GREY LYNN TUNNEL

CONSTRUCTION TRAFFIC EFFECTS

16th May 2019

Prepared by Commute Transport Consultants

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1. EXECUTIVE SUMMARY

1.1 Watercare Services Limited ("**Watercare**") is the water and wastewater service provider for Auckland. Watercare is proposing to construct a wastewater interceptor from Tawariki Street, Grey Lynn to Western Springs Reserve ("**Grey Lynn Tunnel**"). The Grey Lynn Tunnel will connect to the Central Interceptor at Western Springs.

1.2 This assessment considers that Grey Lynn Tunnel and in particular the shaft site at Tawariki Street ("**Tawariki Street Shaft Site**") can be established with less than minor traffic effects on the operation of the surrounding road and pedestrian network during the works period, provided that the following mitigation measures are generally implemented at the Site:

(a) Where possible, construction truck routes generally follow arterial routes as detailed in the Construction Truck Route Diagram for the Site.

(b) Restrict heavy vehicles to the largest recommended truck size (a 450-tonne portable crane) as shown on the Vehicle Tracking Curve diagrams; and

(c) Implementation of a site-specific detailed Construction Traffic Management Plan.

1.3 With the above measures in place, it is considered that the Grey Lynn Tunnel and the Tawariki shafts can occur with less than minor effects to the surrounding roading network.

2. INTRODUCTION

2.1 Watercare is the water and wastewater service provider for Auckland. Watercare is proposing to construct the Grey Lynn Tunnel a wastewater interceptor from Tawariki Street, Grey Lynn to Western Springs Reserve. The Grey Lynn Tunnel will connect to the Central Interceptor at Western Springs.

2.2 This report provides an assessment of the temporary construction traffic effects and the ongoing operational traffic effects of the Grey Lynn Tunnel and Tawariki Shafts.

2.3 It is considered that the proposed development, as detailed in this report, will have less than minor traffic effects to the function, capacity and safety of the surrounding transport network.

2.4 This report and assessment is submitted to accompany an application for resource consents and a notice of requirement by Watercare for the construction, operation and maintenance of the Grey Lynn Tunnel.

3. PROJECT DESCRIPTION

3.1 The Grey Lynn Tunnel involves the elements shown in the drawings and outlined in more detail in the reports which form part of the application. These elements are summarised as follows.

Grey Lynn Tunnel

3.2 The Grey Lynn Tunnel involves the construction, operation and maintenance of a 1.6km gravity tunnel from Western Springs to Tawariki Street, Grey Lynn, with a 4.5m internal

diameter, at an approximate depth of between 15m to 62m below ground surface, depending on local topography. The tunnel will be constructed northwards from Western Springs using a Tunnel Boring Machine ("**TBM**"). The Grey Lynn Tunnel will connect to the Central Interceptor at Western Springs via the Western Springs shaft site.

Tawariki Street Shaft Site

3.3 The Grey Lynn Tunnel also involves construction, operation and maintenance of two shafts (a main shaft and a secondary shaft) and associated structures at the Tawariki Street Shaft Site.

3.4 The Tawariki Street Shaft Site will be located at 44-48 Tawariki Street, where the majority of the construction works will take place. Construction works will also take place within the road reserve at the eastern end of Tawariki Street and a small area of school land (St Paul's College) bordering the end of Tawariki Street (approximately 150m^2).

3.5 The Tawariki Street Shaft Site will involve the following components:

Main Shaft

(a) A 25m deep shaft, with an internal diameter of approximately 10.8m, to drop flow from the existing sewers into the Grey Lynn Tunnel;

(b) Diversion of the Tawariki Local Sewer to a chamber to the north of the shaft. This chamber will be approximately 12m long, 5m wide and 5m deep below ground, and will connect to the shaft via a trenched sewer;

(c) Diversion of the Orakei Main Sewer to a chamber to the south of the shaft. This chamber will be approximately 10m long, 5m wide and 11m deep below ground;

(d) Construction of a stub pipe on the western edge of the shaft to enable future connections (that are not part of this proposal) from the CSO network;

(e) Construction of a grit trap within the property at 48 Tawariki St to replace the existing grit trap located within the Tawariki Street road reserve. The replacement grit trap will be approximately 16m long, 5m wide and 13m deep below ground;

(f) Permanent retaining of the bank at the end of Tawariki Street to enable the construction of the chamber for the Orakei Main Sewer. The area of the bank requiring retaining will be approximately 44m long, 3m wide and 2m high; and

(g) An above ground plant and ventilation building that is approximately 14m long, 6m wide and 4m high. An air vent in the form of a stack will be incorporated into the plant and ventilation building, and will discharge air vertically via a roof vent. The vent stack will be designed with a flange to allow future extension of up to 8m in total height and approximately 1m in diameter in the unexpected event of odour issues.

Tawariki Connection Sewer Shaft – Secondary Shaft

3.6 A secondary shaft will be constructed at the Tawariki Street Shaft Site to enable the connection of future sewers (that are not part of this proposal) from the Combined Sewers Overflows ("**CSO**") network. This will involve the following components:

(a) A 25m deep drop shaft with an internal diameter of approximately 10.2m; and

(b) A sewer pipe constructed by pipe-jacking to connect the secondary shaft to the main shaft.

