
STEVENSON AGGREGATES LIMITED

Proposed Sutton Block Expansion

**Integrated Transportation
Assessment**

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Don McKenzie Consulting Ltd

M: +64 21 656 191

E: don@dmconsulting.co.nz

W: www.dmconsulting.co.nz



Prepared for Stevenson Aggregates Limited by Don McKenzie Consulting Limited.



Don McKenzie | **Director**
Don McKenzie Consulting Ltd
M: +64 21 656 191
E: don@dmconsulting.co.nz
W: www.dmconsulting.co.nz

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1 INTRODUCTION

Don McKenzie Consulting Ltd has been commissioned by Stevenson Aggregates Limited (“**Stevenson**”) to prepare an Integrated Transportation Assessment report to accompany a resource consent application in relation to the establishment and operation of a new pit referred to as the “Sutton Block”, located to the northeast of Stevenson existing Drury Quarry, at Quarry Road, Drury. The proposed Sutton Block will enable the continuity of quarrying activity that can occur from the existing Drury Quarry location without adding to the overall intensity of external traffic effects associated with quarrying in this vicinity.

The following report describes and assesses the external transportation effects associated with the proposal to establish and operate the Sutton Block pit adjacent to the existing Drury quarry pit. Overall, the assessment that follows confirms that the current quarrying operations establish a baseline of existing and future transportation effects (both in terms of scale and intensity), and that the Sutton Block operation will simply represent an extension to the duration over which these effects will be generated.

The developing industrial and associated land-use operations within the surrounding Drury South area have been planned and constructed taking into account the Drury Quarry site. Extending the quarry’s lifespan will improve its ability to meet future aggregate demands in both the surrounding area and broader Metropolitan Auckland, by extending the life and utility of this established quarry site.

This report addresses the transport-related issues of the proposed Sutton Block development in regard to the following matters:

- A description of the Drury Quarry site and its surrounding traffic environment;
- The proposed form of access and egress serving the proposed Sutton Block;
- The proposed site vehicle circulation design;
- The nature and expected volumes of vehicular traffic likely to be generated by the development, and;
- Compliance with the Auckland Unitary Plan – Operative in Part and its associated standards and requirements.

These and other matters will be addressed in the detail of the report that follows. By way of summary however, it can be demonstrated that the establishment of the proposed Sutton Block quarry pit can be undertaken in a manner that results in minimal adverse effects to the function, capacity and safety of the surrounding transport network.

2 Existing Site Context

2.1 Site Location

Drury Quarry is located on the eastern side of State Highway 1 (“SH1”) Southern Motorway at Drury South, Auckland. The wider Drury South area which surrounds Drury Quarry to the west is undergoing substantial redevelopment and growth of the urban area. This includes the supporting transport infrastructure as part of development within the Drury South Precinct (“DSP”) as set out in Chapter I410 of the Auckland Unitary Plan (“AUP”). The Precinct incorporates approximately 200ha and the development is being implemented in a staged programme over the coming decade.

Figure 1 is an aerial photograph with the proposed development site on the right – the quarry extension area is positioned generally to the northeast of the existing main pit which can be clearly appreciated in the diagram.



Figure 1: Site Location (Source: Stevenson)

Drury Quarry is located immediately to the east of and connects directly into the DSP's transport network. The Precinct includes the establishment of a revised road network to service the area as it develops and urbanises over coming years and decades. This new road network is currently undergoing extension and road construction with current work on establishing new and revised roading alignments underway and proceeding at pace.

The connection of Drury Quarry to the DSP represents a key element of and impetus for the newly constructed quarry access road (previously via Quarry Road and now via Bill Stevenson Drive) to provide enhanced and dedicated access to the various activities that occur within the broader Drury Quarry site including the proposed Sutton Block.

The proposed road network forming part of the DSP (with the indicative location of the Sutton Block shown with the red star) is shown in **Figure 2** below.

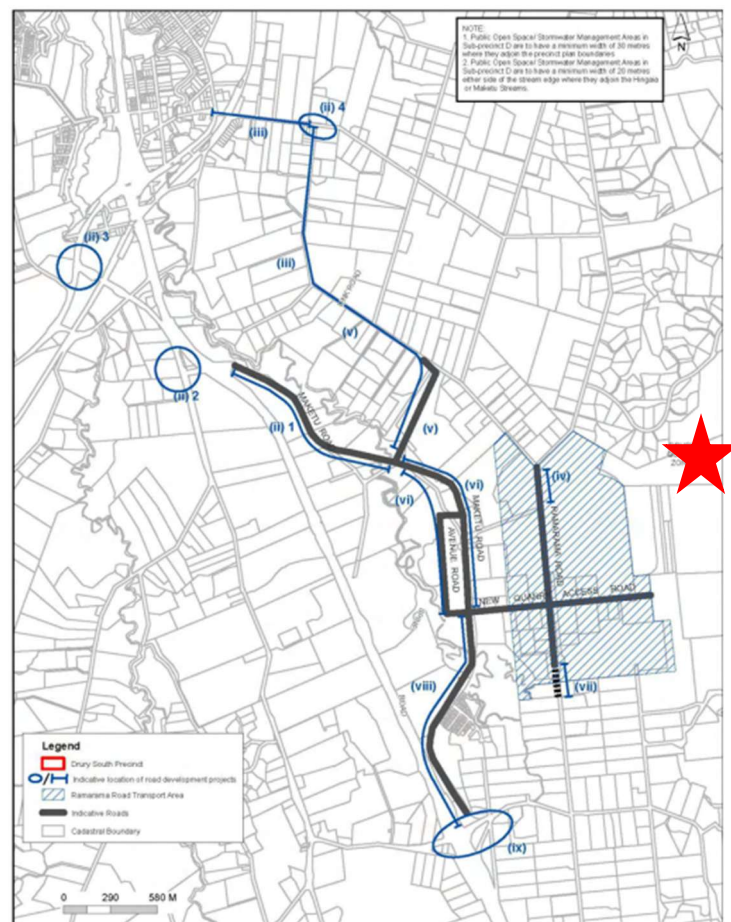


Figure 2: Drury South Precinct Road Network (Source: Auckland Unitary Plan)

As can be appreciated from the above, the DSP was structured around the establishment of:

- a “spine road” transport corridor (now called Maketu Road),
- upgrading to the north-south Ramarama Road (now a combination of Toiawaka Road to the south and Jack Stevenson Drive to the north), and

- a strengthened/new alignment for what is referred to in the diagram above as New Quarry Access Road (now Bill Stevenson Drive) connecting from Drury Quarry to Maketu Road.

This proposed layout and design provides for both existing and future activities within Drury Quarry.

2.2 Existing Zoning and Planning Context

Figure 3 shows the DSP Precinct Plan and depicts the zoning of the Drury Quarry site (Special Purpose – Quarry Zone (“SPQZ”)) as defined in the AUP – shown in the light yellow colouring to the east of the Precinct.

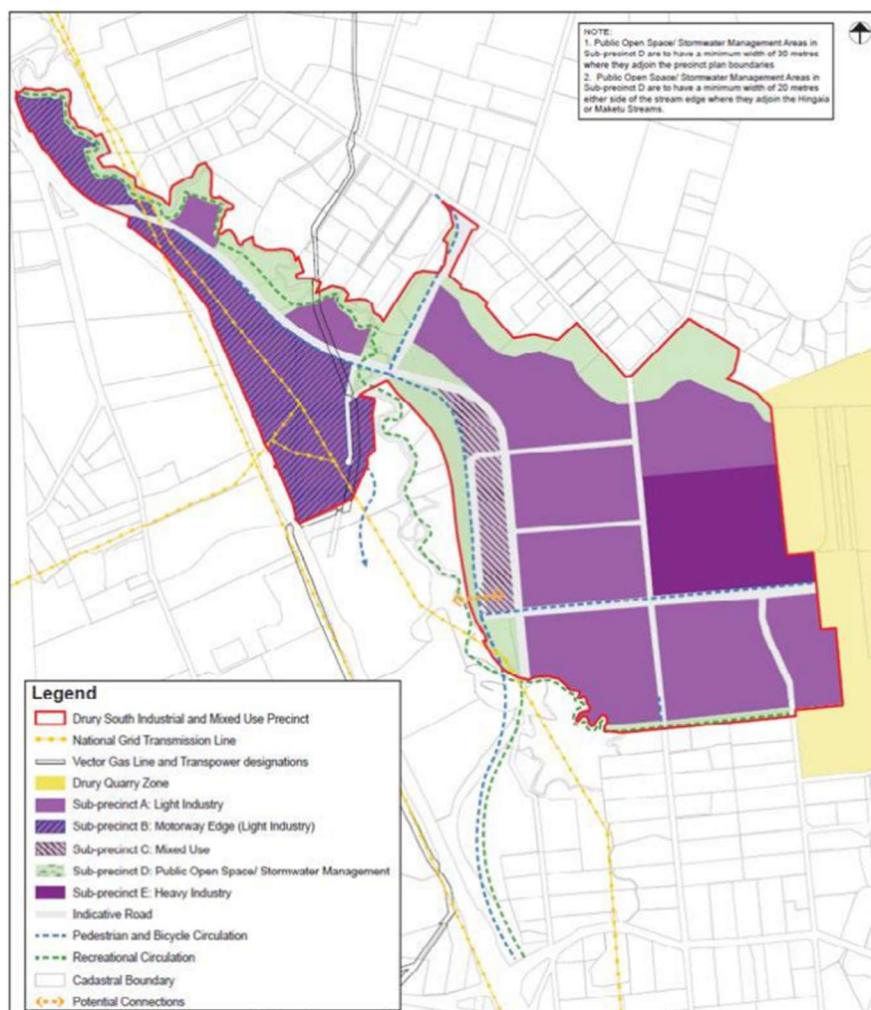


Figure 3: Drury South Precinct (I410) (Source: Auckland Unitary Plan)

The Precinct identifies and provides for a strong and direct relationship with the Drury Quarry and includes an objective (I410.2 (8)) requiring that activities within the quarry zone (as well as within the Precinct’s Business – Heavy Industry Zone and surrounding rural areas) continue to operate efficiently and are not unreasonably constrained by other activities within the Precinct.

