters:*

*(c) the maintenance and enhancement of amenity values:*

*(f) maintenance and enhancement of the quality of the environment:*

Regarding section 7 (c), the adverse effects of the proposal on existing landscape character and visual amenity range from Low to Low-Moderate - Moderate (reducing to Very Low post-restoration). While the proposed quarry will alter the appearance of the site, this does not necessarily translate to an increase in adverse effects on rural character and associated visual amenity values. Although the proposed sand quarry will result in the loss of pastoral land, pastoral land use will continue to have a predominant influence on existing rural amenity values. Because the application site is contained within a small visual catchment, the proposed quarry will not affect the wider landscape amenity values.

In terms of section 7 (f), with the proposed mitigation measures and the long-term rehabilitation plan for the site in place, the quality of the surrounding environment will be maintained and enhanced (long term).

### Waikato Regional Policy Statement

The operative Waikato Regional Policy Statement (WRPS) seeks to protect and preserve the region's Outstanding Natural Features and Landscapes, outstanding freshwater bodies, natural character, and significant indigenous vegetation; and to maintain and enhance amenity values.

The WRPS does not identify the site or the landscape surrounding the site as an ONFL of regional importance, or as containing any outstanding freshwater bodies or significant indigenous vegetation.

Within the scope of the application, the objectives, and policies of the OWRPS appear to have been addressed by the existing provisions of the ODP, and therefore referred to in greater detail below.

## Operative Waipa District Plan

The application site is zoned Rural under the Operative Waipa District Plan (OWDP).

### Section 1 Strategic Policy Framework

#### **Objective - Environmental and heritage protection and recreation values**

1.3.4 To ensure that development and subdivision activities maintain and where possible enhance the environmental, heritage and recreational values of the District.

#### *Policy - Management of adverse effects*

1.3.4.1 To ensure that development and subdivision is undertaken in a manner that:

- (a) Does not result in a net loss of indigenous biodiversity; and
- (b) Protects areas of outstanding landscape; and
- (c) Maintains cultural landscapes and other identified landscape areas and features of high amenity; and
- (d) .... [emphasis added]

The quarry footprint borders the Karapiro Stream and overlaps the identified Cultural Landscape Area Alert (OWDP layer for information only). The proposed extraction (Stage 1) will alter the edge of the Karapiro Stream by lowering the river terrace to a maximum depth of 35m (RL 75-40 on the Updated Quarry Plan and Plant Area, dated 18/01/2021). Although there will be a progressive change in appearance, once the sand is extracted and the site has been rehabilitated, the adverse effects associated with this will cease and decrease.

The application site is not an outstanding natural feature or landscape or a landscape of high amenity. There are no identified heritage items or recreation values on-site or surrounding the site.

While the site is largely pasture and exotic tree land, of minimal ecological value, the Karapiro Stream margins, the gullies incising the upper terrace farmland and key mature shelter belt trees were shown to be utilised by bats throughout both survey periods undertaken by Bluewattle Ecology.

The Alliance Ecology Ltd report identifies:

*In broad terms the site includes alluvial terrace, gully and floodplain habitats. Intensively grazed pastureland is the predominant vegetation type on alluvial terrace though mature stands of exotic trees are also present. Several gully systems incise the upper main terrace of the property. These gullies include exotic-dominated forest, exotic pine plantation forestry, exotic-dominated scrub and rank pasture grassland. Most gullies include gully seepage wetlands, and gully streams on site range from ephemeral to permanent in nature. The floodplain at the base of the gullies is dominated by exotic and rank pasture grasses but also includes riparian floodplain wetlands and a large gully basin wetland. All terrestrial vegetation types and wetland and stream habitats onsite support or may support nationally 'Threatened', nationally 'At Risk' or 'Regionally uncommon' species, most importantly the nationally 'Threatened' long-tailed bat.*

*None of the terrestrial vegetation or wetland habitats on the site are classified as Significant Natural Areas (SNAs). However, the Waipa District Significant Natural Area (SNA) assessment<sup>7</sup> has ranked two significant natural areas (SNAs) in close proximity. Moreover, the terrestrial vegetation types and wetland and freshwater habitat types with the highest ecological values are located outside the proposed project footprint. However, the project is expected to have effects on a range of terrestrial and wetland ecological values, most importantly on long-tailed bats, the collective native forest fauna assemblage, and gully seepage wetlands.*

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<sup>7</sup> Waipa District Plan

*Effects on these and other ecological values will be further avoided, remedied and mitigated through a range of measures that centre on minimising the project footprint, undertaking vegetation clearance and earthworks outside of bird breeding season, adopting a bat roost tree felling protocol and salvaging and relocation operations for lizards and invertebrates.*

A significant portion of the tall vegetation within the site will be removed as a consequence of the mining activity. While of low value (comprising of young pine, and secondary growth exotic and native shrubs and trees), the area is being utilised by long-tailed bats in its entirety. Removal of this vegetation will remove habitat for this species. Further, disturbance of the remaining habitat by ongoing quarry activities may deter bats from utilising or migrating through this site.

#### **Section 4 – Rural Zone**

##### **Objective - Rural activities: farming**

*4.3.2 The capacity of rural areas and rural resources to support farming activities and lawfully established rural based activities is maintained.*

##### *Policy - Management of rural resources*

*4.3.2.1 Manage rural resources so that farming activities can continue to establish and operate.*

##### *Policy - Rural environment*

*4.3.2.2 Recognise and protect the continued operation of the Rural Zone as a pastoral working environment.*

##### *Policy - Farm buildings and activities to internalise adverse effects*

*4.3.2.4 Farm buildings and activities shall be located and scaled to minimise adverse effects on rural character and amenity. [emphasis added]*

Although the proposed sand quarry will result in the loss of pastoral land, pastoral land use will continue to have a predominant influence on existing rural amenity values within the surrounding landscape.

Following restoration and closure of the quarry, the site will be able to be returned to productive pastoral land use.

Any proposed buildings will have the capability of integrating into the surrounding landscape and will be located appropriately within the site.

##### **Objective - Rural activity: mineral and aggregate prospecting, exploration and extraction**

*4.3.5 To meet the District's and Region's mineral and aggregate needs from predominantly local sources and ensure that the location, use and development of the District's mineral and aggregate resources is provided for, subject to the management of the adverse effects associated with such activities.*

##### *Policy - Mineral prospecting and exploration*

*4.3.5.1 Mineral prospecting and exploration are enabled provided that the adverse effects of the activities are not significant. [emphasis added]*

Adverse effects of the sand quarry range from Low to Moderate - High. The proposed sand quarry is capable of being mitigated through staged sequencing, earth bunds and planting. Once completed the application site will be rehabilitated to emulate the surrounding rural landscape. Once completed the effects on landscape and rural character will be Low. This is below the significant threshold of the RMA.

##### *Policies - Mineral extraction*

*4.3.5.3 Mineral extraction activities are managed so that the adverse effects of the activities are internalised, or avoided, remedied or mitigated as far as practicable through methods such as management, mitigation and rehabilitation plans that address matters such as:*

- (a) Managing dust, noise, vibration, access and illumination to maintain amenity values, particularly during the night time; and
- (b) Ensuring buildings and structures are appropriately located in relation to boundaries, and of an appropriate scale; and
- (c) Undertaking remedial measures during extraction operations; and
- (d) Requiring sites to be rehabilitated and ensuring appropriate materials are used for this purpose.

4.3.5.4 *The scale and location of mineral extraction shall:*

- (a) *Be consistent with the capacity, design and function of the roading hierarchy; and*
- (b) Not adversely affect rural character. [emphasis added]

All fixed lighting will comply with the requirements of the District Plan to avoid adverse effects on night-time amenity values. Shielding will be fitted to all lighting that will be potentially visible from outside the site to prevent issues relating to glare.

Planting will be established along the access road into the site to prevent headlight glare. Headlights and safety beacons on vehicles within the pit will generally be screened by the pit walls (crested) from the south, west and east. At night vehicle movement may be visible from private property on the northern side of the Karapiro Stream gully, but this is not expected to cause night-time amenity effects due to the hours of operation.

Overburden material from the plant area will be stripped and used to form the earth bunding and visual screen around the processing and stockpile area, and along the western and southern boundaries of the site. A temporary bund will also be constructed along the Stage 1 – Stage 2 boundary. As quarrying progresses, rehabilitation of the site will occur incrementally, with topsoil and overburden materials from the next stage to be quarried and used to rehabilitate those areas of the pit where the sand is exhausted. Following the completion of the final stage of extraction, materials from the earth bunds will be used to restore the soils, allowing the site to be returned to pasture.

#### ***Objective - Rural character***

4.3.7 *Rural character and amenity is maintained.*

#### *Policies - Rural character*

4.3.7.1 Land use activities should be at a density, scale, intensity and location to maintain rural character.

4.3.7.2 Rural character and associated amenity values shall be maintained by ensuring rural land uses predominate in the Rural Zone, and buildings are of an appropriate scale and location.  
[emphasis added]

The limited availability of views into the site from surrounding public areas means that wider rural character and amenity, associated with the existing pastoral development in and around the site will be maintained. While visible from some locations to the north, the proposed quarry will be seen within the context of the wider rural landscape. While the appearance of the site will change for the duration of the activity, it will be restored to its existing rural land use once extraction is complete and the quarry is closed. Existing rural character and amenity will be maintained through the predominance of agrarian (rural) land uses within the zone. While the quarry may affect rural character immediately in and around the site, by changing the appearance of the site from a working farm to a quarry, such features are not uncommon and contribute to the rural characteristics of the wider landscape (as shown in the quarry distribution map in figure 7).

4.1.4 of the District Plan identifies mineral extraction as a rural-based industrial use that can occur in the rural zone.

At a site level, the proposed buildings will be limited to offices and staff rooms. Buildings will not be located on the edge of the Karapiro Stream. Buildings will be located on the access road 60m from the entrance to the site (Refer to the Updated Quarry Plan and Plant Area, dated 18/01/2021).

**Objective - Non-farming activities**

*4.3.12 Only non-farming activities that have a functional and compelling requirement to locate in the Rural Zone should be enabled to locate in the Rural Zone.*

*Policies - Non-farming activities*

*4.3.12.1 To limit non-farming activities in rural areas except for activities that:*

- (a) Have a functional and compelling reason to establish in a rural area; and*
- (b) Do not result in any further loss of land from primary production purposes; and*
- (c) Maintain rural character.*

As previously identified, the existing rural character of the wider landscape can be maintained.

## RECOMMENDED MITIGATION MEASURES

Recommended mitigation measures focus on landform restoration and revegetation to minimise the extent of quarry and/or overburden disposal areas open at any one time, reducing effects on visual amenity and allowing the quarry to better integrate with the surrounding landscape.

Recommended mitigation measures include:

- a. The implementation of the Ecological Restoration proposed in the *Newcombe Road Sand Quarry: Ecology Report* prepared by Alliance Ecology.
- b. The establishment of planting capable of growing up to 2-3m high, on the earth bunds. Only low-growing species should be planted along the top of the bund adjacent to the dwellings located adjacent to the western boundary (VL 4), to ensure the overall height of the bund is minimised at this location, and potential shading effects are reduced.
- c. The establishment of a bund and/or planting to prevent headlight glare along the main accessway to the site.
- d. The retention of all existing vegetation (outside of the quarry footprint) within the site which screens or partially screens the site from surrounding locations. This should include existing hedgerows and the mature specimen trees lining the entranceway to the site.
- e. The progressive rehabilitation of the site back to pasture (as quarrying progresses) including the recontouring of all excavated areas to resemble a natural river terrace, the reestablishment of a topsoil and subsoil profile suitable for the pastoral land use, and the re-grassing of the site.

## FINDINGS & CONCLUSIONS

Existing landscape and rural features in and around the site influence the extent to which the proposal will affect the existing landscape character and visual amenity.

Analysis of the proposal found that:

- a. The landscape containing the application site can be characterised as a rural landscape comprised of open expanses of pasture, delineated into paddocks by shelterbelts, hedgerows and post and wire fencing, punctuated by trees and scattered buildings.
- b. The site is of low natural character value. It is not located on any identified protected landscape features or landscapes (ONFL) or prominent landforms. The site is located by and overlays a Cultural Landscape Area Alert (an OWDP layer for information purposes only).
- c. Adverse effects on the key attributes of the surrounding landscape (landscape effects) which influence the existing wider landscape and rural character include a change in the rural characteristics of the existing land use patterns within the site and the modification to the river terrace landform. The magnitude of this effect will be no greater than **Low** to **Moderate-High**. Effect levels will drop to **low** once the quarry has been decommissioned and the landform restored to look like a natural river terrace.
- d. The site's ability to absorb the development enabled by the zone change afforded by the proposed zone change ranges from **Poor-Neutral** to **Very Good**. Vegetation and gently undulating terrain backdrop the site and will aid in integrating the proposal into the surrounding landscape. The proposed quarry will be seen in the context of a highly modified area, including State Highway 1 to the south, pastoral land surrounding and Cambridge to the west.
- e. Intervening vegetation in combination with the gently undulating to flat terrain means that the application site and the proposed sand quarry are reasonably contained within a small visual catchment (within 1km), and predominately visible from the south along State Highway 1, at the site entrance along Newcomb Road and the west (neighbouring private property). The application site is not likely to be visible from locations to the south of State Highway 1.
- f. The ZTV maps show that as quarrying progresses, the quarry (as a whole) becomes less visible as the pit depth increases. This is because views into the pit are crested by the upper (undisturbed) edges of the quarry. Further screening is facilitated by the earth bund around the outside of the extraction area. Levels of disturbance to the original land surface (i.e., the extent of change caused by the quarry when compared to the original landscape) will remain relatively constant within each stage.
- g. When approaching the application site along State Highway 1 from the north, motorists will be able to glimpse the proposed quarry for a fleeting moment during Stage 1 construction. Once the earth bunds are in place, most of the proposed quarry works will be screened from view. The bunds will also restrict views of the rural landscape beyond. From locations to the north (French Pass Road), only limited views of the site are attainable along a tributary to the Karapiro Stream.
- h. Adverse effect on visual amenity (visual effects) includes a loss of views across the open pastoral rural landscape (where screened by the proposed earth bunds) and a change in the appearance of the site. The proposed sand quarry will visually contrast with the surrounding pastoral land which will draw viewers' attention to the site.
- i. While sand quarrying is currently experienced within the visual catchment containing the site, earth works, and quarrying is experienced throughout the wider landscape and will not be an unexpected activity to viewers. The magnitude of effects was found to range between **Low** and **Low-Moderate**



from surrounding public locations (dropping to **Very Low** post quarry restoration). From the dwelling closest to the site boundary to the west of the site (VL 4) the effects will be **Low-Moderate** to **Moderate** (dropping to **Very Low** post-quarry restoration). From private property to the north of the site (with direct views), the effects likely range between **Low-Moderate** and **Moderate**<sup>8</sup> during the operational stages of the quarry, reducing to **Very Low** following restoration.

- j. The mitigation measures required for noise and ecological disturbance will also help mitigate the effects of the proposal on visual amenity. Effects on visual amenity will be mitigated with the installation of the earth bunding during the establishment of the plant area. Effects on landscape character (associated with effects on the natural landform of the river terrace) will be progressively mitigated as extraction progresses but will not be fully mitigated until quarrying is complete, at which time the pre-existing rural characteristics of the site will be fully restored.

During its initial stages of development, the proposed sand quarry will have a **more than minor** adverse effect on the existing landscape and rural character of the application site and its immediate surroundings (including temporary effects while the quarry becomes established) As the quarry develops, effect levels will drop **less than minor** with post-extraction contouring, and the re-establishment of planting on the gully slopes. While the proposed sand quarry will change the appearance of the site and alter the natural river terrace landform associated with the site, it will not do so to the extent that it affects the wider rural landscape surrounding the site. Successfully mitigated and rehabilitated, the application site will integrate back into the landscape post-closure.

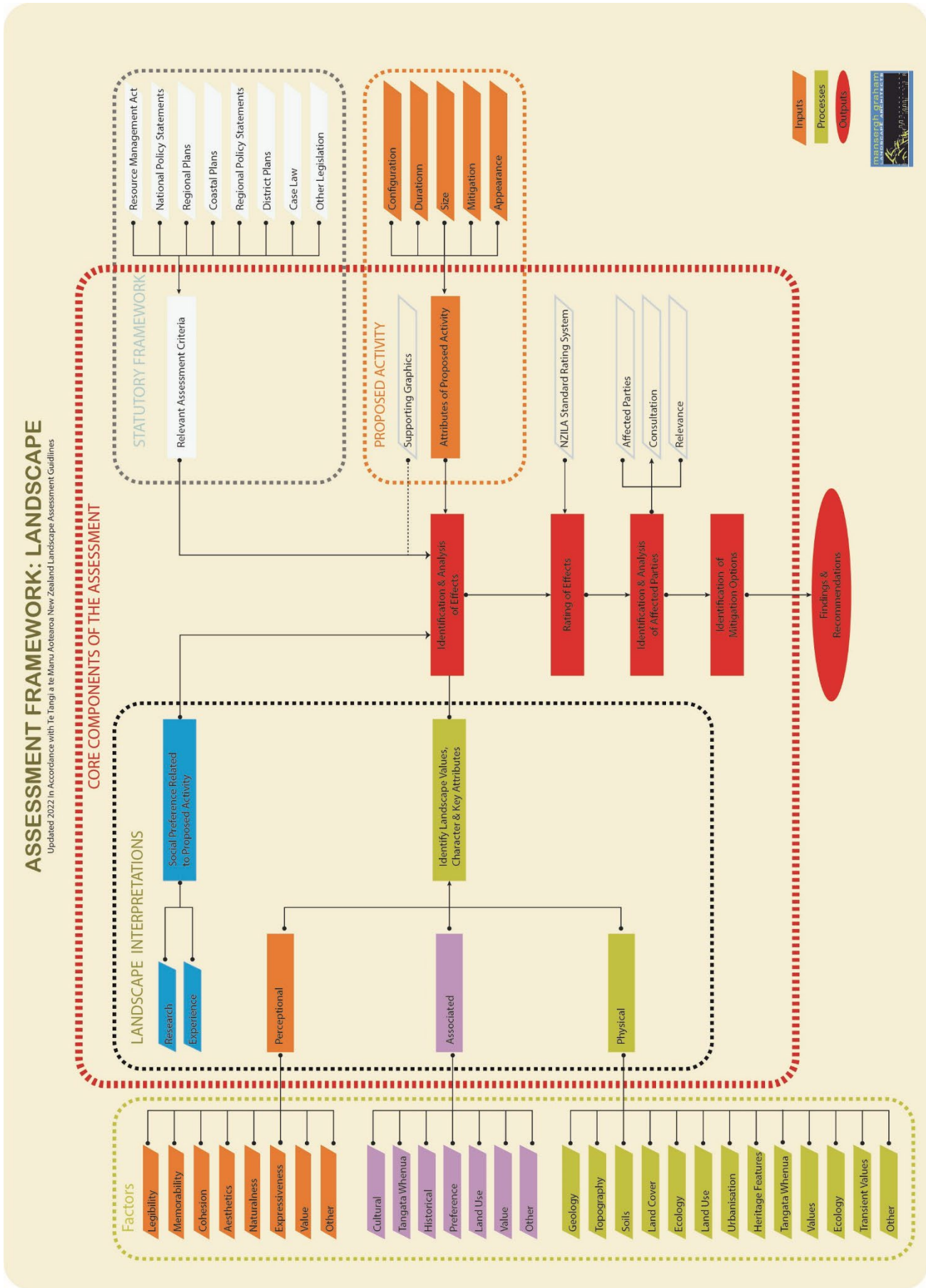
From surrounding areas accessible to the public, the effects of the proposed sand quarry will be **less than minor** or **minor**. Effects on private view locations to the north (during the early operational stages of the quarry (Stages 1, 2 and 3) and the private dwelling adjacent to VL4 will be **more than minor**. As quarrying proceeds south, and the eastern walls and floor of these stages are rehabilitated<sup>9</sup>, effects on landscape and visual amenity will decrease on private view locations to the north to **minor** for Stages 4 and 5 (until Stage 5 is rehabilitated). Following completion, the effect will be **less than minor**.

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<sup>8</sup> These ratings are preliminary only and are subject to on site verification. No ground truthing has occurred for these locations.

<sup>9</sup> The rehabilitation of each stage will occur progressively. The cumulative extent of the rehabilitation to occur by the end of each stage is shown on Map 1.

# Appendix One: Methodological Flow Chart



## Appendix Two: Landscape and Visual Amenity Effect - Rating System

The following standardised rating system has been developed by Mansergh Graham Landscape Architects Ltd and is consistent with the recommended rating system identified in the *Te Tangi a te Manu - Aotearoa New Zealand Landscape Assessment Guidelines (Final Version)*.

| LANDSCAPE AND VISUAL AMENITY EFFECT - RATING SYSTEM  |  |
|--|--|
| Effects Rating   | Use and Definition   |
| Very High  | <p><u>Use</u></p> <p>The development/activity would:</p> <ol style="list-style-type: none"> <li>Have a very high level of effect on the character or key attributes of the receiving environment and/or the vista within which it is seen; and/or</li> <li>Have a very high level of effect on the perceived amenity derived from it.</li> </ol> <p><u>Oxford English Dictionary Definition</u></p> <p>Very: adverb 1 in a high degree. 2 with superlative or own without qualification: the very best quality.<br/>High: adjective 1 extending above the normal level. 2 great in amount, value, size, or intensity. 3 great in rank or status. 4 morally or culturally superior.</p> |
| High   | <p><u>Use</u></p> <p>The development/activity would:</p> <ol style="list-style-type: none"> <li>Have a high level of effect on the character or key attributes of the receiving environment and/or the vista within which it is seen; and/or</li> <li>Have a high level of effect on the perceived amenity derived from it.</li> </ol> <p><u>Oxford English Dictionary Definition</u></p> <p>High: adjective 1 extending above the normal level. 2 great in amount, value, size, or intensity. 3 great in rank or status. 4 morally or culturally superior.</p>  |
| <p>Threshold under the RMA. Ratings above this threshold are "Significant". Ratings below this threshold are "More than Minor".<br/>Threshold under the NZCPS. Ratings above this threshold are "Significant".</p> |  |
| Moderate-High  | <p><u>Use</u></p> <p>The development/activity would:</p> <ol style="list-style-type: none"> <li>Have a moderate-high level of effect on the character or key attributes of the receiving environment and/or the vista within which it is seen; and/or</li> <li>Have a moderate-high level of effect on the perceived amenity derived from it.</li> </ol> <p><u>Oxford English Dictionary Definition</u></p> <p>Moderate: adjective 1 average in amount, intensity, or degree.<br/>High: adjective 1 extending above the normal level. 2 great in amount, value, size, or intensity. 3 great in rank or status. 4 morally or culturally superior.</p>                                   |
| Moderate   | <p><u>Use</u></p> <p>The development/activity would:</p> <ol style="list-style-type: none"> <li>Have a moderate level of effect on the character or key attributes of the receiving environment and/or the vista within which it is seen; and/or</li> <li>Have a moderate level of effect on the perceived amenity derived from it.</li> </ol> <p><u>Oxford English Dictionary Definition</u></p> <p>Moderate: adjective 1 average in amount, intensity, or degree.</p>  |
| <p>Threshold under the RMA. Ratings at or above this threshold are "More than Minor". Ratings below this threshold are "Minor".</p>  |  |
| Low-Moderate   | <p><u>Use</u></p> <p>The development/activity would:</p> <ol style="list-style-type: none"> <li>Have a low-moderate level of effect on the character or key attributes of the receiving environment and/or the vista within which it is seen; and/or</li> <li>Have a low-moderate level of effect on the perceived amenity derived from it.</li> </ol> <p><u>Oxford English Dictionary Definition</u></p> <p>Low: adjective 1 below average in amount, extent, or intensity. 2 lacking importance, prestige, or quality; inferior.<br/>Moderate: adjective 1 average in amount, intensity, or degree.</p>  |
| Low  | <p><u>Use</u></p> <p>The development/activity would:</p> <ol style="list-style-type: none"> <li>Have a low level of effect on the character or key attributes of the receiving environment and/or the vista within which it is seen; and/or</li> <li>Have a low level of effect on the perceived amenity derived from it.</li> </ol>   |
| <p>Threshold<sup>10</sup> under the RMA. Ratings above this threshold are "Minor". Ratings at or below this threshold are "Less than Minor".</p>   |  |
| Low (continued)  | <p><u>Oxford English Dictionary Definition</u></p> <p>Low: adjective 1 below average in amount, extent, or intensity. 2 lacking importance, prestige, or quality; inferior.</p>  |
| Very Low   | <p><u>Use</u></p> <p>The development/activity would:</p> <ol style="list-style-type: none"> <li>Have a very low effect on the character or key attributes of the receiving environment and/or the vista within which it is seen; and/or</li> <li>Have a very low effect on the perceived amenity derived from it.</li> </ol> <p><u>Oxford English Dictionary Definition</u></p> <p>Very: adverb 1 in a high degree. 2 with superlative or own without qualification: the very best quality.<br/>Low: adjective 1 below average in amount, extent, or intensity. 2 lacking importance, prestige, or quality; inferior.</p>  |
| <p>Detectable Effect Threshold</p>   |  |
| No Effect  | <p>The development/activity would have no detectable effect on the receiving environment.</p>  |
| <p>Note: Ratings may be positive (e.g. high level of enhancement) or negative (e.g. high adverse effect).</p>  |  |

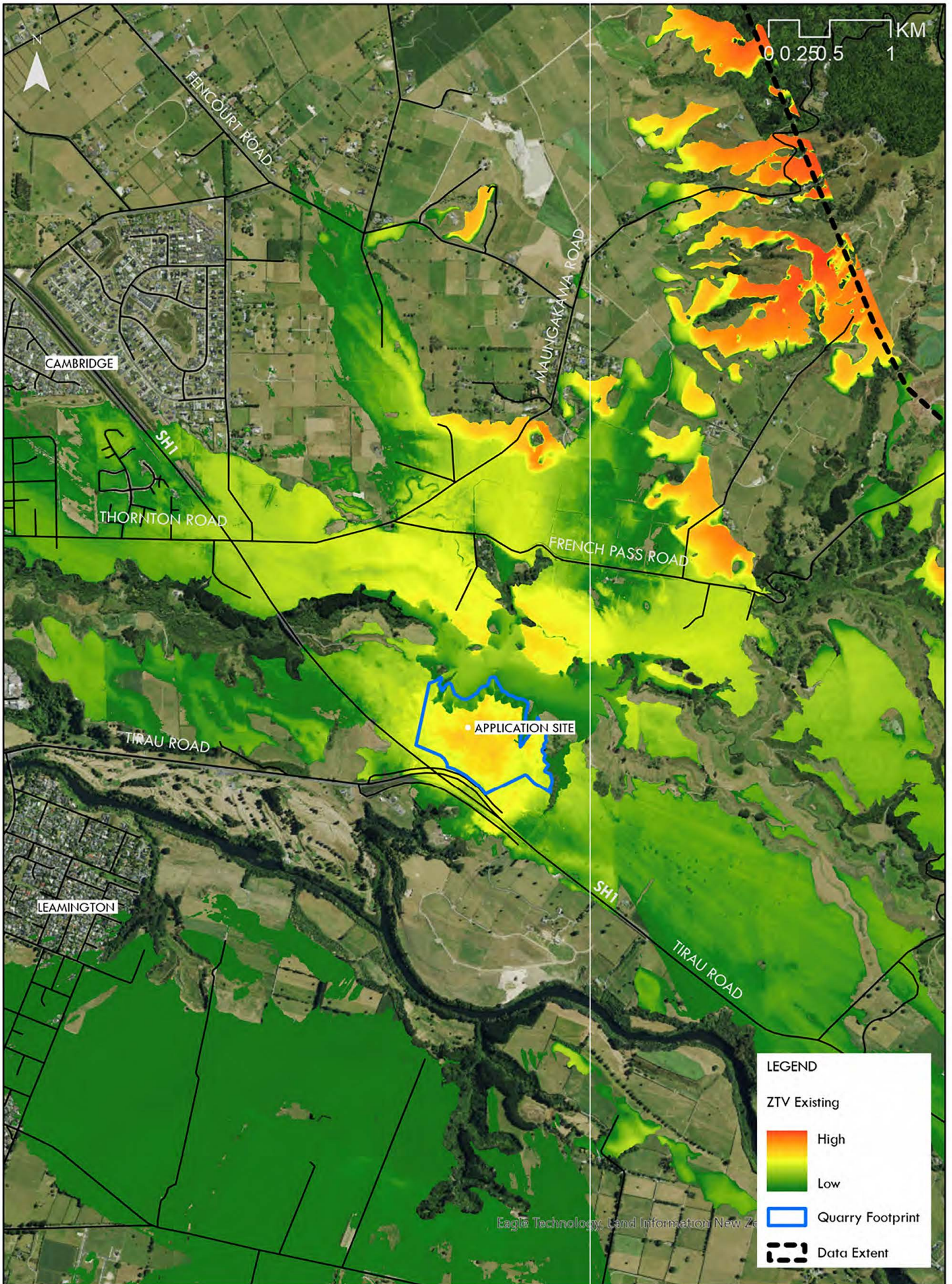
<sup>10</sup> Note: the threshold between less than minor and minor differs from the draft version but is consistent with the final (print) version of *Te Tangi a te Manu - Aotearoa New Zealand Landscape Assessment Guidelines*.

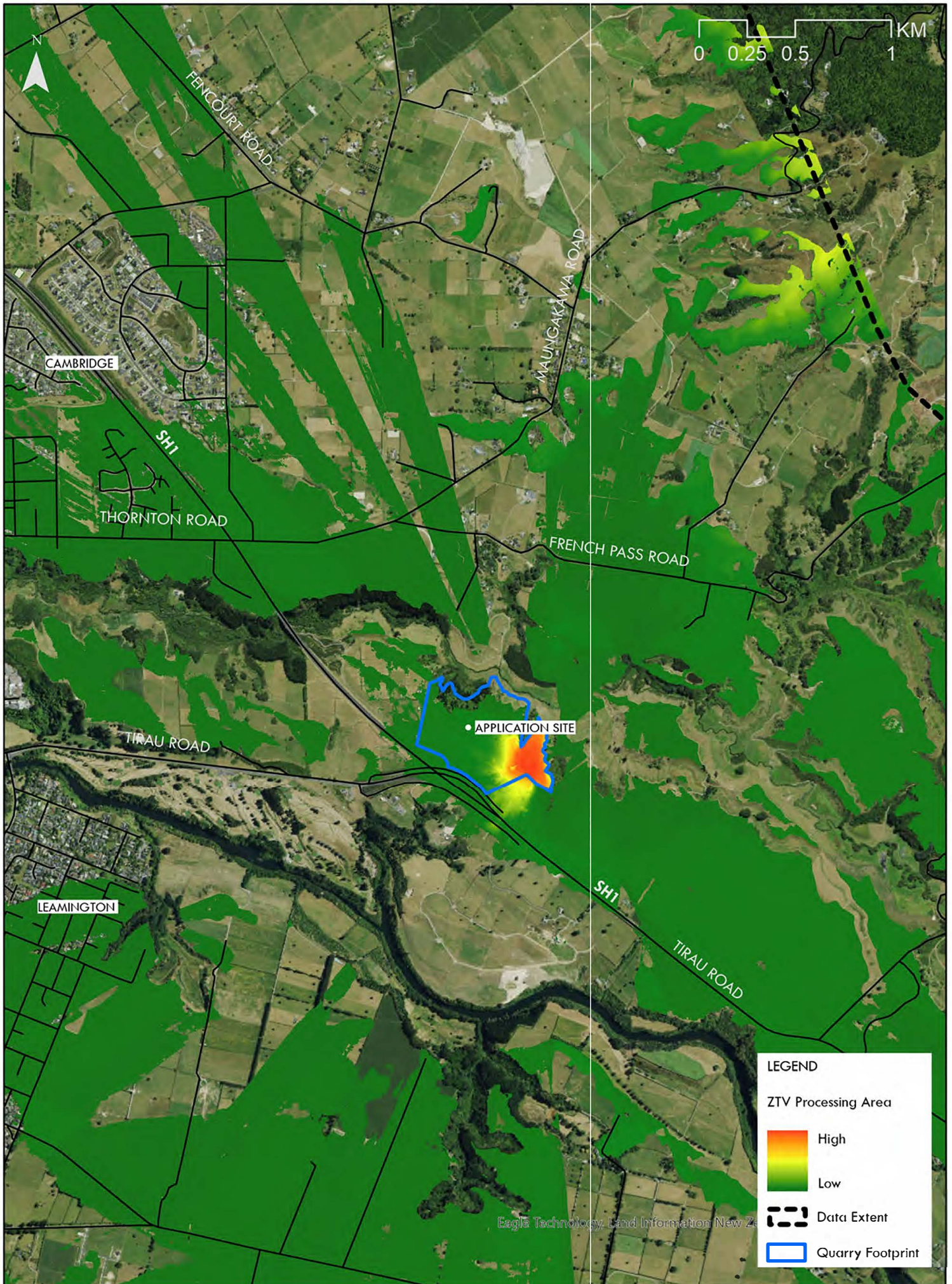
## Appendix Three: Visual Absorption Capability Ratings

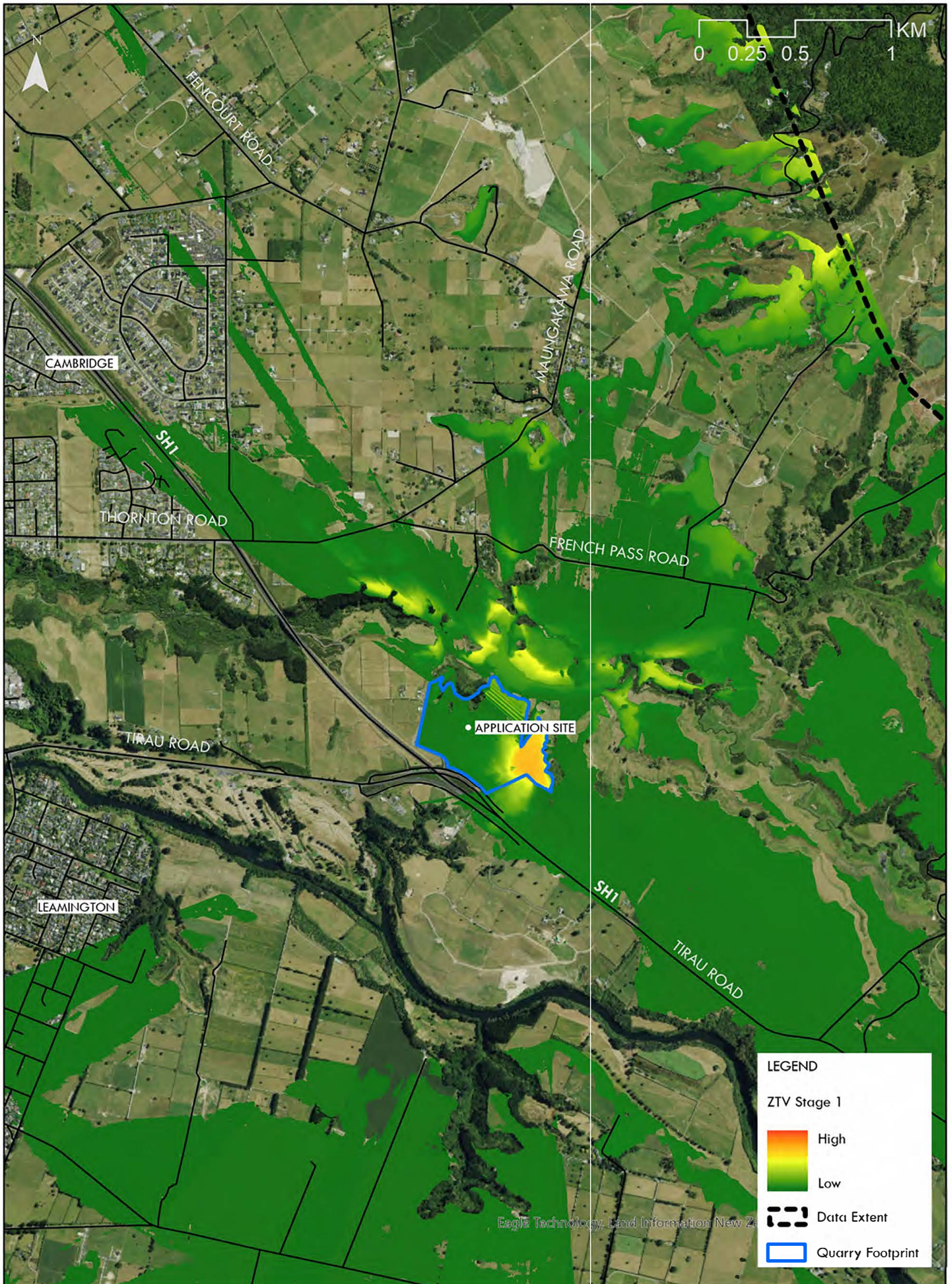
The following standardised rating system has been developed by Mansergh Graham Landscape Architects Ltd and is consistent with the recommendations of *Te Tangi A Te Manu - Aotearoa New Zealand Landscape Assessment Guidelines (Draft 2021)*.