Assessment

3.7 This report assesses the transport-related matters of the Grey Lynn Tunnel, including:

(a) A description of the Tawariki Street Shaft Site and its surrounding transport environment;

(b) A description of the key transport-related aspects of the Grey Lynn Tunnel; and

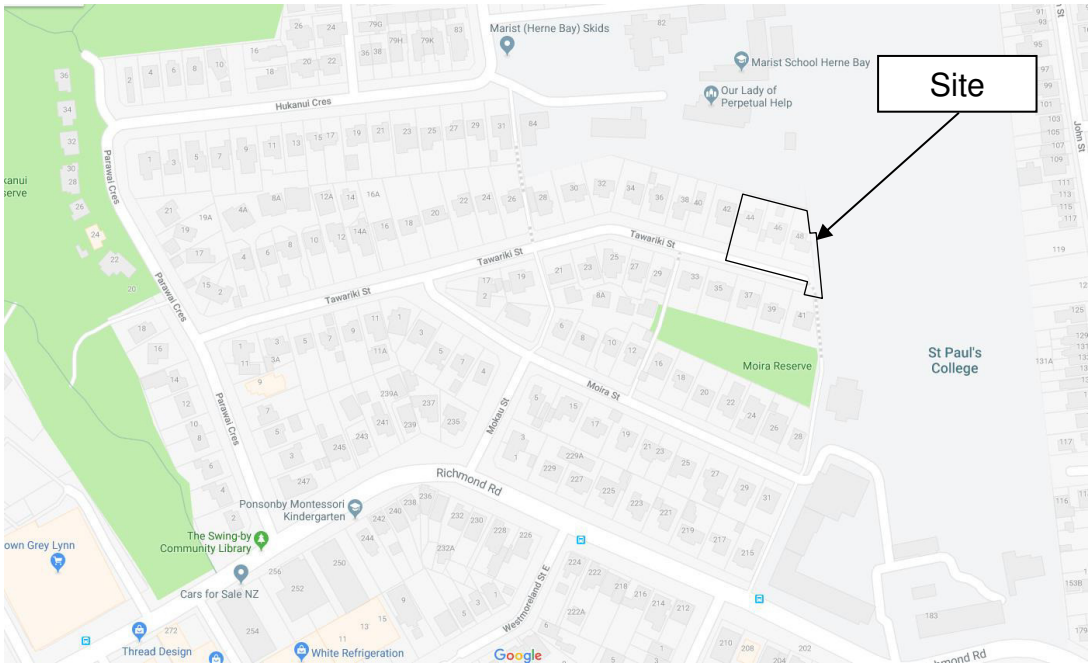
(c) The anticipated effects on the local road network of the construction activities.

4. SITE DESCRIPTION

4.1 The Tawariki Street Shaft Site will be located within the properties at 44-48 Tawariki Street. Construction works will take place within the shaft site and the road reserve of Tawariki Street and a small area of adjacent St Paul's College land.

4.2 Figure 1 below shows the location of the Site in relation to the surrounding road network.

Figure 1: Site Location



4.3 Tawariki Street runs in a general east-west direction and connects to Parawai Crescent at its western end and terminates in a cul-de-sac to the east. Tawariki Street provides for a single traffic lane in either direction with on-street parking provided on both sides of the road near the Site. Pedestrian footpaths are also provided along Tawariki Street near the site.

4.4 Currently the surrounding area of the Tawariki Street Shaft Site is residential in nature, as well as St Paul's College to the east. The posted speed limit in the area is 50km/h.

4.5 Parawai Crescent runs in a general north-south direction and connects to Hukanui Crescent at its northern end and Richmond Road to the south. Parawai Crescent provides for a single traffic lane in either direction with on-street parking provided on both sides of the road. Pedestrian footpaths are also provided along Parawai Crescent near the site. It is noted that traffic islands are located within the carriageway that only allow one-way movement for vehicles to encourage a low-speed environment.

4.6 Moira Street runs in a general east-west direction and connects to Tawariki Street at its western end and to a St Pauls College accessway to the east to the east. Moira Street provides for a single traffic lane in either direction with on-street parking provided on both sides of the road near the site. Pedestrian footpaths are also provided along Moira Street.

4.7 Mokau Street runs in a general north-south direction and connects to Moira Street at its northern end and Richmond Road to the south. Mokau Street provides for a single traffic lane in either direction with on-street parking provided on both sides of the road. Pedestrian footpaths are also provided along Mokau Street near the site.

4.8 It is anticipated that Richmond Road to the south will provide the main route connecting to Tawariki Street. Richmond Road in the vicinity of the Site runs in a general east-west direction and connects to Warnock Street at its western end and Ponsonby Road at its eastern end. Richmond Road provides for a single traffic lane in each direction and is separated by a flush median. Pedestrian footpaths and kerbside parking is also provided along both sides of Richmond Road near the site.

4.9 Figure 2 below details the location of the site in relation to the surrounding transport environment.

Figure 2: Roading Environment

4.10 With reference to the Auckland Unitary Plan – Operative in Part ("**Unitary Plan**"), the site is zoned Residential – Mixed Housing Urban and St Paul's College is zoned Special Purpose – School. The nearby roads (Tawariki Street and Richmond Road) are classified as non-arterial roads under the Unitary Plan.