In terms of Drury Quarry and its inclusion in the AUP's SPQZ, the AUP describes the overall intention of the zone (including at Drury Quarry) as follows:

"Mineral resources are important to Auckland's economy and development. The Special Purpose – Quarry Zone provides for significant mineral extraction activities to ensure that mineral extraction can continue in a manner that minimises adverse effects. These provisions seek to ensure that the demand for minerals can be met, where possible, from supply sources within Auckland."

In terms of the transport elements of the zone, policies are included:

"(6) Avoid, remedy or mitigate adverse effects of traffic generation and maintain safety for all road users, and particularly measures to manage heavy vehicles entering or exiting the site and on quarry transport routes."

"(7) Require quarry operators to internalise the adverse effects associated with new or enlarged mineral extraction activities as far as practicable while recognising the need to allow for the efficient ongoing extraction of mineral resources."

In this regard and taking into account both the DSP and the SPQZ provisions, it is apparent that Drury Quarry is a fundamental part of this area. The quarry and its transport features have been specifically provided for with both the AUP generally via the SPQZ provisions, as well as the more specific DSP provisions including high levels of physical provision via the roading network. The primary roading links associated with the DSP are already completed and well developed, as well as the future extension of the network across the wider Drury area.

3 Transport Environment

3.1 Roothing Network

Figure 4 presents the setting of the existing Drury Quarry in the context of the surrounding (current) road network. The roading network within the DSP continues to evolve almost on a daily basis.

Maketu Road and Bill Stevenson Drive serve as the primary vehicular access routes facilitating the access needs for the current quarrying activities with the wider access movements to and from the regional transport network (SH1 Southern Motorway) via the Ramarama interchange at the southern end of Maketu Road approximately 2.5km from the Quarry entrance.

An alternative connection to the Southern Motorway is available via the combination of the northern section of Maketu Road, Drury Road, Great South Road and SH22 – a travel distance of approximately 5.3km to the northbound on-ramp at the Drury Interchange. This route is currently (and likely to continue for some time into the future) somewhat interrupted and of a generally lesser standard than the Maketu Road alternative connecting to the Ramarama Interchange to the south. In this regard, the Drury Road/Great South Road route to the north is generally less favoured for quarry-related travel beyond the Drury area.



Figure 4: Location in the Transport Network (Source: Google Earth)

As can be appreciated from this aerial photograph image flown in February 2024, there continues to be a high degree of modification, current earthworks and building activity within Drury South that is expected to continue to occur over the coming several years. Since the time that this aerial image was flown there has also been further advances in terms of both buildings and the road network near the Drury Quarry site.

The previous “main entrance” into Drury Quarry from the northwest via Quarry Road is now closed and all quarry traffic enters via Bill Stevenson Drive. The Bill Stevenson Drive entrance has been in exclusive use serving as the quarry main gate entrance since January 2023.

The aerial image above clearly indicates that the previous Quarry Road entrance has been decommissioned and removed, with the Bill Stevenson Drive connection and its signalised intersection with Maketu Road (as well as the Toiawaka/Jack Stevenson signalised intersection) providing primary and exclusive access to and from the Quarry. The DSP precinct plans and zoning maps presented earlier, highlighted the intention that Quarry Road would no longer provide for the primary travel route to and from the quarry, and would instead be replaced by the combination of road network elements including Bill Stevenson Drive, Jack Stevenson Drive and Maketu Road – each of which have been designed and constructed to a higher standard and resulting traffic carrying capacity. This is now fully the case – there is no physical connection for traffic movement between the Drury Quarry and Quarry Road.

The wider Drury area is experiencing (and will continue to experience over the coming decade or more) a great deal of new development in terms of both land-use development and upgraded transport infrastructure. The combination of the DSP, the recently approved Plan Changes 48-50, various future consents, designations to enable the upgrading of key transport elements (including new train stations at Drury and a proposed new Drury South Interchange with SH1 Southern Motorway) will combine to deliver a much greater urban population and activity node encompassing the Drury and Drury South areas. The transport network set out in the DSP and currently being extended through the works within Drury South have been set up to provide for that future growth from both a functional and capacity perspective – in all cases with the current nature and scale of Drury Quarry embedded within those plans.

3.2 Traffic Volumes

As part of previous transport assessments prepared by TEAM consultants to support the previous elements of the quarry operations, a series of traffic surveys were undertaken to confirm traffic volumes in the vicinity of the quarry. This data was combined with data available from Auckland Transport via its database of traffic counts undertaken across the region.

The daily (and where data is available, peak hours) traffic counts for the routes serving Drury Quarry are presented in the following table.

Table 1: Traffic Volumes

Location	Date	Average Weekday Volume (vpd)	AM Peak (vph)	PM Peak (vph)
Maketu Road (north of Bill Stevenson Road)	Nov 2022	1,240	100	100
Maketu Road (south of John Main Drive)	Nov 2022	3,680	337	279
Bill Stevenson Road (east of Maketu Road)	Nov 2022	3,120	280	259
Fitzgerald Road (between Quarry Road and Drury Hills Road)	Sep 2016	1,880	206	157

It is apparent from the age of some of these counts that there are limited current sources of information due largely to the on-going development and construction works currently being undertaken within the DSP and Drury South areas. Updated traffic counts including intersection turning movement surveys at each of the intersections along Bill Stevenson Drive route undertaken in an assessment of the transport capacity of the Bill Stevenson Drive route (and reported in the Appendix to this report) indicate that daily (15hr) volumes along Maketu Road (north of Bill Stevenson Drive) and Bill Stevenson Drive (east of Maketu Road) are currently approximately 1,400vpd and 2,300 vpd (i.e. broadly consistent with the data presented in Table 1 above).

It is clear that the more significant traffic volumes carried within the road network – as it currently exists and in accordance with the overall network hierarchy functions set out in the previous transport assessment reporting and strategies development for the area – relate to the Bill Stevenson Drive and Maketu Road/Fitzgerald Road linkages. Such volumes are currently handled by these routes remains well within the ordinary capacity of these routes and provide satisfactory spare capacity in terms of what has been planned and delivered by these routes as part of the wider DSP development programme.

Further consideration of any potential traffic effects associated with the Sutton Block application are provided in subsequent sections of this report.

3.3 Road Safety

A search was made of the Waka Kotahi | New Zealand Transport Agency's Crash Analysis System for all reported crashes that had occurred within the vicinity of the site for the latest full five-year period from 2019 – 2023 available from the NZTA records. The search area included the length of Bill Stevenson Drive between the quarry entrance at the signals at Maketu Road, and for Maketu Road from the intersections of John Main Drive (to the south) and Ross Stevenson Drive to the north. The newly established nature of many of the

surrounding roading network elements means that there is limited, if any, reported road safety record.

Only one serious crash has been reported in either of the search roads over this five-and-a-half-year search period. The road user injured was a pedestrian observing a “burnout” on Maketu Road near the intersection with Bill Stevenson Drive. One of the vehicles lost control, impacted another vehicle which then impacted the pedestrian standing in the middle of the road watching the events.

Two non-injury events were recorded: one at the intersection of Maketu and John Main Drive, involving a vehicle undertaking a u-turn, and another at the intersection of Maketu Road and Ross Stevenson Drive, involving another burnout/doughnut manoeuvre.

In terms of the overall operation and effectiveness of the road environment under ordinary, day-to-day operation, these three reported events do not point to any repeated or significant road safety issues affecting or likely to be affected by, the proposed Sutton Block expansion being sought. As will be considered in subsequent sections, the current high standard of roading provision serving the site also indicates that there would be little if any change in road safety patterns in the surrounding network.

3.4 Walking and Cycling

Footpaths are provided on both sides of Bill Stevenson Drive as well as on both sides of Maketu Road. Separate walking and cycling facilities are available on Maketu Road – extending along the western side of the road between Ron Stevenson Drive (signalised intersection) and John Main Drive (signals). The separated walking and cycling facilities swap onto the eastern side of Maketu Road at the signals with John Main Drive.

Along the length of Bill Stevenson Drive serving the quarry activities, two temporary pedestrian refuge islands provide for the movement of pedestrians across the road between work sites (generally along the southern side of the road) and temporary staff parking areas along the northern side of the road. Formal, dedicated pedestrian crossing facilities are available across all approaches to the signals controlling the intersections of Bill Stevenson Drive and Maketu Road, and Bill Stevenson Drive and Toiawaka Road.

4 Current Quarry Operations

4.1 Overview

Stevenson's Drury Quarry is located in Drury, Auckland, and has been in operation for over 80 years. Drury Quarry is a greywacke hard rock quarry supplying concrete, asphalt and roading aggregate to the Auckland market. The pit is located within the wider landholdings owned by Stevenson which encompasses an area of approximately 562ha. This landholding includes quarry activities, a clean fill, farmland and large swathes of native vegetation.

Based on current demand estimates, the existing pit will provide approximately 20 years of aggregate supply to Auckland.

Generally, there are a total of up to 800 truck movements on a busy day, and typically 600-700 on an average day.

The demand for quarried and processed material is steadily increasing and the projection is that the demand for material to be delivered by Drury Quarry will continue to increase over coming years. This natural increase is dictated by the general growth of development activity within the Auckland metropolitan area and could potentially result in an increase to 1,200 and 1,400 truck movements per day generated by the quarrying and ancillary activities.