| Visual Absorption Capability Definition Ratings |   |
|---|---|
| VAC Rating                                      | Use   |
| Very Good                                       | <p>The proposed development/activity would be completely screened, almost completely screened or completely absorbed by existing landscape features. Any views of the development would be either unidentifiable or at a great distance, and/or;</p> <p>The development/activity would not affect the existing character of the surrounding landscape or view in which it is seen, and/or;</p> <p>The development/activity would introduce a visual element into the landscape or view which may be viewed very frequently or continuously in that or similar landscape types.</p>  |
| Good  | <p>The proposed development/activity would be mostly screened or visually absorbed by existing landscape features, but still be identifiable. The development/activity may act as a tertiary focal attraction within the landscape or view in which it is seen, and/or;</p> <p>The development/activity would not affect the existing character of the surrounding landscape or view in which it is seen, and/or;</p> <p>The development/activity may introduce a visual element into the landscape or view which may be viewed frequently in that or similar landscape types.</p>  |
| Neutral   | <p>The proposed development/activity would neither be screened nor become a visual intrusion or focal attraction within the landscape or view in which it is seen. The proposed development/activity may act as a minor focal attraction from some locations, and/or;</p> <p>The development/activity would alter the existing character of the surrounding landscape or view in which it is seen, and/or;</p> <p>The development/activity would introduce a visual element into the landscape or view which may be viewed occasionally in that or similar landscape types.</p>   |
| Poor  | <p>The proposed development/activity would be clearly visible but would not act as a primary focal attraction, and/or;</p> <p>It would be expected that the proposed development/activity would alter the existing character of the surrounding landscape or view in which it is seen, and/or;</p> <p>The development/activity may introduce a new visual element into the landscape or view. The development/activity may be viewed infrequently in that or similar landscape types.</p>   |
| Very Poor                                       | <p>The proposed development/activity will be highly visible and may act as a primary focal attraction or feature. It would also be expected that the proposed development/activity will significantly alter the existing character of the surrounding landscape or view in which it is seen, and/or;</p> <p>The development/activity will introduce a new visual element into the landscape or view, which will be significantly different in appearance, or scale from the landscape elements surrounding it, and/or;</p> <p>The development/activity would be found very rarely in that or similar landscape types.</p> |

## Appendix Four: ZTV Maps





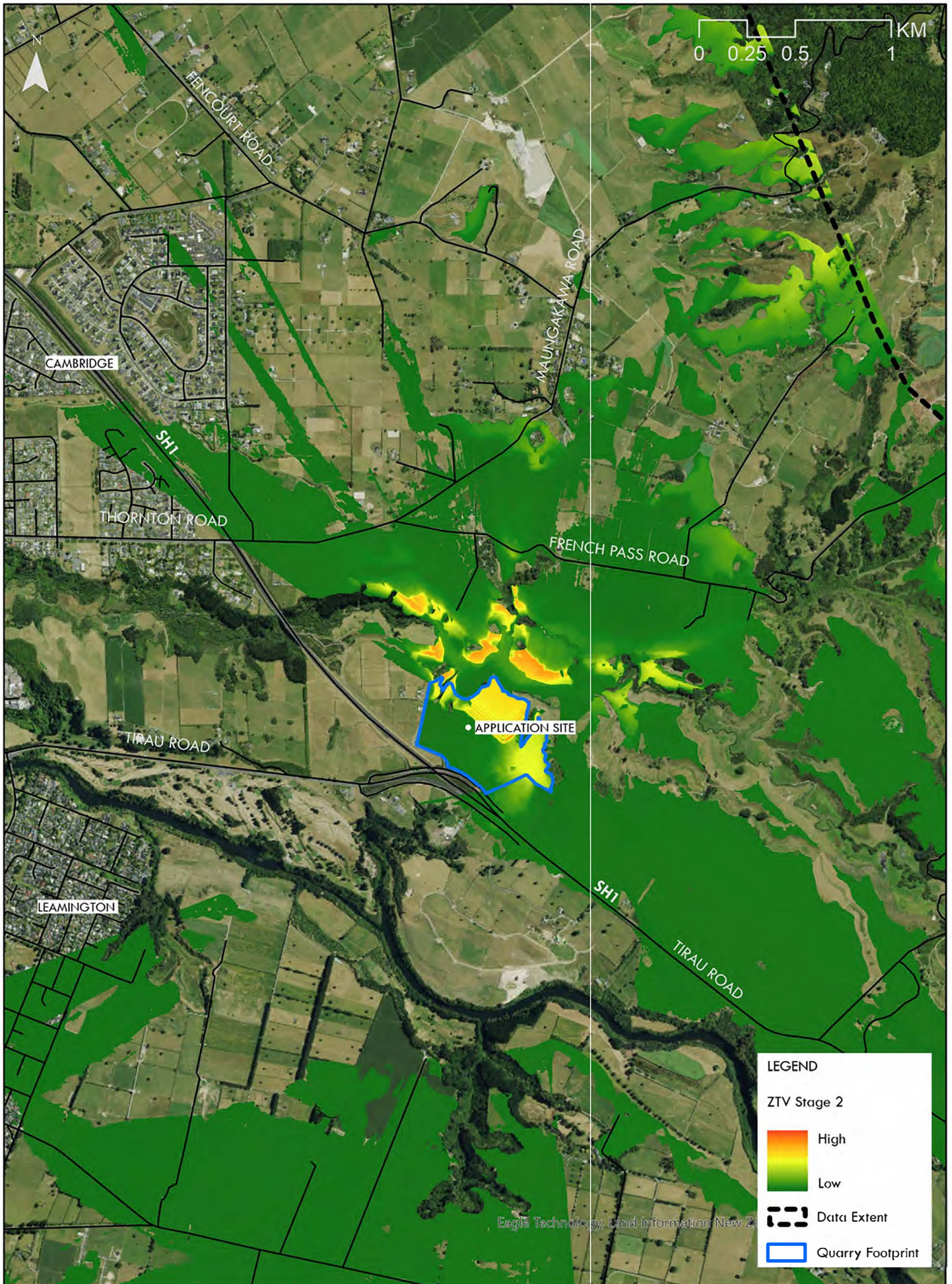


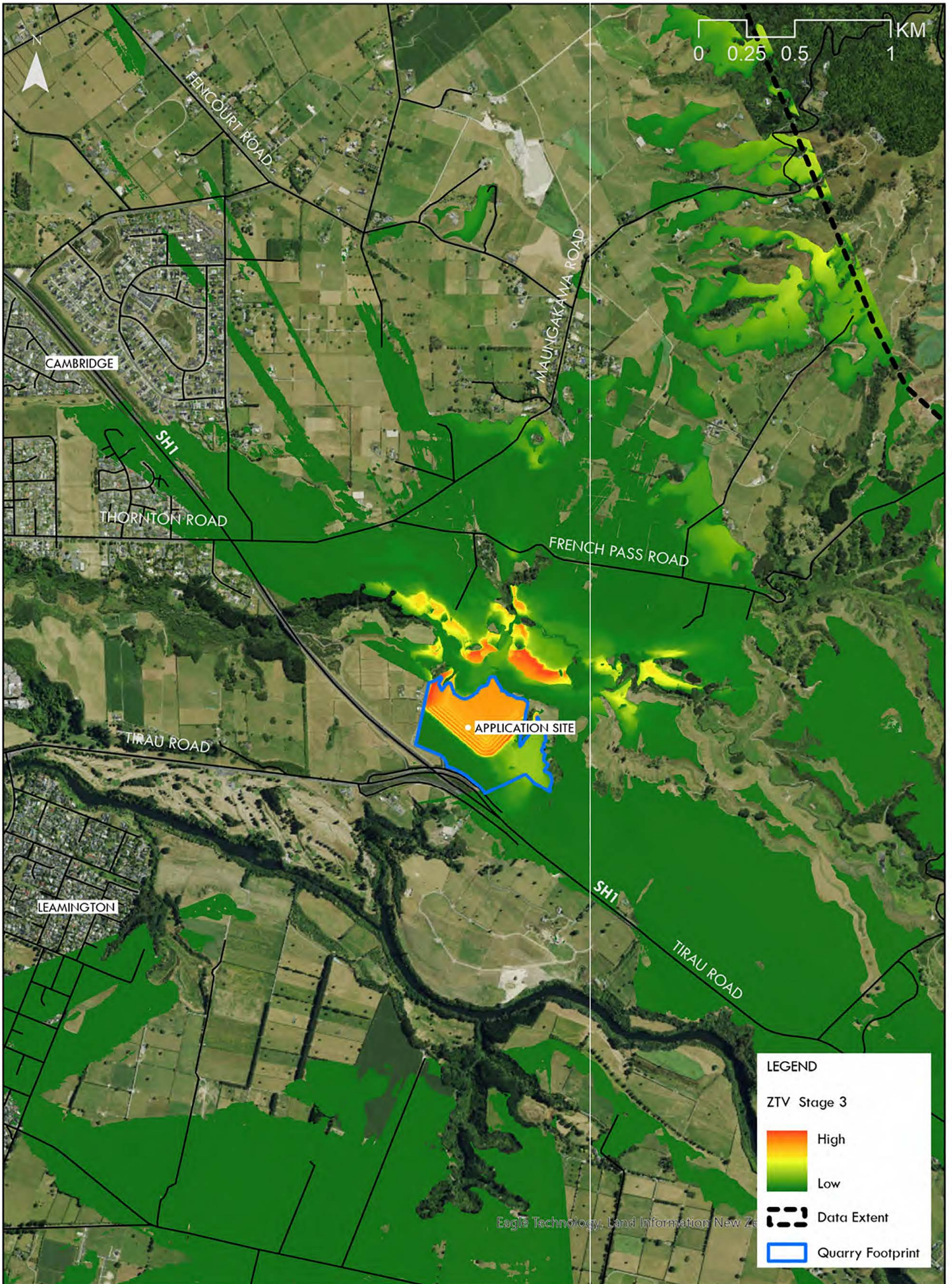
**LEGEND**

ZTV Stage 1

- High
- Low
- Data Extent
- Quarry Footprint



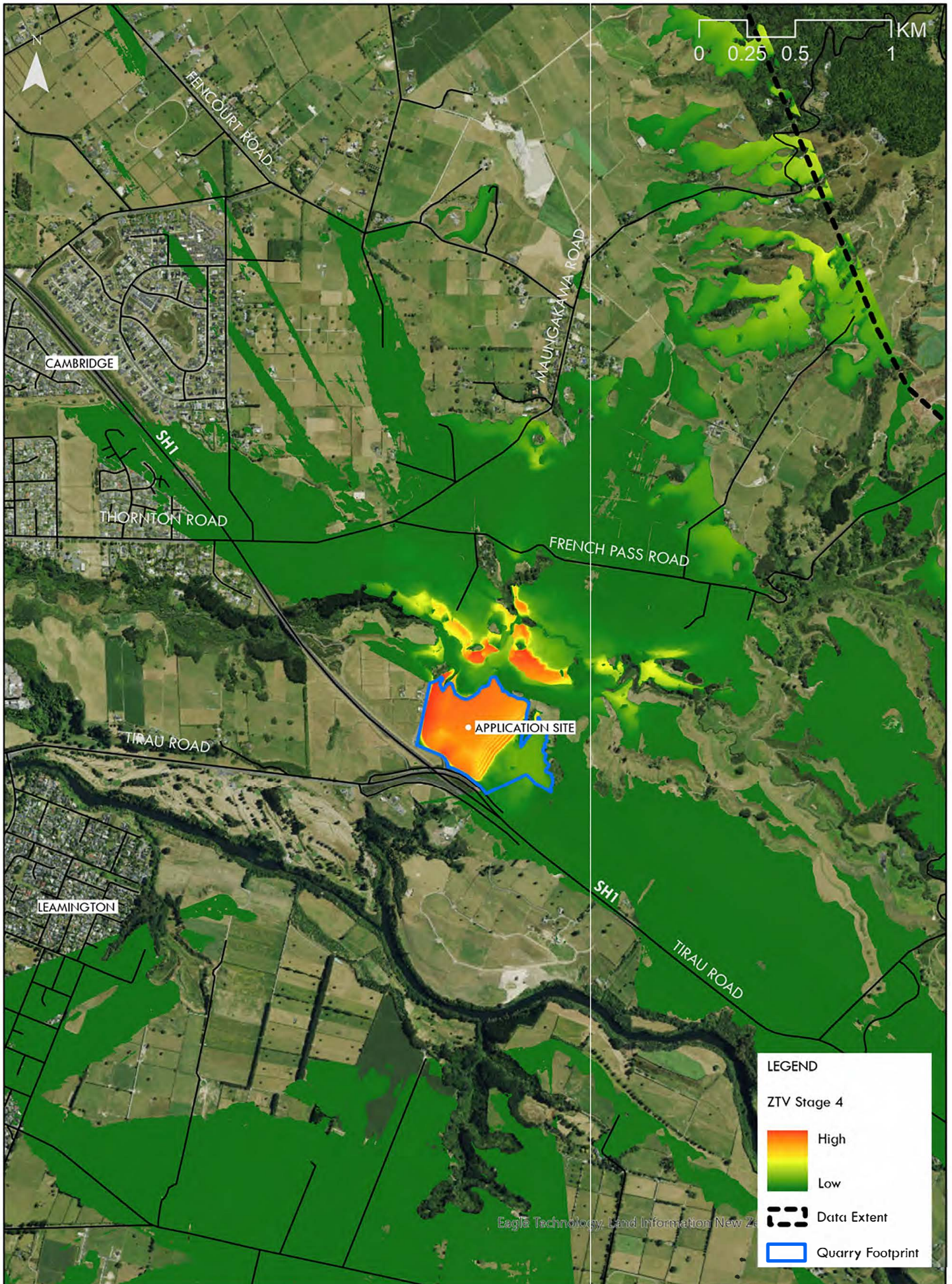


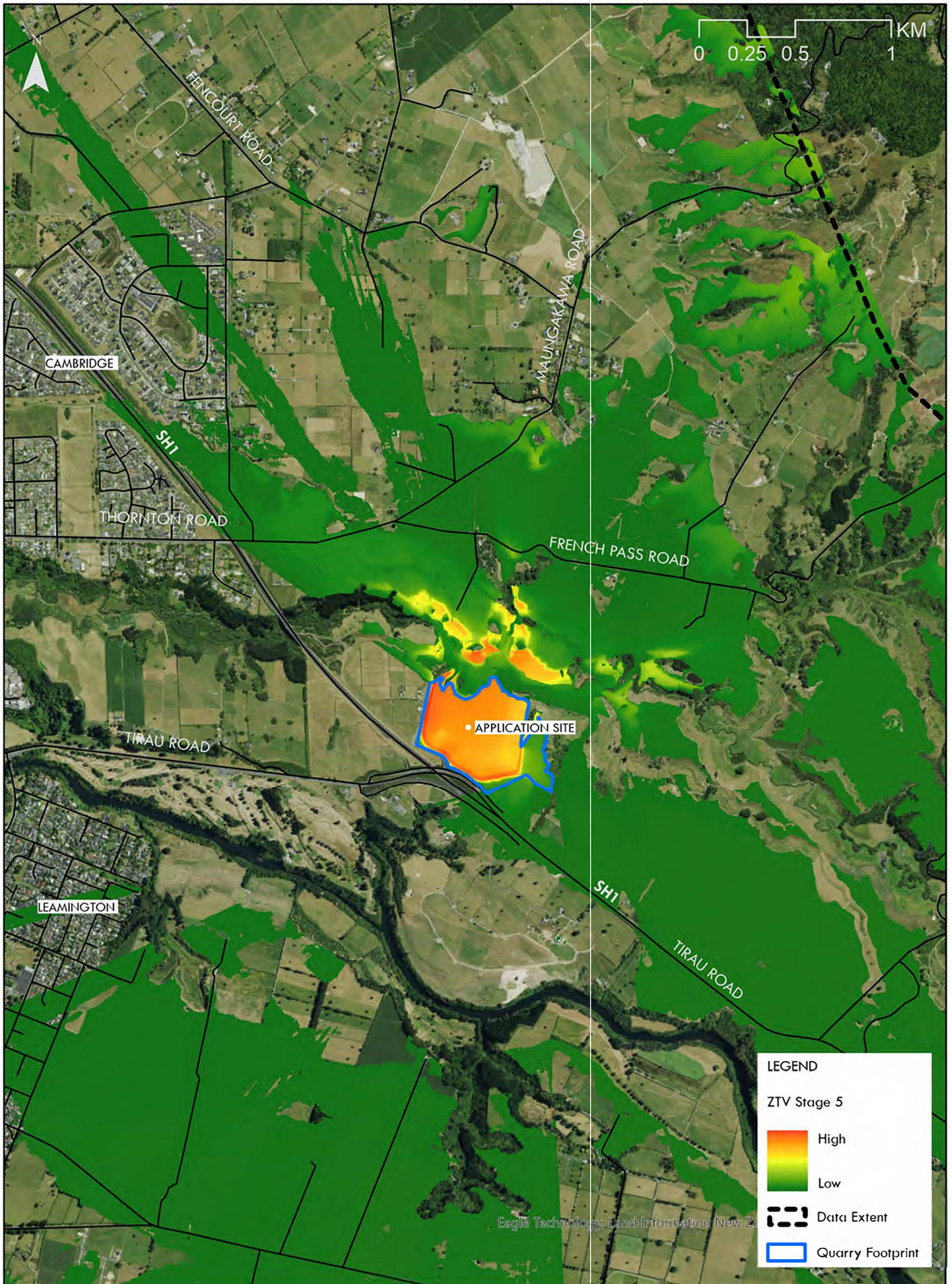


**LEGEND**

ZTV Stage 3

- High
- Low
- Data Extent
- Quarry Footprint





**LEGEND**

ZTV Stage 5

- High
- Low
- Data Extent
- Quarry Footprint

## Appendix Five: View Location Photographs



**View Location Data**

NZTM Easting: 1820593.69  
NZTM Northing: 5802664.28  
Focal length: 50mm  
Photographer: D. Mansergh  
Camera: Canon EOS D5 Full Frame Digital  
with EF 50mm f/1.4 USM (Prime)  
Date: 22nd October 2020

**VL 1 - PHOTOGRAPH FROM NEWCOMBE ROAD (LOOKING NORTH TOWARDS THE SITE)**

NEWCOMBE ROAD VLA, JANUARY 2021, RD





**View Location Data**

NZTM Easting: 1820118.15  
NZTM Northing: 5803000.63  
Focal length: 50mm  
Photographer: D. Mansergh  
Camera: Canon EOS D5 Full Frame Digital  
with EF 50mm f/1.4 USM (Prime)  
Date: 22nd October 2020

**VL 2 - PHOTOGRAPH FROM STATE HIGHWAY 1 (LOOKING EAST TOWARDS THE SITE)**

NEWCOMBE ROAD VLA, JANUARY 2021, RD





**View Location Data**

NZTM Easting: 1819968.64  
NZTM Northing: 5802218.93  
Focal length: 50mm  
Photographer: D. Mansergh  
Camera: Canon EOS D5 Full Frame Digital  
with EF 50mm 1:1.4 USM (Prime)  
Date: 22nd October 2020

**VL 3 - PHOTOGRAPH FROM STATE HIGHWAY 1 (LOOKING SOUTH-EAST TOWARDS THE SITE)**

NEWCOMBE ROAD VLA, JANUARY 2021, RD







**View Location Data**

NZTM Easting: 1820191.06  
NZTM Northing: 5802207.76  
Focal length: 50mm  
Photographer: D. Mansergh  
Camera: Canon EOS D5 Full Frame Digital  
with EF 50mm f/1.4 USM (Prime)  
Date: 26th November 2020

**VL 4 - PHOTOGRAPH FROM EDGE OF SITE REPRESENTATIVE OF DWELLING AT 41 NEWCOMBE ROAD (LOOKING EAST TOWARDS THE SITE)**

NEWCOMBE ROAD VLA, JANUARY 2021, RD





Proposed Sand Quarry



**View Location Data**

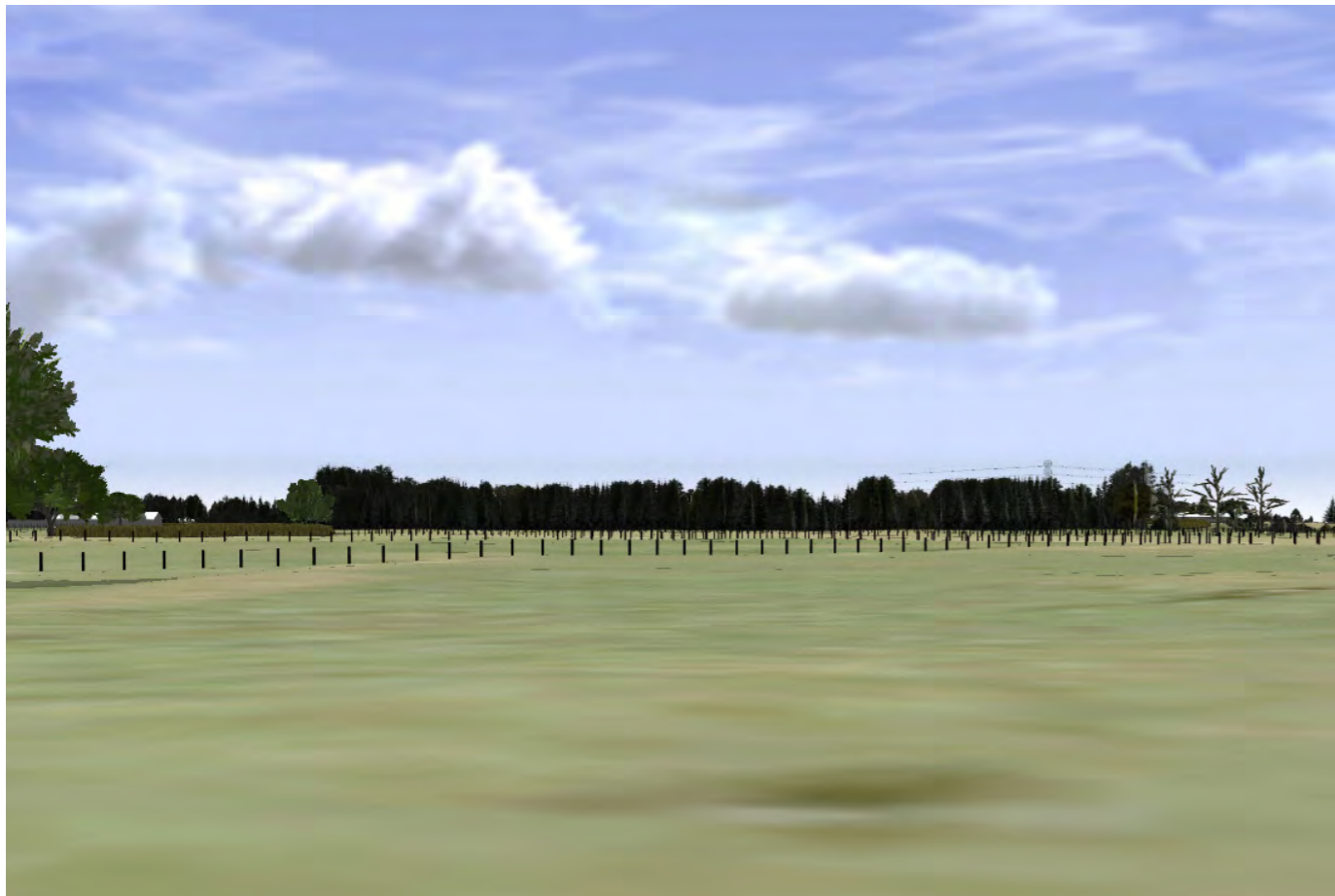
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Camera: Canon EOS D5 Full Frame Digital  
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Date: 22nd October 2020

**VL 5 - PHOTOGRAPH FROM FRENCH PASS ROAD (LOOKING SOUTH-WEST TOWARDS THE SITE)**

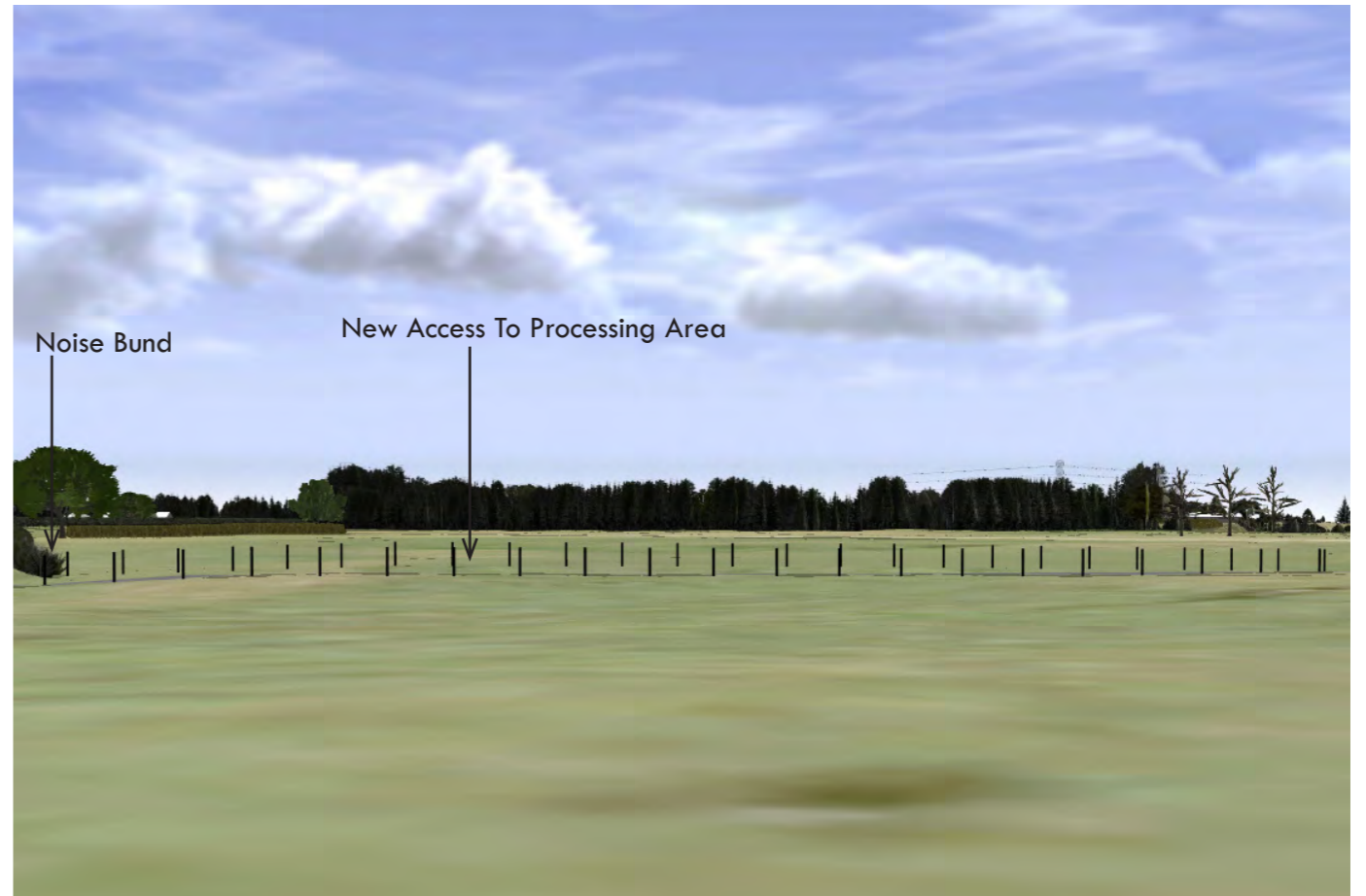
NEWCOMBE ROAD VLA, JANUARY 2021, RD



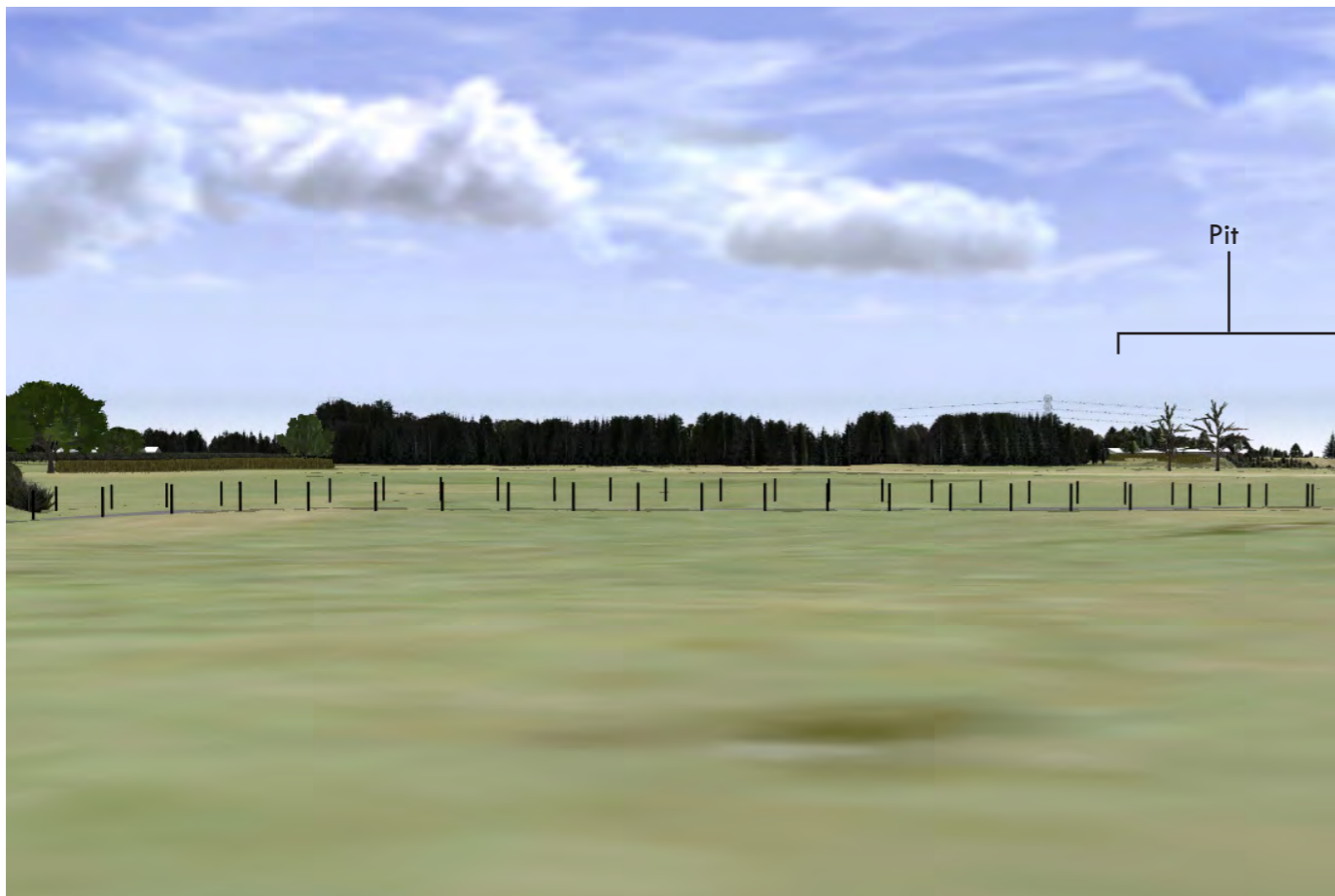
## Appendix Six: Images Generated from the 3D Interactive Model



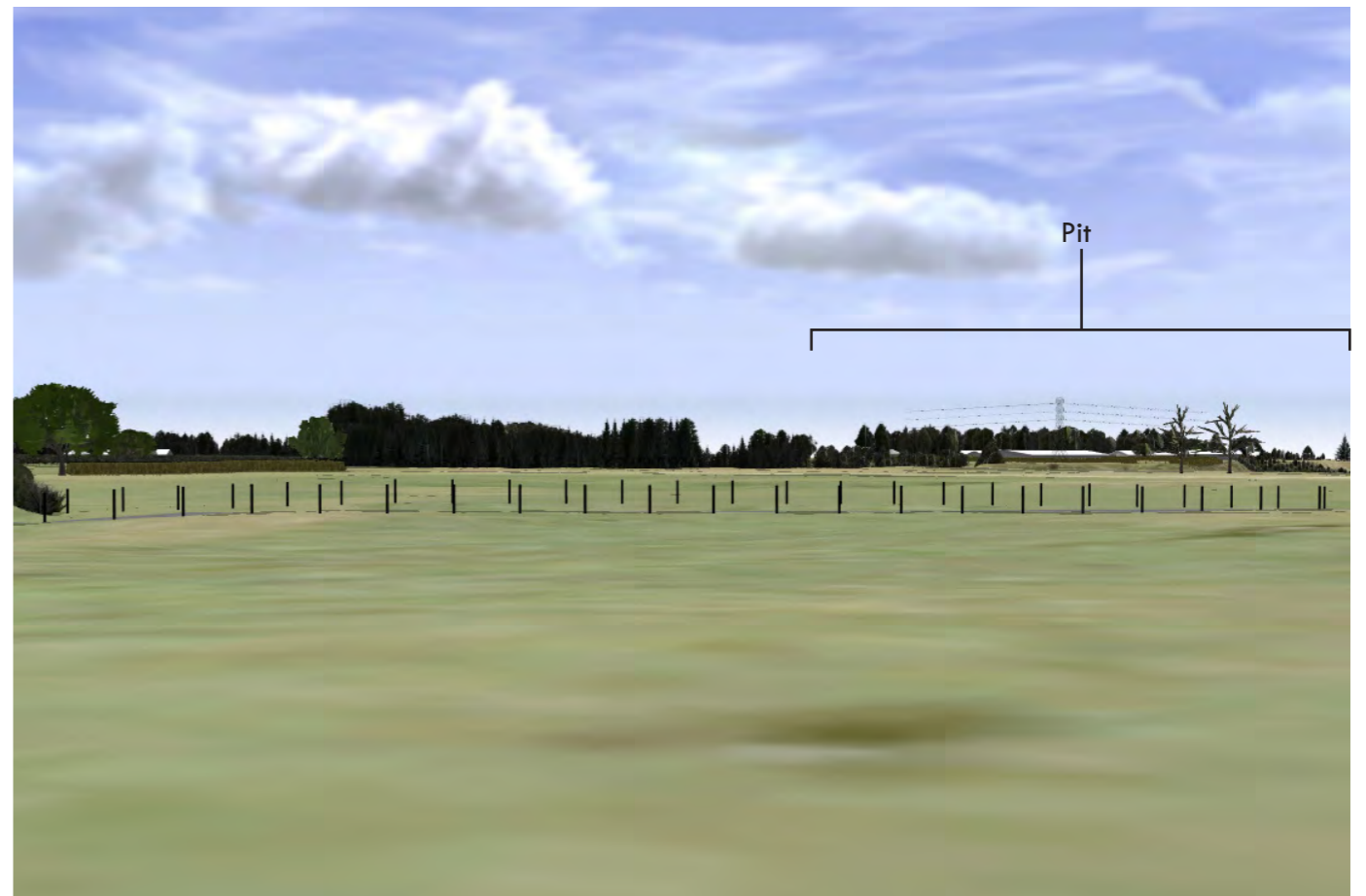
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PROCESSING AREA (OUT OF FRAME)