4.11 Figure 3 below shows the Unitary Plan zoning map.

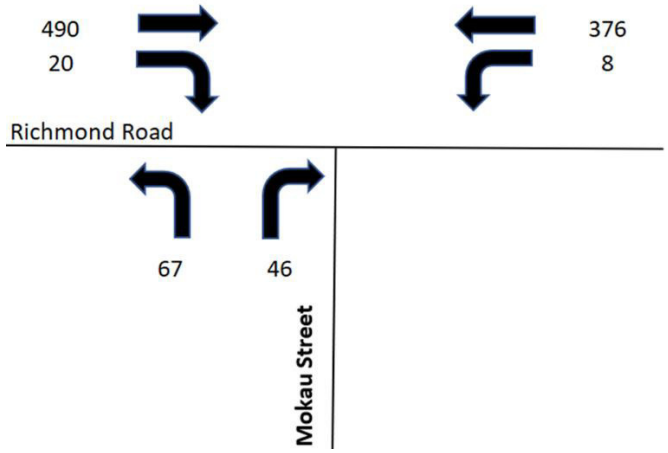
Figure 3: Unitary Plan Zoning Map

5. TRAFFIC VOLUMES

5.1 Traffic data obtained from Auckland Transport ("**AT**") reveals that Richmond Road (between Jessel Street and Cockburn Street) had a 5-day average annual daily traffic (AADT) volume of 13,105 vehicles (two-way) in May 2013. Furthermore, it indicates that the morning peak volume (8.00am) is 1,415 vehicles per hour (vph) and the evening peak volume (5.00pm) is 1,327 (vph).

5.2 A traffic survey of the Mokau Street / Richmond Road intersection was also undertaken on Thursday 15 November 2018 between 2.30pm and 4.30pm (coinciding with the busy period of nearby schools). The evening peak hour movements are shown in Figure 4 below.

Figure 4: Traffic Volumes



5.3 A pedestrian survey was also undertaken on Tawariki Street on Thursday 15 November 2018. This revealed a total of 19 pedestrian movements in the critical peak hour from

2.30pm to 3.30pm (coinciding with the busy period of nearby schools). As such, the local traffic network is considered to feature low pedestrian volumes

5.4 Overall, it is considered that volumes on Richmond Road are typical of an arterial road (as classified in the Unitary Plan) in this location and surveyed volumes on Mokau Street are low, typical of a local road in a residential area. No traffic volumes are available for Tawariki Street, however these are considered to be in the same order as Mokau Street, due to it also being an adjacent non-arterial road (as classified in the Unitary Plan) in the same residential area.

6. ROAD SAFETY ASSESSMENT

6.1 A search of the NZ Transport Agency ("**NZTA**") CAS database has been undertaken for all reported crashes occurring on the entire length of Tawariki Street and Mokau Street, as well as the Tawariki Street / Moira Street, Moira Street / Mokau Street and Mokau Street / Richmond Road intersections for the five-year period from 2013-2017, including all available data for 2018. One crash was identified by the crash search, involving a vehicle on Tawariki Street striking a parked vehicle.

6.2 There is no history of accidents occurring relating specifically to movements into or out of the area of the Tawariki Street Shaft Site nor a pattern of accidents around the Site. The local network is considered to feature a crash record typical of a residential network adjoining an arterial road (Richmond Road), as evidenced by the crash search only identifying one crash in the search area. From the assessment of the crash history, there is no indication of any significant safety concerns from the Tawariki Street Shaft Site.

7. PROPOSED WORKS

7.1 The Tawariki Street Shaft Site will be located within the properties at 44, 46 and 48 Tawariki Street. Access to the site will be from Tawariki Street, via Moira Road and Mokau Street, before connecting to Richmond Road to the south. Figure 5 below details the proposed site works.

7.2 The proposed works detailed above and below in Figure 5 are for works at the Tawariki Street Shaft Site only. The Tunnel Boring Machine works and spoil removal will occur elsewhere, and is detailed in separate reporting.

Figure 5: Proposed Site Works

8. ACCESS AND SIGHT DISTANCE

8.1 Access to the Tawariki Street Shaft Site will be from the eastern end of Tawariki Street. The subject site is detailed in Photograph 1 below:

Photograph 1: Tawariki Street

8.2 Attachment A1 details an 8m truck accessing the Tawariki Street Shaft Site and exiting onto Tawariki Street. It is noted that no specific access points have been developed as yet, and this vehicle tracking is indicative only. The tracking shows than an 8m truck can safely and efficiently manoeuvre to and from the Site via Tawariki Street.

8.3 Attachment A2 details vehicle tracking of a low-loader carrying plant accessing and egressing the Tawariki Street Shaft Site. The vehicle will need to reverse down Tawariki Street to unload plant and materials and, as such, will require specific traffic management during these deliveries. This traffic management should be detailed in the associated site-specific Construction Traffic Management Plan.

8.4 Attachment A3 details vehicle tracking of a 450 tonne portable crane accessing and egressing the site. This vehicle will require specific traffic management during these activities. This traffic management should be detailed in the associated site-specific Construction Traffic Management Plan.