4.2 Existing ancillary site infrastructure

There are a number of existing ancillary facilities and activities that support the broader quarry operation. These are referred to as the Front of House ("**FOH**") operations and comprises of a number of existing facilities, some of which are under construction as well as planned for the future. The FOH is accessed from Bill Stevenson Drive at the quarry entrance. The FOH includes the weighbridge, truck wheel wash, aggregate storage bins and stockpiles, primary and tertiary processing plants, seal chip plant, mechanical workshop, laboratory, stockyard and staff offices, the lamella and filter press, concrete, asphalt and perlite plants.

The figure below shows the various facilities located within the FOH area.



Figure 5: FOH facilities layout

4.2.1 Concrete Plant

The existing concrete plant is located immediately west (within the FOH area) of the existing pit and produces a maximum output of around 600m³ per day. A condition of the concrete plant consent limits the number of truck movements generated by this plant to 110 trucks per day.

4.2.2 Asphalt Plant

A recently-established asphalt plant is located adjacent to the Bill Stevenson Drive main entrance, within the FOH area.

The number of truck movements generated by the asphalt plant will depend upon the daily tonnages manufactured and the external demands for asphalt. However, the following table of estimated daily movements¹ (for those movements external to the site) based on the level of production was included in the consent application documents for the plant.

Table 2: Concrete Plant – Estimated daily movements

Daily Output	AM Peak Hour Movements (vph)	PM Peak Hour Movements (vph)	Daily (vpd)
300 tonnes	26	24	88
600 tonnes	26	26	134
800 tonnes	26	26	166
3000 tonnes	38	44	634

4.2.3 Perlite Plant

A perlite processing plant is currently under construction within the FOH area. It will provide for the drying, crushing, and storing of perlite prior to its transport off-site to other concrete production plants elsewhere around Auckland. The consent for the perlite plant permits operation across 24 hours 7 days per week and does not include any limitation on the scale or intensity of traffic movements associated with the plant.

It is understood that the plant could be expected to generate a modest amount of external traffic activity of approximately 40 truck movements per week associated with the transport of the raw perlite material from the Kinleith area, and then the processed product leaving the site to the Stevenson concrete plants around greater Auckland.

4.3 Thorburn Fill

A managed fill operation is currently operating east of the existing pit. The quarry has a consent for the disposal of imported managed fill into this area.

¹ Resource consent for the asphalt plant (BUN60400412) does not include any traffic generation limits by way of consent conditions.

The volume of activity generated by the Thorburn Fill varies in accordance with weather conditions, construction demand and wider economic factors within Auckland. The transportation assessment prepared for the Thorburn Fill² estimated that an average of 200 truck deliveries each day would occur at the site from the external road network (giving a total of 400 truck movements per day). The upper estimate³ indicated that up to 600 truck movements per day. That assessment also assessed that approximately 40% of the departing heavy vehicles, after having deposited their loads within the fill site, would then be loaded (“back filled”) with an aggregate product and leave the site laden, with the balance of 60% of the departing vehicles being unladen.

In reality, the Thorburn Fill has primarily been servicing the development at Drury South (immediately west of the quarry) for many years.

4.3.1 Offices and Laboratory

The quarry administration and laboratory facilities are accessed from Waikura Road/Davies Road and supported by a total of approximately 127 parking spaces. This part of the site especially the parking facilities provided enables the major component of staff and visitor parking to be removed from the main part of the quarry site and provided for within a dedicated parking area adjacent to the offices and laboratory. There is still a minor component of light vehicle/car parking catered for by the main entrance associated with staff accessing the transport office and workshops, together with those light vehicles involved with the range of tasks across the quarry site.

Further changes to consolidate and integrate the light traffic movement (and parking) across the whole site (especially between the office/laboratory and main site) could see a complete removal of light traffic from the main Bill Stevenson Drive entrance point. Irrespective of the eventual plans for light vehicle access and parking between these parts of the wider site, all quarry-related light traffic will pass through the intersection of Waikura/Bill Stevenson and along Bill Stevenson Drive through the intersection with Toiawaka Road and a large proportion of this continuing out to Maketu Road.

4.4 Hours of Operation

There are no resource consent conditions restricting the hours of operation of the current Drury Quarry, however, AUP noise-related standards require lower noise levels during evenings and weekends. The hours of operations across the site are not fixed, and are impacted by matters such as the demand, product needs and staffing requirements. Generally, the hours of operation of the current site (across all activities) are as follows:

² Proposed Managed Fill Activity at Drury Quarry, Quarry Road, Drury - Traffic Assessment, prepared by P R Brown, Traffic Engineering and Management (January 2015)

³ Resource consent for the managed fill (R/LUC/2015/2513) does not include any traffic generation limits by way of consent conditions.

Table3: General peak hours of operation for existing ancillary site infrastructure

Activity	Current Peak Times of Operation
Sales	Mon – Fri: 5am – 5.00pm Sat: 6.00am – 12.00noon
Production (primary plant)	Mon – Fri: 7.00am – 9.00pm Sat: 7.00am – 2.00pm
Production (tertiary plant)	Mon – Fri: 5.30am – 9.00pm Sat: 7.00am – 2.00pm
Sealing chip	Mon – Fri: 5.00am/7.00am – 9pm – 2.00am (peak) (varies) Sat: 7.00am – 2.00pm
Asphalt Aggregates Plant	Mon – Fri: 5.30am – 7.00pm Sat: 7.00am – 2.00pm
Portable processing plants	Mon – Fri: 6.00am – 5.00pm (upper benches) Mon – Fri: 6.00 am – 5pm, 5.00pm – 3.00am (in main pit) Sat: 6.00am – 3.00pm

5 Proposal

As noted above, the existing Drury Quarry pit has an approximate 20-year lifespan. In order to continue a local supply of aggregate resource, Stevenson proposes to develop a new pit within the existing site, called the Sutton Block. The Sutton Block pit has been designed to provide approximately 240 million tonnes of additional aggregate to supply the market.

The Sutton Block is located to the northeast of the existing pit. Its development will involve the staged development of an area of approximately 108 ha to a maximum pit depth of approximately RL -60 m. The overall site layout, including staging plans, is shown on the drawing provided in Assessment of Environmental Effects (“AEE”) report. The Sutton Block is designed to be a separate quarry pit, although it will be serviced via the existing Drury Quarry ancillary site infrastructure and FOH facilities, with external traffic access via Bill Stevenson Drive.

The hours of operation in the Sutton Block will ostensibly be 24 hours a day, and activities will scale down as needed to ensure compliance with the AUP noise standards. The assessments contained in Section 6.1 of this report sets out the typical and anticipated night-time activities.

Stevenson anticipates that, as the existing pit nears the end of its life and reduces aggregate extraction, the Sutton Block pit will increase its aggregate extraction. This will ensure a continuous aggregate supply to the market.

To enable the development of the Sutton Block, and support the extraction of aggregate, the project will also include the construction of road infrastructure to establish haul road access, overburden removal, stockpiles including bunding; stormwater ponds and supporting infrastructure, and construction of a conveyor belt connecting the Sutton Block pit to the existing Drury Quarry FOH area. The works will also require stream diversions, stream reclamation, wetland reclamation, vegetation removal and mitigation offset. The Sutton Block will generally be developed in the following five stages:

Stage 1 – Infrastructure establishment (three-year plan)

The initial stage of work (Years 1 -3) involves constructing the site access roads, draining the existing farm dam to establish a sediment retention pond, associated stream diversion, initial offset planting, commencement of overburden removal, stockpiles (including bunding), and establishing the conveyor system.

The existing track will be widened to form a 12 m wide by 2.5km long haul road, which will be used to access a bund location to the north. These are construction activities, subject to different (more permissive) noise rules. Once established the haul road will also connect the Sutton Block pit to the existing pit.

Stage 2 – Operating Quarry (15-year plan)

The second stage of work is the 15 year plan which involves the start of quarrying within the interim pit boundary. The pit may start on either the west or east side of the pit boundary, depending on market demand for blue or brown rock. The indicative staging plans show it expanding to the east. Either way, the pit will expand incrementally – deepening and widening as resource is extracted. Internal pit roads will be constructed as the pit expands. Offset planting and weed and pest control will continue.

Stage 3 Operating Quarry (30-year plan)

The third stage of works is further expansion of the interim pit boundary. Like Stage 2, the expansion direction will depend on market demand. The indicative staging plan shows it expanding to the east. The pit will expand incrementally – widening and deepening as resource is extracted. Internal pit roads will be constructed as the pit expands.

The works involved in Stage 3 will generally include the same activities as Stage 2.

Stage 4 – Operating Quarry (40-year plan)

The fourth stage of works is a further expansion of the interim pit boundary. As with Stage 3, the direction of the expansion will depend on market demand, however, the indicative staging plan shows the expansion of the pit to the east. During this stage of the works, the expansion of the pit will be incremental, widening and deepening as resource is extracted. Internal pit roads will be constructed as the pit expands.

The works involved in Stage 4 will generally include the same activities as Stages 2 and 3.

Stage 5- Life of Quarry Plan (50-year plan)

The fifth stage reflects the full extent of the quarry pit over an approximate 50-year period. As with the previous stages, expansion of the pit will be incremental, deepening and widening as resource is extracted. The indicative staging plans show the pit expanding to the north and east. During this stage, the temporary northern bund will be removed. Internal pit roads will be constructed as the pit expands.

The existing quarry vehicle entrance from Bill Stevenson Drive that was established as a part of the previous FOH development elements will continue to be used in support of the Sutton Block expansion.

6 Traffic Effects

6.1 Bill Stevenson Drive Entrance

In its current form and function serving the continuing access and transport needs of the existing pit and in recognition that the Sutton Block expansion is not expected to alter the overall scale and intensity of traffic movements currently generated, the existing access arrangement is considered appropriate from a transportation operations and safety perspective.