STAGE 1

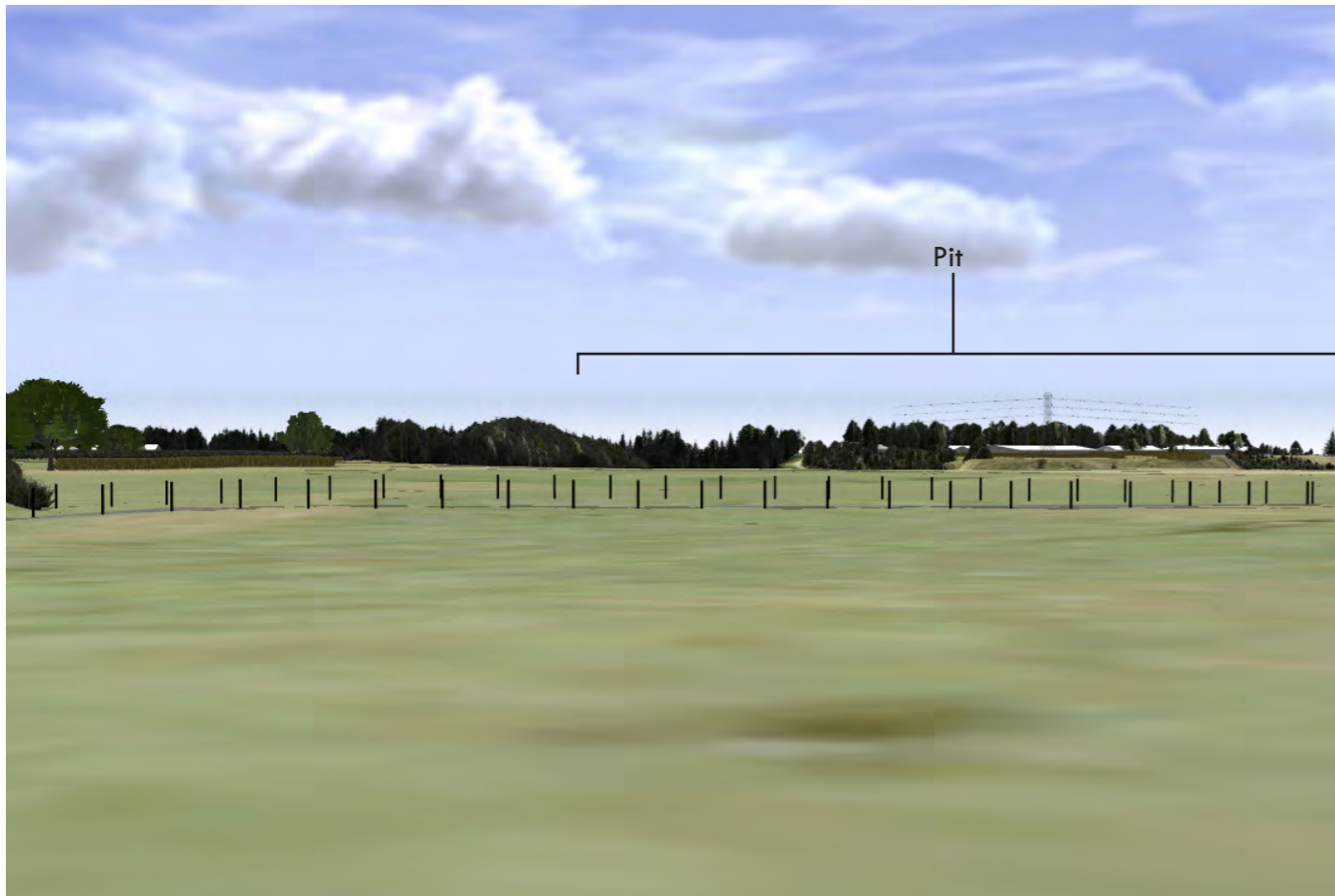


STAGE 2

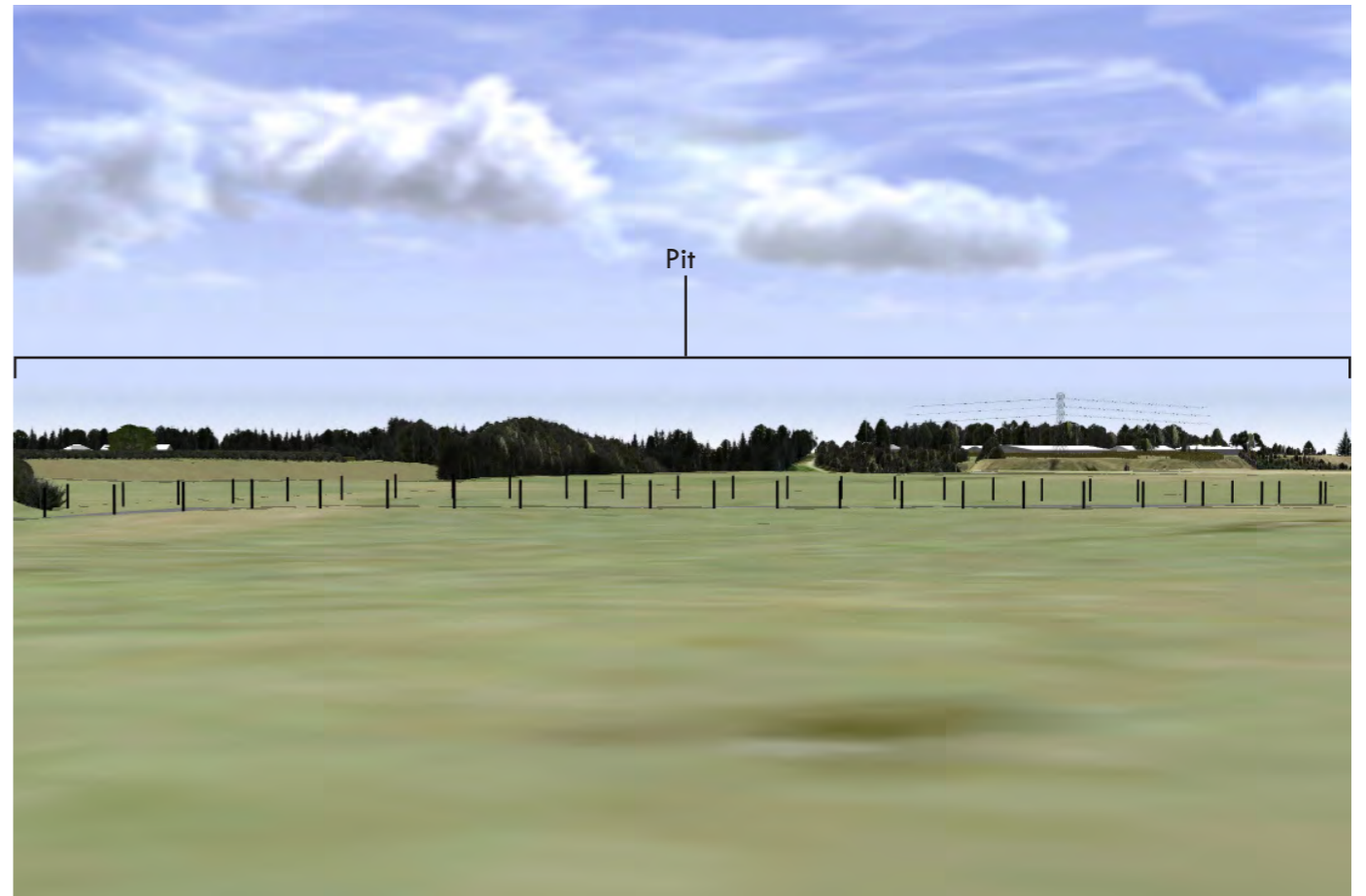
IMAGES GENERATED FROM MODEL SHOWING CHANGE FROM VL 1 (LOOKING NORTH TOWARDS THE SITE)

RS SAND VLA. JULY 2022. R2

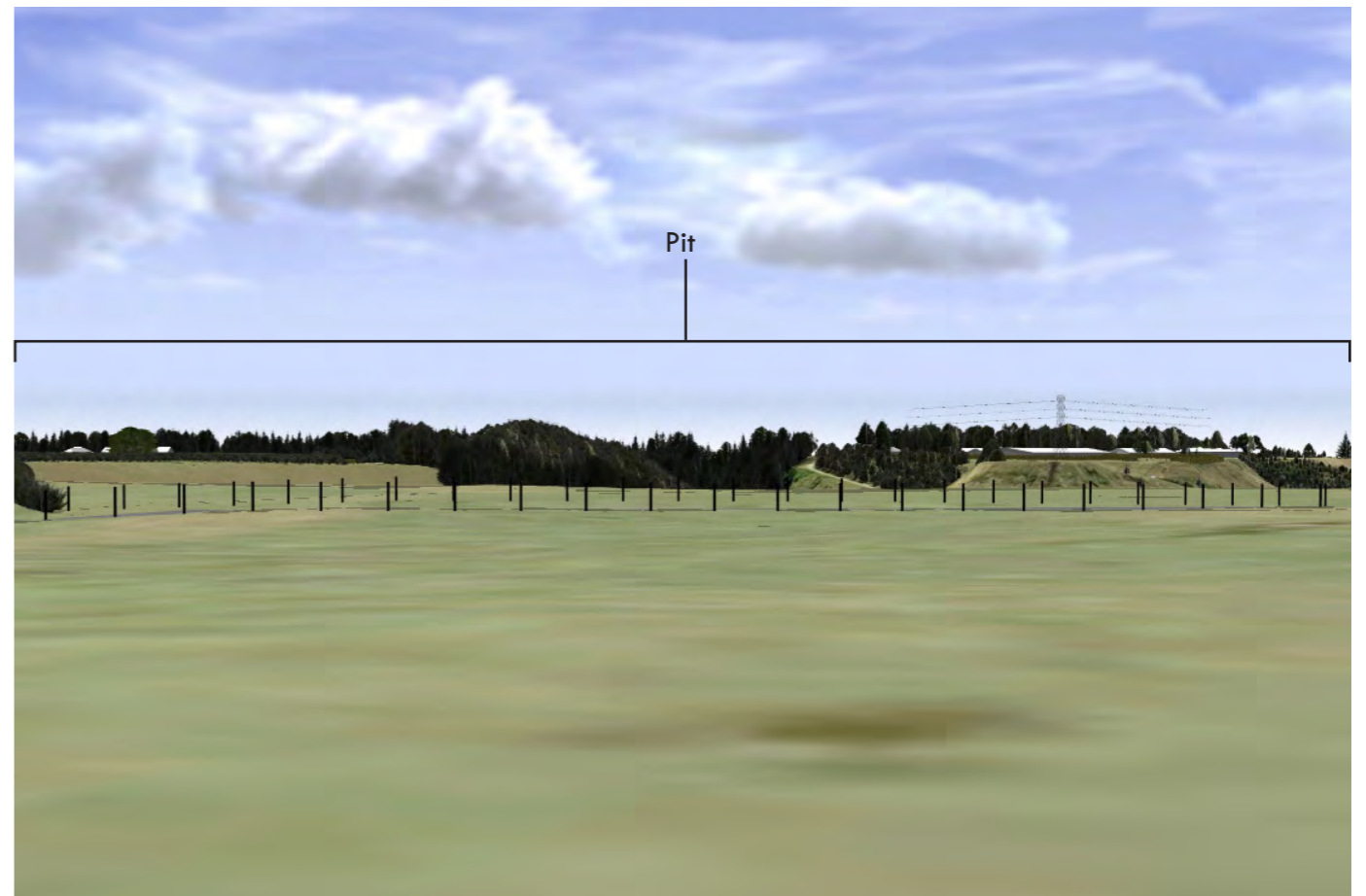




STAGE 3



STAGE 4

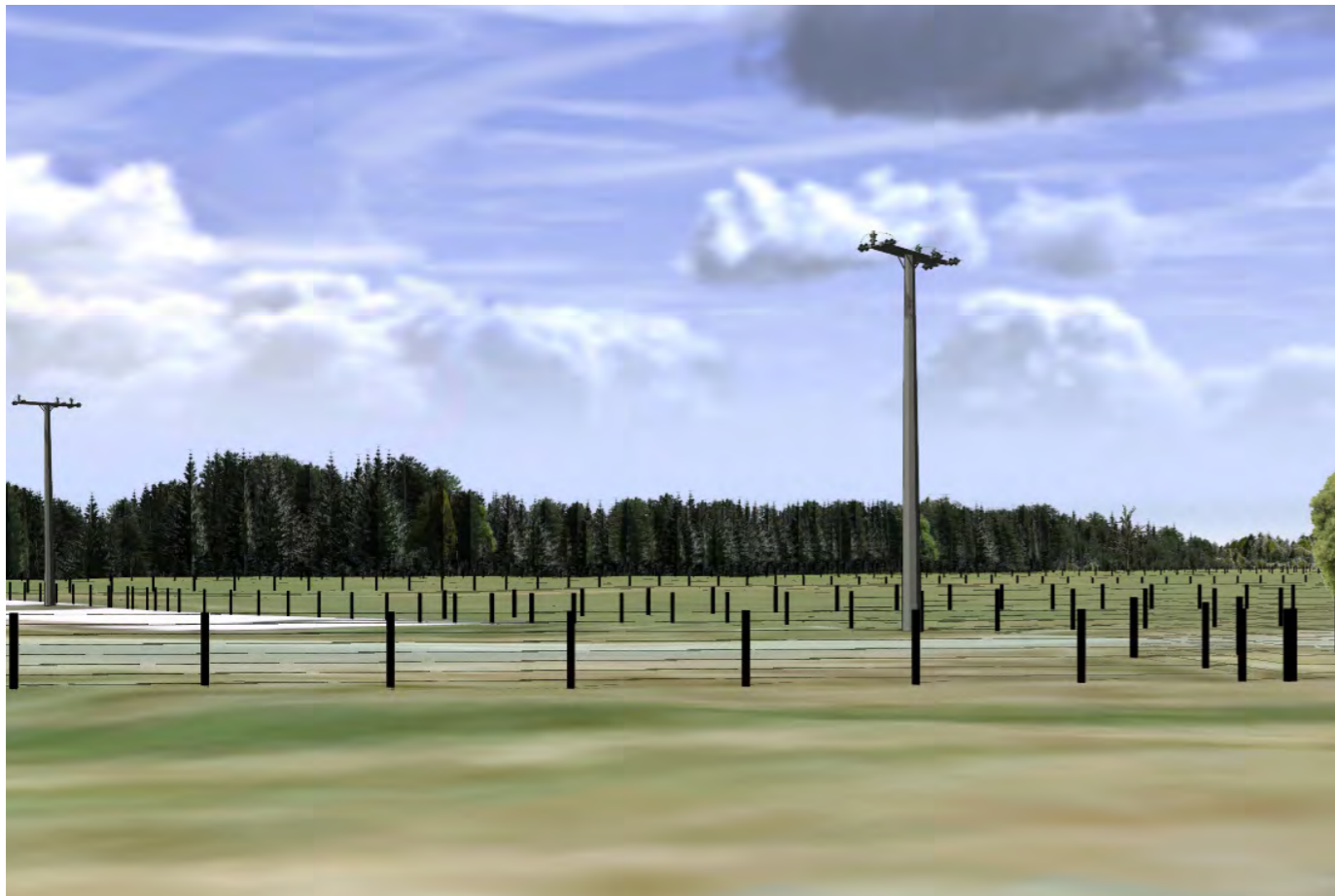


STAGE 5

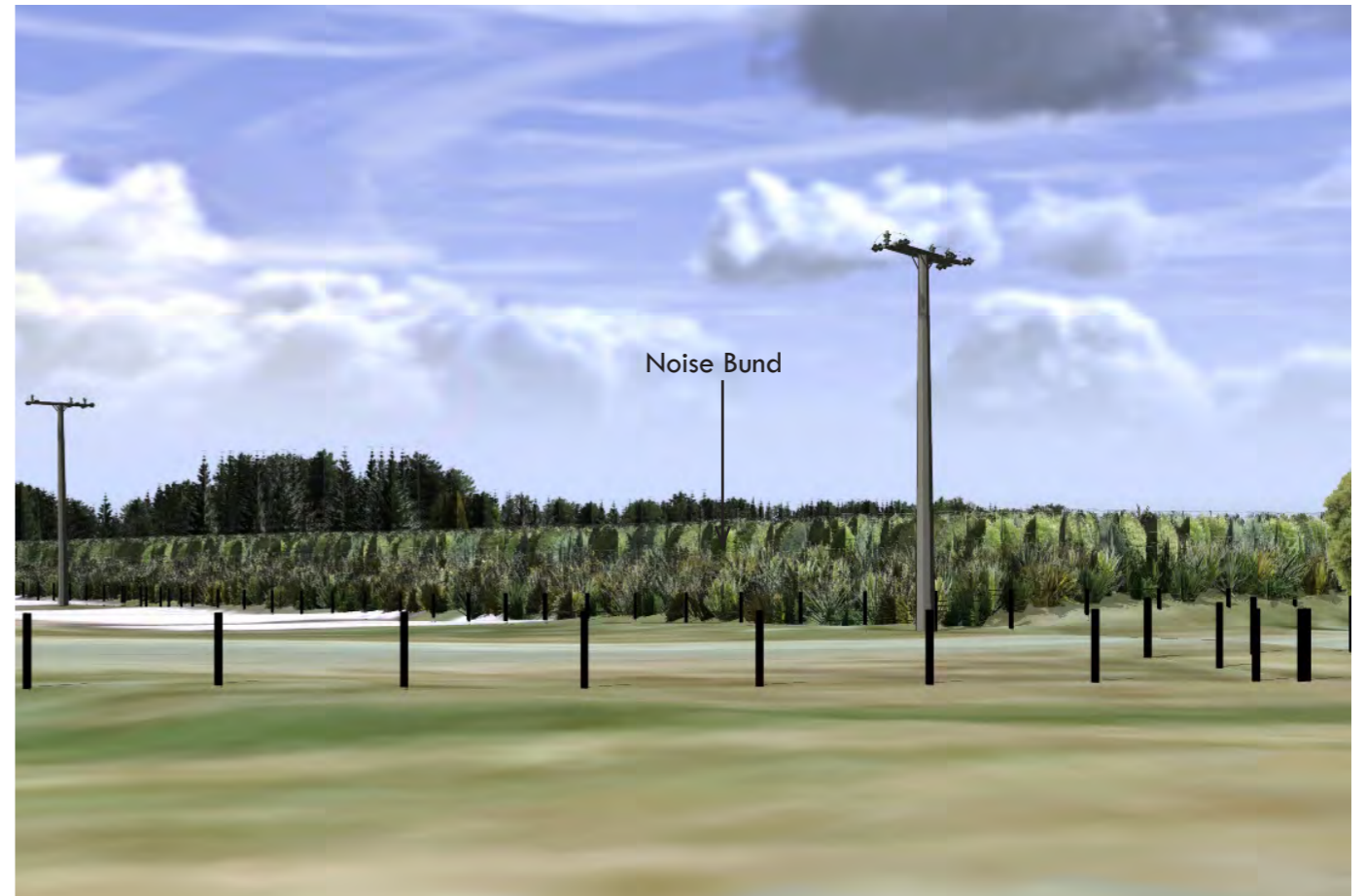
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RS SAND VLA. JULY 2022. R2

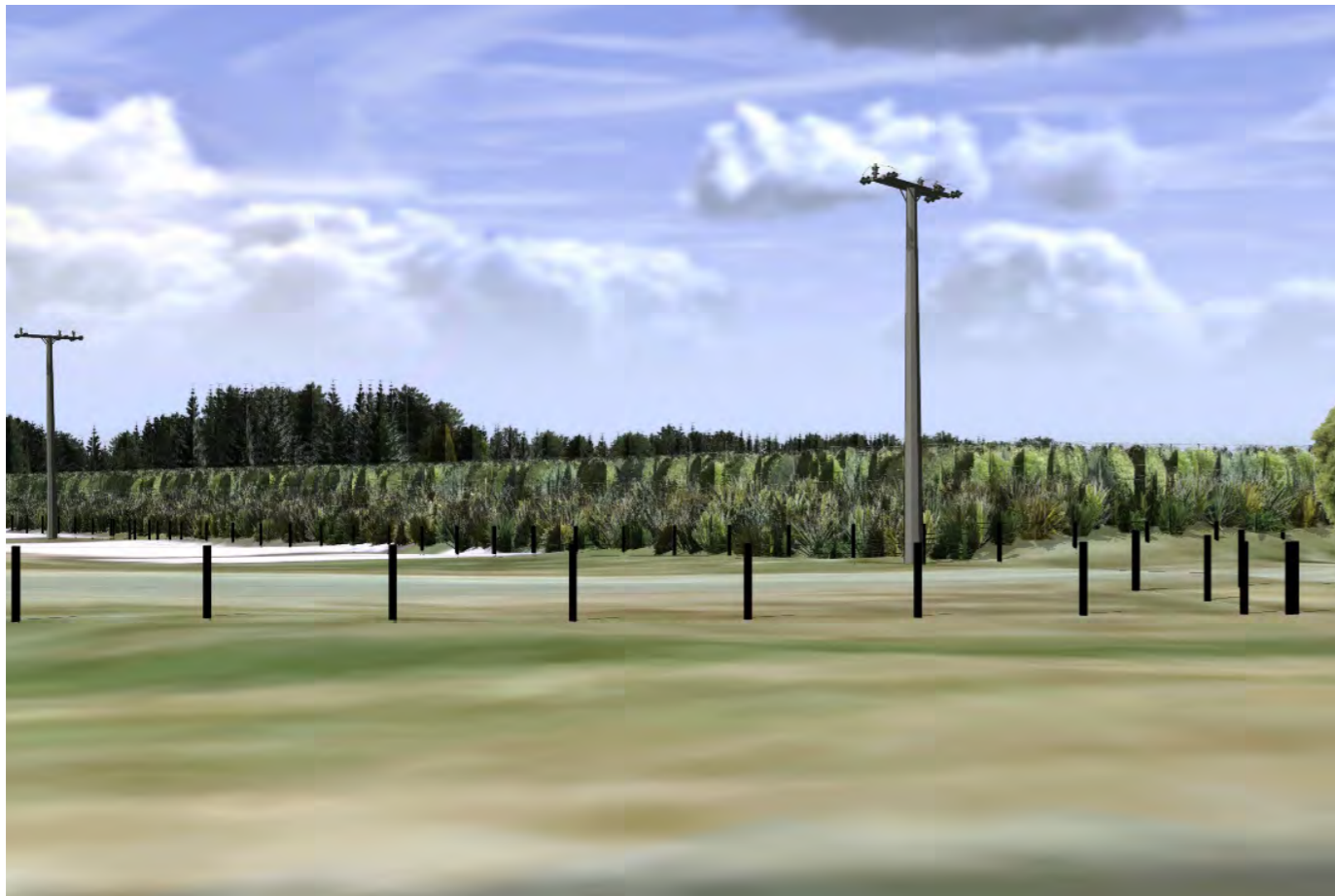




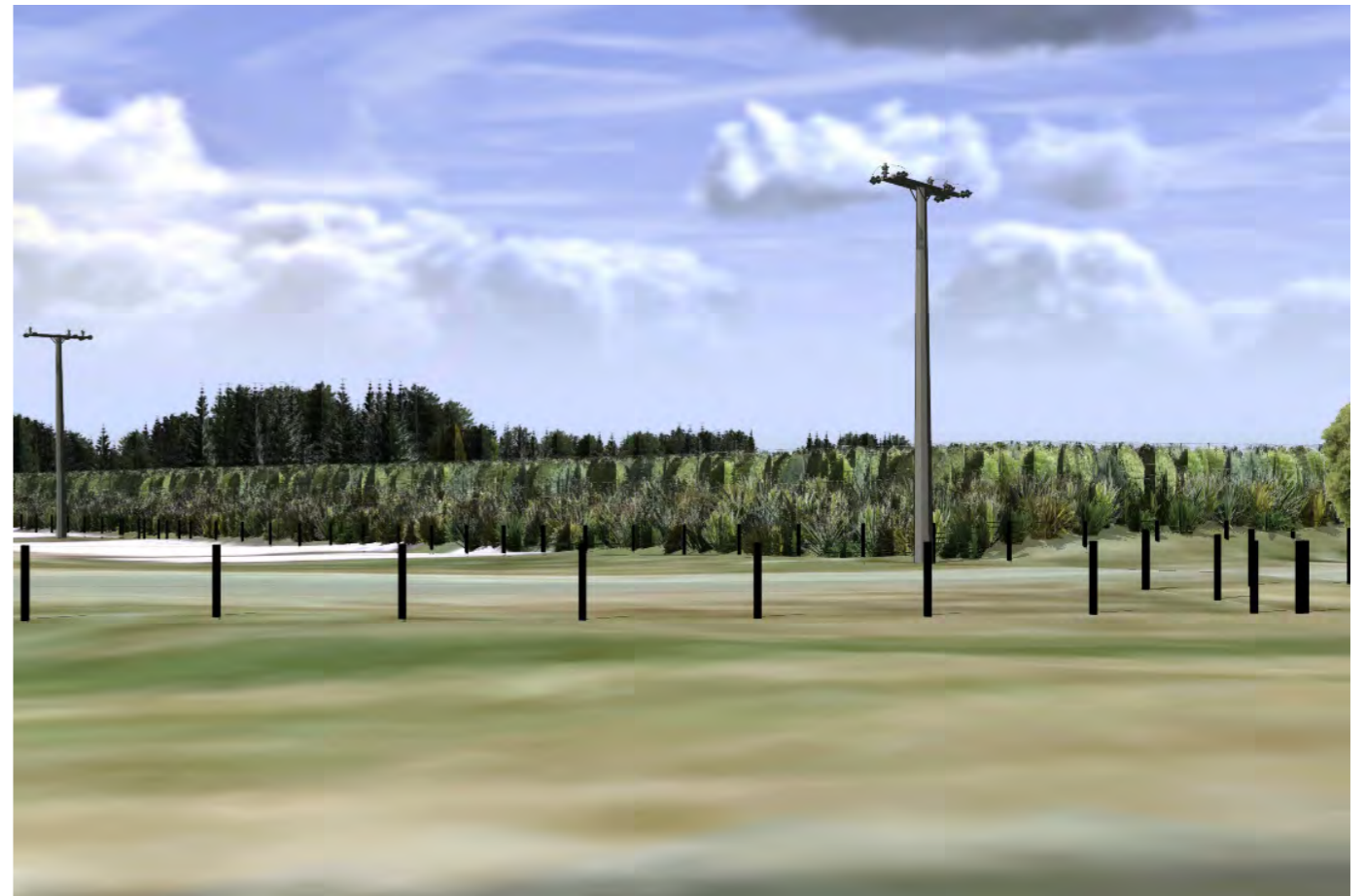
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PROCESSING AREA (OUT OF FRAME)



STAGE 1

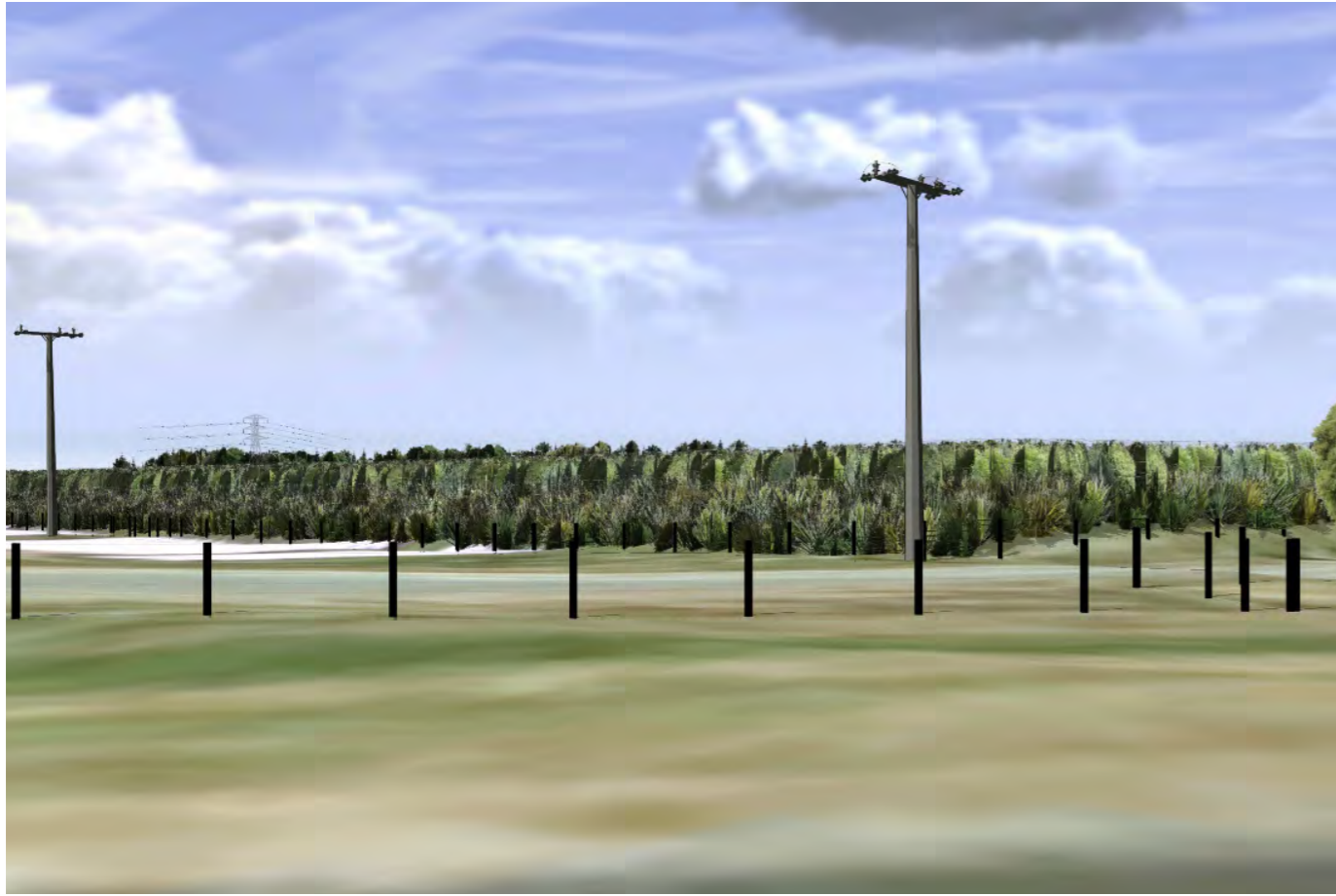


STAGE 2

IMAGES GENERATED FROM MODEL SHOWS CHANGE FROM VL 2 (LOOKING EAST TOWARDS THE SITE)

RS SAND VLA. JULY 2022. R2





STAGE 3 - STAGE 5

IMAGES GENERATED FROM MODEL SHOWING CHANGE FROM VL 2 (LOOKING EAST TOWARDS THE SITE)

RS SAND VLA. JULY 2022. R2



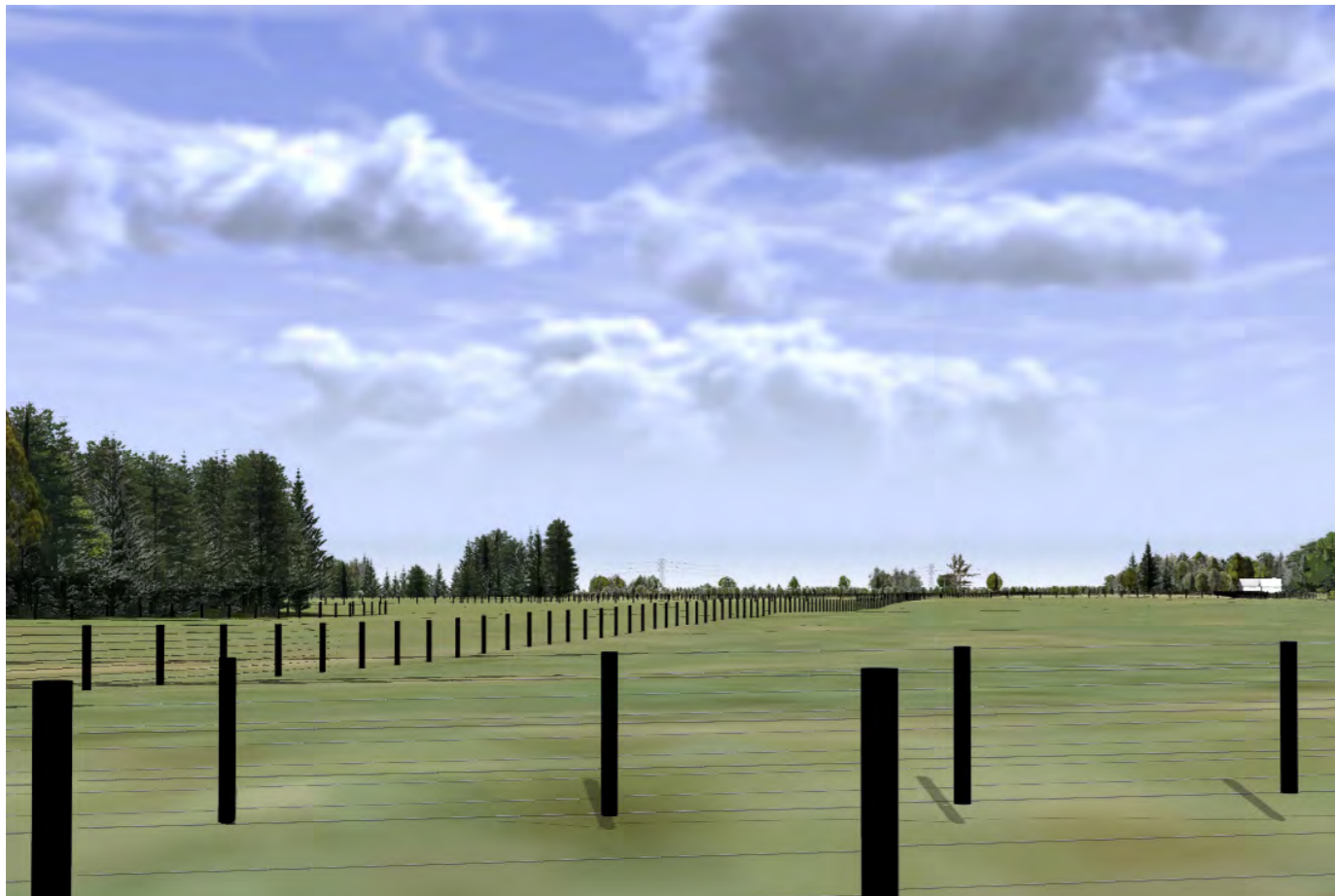


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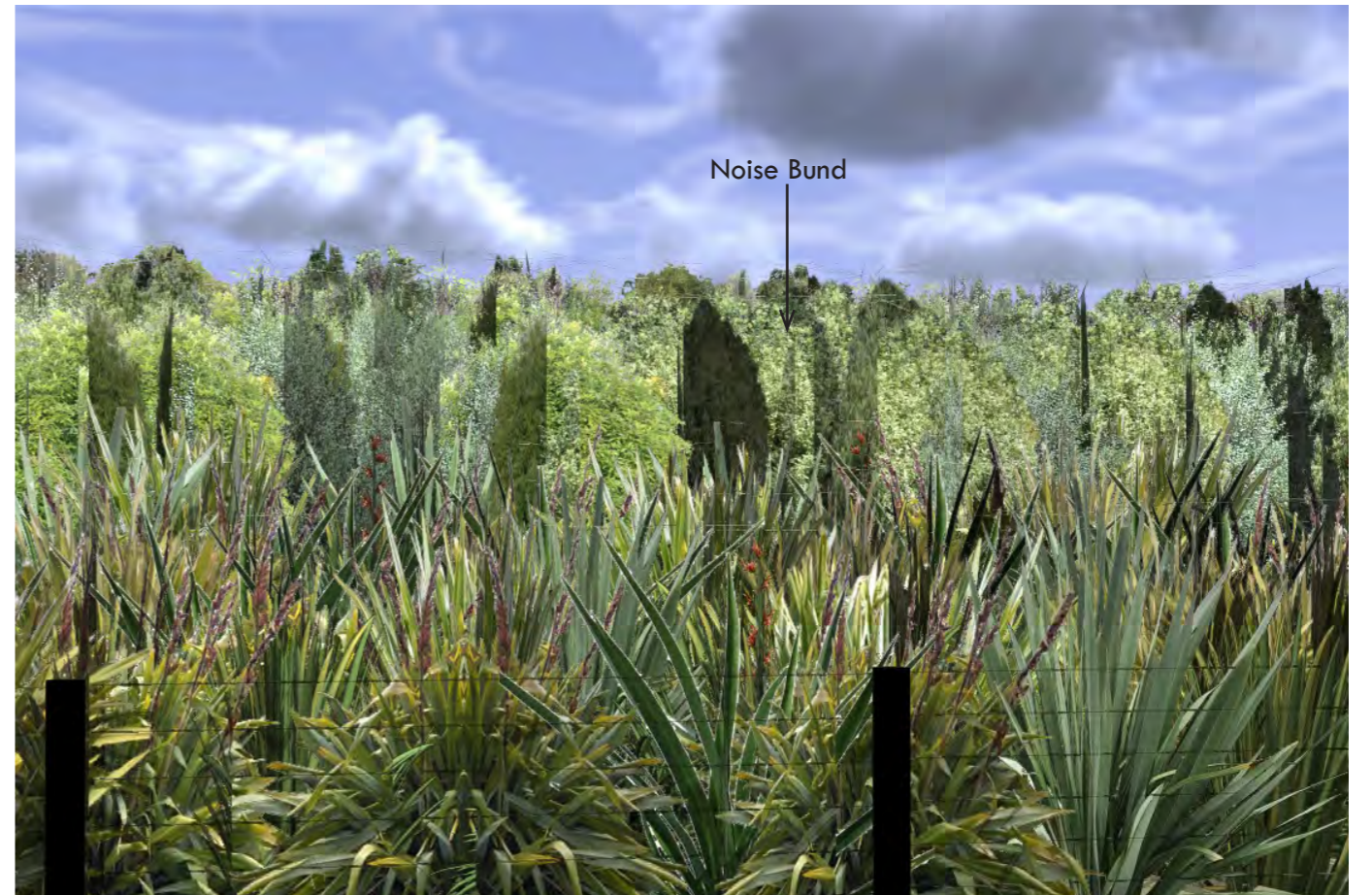


PROCESSING AREA - STAGE 5





EXISTING (REFER PHOTOGRAPH FOR TRUE CONCEPT)