8.5 Attachments A4 and A5 detail vehicle tracking of a 450 tonne portable crane accessing and egressing the site respectively. This vehicle will require specific traffic management during these activities. This traffic management should be detailed in the associated site-specific Construction Traffic Management Plan.

8.6 The speed limit on Tawariki Street east of Moira Street will be lowered during construction (likely to be 30km/h as is in line with standard industry practice), with good sight distances from the Site access available. It is therefore considered that sufficient sight distance is provided for all vehicles access the Site, and effects on residents travel times will be minimal.

8.7 It is recommended that parking on the southern side of Tawariki Street for the length of the proposed site works is removed, to enable vehicles to access and egress these southern properties.

8.8 Parking along the length of Tawariki Street, Moira Street and Mokau Street will be required to be temporarily removed during large vehicle movements (cranes, plant etc.).

8.9 The temporary removal of parking can be achieved through the detailed site-specific Construction Traffic Management Plan approval process. This temporary removal of parking is indicatively shown in Figure 6 below.

Figure 6: Parking Removal

8.10 As detailed in Figure 6, the indicative removal of parking is required for the full project duration, and temporarily during plant delivery. The project duration removal is required to ensure access is provided to the dwellings located on the southern side of Tawariki Street and to allow site vehicle to access and egress the site safely and efficiently.

8.11 Approximately 14 parking spaces are required to be removed for the project duration. It is noted that on-street parking is available on Tawariki Street, Mokau Street and Moira Street nearby, suitable for accommodating residential parking demand in this area. Further, three dwellings will be removed as part of the site works, reducing this parking demand.

8.12 Temporary parking removal will be required when large vehicles are accessing the site. These deliveries will occur infrequently, for only a few hours at a time, and can be scheduled for off-peak times when Tawariki Street is lightly trafficked.

8.13 Overall, given the parking availability on the surrounding streets, the maintaining of property accesses, and the infrequent nature of large vehicle deliveries, the effects on residents and visitors are considered to be less than minor.

9. PEDESTRIAN ACCESS

9.1 Any pedestrian connections affected by the Grey Lynn Tunnel can be mitigated with temporary pedestrian diversions. However, no diversions are expected to be required for the Grey Lynn Tunnel, with pedestrian connections from Moira Street to Tawariki Street and from Tawariki Street to Hukanui Crescent maintained during construction.

9.2 The existing pedestrian connections are considered to be satisfactory to provide safe and efficient movement throughout the local traffic network with the additional construction traffic volumes during the project works.

10. CONSTRUCTION TRAFFIC TRIP GENERATION

10.1 The construction programme will occur in four stages, as detailed below:

(a) Stage 1 – shaft excavation (main shaft and chambers). This will occur over a period of 12 months.

(b) Stage 2 – preparation for TBM arrival at termination point of Tawariki Street Shaft Site. This will occur over several months. Truck volumes will be significantly lower than those generated in Stage 1. Stage 3 – TBM removal and final construction. This will occur over a period of 9 months. Truck volumes are expected to be of a similar or lower level to those generated in Stage 1. The TBM removal will be a one-off event.

(c) Stage 4 - Secondary shaft – This will occur at a later date, over a period of 12 months. Truck volumes are expected to be of a similar level to those generated in Stage 1.

10.2 Based on the information above, Stage 1 is considered the critical stage due to the largest truck volumes expected. The expected Stage 1 and Stage 4 construction truck volumes are detailed below.

Table 1: Anticipated Trip Generation

STAGE	ACTIVITY	VEHICLE TYPE	ASSUMPTIONS	PEAK VEHICLES PER DAY	PEAK MOVEMENTS PER DAY
Stage 1	Shotcrete delivery	6m^3 concrete truck	Total volume of shotcrete at site is 1,280m^3; Intermittent over 2-3week period.	4	8
	Labour	Standard vehicle	Constant duration of project	9	18
	Site supervision	Standard vehicle	As needed	2	4
	Maintenance	3-axle truck	-	1	2
	Rock bolt, soil nail and steel delivery	Semi-trailer truck with flatbed	Intermittent over 2-3 week period and does not occur on the same day as concrete delivery	-	-
	Spoil removal	15m^3 spoil removal truck	Average excavation rate of 400m^3 per day; 6-day work week; Constant for 20 week period	27	54
Total				**43**	**86**

10.3 Approximate traffic generation in Stage 1 and Stage 4:

(a) 22 standard vehicle movements per day.

(b) 64 heavy vehicle movements per day (average of 5 heavy vehicles movements per hour over a 12 hour day).

10.4 In total, it is estimated that the proposed works at the Tawariki Street Shaft Site will generate a maximum of no more than 86 vehicle movements per day during Stage 1 and Stage 4 of the works.

10.5 The additional traffic volumes are well within the capacity of the surrounding roads and are well within the typical hourly fluctuations of the nearby roads. Less than minor effects on the surrounding road network are therefore expected.