The Bill Stevenson Drive entrance was designed and constructed to serve the full extent, scale and intensity of traffic movements associated with quarrying and ancillary activities at the Drury Quarry site. Over the next several years Stevenson expects that the natural increase in demand for aggregate and associated materials could result in the day number of quarrying-related truck movements rising to at least 2,000 tmpd. Despite this increase, the existing access design and configuration is considered to be operating safely and effectively, and is able to handle the existing and expected traffic numbers.

As the scale and intensity of traffic activity is not expected to change with the operation of the Sutton Block compared to what is facilitated at the existing pit inclusive of the ancillary activities, it is considered the existing layout and design is appropriate.

In terms of access for non-vehicular modes, pedestrian paths are provided on both sides of Bill Stevenson Drive extending around the cul-de-sac head and providing for connection into the Drury Quarry site. It is not expected that there would be any change to the number, intensity or pattern of non-vehicular activity currently generated by the existing quarry pit and associated on-site activities – which is at a very low level. Accordingly, it is considered that there is no requirement for any upgrade or extension of these vehicular or non-vehicular provisions compared to what is currently in place.

6.2 Trip Generation

As described earlier the present scale and nature of traffic generation of the Drury Quarry site represents the combination of trip generation associated with the various existing activities occurring within the site (as described in Section 4 of this report).

The overall traffic activity for the combined activities within the site and served by the existing main access connection to Bill Stevenson Drive, accounts for typically between 600 – 800 tmpd (and could be expected to provide for up to 1200 – 1400 tmpd). Further assessment of the current and operating capacity of the Bill Stevenson Drive access route to and from the Drury Quarry is provided in the Appendix to this report. That assessment confirms that the primary transport route serving quarrying and related activity has available future capacity (after some consideration is made of future growth in traffic movements within the Drury South area) to accommodate up to an additional 8,000 tmpd from the Drury Quarry.

Drury Quarry currently employs approximately 115 staff, plus some 100 full and part-time contractors. Each of these full-time and part-time staff/contractors are able to park within the site (largely at the office/laboratory site off Waikura Road) and are likely to travel to and from the Drury site by private car each day. The expansion of quarrying activities into the Sutton Block pit area is not expected to be associated with any change in the level or nature of staff/contractors currently engaged within the wider Drury Quarry site.

The proposed Sutton Block pit and associated quarrying is not expected to generate any additional truck movements above what is able to be generated by the existing pit and processed through the FOH facilities at the Drury site. The intention is for the Sutton Block to continue to provide the raw material to be processed into usable aggregate via the existing Drury Quarry operations and facilities within the FOH part of the site. This involves a range of processes following the flow of aggregate from the quarry face to the delivery of product through the Bill Stevenson Drive vehicle crossing and out onto the public road network.

The volumes of aggregate and processed material that are able to leave the site are subject to a number of internal capacity constraints and processing factors within the quarry that limit the intensity of traffic generation off-site through any period. These existing constraints will remain at their current level as the Sutton Block operation proceeds. There is no current proposal (beyond currently held resource consents) by Stevenson to alter or upgrade any of the FOH activities at the site. As demonstrated in the capacity assessment of the Bill Stevenson Drive route presented in the Appendix to this report, show that there is notable additional traffic capacity along this route to cater for up to a further approximately 8,000 truck movements per day to and from the quarry.

Overall, it is concluded that the number and intensity of truck movements generated to and from the Drury Quarry generally, is dictated by both external demand for aggregate, as well as the ability for the site to process material ready for off-site delivery. Accordingly, the future number and intensity of quarrying-related vehicles generated by the Sutton Block operation is expected to remain within the range of movements currently anticipated by the existing consented quarrying activity within the existing pit, and well within the capacity limits assessed in the Appendix to this report..

6.3 Effects of Trip Generation

To assess the impact of the Sutton Block proposal, consideration has been given to a number of key elements that contribute to the traffic-related characteristics and any constraints along the routes to be used by quarrying traffic associated with the Sutton Block. As identified above, the number and intensity of future traffic movements, once the Sutton Block is operational, will be broadly consistent with the current and projected activity that can be expected from the existing pit. The capacity assessment included in the Appendix

In terms of the ability for the surrounding transport network to accommodate these existing and expected traffic numbers, the network characteristics relevant to consideration of the effects of the Sutton Block proposal include:

- the capacity of the roads (based on width and types of vehicles);
- the capacity of the intersections;
- operational considerations on the roads;
- safety considerations demonstrated from recent historical patterns, and
- impact on local non-motorised traffic.

An assessment against each of these in terms of the potential capacity of the existing network to accommodate these quarry-traffic volumes are discussed in detail below, with this assessment focussing on the weekday traffic environment due to the generally higher traffic flows occurring in this period.

6.3.1 Capacity of the Roads

An assessment of the identified key access route (via Bill Stevenson Drive and Maketu Road) to and from the subject site has been undertaken from a traffic-carrying capacity perspective. A detailed capacity assessment of the immediately adjoining section of Bill Stevenson Drive between the Drury Quarry and Maketu Road (including current traffic counts) is provided in the Appendix to this report. That assessment confirms the broader transport route considerations provided below, and indicates that the signalised intersections along Bill Stevenson Drive will enable substantial additional capacity to serve the future needs of the Drury Quarry.

Beyond these key links through and to/from the Drury South area (including the connection to SH1 at the Ramarama interchange) the quarry-generated traffic movements become increasingly dispersed over a larger number and spatial extent of routes across the urban area of Auckland.

In this regard, consideration has been made with respect to the following:

- Bill Stevenson Drive (site to Maketu Road) – mid-block capacity (see Appendix);
- Bill Stevenson / Maketu – signalised intersection (see Appendix);
- Bill Stevenson / Jack Stevenson / Toiawaka – signalised intersection (see Appendix);
- Maketu Road – mid-block capacity;
- Ararimu Road / Maketu Road roundabout, and
- SH1 Ramarama Interchange ramps.

6.3.1.1 *Mid-block capacity of routes*

To determine the general capacity of these roads serving the quarry, an analysis has been carried out using the standard procedures set out in the AUSTROADS Guide to Traffic Management Part 3 Transport Study and Analysis ("**AUSTROADS Part 3**"), and in particular,

the procedures and equations provided in Section 6.2.1 – Urban Arterial Roads with Interrupted Flow. This section provides typical mid-block capacities of routes subject to various traffic and access conditions such as adjacent parking lanes or “clearway” conditions. In the case of both Bill Stevenson Drive and Maketu Road between the quarry and the Ararimu Road roundabout the routes are subject to No Stopping At All Times (broken yellow lines) controls along both sides of the route. In this regard the AUSTROAD Part 3 guideline indicates that the one-way, directional capacity of the kerb lane of such routes is approximately 900 passenger car unit (“pcu”) equivalents⁴ or at a 50% proportion of heavy vehicles along the route, a capacity of approximately 600vph per lane. On this basis, the full-width, two-way traffic capacity of each of Bill Stevenson Drive and Maketu Road mid-block sections between intersections is between approximately 1,200 and 1,800 vph (depending on the proportion of heavy vehicles being carried). This capacity is the hourly two-way volume for the carriageway sections providing one travel lane in each direction.

With the latest reported daily and estimated peak hour two-way flows of:

- Bill Stevenson: daily 3,121vpd and estimated peak hour 470vph; and
- Maketu (south of Bill Stevenson): daily 2,657vpd and estimated peak hour 400vph.

it is concluded that both routes are currently operating at only around 33% - 39% of the practical traffic carrying capacity of each of these routes. As such, the current and future natural growth-related traffic volumes associated with all activity within the Drury Quarry site and surrounding parts of the DSP area will remain well within the capacity of these well designed and constructed routes. It is therefore considered that there are no current capacity-related constraints associated with the mid-block sections of these routes and as a result there not expected to be any external adverse traffic effects associated with these mid-block sections of the access routes.

6.3.1.2 Intersection capacity – Bill Stevenson/Maketu

Based on a visual assessment of the traffic flows through this primary intersection serving effectively the entirety of the generated trips to and from the quarry, it is apparent that it has significant reserve capacity. The intersection has been designed and constructed as part of the DSP development programme and provides:

- Separate left and right turning lanes (and associated traffic signal phasing) from Bill Stevenson Drive for turns to the left and right onto Maketu Road (noting that quarrying activity will largely be limited to the left turn lane for movements towards the south and the Ramarama Interchange);
- A dedicated 100m long turn lane on Maketu Road catering for right turns from the south into Bill Stevenson Drive;
- Two through lanes in each direction on Maketu Road, and
- Signalised pedestrian crossings on each of the approaches to the intersection.

⁴ Typically a heavy vehicle such as the quarry-related truck and trailer would have a 2.0 pcu equivalency

A photograph of the Bill Stevenson Drive approach to the signals at this intersection is shown below.



Figure 6: Intersection of Bill Stevenson Drive and Maketu Road (eastern approach)



Figure 7: Intersection of Bill Stevenson Drive and Maketu Road (southern approach)

This intersection has been designed and laid out to specifically cater for the quarrying related activity. It is considered that the intersection is currently operating well below generally accepted key performance indicators during most peak periods of the day and will continue to do so through the life of the proposed Sutton Block. On the basis of the conclusion that there will be no net change in external traffic generation associated with the Sutton Block application compared to what is occurring and expected to occur, there is little or no benefit in undertaking any further detailed analysis to gauge any change in performance.

6.3.1.3 Intersection capacity –Maketu/Ararimu

The intersection between Maketu Road and Ararimu Road is in the form of a high-standard, single circulating lane roundabout. The intersection was upgraded as part of the broader transport network improvements supporting the DSP and surrounding area. As can be seen the roundabout provides connections to and from the Southern Motorway, the DSP and Ararimu Road, as well as a minor connection (on the southern side of the roundabout) providing for movements to and from this property.