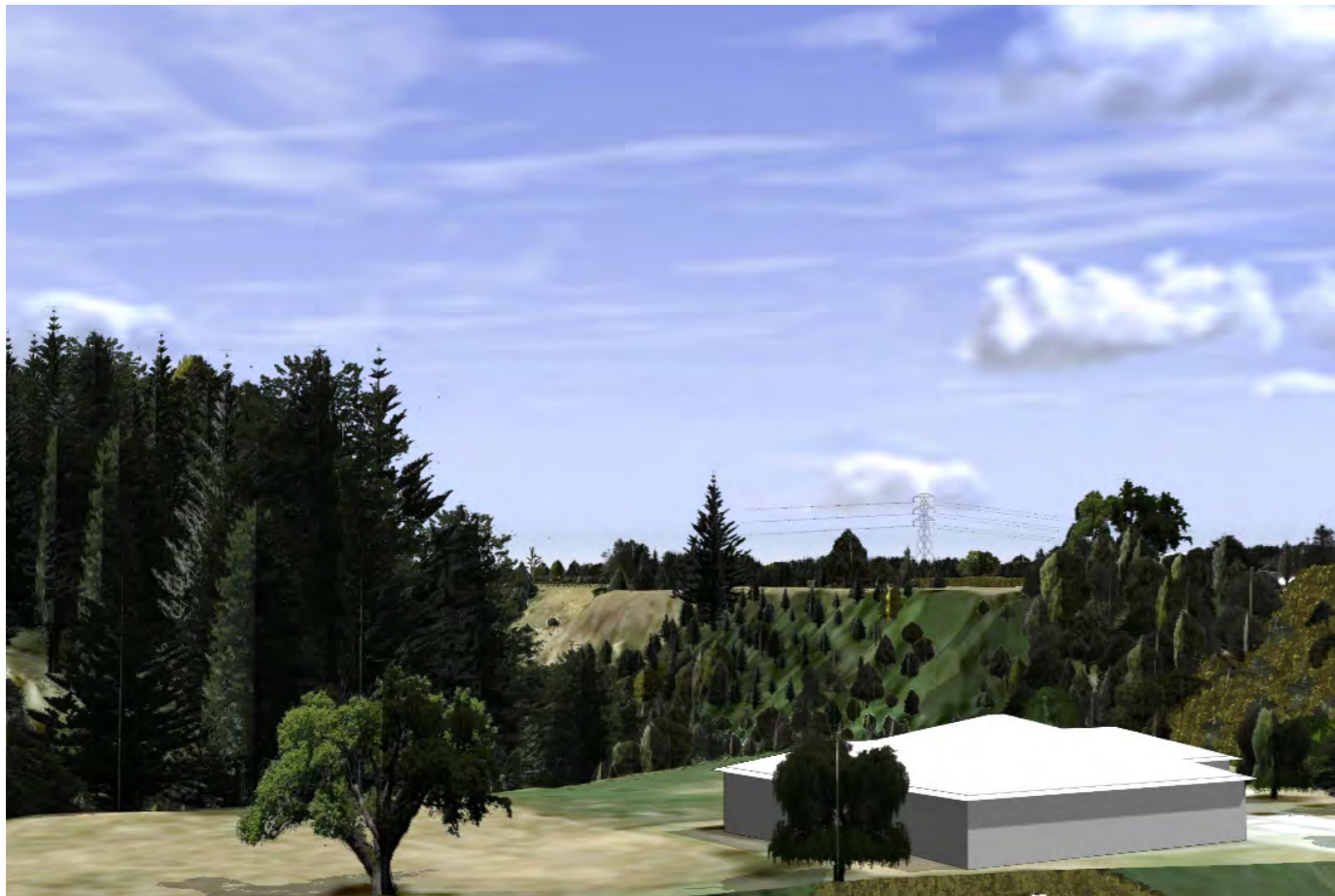


PROCESSING AREA - STAGE 5

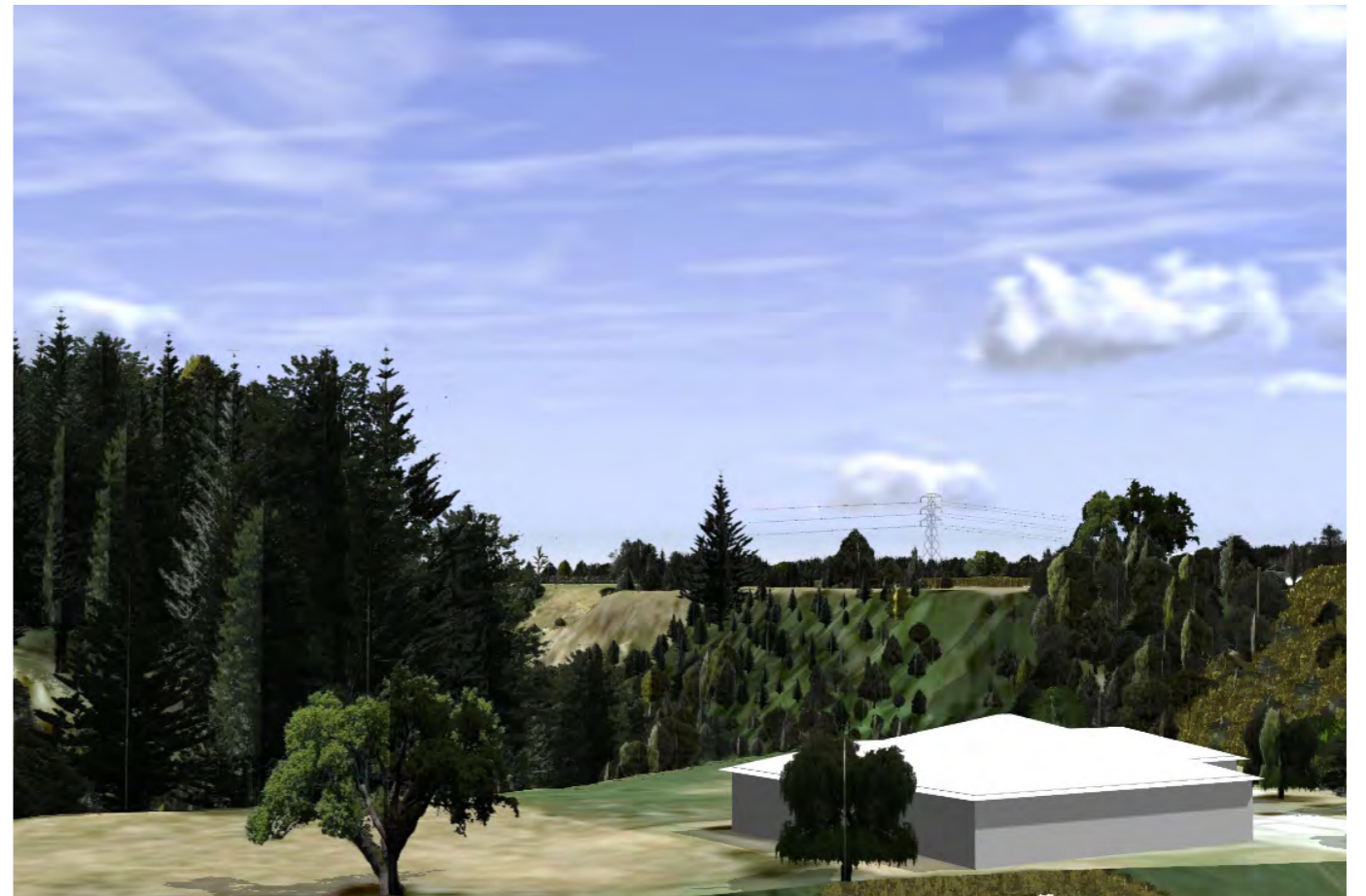
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RS SAND VLA. JULY 2022. R2

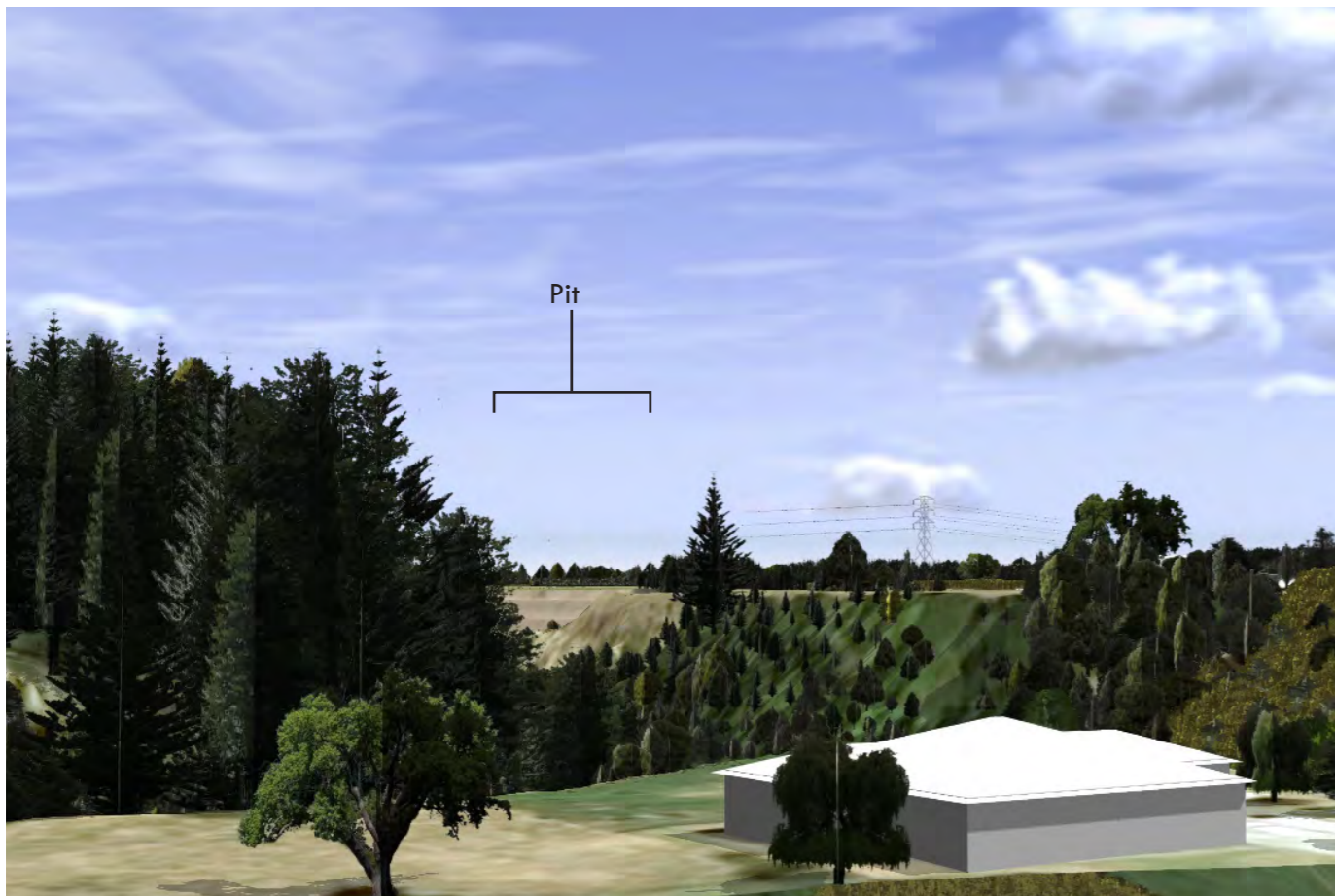




EXISTING (REFER PHOTOGRAPH FOR TRUE CONCEPT)



PROCESSING AREA (OUT OF FRAME)



STAGE 1

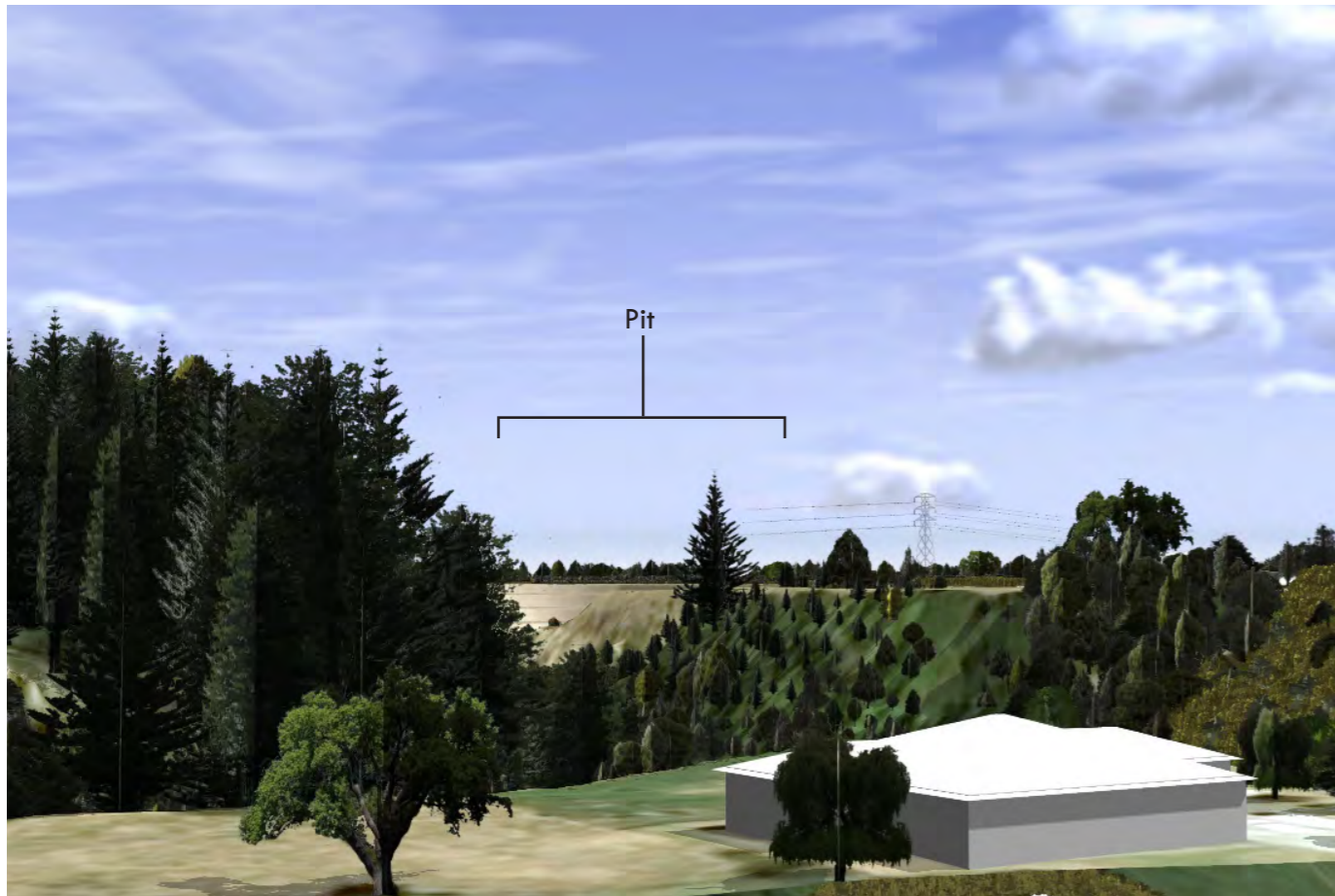


STAGE 2

IMAGES GENERATED FROM MODEL SHOWING CHANGE FROM VL 5 (LOOKING SOUTH-WEST TOWARDS THE SITE)

RS SAND VLA. JULY 2022. R2





STAGE 3



STAGE 4

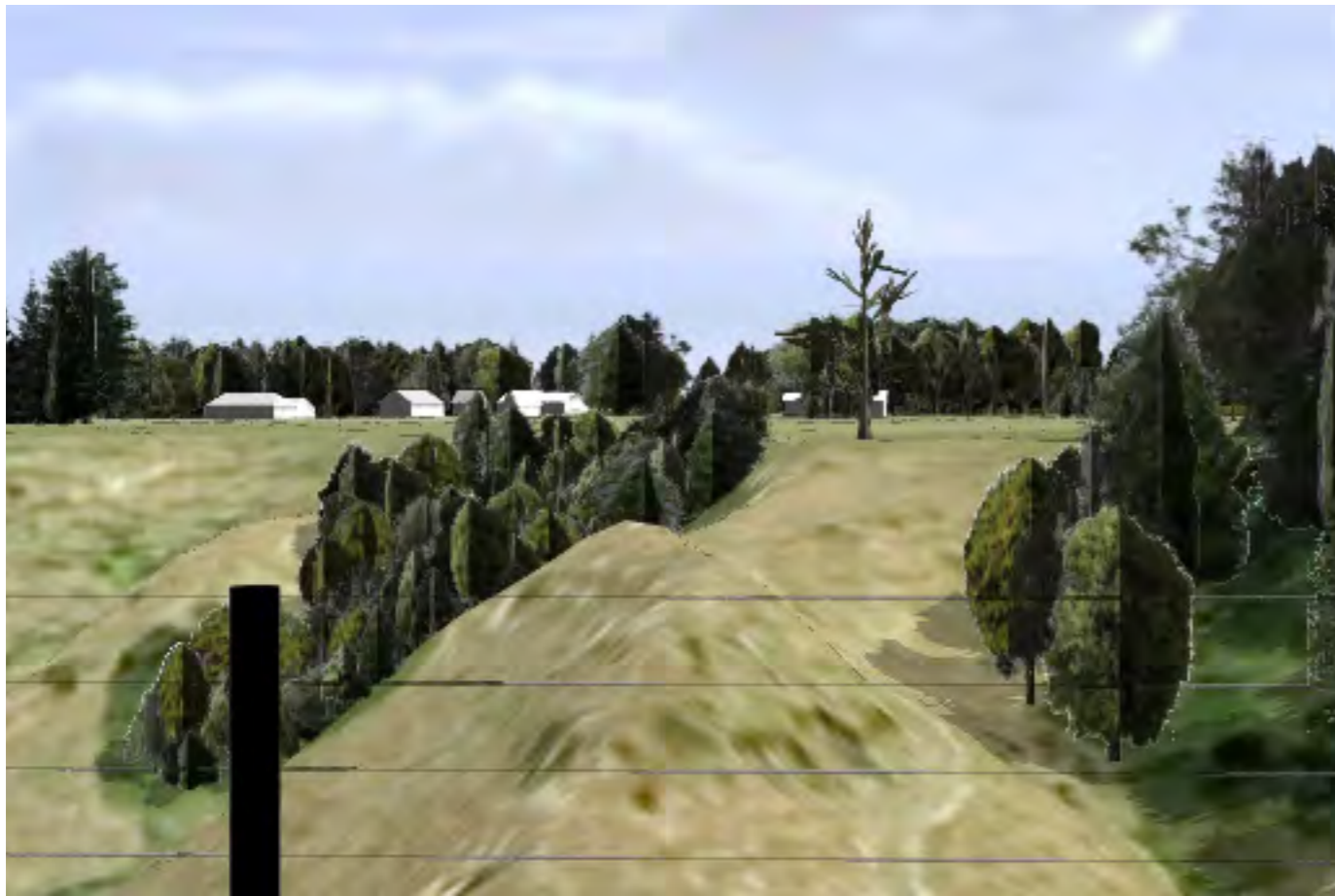


STAGE 5

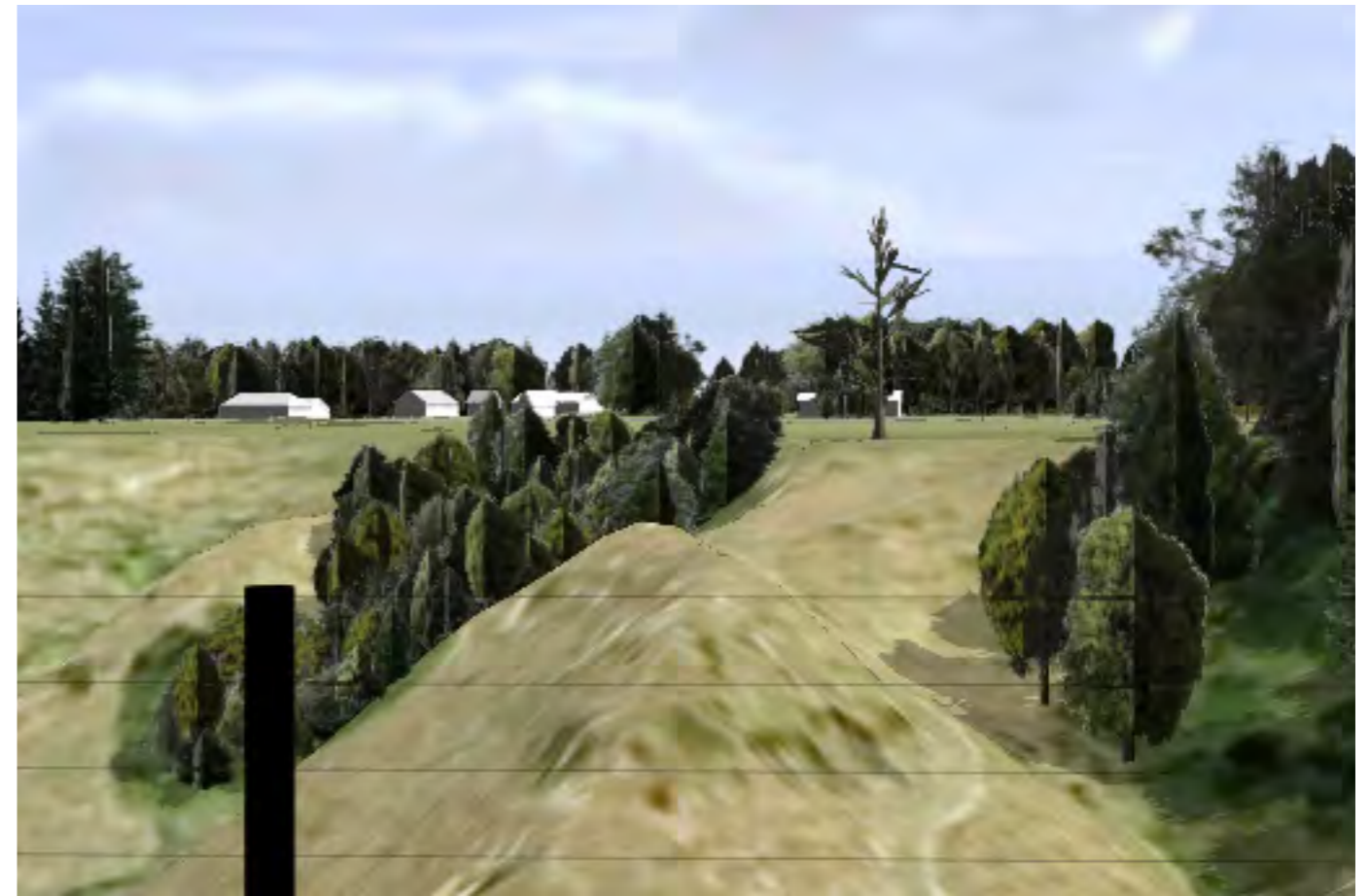
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RS SAND VLA. JULY 2022. R2

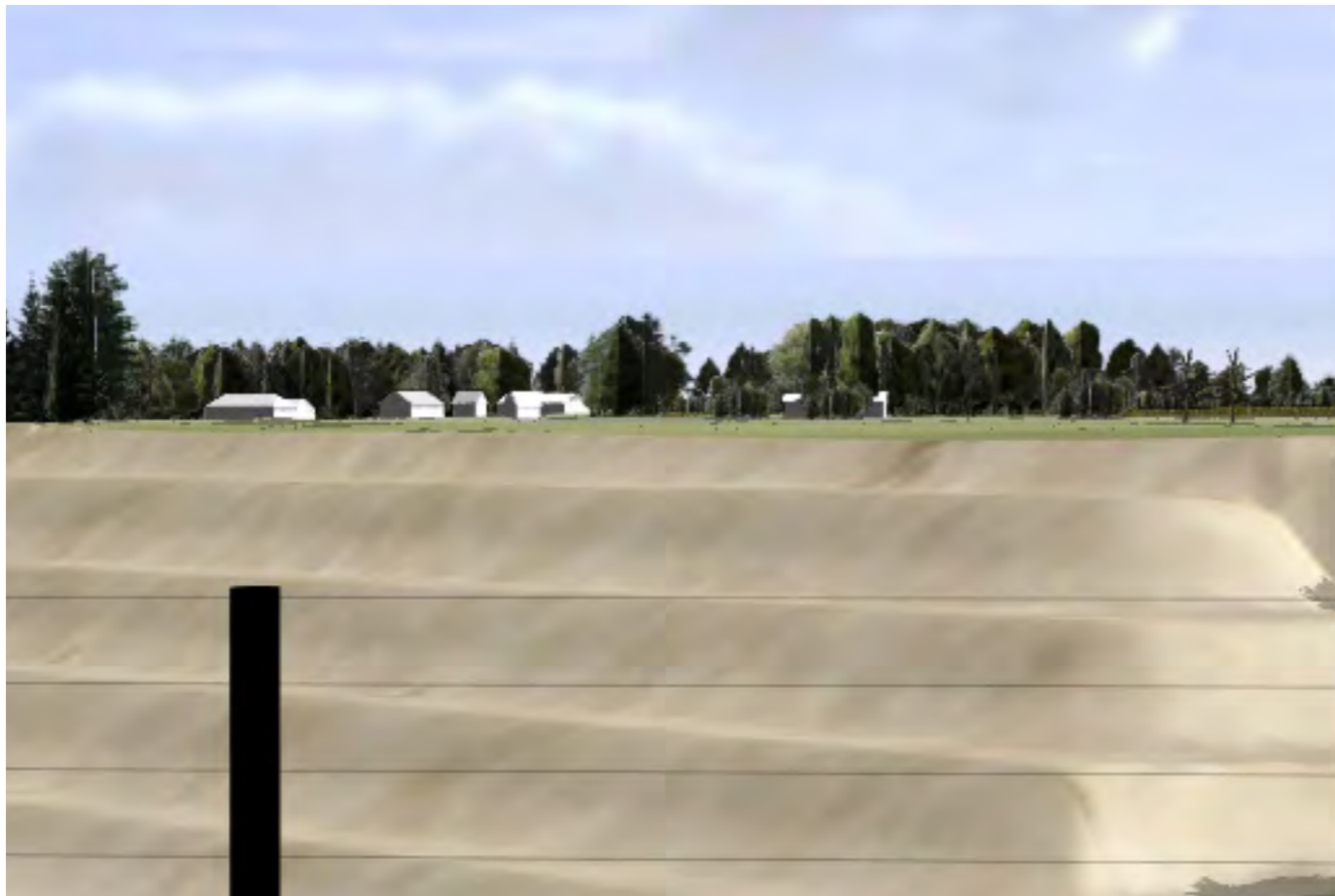




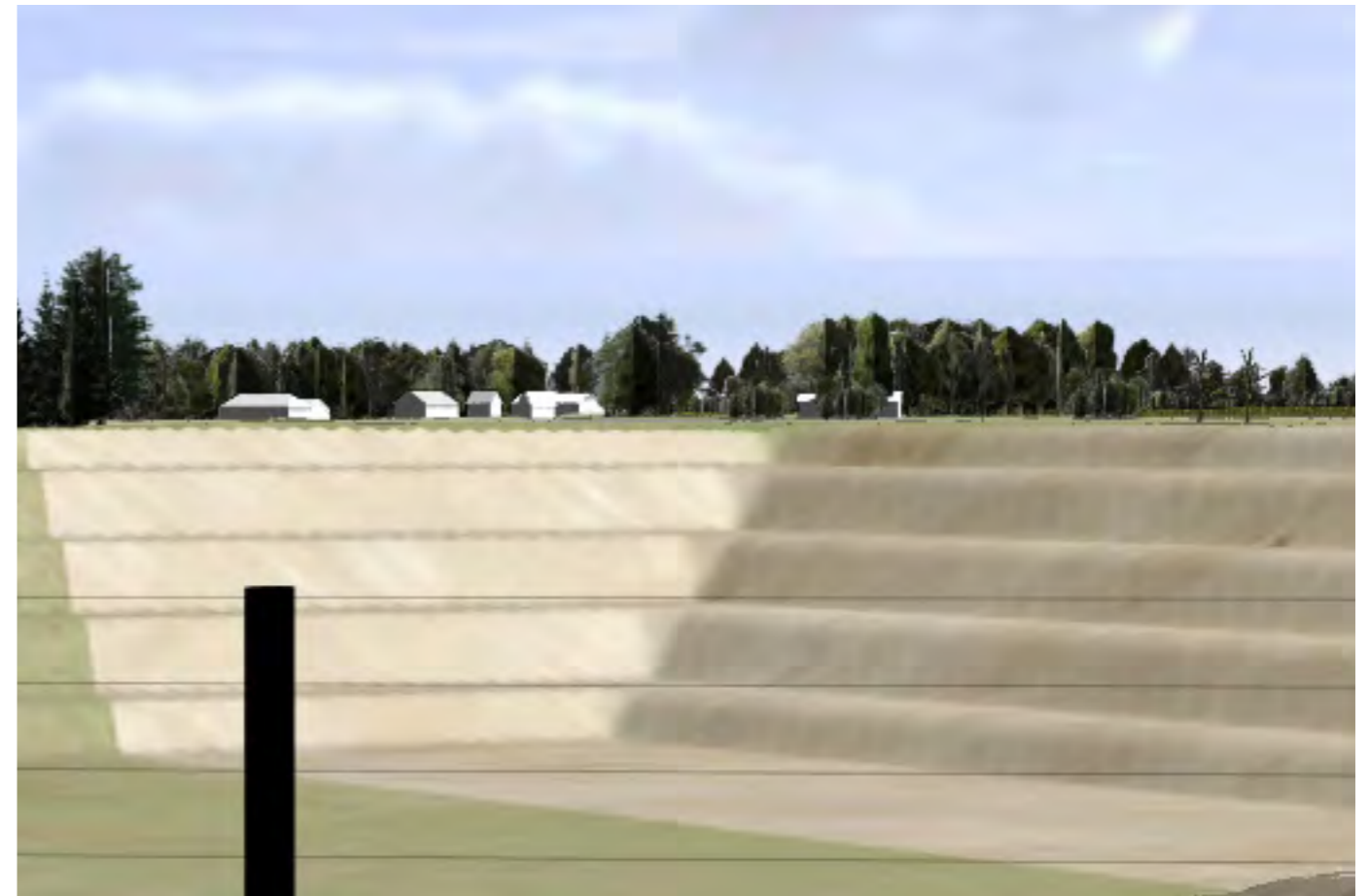
EXISTING



PROCESSING AREA



STAGE 1

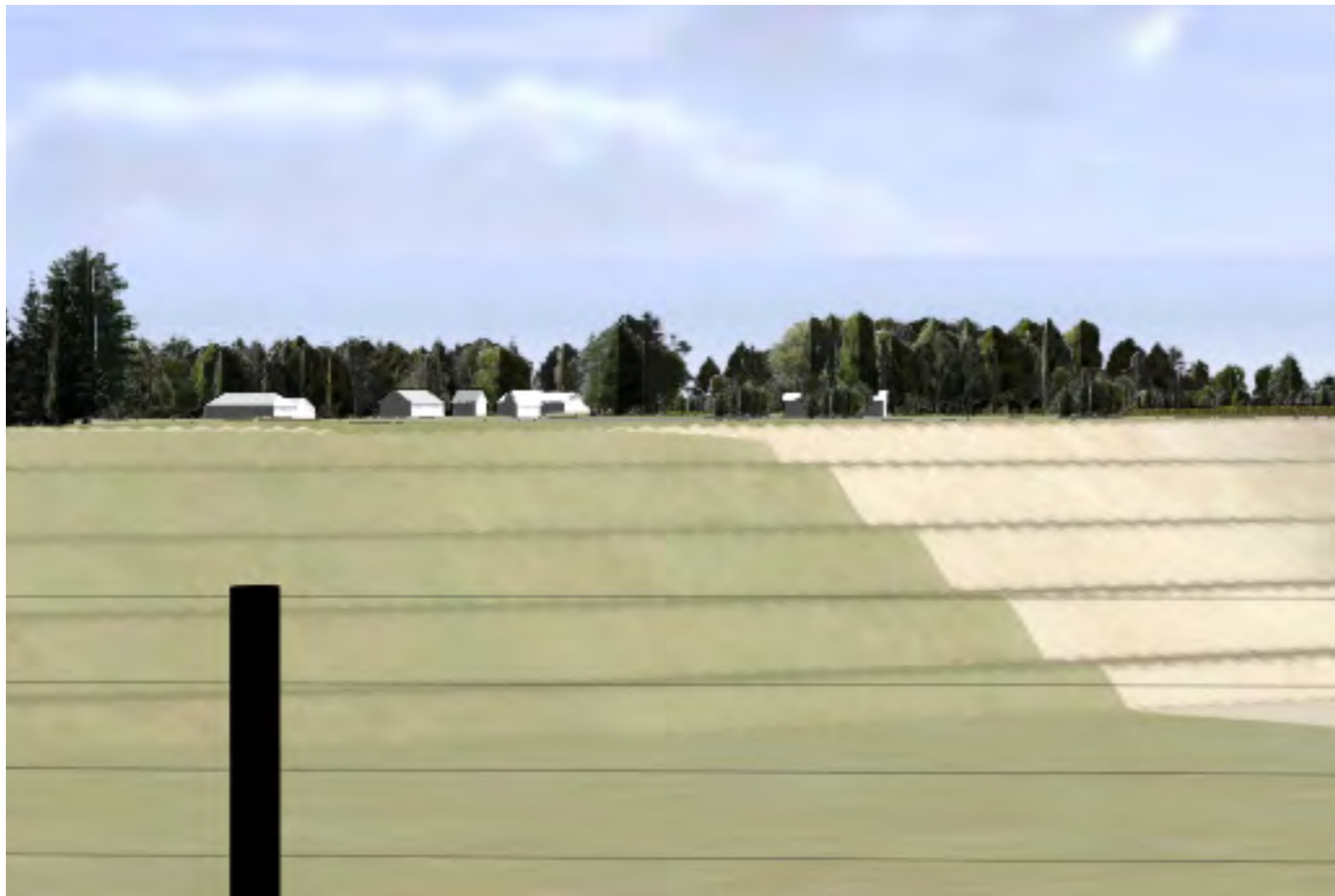


STAGE 2

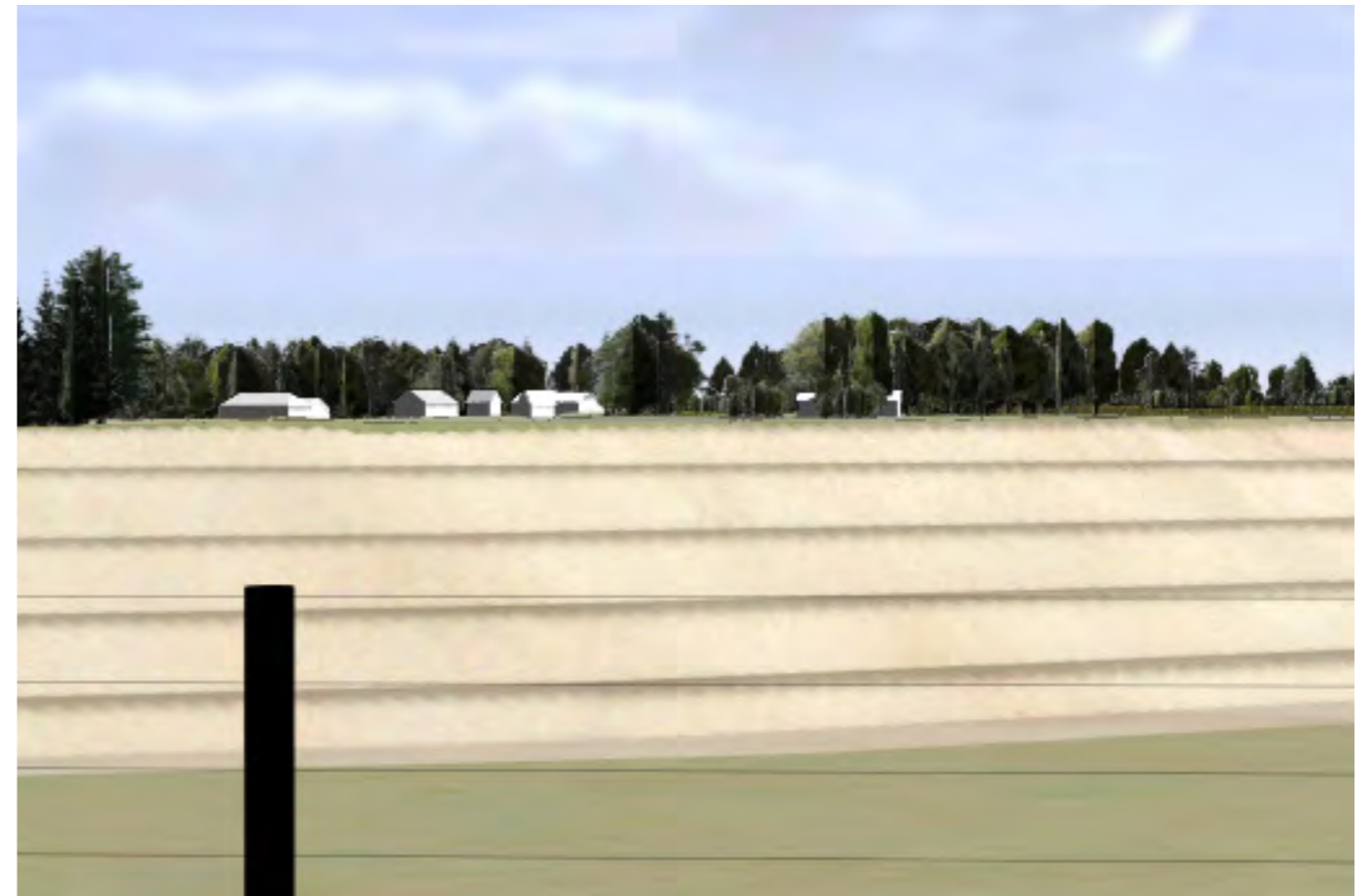
IMAGES GENERATED FROM MODEL SHOWING CHANGE FROM VL A (NORTHERN ESCARPMENT OF THE KARAPIRO STREAM GULLY)