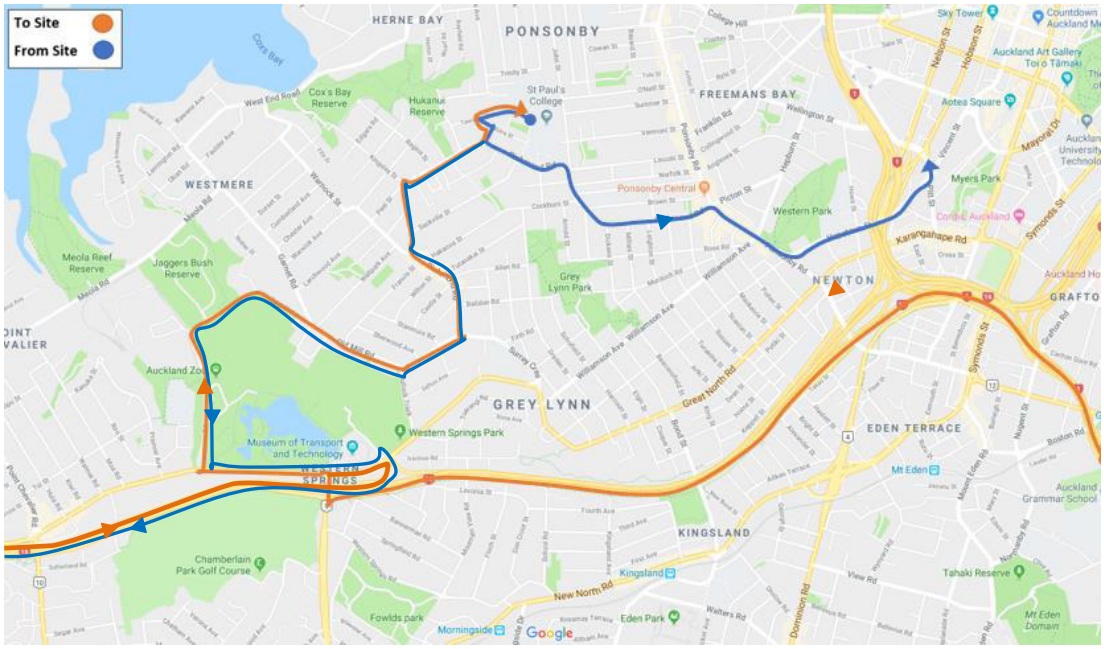
10.6 Accordingly, it is considered that the existing roading environment can cater for the expected temporary truck movements associated with the works in Stage 1 (with detailed traffic management of the Site). It is noted that vehicle movements in the subsequent stages are

expected to be similar to or lower than those in Stage 1, and therefore these volumes are considered to also be readily accommodated by the existing roading environment.

11. CONSTRUCTION TRAFFIC TRUCK ROUTES

11.1 Figure 7 below displays the recommended truck routes between the site and the nearest motorway interchange.

Figure 7: Truck Routes



11.2 These routes have been chosen to minimise heavy vehicles undertaking uncontrolled right turns and maximising the arterial roading network (which are generally more appropriately designed to accommodate large heavy vehicles).

12. TRAFFIC GENERATION DURING OPERATION

12.1 The Tawariki Street Shaft Site is proposed to provide long-term maintenance access to the Grey Lynn Tunnel and as such ongoing maintenance access to part of the Site is required. After construction, the temporary site facilities and access path will be removed, while the residual land will be reinstated. However, it is proposed to have a permanent maintenance access in the same location as the temporary access with a lockable gate. Maintenance vehicles will park on-site. The traffic generation post construction will be limited to regular maintenance of site facilities. It is estimated that traffic generated by the site will normally be one vehicle per month. The access design will be confirmed at detailed design stage.