Figure 8: Intersection of Maketu Road and Ararimu Road (Image Source: Google Earth)

The southbound off-ramp that can be seen in the upper left-hand corner of the intersection provides a dedicated left turn movement from SH1 onto the Maketu Road northbound lane, while the turning movement from Maketu Road towards SH (both southbound and northbound) are catered for via the single lane approach from Maketu Road and then the single circulating lane through the body of the roundabout and onto the overbridge towards the northbound on-ramp.

On the basis of the flows recorded on Ararimu Road and across the overbridge and on the basis of NZTA's reporting of the ramp flows to and from Southern Motorway, it is considered that a peak period flows of no more than 200vph would be expected to "conflict" with the Maketu Road right turn towards the interchange. A number of international traffic engineering guidelines including AUSTROADS Guide to Road Design Part 4B: Roundabouts (AGR04B-23) and the US Transportation Research Board's Highway Capacity Manual (6th edition) provide estimates of the capacity of an approach based on the circulating or conflict flow past the approach.

In this case, with a conflicting hourly volume of 200vph the Maketu approach could be expected to have a practical capacity in the range of 1000-1200vph. With the quarry-related traffic movements (and considering the results of the detailed capacity assessments along the Bill Stevenson Drive route reported in the Appendix to this report) the generated approach flows to this roundabout would be no more than about 20 - 30% of the available traffic-carrying capacity of this approach, even at the busiest hours.

As with the conclusions reached regarding both the mid-block sections of Maketu Road and Bill Stevenson Drive, and the signalised intersection of Maketu Road and Bill Stevenson Drive, the available capacity of the Maketu Road southbound approach to the Ararimu Road roundabout is not expected to impose any capacity restraints to the operation of the current quarrying activities nor those associated with the Sutton Block proposal. Similar and potentially greater operational capacity would be available for the arrival movements via the SH1 southbound off-ramp and the left turn into Maketu Road, bearing in mind that the southbound off-ramp movements are provided with a dedicated left turn lane into Maketu Road.

6.3.1.4 Intersection capacity –Ramarama Interchange

The grade-separated motorway-standard interchange connection at the Ramarama Interchange enables a high-capacity of traffic movements to and from the SH1 Southern Motorway. Current traffic counts available from NZTA shows that the current peak period flows on both the on- and off-ramps remain with the range of approximately 900 (south facing ramps) and 3,100 vpd (north-facing ramps) meaning that typical peak period flows carried by each ramp is expected to be in the range of approximately 100-300 vph.

As such, the operation of these ramp connections during typical day to day operation when quarry-related vehicles are expected to be moving through the interchange, indicates that the ramp flows represent less than 10-15% of their practical operating capacity. Therefore, the movement of quarry-related vehicles through the Ramarama interchange is not considered to be affected in any way by the capacity performance of the ramps and their connection to the mainline lane.

6.3.1.5 Summary

The transport routes likely to be adopted in service of the Sutton Block proposal are exactly the same as those currently adopted by the transport of materials (and supporting activities) for the existing Drury Quarry pit. As previously identified, there are no resource consent controls or limitations applying to the current operation of this quarry. The capacity assessments undertaken for these transport connections primarily relating to the Bill Stevenson Drive and Maketu Road routes that will serve the Sutton Block operations have confirmed that from a capacity point of view the current and reasonably expected traffic activity along these routes will remain well within the available traffic-carrying capacity of the roads and intersections even at full build-out of the DSP.

Major upgrading of the transport network has been undertaken in support of and delivery of the transport outcomes anticipated by the DSP and associated development in the surrounding area. These improvements by way of high capacity arterial roading, signalised and roundabout intersection forms have taken specific account of the needs of the Drury Quarry activity, including the proposed Sutton Block pit development. Given that the demand for aggregate and operational methods and dynamics of the quarrying activities will largely determine the future volume and intensity of traffic generation associated with either the existing pit or the Sutton Block, it is concluded that there are no transportation network effects that would need to be specifically mitigated as part of the Sutton Block application.

The only potential traffic effect of the Sutton Block operation that will vary from what is operating now, is that the Sutton Block will extend the timeframe over which the Drury Quarry as an overall activity continues to operate. This means that while the magnitude of the effect will remain the same, they will be experienced over a longer period of time. Despite this, it is expected that there will be no change in the ability of this network and the associated connections to the region strategic transport network via the SH1 Southern Motorway (primarily via the Ramarama Interchange) to continue to provide this available capacity into the future.

It is therefore concluded that there are no adverse transportation effects associated with this application that require mitigation beyond the day-to-day operational site and traffic management already applied to the existing pit activities.

7 District Plan Assessment

An assessment of the proposal has been undertaken against the key relevant transport-related standards of the AUP. In broad terms and as has been noted on a number of occasions throughout this report, the Sutton Block proposal will be served by physical transport infrastructure and operational traffic management applying to the existing consent framework applying to the wider Drury Quarry operation.

7.1 Chapter E27 Transport

There are no proposed changes to the existing connection of the quarry site to the existing Bill Stevenson Drive public roadway, hence the compliance with regard to the design and operational standards set out in Chapter E27 Transport (and the most recent changes to these matters brought about through PC79) is achieved by the Sutton Block application. In transportation terms, there are no changes associated with:

- Access to/from Bill Stevenson Drive in terms of access location, reversing activity, width, gradient and formation; and
- Parking – no current AUP requirements other than design matters that are of no relevance to the current Sutton Block application.

There are no specific or general compliance matters with respect to the AUP Chapter E27 transport standards relevant to the current application.

7.2 Chapter H28 Special Purpose - Quarry Zone

Any consent sought for quarrying within the SPQZ (which covers the existing Dury Quarry and majority of the Sutton Block area) is required to be assessed in terms of the transport elements and assessment matters contained within the Chapter H28 relating to the SPQZ. The relevant transport aspects of Chapter H28 are as follows:

“H28.7.2. Assessment criteria

The Council will consider the relevant assessment criteria below for controlled activities:

(1) mineral extraction activities:

(a) traffic and access:

(i) whether the expected traffic generated by the activity appropriately avoids, remedies or mitigates adverse effects on the safe and efficient functioning of the surrounding road network;

(ii) the extent to which entry and exit points to the site are designed to suitably accommodate all traffic movements, and in doing so, avoid, remedy or mitigate disruption to traffic flows on the adjoining road network.”

The assessment contained herein addresses each of these matters from within Chapter H28, and has demonstrated that the planned and constructed road network within the DSP area has been delivered on the basis of catering for the full extent of external transport associated with those activities generated to and from the existing Drury Quarry pit, and broadly replicated by the proposed activity in the Sutton Block.

The main access point to the existing pit and onward connection to the planned Sutton Block has been thoroughly designed and constructed to cater for these volumes of quarry-related truck activity which can be expected in the medium-term future to fall well within the available capacity determined through the various assessments presented in this report and supporting Appendix.

There are therefore considered to be no further or different effects associated with the use of this high-standard connection to Bill Stevenson Drive by the quarrying of the Sutton Block which seeks to extend the life of quarrying within Drury Quarry generally without changes to the FOH and associated processing aspects of the current Drury Quarry site.

8 Conclusion

This report has considered the traffic-related aspects of an application to extend the current quarry operation at the Drury Quarry to ensure continuity of supply of aggregate to service the Auckland region for the foreseeable future. The proposed quarrying activity within Sutton Block will be served by the same external traffic and roading connection to Bill Stevenson Drive, and the same external transport network and infrastructure, and generate a scale and intensity of traffic movements as that occurring (or consented to occur) as a result the existing quarry operation.

A detailed consideration has been made of the adjoining and wider parts of the transport network that would be utilised by traffic associated with the Sutton Block. That assessment has determined that specific account was taken of the current and consented Drury Quarry activity as part of the DSP planning, design and transport network upgrading. Accordingly, those parts of the transport network that would be directly used by vehicles associated with the Sutton Block are provided with sufficient traffic-carrying capacity and have been designed to ensure the safety and operational effectiveness of the quarrying activity while promoting the overall effectiveness and efficiency of the network for all users and visitors to the Drury South area.

Overall, it is considered that the traffic engineering aspects of the proposal are appropriate for the intended use that would be associated with the extension of quarrying activity within the Drury Quarry site and are not expected to result in any operational or safety issues. There are no adverse transportation effects that require additional mitigation beyond those matters that are already subject to existing traffic management plans and procedures.

It is therefore concluded that there are no transportation reasons to preclude acceptance of the Sutton Block application as sought.

Don McKenzie Consulting Ltd.

APPENDIX – Transport Route Capacity Assessment

Introduction

This assessment of the future operating capacity of the transport route serving the Stevenson Drury Quarry has been prepared as part of the Fast-track application for the Drury Quarry Expansion – Sutton Block. It forms part of the preceding Integrated Transport Assessment (“ITA”) in support the Fast-track substantial application to address the broader transport matters associated with the proposed extension of quarrying activities at the site.

Summary

The assessment of traffic-related constraints applying to the operation of the Drury Quarry have identified that the primary constraints are the two signalised intersections of:

- Bill Stevenson Drive and Maketu Road, and
- Bill Stevenson Drive / Jack Stevenson Drive / Toiawaka Road.

Those intersections currently cater (respectively) during the critical weekday morning peak hour traffic movements of 301 vehicle per hour and 274 vph, with current average intersection delays of 21.8 seconds per vehicle at the Bill Stevenson/Maketu Road intersection, and 27.8 seconds per vehicle for the Bill Stevenson/Jack Stevenson intersection. The current peak period traffic activity at these intersections includes approximately 80 - 100 vph of quarry-related heavy vehicles.

Detailed intersection traffic modelling of both of these intersections undertaken using current traffic volumes along the Bill Stevenson Drive route and turning movements at each intersection.