RS SAND VLA. AUGUST 2022. RD

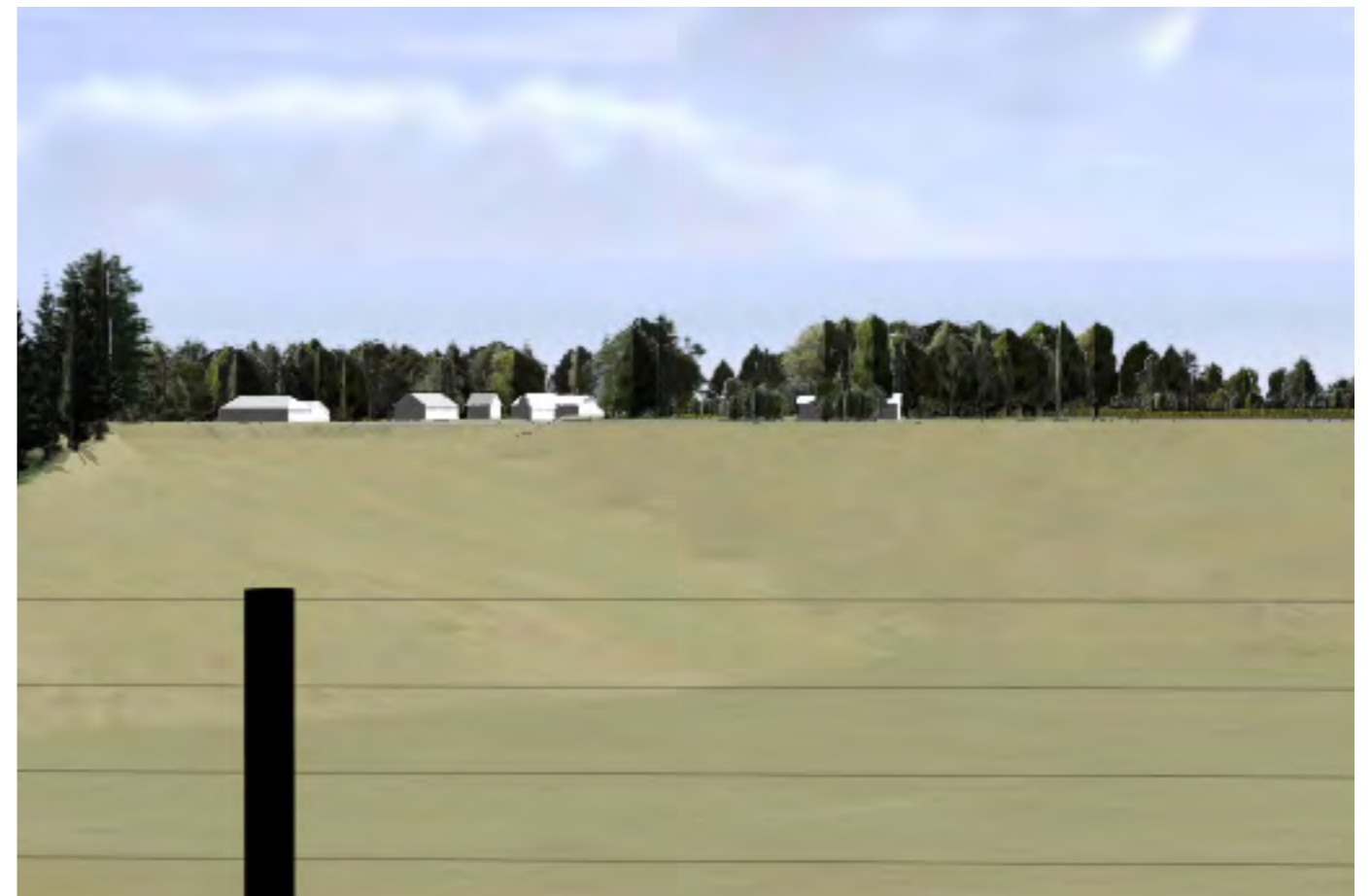




STAGE 3



STAGE 4



STAGE 5

IMAGES GENERATED FROM MODEL SHOWING CHANGE FROM VL A (NORTHERN ESCARPMENT OF THE KARAPIRO STREAM GULLY)

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## Appendix Seven: View Locations and Visual Effect Ratings

| No. | Viewing Audience & Sensitivities              | Existing Landscape & Visual Amenity  | Expected Change  | Visual Absorption Capability Ratings & Notes  | Potential Effects & Mitigation Requirements  | Effect Rating  |
|-----|---|--|--|---|--|--|
| 1   | Newcombe Road<br><br><i>Transient Viewers</i> | <ul style="list-style-type: none"> <li>Flat pastoral terrain compartmentalized by shelterbelt and hedgerow planting and post and wire fencing.</li> <li>Steeply undulating terrain associated with the Maungakawa hills forms the backdrop in the view.</li> <li>Mature vegetation is located along the Karapiro Stream.</li> <li>State Highway 1 and local roads such as Newcombe Road.</li> <li>Scattered dwellings with amenity planting and farm ancillary buildings.</li> </ul> | <ul style="list-style-type: none"> <li>Once the overburden stripping and extraction process begins, the existing flat, open pastoral terrain within the site will progressively change to an open quarry sandpit, as works progress in a southerly direction across the site over 4 stages.</li> <li>The existing land will be progressively lowered.</li> <li>Land use character change associated with views of plant and machinery, stockpiles, weighbridge facilities and offices (not currently existing within the site or immediate surroundings).</li> <li>Earth bunding will appear in view as quarrying progresses. The bund along the southern and eastern site boundaries will screen the majority of the site from view.</li> </ul> | <p><u>Neutral</u></p> <p>The proposed sand quarry will be backdropped by vegetation located along the Karapiro Stream and the steeply undulating land associated with Sanatorium Hill. The vegetation and land backdrop will aid in integrating the quarry with the surrounding landscape as it will appear less obvious than if seen against the skyline.</p> <p>Because of the low viewing angle, the full extent of the quarry will not be visible from this location. The landform in the fore-midground will crest views of the quarry pit, processing and stockpile areas. Works associated with the site entranceway, weighbridges, office buildings and Stage 1 overburden stripping will be seen initially (before earth screen bunds are created).</p> <p>Although the proposal will be introducing a different land-use activity into view and result in a change from an open pastoral landscape to a landscape compartmentalised by planted earth bunds along the application site boundaries, the landscape character will remain rural. Existing bunding seen extensively along the Waikato Expressway will provide context for the proposed planted bunds.</p> <p>Machinery used will be of a similar size to that seen commonly through surrounding farms.</p> | <p>The site entranceway, weighbridges, office buildings and Stage 1 overburden stripping works will be visible from this VL until earth bunds are in place. The landform in the fore-midground will crest views of the quarry pit, processing and stockpile areas. As excavation progresses south towards this VL and west (requiring removal of existing vegetation within the site), excavation works, and associated machinery will become increasingly visible until earth bunds are in place. There will be a loss of pastoral land as a result of the proposed sand quarry.</p> <p>The sand quarry will visually contrast with the pastoral land and dense vegetation surrounding the site for the duration of the life of the quarry. Although this extent of extraction is not overly common within the immediate surrounding landscape, earthworks, and quarrying is seen throughout the wider landscape and will not be an unexpected activity to viewers.</p> <p>The frequency of machinery movement and flashing light beacons is expected to increase viewers' attention to the application site. Although this machinery is not currently present within the site, it will not be seen out of context when</p> | <p><b>Rating:</b></p> <p><u>During quarrying:</u><br/><b>Low</b> Adverse effect.</p> <p><u>Post Restoration:</u><br/><b>Very Low</b> Adverse effect.</p> |

| No. | Viewing Audience & Sensitivities                       | Existing Landscape & Visual Amenity   | Expected Change   | Visual Absorption Capability Ratings & Notes  | Potential Effects & Mitigation Requirements  | Effect Rating   |
|-----|--|---|---|---|--|---|
|     |  |   |   |   | <p>associated with farm vehicles, tractors and other machinery commonly found throughout the rural landscape.</p> <p>Once the earth bunds along the southern and eastern site boundaries have been implemented, a change from an open pastoral landscape to a landscape compartmentalised by planted earth bunds will be seen from this VL. However, the landscape character will remain rural. Existing bunding seen extensively along the Waikato Expressway will provide context for the proposed planted bunds.</p>  |   |
| 2   | <p>State Highway 1</p> <p><i>Transient Viewers</i></p> | <ul style="list-style-type: none"> <li>State Highway 1, including wide berms, barriers, cycleways and streetlights.</li> <li>Gently undulating to flat terrain associated with the Karapiro Stream.</li> <li>Steeply undulating terrain to the north and south such as Sanatorium Hill.</li> <li>Mature vegetation is located along the Karapiro Stream.</li> <li>Scattered dwellings and farm ancillary buildings.</li> <li>Pastoral land is compartmentalized by shelterbelt and</li> </ul> | <ul style="list-style-type: none"> <li>Once the overburden stripping and extraction process begins, the existing flat, open pastoral terrain within the site will progressively change to an open quarry sandpit, as works progress in a southerly direction across the site over 4 stages.</li> <li>Because of the orientation of the site and the direction of quarrying moving north to south, the quarry will not be</li> </ul> | <p><i>Neutral - Good</i></p> <p>The proposed sand quarry will be backdropped by vegetation located along the Karapiro Stream and the steeply undulating land associated with Sanatorium Hill. The vegetation and land backdrop will aid in integrating the quarry with the surrounding landscape as it will appear less obvious than if seen against the skyline.</p> <p>Because of the viewing angle and direction of extraction, the full extent of the quarry will not be visible from this location. The landform in the fore-midground will crest views of the quarry pit, processing and stockpile areas.</p> <p>Once the earth bunds along the western and southern site boundaries are in place</p> | <p>The landform in the fore-midground will crest views of the quarry pit, processing and stockpile areas. As excavation progresses south and west towards this VL (requiring removal of existing vegetation within the northwest of the site), excavation works, and associated machinery will become increasingly visible until earth bunds are in place. There will be a loss of pastoral land as a result of the proposed sand quarry.</p> <p>The sand quarry will visually contrast with the pastoral land and dense vegetation surrounding the site for the duration of the life of the quarry. Although this extent of extraction is not overly common within the immediate surrounding landscape,</p> | <p><b>Rating:</b></p> <p><u>During quarrying:</u></p> <p><b><i>Low-Moderate</i></b><br/>Adverse effect.</p> <p><u>Post Restoration:</u></p> <p><b><i>Very Low</i></b> Adverse effect.</p> |

| No. | Viewing Audience & Sensitivities            | Existing Landscape & Visual Amenity  | Expected Change  | Visual Absorption Capability Ratings & Notes  | Potential Effects & Mitigation Requirements   | Effect Rating  |
|-----|---|--|--|---|---|--|
|     |   | hedgerow planting and post and wire fencing.   | <p>immediately visible and will not become visible even as works move south and west, closer to this VL, as earth bunding will screen views.</p> <ul style="list-style-type: none"> <li>Land use character change associated with distant views of plant and machinery, stockpiles, weighbridge facilities and offices (not currently existing within the site or immediate surroundings).</li> <li>Earth bunding will appear in view as quarrying progresses. The bund along the western site boundary and the bund along the southern site boundary will screen the majority of the site from view.</li> </ul> | the majority of the proposed quarry works will be screened from view.   | <p>earthworks, and quarrying is seen throughout the wider landscape and will not be an unexpected activity to viewers.</p> <p>The frequency of machinery movement and flashing light beacons is expected to increase viewers' attention to the application site. Although this machinery is not currently present within the site, it will not be seen out of context when associated with farm vehicles, tractors and other machinery commonly found throughout the rural landscape.</p> <p>Once the earth bunds along the southern and western site boundaries have been implemented, a change from an open pastoral landscape to a landscape compartmentalised by planted earth bunds will be seen from this VL. However, the landscape character will remain rural. Existing bunding seen extensively along the Waikato Expressway will provide context for the proposed planted bunds.</p> |  |
| 3   | State Highway 1<br><i>Transient Viewers</i> | <ul style="list-style-type: none"> <li>State Highway 1, including wide berms, barriers, cycleways and streetlights.</li> <li>Gently undulating to flat terrain associated with the Karapiro Stream.</li> </ul> | <ul style="list-style-type: none"> <li>Once the overburden stripping and extraction process begins, the existing flat, open pastoral terrain within the site will progressively change to an open quarry sandpit, as</li> </ul>  | <p><u>Neutral-Good</u></p> <p>The application site will be visible over an existing hedgerow located within the midground of the view. When compared to VL2, the site will not be as notable due to the separation distance and viewing angle involved.</p> | The landform in the fore-midground will crest views of the quarry pit, processing and stockpile areas. As excavation progresses south and west towards this VL (requiring removal of existing vegetation within the northwest of the site), excavation works, and associated machinery will become increasingly visible until   | <p><b>Rating:</b></p> <p><u>During quarrying:</u></p> <p><b><u>Low to Low-Moderate</u></b> Adverse effect.</p> <p><u>Post Restoration:</u></p> |



| No. | Viewing Audience & Sensitivities | Existing Landscape & Visual Amenity   | Expected Change   | Visual Absorption Capability Ratings & Notes  | Potential Effects & Mitigation Requirements   | Effect Rating                                 |
|-----|----------------------------------|---|---|---|---|---|
|     |                                  | <ul style="list-style-type: none"> <li>Steeplly undulating terrain to the north and south such as Sanatorium Hill.</li> <li>Mature vegetation is located along the Karapiro Stream.</li> <li>Scattered dwellings and farm ancillary buildings.</li> <li>Pastoral land is compartmentalized by shelterbelt and hedgerow planting and post and wire fencing.</li> </ul> | <p>works progress in a southerly direction across the site over 4 stages.</p> <ul style="list-style-type: none"> <li>Land use character change associated with distant views of plant and machinery, stockpiles, weighbridge facilities and offices (not currently existing within the site or immediate surroundings).</li> <li>Earth bunding will appear in view as quarrying progresses. The majority of the site and progressive quarrying works will be screened from view once the 3m high bund is in place along the western site boundary.</li> </ul> | <p>The proposed sand quarry will be backdropped by vegetation located along the Karapiro Stream and the steeply undulating land associated with Sanatorium Hill. The vegetation and land backdrop will aid in integrating the quarry with the surrounding landscape as it will appear less obvious than if seen against the skyline.</p> <p>Because of the viewing angle and direction of extraction, the full extent of the quarry will not be visible from this location. The landform in the fore-midground will partially crest views of the quarry pit, processing and stockpile areas as the quarry work progress towards the south and west.</p> <p>Views of the proposed quarry works will be partially screened from view once the earth bund along the western site boundaries is in place.</p> | <p>earth bunds are in place. There will be a loss of pastoral land as a result of the proposed sand quarry.</p> <p>The sand quarry will visually contrast with the surrounding pastoral land and dense vegetation surrounding the site for the duration of the life of the quarry. Although this extent of extraction is not overly common within the immediate surrounding landscape, earthworks, and quarrying is seen throughout the wider landscape and will not be an unexpected activity to viewers.</p> <p>The frequency of machinery movement and flashing light beacons is expected to increase viewers' attention to the application site. Although this machinery is not currently present within the site, it will not be seen out of context when associated with farm vehicles, tractors and other machinery commonly found throughout the rural landscape.</p> <p>Once the 3m high earth bund along the western site boundary has been implemented, a change from an open pastoral landscape to a landscape partially compartmentalised by the planted bund will be seen from this VL, with some views over the bund across the application site retained. However, the landscape character will remain rural. Existing bunding seen extensively along the Waikato</p> | <p><b><u>Very Low</u></b> Adverse effect.</p> |

| No. | Viewing Audience & Sensitivities | Existing Landscape & Visual Amenity   | Expected Change   | Visual Absorption Capability Ratings & Notes  | Potential Effects & Mitigation Requirements   | Effect Rating   |
|-----|----------------------------------|---|---|---|---|---|
|     |                                  |   |   |   | Expressway will provide context for the proposed planted bund.  |   |
| 4   | 41 Newcombe Road (Private)       | <ul style="list-style-type: none"> <li>Flat pastoral Land compartmentalized by shelterbelt and hedgerow planting and post and wire fencing.</li> <li>State Highway 1.</li> <li>Steeply undulating terrain to the north and south such as Sanatorium Hill and Maungatautari Mountain.</li> <li>Mature vegetation is located along the Karapiro Stream.</li> <li>Scattered dwellings and farm ancillary buildings.</li> </ul> | <ul style="list-style-type: none"> <li>Work associated with the Stage 1 topsoil and overburden stripping will be visible from this location. Once the 3m high earth bund is constructed along the western boundary of the site, views into the quarry will be completely screened from view.</li> <li>Construction of the earth bund and the associated operation of large machinery will be visible from this location (within 20m of the dwelling). It will introduce machinery not currently seen within the view.</li> <li>The proposed bund will screen/encroach on views of mountains currently visible in the distance.</li> </ul> | <p><u>Poor-Neutral</u></p> <p>The proposed sand quarry will be backdropped by vegetation located within the surrounding rural landscape and the steeply undulating land associated with the hills that backdrop the site from this location. The vegetation and land backdrop will aid in integrating the quarry with the surrounding landscape as it will appear less obvious than if seen against the skyline.</p> <p>Because of the viewing angle and direction of extraction, the full extent of the quarry will not be visible from this location. The landform in the fore-midground will partially crest views of the quarry pit, processing and stockpile areas as the quarry work progress towards the south and west.</p> <p>Views of the proposed quarry works will be completely screened from view once the 3m high earth bund along the western site boundary has been completed.</p> <p>Although the earth bund will prevent clear views of the proposed sand quarry, the bund itself will partially obstruct views across the existing open pastoral landscape and to the backdrop of the hill country.</p> <p>Planting along the bund will help to integrate the earth bund into the view.</p> | <p>The landform in the fore-midground will partially crest views of the quarry pit, processing and stockpile areas during Stage 1 works.</p> <p>There will be a loss of pastoral land as a result of the proposed sand quarry.</p> <p>Once the earth bund is in place along the western site boundary the proposed quarry will be completely screened from view.</p> <p>Loss of visual amenity is likely to occur during the construction of the bund (short-term effect), with large machinery operating within 20m of the dwelling and, upon completion, the bund will partially obstruct views across the open rural landscape towards Maungatautari Mountain and the hill country around French Pass. The bund is also likely to shade the dwelling (and its adjacent service court), creating adverse effects on existing amenity values.</p> <p>The proposed 3m high earth bund will alter the existing vista. Creating a change from an open pastoral landscape to a landscape partially compartmentalised by the planted bund (partial views over the bund to the distant hill country will be retained) will be seen from this VL.</p> | <p><b>Rating:</b></p> <p><u>During quarrying:</u></p> <p><b><u>Low-Moderate</u></b> to <b><u>Moderate</u></b><br/>Adverse effect.</p> <p><u>Post Restoration:</u></p> <p><b><u>Very Low</u></b> adverse effect.</p> |

| No. | Viewing Audience & Sensitivities  | Existing Landscape & Visual Amenity  | Expected Change   | Visual Absorption Capability Ratings & Notes  | Potential Effects & Mitigation Requirements  | Effect Rating  |
|-----|---|--|---|---|--|--|
|     |   |  |   |   | However, the landscape character will remain rural. Existing bunding seen extensively along the Waikato Expressway will provide context for the proposed planted bund.   |  |
| 5   | French Pass Road (Public)<br><br><i>Permanent Viewers (near the VL) and Transient Viewers</i> | <ul style="list-style-type: none"> <li>River terracing associated with the Karapiro Stream to the south.</li> <li>Gently undulating to flat terrain.</li> <li>Steeply undulating terrain to the north and south such as Sanatorium Hill.</li> <li>Mature vegetation is located along the Karapiro Stream.</li> <li>Scattered dwellings and farm ancillary buildings. Associated curtilage planting.</li> <li>Pastoral land is compartmentalized by shelterbelt and hedgerow planting and post and wire fencing.</li> </ul> | <ul style="list-style-type: none"> <li>Once the overburden stripping and extraction process begin, the existing gully and flat, open pastoral terrain within the site will progressively change to an open quarry sandpit, this will be particularly notable during Stage 1 extraction as this stage will occur in the northern portion of the site (closest to this VL).</li> <li>Because earth bunding has not been proposed along the northern site boundary, the sand quarry will be visible from this VL until the quarry is progressively recontoured and re-grassed.</li> <li>Land use character change associated with views of plant and machinery (not currently existing within the site or</li> </ul> | <p><u>Very Good</u></p> <p>The separation distance between the site and the VL will mean that the site and the proposed sand quarry will not be easily discernible.</p> <p>The full extent of the quarry will not be visible from this location due to intervening vegetated river terrace landform and vegetation located within the fore-midground of the view, within the Karapiro Stream gully.</p> <p>Subsequent stages will be seen within the context of the first stage of the proposed sand quarry and will be seen progressing further away from this VL.</p> | <p>The working faces and the floor of the pit will be visible from this viewer location. Excavation works and associated machinery will be most visible during Stage 1 works, and then the working faces with the pit will progressively recede to the south, towards State Highway 1.</p> <p>There will be a loss of pastoral land as a result of the proposed sand quarry.</p> <p>The sand quarry will visually contrast with the pastoral land and dense vegetation surrounding the site for the duration of the life of the quarry. Although this extent of extraction is not overly common within the immediate surrounding landscape, earthworks, and quarrying is seen throughout the wider landscape and will not be an unexpected activity to viewers.</p> <p>The frequency of machinery movement and flashing light beacons is expected to increase viewers' attention to the application site. Although this machinery is not currently present within the site, it will not be seen out of context when associated with farm vehicles,</p> | <p><b>Rating:</b></p> <p><u>During quarrying:</u></p> <p><u>Low</u> Adverse effect.</p> <p><u>Post Restoration:</u></p> <p><u>Very Low</u> adverse effect.</p> |

| No. | Viewing Audience & Sensitivities | Existing Landscape & Visual Amenity | Expected Change          | Visual Absorption Capability Ratings & Notes | Potential Effects & Mitigation Requirements   | Effect Rating |
|-----|----------------------------------|-------------------------------------|--------------------------|--|---|---------------|
|     |                                  |                                     | immediate surroundings). |  | <p>tractors and other machinery commonly found throughout the rural landscape.</p> <p>Due to the distance between the site and the view location, the adverse effects will be lessened.</p> <p>The rehabilitation of the floor of the pit, following the completion of the first stage of extraction, will reduce the amount of the open pit visible, reducing the extent to which the pit sand is seen in contrast to the surrounding pastoral and vegetation. Once completed and revegetated, the rehabilitated landform will not appear out of place within the context of the surrounding river terraces.</p> |               |

# **NEWCOMBE ROAD SAND QUARRY**

## **77 NEWCOMBE ROAD, CAMBRIDGE**

### **ASSESSMENT OF NOISE**

**Report No 20205**

**Prepared for:**

*RS Sand Ltd  
Hamilton  
24 May 2022*

**Prepared by:** .....

  
Nevil Hegley

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## 1. INTRODUCTION

It is proposed to develop and operate a sand quarry at 77 Newcombe Road, Cambridge as show on Figure 1.



**Figure 1. Location of proposed sand quarry**

This report assesses the noise from the overburden removal and sand quarrying operation and sets out how the activities will be operated to control the noise to within a reasonable level for the neighbours.

## 2. DESIGN CRITERIA

The site and all sites near the proposed sand quarry are located in a Rural Zone in the Waipa District Plan. Rule 4.4.2.15 of the District Plan sets the limits for a permitted activity at:

*Noise generating activity other than that from farm animals including farm dogs, agricultural vehicles (when not being used for recreational purposes), agricultural machinery or equipment (including produce packing facilities where the only produce packed is grown on site) operated and maintained in accordance with the manufacturer's specifications and in accordance with accepted management practices (e.g. for milking, spraying, harvesting, packing and the like, but not including frost fans) and provided that the best practicable option (including the option for the activity to take place at another time of the day), is adopted to ensure that the emission of noise does not exceed a reasonable level; shall be conducted and buildings located, designed and used to ensure that they do not exceed the following limits within the notional boundary of any dwelling (excluding dwellings within mineral extraction sites):*

|     |                                |                     |
|-----|--------------------------------|---------------------|
| (a) | Day time - 7.00am to 10.00pm   | 50dBA ( $L_{eq}$ )  |
| (b) | Night time - 10.00pm to 7.00am | 40dBA ( $L_{eq}$ )  |
| (c) | Night time single noise event  | 70dBA ( $L_{max}$ ) |

*The noise levels shall be measured and assessed in accordance with the requirements of NZS 6801:2008 – Acoustics – Environmental Sound and assessed in accordance with NZS 6802:2008 – Acoustics – Environmental Noise. Provided that this rule shall not apply to the use or testing of station and vehicle sirens or alarms used by emergency services*

For this project, the sand quarry will operate 50 weeks of the year. It will be open 10 hours per day from Monday to Friday and 5 hours on Saturday so the daytime noise limit of 50dBA  $L_{eq}$  will be applicable for this project.

Rule 4.4.2.19 sets the noise from construction activities at:

*Construction noise emanating from a site shall meet the limits recommended in and be measured and assessed in accordance with New Zealand Standard NZS 6803:1999 Acoustics – Construction Noise.*

Table 2 of NZS6803:1999 Acoustics – Construction Noise sets the noise limits to be complied with when measured at 1m from the façade of a dwelling. This



measurement position is different to the notional boundary that is adopted for general operation noise and reflects the aim to protect the occupants of the dwelling from the effects of construction noise rather than the outdoor area. As construction is transient this approach is considered reasonable. Table 2 of the NZS6802 sets the following construction noise limits:

**Recommended Upper Limits for Construction Noise received in Residential Zones and Dwellings in Rural Areas**

| Time of week                | Time period | Typical duration (dBA) |                  | Short term duration |                  | Long term duration |                  |
|-----------------------------|-------------|------------------------|------------------|---------------------|------------------|--------------------|------------------|
|                             |             | L <sub>eq</sub>        | L <sub>max</sub> | L <sub>eq</sub>     | L <sub>max</sub> | L <sub>eq</sub>    | L <sub>max</sub> |
| Weekdays                    | 0630-0730   | 60                     | 75               | 65                  | 80               | 55                 | 75               |
|                             | 0730-1800   | 75                     | 90               | 80                  | 95               | 70                 | 85               |
|                             | 1800-2000   | 70                     | 85               | 75                  | 90               | 65                 | 80               |
|                             | 2000-0630   | 45                     | 75               | 45                  | 75               | 45                 | 75               |
| Saturdays                   | 0630-0730   | 45                     | 75               | 45                  | 75               | 45                 | 75               |
|                             | 0730-1800   | 75                     | 90               | 80                  | 95               | 70                 | 85               |
|                             | 1800-2000   | 45                     | 75               | 45                  | 75               | 45                 | 75               |
|                             | 2000-0630   | 45                     | 75               | 45                  | 75               | 45                 | 75               |
| Sundays and public holidays | 0630-0730   | 45                     | 75               | 45                  | 75               | 45                 | 75               |
|                             | 0730-1800   | 55                     | 80               | 55                  | 85               | 55                 | 85               |
|                             | 1800-2000   | 45                     | 75               | 45                  | 75               | 45                 | 75               |
|                             | 2000-0630   | 45                     | 75               | 45                  | 75               | 45                 | 75               |

Where:

- (a) "Short-term" means construction work at any one location for up to 14 calendar days;
- (b) "Typical duration" means construction work at any one location for more than 14 calendar days but less than 20 weeks; and
- (c) "Long-term" means construction work at any one location with a duration exceeding 20 weeks.

The only construction noise will be the establishment of the proposed 2.5m minimum height noise control and visual bund to be constructed on the western, southern and eastern site boundaries. It is expected the construction noise for any given receiver position will be more than 14 calendar days but less than 20 weeks so the typical duration noise limits will be applicable as shown shaded in the above table.

### 3. THE PROPOSAL

The overburden will be removed using a machine, such as a Hyundai 39t excavator loading a dump truck as shown on Figure 2. These machines have been measured in the field having a sound power of 102dB  $L_{WA}$ .

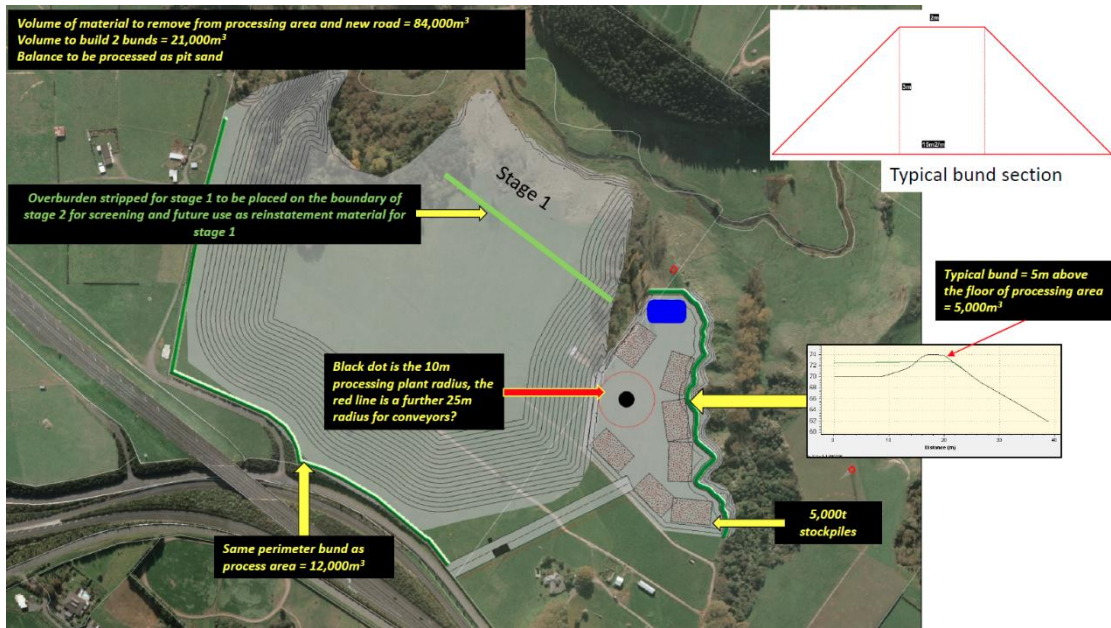


**Figure 2. Hyundai 39t Excavator**

The excavated overburden will then be transported with trucks, such as 30 – 40t ADT trucks, as shown on Figure 3, which have a measured sound power of 110dB  $L_{WA}$ . Initially, the overburden will be used to build a noise bund and visual barriers on the site boundaries as shown on Figure 4. Once these bunds have been completed the overburden will be used to reinstate the excavated area.



**Figure 3. Articulated Dump Truck**



**Figure 4. Location of noise bunding and processing plant**

The overburden will be spread using a D10 or smaller bulldozer. The D10 bulldozer as shown on Figure 5 has a measured sound power of 114dB  $L_{WA}$ .



**Figure 5. Komatsu D155A Bulldozer**

Once the overburden has been removed the sand will be excavated with the same excavator as shown on Figure 2 and transported to the screens using the same ADT trucks as shown on Figure 3.

The screening plant at the Tuakau site as shown on Figure 6 is the same or very similar to the proposed plant that will be used on site. This plant had a measured sound power of 103dB L<sub>WA</sub>. Figure 7 shows the processing plant, which has a measured sound power of 98dB L<sub>WA</sub>.



**Figure 6. Screening Plant**



**Figure 7. Processing plant**

Mobile plant that will be used on site includes a Volvo L220H loader as shown on Figure 8 and a Cat 336D excavator as shown on Figure 9. Both machines have a measured sound power of 104dB  $L_{WA}$  although the sound spectrum of the two machines operating is different.



**Figure 8. Volvo L220H loader**



**Figure 9. Cat 336D excavator**

#### 4. PREDICTED NOISE

Noise from the site has been predicted assuming each of the different activities will be undertaken at the most exposed location to the neighbours with the maximum plant operating at any one time. That is, during the construction of the noise and visual control bunds the assessment has been based on the plant being at the closest point to the dwellings. For the ongoing sand excavation, the assessment has been based on the initial excavations. As the excavation progresses the face of the sand excavation will be lower so will be better screened and hence there will be less noise to the neighbours. Consequently, this gives the upper noise level that will be experienced by the neighbours. For most of the time the level of noise received will be 5 – 10dBA  $L_{eq}$  lower than predicted.

The noise has been predicted using the Brüel & Kjær Predictor programme v2021.1. This is a powerful environmental noise calculation software package that uses a digital terrain model with the ground conditions modelled and each of the noise sources modelled at the various locations on the ground. An existing ground contour interval of 0.5m has been used with a minimum of a 2.5m bund to screen the closer dwellings opposite the western site boundary. Calculations are undertaken in accordance with the requirements of ISO 9613-1/2 Acoustics – Attenuation of Sound during Propagation Outdoors. For this project, a grid varying between 5 - 50m has been adopted to calculate the noise contours. The cumulative noise from each item of plant operating is calculated at each grid point and the noise contours have been drawn based on these levels. All calculations have been undertaken assuming a slightly positive meteorological effect at the receiver position. Ground absorption of 0.7 and a receiver height of 1.5m have been assumed in the calculations.

Figure 10 shows the noise contours as predicted for the construction of the noise control bund on the western boundary and construction work in the processing

plant area on the eastern side of the site. The worst case scenario has been assumed with both construction works being undertaken together.

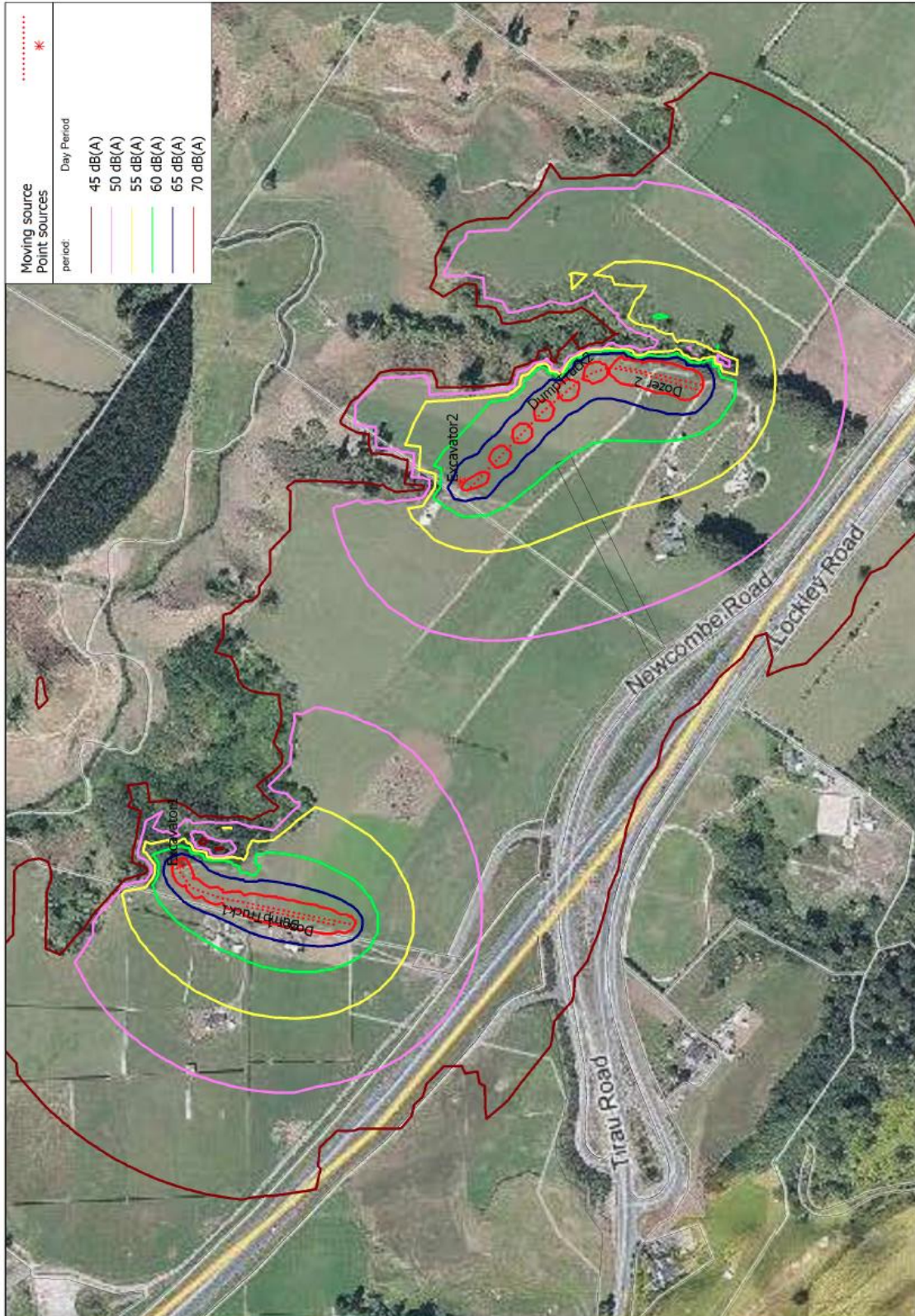


Figure 10. Construction of the bunds, dBA  $L_{eq}$

Figure 11 shows the excavation of the sand at the initial ground height being undertaken on the western side of the site opposite the two nearby dwellings.