13. SUMMARY AND CONCLUSIONS

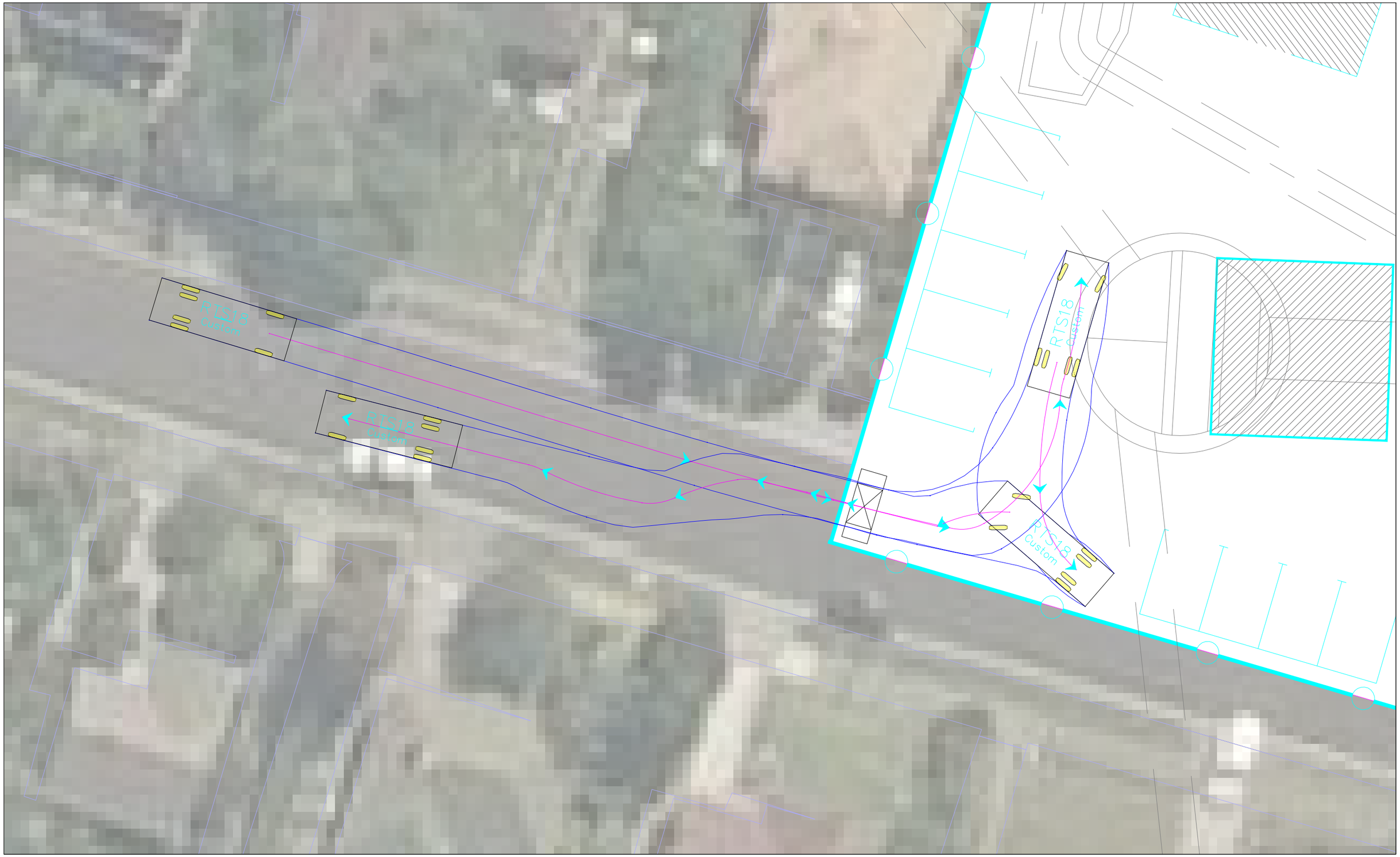
13.1 On the basis of this transport assessment, it is concluded that the Tawariki Street Shaft Site can be established with less than minor traffic effects on the operation of the surrounding road and pedestrian network during the works period, provided that the following mitigation measures are generally implemented at each site:

(a) Where possible, construction truck routes generally follow arterial routes as detailed in the Construction Truck Route Diagram for the Site.

(b) Restrict heavy vehicles to the largest recommended truck size (a 450-tonne portable crane) as shown on the Vehicle Tracking Curve diagrams; and

(c) Implementation of a site-specific detailed Construction Traffic Management Plan.

13.2 With the above measures in place it is considered that the Grey Lynn Tunnel can be constructed and operated with less than minor effects to the surrounding roading network.



Revision notes:		
Rev:	Date:	Notes:

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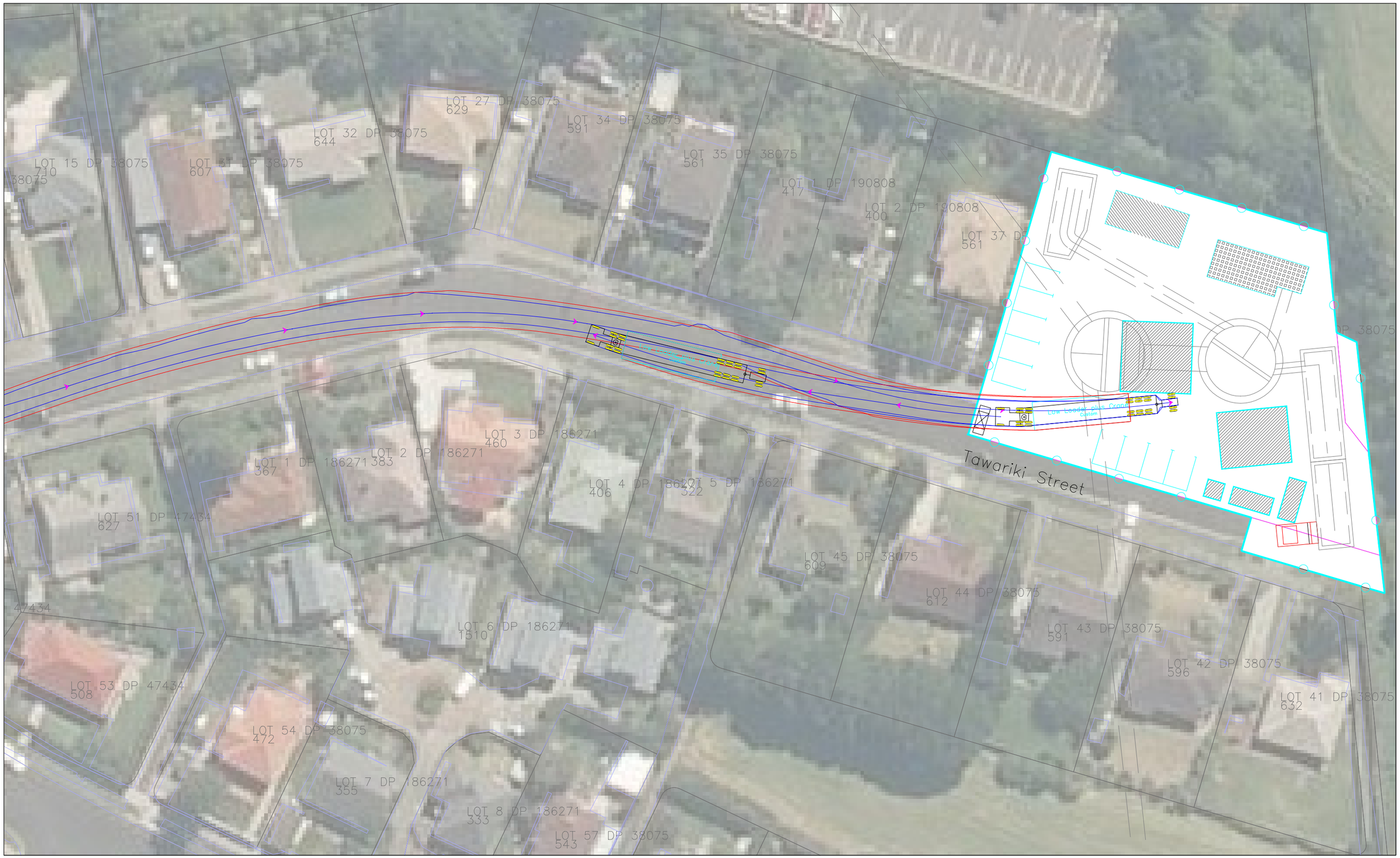
		Revision: A		