The results of the traffic modelling assessment shows that even assuming a background growth of 50% applied to existing non-quarry traffic (equivalent to an extra 60 – 100 vph during peak periods through the Jack Stevenson and Maketu intersections, respectively), the operational capacity of the critical intersection at Jack Stevenson Drive enables a total of over 1,100 vph to be catered for within acceptable levels of performance. This represents an increase of some 800 vph of quarry-related traffic from that occurring today.

Background and Site Context

Drury Quarry is located on the eastern side of State Highway 1 (“SH1”) Auckland Southern Motorway at Drury South, Auckland. The wider Drury South area surrounding the quarry has (and continues to) experience substantial redevelopment and growth, with the establishment of significant transport infrastructure including a new urban roading network of routes as part of development that has been facilitated by the Drury South Precinct (“DSP”) within the Auckland Unitary Plan (“AUP”). The Precinct incorporates approximately 200ha of land and sits adjacent to (and to the east/northeast of) the Special Purpose Quarry Zone (“SPQZ”) which encompasses the existing Drury Quarry site and much of the proposed Sutton Block expansion area. The

stated objectives of the DSP refer to ensuring that the Drury Quarry and SPQZ operate efficiently and are not unreasonably constrained⁵.

The intended roading network to be developed within and adjacent to the DSP – the structure and form of which has largely been constructed and is now fully operation – makes specific reference and provision for the operation of the Drury Quarry and the associated roading and transport connections.

The most substantial roading elements in relation to the current application have been the establishment of:

- a major east-west arterial standard road previously referred to in the DSP as “New Quarry Access Road” and now named Bill Stevenson Drive extending westwards from the Drury Quarry (via a new entranceway) which connects into other parts of the arterial road system;
- “Spine Road” (now called Maketu Road) is now the primary north-south route through the DSP area which has replaced the primary access function previously provided by Quarry Road, the connection from Great South Road, across the Southern Motorway and into the former access point for the quarry in the north-western corner of the quarry site, and
- Jack Stevenson Drive / Toiawaka Road is the secondary north-south route situated between Maketu Road and the Quarry which lies adjacent to and expands upon the functions of the former alignment of Fitzgerald Road and Ramarama Road through this area.

The overall structure of the roading network and the classified function of the three primary routes to which this memorandum addresses itself is set out in greater detail in the March 2025 ITA supporting the substantive application. In broad terms, the following assessment of transport route capacity in support of the Drury Quarry centres on:

- the section of Bill Stevenson Drive between the Drury Quarry entrance at the eastern end of the road (including the cross-road intersection formed with Jack Stevenson Drive/Toiawaka Road); and
- the current signalised tee-intersection formed with Maketu Road at the western end.

The focus of the following capacity assessment is therefore on the two signalised intersections of:

- Maketu / Bill Stevenson, and
- Bill Stevenson / Jack Stevenson / Toiawaka

This area of consideration along Bill Stevenson Drive and the two signalised intersections (circled in red) are indicated in the following diagram.

⁵ Auckland Unitary Plan I410.2(8), (13)



Figure A1: Subject Area (Source: Google Earth)

Existing Traffic Counts

Daily Traffic Volumes

The following table shows the reported average daily and peak hour mid-block bothways flows for the routes surrounding the site.

Table A1: Traffic Volumes

Location	Date	Average Weekday Volume (vpd)	AM Peak (vph)	PM Peak (vph)
Maketu Road (north of Bill Stevenson Road)	Nov 2022	1,240	100	100
Maketu Road (south of John Main Drive)	Nov 2022	3,680	337	279
Bill Stevenson Road (east of Maketu Road)	Nov 2022	3,120	280	259
Quarry Road (between Maketu Road and Fitzgerald Road)	May 2021	689	287	226
Fitzgerald Road (between Quarry Road and Drury Hills Road)	Sep 2016	1,880	206	157

It is clear from the above data that the routes supporting the Drury Quarry such as Bill Stevenson Drive and Maketu Road are operating well within the normal operating capacity of such routes. Ordinarily, an urban arterial route such as Bill Stevenson Drive (even accounting for the capacity limitations associated with the site access points and vehicle crossings) should be capable of carrying mid-block daily traffic flows of at least 15,000 vpd. As the daily volume data above shows, these routes are currently operating at only around 20-30% of the total mid-block capacity. Further assessment of the intersection capacity will be provided in subsequent sections of this Appendix.

Peak Period Turning Counts

Weekday peak period intersection turning counts were conducted (11 March 2025) at the following intersections along the Bill Stevenson Drive route:

- Bill Stevenson / Maketu
- Bill Stevenson / Jack Stevenson
- Bill Stevenson / Waikura

The surveys were conducted throughout the day between 5.00am and 8.00pm, with the identified peak traffic flows for the AM peak period, and whole of day (surveyed period) counts summarised in **Figures A2 and A3**.

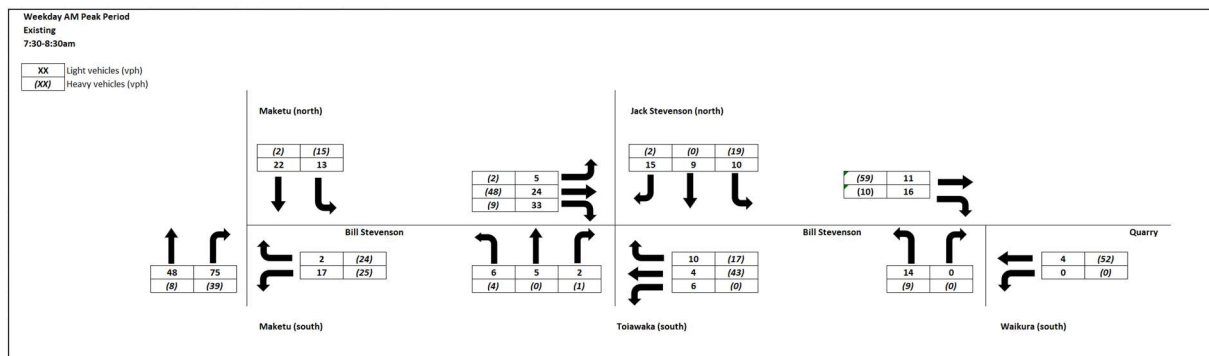


Figure A2: Surveyed Intersection Traffic Counts (AM Peak, 7.30 – 8.30am)

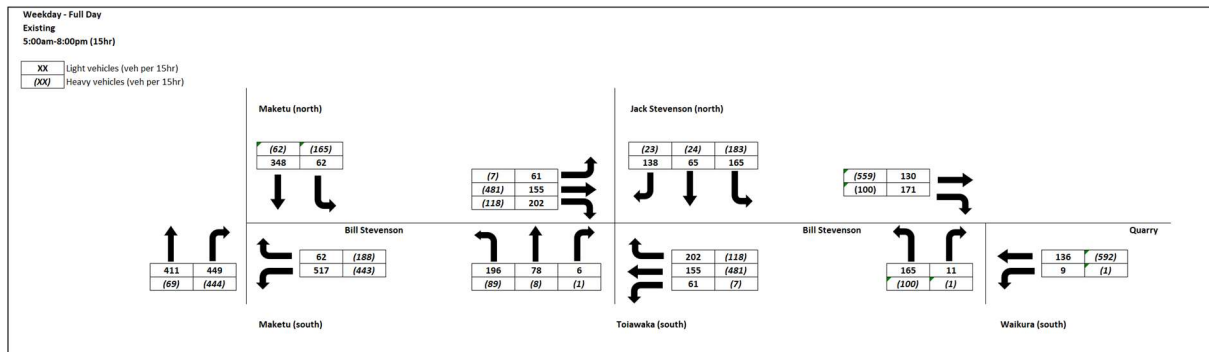


Figure A3: Surveyed Intersection Traffic Counts (Daily Total, 5.00am - 8.00pm (15hr))

These turning counts show the following key features:

- A dominance of turning movement arrivals (especially heavy traffic) approach the Bill Stevenson route eastbound towards the quarry from Maketu Road (south) and from Jack Stevenson Drive (north);
- The reverse movements (i.e. left turn out of Bill Stevenson into Maketu south, and the right turn from Bill Stevenson into Jack Stevenson north) are also demonstrated across the course of the day reflecting departures away from the Drury Quarry;
- Turning movements at the Maketu intersection account for approximately 75% of the total daily (15hr) traffic volumes;
- Of note (albeit somewhat less than the quarry movements) is the frequency of trucks turning into and out of Waikura Road. Current earthworks activity being undertaken

on land adjacent to the Drury Quarry by Drury South Limited (“DSL”). During these peak times, the DSL heavy traffic contributes to approximately 430 truck movements on Bill Stevenson Drive through the course of the day, and

- Turning movements to and from Toiawaka Road at its intersection with Bill Stevenson Drive are generally more modest but reflect the generally busy area of industrial/warehousing premises along this route.

Assessment of Roding and Transport Capacity

Capacity of Roads

The capacity of the roads within the DSP (including the primary Bill Stevenson Drive route used by Quarry traffic) is primarily a function of the mid-block carriageway capacity between intersections. In particular, the number of traffic lanes available at the key intersections that are controlled by traffic signals such as at both Jack Stevenson Drive and Maketu Road has a key influence on the road capacity. Extended sections of single lane carriageway have a similar traffic-carrying capacity to intersections with multiple lanes. The number of vehicles that can travel through an intersection (i.e. its capacity) depends upon a number of factors including the number of heavy vehicles, traffic signals phasing, and conflicting traffic (that largely determines the phasing of the signals and the amount of green-time afforded to the main road). The level of performance or “service” provided to that traffic flow also dictates whether the total maximum capacity can be achieved.

The traffic signals at both intersections along the Bill Stevenson Drive route are monitored and managed via Auckland Transport’s Traffic Operations Centre which automatically adjusts timing of the signals dynamically in response to variable traffic demands and the overall network/corridor operational objectives.