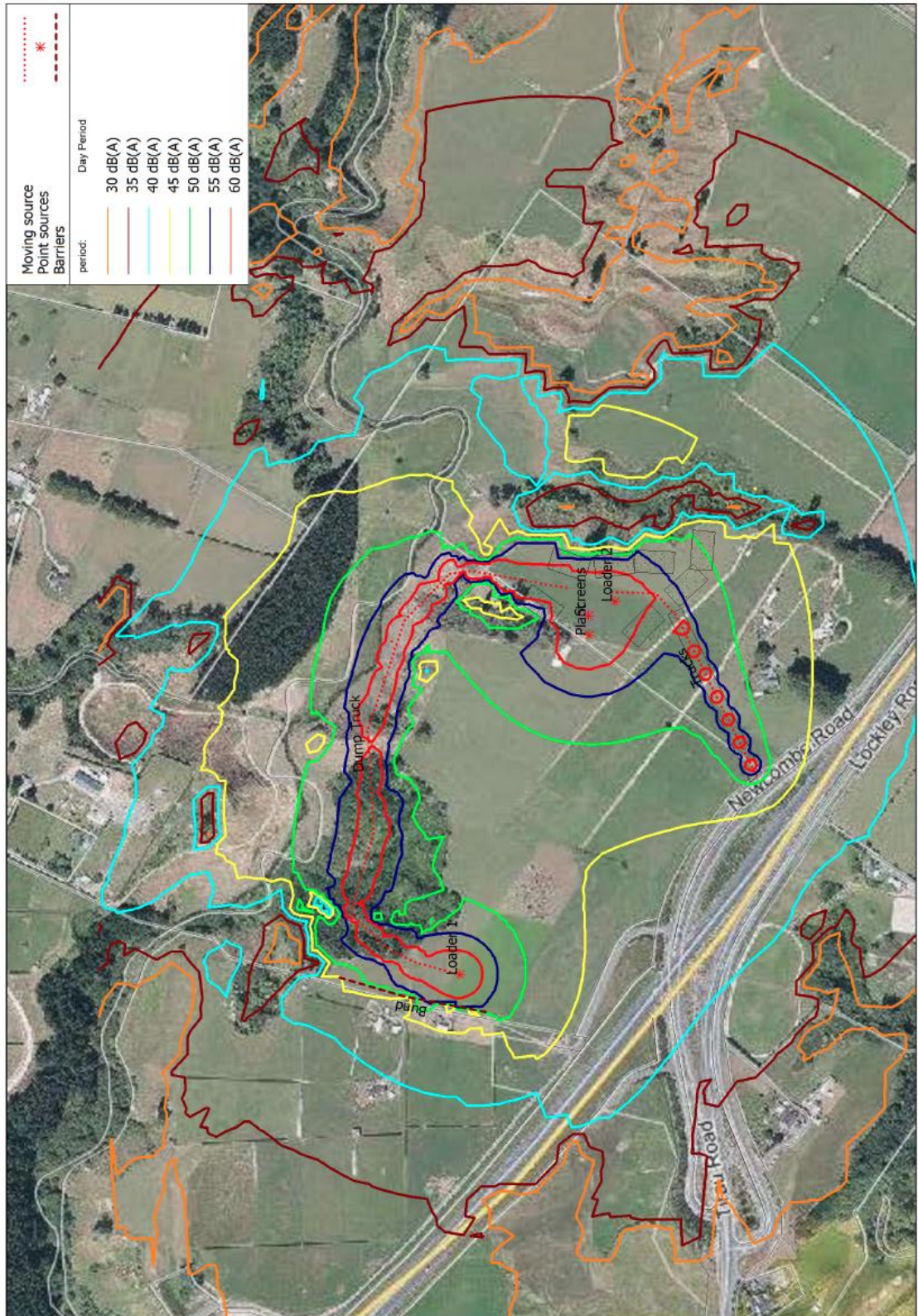


Figure 11. Sand plant processing with excavation to the west, dBA  $L_{eq}$



Figure 12 shows the sand plant operating with the excavation of the sand at approximately half the excavation depth plus processing the sand.

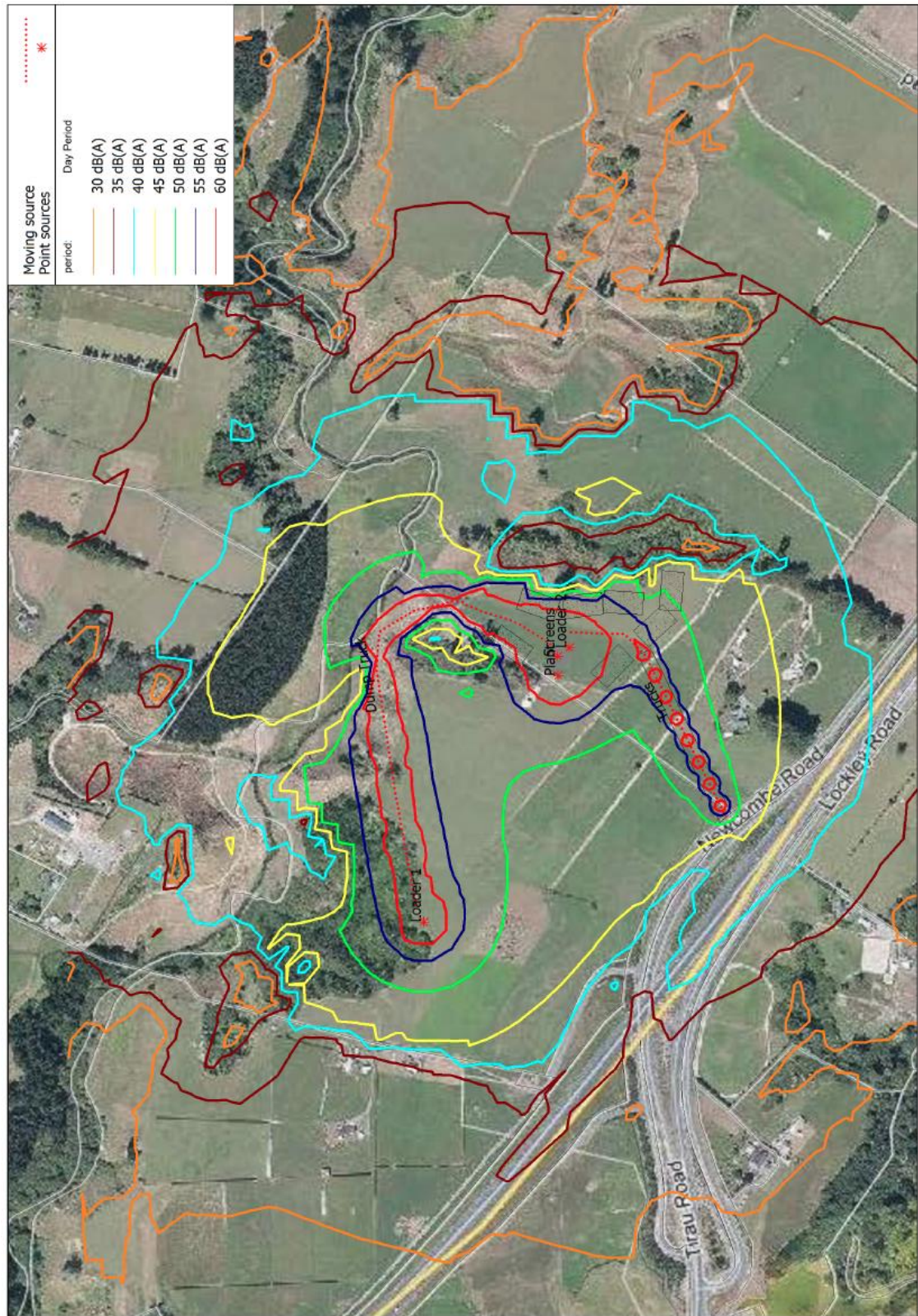
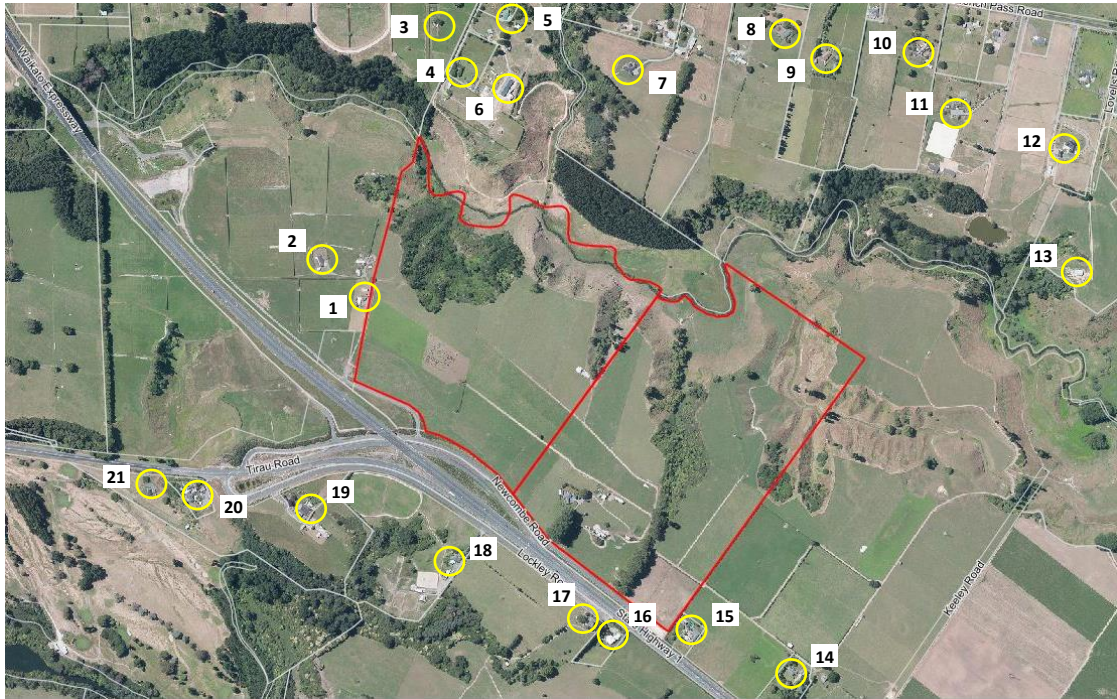


Figure 12. Sand plant processing with excavation at half the final depth, dBA  $L_{eq}$

In addition to the noise contours the noise has been predicted at the boundary / notional boundary of the closer dwellings to the sand pit as shown on Figure 13 with the results given in Table 1.



**Figure 13. Location of closer dwellings**

**Table 1. Predicted noise levels (dBA  $L_{eq}$ )**

| Dwelling<br>(Figure 12) | Construction<br>(Figure 9) | Initial excavation<br>(Figure 10) | Excavation half<br>depth (Figure 11) |
|-------------------------|----------------------------|-----------------------------------|--------------------------------------|
| 1                       | 69                         | 47                                | 36                                   |
| 2                       | 56                         | 40                                | 33                                   |
| 3                       | 40                         | 36                                | 33                                   |
| 4                       | 42                         | 38                                | 36                                   |
| 5                       | 39                         | 36                                | 34                                   |
| 6                       | 42                         | 39                                | 37                                   |
| 7                       | 39                         | 38                                | 34                                   |
| 8                       | 35                         | 33                                | 31                                   |
| 9                       | 35                         | 34                                | 32                                   |
| 10                      | 33                         | 31                                | 30                                   |
| 11                      | 34                         | 32                                | 30                                   |

|    |    |    |    |
|----|----|----|----|
| 12 | 32 | 29 | 28 |
| 13 | 33 | 30 | 28 |
| 14 | 41 | 34 | 33 |
| 15 | 47 | 38 | 37 |
| 16 | 47 | 39 | 37 |
| 17 | 47 | 39 | 37 |
| 18 | 40 | 38 | 35 |
| 19 | 38 | 33 | 31 |
| 20 | 32 | 28 | 28 |
| 21 | 20 | 17 | 17 |

As shown in Table 1 the construction noise is within the 75dBA  $L_{eq}$  limit as set out in NZS6803. The sand extraction is within the daytime noise limit of 50dBA  $L_{eq}$  for a Rural Zone as set out in Rule 4.4.2.15 of the Waipa District Plan.

## 5. CONCLUSIONS

Noise from the proposed sand quarry has been predicted based on plant operating at the most exposed locations plus once the sand pit is at half the excavation depth. For the dwellings to the north across the Karapiro Stream the noise will be well within the expectations of the Waipa District Plan for a permitted activity.

For the dwellings to the south and east of the site noise from the sand plant will also be well within the requirements of the Waipa District Plan. Plant noise at these locations will be masked by traffic noise from the adjacent Waikato Expressway (State Highway 1).

For the two dwellings adjacent to the western site boundary, it is proposed to control the noise from plant operating at its closest point to these dwellings by constructing a minimum of a 2.5m high bund. This bund will ensure the noise is controlled to well within the requirements of the Waipa District Plan.

For most of the time, there will be less equipment operating in the quarry than has been assumed in the analysis and the plant will be further from the closer dwellings than modelled, hence noise levels to the neighbours will be lower than predicted.

When considering the above, the noise effects of the proposed sand plant will be less than minor in terms of the requirements of the Resource Management Act.

\* \* \*





Planning | Surveying | Engineering | Environmental

## Integrated Transportation Assessment

RS Sand Limited

77 Newcombe Road, Cambridge, New Zealand

## DOCUMENT CONTROL

|                         |  |
|-------------------------|--|
| <b>CKL REFERENCE</b>    | B19041   |
| <b>DOCUMENT STATUS</b>  | Approved   |
| <b>REVISION NO.</b>     | 5  |
| <b>FILE NAME</b>        | B19041-TR- -ITA.Docx   |
| <b>AUTHOR</b>           | Michael Hall<br>Transportation Engineering Manager<br> |
| <b>AUTHORISED BY</b>    | Judith Makinson<br>Director<br>                       |
| <b>DATE</b>             | 16 May 2023  |
| <b>OFFICE OF ORIGIN</b> | Hamilton   |

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## 1 Introduction

- 1.1.1 This Simple Integrated Transportation Assessment (ITA) considers the traffic and transportation effects of a proposed sand quarry located on Newcombe Road, east of Cambridge. It is understood that a large portion of the extracted material is likely to be used within the Cambridge area.
- 1.1.2 The site itself is within the Waipa District. A Simple ITA is required as over 250 'car equivalents' per day may be generated by the site which fronts a Local Road.
- 1.1.3 Overall, it is concluded that the traffic generated by the proposed quarry can be accommodated on the surrounding road network with less than minor traffic effects, subject to an appropriate Heavy Vehicle Impact Fee (HVIF) being applied.

## 2 Site Location

- 2.1.1 The site is located at Newcombe Road approximately 3km east of central Cambridge and just north of the interchange between Tirau Road and SH1. The site is generally rectangular in shape with an irregular border to north where the site borders Karapiro Stream.
- 2.1.2 Figure 1 below is an aerial photograph of the site outlined in blue.

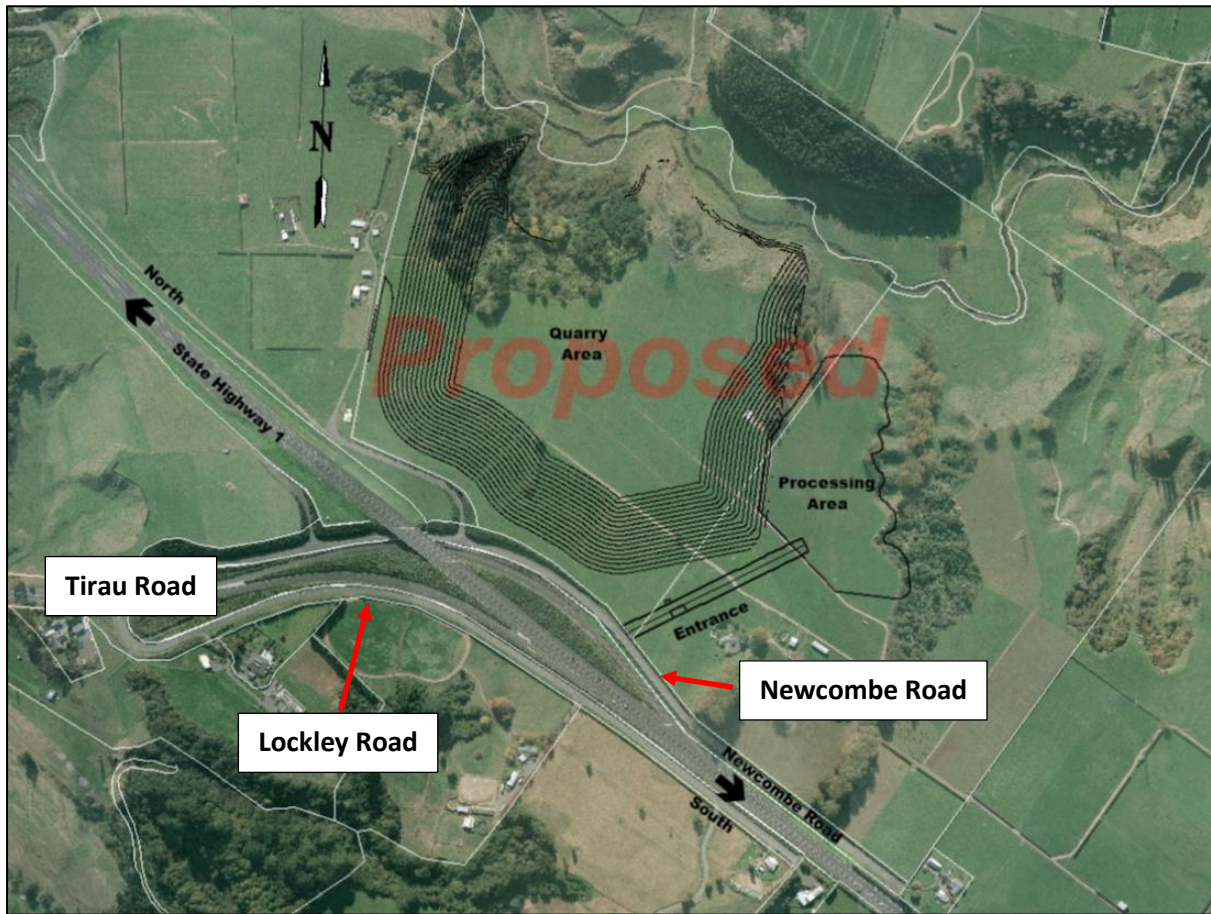


Figure 1: Site Location

2.1.3 The site is included within the Rural zone as stipulated by the Waipa District Plan. The surrounding land is predominantly rural in nature featuring either farming or rural residential dwellings. Cambridge Golf Club is the southwest of the site.

### 3 Existing Environment

#### 3.1 Road Network

3.1.1 Newcombe Road was constructed as part of the Waikato Expressway to provide access to the properties on the northern side of SH1 that would otherwise have been severed from having access to the road network.

- 3.1.2 Newcombe Road is a two-way, two-lane no exit road with a posted speed limit of 100km/h. It intersects with Tirau Road approximately 300m west of SH1 and generally runs parallel to the Expressway on-ramp. Newcombe Road is classified as a Local Road by the District Plan and as such its primary function is to provide access to adjacent properties with less emphasis on catering for through traffic.
- 3.1.3 SH1 bridges over Newcombe Road and the on-ramp. Vertical clearances are suitable to accommodate trucks and are not expected to impact on whether vehicles will be able to access the proposed sand quarry. The general cross-section of Newcombe Road is shown in Figure 2.



Figure 2: Newcombe Road

- 3.1.4 The intersection between Newcombe Road and Tirau Road is a give-way priority T-intersection which is approximately 50m offset from Lockley Road. Lockley Road is similar to Newcombe Road in that it is also a no exit road that was constructed as part of the Waikato Expressway interchange to provide access to properties that would be unable to gain direct access to SH1. A right turn bay is provided which caters for right turn movements into both roads and the offset between the intersections ensures that right turning vehicles do not conflict with each other.
- 3.1.5 Figure 3 below is an aerial photograph showing the layout of the Tirau Road intersections with Newcombe Road and Lockley Road.

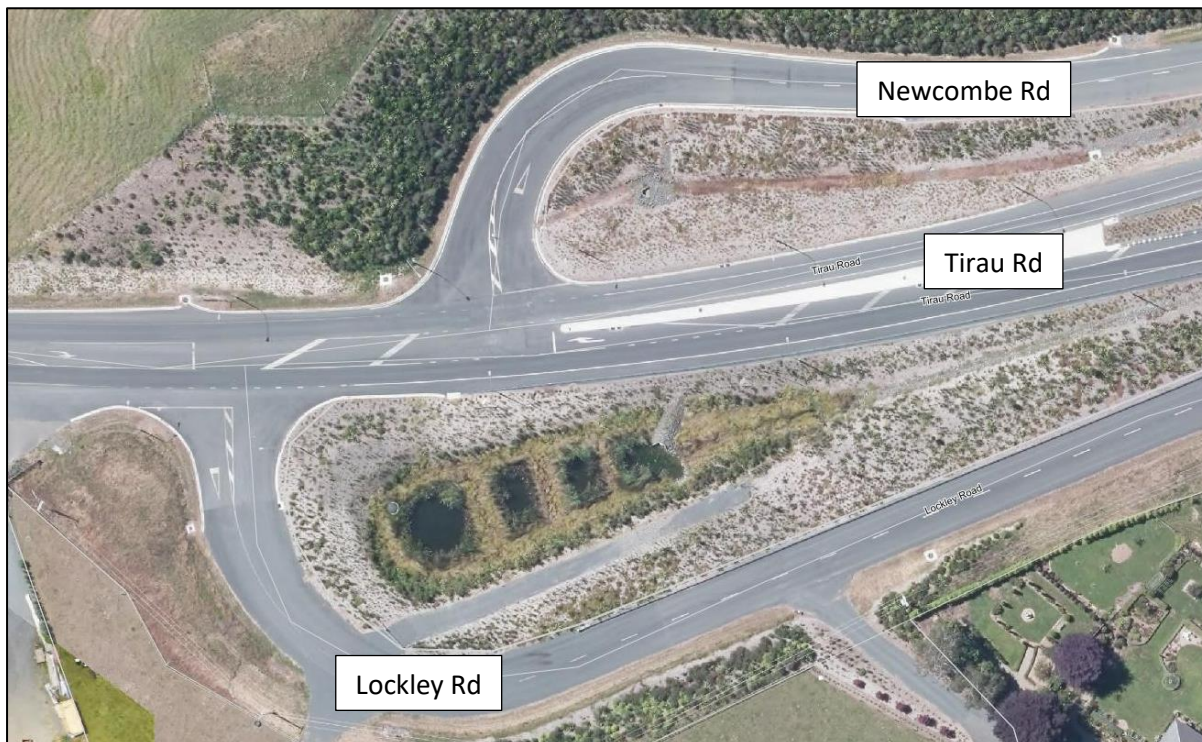


Figure 3: Aerial Photograph of Newcombe Road / Lockley Road / Tirau road Intersections

- 3.1.6 Tirau Road provides a connection between Cambridge and SH1 to the east of the town. It is a two-way, two-lane road with a painted flush median. The speed limit of Tirau Road is 100km/h where it passes Newcombe Road.
- 3.1.7 At the time the District Plan was prepared, the alignment of SH1 was through the centre of Cambridge. Tirau Road, which formed part of SH1, was therefore classified as a Major Arterial Road. Whilst the SH1 status no longer applies, it is considered that Tirau Road would retain its arterial road classification.
- 3.1.8 There is an existing vehicle crossing to site located to the north of the SH1 overbridge. The vehicle crossing and driveway in the vicinity of SH1 were constructed as part of the works associated with the Waikato Expressway. The location where the vehicle crossing meets Newcombe Road is shown in Figure 4.



Figure 4: Vehicle Crossing to Site

### 3.2 Traffic Volumes

- 3.2.1 The latest traffic volumes in the vicinity of the site have been extracted from the Mobile Roads database which collects data directly from the RAMM database, an asset management tool used by various road controlling authorities.
- 3.2.2 The traffic count on Newcombe Road is only an estimate and is 20 vehicles per day (vpd). Given the limited number of properties served by Newcombe Road, this estimated traffic is considered to be appropriate.
- 3.2.3 The count for Tirau Road is 6,286vpd with 12% HCVs (754HCV/day). This count was from 2022 (but outside of any lockdowns associated with the COVID-19 pandemic) when Tirau Road was no longer part of SH1. In 2013, Tirau Road carried over 19,000vpd. The notable reduction in traffic demands can be attributed to the completion of the Waikato Expressway.

### 3.3 Road Safety

- 3.3.1 A search was made of the Waka Kotahi Crash Analysis System for all reported crashes that occurred on Newcombe Road, including a 100m radius around its intersection with Tirau Road, for the full five-year period from 2018 to 2022 and including all available results from 2023.

- 3.3.2 The search found that two crashes had been reported within the study area, neither of which resulted in any injuries. One crash had been reported within the study which occurred on the Tirau Road off-ramp approximately 50m east of Newcombe Road and did not result in any injuries. The crash occurred where a driver lost control and hit the wire barrier on the side road. Driver distraction and fatigue were identified as potential factors in the crash. No road related factors were identified, and this was a single vehicle crash.
- 3.3.3 The other reported crash occurred at the intersection between Tirau Road and Lockley Road approximately 50m west of Newcombe Road. This occurred where a truck turning right out of Lockley Road failed to give-way to westbound truck. No road related factors were identified.
- 3.3.4 Given the low severity and frequency of crashes reported, no road safety issues have been identified in the vicinity of the site.

## **4 Sustainable Travel Modes**

### **4.1 Walking and Cycling**

- 4.1.1 As would be generally expected in a rural area, specific pedestrian and cycling facilities are not provided along Newcombe Road or Tirau Road. It is anticipated that any pedestrians would walk on the shoulders or berms and cyclists would share the road with vehicles.

### **4.2 Public Transport**

- 4.2.1 There are no public transport services in the area as would be expected its rural nature.

## **5 Committed Environmental Changes**

- 5.1.1 Consultation is currently underway for a potential extension of the SH1 Waikato Expressway to Piarere although whether this project proceeds is not confirmed. Consideration of this potential Expressway is included within section 7.3 of this report.

## 6 Development Proposals

### 6.1 Development Proposals

- 6.1.1 It is proposed to operate a sand quarry at Newcombe Road to the east of Cambridge. It is anticipated that up to 400,000 tonnes of material will be extracted per year. The sand quarry is expected to operate 50 weeks of the year and will be open 10 hours per day from Monday to Friday and 5 hours on Saturday. The amount of resource in the quarry is understood to be significant with extraction expected to occur for some 25 years. The majority of the extracted material is likely to be used within the Cambridge area.
- 6.1.2 A small office building will be established within the site approximately 60m inside the site from Newcombe Road. This will include ablutions for truck drivers and act as a location for a staff member to manage vehicles entering the site. Such a building is unlikely to exceed 100sqm in area. A weighbridge will also be located adjacent to the office to measure the amount of material being extracted from the site.
- 6.1.3 Access to the site will be via a new driveway approximately 650m from the intersection with Tirau Road.

### 6.2 Traffic Generation

- 6.2.1 Two types of truck are expected to be used to transport material from the site. The larger truck and trailer units are expected to carry 28 tonnes per load and the smaller truck only units are expected to carry 10 tonnes per load. It is also anticipated that some of the truck and trailer units will be replaced with HPMV units that are able to carry 36 tonnes per load. This will reduce the overall number of trucks generated. However, the truck and trailer unit will be adopted for the purposes of assessing the traffic volume effects.
- 6.2.2 On an annual basis, it is expected that up to 11,188 (56%) of trucks will be the larger units and 8,674 (44%) will be the smaller units, 19,862 units in total. On average, with 55 operating hours per week and 256 operating days per year, it is expected that there would be an average of 78 trucks per weekday and 8 trucks per hour (16 truck movements).
- 6.2.3 The extraction rate and demand for the products of the quarry are likely to vary throughout the year. It is therefore assessed that up to 200 trucks could frequent the site on its busiest

day. For the avoidance of doubt, this means up to 200 trucks could enter and exit from the site equating to 400vpd.

- 6.2.4 The site is expected to generate approximately 8 trucks per hour (16 truck movements) on average per hour. On busier days, this could increase to 20 trucks per hour (equivalent to 40 truck movements). Busy days of this magnitude are only expected to only occur once every couple of months.
- 6.2.5 Section 16.4.2.25 of the District Plan includes requirements as to whether a Simple or Broad ITA is required to accompany a resource consent application. The threshold is based on the number of vehicles generated per day as measured in 'car equivalents' where a heavy vehicle is 10 'car equivalents' (cem). The proposed sand quarry is therefore expected to generate up to 4,000cem per day on busy days and around 800cem on average. As the site fronts a Local Road in the form of Newcombe Road and is expected to generate more than 250cem per day, a Simple ITA is required. This report is considered to satisfy the requirements for a Simple ITA.



## 7 Traffic Effects

### 7.1 Trip Distribution

7.1.1 Figure 5 below illustrates the distribution of trucks to the wider area from the proposed sand quarry. The number of trucks expected to be generated by the site is summarised in Table 1 and includes both the number of trucks on a typical day and the number of trucks expected generated on a peak day. This is based on the likely markets for the sand not only in the Waikato Region but also the wider upper north island with considering the operation of other quarries. Table 1 also tabulates the distribution of trucks and includes both the typical and peak number of trucks per day once the site is operational.

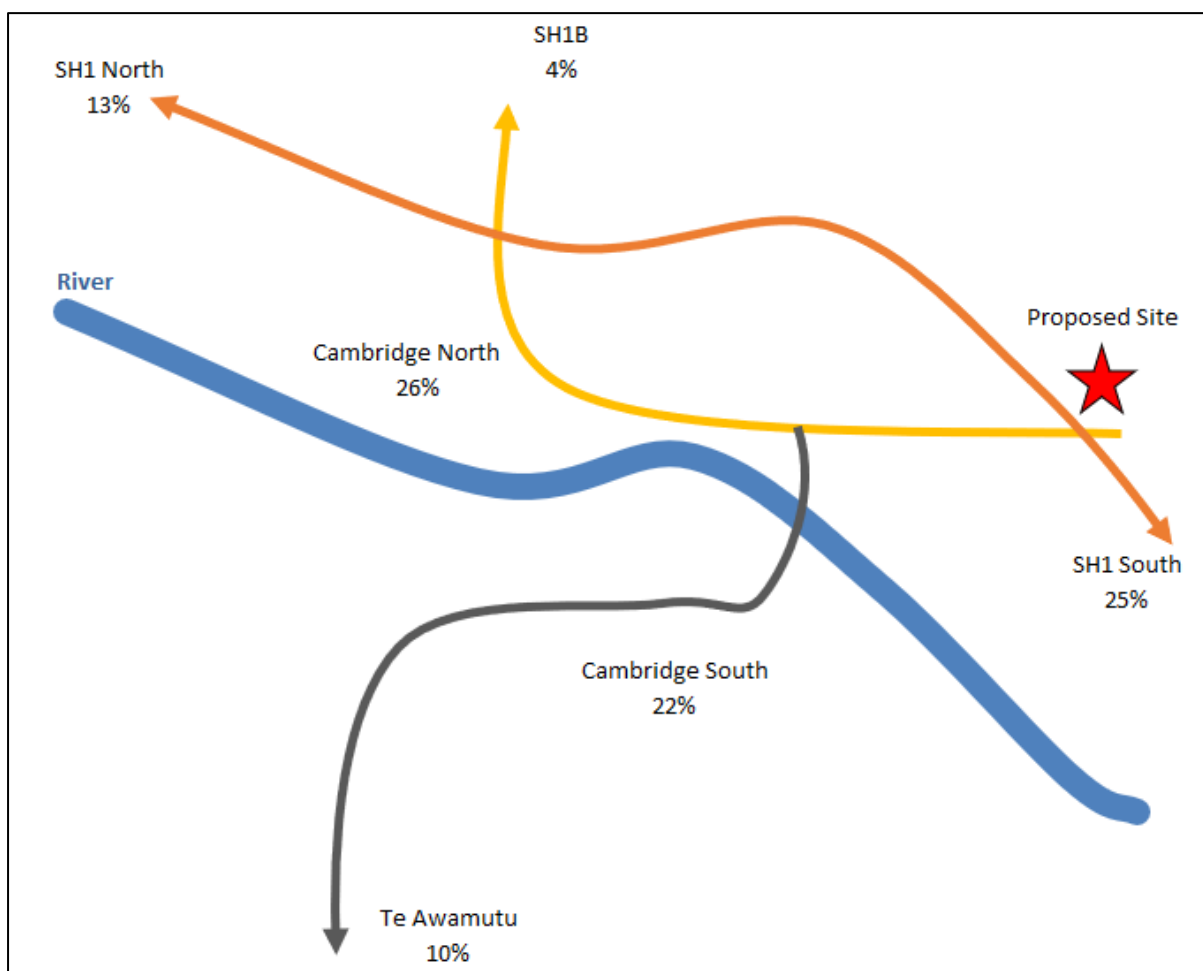


Figure 5: Truck Distribution

Table 1: Truck Distribution Summary

| Direction       | Expected Proportion | Typical Trucks per day | Peak Trucks per day |
|-----------------|---------------------|------------------------|---------------------|
| SH1 North       | 13%                 | 10                     | 25                  |
| SH1B North      | 4%                  | 3                      | 7                   |
| SH1 South       | 25%                 | 20                     | 49                  |
| Te Awamutu      | 11%                 | 9                      | 21                  |
| Cambridge North | 26%                 | 20                     | 52                  |
| Cambridge South | 22%                 | 17                     | 45                  |
| <b>Total</b>    | <b>100%</b>         | <b>78</b>              | <b>200</b>          |

7.1.2 Again, for the avoidance of doubt, the above are truck numbers and represent one-way trips only. Vehicle movements per day would equate to double the above.

7.1.3 The Waipa Growth Strategy 2017 includes forecast demand for future residential, industrial and commercial areas in the Cambridge/Hautapu and Te Awamutu/Kihikihi areas<sup>1</sup>. Of the combined total for the two areas, Cambridge/Hautapu accounts for approximately 70% of the residential total, 85% of the industrial total and 65% of the commercial total. This relative demand aligns with the distributions provided above with the Cambridge area being the dominant destination.

7.1.4 Figure 6 shows the locations of the growth cells in Cambridge as shown in Appendix S1 of the District Plan with the red star indicating the location of the subject site. This further illustrates that the Cambridge area is expected the dominant destination for the material delivered from the site.

<sup>1</sup> Waipa District Growth Strategy 2017, Section 4.3 and 4.4.