Revision notes:

Rev:	Date:	Notes:

Drawn by: JB

Client:

Project: Grey Lynn Tunnel

Drawing Title: Low Loader plus Crane Entry & Exit

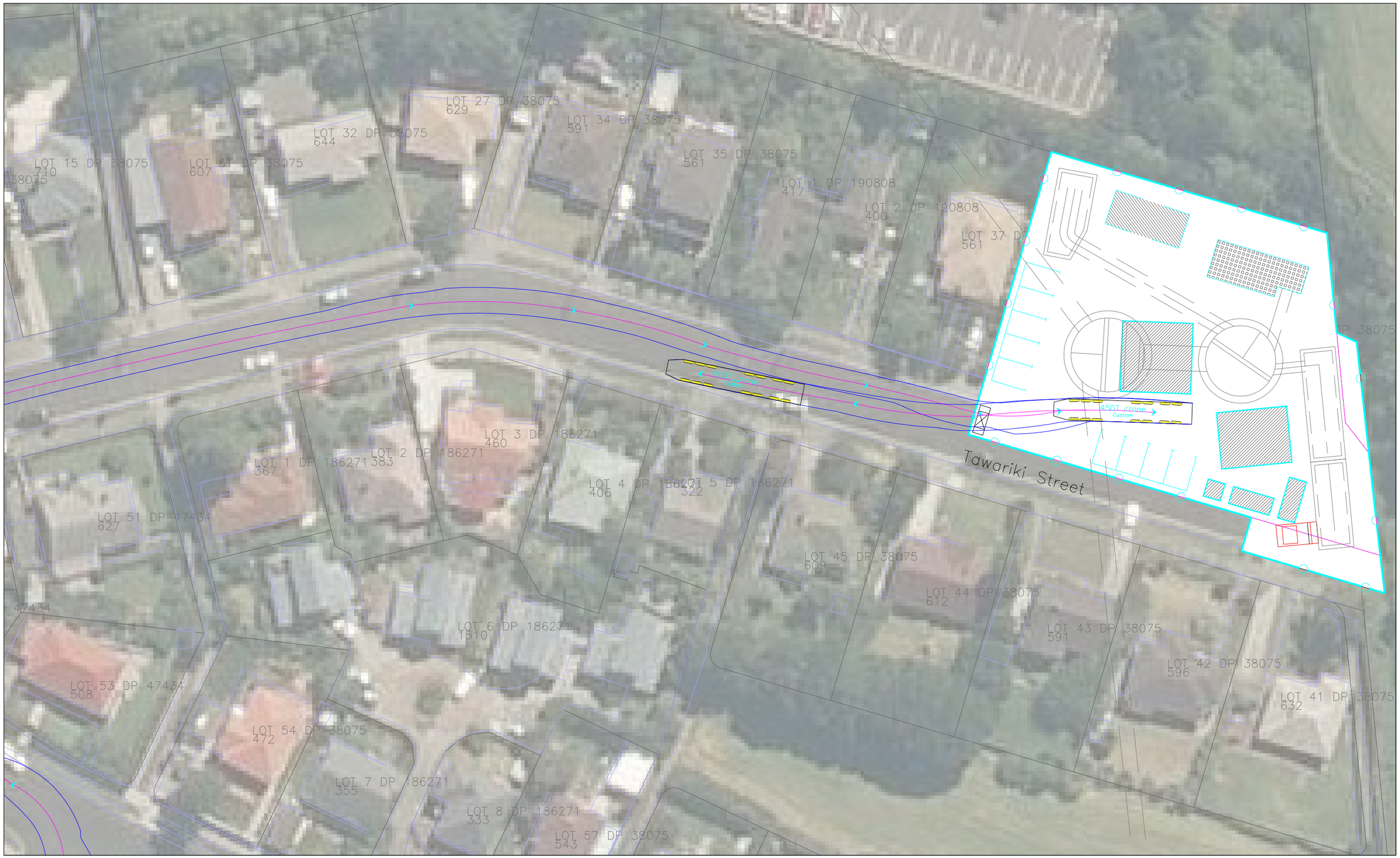
Date: 4 February 2019

Scale @ A3: 1:500

Revision: A

commute TRANSPORTATION CONSULTANTS

Figure: A2



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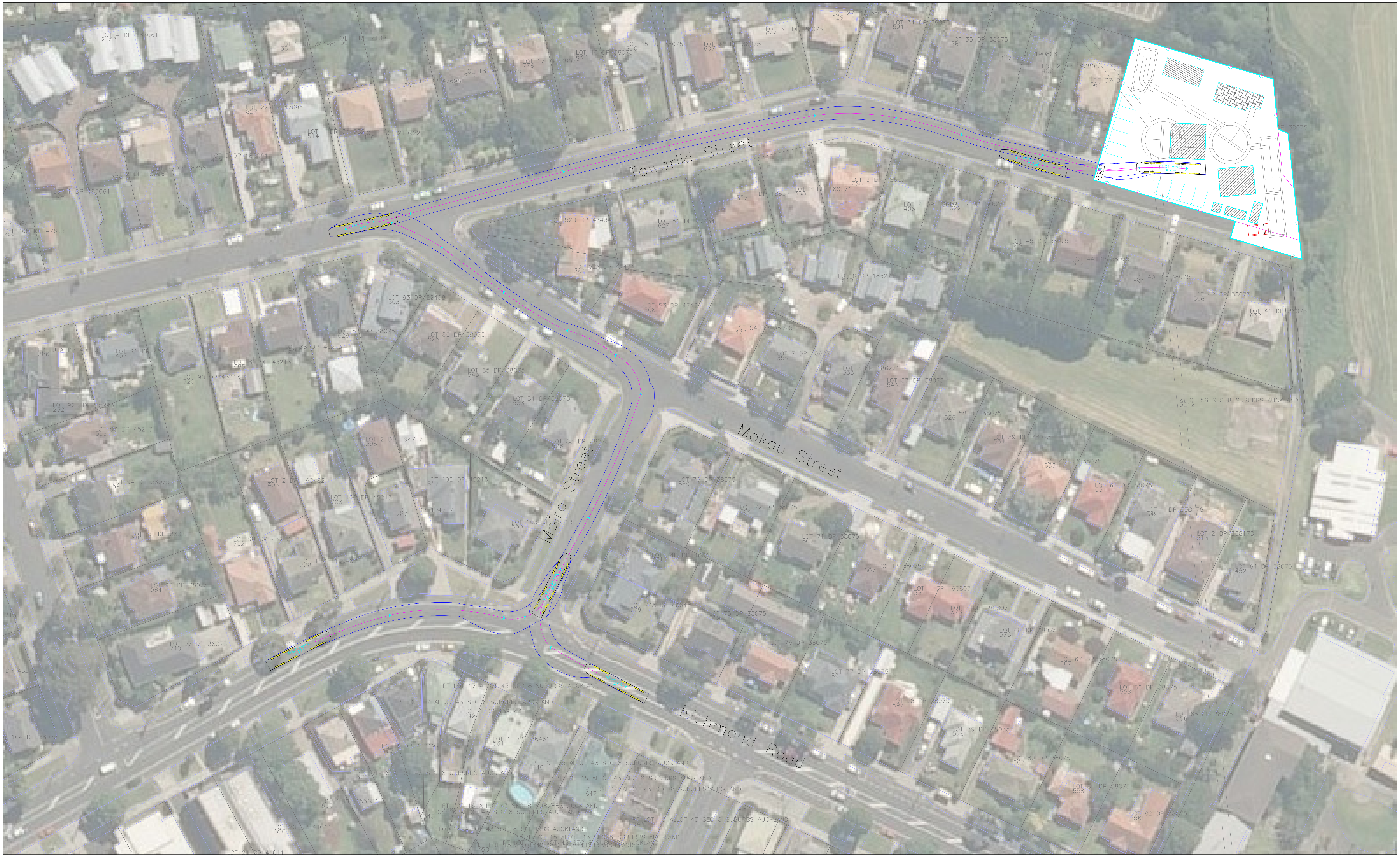
		Revision: A		



Revision notes:		
Rev:	Date:	Notes:

Drawn by: JB

Client:

Project: Grey Lynn Tunnel

Drawing Title: 450t Crane Entry (wide)

Date: 4 February 2019

Scale @ A3: 1:1000

Revision: A

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Figure: A4

Revision notes:

Rev:	Date:	Notes:

Drawn by: JB

Client:

Project: Grey Lynn Tunnel

Drawing Title: 450t Crane Exit (wide)

Date: 4 February 2019

Scale @ A3: 1:1000

Revision: A

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Figure: A5