Capacity of Mid-Block Road Sections

To determine the mid-block capacity of Bill Stevenson Drive (between the signalised intersections) a quantified analysis of the current carriageway was completed using industry-standard procedures set-out in the AUSTROADS guidance document “*Guide to Traffic Management Part 3: Transport Studies and Analysis Methods (Edition 4.0, April 2020)*”, (“**AUSTROADS Part 3**”) and in particular, the procedures provided at Section 5.1.1 - Capacity. The primary approach and principle of this capacity analysis method is summarised the following quotation⁶:

“The capacity of a single traffic lane will be affected by factors such as the pavement width and restricted lateral clearances, the presence of heavy vehicles and grades.”

This section goes on to state:

“The capacity of a significant length of a single traffic lane for the prevailing roadway and traffic conditions can be calculated by using the following equation:

$$C=1800 F_w F_{HV}$$

⁶ AUSTROADS Part 3, Section 5.1.1, Factors Affecting Capacity

Where:

C = capacity in vehicles per hour under prevailing roadway and traffic conditions

F_w = adjustment factor for narrow lanes and lateral clearances {see Figure 5.1}

F_{HV} = adjustment factor for heavy vehicles {see Figure 5.2}

The following characteristics of Bill Stevenson Drive are relevant for the analysis:

- a level gradient along the length of the route;
- equivalent 3.5m lanes (plus painted flush median);
- 0.5m sealed shoulder plus landscaped swale drains on the outer edge of the road;
- 60% heavy traffic within the overall traffic stream along Bill Stevenson Drive.

results in the following:

$$C = 1800 \times 0.85 \times 0.63 = 960 \text{ vehicles per hour per lane}$$

On this basis, the full-width two-way traffic capacity for Bill Stevenson Drive is calculated to be approximately 1,920 vehicles per hour.

The AUSTROADS Part 3 guidance goes on to state that in some situations the “ideal” lane flow under perfect conditions of 1800 passenger car equivalents⁷ (“pcu”) per hour can be increased up to 2400 pcu per hour. If this was applied, it would provide for 2,570 vph for Bill Stevenson Drive. However, the 1,920 vph lane flow rate is considered to be a reasonably conservative estimation. In reality, the lane capacity will be at least this figure.

In light of the application of these conservative assumptions, it is considered that the resulting mid-block traffic capacity of Bill Stevenson Drive (between the signalised intersections) is at least 1,920 vph (total bothways flow). On this basis, of the general patterns observed and recorded in the traffic counts presented earlier in this memorandum, shows that the peak hour volume currently carried by the Bill Stevenson Drive route represents approximately 10-11% of the total daily volume (represented by the surveyed volumes between 5.00am and 8.00pm).

Accordingly, applying this ratio to the peak hour mid-block capacity derived above, the daily capacity of the route would be a minimum of at least 19,000 vpd (both ways).

Intersection Capacity Assessment

Existing intersections

The surveys of the existing intersections along Bill Stevenson Drive derived the busiest hourly period for the day of the survey as being between 7.30 – 8.30am. The traffic surveys also identified a busy middle of the day peak (12.30 – 1.30pm). However, the morning peak was selected as representing the more critical traffic demands for the Maketu Road surveyed intersection and is likely to be more critical as the wider area continues to develop over coming years.

⁷ Passenger car equivalents or pcu is a term used in traffic engineering analysis to represent flow rates and volumes of traffic

A diagram of the pattern of activity across the surveyed day for the three intersections recorded in **Figure A4**.

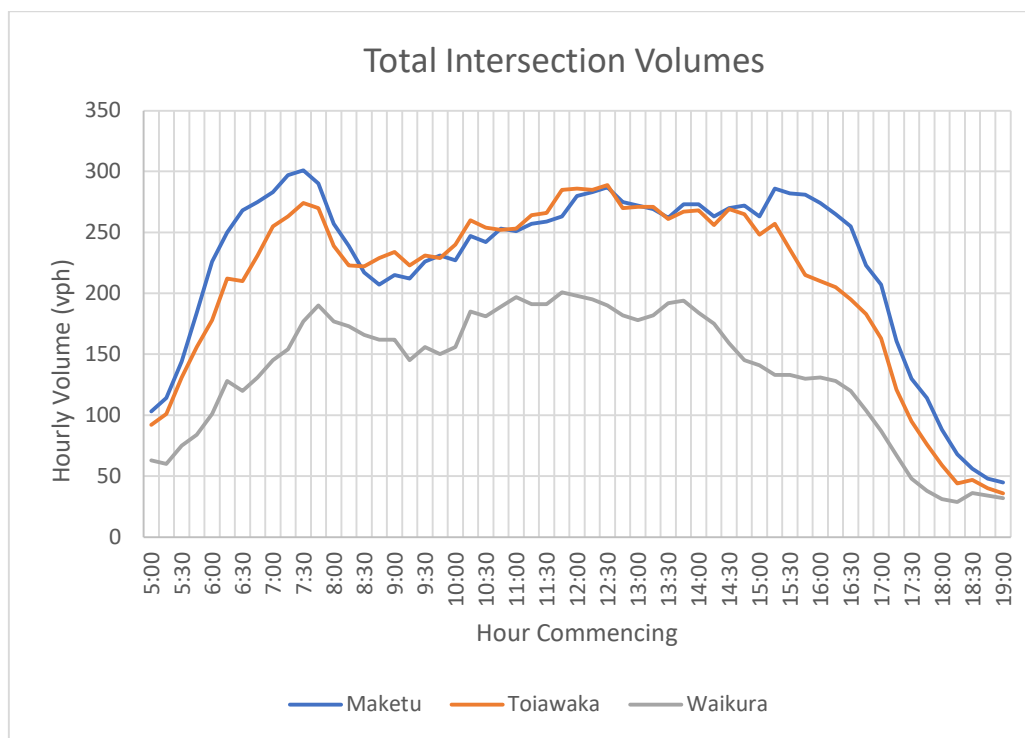


Figure A4: Total Intersection Volumes

In addition to the existing and projected future volumes, and for the purposes of a conservatively over-estimate of effect, a pedestrian crossing demand of 30 pedestrians per hour has been adopted for all approaches of each intersection. However, the surveys undertaken showed very few pedestrians used the intersections.

Existing Quarry Traffic Demands

The traffic survey of the Bill Stevenson Drive route included the two signalised intersection with Jack Stevenson Drive and Maketu Road, as well as the Give Way controlled junction with Waikura Road.

There was observed to be earthworks and site preparation activity occurring within the Drury South Limited land adjacent to the Drury Quarry in Waikura Road generating a notable number and frequency of heavy traffic movements. This is not expected to form part of the background of traffic activity affecting the operation and future capacity of the Bill Stevenson Drive route. Accordingly, these earthworks-related heavy movements to and from the southern leg (Waikura Road) have been excluded from future assessment.

The quarry-related traffic movements from the eastern leg of Bill Steveson Drive were used as the basis for future projection of quarry traffic demand. These quarry-related trips through the other two intersections to the west of Waikura Road have been assessed in proportion to the current flows at each intersection on the assumption that the currently adopted transport routes followed by quarry traffic will be the best indicator of future transport routes. This is considered appropriate given the structure of the roading network in place currently which is not expected to alter dramatically in the foreseeable future.

The light traffic (car) movements recorded on the Waikura Road approach to Bill Stevenson Drive are assumed to be quarry staff/visitors and have been retained in the future projections.

Adjustment for Earthworks on Waikura

The heavy traffic movements surveyed at the Waikura/Bill Stevenson intersection and involving turning right into Waikura Road and the left turn out of Waikura Road are all assessed as being associated with the DSL earthworks activity. These have been discounted from the future analyses (at this intersection and the other intersections to the west).

Other Growth

A 50% future growth factor has been applied to all non-quarry light and heavy movements along Bill Stevenson Drive and Maketu Road to provide an estimation of a future year traffic scenario. The effect of this “global” growth factor has been checked against the future year traffic modelling undertaken by transportation consultants providing the assessment of transport matters in support of the DSL Plan Change 46 application which established the Drury South Precinct within the AUP. The Plan Change 46 Integrated Transport Assessment (“**PC46 ITA**”)⁸ predicted a 2026 daily traffic volume along what was referred to as the New Quarry Access Road (now Bill Stevenson Drive) of 4,900 vpd.

The future volume incorporating the 50% background growth factor plus the specific growth of quarry traffic (that will be discussed shortly), represents a peak hour flow along Bill Stevenson Drive of approximately 800-1,000 vph (bothways) which is equivalent to a daily bothways volume of approximately 10,000 vpd.

For Maketu Road (referred to in both the PC46 ITA and the DSP as the “Spine Road”), the expectation was for a daily volume of approximately 3,500 vpd north of Bill Stevenson Road, and up to 9,100 vpd to the south. The predicted volumes from this current assessment on the basis of the 50% growth factor plus sensitivity testing of quarry volumes, is for daily volumes of approximately 4,000 vpd to the north and 7,000 vpd to the south of the signals at Bill Stevenson Drive.

It is therefore considered that this simplifying approach to traffic growth assumption for the purposes of a broad capacity analysis for the Bill Stevenson Drive corridor is generally consistent with the broad outcomes previously used in other analyses for the area.

Future Tests

The analysis approach to identify the potential future capacity of the two signalised intersections along the corridor has adopted the SIDRA Intersection modelling package that is widely adopted throughout New Zealand (and Australia) to predict the performance levels of the intersections. The acceptable performance levels (to determine capacity to accommodate the additional quarry traffic) is broadly based upon a Level of Service criterion. This is a generalised performance measured (given the values LOS A to LOS E, where LOS A is broadly free flow traffic conditions, predictable travel times and limited or no queuing at intersection, through to LOS E representing poor performance, extending queuing and generally unpredictable travel times). The assessment of acceptable Level of

⁸ “Drury South Industrial Precinct – Plan Variation – Transport Assessment”, prepared by Beca Limited, 12 November 2019

Service for this evaluation has been to ensure that the network continues to operate at a Level of Service D or better (consistent with the general approach taken to transport network planning).