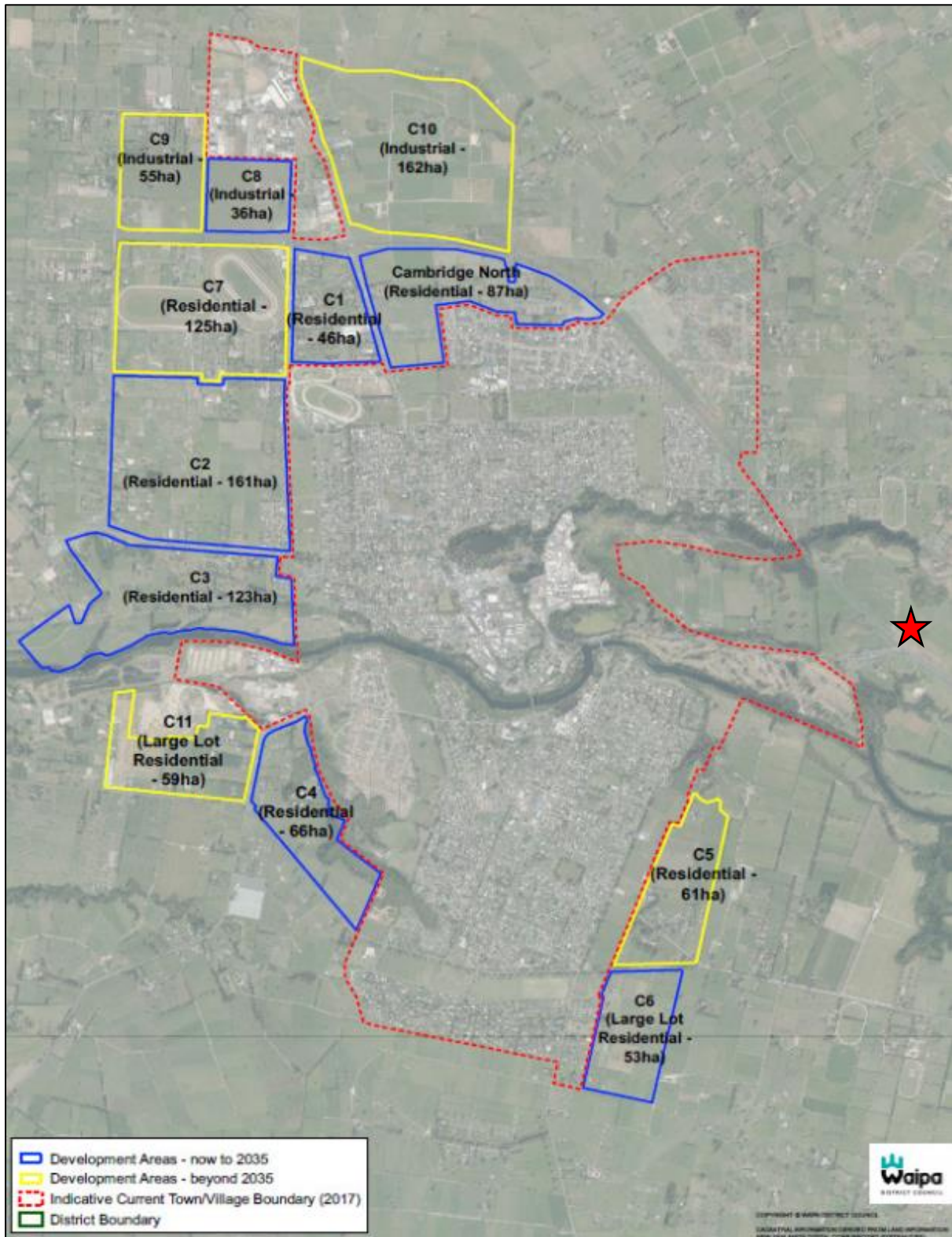


Figure 6: Cambridge Growth Cells

- 7.1.5 Given that a large portion of material is expected to continue to be used within the Cambridge area, restricting or confining truck access to certain routes is not considered to be practical. It is also noted that use of sand from a local source would have a beneficial effect on the wider network as it reduces impacts overall. Using a local source reduces the length of trips trucks take to deliver material and therefore also reduces the amount of carbon emissions.
- 7.1.6 At present, the interchange between SH1 and Tirau Road only includes south facing ramp connections. Consideration has been given as to whether adding north facing ramps would be necessary. Only 17% of trucks from the site would be likely to use any such north facing ramps i.e. those trucks heading north on either SH1 or SH1B. Regardless, it is noted that Waka Kotahi does not support the installation of any such ramps and it is not therefore considered practical to pursue this option further. Further discussion on consultation with Waka Kotahi is provided in Section 12 of this report.

## **7.2 Waipa District Route Options**

- 7.2.1 All trips generated by the site will gain access to the wider road network via Tirau Road. It is also noted that these roads previously formed part of State Highway 1 and carried some 19,000vpd with 12.4% HCVs. This equates to some 2,356 HCV trips per day and an estimated 230-240 HCV trips per hour. Based on current traffic data, Tirau Road carries around 6,285vpd with 754 (12%) HCV per day and 70-80 HCV per hour. These roads continue to be identified as arterial routes within the Waipa District Plan and despite the recent measures to protect the town centre from HCV access, these roads have a primarily through traffic function, including carrying heavy commercial vehicles. The proposed 16 truck movements per hour generated by the site still results in heavy vehicle volumes that are approximately a third of what was previously carried on Tirau Road. It is therefore considered that the vehicles generated by the site are able to be accommodated by the surrounding road network. A more detailed consideration of implications for the Newcombe Road / Tirau Road intersection is provided in section 7.3.
- 7.2.2 Consideration has been given to the routes that trucks could use to transport material from the site. For material delivered to the south or east, trucks will turn left out of Newcombe Road onto Tirau Road and use the interchange to access SH1 to the southeast. It is anticipated that an average of one truck (two movements) per hour would use this route.

- 7.2.3 For trucks heading towards Cambridge or other locations to the north or west, the most direct route for vehicles is via the former SH1 alignment through Cambridge, namely turning right out of Newcombe Road onto Tirau Road, following the main road right onto Albert Street, onto Queen Street, turn right at the roundabout onto Victoria Street and then continue north on SH1B to the Hautapu interchange with SH1. These routes would also be used by other trucks associated with the industrial areas within Cambridge and as such are considered appropriate for the proposed sand quarry. It is expected that approximately 15vph would use this route. This would increase truck movement frequency on this route from around one truck movement approximately every 1 minute 30 seconds to one truck movement every 1 minute 5 seconds. This level of change is unlikely to be discernible day to day.
- 7.2.4 It is noted that there is the potential for larger HPMV trucks to use the route north to transport material. However, this route is predominantly used by trucks serving the Cambridge area which would be done by smaller trucks rather than HPMV vehicles which are more likely to transport material over longer distances such as to Tauranga. The route north through Cambridge is still able to be used by HPMV vehicles on the rare occasions that such vehicles are required to travel north.
- 7.2.5 It is acknowledged that whilst Tirau Road retains an arterial function, the opportunity has been taken by WDC to improve the place function of this route within Cambridge, particularly around Queen Street and Victoria Street, and to reduce the through traffic function of this road. It is noted that trucks will avoid the key centre of town on Victoria Road between Duke Street and Alpha Street. Alternative routes north from the site have been considered where trucks do not pass through the Cambridge Town Centre. Local residential roads within the urban area have also been avoided.
- 7.2.6 The most direct option that avoids central Cambridge is to have trucks heading west on Kaipaki Road and reconnecting with the state highway network at SH3 (Ohaupo Road). A variation to this option would be trucks heading west on Kaipaki Road to turn right onto Mellow Road then left onto Mystery Creek Road to then join SH21. Both options represent notable detours from the most direct route. The increased vehicle kilometres travelled (vkt) would also likely increase the amount of emissions generated by the trucks during transit. It should also be noted that these options would require the use of Pope Terrace and Shakespeare Street and would therefore negate any benefit that would otherwise be accrued to residential properties fronting those roads if trucks were to use the Tirau Road route.

- 7.2.7 From an efficiency and operational perspective, typical travel times to Hamilton from the proposed site are approximately equal with the route via Kaipaki Road being approximately 3km longer and taking about 2-3 minutes longer. Given it is approximately 30km from Cambridge to Hamilton, these differences are not considered to be significant and could provide a solution for gaining access to the state highway network whilst avoiding Cambridge town centre. However, in terms of access the key Cambridge growth cells, it would add approximately 18 minutes to the trip and 25km to the length of journey, having a greater impact on Waipa district roads and requiring the use of the local road network in order to access the growth cells.
- 7.2.8 Objective 16.3.3 of the District Plan relates to the efficiency of the road network where the objective is to maintain the ability of the transport network to distribute people and goods safely, efficiently and effectively. Requiring trucks to take a longer route that affects a greater length of the road network is not considered to align with this objective. Given that a large proportion of the material from the quarry will be used within the Cambridge area and that Tirau Road was formerly part of the state highway network, it is therefore assessed that having trucks use the most efficient route align with the objective of maintaining an efficient road network.
- 7.2.9 From the assessment above, it is considered that having trucks travelling less distance when delivering material will have the least impact on the district's road and reduce the amount of carbon emissions generated. Not restricting truck movements is also assessed as best aligning with the objectives of the District Plan.

### **7.3 State Highway Route Options**

- 7.3.1 As discussed further in Section 12, WDC indicated that they would prefer for north facing ramps to be constructed at the SH1 interchange with SH1. Conversely however Waka Kotahi stated that there were no plans to construct such ramps at this interchange. Based on the expected distribution of trucks as discussed in section 7.1 above, only a small number of trucks would be expected to head north out of Cambridge, approximately an average of seven per day or one per hour. Given the relatively low demand and that the cost of constructing additional flyover is likely to be large, it is considered that there is little benefit to adding additional ramps at the interchange. Route options using the Waipa District roading network have been discussed above.

- 7.3.2 Waka Kotahi also raised some concerns relating to the ability for trucks to safely navigate the Newcombe Road intersection to Tirau Road. These concerns related to visibility from Newcombe Road towards the interchange, the manoeuvrability for trucks to turn at the intersection and the ability for trucks to accelerate to at least 90km/h prior to entering the SH1 mainline.
- 7.3.3 In terms of visibility, there is 290m visibility towards the interchange offramp. The Safe Intersection Sight Distance (SISD) from AUSTROADs states that at least 285m should be provided where the operating speed environment is 110km/h (taking the speed environment to be 10km/h greater than the posted speed limit). The visibility available towards the interchange is therefore assessed as being appropriate.
- 7.3.4 The vegetation on the earth bank on the western side of Newcombe Road has grown to the extent where it impedes the visibility of drivers when looking west to 110m and therefore does not satisfy the AUSTROADs standards. It is reasonable to expect that the intersection and the associated earth bank would have been constructed to appropriate standards given it was only completed recently. It is therefore recommended to trim back and maintain vegetation at the intersection to ensure that it is not reducing the visibility available at the intersection. With the vegetation suitably trimmed back, the visibility available is assessed as being appropriate for the intersection.
- 7.3.5 A tracking assessment has been undertaken to ensure that trucks are able to turn into and out of Newcombe Road. Figure 7 and Figure 8 below show the turning movements into and out of Newcombe Road. The vehicle used is a 23m truck and trailer unit which is the likely largest vehicle that would serve the sand quarry. The tracking figures shows that these trucks are able to turn at the intersection in an appropriate manner, allowing concurrent inbound and outbound manoeuvres. These figures also confirm that an existing truck does not come into conflict with a truck waiting to turn right in.

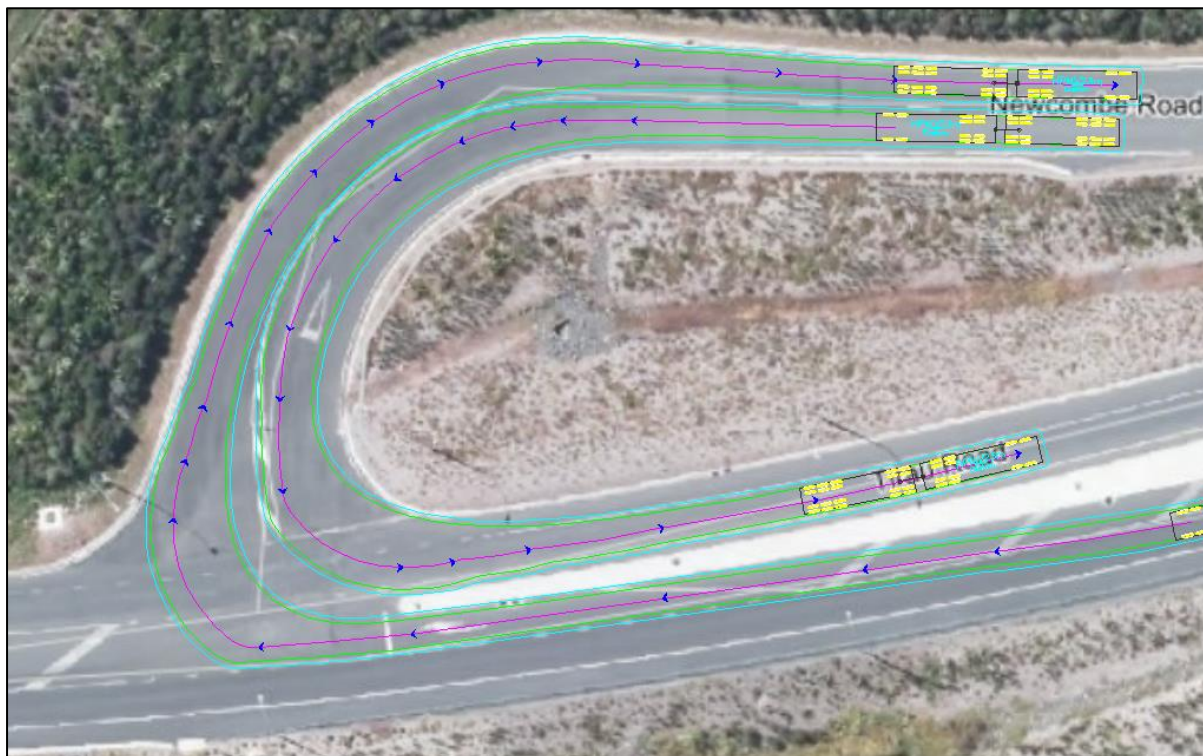


Figure 7: Trucks Turning at Newcombe Road Towards SH1

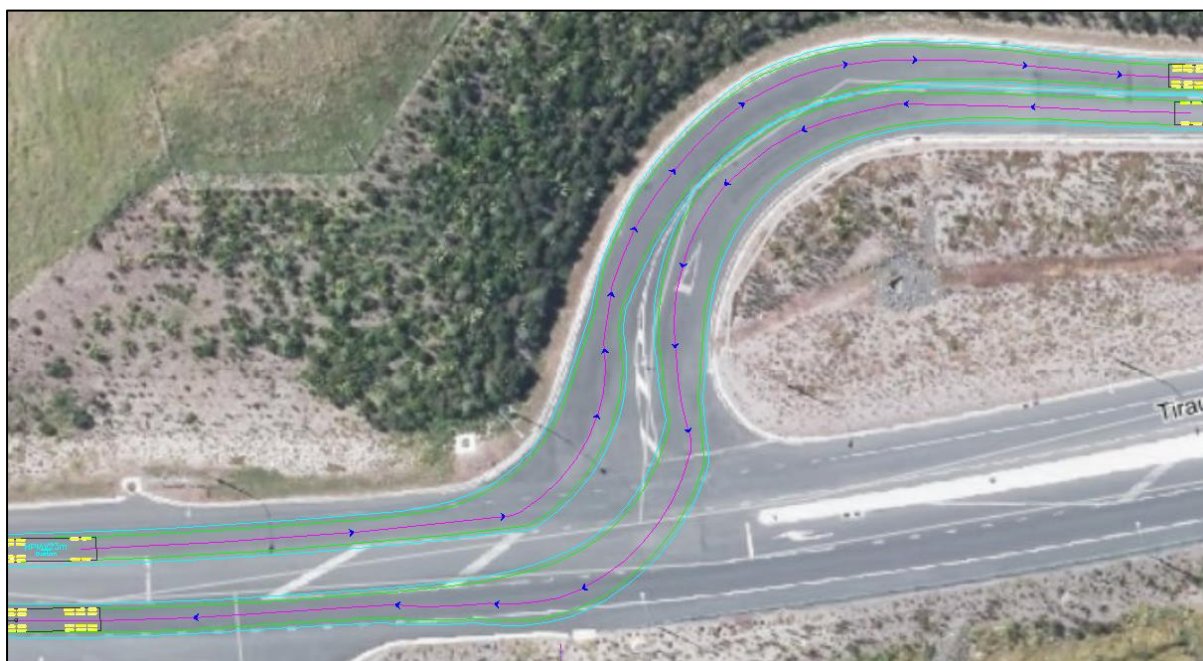


Figure 8: Trucks Turning at Newcombe Road Towards Cambridge



7.3.6 It is noted that the expected average traffic demands to and from the south are less than 2vph. This means that it is unlikely that there will be more than one truck wishing to turn right at any one time. As such, the right turn lane and hatched area adjacent to the physical median is assessed as being long enough to accommodate a truck waiting to turn right without the vehicle impeding westbound through traffic coming off SH1. Figure 9 shows two trucks waiting to turn right into Newcombe Road, on the rare chance that two vehicles happen to be queuing at the same time, without overhanging into the trough lane on Tirau Road.



Figure 9: Trucks waiting to turn right into Newcombe Road

7.3.7 AUSTRoads has also been used to determine whether there is sufficient road length available for trucks to be able to reach appropriate speeds when entering the SH1 mainline. The length of the southbound on-ramp is approximately 1km from Newcombe Road. Table 5.8 from Part 4A of the *Guide to Road Design* states that trucks are not able to accelerate to 90km/h from rest along an upgrade and that 2km would be required to reach 80km/h along a 1% upgrade. A total of 890m is required for trucks to reach 70km/h on a 1% upgrade and therefore this is the likely operating speed of trucks when joining the mainline via the existing Tirau Road interchange.

7.3.8 Alternative routes for trucks heading south have been reviewed. One option is for trucks to head through Cambridge and join SH1 at the Victoria Street / SH1B interchange. The on-ramp at the Victoria Street interchange is approximately 650m long and therefore notably shorter than the lane length available from Newcombe Road although this ramp is flat rather than rising at a shallow gradient. Regardless, trucks would be required to accelerate from rest given

that the interchange is controlled by signals. With the length of on-ramp available and based on its flat gradient, it is likely that trucks would be travelling at about 70km/h when joining the mainline. Therefore, even under normal operating conditions for an interchange, trucks are not expected to join the Expressway mainline travelling at 90km/h.

7.3.9 It is also noted that the posted speed limit of the mainline is 110km/h rather than the 100km/h that applies at the Tirau Road interchange. The speed difference between trucks using the on-ramp and vehicles on the mainline is therefore likely to be larger.

7.3.10 An alternative route is for trucks to travel through Leamington and rejoin SH1 at Ariki Road. However, trucks are not permitted to cross Karapiro Dam due to its tight curvature. The next Waikato River crossing opportunity is via Maungatautari Road. This route forms a T-intersection with SH1 and trucks would therefore be joining the SH1 mainline from rest without any auxiliary acceleration lanes. This route also significantly increases the distance required for trucks to travel as the route diverges away from the Waikato River. Therefore, this route is impractical based on the sand quarry operations and does not allow for trucks to join the mainline at a higher speed.

7.3.11 A third option would be for a new south facing on-ramp to SH1 from Newcombe Road to be constructed to the south of the existing interchange with Tirau Road. An alternative connection between Newcombe Road and SH1 was considered where a new south facing ramp onto SH1 southbound would be added. Given the strategic nature of SH1 providing more access options and intersections is not considered to appropriate or in keeping with the primary function of SH1.

7.3.12 Overall, there are four options for southbound trucks to join SH1:

- Tirau Road interchange
- Victoria Street Interchange
- Maungatautari Road
- New ramp from Newcombe Road

7.3.13 From the above options it is assessed that using the existing Tirau Road interchange is the optimal route as it has the longest on-ramp length, allows trucks to merge with mainline traffic and does not affect the function of SH1. It is reiterated that only seven trucks per day on

average are expected to head south on SH1. While these seven trucks may not be travelling at 90km/h, the length of the on-ramp available allows for trucks to join the mainline at a similar speed to a regular interchange. Therefore, the effect of the seven trucks using the Tirau Road on-ramp is assessed as being less than minor.

## **7.4 HVIF**

7.4.1 WDC charges a Heavy Vehicle Impact Fee (HVIF) for developments that generate a large number of heavy vehicles. The HVIF is based on the number of trucks generated by the proposed development and the length of roads travelled that are maintained by the WDC. From the above assessment, it was concluded that no restrictions on truck movements are necessary. The HVIF calculations have been based on the fact that trucks are not restricted in where they are able to travel.

7.4.2 The calculations of the HVIF are provided in Appendix A. This includes considering the distribution of trucks to the road network. Trucks delivering within Cambridge are considered to travel an average of 5.8km from the site which is the approximate average distance to the middle of the surrounding growth cells.

7.4.3 It has been calculated that the HVIF would be a total of \$547,393 of which \$268,223 would be the 49% contribution share from WDC and \$279,171 would be the contribution from the applicant. This equates to a levy of \$0.04 per tonne of sand excavated from the site.

## **7.5 Sensitivity Testing**

7.5.1 Feedback provided from WDC suggested that the expected distribution of trucks delivering material from the site may be different to that assessed and therefore the HVIF may vary. A number of different scenarios have been reviewed that assess the sensitivity of the expected truck distribution and the associated change to the HVIF calculations. A summary of these scenarios is provided below and in each case the proportion of trucks to Cambridge North and South have been reduced by 5% each.

- Increase trucks to SH1 North and SH1B by a combined total of 10%
- Increase trucks to SH1 South by 10%
- Increase trucks to Te Awamutu by 10%

- 7.5.2 The same methodology and assumptions were used in each of the sensitivity with changes only to the distribution of truck movements. The calculations for each scenario are presented in Appendix A.
- 7.5.3 The scenario that increased trucks heading north to SH1 or SH1B had a negligible effect on the HVIF calculation as the distance travelled only increased by approximately 700m for the trucks heading north instead of staying within the Cambridge area. The total HVIF was calculated to be \$550,291 with the Council contribution of \$269,643 and \$280,648 from the applicant. The levy for this scenario remains at \$0.04 per tonne.
- 7.5.4 The scenario that increased trucks heading south on SH1 resulted in a decrease to the HVIF calculations due to the reduced distance travelled by trucks on Waipa district roads. The total HVIF was calculated to be \$520,283, with the Council contribution of \$254,939 and \$265,344 from the applicant. The levy for this scenario reduces to \$0.03 per tonne.
- 7.5.5 The scenario that increased trucks heading towards Te Awamutu had the greatest effect on the HVIF calculations. This is due to this route being the longest on which trucks spend using Waipa district roads. The total HVIF was calculated to be \$639,606, with the Council contribution of \$313,407 and \$326,199 from the applicant. The levy per tonne of material excavated remains at \$0.04 in this scenario.
- 7.5.6 As noted in feedback from WDC, there are other quarries in the Te Awamutu area and that a previous estimate may have likely overestimated the distribution in that direction. The expected distribution has considered this feedback and hence the HVIF calculated within section 7.4 above is considered to be a more accurate reflection on the distribution of trucks from the site. It is also noted that if demand for sand is less than anticipated that this would likely result in less material being excavated rather than trucks being redistributed to other routes thereby not resulting in an increase to overall traffic impacts.
- 7.5.7 Following additional information requests from WDC in relation to pavement design and maintenance, further review of the appropriate HFIV is provided below in Section 12.1.13 of this report.

## 8 Access Effects

- 8.1.1 A new vehicle crossing will provide access to the quarry. Other existing accesses to the site, such as those to the existing farmhouse, will only provide access to the existing activities ensuring that only a single access serves the quarry facility. Sight distance from the proposed vehicle crossing location is at least 200m in both directions. The NZTA RTS6 document includes minimum sight distance standards that should be provided at vehicle crossings. The vehicle crossing may cater for more than 200vpd during busier days and fronts a local road with a speed limit of 100km/h. The operating speed will therefore be taken as 110km/h. The RTS6 document therefore states that at least 190m visibility should be provided. This is satisfied in both directions. Some vegetation management will be required to ensure that adjacent planting does not grow to impede sight distance in the future.
- 8.1.2 The District Plan also includes minimum distances that should separate vehicle crossings from other vehicle crossings and intersections. For a road with a posted speed limit of 100km/h, at least 200m should be provided between any nearby intersections or vehicles crossings. The proposed access is at least 600m from an intersection but is approximately 160m from the nearest vehicle crossing to the east. This vehicle crossing serves a single dwelling and as such will not cater for large volumes of traffic. The vehicle crossing location can be seen from the proposed access to the site and vehicles associated with the subject site will be able to react to other vehicles. The separation is therefore expected to result in less than minor effects.
- 8.1.3 There is also a vehicle crossing approximately 200m to the west and therefore it is not possible to provide a connection that is 200m clear from both vehicle crossings. The vehicle crossing to the west serves a single dwelling and a farm. This access is therefore expected to generate more vehicle movements than the access to the east. As such, providing 200m separation to the vehicle crossing to the west is considered to be more appropriate than achieving 200m separation to the east. Newcombe Road is a no-exit road with very low traffic volumes from the east and therefore the risk associated with non-compliance to the east is considered to be much lower. Given that the access location has been assessed as having a less than minor effect with respect to the eastern vehicle crossing, it is concluded that the access location is appropriate for the proposed sand quarry.
- 8.1.4 All other aspects of the site access are considered to comply with the requirements of the District Plan. The access arrangements are considered appropriate for the proposed activity and are likely to result in less than minor effects on the wider road network.

## 9 Road Safety Effects

- 9.1.1 A study of the road safety record within the Cambridge urban area over the last five years has indicated that a total of 329 crashes have been reported. Of these, only 24 involved trucks, and were distributed throughout the study area with no particular area experiencing a high number of crashes. Of these crashes, two resulted in minor injuries and the remaining 22 were damage to property only. The two minor injury crashes were a result of cars failing to give-way and being hit by a truck.
- 9.1.2 No crashes that involved trucks also involved any pedestrians or cyclists. Given the relatively low number and severity of crashes involving trucks, it is assessed that there are no existing safety issues in relation to trucks using the roads within Cambridge.
- 9.1.3 A study of the road safety record was also undertaken for the alternative routes along Kaipaki Road. The search found that 56 crashes had been reported of which four involved trucks. Two of these resulted in minor injuries and two were non-injury crashes, none of which occurred in the same place. The crashes that resulted in minor was due to a car rear ending a truck and the other was due to a car driver failing to stop at a Stop sign and hitting a truck. Similar to the crash record within Cambridge, the number of crashes is relatively low with low severity. As such, no specific safety issues have been identified.
- 9.1.4 Overall, there are no significant differences between trucks travelling through Cambridge or using the alternative route via Kaipaki Road. It is considered likely that truck drivers will be able to select their route based on the local condition at the time of travel. During the day, when traffic movements within Cambridge are higher, the route via Kaipaki Road is likely to be the more efficient option while in off-peak time, travelling through Cambridge may be the preferable route. Given that no specific safety issues have been identified for either route, it is assessed that truck drivers and operators will be able to select their route based on the present conditions at the time of travel. No consent conditions are considered necessary to restrict truck movements. This also allows operators to adjust routes if there are changes in traffic patterns in the future.

## 10 SH1 Expressway Extension

10.1.1 Consideration has also been given to the potential extension of Newcombe Road in the context of the potential upgrade of the Expressway through to Piarere. As described in Section 3 of this report, Newcombe Road was constructed as part of the Waikato Expressway to provide access to properties that would no longer access directly to the SH1. It is noted that consultation is currently underway for the extension of the expressway to Piarere (although construction timings are yet to be confirmed).

10.1.2 While the exact route and associated effects are yet to be determined, Waka Kotahi has recently announced that they are about to begin the route protection process for the extension of the expressway to approximately follow the existing SH1 alignment. This includes an extension of Newcombe Road adjacent to the expressway through to Karapiro Road to provide access to properties that would no longer have direct access to SH1. Figure 10 below illustrates the proposed alignment of the expressway extension along with identified the alignment of the Newcombe Road extension.

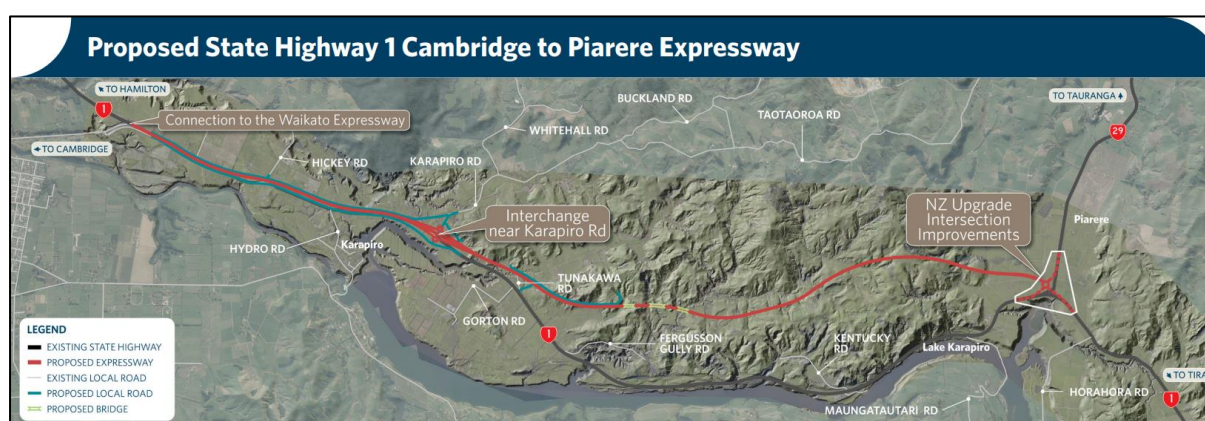


Figure 10: Proposed SH1 Cambridge to Piarere Expressway

10.1.3 From its current terminus to Hickey Road, a distance of some 1.6km, there are six vehicle crossings to the northern side of SH1 serving six properties (one vehicle crossing serves two properties while another property has two vehicle crossings). With the extension of Newcombe Road, it is possible that an extra six vehicles per hour or 60 vehicles per day may use Newcombe Road. Affected proposed southern of Hickey Road would be more likely to head towards Karapiro Road as this is more direct route to get to SH1 with a new interchange proposed at that location. Given the existing low volumes on Newcombe Road, and that Tirau

Road used to carry over 19,000vpd, this additional traffic is unlikely to create any notable congestion even when considered in conjunction with trucks from the sand quarry. From the perspective of the wider road network, trips generated by these properties would already exist on the network and therefore the potential extension of Newcombe Road is not considered to have a perceivable effect on the wider network.

## **11 Parking**

11.1.1 The District Plan does not specify any minimum or maximum parking rates that apply to the proposed quarry activity. Given the size of the site, it is expected that informal car parking can be provided for vehicles as required. The parking demands of the activity can therefore be contained within the site.

11.1.2 It is unlikely that more than 10 staff will operate from the site at any time. As such, no bicycle parking is required.

11.1.3 Overall, it is considered that the parking effects will be less than minor on the wider road network.

## **12 Consultation**

12.1.1 Consultation has been undertaken with both Waipa District Council (WDC) and Waka Kotahi in relation to the proposed sand quarry. WDC indicated that they did not want to have trucks travelling through the Cambridge town centre as significant work has been done to change the nature of Queen Street and Albert Street, following the revocation of the state highway status of these roads. WDC would prefer that all sand trucks would use the Waikato Expressway / SH1 route and that north facing ramps could be installed at Tirau Road to provide such access.

12.1.2 Waka Kotahi indicated that they have no plans for north facing ramps and do not consider them to be a suitable option. They also raised interest in how the Newcombe Road / Tirau Road intersection would cater for significant truck movements as it was not initially designed for this purpose. Waka Kotahi also wishes to understand how the future extension of the



Waikato Expressway and increase in the number of properties accessing Newcombe Road might be affected by the proposals.

12.1.3 CKL has considered potential traffic routing and design options endeavouring to respect the conflicting opinions of the two road controlling authorities. These options have been discussed in previous sections of this report and include considering routes that avoid the inner central Cambridge area (as discussed in Section 7.2) and providing an additional south facing connection to SH1 to the south of Tirau Road (as discussed in section 7.3).

12.1.4 A draft version of this ITA was provided to Waka Kotahi. Feedback seeking extra information was provided on 4 November 2021 in relation to six matters. These are provided below and a response to is provided to each item:

Sightlines:

- *The report identifies that the sightlines that exists presently are sufficient for the existing use – and therefore are sufficient for your proposal. However, this is not the correct interpretation, Waka Kotahi seeks that sightlines should be in accordance with AustRoads safe intersection sight distances (SISD). It is recommended that an assessment is undertaken to identify exactly what is needed to obtain compliant sightlines from this intersection.*

12.1.5 An assessment of visibility at the Newcombe Road / Tirau Road intersection is provided in Section 7.3 and is based on the Austroads standards. Visibility towards SH1 has been assessed as compliant with the AUSTROADS standards. To the west, visibility is limited by vegetation on the nearby earth bank. It is noted that the Newcombe Road intersection was designed by Waka Kotahi as part of the works associated with SH1. It is reasonable to expect that the intersection and the associated earth bank would have been constructed to appropriate standards given it was only completed recently. It is therefore recommended to trim back and maintain vegetation at the intersection to ensure that it is not reducing the visibility available at the intersection. With the vegetation suitably trimmed back, the visibility available is assessed as being appropriate for the intersection.

SIDRA Assessment:

- *It is noted that a majority of vehicles will be turning right out of the Newcombe Road intersection. Our engineers have asked that you provide a SIDRA assessment identifying the delay times for all turning movements and the associated level of service (average and peak traffic).*

12.1.6 As requested, a SIDRA assessment of the intersection of Newcombe Road onto Tirau Road.

Three scenarios have been tested as detailed below:

- Base – Uses existing Traffic Volumes
- Future Average – Adds expected quarry traffic volumes (32vph) and distribution
- Future Sensitive – Adds maximum expected hourly volumes (40 vph) and has all traffic heading south to SH1

12.1.7 Table 2 and Table 3 below summarise the results from the SIDRA for the morning and evening peak hours respectively.

Table 2: SIDRA Results – AM Peak

| Approach            | Movement | Base          |           |           | Future Average |           |           | Future Sensitive |           |           |
|---------------------|----------|---------------|-----------|-----------|----------------|-----------|-----------|------------------|-----------|-----------|
|                     |          | Ave Delay (s) | LOS       | 95% Q (m) | Ave Delay (s)  | LOS       | 95% Q (m) | Ave Delay (s)    | LOS       | 95% Q (m) |
| Tirau Rd (east)     | Through  | 0.0           | A         | 0.0       | 0.0            | A         | 0.0       | 0.0              | A         | 0.0       |
|                     | Right    | 5.0           | A         | 0.0       | 5.1            | A         | 0.2       | 5.1              | A         | 0.5       |
| Newcombe Rd (north) | Left     | 5.1           | A         | 0.9       | 5.1            | A         | 1.7       | 5.1              | A         | 1.4       |
|                     | Right    | 11.7          | B         | 0.9       | 12.0           | B         | 1.7       | 12.2             | B         | 1.4       |
| Tirau Rd (west)     | Left     | 4.6           | A         | 0.0       | 4.6            | A         | 0.0       | 4.6              | A         | 0.0       |
|                     | Through  | 0.0           | A         | 0.0       | 0.0            | A         | 0.0       | 0.0              | A         | 0.0       |
| <b>All Vehicles</b> |          | <b>0.3</b>    | <b>NA</b> |           | <b>0.6</b>     | <b>NA</b> |           | <b>0.6</b>       | <b>NA</b> |           |

Table 3: SIDRA Results – PM Peak

| Approach            | Movement | Base          |           |           | Future Average |           |           | Future Sensitive |           |           |
|---------------------|----------|---------------|-----------|-----------|----------------|-----------|-----------|------------------|-----------|-----------|
|                     |          | Ave Delay (s) | LOS       | 95% Q (m) | Ave Delay (s)  | LOS       | 95% Q (m) | Ave Delay (s)    | LOS       | 95% Q (m) |
| Tirau Rd (east)     | Through  | 0.0           | A         | 0.0       | 0.0            | A         | 0.0       | 0.0              | A         | 0.0       |
|                     | Right    | 7.2           | A         | 0.1       | 7.3            | A         | 0.3       | 7.3              | A         | 0.8       |
| Newcombe Rd (north) | Left     | 7.1           | A         | 0.2       | 7.2            | A         | 1.1       | 7.2              | A         | 0.9       |
|                     | Right    | 11.5          | B         | 0.2       | 12.0           | B         | 1.1       | 12.1             | B         | 0.9       |
| Tirau Rd (west)     | Left     | 4.6           | A         | 0.0       | 4.6            | A         | 0.0       | 4.6              | A         | 0.0       |
|                     | Through  | 0.0           | A         | 0.0       | 0.0            | A         | 0.0       | 0.0              | A         | 0.0       |
| <b>All Vehicles</b> |          | <b>0.2</b>    | <b>NA</b> |           | <b>0.5</b>     | <b>NA</b> |           | <b>0.6</b>       | <b>NA</b> |           |

12.1.8 The above results show that in both peak periods that there is negligible difference in intersection performance with no more than one second in delay difference for any movement. All movements operate at Level of Service (LOS) B or better which represents relatively free flowing conditions. The queuing on all approaches is unlikely to exceed one vehicle in length. Therefore, any vehicles waiting to turn are unlikely to affect through moving traffic and hence no queuing is expected to be generated onto SH1 or the nearby ramps. Overall, it is assessed that the proposed quarry has negligible effect on the performance of the intersection between Newcombe Road and Tirau Road.