The assessment of capacity proceeded through an iterative application of 100 vph increments on top of current quarry activity, and on the assumption that:

- all quarry-generated traffic was heavy traffic (a mix of truck+trailer and trucks); and
- all quarry-related traffic follows the same distribution as estimated for the current quarry operation

The SIDRA models have been permitted to automatically adjust the traffic signal phasing/timing at each intersection to optimise the operation to suit the traffic demand conditions in each test, reflecting the way in which the current traffic signals would adjust to current day-to-day and hour-to-hour variations in traffic demands.

The level of acceptable performance and operation of traffic facilities including traffic signals generally accepted in traffic engineering and transport planning practise is to ensure that a facility does not operate at “ultimate capacity”⁹ but rather that there is sufficient spare capacity without excessive delays or “flow breakdown” when the volume of traffic experienced is in excess of this ultimate capacity. In this regard, an operational 80% of ultimate capacity is typically adopted as a design parameter.

In the case of the quarry future growth (alongside and on top of other background growth) this means that queues are not expected to be excessive and travel times through the network will be generally predictable (i.e. the majority of traffic queues can clear a set of traffic lights in a single light phase).

The following graphs of intersection performance demonstrate the performance in terms of delay and Degree of Saturation (“DoS”) for the progressive increments of quarry traffic added to existing flows.

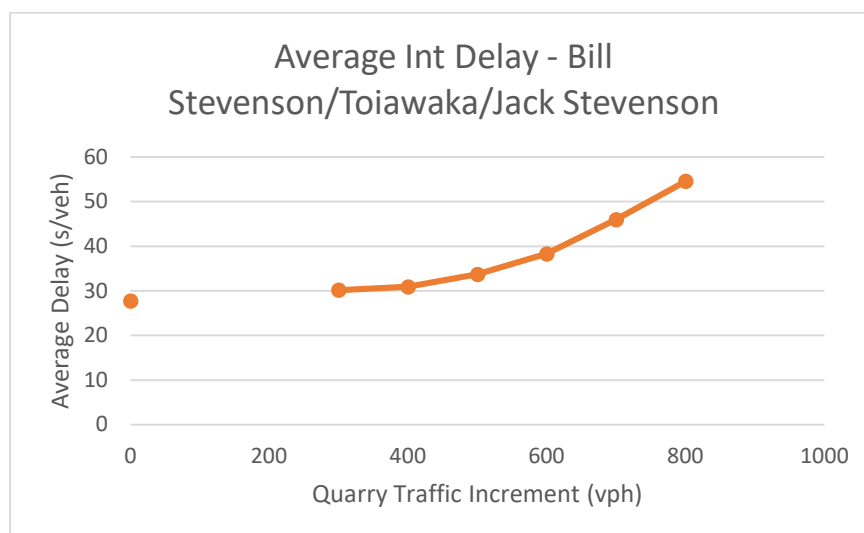


Figure A5: Bill Stevenson/Toiawaka/Jack Stevenson – Average Intersection Delay

⁹ The term Degree of Saturation (“DoS”) is often used to refer to the percentage of saturation (or ultimate capacity) and the value DOS of 0.8 or 80% of ultimate capacity is adopted as a useful target performance level.

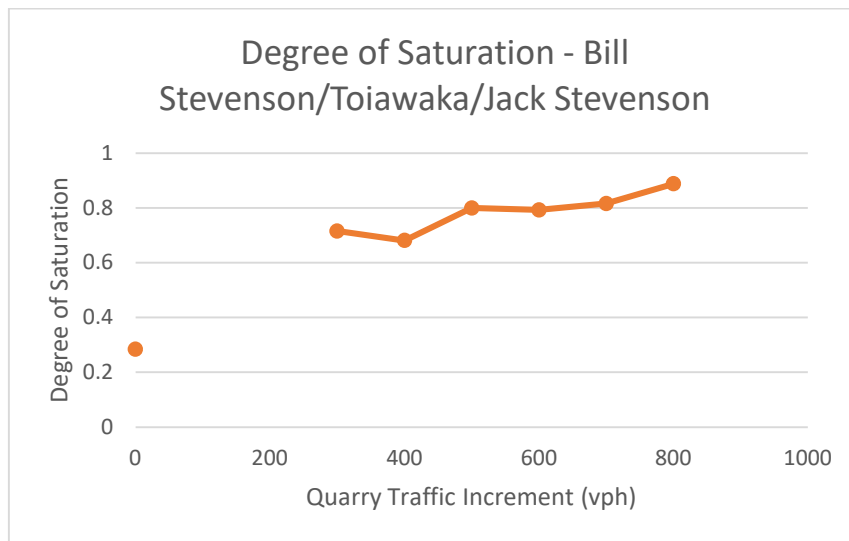


Figure A6: Bill Stevenson/Toiawaka/Jack Stevenson – Degree of Saturation

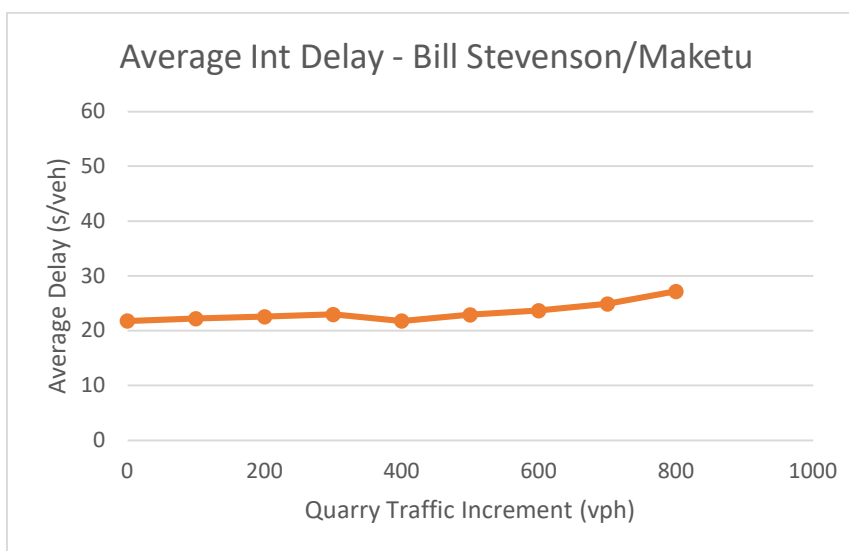


Figure A7: Bill Stevenson/Maketu – Average Intersection Delay

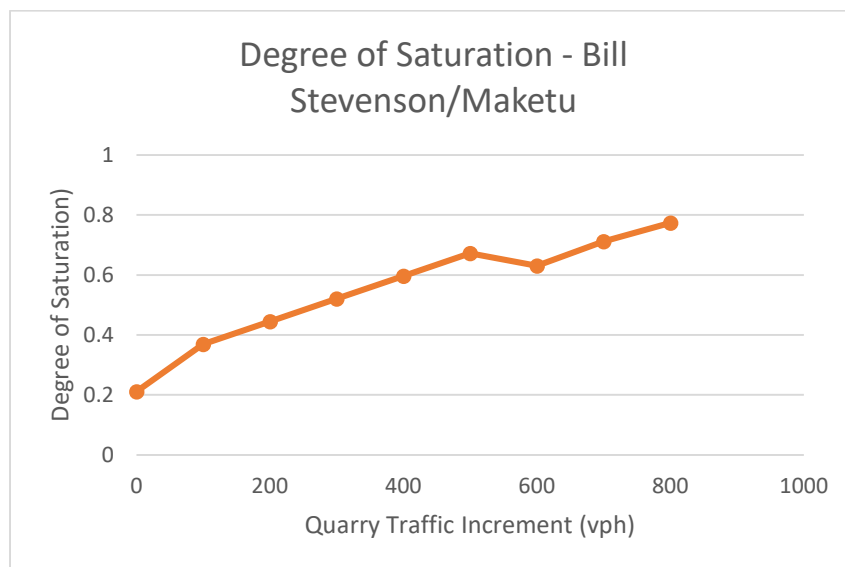


Figure A8: Bill Stevenson/Maketu – Degree of Saturation

Conclusion

As outlined in the above graphs, the Bill Stevenson/Maketu intersection retains sufficient spare capacity due to its greater number of approach lanes and overall capacity to accommodate additional traffic. Even with an increasing DoS ratio in excess of 0.8 of ultimate capacity, the average intersection delay remains relatively constant. In this way, the intersection of Bill Stevenson Drive and Maketu Road is unlikely to impose the capacity restraint for additional quarry-related traffic.

The performance graphs for the Bill Stevenson/Toiawaka/Jack Stevenson intersection meanwhile demonstrate that with increasing DoS levels (especially beyond an additional traffic increment of 600vph), the average intersection delays increase notably. Even with the addition of 800vph on top of current hourly quarry generation of approximately 175vph, the intersection remains able to operate within the target DoS ≤ 0.8 (i.e. 80-% of ultimate traffic-carrying capacity). The average intersection delay of 55 seconds per vehicle at this additional increment 800vph level indicates that additional quarry traffic demands below this point would lead to unsatisfactory performance, added inconvenience to quarry and other traffic, and potentially degradation of the overall traffic environment.

The foregoing assessment therefore indicates that the surrounding traffic environment of Bill Stevenson Drive and accounting for future growth of the surrounding environment 50% higher than currently surveyed, retains sufficient capacity to accommodate at least an additional 800 vph / 8,000 vpd generated by the Drury Quarry (in addition to current traffic movements) while maintaining an appropriate operating performance.