Tracking of material:

- *It is noted that there is the potential for the tracking of materials from the quarry onto the roading network. Will there a wheel wash or other measure to prevent the tracking of material from site?*

12.1.9 A wheelwash will be provided within the site. This can also be required by way of a consent condition.

Pavement Assessment:

- *It does not appear that the assessment looked into the pavement standard for Newcombe Road or the intersection with Tirau Road. Details should be provided to identify the standard of the pavement and the effects that the proposal will have on the pavement.*

12.1.10 A review of the Newcombe Road pavement has been undertaken. The current pavement is designed to accommodate approximately 800 trucks per year. With up to 20,000 trucks proposed from the quarry, the pavement would therefore likely fail within 1-2 years. It is therefore anticipated that this pavement will need to be completely rebuilt. However, a maintenance plan is also proposed for the next 3-4 years to maximise the life of the current pavement structure. This would involve the following:

- Inspection of the pavement surface on a quarterly basis including Benkelman Beam testing.
- Rut filling and pothole repairing. This would be undertaken annually within April/May before the wet season with any potholes being repaired as soon as they are identified.
- Flushing of the chip seal will require localised Watercutting.
- Rehab proposal based on 25-year design life:
  - Import 80 mm M/4 AP 40 over the high spots;
  - In situ Stabilise 180 mm depth 1.5% Cement, compact to subbase industry standard;
  - Import 160 mm M/4 AP40 cement modify 1.5% cement compact to basecourse industry standard;
  - Chipseal Grade 2/4 or 3/5, followed by a single coat grade 5 three months after Grade2/4.

12.1.11 The pavement will be considered to have failed if the Benkelman Beam test results show rutting in excess of 20mm. This would trigger the requirement for Newcombe Road to be reconstructed. This can be required by way of a consent condition as can the maintenance programme. The pavement would be designed to fully accommodate the future number of vehicle movements expected to be generated for the remaining life of the quarry. For the avoidance of doubt, the extent of Newcombe Road to be constructed would only apply from the access to the quarry up to the intersection of Tirau Road.

12.1.12 Pavement reconstruction is expected to be required within 3-4 years as a result of the maintenance plan however this may be extended if truck volumes generated by the quarry are less than anticipated. Quarterly Benkelman Beam testing would still be undertaken regardless of number of trucks generated in order to identify when the pavement would require reconstruction.

12.1.13 With Newcombe Road being reconstructed and maintenance being undertaken by the quarry operator, it is considered that the Newcombe Road component of the HVIF would no longer apply as WDC would not be required to maintain the road in the short term, and in the long term, an upgraded asset designed to accommodate the increased HCV movements would be provided. From the calculations in Appendix A, the Newcombe Road section represents \$224,163 of the \$547,393 (approximately 40%) of the total HVIF. Excluding this section would result in a the total HVIF being \$323,231 of which \$158,383 would the WDC component and \$164,848 being the applicant's component. This would also result in the levy per tonne reducing to \$0.02.

Existing Quarry:

- *You mention that there is an existing quarry in Leamington that will be closed in the near future – which the proposed quarry will replace. Can you please provide the consent decision that authorised this quarry's use, and the consented and operational volumes of heavy vehicles associated with this quarry. Can you please also provide details about the timing of the closure of the Leamington Quarry and if this will operate when the proposed quarry is operational?*

12.1.14 It was previously anticipated that another quarry in Cambridge would close. However, this site is no longer under the same ownership and therefore it is not possible to confirm this closure. The assessment in this report has not discounted any trips from the existing quarry and is not reliant on closure of any other sites.

Maximums of vehicles heading south:

- *You note that it is anticipated that there will only be 18% of heavy vehicles heading south and returning on SH1, and this is reasoning for not needing an extension to the right turn bay. However you have not mentioned what the maximum hourly volume of heavy vehicles could theoretically be. Can you consider this and the suitability of the right turn bay in the maximum scenario.*

12.1.15 As outlined above in Section 6.2.4, the site is expected to generate 20 trucks per hour (40vph). The theoretical maximum case would therefore have 20 trucks turn right into Newcombe Road within an hour. This equates to an average of one truck every three minutes. The ‘Future Sensitive’ scenario in the SIDRA modelling results presented above tested this theoretical maximum scenario and the results demonstrated that there is unlikely to be a noticeable difference on intersection performance. Given only 18% of these 20HCV per hour are expected to travel to and from the south, it is clear that the effects on the right turn bay are negligible, and no extension of this facility is warranted.

### 13 Planning Framework

13.1.1 The transport related objectives and policies of the District Plan have a clear theme of ensuring that there is good integration between land-uses to create a transport network that operates in an efficient manner. The proposed quarry is expected to deliver a large proportion of its material within the Cambridge area. The quarry is therefore considered to integrate well with the surrounding land uses as it minimises the length of trips for material to be delivered. A quarry at this location aligns significantly more with the overarching theme of the District Plan in comparison to a quarry located further outside of Cambridge.

13.1.2 The proposed development is located within the Waipa District and is required to meet the provisions set out in Section 16 of the District Plan. Table 4 below summarises the relevant transportation rules and whether the proposed development complies with these criteria:

Table 4: District Plan Compliance Assessment

| Rule  | Requirement  | Proposed                                    | Compliance |
|---|--|---|------------|
| <b>Road Hierarchy</b>                         |  |   |            |
| 16.4.2.1                                      | All structure plans, plan changes, developments, and subdivision must be consistent with the road hierarchy, as contained in Appendix T5.  | No changes to road hierarchy are proposed.  | Complies   |
| 16.4.2.2                                      | To maintain the effectiveness of the road hierarchy, a road network must be designed so that a road connects to a road at the same level in the hierarchy, or directly above or below its place in the hierarchy | No road network additions are proposed      | N/A        |
| 16.4.2.3                                      | To maintain the effectiveness of the road hierarchy, when a site has two road frontages, vehicle access and egress must be from the lesser road type   | Access proposed to road with lowest status. | Complies   |
| <b>Vehicular Access to Sites in All Zones</b> |  |   |            |

|   |   |  |                 |
|---|---|--|-----------------|
| 16.4.2.4  | Every site shall be provided with vehicle access to a formed road that is constructed to a permanent standard. The vehicle access shall be designed to accommodate the demands of all traffic from the activity on that site, taking into account the form and function of the road.  | Site access is provided to a formed road.                  | Complies        |
| <b>Vehicle Entrance Separation from Intersections and Other Vehicle Entrances</b> |   |  |                 |
| 16.4.2.5  | The minimum distance of a vehicle entrance (accessway) from an intersection or other entrance shall be as follows. Values K, M and N are 200m, 60m, and 200m respectively for the site as the frontage road speed limit is 100km/h  | Less than 200m separation to nearby crossings (Measure N). | Does not comply |
| <b>Vehicle Entrance Separation from Railway Level Crossings</b>                   |   |  |                 |
| 16.4.2.6  | New vehicle access ways shall be located a minimum of 30m from a railway level crossing.  | No level crossings are near the site.                      | Complies        |
| <b>Minimum Sight Distance Requirements for a Railway Level Crossing</b>           |   |  |                 |
| 16.4.2.7  | Any buildings, structure or land use shall be located to comply with the minimum rail level crossing sightline requirements within Appendix T2.   | No level crossings are near the site.                      | Complies        |
| <b>Vehicle Access to Compact Housing Development</b>                              |   |  |                 |
| 16.4.2.8  | Compact housing development must only have one access point to a strategic road   | No housing proposed  | N/A             |
| <b>Vehicle Access to Sites in the Industrial Zone</b>                             |   |  |                 |
| 16.4.2.12   | Where a site has a frontage greater than 50m to a road which is not a State Highway or a major arterial road, two vehicle crossings will be allowed from that road, subject to the requirements of Rule 16.4.2.5.   | Only one vehicle crossing is proposed                      | Complies        |
| <b>Parking, Loading and Manoeuvring Area</b>                                      |   |  |                 |
| 16.4.2.13   | All activities that involve the erection, construction or substantial reconstruction, alteration or addition to a building on any site, or changes the use of any land or building, shall provide loading/unloading spaces for vehicles on the site as set out in Appendix T1.<br><br>If parking is provided in the Residential Zone:<br>(a) One of the car parks allocated to a single dwelling may be stacked (i.e. located in such a way that it cannot be accessed directly from the associated access or manoeuvring area) provided that the stacked car park does not:<br>(i) Encroach on or interfere with any shared access on the site; or<br>(ii) Encroach on any required building setback, side boundaries, or outdoor living area; or<br>(iii) Compromise the ability for any vehicle to manoeuvre within the site | Refer to Section 11 of this report.                        | Can Comply      |
| 16.4.2.14   | Vehicle parking (if provided), loading/unloading, and manoeuvring areas shall:<br>(a) Not encroach on any setback, outdoor living area, or bicycle parking spaces; and loading/unloading areas and  | Refer to Section 11 of this report.                        | Can Comply      |

|  |  |                         |     |
|--|--|-------------------------|-----|
|  | <p>manoeuvring areas shall not encroach over vehicle parking spaces; and</p> <p>(b) Be designed, formed, and constructed to ensure that the surface of the required area provides a dust free environment; and</p> <p>(c) Provide for the safe and efficient disposal of surface stormwater clear of any adjoining access or road surface in a way that does not result in ponding or scouring; and</p> <p>(d) Be constructed to accommodate the anticipated use of the area by all traffic likely to access the site in the zone in which it is located, including construction traffic taking into account pavement, surfacing, demarcation of spaces, aisles and circulation roads; and</p> <p>(e) Be provided on the site on which the building, activity or proposal is located, except where the provisions of Rules 16.4.2.15 and 16.4.2.16 apply.</p>  |                         |     |
| <b>Exemption for On-Site Vehicle Manoeuvring Areas in the Residential Zone</b> |  |                         |     |
| 16.4.2.15  | <p>On front or corner sites in the Residential Zone, on-site vehicle manoeuvring areas may be exempt from Rule 16.4.2.14(e) and shall not be required where:</p> <p>(a) The site contains a single, primary dwelling; and</p> <p>(b) The garage doors, or vehicle entrance to the carport faces the road where the vehicle will access (refer to diagram following Rule 16.4.2.16); and</p> <p>(c) The distance between the garage door, or vehicle entrance to the carport and the road boundary on the site is no more than 12m (refer to diagram following Rule 16.4.2.16); and</p> <p>(d) The driveway does not encroach on any minimum outdoor living area as required under Rule 2.4.2.19 or road boundary setback other than at the vehicle entrance.</p>   | Exemptions not required | N/A |
| 16.4.2.16  | <p>On sites in the Residential Zone with access to a right of way, manoeuvring may occur in the right of way and sites may be exempt from Rule 16.4.2.14(e) where:</p> <p>(a) The site contains a single, primary dwelling; and</p> <p>(b) The garage doors, or vehicle entrance to the carport face the right of way where the vehicle will access; and</p> <p>(c) The distance between the garage door, or vehicle entrance to the carport and the site boundary with the right of way is no more than 12m; and</p> <p>(d) The driveway does not encroach on any minimum outdoor living area as required under Rule 2.4.2.19; and</p> <p>(e) Rights over the right of way shall be apportioned so as to provide legal access to all sites for the purposes of vehicle manoeuvring; and</p> <p>(f) The right of way shall be of sufficient dimension to provide for a vehicle manoeuvring area of a standard adequate to accommodate a 99.8 percentile car, in order to ensure that all vehicles have the ability to access the adjoining road in a forward direction after no more than a three point turning manoeuvre on the site.</p> | Exemptions not required | N/A |



|   |   |                                     |            |
|---|---|-------------------------------------|------------|
| 16.4.2.17   | The design and layout of sites shall ensure that access to each required loading and unloading space, or parking space if provided is directly from the required access or manoeuvring area.  | Access to parking will be provided  | Can Comply |
| 16.4.2.18   | Vehicle manoeuvring areas loading and unloading spaces, and if provided, parking spaces, including those spaces located in a garage, shall be provided on a site, of a standard adequate to accommodate a 99.8 percentile car, or a 99 percentile truck, in order to ensure that all vehicles have the ability to access the adjoining road in a forward direction after no more than a three point turning manoeuvre on the site, except where Rule 16.4.2.16 applies. | Refer to Section 11 of this report. | Can Comply |
| 16.4.2.19   | All car parks (if provided) shall be marked or delineated on site, except in the Residential Zone and in the St Peters School Zone.   | Refer to Section 11 of this report. | Can Comply |
| <b>Car Park Landscaping and Lighting</b>                    |   |                                     |            |
| 16.4.2.20   | Other than in the St Peters School Zone, all car parks must:<br>(a) Provide at least one tree planted for every 5 car parking spaces at a grade of no less than PB95. For the avoidance of doubt, PB95 is equivalent to a tree that is at least 1.5m tall at the time of planting; and<br>(b) Ensure lighting is designed to avoid shading areas or isolating areas of public use.  | Refer to Section 11 of this report. | Can Comply |
| <b>Provision of Bicycle Parking Facilities</b>              |   |                                     |            |
| 16.4.2.24   | In areas other than the Rural Zone and Pedestrian Frontages, activities employing more than ten people must provide bicycle parking facilities at a rate of one bicycle park for every ten people employed  | Refer to Section 11 of this report. | Can Comply |
| <b>Provision of an Integrated Transportation Assessment</b> |   |                                     |            |
| 16.4.2.25   | A Simple or Broad Integrated Transport Assessment (ITA) shall be prepared for activities as required by this rule. A Simple ITA is required for a development generating more than 250 'car equivalents' onto a Collector Road  | This report is a Simple ITA.        | Complies   |

13.1.3 All matters in relation to parking, loading, formation and layout are assumed to be compliant given the scale of land available.

13.1.4 The proposed development is generally compliant with the WDCDP Rules with the only exception relating to driveway separation. As discussed in Section 8, there is 200m separation to the vehicle crossing to the west and 160m to the east. Both vehicle crossing locations can be seen from the proposed vehicle crossing to the site and this technical non-compliance is not expected to result in any discernible effects on the surrounding road network.

## 14 Conclusions and Recommendations

14.1.1 It is proposed to establish a sand quarry on Newcombe Road that will extract up to 400, tonnes of material per year. Based on the assessment undertaken it is concluded that:

- Access to the site will be provided by a new access onto Newcombe Road.
- It is expected that 78 trucks (156 movements or trips on average would be generated on average by the site per day. A maximum of 200 (400 movements or trips) trucks generated per days has been adopted within this assessment.
- The hourly traffic demand is expected to be approximately 8 trucks (16 movements or trips) day to day and some 20 trucks (40 movements or trips) on peak days which are only expected once every couple of months. The majority of trips are expected to be to and from the local Cambridge growth cells.
- There is sufficient network capacity to accommodate these traffic demands with routes used by trucks being part of, or formerly part of the State Highway network. Volumes on Tirau Road would be significantly less than it operated under state highway conditions.
- Pavement reconstruction of Newcombe Road will likely be required. A monitoring and maintenance programme is proposed to identify when this would be required.
- The HVIF would equate to a levy of \$0.02 per tonne excavated from the site given that Newcombe Road will require a full pavement reconstruction and in the interim, maintenance would be provided by the applicant.
- Analysis of the Cambridge road network has identified no particular road safety issues.
- Alternative routes for trucks to and from the site have been considered following feedback from WDC and Waka Kotahi. The analysis of these options has concluded that there is no requirement to restrict certain routes given that most of the material from the site is expected to be used within Cambridge and that the Tirau Road interchange is the best option for providing access for trucks heading south on SH1.
- The overarching theme within the transportation objectives and policies of the District Plan is to integrate land uses and to maximise the efficiency of the road network. With a large proportion of the material from the site being used within the Cambridge area, the

proposed sand quarry location is considered to better align with the District Plan theme than locating the quarry further afield.

- It is recommended to trim back and maintain the vegetation on the western side of the Newcombe Road intersection so that it does not impede driver visibility.

14.1.2 Overall, there are no traffic or transportation reasons to preclude approval of the proposed sand quarry subject to consent conditions being applied requiring maintenance of Newcombe Road between the site access and Tirau Road and full reconstruction of this pavement once failure occurs. Draft consent conditions are as follows:

*The applicant will undertake testing and maintenance of the pavements of Newcombe Road between the site access and the Tirau Road intersection once the site is operational as follows:*

- *Inspection of the pavement surface on a quarterly basis including Benkelman Beam testing.*
- *Rut filling and pothole repairing. This would be undertaken annually within April/May before the wet season with any potholes being repaired as soon as they are identified.*
- *Flushing of the chip seal will require localised Watercutting.*
- *Rehab proposal based on 25 year design life:*
  - *Import 80 mm M/4 AP 40 over the high spots;*
  - *In situ Stabilise 180 mm depth 1.5% Cement, compact to subbase industry standard;*
  - *Import 160 mm M/4 AP40 cement modify 1.5% cement compact to basecourse industry standard;*
  - *Chipseal Grade 2/4 or 3/5, followed by a single coat grade 5 three months after Grade2/4.*

*The pavement will be considered to have failed if the Benkelman Beam test results show rutting in excess of 20mm. On failure of the pavement, the applicant is required to reconstruct the pavement of Newcombe Road between the site access and Tirau Road to a standard suitable to accommodate the HCV traffic arising from the site for the remaining life of the quarry. On completion of the reconstruction, maintenance will revert back to Waipa DC.*

14.1.3 *A Heavy Vehicle Impact Fee of \$0.02 per tonne of sand excavated from the site will apply throughout the lifespan of the quarry activity.*

CKL

## Appendix A – HVIF Calculations

Scenario:  
Expected Distribution

| Road Section               | Existing Traffic     |       | Existing Traffic |             |                  |            |                      |            |       |           |            |         | Proposed Traffic |         |                  |                  |                      |            |       |           |           |             | Cost/km   | Financial Cont. |
|----------------------------|----------------------|-------|------------------|-------------|------------------|------------|----------------------|------------|-------|-----------|------------|---------|------------------|---------|------------------|------------------|----------------------|------------|-------|-----------|-----------|-------------|-----------|-----------------|
|                            | Current Volume (kpd) | % HCV | Base HCV HCV/day | Length (km) | Direction Factor | Life (yrs) | HVs lane HCV/lane/yr | ESAs/ HVAG | NHVAG | ESAs/ veh | DESA       | HCV/day | %Using Route     | HCV/day | Direction Factor | Duration (Years) | HVs lane HCV/lane/yr | ESAs/ HVAG | NHVAG | ESAs/ veh | DESA      |             |           |                 |
| <b>Newcombe Road</b>       | 21                   | 11%   | 2                | 0.65        | 0.5              | 40         | 396                  | 0.6        | 2.4   | 1.4       | 22,812     | 155     | 100%             | 155     | 0.5              | 25               | 19,840               | 1          | 3.13  | 3.13      | 1,532,169 | \$227,500   | \$224,163 |                 |
| <b>Tirau Road</b>          | 6,238                | 12%   | 749              | 1.9         | 0.5              | 40         | 136,608              | 0.6        | 2.4   | 1.4       | 7,868,635  | 155     | 75%              | 117     | 0.5              | 25               | 14,931               | 1          | 3.13  | 3.13      | 1,153,055 | \$665,000   | \$84,993  |                 |
| <b>Achilles Ave</b>        | 14,409               | 7%    | 951              | 0.378       | 0.5              | 40         | 173,560              | 0.6        | 2.4   | 1.4       | 9,997,083  | 155     | 42%              | 66      | 0.5              | 25               | 8,427                | 1          | 3.13  | 3.13      | 650,757   | \$132,300   | \$8,086   |                 |
| <b>Albert St</b>           | 16,759               | 7%    | 1,106            | 0.384       | 0.5              | 40         | 201,857              | 0.6        | 2.4   | 1.4       | 11,626,966 | 155     | 42%              | 66      | 0.5              | 25               | 8,427                | 1          | 3.13  | 3.13      | 650,757   | \$134,400   | \$7,124   |                 |
| <b>Queen St</b>            | 10,065               | 8%    | 795              | 0.647       | 0.5              | 40         | 145,116              | 0.6        | 2.4   | 1.4       | 8,358,684  | 155     | 42%              | 66      | 0.5              | 25               | 8,427                | 1          | 3.13  | 3.13      | 650,757   | \$226,450   | \$16,357  |                 |
| <b>Victoria St (south)</b> | 20,529               | 5%    | 1,026            | 1.8         | 0.5              | 40         | 187,325              | 0.6        | 2.4   | 1.4       | 10,789,900 | 155     | 42%              | 66      | 0.5              | 25               | 8,427                | 1          | 3.13  | 3.13      | 650,757   | \$630,000   | \$35,835  |                 |
| <b>Victoria St (north)</b> | 10,835               | 6%    | 639              | 0.7         | 0.5              | 40         | 116,664              | 0.6        | 2.4   | 1.4       | 6,719,860  | 155     | 16%              | 25      | 0.5              | 25               | 3,236                | 1          | 3.13  | 3.13      | 249,912   | \$245,000   | \$8,785   |                 |
| <b>Shakespeare (north)</b> | 14,975               | 9%    | 1,378            | 0.75        | 0.5              | 40         | 251,453              | 0.6        | 2.4   | 1.4       | 14,483,684 | 155     | 33%              | 51      | 0.5              | 25               | 6,504                | 1          | 3.13  | 3.13      | 502,297   | \$262,500   | \$8,798   |                 |
| <b>Shakespeare (south)</b> | 10,161               | 7%    | 711              | 2.5         | 0.5              | 40         | 129,801              | 0.6        | 2.4   | 1.4       | 7,476,551  | 155     | 22%              | 35      | 0.5              | 25               | 4,427                | 1          | 3.13  | 3.13      | 341,896   | \$875,000   | \$38,263  |                 |
| <b>Pope</b>                | 8,657                | 14%   | 1,216            | 2.9         | 0.5              | 40         | 221,864              | 0.6        | 2.4   | 1.4       | 12,779,390 | 155     | 10%              | 16      | 0.5              | 25               | 2,077                | 1          | 3.13  | 3.13      | 160,401   | \$1,015,000 | \$12,582  |                 |
| <b>Cambridge Rd</b>        | 6,890                | 14%   | 996              | 19.4        | 0.5              | 40         | 181,853              | 0.6        | 2.4   | 1.4       | 10,474,727 | 155     | 10%              | 16      | 0.5              | 25               | 2,077                | 1          | 3.13  | 3.13      | 160,401   | \$6,790,000 | \$102,408 |                 |
| <b>\$547,393</b>           |                      |       |                  |             |                  |            |                      |            |       |           |            |         |                  |         |                  |                  |                      |            |       |           |           |             |           |                 |

FAR 51%  
WDC share (49%) \$268,223  
Levy per cube \$0.06  
Levy per tonne \$0.04  
\$279,171

Scenario:  
Increase to North

| Road Section               | Existing Traffic     |       | Existing Traffic |             |                  |            |             |            |            |          |            |         | Proposed Traffic |         |                  |                  |             |           |       |          |           |             | Cost/km   | Financial Cont. |
|----------------------------|----------------------|-------|------------------|-------------|------------------|------------|-------------|------------|------------|----------|------------|---------|------------------|---------|------------------|------------------|-------------|-----------|-------|----------|-----------|-------------|-----------|-----------------|
|                            | Current Volume (vpd) | % HCV | Base HCV HCV/day | Length (km) | Direction Factor | Life (yrs) | HVs/lane/yr | ESAs/NHVAG | ESAs/NHVAG | ESAs/veh | DESA       | HCV/day | %Using Route     | HCV/day | Direction Factor | Duration (years) | HVs/lane/yr | ESAs/HVAG | NHVAG | ESAs/veh | DESA      |             |           |                 |
| <b>Newcombe Road</b>       | 21                   | 11%   | 2                | 0.65        | 0.5              | 40         | 396         | 0.6        | 2.4        | 1.4      | 22,812     | 155     | 100%             | 155     | 0.5              | 25               | 19,840      | 1         | 3.13  | 3.13     | 1,532,169 | \$227,500   | \$224,163 |                 |
| <b>Tirau Road</b>          | 6,238                | 12%   | 749              | 1.9         | 0.5              | 40         | 136,608     | 0.6        | 2.4        | 1.4      | 7,868,635  | 155     | 75%              | 117     | 0.5              | 25               | 14,931      | 1         | 3.13  | 3.13     | 1,153,055 | \$665,000   | \$84,993  |                 |
| <b>Achilles Ave</b>        | 14,409               | 7%    | 951              | 0.378       | 0.5              | 40         | 173,560     | 0.6        | 2.4        | 1.4      | 9,997,083  | 155     | 47%              | 74      | 0.5              | 25               | 9,419       | 1         | 3.13  | 3.13     | 727,366   | \$132,300   | \$8,973   |                 |
| <b>Albert St</b>           | 16,759               | 7%    | 1,106            | 0.384       | 0.5              | 40         | 201,857     | 0.6        | 2.4        | 1.4      | 11,626,966 | 155     | 47%              | 74      | 0.5              | 25               | 9,419       | 1         | 3.13  | 3.13     | 727,366   | \$134,400   | \$7,913   |                 |
| <b>Queen St</b>            | 10,065               | 8%    | 795              | 0.647       | 0.5              | 40         | 145,116     | 0.6        | 2.4        | 1.4      | 8,358,684  | 155     | 47%              | 74      | 0.5              | 25               | 9,419       | 1         | 3.13  | 3.13     | 727,366   | \$226,450   | \$18,128  |                 |
| <b>Victoria St (south)</b> | 20,529               | 5%    | 1,026            | 1.8         | 0.5              | 40         | 187,325     | 0.6        | 2.4        | 1.4      | 10,789,900 | 155     | 47%              | 74      | 0.5              | 25               | 9,419       | 1         | 3.13  | 3.13     | 727,366   | \$630,000   | \$39,787  |                 |
| <b>Victoria St (north)</b> | 10,835               | 6%    | 639              | 0.7         | 0.5              | 40         | 116,664     | 0.6        | 2.4        | 1.4      | 6,719,860  | 155     | 26%              | 41      | 0.5              | 25               | 5,220       | 1         | 3.13  | 3.13     | 403,129   | \$245,000   | \$13,866  |                 |
| <b>Shakespeare (north)</b> | 14,975               | 9%    | 1,378            | 0.75        | 0.5              | 40         | 251,453     | 0.6        | 2.4        | 1.4      | 14,483,684 | 155     | 28%              | 43      | 0.5              | 25               | 5,512       | 1         | 3.13  | 3.13     | 425,689   | \$262,500   | \$7,495   |                 |
| <b>Shakespeare (south)</b> | 10,161               | 7%    | 711              | 2.5         | 0.5              | 40         | 129,801     | 0.6        | 2.4        | 1.4      | 7,476,551  | 155     | 17%              | 27      | 0.5              | 25               | 3,435       | 1         | 3.13  | 3.13     | 265,287   | \$875,000   | \$29,983  |                 |
| <b>Pope</b>                | 8,657                | 14%   | 1,216            | 2.9         | 0.5              | 40         | 221,864     | 0.6        | 2.4        | 1.4      | 12,779,390 | 155     | 10%              | 16      | 0.5              | 25               | 2,077       | 1         | 3.13  | 3.13     | 160,401   | \$1,015,000 | \$12,582  |                 |
| <b>Cambridge Rd</b>        | 6,890                | 14%   | 996              | 19.4        | 0.5              | 40         | 181,853     | 0.6        | 2.4        | 1.4      | 10,474,727 | 155     | 10%              | 16      | 0.5              | 25               | 2,077       | 1         | 3.13  | 3.13     | 160,401   | \$6,790,000 | \$102,408 |                 |
| <b>\$550,291</b>           |                      |       |                  |             |                  |            |             |            |            |          |            |         |                  |         |                  |                  |             |           |       |          |           |             |           |                 |

FAR 51%  
WDC share (499) \$269,643  
Levy per cube \$0.06  
Levy per tonne \$0.04  
\$280,648

Scenario:  
Increase to South

| Road Section               | Existing Traffic     |       | Existing Traffic |             |                  |            |                      |                  |                |      |            |              | Proposed Traffic |                  |                  |                      |                |                |      |      |           |             | Cost/km   | Financial Cont. |
|----------------------------|----------------------|-------|------------------|-------------|------------------|------------|----------------------|------------------|----------------|------|------------|--------------|------------------|------------------|------------------|----------------------|----------------|----------------|------|------|-----------|-------------|-----------|-----------------|
|                            | Current Volume (vpd) | % HCV | Base HCV HCV/day | Length (km) | Direction Factor | Life (yrs) | HVs/lane HCV/lane/yr | ESAs/NHVAG HVAAG | ESAs/NHVAG veh | DESA | HCV/day    | %Using Route | HCV/day          | Direction Factor | Duration (years) | HVs/lane HCV/lane/yr | ESAs/NHVAG VAG | ESAs/NHVAG veh | DESA |      |           |             |           |                 |
| <b>Newcombe Road</b>       | 21                   | 11%   | 2                | 0.65        | 0.5              | 40         | 396                  | 0.6              | 2.4            | 1.4  | 22,812     | 155          | 100%             | 155              | 0.5              | 25                   | 19,840         | 1              | 3.13 | 3.13 | 1,532,169 | \$227,500   | \$224,163 |                 |
| <b>Tirau Road</b>          | 6,238                | 12%   | 749              | 1.9         | 0.5              | 40         | 136,608              | 0.6              | 2.4            | 1.4  | 7,868,635  | 155          | 65%              | 101              | 0.5              | 25                   | 12,947         | 1              | 3.13 | 3.13 | 999,838   | \$665,000   | \$74,973  |                 |
| <b>Achilles Ave</b>        | 14,409               | 7%    | 951              | 0.378       | 0.5              | 40         | 173,560              | 0.6              | 2.4            | 1.4  | 9,997,083  | 155          | 37%              | 58               | 0.5              | 25                   | 7,435          | 1              | 3.13 | 3.13 | 574,149   | \$132,300   | \$7,186   |                 |
| <b>Albert St</b>           | 16,759               | 7%    | 1,106            | 0.384       | 0.5              | 40         | 201,857              | 0.6              | 2.4            | 1.4  | 11,626,966 | 155          | 37%              | 58               | 0.5              | 25                   | 7,435          | 1              | 3.13 | 3.13 | 574,149   | \$134,400   | \$6,324   |                 |
| <b>Queen St</b>            | 10,065               | 8%    | 795              | 0.647       | 0.5              | 40         | 145,116              | 0.6              | 2.4            | 1.4  | 8,358,684  | 155          | 37%              | 58               | 0.5              | 25                   | 7,435          | 1              | 3.13 | 3.13 | 574,149   | \$226,450   | \$14,555  |                 |
| <b>Victoria St (south)</b> | 20,529               | 5%    | 1,026            | 1.8         | 0.5              | 40         | 187,325              | 0.6              | 2.4            | 1.4  | 10,789,900 | 155          | 37%              | 58               | 0.5              | 25                   | 7,435          | 1              | 3.13 | 3.13 | 574,149   | \$630,000   | \$31,830  |                 |
| <b>Victoria St (north)</b> | 10,835               | 6%    | 639              | 0.7         | 0.5              | 40         | 116,664              | 0.6              | 2.4            | 1.4  | 6,719,860  | 155          | 16%              | 25               | 0.5              | 25                   | 3,236          | 1              | 3.13 | 3.13 | 249,912   | \$245,000   | \$8,785   |                 |
| <b>Shakespeare (north)</b> | 14,975               | 9%    | 1,378            | 0.75        | 0.5              | 40         | 251,453              | 0.6              | 2.4            | 1.4  | 14,483,684 | 155          | 28%              | 43               | 0.5              | 25                   | 5,512          | 1              | 3.13 | 3.13 | 425,689   | \$262,500   | \$7,495   |                 |
| <b>Shakespeare (south)</b> | 10,161               | 7%    | 711              | 2.5         | 0.5              | 40         | 129,801              | 0.6              | 2.4            | 1.4  | 7,476,551  | 155          | 17%              | 27               | 0.5              | 25                   | 3,435          | 1              | 3.13 | 3.13 | 265,287   | \$875,000   | \$29,983  |                 |
| <b>Pope</b>                | 8,657                | 14%   | 1,216            | 2.9         | 0.5              | 40         | 221,864              | 0.6              | 2.4            | 1.4  | 12,779,390 | 155          | 10%              | 16               | 0.5              | 25                   | 2,077          | 1              | 3.13 | 3.13 | 160,401   | \$1,015,000 | \$12,582  |                 |
| <b>Cambridge Rd</b>        | 6,890                | 14%   | 996              | 19.4        | 0.5              | 40         | 181,853              | 0.6              | 2.4            | 1.4  | 10,474,727 | 155          | 10%              | 16               | 0.5              | 25                   | 2,077          | 1              | 3.13 | 3.13 | 160,401   | \$6,790,000 | \$102,408 |                 |

**\$520,283**

FAR 51%  
WDC Share (49) \$254,939  
Levy per cube \$0.06  
Levy per tonne \$0.03  
\$265,344

| Road Section        | Existing Traffic     |       | Existing Traffic |             |                  |            |             |           |       |          |            |         |              |         |                  | Proposed Traffic |             |           |       |          |           |             |           |  |  | Cost/km | Financial Cont. |
|---------------------|----------------------|-------|------------------|-------------|------------------|------------|-------------|-----------|-------|----------|------------|---------|--------------|---------|------------------|------------------|-------------|-----------|-------|----------|-----------|-------------|-----------|--|--|---------|-----------------|
|                     | Current Volume (vpd) | % HCV | Base HCV HCV/day | Length (km) | Direction Factor | Life (yrs) | HVs/lane/yr | ESAs/HVAG | NHVAG | ESAs/veh | DESA       | HCV/day | %Using Route | HCV/day | Direction Factor | Duration (Years) | HVs/lane/yr | ESAs/HVAG | NHVAG | ESAs/veh | DESA      |             |           |  |  |         |                 |
| Newcombe Road       | 21                   | 11%   | 2                | 0.65        | 0.5              | 40         | 396         | 0.6       | 2.4   | 1.4      | 22,812     | 155     | 100%         | 155     | 0.5              | 25               | 19,840      | 1         | 3.13  | 3.13     | 1,532,169 | \$227,500   | \$224,163 |  |  |         |                 |
| Tirau Road          | 6,238                | 12%   | 749              | 1.9         | 0.5              | 40         | 136,608     | 0.6       | 2.4   | 1.4      | 7,868,635  | 155     | 75%          | 117     | 0.5              | 25               | 14,931      | 1         | 3.13  | 3.13     | 1,153,055 | \$665,000   | \$84,993  |  |  |         |                 |
| Achilles Ave        | 14,409               | 7%    | 951              | 0.378       | 0.5              | 40         | 173,560     | 0.6       | 2.4   | 1.4      | 9,997,083  | 155     | 37%          | 58      | 0.5              | 25               | 7,435       | 1         | 3.13  | 3.13     | 574,149   | \$132,300   | \$7,186   |  |  |         |                 |
| Albert St           | 16,759               | 7%    | 1,106            | 0.384       | 0.5              | 40         | 201,857     | 0.6       | 2.4   | 1.4      | 11,626,966 | 155     | 37%          | 58      | 0.5              | 25               | 7,435       | 1         | 3.13  | 3.13     | 574,149   | \$134,400   | \$6,324   |  |  |         |                 |
| Queen St            | 10,065               | 8%    | 795              | 0.647       | 0.5              | 40         | 145,116     | 0.6       | 2.4   | 1.4      | 8,358,684  | 155     | 37%          | 58      | 0.5              | 25               | 7,435       | 1         | 3.13  | 3.13     | 574,149   | \$226,450   | \$14,555  |  |  |         |                 |
| Victoria St (south) | 20,529               | 5%    | 1,026            | 1.8         | 0.5              | 40         | 187,325     | 0.6       | 2.4   | 1.4      | 10,789,900 | 155     | 37%          | 58      | 0.5              | 25               | 7,435       | 1         | 3.13  | 3.13     | 574,149   | \$630,000   | \$31,830  |  |  |         |                 |
| Victoria St (north) | 10,835               | 6%    | 639              | 0.7         | 0.5              | 40         | 116,664     | 0.6       | 2.4   | 1.4      | 6,719,860  | 155     | 16%          | 25      | 0.5              | 25               | 3,236       | 1         | 3.13  | 3.13     | 249,912   | \$245,000   | \$8,785   |  |  |         |                 |
| Shakespeare (north) | 14,975               | 9%    | 1,378            | 2.5         | 0.5              | 40         | 251,453     | 0.6       | 2.4   | 1.4      | 14,483,684 | 155     | 38%          | 59      | 0.5              | 25               | 7,496       | 1         | 3.13  | 3.13     | 578,906   | \$262,500   | \$10,089  |  |  |         |                 |
| Shakespeare (south) | 10,161               | 7%    | 711              | 2.5         | 0.5              | 40         | 129,801     | 0.6       | 2.4   | 1.4      | 7,476,551  | 155     | 17%          | 27      | 0.5              | 25               | 3,435       | 1         | 3.13  | 3.13     | 265,287   | \$875,000   | \$29,983  |  |  |         |                 |
| Pope                | 8,657                | 14%   | 1,216            | 2.9         | 0.5              | 40         | 221,864     | 0.6       | 2.4   | 1.4      | 12,779,390 | 155     | 20%          | 32      | 0.5              | 25               | 4,061       | 1         | 3.13  | 3.13     | 313,618   | \$1,015,000 | \$24,312  |  |  |         |                 |
| Cambridge Rd        | 6,890                | 14%   | 996              | 19.4        | 0.5              | 40         | 181,853     | 0.6       | 2.4   | 1.4      | 10,474,727 | 155     | 20%          | 32      | 0.5              | 25               | 4,061       | 1         | 3.13  | 3.13     | 313,618   | \$6,790,000 | \$197,386 |  |  |         |                 |

\$639,606

FAR 51%  
 WDC share (49%) \$313,407  
 Levy per cube \$0.07  
 Levy per tonne \$0.04  
 \$326,199

Scenario:  
 Increase to Te Awamutu